Cumulative sociodemographic risk, adolescent antisocial behaviour, and the explanatory value of General Strain Theory

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ABSTRACT

Antisocial behaviour during adolescence can have grave consequences for young people, particularly when such behaviour leads to official contact with the criminal justice system. Numerous risk and promotive/protective factors have been identified by researchers. Often these are proximal influences such as individual characteristics or relationships with parents which have a strong, direct, and mostly immediate effect on outcomes. While the ways in which proximal factors influence antisocial activity are quite well established, a much smaller body of literature within Criminology (as well as associated fields such as Health), demonstrates that broader sociodemographic contexts also impact adolescent lives. These distal factors include contextual risks such as neighbourhood of residence, family SES, and cultural background. It has been difficult to establish in empirical research that the strong statistical relationship between structural characteristics such as social class and delinquency/crime can also be a direct relationship. Instead, the literature suggests that sociodemographic factors have an interactive and/or mediated effect on adolescent experiences, especially through effects on family functioning and parenting capabilities, the positive effects of which tend to be undermined by poverty and social exclusion. Testable theory-based models of the moderated mediation pathways of environmental and structural contexts are not particularly common in the literature on adolescent antisocial behaviours.

The aim of this research is to explore how broad sociodemographic contexts affect adolescent involvement in antisocial behaviours. In line with biocological theory, I posit that distal or macro variables related to environmental and social structural contexts affect proximal processes in a number of ways that lead to increases in the likelihood of antisocial activities. Because General Strain Theory (GST) proposes that strains increase the likelihood of crime due to the negative emotions which they evoke, I
have adopted GST as an explanatory framework which is suitable for constructing and testing a moderated-mediation model for youth antisocial behaviours.

Central to this thesis is the notion of *cumulative sociodemographic risk*. Risk factors tend to co-occur, and many adolescents are subjected to an accumulation of risks experienced simultaneously. Cumulative risk research has demonstrated that the likelihood of poor outcomes increases markedly as more and more risks co-occur. The literature on this phenomenon most often uses indices that count the number of risks experienced, with risks that are drawn from different domains, including individual, family, and social-structural grouped together. While this is useful to examine how increased risk exposure is related to outcomes, such an approach makes it difficult to explore the specific processes through which structural or sociodemographic stressors operate. I addressed this gap in the literature by constructing a cumulative index of risks related *only* to structural or social-environmental factors.

I sourced data from 524 Australian youths aged 13 to 18 who responded to social media advertisements for participation, or who were registered with organisations providing rewards for survey completion. In order to ‘oversample’ adolescents likely to be exhibiting antisocial involvement, a subset of the study participants \( n = 62 \) was made up of adolescents already exhibiting problematic behaviours and/or experiencing difficulties of some kind, to a level requiring assistance, resulting in them either being in contact with a Youth Service Agency, or attending an alternate schooling program.

All participants completed a self-report survey that collected information on individual attributes (self-control, prosocial beliefs, empathy), emotional wellbeing (self-esteem, self-worth, life satisfaction, depressed feelings), social ties (social acceptance, school membership) and parenting relationships (parental attachment, knowledge, monitoring and availability). Antisocial behaviour of both self and friends
during the previous 12-months was assessed using the 24-item scale utilised in 2006 in the Australian Healthy Neighbourhoods Study. This scale was adapted for Australian participants from the Communities That Care Youth Survey. Items in this scale assess antisocial behaviours, engagement in risk taking behaviours (such as drug and alcohol use) and deviant/criminal behaviours (such as truancy, theft, physical violence). With the influence of structural background characteristics being a key question in this study, information was also collected on several demographic and contextual variables. From this information participants were assigned cumulative sociodemographic risk scores ranging from 0 to 12, based on reported family size, family mobility, family structure, socioeconomic status, neighbourhood of residence, and Indigeneity. These scores were used to categorise youths as vulnerable or not vulnerable due to cumulative sociodemographic risk.

As is frequently the case with data on antisocial behaviours, particularly where it consists of a count of antisocial acts, issues arose in relation to the modelling of a highly skewed outcome variable with an excess of zero values. I undertook an extensive investigation of suitable statistical approaches for highly skewed count data, including an in-depth exploration of model fit as a means of determining the optimal statistical distribution for my measure of antisocial behaviour. Consistent with much of the criminological literature in this area, a Negative Binomial Regression model (NBRM) was identified as the ‘least-worst’ solution, based simultaneously on statistical, theoretical, and practical considerations.

As the notion of cumulative sociodemographic risk is relatively novel in the criminological literature, this aspect of the research was largely exploratory in nature. I aimed to present a picture of what constitutes cumulative sociodemographic vulnerability, how this phenomenon affects the lives of adolescents, and whether, why,
and how it is related to an increased likelihood of antisocial behaviour. In exploring the ‘how’ I was particularly interested in the explanatory value of GST. I structured the overall investigation of these issues through three research questions:

1. **How does cumulative sociodemographic risk influence adolescent lives?**

   In responding to this question, I identified risk, promotive, and protective factors for poor youth outcomes according to cumulative sociodemographic vulnerability, thus providing insight into how cumulative sociodemographic risk affects individual attributes as well as proximal processes for male and female adolescents. Socio-demographically vulnerable youths exhibited lower levels of factors which research suggests should act protectively, including the individual characteristics of self-control, empathy, and prosocial beliefs, as well as lower levels of life satisfaction and school membership. In addition, sociodemographic vulnerability increased the likelihood of interaction with other adolescents who were also behaving antisocially, a known risk factor for antisocial involvement.

   Cumulative sociodemographic risk was associated with higher likelihoods of engaging in antisocial activities for both male and female adolescents. Socio-demographically vulnerable males (but not females) were also significantly more likely to use illicit substances and alcohol than their not-vulnerable counterparts. Vulnerable adolescents were more likely than non-vulnerable adolescents to engage in all categories of antisocial activity. The greatest differences in participation rates were observed for more serious offending, namely automotive crime, property crime, assault, and substance use, in contrast to acts of minor delinquency including truancy, shoplifting and stealing money.
2. Do predictors of adolescent antisocial behaviour differ according to cumulative sociodemographic risk status?

Model fit analyses suggested that predictors of adolescent antisocial involvement during the previous year were best investigated utilising a hurdle model. My hurdle model first involved a logistic regression to determine predictors of absence/presence of antisocial behaviour, and then a truncated negative binomial regression to determine predictors of the extent of antisocial behaviour amongst those youths who reported some antisocial activity.

The hurdle model analyses showed that cumulative sociodemographic vulnerability was related to differences in predictors of the absence/presence of antisocial behaviour. Specifically, while several individual and parenting characteristics predicted antisocial involvement for not-vulnerable adolescents, exposure to peer antisocial behaviour and the extent of sociodemographic risk overwhelmed other predictors of antisocial involvement for vulnerable youths. I found greater commonalities between vulnerability groups for predictors of the extent of antisocial behaviour for youths reporting some antisocial activity, with peer antisocial behaviour and parental monitoring being the strongest predictors. These findings suggest that while antisocial activity (particularly its extent) might be reduced for all youths through increased monitoring and reduced contact with antisocial peers, participation (vs non-participation) in antisocial behaviour amongst vulnerable adolescents is most strongly influenced by the extent of their vulnerability — something which is beyond the immediate control of these youths and their families, or prevention scientists.
3. Can the relationship between cumulative sociodemographic risk and adolescent antisocial behaviour be explained with a General Strain Theory (GST) model?

Given the lack of theoretically based explanations for the impact of cumulative socioeconomic disadvantage on adolescent antisocial behaviour, I tested the applicability of a General Strain Theory (GST) model. This model included mediation of cumulative sociodemographic risk on adolescent antisocial behaviour through affective responses to sociodemographic strain. Two affective mediators of strain were tested. The first, depressed feelings, has shown mixed success as a mediator in previous strain research. The second, life satisfaction, has not previously been explored in the strain literature, but was considered to be an appropriate affective mediator due to its ability to capture a wide range of affective responses, thus reducing the likelihood of gender effects. Of these two mediators, only life satisfaction was found to be significant, partially mediating the relationship between cumulative risk and antisocial behaviours.

In an extended moderated mediation model, I found several interactions that were consistent with predictions based on GST. Strong parenting relationships, better emotional wellbeing, and bonds with school acted protectively to reduce the effects of strain (cumulative sociodemographic risk) as well as the affective consequences of experiencing strain (life satisfaction). However other significant moderators did not fit with GST, with some findings suggesting that the possibility of reciprocal relationships over time should be tested using longitudinal data. Despite these inconsistencies, the pattern overwhelmingly revealed through the modelling was that the magnitude of the positive effects of factors that should be protective for adolescents reduced as levels of cumulative risk increased.
Conclusion

While society emphasises personal accountability in relation to youth offending, it is clear that environmental and structural contexts, which are beyond immediate control, have a powerful effect on adolescent lives. Cumulative sociodemographic risk increases the likelihood of experiencing more risk factors and fewer protective factors. Adolescents who are socio-demographically vulnerable not only engage in more antisocial acts, they participate in more serious delinquent behaviours. The extent of sociodemographic disadvantage is the strongest predictor of this antisocial involvement. Factors which act protectively in reducing the impact of the strain of disadvantage on the extent and seriousness of antisocial behaviour have reduced effects as cumulative sociodemographic risk increases. The influence of cumulative sociodemographic risk is pervasive and all-encompassing, suggesting that it should be more carefully measured and modelled in future criminological research.

Some limitations are acknowledged in this research, most notably the use of cross-sectional data which has prevented the investigation of time-order in relationships between variables. Statistical issues in regard to the problematic nature of a highly skewed dataset have been addressed to the greatest extent possible within the bounds of a PhD study that is not primarily statistical in nature, but it is clear that further investigation using advanced analytic procedures is possible and desirable.

Despite these limitations, the findings reported in this thesis have important implications for preventing and responding to youth antisocial activity. While there is much that can be done using data-driven, evidence-based strategies to tackle antisocial behaviour during the adolescent period, without some attention to the effects of structural and contextual factors these approaches are likely to fall short of their full potential. Further research is necessary to better understand the processes through
which cumulative sociodemographic disadvantage affects adolescents, and the factors that are most influential in reducing its impact. Such understanding will facilitate the development of realistic and effective countermeasures for youths at the ‘sharp end’ of structural social inequality.
Statement of Originality

This work has not previously been submitted for a degree or diploma in any university.

To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

Lisa Thomsen
CONTENTS

ABSTRACT iii
LIST OF TABLES xix
LIST OF FIGURES xxi
ACKNOWLEDGEMENTS xxv

CHAPTER 1: ADOLESCENT ANTISOCIAL BEHAVIOUR
1.1 Thesis Overview 1
  1.1.1 Thesis Outline 2
  1.1.2 Gaps in the Literature 5
1.2 Introduction- Adolescent Antisocial Behaviour 5
1.3 Poor Outcomes during Adolescence 7
  1.3.1 Prevalence of Adolescent Antisocial Behaviour 7
1.4 Summary 12

CHAPTER 2: PROXIMAL RISK, PROMOTIVE AND PROTECTIVE FACTORS
2.1 Introduction 13
2.2 Risk, Promotive and Protective factors 14
  2.2.1 Risk Factors 15
  2.2.2 Promotive and Protective Factors 15
  2.2.3 Individual Characteristics 18
  2.2.4 Emotional Wellbeing 21
  2.2.5 Family Functioning 27
  2.2.6 Social Influences 30
2.3 Summary of Proximal Risk, Promotive and Protective Factors 35

  xiii
CHAPTER 3: SOCIODEMOGRAPHIC RISK FACTORS AND CUMULATIVE RISK

3.1 Introduction

3.2 Sociodemographic Risk Factors
  3.2.1 Family Size
  3.2.2 Family Structure
  3.2.3 Family Mobility
  3.2.4 Neighbourhood
  3.2.5 Socioeconomic Status
  3.2.6 Summary of Sociodemographic Risk Factors

3.3 Multiple Risk
  3.3.1 Cumulative Risk
  3.3.2 Multiple Risk during Childhood
  3.3.3 Multiple Risk during Adolescence
  3.3.4 Protective Factors for Multiple Risk
  3.3.5 Cumulative Sociodemographic Risk
  3.3.6 Summary of Multiple Risk

3.4 Summary of Cumulative Sociodemographic Risk

CHAPTER 4: THEORETICAL FRAMEWORKS

4.1 Introduction

4.2 Ecological Systems Theory
  4.2.1 The Need to Consider Context
  4.2.2 Ecological Systems Theory and Cumulative Sociodemographic Risk

4.3 General Strain Theory
  4.3.1 Mediators of Strain
  4.3.2 Moderators of Strain
  4.3.3 General Strain Theory and Cumulative Sociodemographic Risk

4.4 Summary of Theoretical Frameworks
CHAPTER 5: METHODOLOGICAL ISSUES WITH COUNT DATA
5.1 Introduction 143
5.2 Issues with Modelling Count Data 143
5.3 Analytical Responses to Problematic Count Data 149
  5.3.1 Transformations into Categorical or Binary Variables 149
  5.3.2 Logit, Tobit and Probit models 150
  5.3.3 Arguments against the use of Categorical and Binary Variables 152
5.4 Alternative Models for Count Data 153
  5.4.1 Poisson Regression 153
  5.4.2 Negative Binomial Regression 156
  5.4.3 Zero-inflated Models 158
5.5 Selecting an Analytical Strategy 161
5.6 Summary of Methodological Issues with Count Data 162

CHAPTER 6: STUDY METHODOLOGY
6.1 Introduction 164
6.2 The Youth Experience Study 165
6.3 Measurement of Variables 165
6.4 Instrumentation 168
  6.4.1 Outcome Variable - Antisocial behaviour 168
  6.4.2 Individual Variables 169
  6.4.3 Emotional Wellbeing Variables 171
  6.4.4 Parenting Variables 175
  6.4.5 Social Variables 177
6.5 Participants 179
  6.5.1 Recruitment 179
  6.5.2 On-line Study Participants 179
6.5.3 "At-risk" Study Participants 183
6.6 Data Screening and Preparation 186
6.6.1 Missing Values 186
6.6.2 Data Screening 188
6.6.3 Characteristics of the Final Sample 189
6.7 Creating a Cumulative Sociodemographic Risk Index 189
6.7.1 Identifying Vulnerable Adolescents 189
6.7.2 Factors used to create a Cumulative Sociodemographic Risk Index 194
6.7.3 Cumulative Risk Scores 199
6.8 Research Plan 216
6.8.1 Gaps in the Literature 216
6.8.2 Research Questions 218

CHAPTER 7: MODEL SELECTION

7.1 Introduction 220
7.2 Modelling Count Data 222
7.3 Statistical Assessment of Model Fit 223
  7.3.1 Model Fit across Alternate Distributions 226
7.4 Theoretical and Practical Considerations 230
  7.4.1 Identifying the Source of Excess Zeroes 230
  7.4.2 Sources of Excess Zeroes in the Dataset 232
7.5 Improving NBRM Model Fit 233
  7.5.1 Classification Tree to Remove ‘True’ Zeroes 233
  7.5.2 Hurdle Model 239
7.6 Summary of Model Fit Chapter 241
CHAPTER 8: THE IMPACT OF SOCIODEMOGRAPHIC VULNERABILITY DURING ADOLESCENCE

8.1 Introduction 244

8.2 Whole Sample Descriptive Statistics 246
  8.2.1 Correlations between Variables 248

8.3 The Impact of Sociodemographic Vulnerability on Adolescents 249
  8.3.1 Risk, Promotive and Protective Factors 250
  8.3.2 Antisocial Involvement 256

8.4 Predictors of Antisocial Involvement according to Sociodemographic Vulnerability 267
  8.4.1 Predictors of Absence or Presence of Antisocial Involvement 270
  8.4.2 Predictors of Extent of Antisocial Involvement 275
  8.4.3 Hurdle Model using Alternate Measure of Peer Pro-sociality 276
  8.4.4 Classifying Risk and Protective Factors for Adolescent Antisocial Behaviour 279

8.5 Summary of Impact of Sociodemographic Vulnerability on Adolescent Experiences and Outcomes 286

CHAPTER 9: THE APPLICABILITY OF GST IN EXPLAINING THE RELATIONSHIP BETWEEN CUMULATIVE SOCIODEMOGRAPHIC RISK AND ANTISOCIAL BEHAVIOUR DURING ADOLESCENCE.

9.1 Introduction 290

9.2 Moderated Mediation Model of Strain 291
  9.2.1 Assessing Moderated Mediation in a Negative Binomial Model 293

9.3 Method 294

9.4 Results 297
  9.4.1 The Mediation Model 297
  9.4.2 Moderated Mediation Models 299
  9.4.3 First-stage Moderators of the Mediated Relationship between Cumulative Risk and Antisocial Behaviours 301
9.4.4 Moderators of both the Mediation Pathway between Cumulative Risk and Life Satisfaction, and the Direct Effect between Cumulative Risk and Antisocial Behaviour

9.4.5 Second-stage Moderators of the Mediated Relationship between Cumulative Risk and Antisocial Behaviours

9.5 Summary of GST Moderated Mediation Model

9.5.1 Individual Characteristics as Moderators
9.5.2 Parenting Relationships as Moderators
9.5.3 Social Relationships as Moderators
9.5.4 The Utility of GST in Explaining the Relationship between Cumulative Sociodemographic Risk and Adolescent Antisocial Behaviour

CHAPTER 10: DISCUSSION
10.1 Introduction
10.2 Why Sociodemographic Risk and Positive Adolescent Development
10.3 Aims of the Study
10.3.1 Exploring Methodologies for Modelling Count Data
10.3.2 Exploring the Influence of Cumulative Sociodemographic Risk
10.3.3 The Utility of a GST Model to explain Cumulative Sociodemographic
10.4 Limitations
10.5 Suggestions for Further Research
10.6 Conclusions

REFERENCE LIST
LIST OF TABLES

Table 6.1 Variables measured through the Youth Experience 168
Table 6.2 Exposure to the Youth Experience Study as reported by advertised study 182
Table 6.3 On-line participants recruited through advertising by age and 182
Table 6.4 On-line, paid participants by age and 183
Table 6.5 Sources of at-risk 185
Table 6.6 Combined at-risk participants by age and 185
Table 6.7 Final Sample 189
Table 6.8 Allocation of risk points and risk category 211
Table 6.9 Cumulative risk index scores 212
Table 6.10 Correlations between cumulative risk, sociodemographic risk factors, and antisocial behaviours 214
Table 6.11 Cumulative Sociodemographic Vulnerability by age, gender and recruitment 216
Table 7.1 Summary of model fit 228
Table 7.2 Predicted and actual 229
Table 7.3. Model fit following removal of true 236
Table 7.4. Improved fit of hurdle 240
Table 8.1. Means and standard deviations- Whole 247
Table 8.2 Correlations between key 249
Table 8.3 Mean differences according to sociodemographic 251
Table 8.4 Mean differences according to sociodemographic vulnerability and 252
Table 8.5 Mean differences according to vulnerability and gender: Antisocial behaviours 259
Table 8.6 Eigenvalues and variance accounted for by components 262
Table 8.7 Pattern coefficients and communalities of 263
Table 8.8 Antisocial acts during the past year by vulnerability and 264
Table 8.9 Hurdle model for adolescent antisocial 268
Table 8.10 Hurdle model for adolescent antisocial behaviour with Cumulative Risk...

Table 8.11 Proportion of absence or presence of antisocial behaviour for vulnerable and not-vulnerable adolescent groups

Table 8.12 Alternate hurdle model for adolescent antisocial behaviour

Table 9.1 Mediation of the effect of cumulative risk on antisocial

Table 9.2 Significant moderators of the relationship between Cumulative risk and life satisfaction

Table 9.3 Significant first-stage moderators – direct and moderated mediation effects

Table 9.4 Significant moderators of the relationship between life satisfaction and antisocial behaviours
LIST OF FIGURES

Figure 6.1 Reported number of children in family 196
Figure 6.2. Reported family house moves since Grade One 200
Figure 6.3 Distribution of age adjusted family mobility score 200
Figure 6.4 Reported living arrangements 202
Figure 6.5 Frequency distribution of SEIFA decile scores 206
Figure 6.6 Frequency of AUSEI06 scores of occupations reported for fathers 209
Figure 6.7 Frequency of AUSEI06 scores of occupations reported for mothers 210
Figure 6.8 Distribution of cumulative risk scores in the sample 212
Figure 7.1 Distribution of antisocial behaviours during the previous year 223
Figure 7.2 Residuals according to model for count score values of zero to nine 227
Figure 7.3. Classification tree to identify ‘true’ zeroes 235
Figure 7.4 Fit plots of antisocial behaviour before and after removal of true zeroes 238
Figure 7.5 Fit plots of antisocial behaviour comparing full NBRM to truncated NBRM 241
Figure 8.1 Mean differences in risk and protective factors by gender and Vulnerability status 253
Figure 8.2 Mean differences in self-control by gender and vulnerability status 254
Figure 8.3 Mean differences in prosocial beliefs by gender and vulnerability status 254
Figure 8.4 Mean differences in empathy by gender and vulnerability status 254
Figure 8.5 Mean differences in peer antisocial behaviour by gender and vulnerability status 255
Figure 8.6 Mean differences in school membership by gender and vulnerability status 255
Figure 8.7 Relationship between cumulative sociodemographic risk and antisocial behaviour-Males 257
Figure 8.8 Relationship between cumulative sociodemographic risk and antisocial behaviour- Females 257
Figure 8.9 Distribution of antisocial behaviours- Vulnerable adolescents 258
Figure 8.10 Distribution of antisocial behaviours- Not-vulnerable adolescents 258
Figure 8.11 Mean differences in antisocial acts by gender and vulnerability status

Figure 8.12 Mean differences in substance use by gender and vulnerability status

Figure 8.13 Scree plot of PCA

Figure 8.14 Adolescent involvement in different antisocial behaviours, by vulnerability status

Figure 8.15 Prevalence (%) of different antisocial behaviours: Vulnerability by gender

Figure 8.16 Absence or presence of antisocial behaviours according to level of cumulative sociodemographic risk, for vulnerable adolescents

Figure 8.17 Relationship between cumulative sociodemographic risk scores and social acceptance for vulnerable adolescents who were antisocial during the previous year

Figure 8.18 Relationship between cumulative sociodemographic risk scores and self-esteem for vulnerable adolescents who were antisocial during the previous year

Figure 8.19 Antisocial behaviours according to levels of peer antisocial behaviour

Figure 8.20 Antisocial behaviours according to levels of parental monitoring

Figure 8.21 Antisocial behaviours according to levels of self-control

Figure 8.22 Antisocial behaviours according to levels of prosocial beliefs

Figure 8.23 Antisocial behaviours according to levels of social acceptance

Figure 9.1 Theorised mediation of the influence of cumulative sociodemographic risk on antisocial behaviours

Figure 9.2 First stage moderated mediation

Figure 9.3 Second stage moderated mediation

Figure 9.4 Significant moderators of the mediated relationship between cumulative risk and antisocial behaviours

Figure 9.5 Interaction of self-worth and cumulative risk on life satisfaction

Figure 9.6 Interaction of self-control and cumulative risk on life satisfaction

Figure 9.7 Interaction of parental attachment and cumulative risk on life satisfaction

Figure 9.8 Interaction of parental knowledge and cumulative risk on life satisfaction

Figure 9.9 Interaction of parental availability and cumulative risk on life satisfaction
Figure 9.10 Interaction of depressed feelings and cumulative risk on life satisfaction

Figure 9.11 Interaction of depressed feelings and cumulative risk on antisocial behaviour

Figure 9.12 Interaction of parental monitoring and cumulative risk on life satisfaction

Figure 9.13 Interaction of parental monitoring and cumulative risk on antisocial behaviour

Figure 9.14 Interaction of peer antisocial behaviour and cumulative risk on life satisfaction

Figure 9.15 Interaction of peer antisocial behaviour and cumulative risk on antisocial behaviour

Figure 9.16 Interaction of self-worth and life satisfaction on antisocial behaviour

Figure 9.17 Interaction of depressed feelings and life satisfaction on antisocial behaviour

Figure 9.18 Interaction of self-esteem and life satisfaction on antisocial behaviour

Figure 9.19 Interaction of parental knowledge and life satisfaction on antisocial behaviours

Figure 9.20 Interaction of parental monitoring and life satisfaction on antisocial behaviours

Figure 9.21 Interaction of school membership and life satisfaction on antisocial behaviours

Figure 9.22 Interaction of peer antisocial behaviour and life satisfaction on antisocial behaviours

Figure 10.1 Moderator effects within the GST moderated mediation model
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CHAPTER 1: ADOLESCENT ANTISOCIAL BEHAVIOUR

1.1 Thesis Overview

There is no shortage of research exploring the nuances of adolescent antisocial behaviour, or identifying factors which cause (or at least correlate with) antisocial activity. Much research investigates the influence of risk factors within the individual (including social connections), and within the family, but one shortcoming identified in regard to criminological theory around juvenile delinquency is the need to understand the influence of broader social conditions (often termed macro factors) on antisocial involvement (Wikstrom et al., 2012). Despite structural characteristics such as social class having an apparent relationship with delinquency and crime when offender background characteristics are explored, empirical research provides little evidence of a direct influence of class on crime (Wikstrom & Butterworth, 2006; Wright et al., 1999). In this thesis I therefore examine both the moderated and mediated influence of structural characteristics on adolescent delinquency. That is, I explore the ways in which sociodemographic characteristics impact and/or interact with risk and protective factors during adolescence, to affect the likelihood of antisocial behaviour.

Structural characteristics include socioeconomic status, social class, ethnicity, family structure and mobility, as well as neighbourhood of residence. These characteristics are consistently identified in research as being associated with adolescent antisocial behaviours (Farrington, 2011; McBride Murry et al., 2011; Piotrowska et al., 2015). Structural risk factors also tend to co-occur (Evans, 2004; Moss et al., 2003), with many adolescents subjected to an accumulation of sociodemographic risks experienced simultaneously. For this reason, structural risk in this thesis is examined in light of the research literature on cumulative risk, which posits that when there are numerous risks stressors tend to interact with each other, exacerbating the effect on
outcomes. Thus, I examine the influence of cumulative sociodemographic risk on antisocial outcomes during adolescence.

This thesis provides evidence to support the argument that the contextual influence of cumulative sociodemographic risk moderates adolescent experiences, both in terms of the presence of risk and protective factors in adolescent lives, as well as in regard to how these factors function in predicting antisocial involvement. The tendency for youths facing higher levels of cumulative sociodemographic risk to be more likely to behave antisocially, as well as engage in a greater variety of antisocial behaviours is demonstrated. A General Strain theory (GST) model, in which cumulative sociodemographic risk is conceptualised as strain, mediated by levels of adolescent life satisfaction, is shown to be a suitable framework for explaining the process through which cumulative sociodemographic risk influences adolescent antisocial involvement. In sum, this thesis demonstrates that adolescent antisocial behaviour must be considered in light of contextual influences on both processes and outcomes.

1.1.1 Thesis Outline

In Chapters 1 to 5 I review the literature on adolescent risk for antisocial behaviours, provide a theoretical framework for exploring this influence, and highlight methodological issues encountered in the process. Chapter One explores poor outcomes during adolescence, particularly antisocial behaviours, and shows that while some degree of experimentation during adolescence might be expected, the consequences of antisocial involvement can be far-reaching.

In Chapter 2 I review research on proximal risk, promotive and protective factors for adolescent delinquency. Characteristics that increase and decrease the likelihood of poor outcomes across domains of the individual, family, and social ties are discussed,
and literature demonstrating the influence of sociodemographic variables on antisocial
behaviours is examined in-depth, with a focus on the processes through which these
relationships operate. The tendency for adolescents facing sociodemographic
disadvantage to experience increased prevalence and/or severity of proximal risk
factors, while also lacking proximal protective factors which would buffer their risk, is
highlighted.

The tendency for risks to co-occur is explored in Chapter 3, which outlines the
literature around multiple risk, and its cumulative effects. I discuss protective factors
against cumulative risk, and the idea of cumulative protection. I argue that cumulative
risk should be examined within a single domain, so as to understand the processes
through which risk affects outcomes. In particular, sociodemographic variables which
have a distal effect on outcomes should be examined in a cumulative form but separate
to risks across other domains. This way, processes of mediation and moderation can be
explored. I conclude the chapter by highlighting the need for further research regarding
the influence of cumulative sociodemographic risk on adolescent outcomes, that is
theory driven and context specific.

Theories relevant to understanding the relationship between sociodemographic risk
and outcomes are introduced in Chapter 4. I propose Bronfenbrenner’s bioecological
theory as a framework through which the effects of sociodemographic risk on
adolescent experiences can be explored. The pervasive influence of macro variables on
proximal processes stressed in bioecological theory highlights the need to examine this
phenomenon in regard to sociodemographic vulnerability. Agnew’s General Strain
Theory (GST) is introduced to explain the processes through which cumulative
sociodemographic risk has its effects on outcomes. I propose exploring the utility of a
GST model for explaining the pathways through which cumulative risk influence
outcomes. In this model, cumulative risk is examined as strain, and avenues of mediation, as well as moderation (by GST specific risk and protective factors) are explored.

In Chapter 5 I present a discussion of methodological issues relevant to research exploring antisocial behaviours recorded as counts of acts, with consideration of these issues necessary before analyses can be undertaken. Specifically, the need to thoroughly assess the characteristics of count data and identify suitable statistical approaches to examining it is argued, and an overview and assessment of commonly utilised approaches to this is provided.

In the second half of this thesis (Chapters 6 to 10), data collection, preparation and analysis are discussed. In the Methodology (Chapter 6) I explain the creation of the Cumulative Sociodemographic Risk Index which is used as a measure of sociodemographic disadvantage in analyses, and I present the specific research questions to be addressed in the following results chapters. In Chapter 7, I provide an in-depth exploration of model fit, as a means of determining the optimal distribution for analyses given the challenges inherent in the dataset. In Chapter 8 I provide descriptive statistics of the study sample, and examine differences in research-identified risk and protective factors for poor outcomes according to risk status and gender. Chapter 9 presents the results of analyses testing the effectiveness of a GST model in explaining the relationship between cumulative sociodemographic risk and antisocial behaviours. Finally, the thesis concludes with a summary of the research findings, and a discussion of their implications in Chapter 10.
1.1.2 Gaps in the Literature

This thesis makes a contribution to the research literature by constructing and analysing a measure of cumulative risk that includes sociodemographic variables only. It is argued that this is necessary in order to understand the ways in which macro level risks affect adolescent wellbeing. Thus, sociodemographic risk is separated from the processes through which this risk manifests itself (that is, mediators of risk, which are often included in cumulative risk indices). Surprisingly few studies examine sociodemographic disadvantage in this way. Amongst the few which do, while the relationship between cumulative sociodemographic risk and poor outcomes is explored, the pathways through which risk has its influence tend not to be addressed. This study therefore makes a unique contribution by testing the ability of a GST model to explain how cumulative sociodemographic risk impacts on adolescent antisocial behaviour.

The second original contribution that this research makes lies in its exploration of statistical issues related to research which examines phenomena like antisocial behaviours that are measured as counts of acts and frequently result in large proportions of zero values representing absence of behaviours. The need to balance statistical fit of models (through oft-overlooked examinations of model-fit) with theoretical knowledge when selecting a model for analysis is emphasised, and the success of new quantitative strategies for dealing with excess zeroes associated with count data response variables, such as the use of classification trees, are explored.

1.2 Introduction- Adolescent Antisocial Behaviour

The transition from childhood to adolescence is arguably the period of greatest upheaval throughout life, involving change across multiple domains: biological, cognitive, familial, social, psychological and environmental. The pressures resulting
from such a variety of changes occurring simultaneously make this developmental phase a period for vulnerability for young people (Shaw & Dallos, 2005), to the point where it has been traditionally labelled as a time of storm and stress (Hall, 1904). Some children enter into adolescence with pre-existing difficulties, which are exacerbated by the stressors of the transition, while for other apparently well-functioning children, adolescence is the point at which they veer off at a tangent to their previous positive behavioural trajectory (Moffitt, 1993). Poor decisions made in adolescence portend greater negative consequence than those made as a child. The future prospects of many adolescents are made poorer by academic underachievement and school dropout, crime, teen pregnancy, and general feelings of despair and hopelessness (Lerner & Galambos, 1998). Thus, adolescence is often the point at which pathways divide: young individuals may travel one route of positive growth, or another path to less favourable outcomes.

This chapter discusses poor outcomes for adolescents that are externalised in the form of antisocial behaviours. It explores the prevalence of delinquent behaviours both internationally and in Australia, according to both official records and self-report research. Following discussion of the consequences of delinquent involvement during adolescence, the chapter concludes by providing a roadmap which outlines the topics to be covered in this thesis. These topics include risk and protective factors for antisocial behaviours during adolescence, the effects of sociodemographic disadvantage on adolescent experiences, and theoretical explanations for the processes through which sociodemographic risk affects outcomes. In addition, an overview of the research questions, which aim to examine the effects of cumulative sociodemographic disadvantage on adolescent experiences, is provided.
1.3 Poor Outcomes during Adolescence

Adolescence is a key period for the emergence of problematic conditions and behaviours which can have far reaching implications throughout the remainder of the lifespan. For example, adolescence is the most likely time for the onset of mental health problems (Patel et al., 2007) and significant increases in conditions such as depression occur during the early adolescent period (Gutman & Sameroff, 2004). Studies report the prevalence of depression rising from 5% in childhood to between 10% and 20% in adolescence (e.g. Kandel & Davies, 1982; Kessler & Walters, 1998; Larsson et al., 2016; Seeley et al., 2009).

Increasing autonomy during the adolescent years also provides opportunities for socially unacceptable behaviours to flourish (Loeber 1990; Sentse et al., 2010), including antisocial behaviours (Lacourse et al., 2002; Moffit, 1993). The dangers of poor psychosocial health and antisocial behaviours during adolescence become more evident as the individual enters adulthood, when it is possible to become entrenched in a self-perpetuating cycle of drug and alcohol dependence, unemployment, poverty, criminal behaviour, and abusive relationships (Kandel & Davies, 1986; Myers et al., 1998; Patel et al., 2007).

1.3.1 Prevalence of Adolescent Antisocial Behaviour

Capturing the true prevalence of adolescent activity is difficult. Official records, such as police and court reports reflect more serious deviancy, and even then only those acts that the justice system is aware of. Australian data on youth offenders shows that while rates of official contact are decreasing nationwide, during the 2016-17 period 54,064 young people aged 10 to 17 were recorded by police (a rate of 2,330 per 100,000 youths), with theft (36 % of youth offenders proceeded against) the most common
offence, followed by acts intended to cause injury (16%), illicit drug offences (11%) and public order offences (10%) (ABS, 2018).

Self-report measures of delinquency and crime have acceptable levels of accuracy and validity, with studies comparing self-report rates of offending to official measures suggesting these tend to be consistent. For example, Maxfield, Weiler and Widom’s (2000) comparison of self-report and official offending records of young adults (mean age of 28.7 years) found that 73% of subjects with official arrest records self-reported those offences. The authors suggest that rates of self-reporting would be higher for adolescents due to a greater willingness to disclose delinquency as well as a lower likelihood of forgetting. An early study of juvenile reporting by Hardt and Petersen-Hardt (1977) showed that 78% of juveniles with criminal records self-reported their offences, and accuracy of self-reporting was even higher for those adolescents who did not have criminal records, with 95% accurately reporting their absence of offending. More recently, Kirk (2006) found that 21.4% of a sample of youths aged 12 to 18 self-reported an offence, which closely resembled the 19.2% of the sample identified in official records of offending. While Kirk highlighted some discrepancies between self-reporting and official records of crime, particularly in regard to frequency of offending and age of onset, he found that the effects of risk factors such as parent-child conflict and parental monitoring were not affected by choice of offending measure. This suggests that in studies examining such risk factors, either measure of offending is equally useful.

At any rate, research exploring antisocial behaviours is reliant on self-report data where antisocial acts do not qualify as official crimes. Self-report measures of adolescent delinquency tend to capture a range of acts that include less serious deviancy and risk taking, such as truancy, running away from home, bullying, fighting and so on.
The greater scope of self-report measures, as well the fact that such measures do not require the offender to be caught, mean prevalence estimates are higher than official records, but these rates must be viewed in light of the fact that some youths may under-, or over-report behaviours (Kirk, 2006). However, in general, studies most often suggest acceptable to good levels of validity for self-report measures (although differential or under-reporting by African American males has sometimes been noted) (Maxfield et al., 2000; Thornberry & Krohn, 2000). Further, more recent self-report scales are highly reliable instruments, demonstrating strong internal consistency and test-retest correlations often of .8 or higher (Thornberry & Krohn, 2000).

Self-report studies demonstrate that adolescent antisocial behaviour is a global phenomenon. The Second International Self-Report Delinquency Study (ISRD-2) investigated antisocial behaviours in a sample of over 40,000 youths aged 12 to 15 across 31 countries. Rates of self-reported delinquency during the previous year, based on 12 questions that included involvement in behaviours such as theft, purposeful damage, physical assaults and drug use, yielded prevalence rates ranging from 13.0% in Venezuela to 40.1% in Ireland, with a higher prevalence of delinquency (averaging 29.6%) in Anglo-Saxon countries (Canada, Ireland, USA) (Enzmann et al., 2010). Closer to home, in the Dunedin Health and Development Study, around a third of the boys included in the study engaged in some form of delinquent behaviours between the ages of 11 and 15 (Moffitt, 1993).

In the US, several large-scale longitudinal studies have provided estimates of the prevalence of delinquency during adolescence. In 1986, three coordinated projects were initiated by the Office of Juvenile Justice and Delinquency Prevention (OJJDP) with the aim of exploring pathways into delinquency, with study sites in Denver, Pittsburgh, and Rochester. Across all three studies, which encompassed more than 4000 participants,
involvement in serious delinquency (referred to as *street crimes*, and including crimes such as burglary, serious theft, robbery, and aggravated assault) amongst youths aged 11 to 17 was reported by 20 to 25% of males, and 8 to 14% of females (Huizinga et al., 1993). Incidents of serious aggression were even more common – 32% of the Pittsburgh sample, and around half of the Denver sample (57% of boys and 40% of girls) had assaulted another person leaving them bruised or worse. Further, 14% of the Pittsburgh sample and around one third of those in Denver (47% of boys and 28% of girls) had assaulted another person resulting in serious injuries to the victim (Thornberry et al., 2004).

Australian rates reflect those observed internationally. McMorris and colleagues (2007) compared Australian and US prevalence rates of delinquent behaviours and substance use in a large sample that included 2,885 Grade 5, 7, and 9 students from Washington State, and 2,884 students from the same year levels in Victoria. When exploring delinquent behaviours however, the researchers found only small differences between the two samples in acts including stealing, fighting and violence. For example, when examining delinquent behaviours during the previous year amongst male Year 9 Victorian students, 17% reported having stolen something worth more than $5 (compared to 19.3% of Washington State boys), 19.4% reported having carried a weapon (compared to 18.9% of Washington State boys) and 8.6% reported having beaten someone badly (compared to 6.0% of Washington State boys). Based on the consistency in patterns of antisocial behaviours observed across both countries, the authors concluded that these rates of delinquent involvement may reflect characteristics of adolescent development that are universally experienced. Larger differences were found however, in regard to substance use. Victorian youths were more likely to report having ever used alcohol (81% of Victorian Year 9 boys, compared to 56.7% of
Washington State Year 9 boys) and binge drinking during the previous 2 weeks (30.1% of Victorian Year 9 boys, compared to 9.1% of Washington State Year 9 boys), while students from Washington State were more likely to report marijuana use (19.2% of Victorian Year 9 boys, compared to 26.8% of Washington State Year 9 boys).

A more recent Australian study by Czech and Kemp (2010) explored self-reported offending rates in a community sample of 233 male and female NSW adolescents aged 11 to 17 years where participants were described as “relatively advantaged” (p. 151), and according to parental occupation information were mostly classified as high SES (60%), or moderate SES (20%). Around one in five participants reported they had: vandalised personal property (21.0%), been involved in a group fistfight (18.6%) or been drinking or drunk in public (19.9%), with male involvement more prevalent than female. In addition, around 1 in 3 youths had: made a prank phone call (35%), shoplifted (30.1%), stolen less than $10 (35.8%) or damaged school property (35.4%), while almost half the participants (46.9%) reported having purposely beaten up another person. While it is difficult to compare rates of antisocial behaviours between these Australian studies, due to differences in the specific acts investigated (for example, “ever using alcohol” versus “binge drinking” versus “been drinking/drunk in public”), it is evident that for Australian adolescents, antisocial behaviours are not rare.

While some level of involvement in antisocial activities is not unusual amongst adolescents, such involvement is often experimental and transitory (Vassallo et al., 2002). While the ramifications of low level adolescent delinquency may not be as serious as those experienced by life course persistent offenders whose offending starts earlier and is usually more serious and/or violent (Moffitt, 1993), low-level adolescent offenders have been noted to exhibit adjustment problems later in life (Moffitt et al., 2002). Furthermore, those dabbling in antisocial activities during adolescence face the
possibility of becoming caught by snares such as school dropout, unemployment, teen parenting, substance addiction and official contact with the criminal justice system as a consequence of their delinquency, thus limiting their ability to revert to a more normative lifestyle as they enter into adulthood (Gatti et al., 2009; McGee et al., 2015; Moffitt, 1993).

Given the difficulty of escaping cycles of poor outcomes, the damage these lifestyles cause others, and the financial burden to Governments for legal and health services, identifying those underlying conditions which contribute to, or are associated with poor youth outcomes is critical. In response to this need, over the years a robust body of literature has emerged utilising large scale longitudinal studies to pinpoint variables which serve as statistical markers for later problematic behaviours (as well as the avoidance of these problems). These variables, known as risk and protective (as well as promotive) factors, have become key in understanding participation in antisocial behaviours and crime.

1.4 Summary

Adolescence is a period of great upheaval, with change occurring across many domains of life simultaneously. It is a period of potential vulnerability for young people, when poor decisions can have serious long-term consequences. While involvement in antisocial behaviours is not entirely uncommon in the teen years, not all adolescents engage in antisocial activities. Preventing or at the very least limiting these behaviours can help young people avoid snares which may have future damaging effects. Identifying the underlying conditions which contribute to or are associated with poor youth outcomes is therefore an important undertaking.
CHAPTER 2: PROXIMAL RISK, PROMOTIVE AND PROTECTIVE FACTORS

2.1 Introduction

Researchers have identified numerous factors that are consistently associated with increased likelihood of poor outcomes during adolescence. These risk factors are noted across various domains of life, and include individual characteristics, family dynamics, and social interactions. Such risk factors are proximal due to having a direct and immediate effect on outcomes (Weatherburn, 2001). In addition to risk factors, some variables have been noted to reduce the likelihood of poor outcomes, either by universally improving wellbeing (promotive factors), or by countering risk (protective factors).

One benefit of identifying proximal risk, promotive and protective factors, is the ability to tailor interventions with the intention of altering behaviours through targeting specific risks. For example, attempts to prevent antisocial and criminal behaviours include strategies to increase levels of self-control and problem-solving skills among individuals; foster effective communication and discipline strategies within families, or promote positive social interactions through enhancement of social skills. In addition, bolstering those (protective) factors that reduce or ameliorate risk provides adolescents with tools that increase resilience when facing adversity.

This chapter provides a review of the literature on proximal risk, promotive and protective factors for adolescent antisocial behaviours. Individual characteristics shown to increase the likelihood of delinquency include cognitive ability, impulsivity, and variables related to emotional wellbeing (for example, self-esteem, and depressed feelings). Factors related to the family, including parental attachment, involvement, and monitoring continue to have an effect during adolescence, but as youths become
increasingly autonomous, social connections have a more powerful influence. Antisocial connections, such as associations with deviant peers, increases the likelihood of delinquent behaviours, but pro-social connections, such as feelings of school membership foster bonds which act as social controls for behaviours. Overall, this chapter argues that across all the domains of proximal risk, the relationship between risk factors and antisocial outcomes is affected in some way by contextual factors. Adolescents facing sociodemographic disadvantage tend to experience an increased prevalence and/or severity of proximal risk factors, or lack proximal protective factors which could buffer their risk.

2.2 Risk, Promotive and Protective Factors for Adolescent Antisocial Behaviours

While research consistently identifies increases in antisocial behaviours during the adolescent period (Lacourse et al., 2002; Moffit, 1993), contributing to the well-documented age crime curve, there is less agreement about why offending peaks at this age (Ulmer & Steffensmeier, 2015). Identifying 'causes' of delinquency is a near to impossible task. Causation presumes that an effect invariably follows from a condition or incident that precedes it, but there is no definitive set of factors which guarantees involvement in adolescent delinquency (Weatherburn, 2001).

Instead, research provides information about risk factors for antisocial behaviour -- variables across various domains of life that increase the likelihood of adolescent offending. More recently, promotive and protective factors- those which decrease the likelihood of poor outcomes under certain circumstances- have also been explored. Identification of risk, promotive and protective factors is crucial for understanding processes related to delinquency as well as for designing effective intervention programs.


2.2.1 Risk Factors

In the field of criminology, risk factor research had its beginnings in Sheldon and Eleanor Glueck's exploration of the childhood characteristics of juvenile offenders, published in *500 Criminal Careers* (1930). While the Glueck's explored risk factors simplistically (as linear predictors believed to be causal due to pre-dating the outcome measure), they were the first to identify common traits, family characteristics and social situations amongst juvenile offenders (Case & Haines, 2009), opening the research floodgates. The result has been a large body of risk factor research, reflecting "a collection of differing and sometimes competing paradigms" (Case & Haines, 2009, p. 5). Despite these differences, several key risk factors have been identified consistently across numerous studies and are therefore considered to be reliable predictors of an increased likelihood of delinquency (Farrington, 2007). It is important to note however that risk factors are not necessarily causes (Farrington et al., 2016) and in much research can only be said to be correlated with outcomes of interest.

2.2.2 Promotive and Protective factors

In addition to variables which are noted to increase the likelihood of poor outcomes, research has also identified variables which decrease this likelihood, but the definitions of such variables are inconsistent. Historically, risk factors have often been viewed as existing on a continuum, with ‘risk’ at one end of this continuum and protection from risk at the other. For example, youths that demonstrate low levels of self-control are at a higher risk of becoming involved in antisocial activities, while youths with higher levels of self-control are presumed to have a lower probability. More recently however, the idea that these factors always operate in such a linear manner has
been questioned and consequently a distinction has been drawn between \textit{promotive factors} and \textit{protective factors}.

\textit{Promotive factors} are those that decrease the likelihood of a poor outcome across a specified population. They may indeed be the opposite of risk factors, but this is not a necessity. Promotive factors are not always linearly related to outcomes, meaning that while high levels of the promotive factor may be observed to increase the likelihood of positive outcomes, low levels of the factor do not necessarily mean increased risk of poor outcomes (Loeber et al., 2008). For example, an analysis of data from the Cambridge Study in Delinquent Development (CSDD) showed that high levels of nervousness and having few or no friends were both associated with a lower probability of criminal convictions later in life, while low levels of nervousness and having many friends did not significantly increase the likelihood of later conviction (Farrington et al., 2016), with the authors therefore concluding that these variables were promotive only. When variables are promotive, a main or direct effect of their influence is noted on the outcome for all individuals. Consequently, in terms of crime, a promotive factor is one which predicts a low likelihood of the antisocial behaviour, without consideration of any other variables (Losel & Farrington, 2012), including individuals' levels of risk.

Some research describes promotive factors as working within a \textit{compensatory} model where positive influences reduce overall risk exposure (for example: Evans et al., 2010; van der Laan et al., 2009). Zimmerman et al. (2013) classify promotive factors as either assets (within the individual) or resources (outside of the individual) that can be drawn upon to promote healthy development.

In contrast, \textit{protective factors}, whilst still being promotive in that they decrease the probability of a poor outcome, have the additional characteristic of interacting with risk in some way. As explained by Rutter (1987, p. 317), protective factors are those which
"change the effect of another variable, instead of (or in addition to) having a direct effect of its own"

Protective factors are therefore either promotive factors found amongst high-risk populations, or otherwise are variables which moderate the influence of risk factors by lessening or altogether countering that risk. For example, in the Cambridge Study analysis, having a high IQ and attaining high grades in school significantly reduced the likelihood of later criminal convictions amongst boys who experienced poor child-rearing practices during childhood (Farrington et al., 2016). Protective factors are central to research around resilience, where researchers aim to identify the mechanisms behind this "dynamic process encompassing positive adaptation within the context of significant adversity" (Luthar et al., 2000, p. 543).

A clearer understanding of promotive and protective factors has important implications for prevention. As Farrington (2007) points out, if an intervention is aimed at a high-risk population, focussing on protective factors for that specific population makes more sense than aiming to target factors which are promotive among a general population. The interactive nature of protective factors necessitates an unravelling of their processes of moderation in order to understand the mechanisms involved, and to ensure that interventions are designed in ways which maximise the chances of good outcomes.

The following sections provide a brief summary of influential risk and promotive factors for adolescent antisocial behaviours within the individual, family and social domains. As discussed in Chapter 4, these are proximal influences which are frequently demonstrated to have a strong and direct effect on outcomes. However, it must be noted (as discussed in Chapter 3) that they are themselves influenced by contextual factors.
2.2.3 Individual Characteristics

Individual level factors related to delinquency include biological and genetic influences, psychological and cognitive functioning, as well as personality characteristics, attitudes and beliefs. While these are considered individual characteristics, they are often externally influenced, such as through family or social interactions.

While there is a tendency for behaviours such as crime (Farrington et al., 1996) and interpersonal violence (Frisell et al., 2011) to run in families, it is difficult to draw a line between nature and nurture to determine genetic influences. Recent studies that investigate epigenetics show that genotypes play an interactive role, such as in moderating how sensitive children are to environmental risks (Caspi et al., 2002). Therefore, while genetic vulnerability for delinquency may exist, it likely requires exposure to specific environmental contexts to trigger it. Similarly, longitudinal research has highlighted prenatal and perinatal influences on adolescent offending, with babies born prematurely, with low birth weight or birth complications, at increased risk for antisocial behaviours (Hayes & Sharif, 2009; Raine, 2002). However, most infants suffering such complications do not exhibit problematic behaviours later in life, and those which do are frequently found to come from socially disadvantaged backgrounds (NRCIM, 2001). In the case of both genetic and biological risks for antisocial behaviour, environmental context appears to play a key role.

Of the many individual level risk variables investigated, amongst the strongest predictors of offending are cognitive abilities/intelligence and impulsiveness (Farrington, 2006). The nature of the relationship between intelligence and delinquency is difficult to tease out. For example, it may be that lower intelligence affects academic performance (Weatherburn, 2001), with poor achievement lowering feelings of school
membership and increasing the likelihood of delinquency (Catalano et al., 2004). It is certainly the case that academic achievement is related to a lower likelihood of delinquency (Katsiyannis et al., 2008). In particular, language skills are noted to be influential (Benner et al., 2002), with delinquent adolescents often exhibiting lower verbal IQ scores than their non-delinquent counterparts (NRCIM, 2000). Language delays in early childhood are theorised to affect social interactions, possibly resulting in aggressive reactions. Such language processing difficulties are consistently associated with low SES and family poverty (Perkins et al., 2013).

Another theorised pathway is that lower intelligence limits consideration of the consequences of behaviours (Weatherburn, 2001), although this lack of forethought is also attributed to problems related to executive functioning. Difficulties in problem solving, planning, and inhibitory control were demonstrated in Morgan and Lilienfeld's (2000) meta-analysis of 39 studies to have a robust and significant relationship with antisocial behaviours. Of all individual characteristics, impulsivity (or poor self-control) dominates the risk literature as the strongest predictor of antisocial behaviours (Murray & Farrington, 2010), particularly delinquency that is serious (White et al., 1994) and persistent (Carrasco et al., 2006). In fact, Gottfredson and Hirschi (1990) declared as part of their General Theory of Crime that of all personality characteristics, only low self-control could effectively predict criminal behaviours.

Farrington (2007) suggests that cognitive difficulties manipulating abstract concepts result in an inability to foresee consequences, but also concedes that disadvantaged families "tend to talk in terms of the concrete rather than the abstract and tend to live for the present, with little thought for the future" (p. 11). Limitations in considering consequences may therefore be a facet of how context affects every day
living strategies as much as an individual failing. Immediate reward tends to be most highly valued by adolescents from low SES families (Anokhin et al., 2011).

In addition, neighbourhoods may influence tendencies towards impulsivity. Teasdale and Silver (2009) found that 27% of the neighbourhood variance in self-control was explained solely by neighbourhood socioeconomic disadvantage, with adolescents from more disadvantaged areas exhibiting lower levels of self-control. Where resources are consistently available and plentiful, delay of gratification is more likely, with a focus on long-term outcomes (Gonzalez et al., 2016). In comparison, immediate gratification occurs more often where "environments with scarce and unreliable resources encourage “fast” strategies that are relatively high-risk and present-focused” (Gonzalez et al., p. 48).

Some studies have suggested that environment interacts with individual levels of self-control when predicting offending. Compared to more affluent neighbourhoods, the relationship between impulsivity and delinquency has been demonstrated to be stronger for youths from neighbourhoods characterised by low SES (Lynam et al., 2000), disadvantage and low collective efficacy (Meier et al., 2008) or amongst high school students who perceived their neighbourhoods to have lower levels of informal social control (Jones & Lynam, 2009).

While self-control is important in regulating behaviours, individual prosocial norms determine what behaviours an adolescent believes are acceptable. Beutel and Johnson (2004, p 380) differentiate between values, defined as “the criteria by which things are judged as good or bad, right or wrong” and attitudes, defined as “sets of beliefs organised around specific objects and situations”, where beliefs are more singular and make up these attitudes. When attitudes and beliefs are favourable to deviance, there is
a greater likelihood of behaving antisocially, whereas holding prosocial attitudes and beliefs decreases the likelihood of these behaviours.

Social cognitive theories posit that processes of modelling and social reinforcement lead to the emergence of behavioural norms, therefore children who are exposed to environments more accepting of rule-breaking, violence, and drug and alcohol use, are likely to have lower levels of prosocial beliefs than children raised in less accepting environments. Disadvantaged neighbourhoods, which are frequently characterised by higher rates of crime and may offer few positive adult role models (Roosa et al., 2003) are theorised to have a greater proportion of residents endorsing antisocial behaviours, making deviancy the dominant norm in the community, and resulting in a contagion effect (Friedrichs & Blasius, 2003). For example, Stewart and Simon's (2010) investigation of the code of the street (Anderson, 1999) found that adolescents were influenced to present themselves as violent and dangerous by a neighbourhood street culture that emphasised the value of these behaviours, with the authors concluding that "context matters for shaping and moderating beliefs, values, and behavior patterns" (p. 592).

2.2.4 Emotional Wellbeing
2.2.4.1 Self Concept

In 1961, Walter Reckless proposed a Containment Theory of crime, which suggested that conforming behaviours are influenced by both internal and external elements. While outer containment influences included community norms and beliefs, inner containment relied on not only self-control, but also a good self-concept (Reckless, 1961). Since then, exploration of the relationship between views of self (operationalised most often as self-esteem or self-worth) and delinquency has suggested
a complicated relationship, where not only do low levels of self-esteem/worth predict delinquency (Donnellan et al., 2005; Trzesniewski et al., 2006) but extremely high levels do as well, particularly when they reach the point of narcissism (Barry et al., 2007; Baumeister et al., 2000). To further complicate the relationship, while adolescents with low self-esteem are more likely to be delinquent, their participation in delinquency is often demonstrated to increase levels of esteem (Mason, 2001). These findings support Kaplan's (1975) self-derogation theory of delinquency which suggests a countervailing loop wherein self-esteem negatively influences delinquency over time, but delinquency enhances self-esteem over time (Mason, 2001).

Investigations into the influence of self-concept on behaviours was prevalent in research during the 1990's, as a reaction to the emerging interest in cognitive psychology which suggested that self-views formed part of an individual's schemas and beliefs and were therefore highly influential on outcomes (Swann et al., 2007). More recently, research showing small effect sizes, as well as unclear and frequently narrow conceptualisations of constructs means that esteem and worth are less frequently considered when exploring behaviours such as delinquency (Swann et al.). Nonetheless, self-concept has been demonstrated to be an important indirect influence on a variety of outcomes, particularly when operating as a protective factor that buffers the effects of risk (Byrne & Mazanov, 2001; Mann et al., 2004). An example is Buckner, Mezzacappa and Beardslee's (2003) study which found that self-esteem was a key factor in differentiating between resilient and non-resilient youths from low income families.

While self-concept may be an individual level measure, determinants of self-esteem and related constructs are structural as well as individual (Kahne, 1996). Levels of self-esteem and worth, which are known to vary according to gender, also vary in
accordance with sociodemographic characteristics. For example, a meta-analysis of 446 studies demonstrated a significant negative relationship between SES and self-esteem, with age playing a key moderating role. The strength of the relationship between SES and self-esteem increased over time from childhood into middle age (Twenge & Campbell, 2002).

### 2.2.4.2 Depressed Feelings

The co-occurrence of internalised and externalised behaviours is well demonstrated in the research literature (see Aske et al., 2007; Beyers & Loeber, 2003; Diamantopoulou et al., 2010; Leas & Mellor, 2000; Overbeek, et al., 2006; Vieno et al., 2008). Studies show consistent relationships between adolescent depression, delinquency, substance use (de Graaf et al., 2003; Windle et al., 1992) and risk taking (Leas & Mellor, 2000). Reports of between 10% and 35% of overlap between depression and delinquency in adolescence (Kaslow et al., 1984; McManus et al., 1984; Mitchell et al., 1988) suggests that this co-occurrence is more than can be considered coincidental (Krueger et al., 2000). The link between depression and antisocial behaviours is especially relevant for girls (Kandel & Davies, 1982), with significantly higher prevalence rates of depression amongst female offenders (Vaske & Gehring, 2010).

Adolescents who exhibit internalised and externalised problem behaviours concurrently have more serious antisocial outcomes (Fombonne et al., 2001). This interaction between mental health and delinquency is highlighted in the most recent comprehensive assessment of children's wellbeing in Australia, the Child and Adolescent component of the Australian Government’s second National Survey of Mental Health and Wellbeing 2013-14. Utilising self-report data from adolescents aged
13 to 17, the researchers found that around one in ten adolescents (9.9%) reported having smoked cigarettes at least once a week, 37.9% had drunk alcohol, 11.6% had used cannabis, and 4.5% had used other drugs (Lawrence et al., 2015). These behaviours were more prevalent amongst adolescents with mental disorders. For example, within the sample of adolescents whose responses identified the presence of major depressive disorder, 29.9% reported smoking, 65.3% reported drinking alcohol, 28.8% reported cannabis use, and 16.1% reported use of other drugs.

Comorbidity of mental health problems and antisocial behaviours is not uncommon during adolescence, but there is little agreement on the underlying mechanisms. With the exception of drug use, little is known about the overlap of these problem behaviours in general populations, leading researchers to question the causal direction: "Do most youth who commit serious delinquent acts have mental health problems? Are most youth who have mental health problems also seriously delinquent?" (Thornberry et al., 2004, para 18). The precise nature of the relationship between depression and antisocial behaviours, especially regarding directionality, remains unclear (Beyers & Loeber, 2003). Evidence highlights a strong association between poverty and depression, particularly for females (Belle Doucet, 2003; Heflin & Iceland, 2009; Simmons et al., 2008), suggesting the possibility of overlap given the relationship between poverty and delinquency.

There are three major schools of thought concerning the relationship between depression and antisocial behaviours during adolescence-- Failure Theory, Acting Out Theory and the Stability Perspective:

**Failure Theory** suggests that antisocial behaviours precede depression (see Capaldi & Stoolmiller, 1999; MacPhee & Andrews, 2006). For example, Mesman and colleagues (2001) found that internalising problems at ages 10 and 11 were predicted by
oppositional behaviours in 2 and 3 year old girls, and social difficulties in 4 and 5 year old boys. Externalised displays of disruptive behaviours are theorised to result in rejection from others causing subsequent anxiety and depressed feelings due to social failure (Burke et al., 2005; Capaldi & Rothbart, 1992). Patterson, Reid and Dishion (1992) extended the failure theory model to include reciprocal effects, whereby antisocial behaviour leads to depression, which leads to increases in antisocial behaviour, with several studies supporting the notion that depression escalates deviant behaviours (Capaldi & Rothbart, 1992; Kovacs et al., 1988).

In theorising on the origins of antisocial personality disorder (APD), Loeber and colleagues (2000) suggested a gradual hierarchical model similar to the failure model, which begins with the exhibition of mild forms of disruptive childhood behaviours such as oppositional defiant disorder (ODD), and attention deficit hyperactivity disorder (ADHD). These behaviours, in combination with anxiety the child experiences, leads to the development of depression, sometimes exhibited through somatoform disorders (Loeber et al., 2000). What emerges in adolescence is a reciprocal relationship between depression and antisocial behaviours (Diamantopoulou et al., 2010), where depressive symptoms such as hopelessness result in a lack of concern about consequences of antisocial actions (Kasen et al., 2001).

*Acting out theory* explains the frequent occurrence of antisocial behaviours in depressed children by proposing that children who suffer from depression exhibit their underlying distress through displays of externalised problem behaviour (Carlson & Cantwell, 1980). Similarly, the concept of *masked depression* suggests that externalised antisocial behaviours are an expression of depressed feelings that due to their more obvious nature hide the underlying mood disturbances (Ben-Amos, 1992). Masked depression has also been used to explain gender differences in problem behaviours. It is
theorised that antisocial behaviour in boys and depression in girls express an equivalent underlying condition, which manifests differently due to societal convention. In studies that examine depression and antisocial behaviour as one unified construct, sex differences disappear (Kandel & Davies, 1982), supporting the concept of masked depression.

In support of acting out theory, some studies have demonstrated that depression precedes, and is a risk factor for, antisocial behaviours in adolescence (Beyers & Loeber, 2003; Leas & Mellor, 2000) and Conduct Disorder (Kovacs et al., 1988). Vaske and Gehring (2010) suggest that consequences of adolescent depression, such as weakened cognitive and behavioural regulation, withdrawal from social involvement and subsequent free time, peer rejection and substance use may increase the likelihood of adolescents becoming involved in delinquent behaviours.

The Stability perspective is demonstrated in studies such as Vieno, Kiesner, Pastore and Santinello (2008) and Beyers and Loeber (2003), which reveal a stronger concurrent relationship between depression and antisocial behaviour than exists between the two variables over time. Aske and colleagues (2007) suggest that the overlap of internalising and externalising behaviours is best understood not in terms of directional relationships, but rather as a stability model, where co-occurrence is caused by other non-specific risk factors resulting in the child experiencing the same underlying conditions through two separate but related modes of expression (Krueger, 1999).

While the mechanisms through which macro level influences result in depression require further elucidation (Dobson & Dozois, 2011), the fact that those from low SES backgrounds are more likely to experience both depression and engage in antisocial
behaviours suggests that contextual factors may provide at least a partial explanation for co-occurrence.

2.2.5 Family Functioning

While family risk factors may have their biggest effect during early childhood, characteristics of families remain influential during the adolescent years. Poor family functioning, such as family violence, parental conflict, and child abuse and neglect, increase the likelihood of poor outcomes during adolescence (Murray & Farrington, 2010). For example, in the Rochester Study, youths who experienced some kind of abuse or neglect during their adolescence (but not those with a history of maltreatment in childhood only) also reported greater involvement in delinquent activities, particularly serious violent offending, and were more likely to have been arrested (Thornberry et al., 2004). Similar results were found in Stewart, Livingston and Dennison’s (2008) study of Australian youths, where those whose maltreatment began or continued into adolescence were more likely to commit offences than those who were maltreated in childhood only. As Rankin and Quane (2002) point out however, "it is important to note that parenting styles are not randomly distributed in the population, but are associated with characteristics of families, especially socioeconomic status" (p. 82).

The role that parent-adolescent relationships plays is often indirect. The increasing importance of peers during this time of development means that adolescent-parent relationships are frequently a moderating factor in regard to outcomes. Some studies have shown that the effect of delinquent friends has a greater impact on delinquent behaviour for adolescents with weak family support rather than strong (Poole & Regoli, 1979). Positive mother-adolescent relationships reduced the influence of deviant friends
(Mason et al., 1994), and adolescents with low attachment to parents were affected by best friend deviancy, while the deviancy of adolescents with high attachment to parents was not affected (Vitaro et al., 2000). McCord (1990) suggests that the indirect effect of parent child attachment may be due to the adolescent's internalisation of parental standards, as part of the parent-child bond. Other studies propose that the adolescent-parent relationship on a temporal level; that is, purely the amount of time spent together; best explains the association between parenting characteristics and adolescent outcomes (Warr, 1993).

2.2.5.1 Parental Involvement and Monitoring

McNeal (1999) refers to parental involvement as a form of social capital, stating that it involves investment (time and effort) and return (experienced as an effect on the child's behaviours). Parental involvement has been demonstrated to influence children's well-being (LeCroy, 1988; Richards et al., 1991), with higher levels of involvement reducing the risk of poor outcomes such as low academic achievement, adolescent delinquency and depression, and teenage pregnancy (Harris & Marmer, 1996). In its most simple form, spending time with parents means that the adolescent has less time to engage in unsupervised, unstructured activities, which is effective in reducing antisocial behaviours given the link between delinquency and the absence of supervision (Agnew, 2003; Warr, 1993). Simply eating a family meal together on a regular basis has been associated with reducing the risk of adolescent substance use, low school achievement, poor self-esteem, high depressive symptoms and suicidal ideation and/or attempts (Eisenberg et al., 2004).

The effect of parental involvement appears to be stronger in lower socioeconomic families, where for children growing up in circumstances of disadvantage, presence of
and interactions with parents can be an important buffering influence. For example, involvement with mother was noted to have stronger protective effects among disadvantaged youth (Harris & Marmer, 1996), and both father and mother involvement was more often associated with better school performance and fewer behavioural problems among poor children than children from higher socioeconomic families (Mosley & Thomson, 1995). These findings are concerning however, given that involvement of both parents has been demonstrated to reduce in line with family income (Harris & Marmer, 1996) as well as mother's level of education (Rankin & Quane, 2002).

Parental monitoring is one of the strongest protective factors against adolescent antisocial behaviours and has consistently been linked with decreased levels of delinquency (Lahey et al., 2008; Murray & Farrington, 2010; Neumann et al., 2010). Monitoring and supervision are especially important for boys in early and mid-adolescence, as parental influences on behaviour at this time help in the development of self-regulation capabilities (Caprara et al., 2010). Most obviously, parental monitoring affects adolescent behaviour by limiting time spent with deviant peers, and opportunities to engage in risky behaviours (Li et al., 2000). However, Sampson and Laub (1993) identified supervision as one of the components of informal social control which facilitate a link between the child and the family, thereby influencing antisocial behaviour. In addition, parental monitoring mediates the effect of other family problems on adolescent outcomes. For example, parental deviance such as excessive drinking has an effect on adolescent behaviours due to such parents being lax in monitoring their children (Sampson & Laub).

Contextual factors influence levels of parental monitoring. Beyers, Bates, Pettit, and Dodge (2003) found that levels of parental monitoring differed in accordance with
neighbourhood measures of disadvantage and instability, with less affluent
neighbourhoods exhibiting lower levels of monitoring. This may in part have been due
to a greater number of single parent families living in such communities (Beyers et al.),
given that single parents managing a household may struggle to effectively monitor
their child's whereabouts (Neumann et al., 2010). Increased stressors associated with
disadvantage also affect monitoring through parental psychological distress (Kotchick et
al., 2005). Finally, low levels of informal social control in the neighbourhood have
been theorised to impact on the effectiveness of parental monitoring, due to a decreased
likelihood of residents sharing their observations of youth behaviour with parents
(Neumann et al., 2010). Again, the finding of decreased levels of monitoring within
disadvantaged communities runs contrary to what is required for best outcomes, with
the effect of parental monitoring on reducing adolescent antisocial behaviours being
stronger in neighbourhoods characterised by residential disadvantage and instability
(Beyers et al., 2003; Brody et al., 2003).

2.2.6 Social Influences

2.2.6.1 Peer Deviancy

During adolescence, the developmental task of increasing autonomy means that
independence from parents increases (Havighurst, 1953), and social relationships with
peers take on a greater significance (Furman & Buhrmester, 1992). Peer acceptance or
rejection has a dramatic influence on youth psychosocial adjustment, particularly as
adolescents negotiate the development of self-identity (Harter, 1999). Studies
investigating the role of peers in adolescent psychological health show that positive
social relationships are a protective factor, and an integral component of healthy
development (Sun & Stewart, 2007), while poor peer relationships during adolescence have been associated with externalised problem behaviours (Hodges et al., 1999).

The increasing importance of social relationships in adolescence affects youth attitudes and behaviours (Wilkinson & Kraljevic, 2004), and increases susceptibility to peer pressure (Isakson & Jarvis, 1999). Three main streams of thought dominate criminological theories of the relationship between peers and antisocial behaviour—socialisation theories, opportunity theories and social control theory.

Socialisation theories, or peer influence models have their roots in theoretical viewpoints such as Sutherland's (1947) Differential Association theory, and are based on social learning theories derived from Bandura (1977), with the suggestion that peers are the potential instigators of antisocial behaviours. The normative behaviour of the group is taken on by the group members, meaning that association with deviant peers results in the initiation or aggravation of antisocial behaviours (Vitaro et al., 2000). Numerous studies have provided evidence to support the idea that association with deviant peers increases delinquency (Jessar et al., 1995; Vitaro et al., 2000). For example, Vitaro and colleagues' longitudinal study of 567 boys from kindergarten to age 14 showed that best friend's deviancy significantly predicted adolescent's subsequent delinquent behaviour, regardless of preadolescent delinquent behaviours.

While it is apparent that delinquent adolescents spend considerable amounts of time with other delinquents, it is however difficult to determine whether the effects of adolescent associations with similar peers is due to selection or socialisation (Giordano, 1986). The opportunity perspective posits that it is time spent unmonitored, in unstructured activities, which results in adolescents engaging in antisocial behaviours. This theoretical viewpoint draws from social ecological approaches (Hawley, 1950), and was developed in Cohen and Felson's (1979) routine activity perspective. The idea
is that social life is shaped by interpersonal relations, providing increased opportunity for some behaviours, and decreased opportunity for others (Haynie & Osgood, 2005). Warr (1993) argues that merely spending time with peers encourage delinquency, regardless of whether those peers are prosocial or deviant themselves. He suggests that parents counteract this influence, meaning that the more time an adolescent spends with family, the less likely it is that he will engage in deviant behaviours, due to reduced opportunity as well as greater exposure to parental modelling.

Explanations of peer influence based on Social Control theory suggest that young people comply with societal rules because of bonds between them and other people and/or institutions, which cause them to internalise and act on accepted norms (Hirschi, 1969/2009). Antisocial adolescents are rejected by conventional peers, and therefore gravitate towards similar peers. Simons and colleagues (1991) suggest that children rejected by conventional peers tend to "drift into association with each other" (p. 467), and that over time other children with similar values choose to associate with them, resulting in groups of antisocial peers who are more accepting of deviant behaviours. The adolescent with high stakes in conformity is unlikely to associate with delinquent peers, and the greater the stake in conformity, the lower the impact of a deviant friend (Hirschi, 1969/2009). Therefore, the reason for both engagement in delinquency and association with deviant peers is that the adolescent has lost his stake in conformity, meaning that he is no longer compelled to adhere to societal norms, due to a lack of attachment to conventional adults, peers and others.

Regardless of which theoretical framework is used to explain the effects of peer deviancy on adolescents, the evidence suggests that environments play an important role. In disadvantaged neighbourhoods characterised by high rates of crime, association with deviant peers is more likely (Chung & Steinberg, 2006; Friedrichs & Blasius,
In addition, context moderates deviant peer associations. For example, Lacourse, and colleagues (2006) found that family adversity interacted with individual behavioural characteristics in predicting early onset association with deviant peers, and later deviancy. Of boys categorised as high hyperactivity, high fearlessness and low prosociality, 26% living in low family adversity environments were associating with deviant peers by early adolescence, in comparison to 55% of those from families living in highly disadvantaged circumstances (eg. broken families, low level parental occupational status and education) (Lacourse et al., 2006).

2.2.6.2 School Membership

Just as connections with prosocial peers work as social controls, relationships with institutions such as schools can form part of the adolescent's stake in conformity. Weak connections to school are associated with poor outcomes, including antisocial behaviours, but strong bonds to school can be protective for adolescents (Ang et al., 2015; Li & Lerner, 2011; Loukas et al., 2009). The most prominent measure of school connectedness is Goodenow's (1993) Psychological Sense of School Membership, where membership is defined as "the extent to which students feel personally accepted, respected, included, and supported by others in the school environment" (p. 80), and is found to be related to motivation, effort, participation and achievement.

The effect of school connection on deviant behaviour has been shown to be stronger in the prevention of initiation of deviancy than in reducing the intensity of it in those already behaving antisocially (Dornbusch et al., 2001), but the consequences of having low levels of school membership far outweigh those of having moderate or high levels (Goodenow, 1993). Adolescents who experience lower levels of connectedness to
school in conjunction with interpersonal conflict are more likely to experiment with substance use and have mental health problems (Bond et al., 2007).

School connectedness has a reciprocal relationship with participation in extracurricular activities, the benefits of which are well documented for adolescents. Not only does more structured activity mean less time for problem behaviour related to stimulation seeking, but it also provides the adolescent with an opportunity to demonstrate skills such as effort, persistence and concentration (Fredricks & Eccles, 2005; Li & Lerner, 2011). Furthermore, extra-curricular activities often facilitate contact with prosocial peers, and provide the adolescent with links to adults who may offer additional social support. These processes are theorised to contribute to the reduced likelihood of engaging in risky or delinquent behaviours (Fredricks & Eccles, 2005; Loukas et al., 2009).

The school experience appears to vary for students according to socio-demographic characteristics. The level of disadvantage in the local neighbourhood affects likelihood of graduating (Wodtke et al., 2011). Quality of schooling (for example, quality of teaching and classroom practices) also differs according to neighbourhood disadvantage (Lupton, 2005). School quality influences overall school culture, and affects feelings of school membership (Osterman, 2000). Students from lower SES families demonstrate weaker levels of engagement with schools, on intellectual (Marks, 2000), behavioural (involvement in school-based activities, positive conduct) and emotional (Li & Lerner, 2011) levels, with low levels of engagement increasing the likelihood of school dropout (Janosz et al., 2008). However Hopson and Lee (2011) found that perceptions of school climate were particularly important for students living in poverty, where a sense of membership worked as a protective factor in reducing the likelihood of engaging in problem behaviours such as truancy, arguments with teachers, and suspensions. While
there was little difference in behavioural outcomes between advantaged and disadvantaged students who rated their school climate positively. Disadvantaged students who rated school climate less positively engaged in significantly worse behaviours than students from higher income families (Hopson & Lee).

2.3 Summary of Risk, Promotive and Protective Factors

A key strategy for preventing adolescent antisocial behaviours has been to identify risk factors for delinquency, in the hope of addressing these factors and thereby reducing the likelihood of delinquent involvement. More recently, promotive factors have been a focus. Promotive factors reduce the likelihood of poor outcomes amongst all people in a population, while protective factors, which interact with risk in some way, buffer or ameliorate the effect of risk. Research has identified key risk, promotive and protective factors across different domains, including individual characteristics, emotional wellbeing, family dynamics, and social ties. These variables are proximal influences on adolescent outcomes, and their effects are direct and often strongest when compared to more distal factors.

What is common to risk, promotive and protective factors across all domains is the distal influence of sociodemographic context on these relationships. The key risk factors for poor outcomes are more frequently found (and promotive/protective factors are less frequently found) amongst youths with socio-demographic vulnerabilities, such as low SES backgrounds, single parent families, and/or those who reside in disadvantaged neighbourhoods. However, while proximal risks tend to be more prevalent amongst disadvantaged adolescents, the influence of these risk factors amongst vulnerable youths tends to be stronger and more impactful than within normative populations. So too, proximal protective factors, which are often more influential in preventing poor
outcomes amongst disadvantaged youths, tend to occur less frequently for these adolescents.

Further, while the usefulness of proximal risk and protective factor research is evident in its ability to identify potential starting points for intervention, there are a number of criticisms of this research. These include a tendency towards reductionism, where risks are viewed primarily as deficits within the individual's personal and social circumstances, and the influence of broader socio-structural factors are largely ignored (Haines & Case, 2015) or else identified in quantitative studies as being 'significant' despite their nature as "vague, inadequate proxies for putative causal processes" (O'Mahony, 2009, p. 106). However, as noted, while risk factors at individual, family and social levels may have a stronger and more direct effect on adolescent outcomes, these cannot be extricated from the larger contextual influences at play. Life does not take place within a vacuum-- individual, family and social risk factors vary across contexts, and in addition these risks interact with contexts. In order to illustrate the effects of environmental context on adolescent experiences, Chapter 3 provides an in-depth examination of the ways in which sociodemographic variables influence outcomes.
3.1 Introduction

While the proximal risk and protective factors discussed in Chapter 2 are frequently demonstrated to have the strongest effects on adolescent outcomes, research shows that environmental contexts play a large role in regard to the existence and prevalence of such risk factors, and also interact with these risks in influencing outcomes (e.g. Cambron et al., 2018; Hicks et al., 2009; Kim et al., 2003; Lynam et al., 2000; Neumann et al., 2010; Rankin & Quane, 2002). Sociodemographic characteristics, including socioeconomic status, family structure and mobility, as well as neighbourhood of residence, are consistently identified in research as being associated with adolescent antisocial behaviours (Farrington, 2011; McBride Murry et al., 2011; Piotrowska et al., 2015). These distal risk factors are fixed in nature, that is, they are (in the majority of cases) unable to be manipulated or changed.

Rather than directly influencing outcomes, contextual risk factors tend to have an indirect effect, exerting their influence through processes of mediation and moderation. For example, families facing sociodemographic disadvantage are faced with an increased likelihood of experiencing risk factors across other domains, or experience higher levels of such risk. This means that while the effect of sociodemographic risk is largely indirect, it can be all encompassing and pervasive. It is therefore important to understand the ways in which these contextual influences affect the development of adolescent deviance.

A further characteristic of risk factors is their tendency to co-occur, particularly when considering sociodemographic risks. Youths from low SES families frequently reside in more disadvantaged neighbourhoods and are more likely to experience family
discord and be exposed to peer deviancy (Evans, 2004; Moss et al., 2003). This phenomenon is concerning in light of research around cumulative risk, which demonstrates that the risk of poor outcomes is exacerbated when multiple risks occur concurrently.

This chapter begins by summarising the research literature on five sociodemographic factors: family size, mobility, structure and socioeconomic status, as well as neighbourhood of residence. It demonstrates the pervasive influence that these sociodemographic characteristics have on the lives of children and adolescents. Next, the chapter explores the tendency for risk factors to co-exist and highlights that individuals facing sociodemographic risk are particularly affected by the experience of multiple risk. This functions in a cumulative way where negative outcomes increase exponentially as the number of risks increase. The effects of multiple risk during childhood and adolescence are discussed, along with research identifying factors which act protectively against such risk. Finally, conceptual and methodological problems regarding the notion of multiple and cumulative risk are discussed, culminating in the proposal that the best way to investigate the processes through which multiple risk affects outcomes is to separate indirect influences such as sociodemographic risk, from mediating processes including family functioning and individual characteristics.

3.2 Sociodemographic Risk Factors for Poor Adolescent Outcomes

There are numerous sociodemographic factors that throughout the research literature are consistently linked with poor outcomes for children, adolescents and their families. Explanations for the processes through which such contextual factors exert their influence vary, and are more often addressed in theoretical explanations than tested in studies. The following sections summarise the literature on the effects of family size,
structure (in terms of parental marital status), family mobility, neighbourhood of
residence and socioeconomic status on child and adolescent outcomes. It outlines
research demonstrating the influence of these sociodemographic variables, and also
discusses the processes through which they are theorised to operate.

3.2.1 Family Size

Family size, specifically having a large number of children in the family, has been
linked to numerous poor outcomes for young people, including poorer educational
achievement, increased likelihood of abuse and neglect as well as mental health
difficulties, and delinquency. Poorer educational outcomes for children from large
families have been demonstrated by studies such as Blake (1989), who synthesized the
findings of 6 studies exploring family size and educational outcomes, and concluded
that being a child in a larger family was associated with poorer educational
performance, earlier school departure/dropout, and decreased likelihood of
college/University attendance. Likewise, Mednick, Baker and Hocevar (1985) found a
significant difference in the mean number of problems at school experienced by
children from large families where there were 4 or more children in the household
compared to families with 3 or fewer children. The Rochester Longitudinal Study found
that in families with 4 or more children, there was a higher risk of a child exhibiting
poor cognitive performance as well as experiencing poor socioemotional outcomes
(Sameroff et al., 1998).

Larger family size has also been linked to increased probability of experiencing
poor parenting. In an investigation of risk factors contributing to child abuse and neglect
based on youths from 644 participating US families, Brown, Cohen, Johnson and
Salzinger (1998) found that being a child in a family of 3 or more siblings increased the
likelihood of youths reporting some kind of abuse or neglect by 1.8 times. When youth self-reports were combined with official New York State Central Registry for Child Abuse and Neglect (NYSCR) records, youths from large families were 3.2 times more likely to report neglect than those from families of less than 3 children (Brown et al., 1998).

In terms of antisocial behaviours, several studies have demonstrated that children from large families have an increased likelihood of exhibiting undesirable behaviours, or engaging in delinquent activities. Farrington's Cambridge study found family size, among other socioeconomic variables, to be a predictor of antisocial involvement, with boys from families containing four or more biological siblings by the time they reach 10 years, doubling in likelihood of being convicted for delinquent behaviours (West & Farrington, 1973). Children from large families in the Cambridge study were 3.1 times more likely than those from families with fewer than four children to engage in antisocial behaviours at the age of 18, and a logistic regression showed that family size at age 10 was the strongest predictor of being convicted of a crime by the age of 32 (Farrington, 1993). In the Newcastle Thousand Family Study, a longitudinal study from 1947 to 1980, only 3.4% of men from families with six or more children were identified as non-delinquent throughout the study period, while comparatively 17.3% had a criminal offence recorded during this time (Kolvin et al., 1988).

Family size has also been linked to aggression and violent offending. In Lipsey and Derzon's (1998) meta-analysis examining predictors of violence in late adolescence and early adulthood, family size at ages 6 to 11 had a significant but moderately strong relationship with violent offending aged 15 to 25. Huesmann, Eron and Dubow (2002) analysed data from 322 boys collected through the Columbia County Longitudinal study and found a significant correlation between the number of siblings in the household and
levels of aggression at age 8, where the boys from larger families were somewhat more aggressive than those from smaller families. At age 30, the children from larger families were more likely to have been arrested for violent crimes (Huesmann et al.).

The mechanisms through which family size affects antisocial outcomes are not direct. Despite a correlation between low socioeconomic status and large family size, due to the tendency for lower SES families to be generally larger in size, the number of siblings within the family makes an independent (albeit not strong) contribution to delinquency outcomes (West & Farrington, 1973; Mednick et al., 1985). Additionally, while the possibility exists that antisocial individuals may simply have a tendency to create larger families (and therefore 'pass on' criminal tendencies, genetically or otherwise), the relationship between family size and delinquency has been demonstrated to exist in studies which have controlled for variables such as parental criminality, parental age, socioeconomic status, income, and family structure (Fischer, 1984).

Blake (1989) explains the relationship between family size and poor outcomes in what she terms the 'dilution hypothesis', in which she proposes that the dilution of available resources is the mechanism through which larger family size affects outcomes. These resources include divisible resources, such as "the parents' time, emotional and physical energy, attention, and ability to interact with children as individuals" (Blake, 1989, p. 11), which are diluted not only by the number of children in the household, but are also affected by the time the mother spends during, or recovering from, pregnancy. In addition, family size affects material resources, such as a home in a desirable area, adequate living space, financial resources that allow access to high quality schools, the ability to source specialised medical, dental or educational assistance, extracurricular activities such as music or sporting lessons, and cultural experiences through travel, as well as physical resources in the home such as books and computers (Blake, 1989). In
terms of material resources, being a low income family further exacerbates the difficulties of providing adequate resources for a large number of children.

Blake's dilution hypothesis focussed on educational outcomes, but is equally applicable in understanding how family size affects the outcomes of antisocial behaviour and delinquency during childhood and adolescence. The dilution of material resources hypothesis is reflected in Farrington's (2011) assertion that it may not be the number of siblings within the family that is connected with delinquency, but rather the conditions in which the family is housed. Evidence from the Cambridge study showed large family size was only useful in predicting delinquency when overcrowding of the home occurred, suggesting an interaction between family size and SES. In cases where there were two or more rooms than children, large family size failed to have predictive power (West & Farrington, 1973). Thus it may be that the stretching of resources necessary to meet the needs of a larger number of children may lead to increased levels of conflict, family dysfunction and stress, particularly in low socioeconomic families just struggling to survive.

Rutter, Giller and Hagell (1988) suggest that the link between family size and antisocial behaviours operates in two ways. The first explanation resembles Blake's dilution of divisible resources, discussed above and argues that having an increased number of children in the family affects the parents' abilities to effectively monitor and supervise children, and may also result in inadequate disciplinary techniques (Rutter et al.). Indeed, parenting in larger families has been found to be more authoritarian, with a focus on strict adherence to rules and a lack of flexibility and individualisation (Wagner et al., 1985). In addition, large families often mean less frequent interactions between adults and children, with older siblings responsible for supervision of younger children (Hogan & Kitagawa, 1985).
In addition to the effects of large family size being mediated through parenting practices, a second mechanism proposed by Rutter, Giller and Hagell (1988) is contagion effect as a result of the number of delinquent siblings. This notion is supported by studies examining sibling delinquency and birth order, which find that it is most often younger children with delinquent older siblings who behave antisocially, suggesting a modelling effect (Brownfield & Sorenson, 1994). The tendency for larger families to inhibit a child's opportunities for "privacy and freedom from impingement from other siblings" (Blake, 1989, p 11) suggests that engagement in antisocial activities by one child in the family may be more easily observed (and subsequently copied) by siblings in larger families than in smaller ones, particularly with siblings sharing bedrooms, and/or if overcrowding occurs in the home. Additionally, having older siblings who are delinquent not only has a modelling effect for younger siblings, but also provides opportunity for antisocial involvement together, thus accelerating deviant involvement (Synder et al., 2005).

Sibling gender plays a role in the relationship between family size and antisocial behaviours. The modelling of delinquency effect has been found to be stronger with same-sex siblings than with different-sex siblings (Rutter et al., 1988). Jones, Offord and Abrams (1980) found that for delinquent boys, increases in the number of male siblings resulted in increased antisocial activities, while increases in the number of female siblings resulted in reduced antisocial behaviours; a phenomenon they termed 'male potentiation and female suppression'. This phenomenon was not found for the female delinquents in their study, whose antisocial behaviours increased as the number of siblings increased, regardless of sibling gender (Jones et al.). Similarly, Snyder, Bank and Burrraston (2005) found that in the case of older delinquent brothers, younger brothers were more likely than younger sisters to exhibit adjustment problems such as
antisocial behaviours and substance use later in life. In contrast, younger sisters who were directly involved with older delinquent brothers (and their peers) were more likely to have been the victims of antisocial acts, and other traumatic experiences (Snyder et al., 2005).

For young females, family size has been linked to attitudes towards sexual involvement, age of first engagement in sexual activities, and likelihood of non-marital childbearing (Kalil & Kuntz, 1999). In a sample of over 1000 black females aged 13 to 19, Hogan and Kitagawa (1985) found that for girls with 5 or more siblings, the likelihood of engaging in sexual intercourse was increased by around one fifth when compared to girls with fewer siblings. In addition, pregnancy rates for girls from large families were around 55% higher than those of girls from smaller families (Hogan & Kitagawa). East, Felice and Morgan (1993) found that amongst 455 adolescent girls aged from 11 to 15, the number of sexually active sisters a girl had was significantly correlated with girls' own sexual attitudes, intentions, and sexual status.

### 3.2.2 Family Structure

Another key factor noted to influence antisocial outcomes is family structure, particularly in regard to which adults reside in the family home. Classic studies examining family structure focus on the effects of being raised by a single mother, or the influence of divorce on children's outcomes, but in modern times the family unit has evolved, with an increase in defacto relationships, as well as shared care arrangements for separated biological parents, in which children spend a percentage of time living in each parent's home. This makes the effects of family structure more complicated, but regardless of the specific family unit in which a child lives, the processes through which family structure influences antisocial outcomes appear to remain the same.
To generalise, it appears that children and adolescents who live with two biological parents have less likelihood of poor outcomes. When comparing US adolescents of similar social positions, not growing up in a household with two biological parents doubled the likelihood of early school dropout, teenage pregnancy, and unemployment in early adulthood (McLanahan & Sandefur, 1994). Farrington (2011) states that criminality is more likely for children who are separated from a biological parent for whatever reason, than for children whose family remains intact during their childhood years. However research suggests that the long accepted link between family structure and poor outcomes has been overstated, particularly due to methodological issues which confound other demographic variables such as family poverty with that of family structure (McCord, 2002). What is clear is that the link between family structure and delinquency is indirect, and mediated through other family dynamics.

Traditionally, the focus on single parent households and crime came from a time when a nuclear family was the society standard (McCord, 2002), and the move to a one parent household was a result of family breakdown or tragedy. It was therefore difficult to separate the effects on children's outcomes of parental loss (through divorce or death) and the experience of being raised by one parent only. Further, parental separation or divorce is commonly preceded by a period of parental conflict, which in many cases may occur for long periods, with children exposed. Numerous studies have highlighted the link between parental discord and child behaviour problems (Emery, 1982), and in cases where separation is the culmination of ongoing marital disharmony, it would not be unusual to observe problematic outcomes for the children. Family breakdown has been found to result in intense emotional reactions from the children, lower self-esteem, and increased behavioural problems (Haurin, 1992). In cases of parental separation or divorce, family relationships may be strained, and children may blame or resent either
parent, resulting in diminished parent-child relationships (Hetherington & Stanley-Hagan, 1999). Parental conflict that results in divorce does not always cease once parents separate, and ongoing fighting between parents may affect child outcomes (Emery, 1982). Thus, the poor outcomes associated with living in a single parent family may be a proxy for the effects of ongoing family conflict and breakdown.

A highly influential factor related to the effects of family structure on childhood wellbeing is the stability of relationships. Patterson and Capaldi (1991) reported finding a linear relationship between the number of family transitions and boys’ problematic adjustment-- a construct including antisocial behaviours, drug-use, deviant peer association, low self-esteem, depression and poor academic achievement. Similarly, Aquilino (1996) found that children of single mothers who were exposed to multiple family transitions had poorer outcomes than children of single mothers who remained single throughout the child's life-course. Specifically, instability in family living arrangements as a result of mothers' relationships led young people to leave school earlier, and seek independence earlier, through obtaining work and their own place of residence (Aquilino).

Contemporary criminological research acknowledges that "not all single parent families are broken" (McCord, 2002, p 677), and while traditionally family breakdown was the catalyst leading to single parenting, in more recent times it has become more common for women to have children outside of marriage. The characteristics of women who become single mothers (as opposed to those who are left single due to separation or divorce) may confound the effects of family structure on child outcomes. For example, Ellwood and Jencks (2004) state that the rapid rise in US single parent families that has occurred since the 1960's is predominantly driven by black Americans, and those with lower levels of education. Both these populations are already found to be disadvantaged
in regards to wellbeing outcomes. Single parenting as a consequence of teenage pregnancy is most likely to occur for young delinquent females, with antisocial behaviours in their children more likely to be due to issues such as the mother's own antisocial attitudes, welfare dependence, school dropout, parenting difficulties, and even health issues such as low birth weight (National Research Council and Institute of Medicine, 2001).

McCord (1982) found evidence that the parenting qualities of single mothers were largely responsible for their child's involvement in antisocial activities with 62% of boys with non-affectionate single mothers engaging in juvenile offending, in comparison to only 22% of boys with affectionate single mothers. However, while no greater prevalence of maternal rejection was found in broken homes compared to two-parent homes, sons of rejecting single mothers were significantly more likely to be convicted of serious crimes than sons of rejecting mothers from families with two residing parents (McCord, 1982). While self-selection may explain some of the relationship between single parenting and poor outcomes for children, heading a single parent household exacerbates any pre-existing difficulties.

It is evident that the burden of parenting is most often greater on a single parent than for a parent within a two-parent family, and therefore being a single parent may have similar effects to being a parent of a large family in terms of resources, with reduced time available for parent-child interactions, as well as monitoring and supervision. Aquilino (1996) explains this in terms of the socialisation perspective according to which having access to two parents provides the young person with adequate support, supervision and control, which is less likely to be available with only one adult in the household. Demuth and Brown (2004) found that both formal and informal social controls, including levels of monitoring and supervision, as well as closeness and
involvement, were higher in two-parent biological families than in single parent families (regardless of whether these were mother only or father only). They theorised that these family processes, rather than parental absence, explained their findings where adolescent delinquency levels were higher in one-parent families (Demuth & Brown). The increased load experienced by a single parent may result in heightened stress levels, affect parental efficacy and ultimately have an impact on family dynamics.

Perhaps the greatest resource affected by single parenting is income. A family relying on a single wage is, in the majority of cases, more likely to experience financial pressures than a family where both parents are receiving an income. Regardless of whether single parenting is a result of divorce, or due to a child being born out of wedlock, the correlation between single parent households and poverty remains, with 1992 US census data showing that 45% of families headed by single mothers fell below the poverty line, compared to only 8.4% of two-parent families (McLanahan & Sandefur, 1994). Brown and Moran (1997) found single mothers to be twice as likely to experience financial hardship as married mothers, despite also being twice as likely to have fulltime employment. In traditional studies, this relationship between single parenting and poverty confounds the impact of family structure on crime (McCord, 2002). Not only are poverty and single parenting linked, but Thomas and Sawhill (2005) argue that for US families marriages are economically beneficial to such an extent that single parent households are essentially maintaining the existence of poverty.

3.2.3 Family Mobility

Moving homes involves far more than the relocation of one's residence. Stokols and Shumaker (1982) describe the process as a complex environmental transition, and suggest that it not only affects such factors as employment, peer and friendship
networks, recreational activities, and ways of commuting, but that it also encompasses
the consequences of the greater issues which triggered the move initially. Frequent
relocation results in families experiencing the effects of these transitions multiple times,
and the consequent instability of living arrangements has been associated with
problematic child development, although the effects of high family mobility are difficult
to disentangle from outcomes associated with demographics most commonly found
amongst those who move often (Hanushek et al., 2004).

Renters, younger families, and low-income earners tend to have the highest mobility
rates (Coulton et al., 2009). Based on 1986/87 US census data, Wood et al. (1993)
concluded that poor families moved homes 50 to 100% more often than families not
categorised as poor, and their study found that frequent family moves were more
common for children in families that were poor, or that were headed by a single,
unemployed, young or below high school educated parent. Amongst low-income
 earners, the process of moving is often a negative experience, motivated by problems,
and with little resultant benefit (Nichols & Gault, 2003). Coulton, Theodos and Turner
(2009) describe these highly mobile, low income families as churning movers- those
who move often to escape financial problems and difficulties with their current rental
circumstances but who did not experience any increase in life quality following each
move. Further, these families who move often are commonly renters, and therefore do
not benefit from the positive and protective attributes of home ownership (Coulton et
al.).

The disruption and change associated with any move can cause family members
stress, but the stressful impact of moving home is amplified in families with already
limited resources for coping, particularly if the move is necessitated by a negative life
event such as divorce, job loss or eviction (Scanlon & Devine, 2001; Wood et al., 1993).
Stokols and Shumaker (1982) suggest that the physical and emotional effects of moving residence are mediated by both the predictability of the move and how controllable the new environment is perceived to be. People who choose to move homes based on a desire to do so fare better than those who feel compelled to move for reasons they consider beyond their own control, particularly if their new home is one which they dislike or is in a neighbourhood they have no desire to reside in. In addition, those who move often for reasons other than choice are likely to experience a cumulative stress effect (Stokols & Shumaker).

Being highly mobile affects the ability to maintain social networks and may even affect employment. Pribesh and Downey (1999) propose a social capital explanation of the influence of moving on family outcomes, suggesting that moving severs (or at best damages) the ties that family members have with their communities, workplaces and neighbourhoods. Highly mobile families that are economically disadvantaged add to their existing financial difficulties the problems associated with this lack of community links, including those with schools, which affects children's academic performance (Hanushek et al., 2004). In addition to the child’s bond with the school he or she attends being important, the ties between parents and the school, such as knowing a child's classmates and teachers, have also been demonstrated to influence children's academic achievement (Pribesh & Downey). Such ties are lost when one moves.

Frequent changes in residence often results in simultaneous changes in schools attended by the children of highly mobile families. Instability in schooling has been linked to poorer academic performance, as well as school dropout (Nichols & Gault, 2003; Pribesh & Downey, 1999). For example, Wood and colleagues (1993) analysed a sample of 9915 American students aged between 6 and 17, to explore how frequent residential moving influenced outcomes of academic achievement and behaviour. Their
analysis found high rates of family mobility to be associated with delays in child development, learning disorders, academic failure, and behavioural problems, but after controlling for parental education, child sex, family structure and socioeconomic status, significant associations remained only for academic failure (having to repeat a grade) and having multiple frequently occurring behavioural problems. Specifically, children in frequently moving families were 35% more likely to repeat a grade, and 77% more likely to exhibit 4 or more problem behaviours in comparison to children with stable housing (Wood et al., 1993).

Adolescents who move frequently may not only struggle academically, but also face increased difficulty in cultivating friendships at school. For example, an Australian study by Fields (1995) on the academic and social effects of family mobility assessed 40 highly mobile adolescents (those who had attended 3+ schools within the last 2 years) in years 7 to 9 from non-defence force families, and found over 70% of the sample to have significant academic and social adjustment problems. Teacher's ratings of students' academic achievement in English placed 45% of the mobile sample in the lowest third and 47.5% in the middle third of the class. Additionally, mean ratings for peer acceptance amongst the mobile sample was 1.7 (on a scale of 0 to 5) compared to a mean rating of 3.3 for the remainder of the students within the school assessed, suggesting that the mobile students experienced far lower levels of social acceptance amongst classmates.

Bonds within families can be strained by the stress resulting from moving (Pribesh & Downey), particularly if that moving is frequent. In terms of family dynamics, it is difficult to ascertain the temporal order of the relationship between high family mobility and family characteristics. In a re-analysis of the Glueck data, Sampson and Laub (1994) found a significant negative correlation between family residential mobility and
both parent-child attachment, and maternal supervision, and a significant positive association between mobility and child delinquency. In their logistic regression model that included family dynamic variables such as attachment, monitoring and harsh discipline, residential mobility had a small direct effect on unofficial delinquency as reported by parents, teachers and the child himself (Sampson & Laub). Breakdown in family relationships may be a consequence of frequent mobility, but it may also be that frequently mobile families tend to exhibit these family characteristics. Hagan, MacMillan and Wheaton's (1996) finding that frequent moves tended to be most disruptive for those children whose parents scored low on involvement and support measures, adds further weight to the argument that those who tend to move most often are also those who may be most affected by it.

3.2.4 Neighbourhood

Where one lives matters. The neighbourhoods in which families reside have been found to affect life through multiple avenues, both direct and indirect, and numerous theoretical explanations have been posited in explanation. It is acknowledged that studies of neighbourhood influences face methodological issues, as demonstrated through a lack of consensus and consistency within the research history, particularly regarding the best way in which both 'neighbourhood' and 'disadvantage' should be defined and measured (Curley, 2005; Small & Newman, 2001). Despite these methodological concerns, empirical results show that the operational unit of analysis is not a large cause for concern, as in America at least the structural composition of 'neighbourhoods' differ little when measured at different geographical levels (Sampson et al., 2002). Further, regardless of the ways in which 'disadvantage' is measured, studies have clearly demonstrated that residents in less advantaged neighbourhoods do
not fare as well as residents from more advantaged neighbourhoods on multiple outcomes (Curley, 2005). Therefore, despite debate around measurement issues and operational characteristics, the influence of neighbourhood on wellbeing outcomes is noted in the research literature.

Where one lives influences health, emotional and social wellbeing, and also educational and occupational outcomes. Health behaviours of individuals have been shown to vary according to neighbourhood, with residents from disadvantaged neighbourhoods engaging in more high risk behaviours (smoking, excessive use of alcohol and inadequate exercising), even when controlling for individual SES (Halonen et al., 2012). In particular, the influence of neighbourhood poverty on children and adolescents has been noted (Brooks-Gunn et al., 1997), with researchers suggesting that the growth, development and adjustment of young people are all affected by their residential location (McBride Murry et al., 2011).

Leventhal and Brooks-Gunn's (2000) review of research examining neighbourhood influences on young people demonstrated that children and adolescents living in affluent neighbourhoods experienced better educational and learning outcomes, such as being rated as more ready for school, having higher academic achievement and IQ, and increasing the likelihood of both finishing high school and attending college after school. Moreover, studies suggest that the influence of neighbourhood on educational outcomes may be stronger for males than for females. Living in a low SES neighbourhood was found to increase the likelihood of mental health problems in young people, particularly in regards to externalised behaviours, and to be associated with higher levels of delinquency, as well as increased rates of adolescent sexual activity and child-bearing (Leventhal & Brooks-Gunn).
While such differences in outcomes have been noted for individuals living in different neighbourhoods, there is a lack of consensus within the literature regarding the specific ways in which neighbourhood influences individual wellbeing, and what direction future neighbourhood research should take is currently a matter for discussion amongst researchers (Small & Feldman, 2012). When exploring the mechanisms through which neighbourhoods influence the beliefs and behaviours of residents, it is difficult to disentangle variables on different levels that contribute to outcomes, particularly the interaction of individual, and family level characteristics with neighbourhood level variables. Family characteristics not only affect developmental outcomes of children regardless of where a family lives, they also have a major influence on where a family does live (Jencks & Mayer, 1990). Further, neighbourhoods themselves are not random distributions and their residents often tend to share certain characteristics. For example, parents in disadvantaged neighbourhoods often have low educational attainment and aspirations (Small & Newman, 2001).

Throughout the decades numerous theories have emerged to explain the relationship between residential location and the wellbeing of residents, with a focus on the mechanisms through which disadvantaged neighbourhoods and problematic outcomes interact. An overview by Sampson, Morenoff and Gannon-Rowley (2002) of over 40 studies of neighbourhood effects conducted between mid-1990 and 2001, concluded that while correlations between processes were evident, the ways through which neighbourhoods influence outcomes was able to be classified in terms of four independent mechanisms-- social ties and interactions, norms and collective efficacy, institutional resources, and routine activities.
3.2.4.1 *Social Ties and Interactions*

Central to explanations of the relationship between neighbourhood and resident outcomes are socialisation theories that explore both the characteristics of residents within the neighbourhood, as well as the social interactions that occur within the community, partly as a result of these characteristics. These processes of socialisation collectively contribute to *social capital* a resource whose existence is theorised to positively improve wellbeing (Curley, 2005). Social capital refers to the collective value of social networks and is understood as the characteristics of relationship networks which allow the transformation of resources into economic and cultural capital (Portes & Vickstrom, 2011). In its earliest sociological forms (as discussed by Bourdieu and Coleman), it centred around persons and families, but Putnam (an American political scientist) transformed the idea of social capital to include aggregate characteristics of a neighbourhood such as the proportion of people involved with civic associations or local organisations (Portes & Vickstrom, 2011). Both the frequency of social interactions and the strength of social ties in the neighbourhood contribute to social capital (Sampson et al., 2002), but the structural characteristics of the neighbourhood itself are a key factor.

The relationship between neighbourhood characteristics and social capital is best understood through the distinction between *bonding social capital* and *bridging social capital*. Both forms refer to trusting and cooperative bonds between individuals, but bonding social capital emerges amongst networks of people with an awareness of their shared similarities, whereas bridging social capital is found amongst people who are conscious of their differences in relation to socio-demographics, social identities, and other characteristics (Szreter & Woolcock, 2004). Bonding social capital, while useful in terms of social cohesion and support in communities (Poortinga, 2006) carries the
risk of *out-group antagonism* due to the similarities between members and the consequent reinforcement of these (Putnam, 2000). Bridging capital not only fosters social inclusion, but also aids in the diffusion of information, links people to external assets, and provide opportunities such as employment (Putnam, 2000), meaning that while it is considered more fragile than bonding capital it is much more valuable (Schuller et al., 2000). Putnam (2000) explains that bonding social capital helps people get by, but bridging social capital enables them to get ahead: "Bonding social capital constitutes a kind of sociological superglue, whereas bridging social capital provides a sociological WD-40" (p. 19). Thus, in terms of neighbourhood characteristics, *heterogeneous neighbourhoods* (those that contain a diversity of residents) allow the emergence of bridging social capital and the benefits that it brings to community members.

Recognition of the importance of neighbourhood heterogeneity was emphasised by Wilson (1987), who in his thesis *The Truly Disadvantaged* sought to explain the link between neighbourhood conditions and outcomes for residents on the basis of concentrated disadvantage. Focussing mainly on the experience of the American black population, Wilson argued that is the social composition of disadvantaged neighbourhoods that is influential. Neighbourhoods which are dominated by economically disadvantaged residents (the ‘underclass’) result in social isolation, in that the inability to interact with working or middle class families results in residents becoming disconnected from mainstream society. Social disconnection therefore limits human agency, particularly in regards to employment opportunities, with residents in high unemployment neighbourhoods having minimal contact with working peers and being excluded from informal job network systems through which employment opportunities might otherwise be learnt (Small & Newman, 2001). These ideas are
supported by research such as Tigges, Browne and Green (1998), who found that living in a neighbourhood characterised by poverty significantly reduced the likelihood of having close ties with someone who was employed, or had a college education, although in both cases further analysis by race showed this to hold true only for participants who were black. Thus, while residents in disadvantaged neighbourhoods may have connections within their communities that provide them with social support, they are theorised to lack the connections that would provide them with social leverage to mobilise and succeed (Curley, 2005).

While the influence of neighbourhood on social leverage has been noted, research examining the influence of neighbourhood on social ties is less conclusive in its findings, with some studies concluding that social ties are weaker in disadvantaged communities, and others suggesting that strong social networks do exist between residents in such neighbourhoods (Curley, 2005). One neighbourhood characteristic theorised to affect the ability of residents to form effective social ties is residential stability, with research by Ross, Reynolds and Geiss (2000) suggesting that high turnover rates of residents limit the ability to form social connections with neighbours. In neighbourhoods perceived by residents as disordered and dangerous, due to high rates of crime and drug-use, social ties were observed to buffer (but not negate) the effects of fear and mistrust felt by residents (Ross & Joon Jang, 2000). However, residential stability and social ties may not be beneficial under all conditions. While stability was found to be associated with lower levels of overall psychological distress (measured as depression and anxiety) in advantaged neighbourhoods, in high poverty neighbourhoods the relationship between residential stability and distress was instead found to be positive, with the authors suggesting that stability may increase resident's perceptions of feeling stuck and unable to escape highly disadvantaged neighbourhoods
(Ross et al., 2000). Characteristics of the neighbourhood, such as extreme disadvantage, may therefore affect the ability of social ties to transform into social order, suggesting that it is not the social ties themselves, but rather the consequent informal social controls they create, that determine the influence of neighbourhood on outcomes.

Neighbourhoods also moderate the influence of social ties. For example, Homel, Burns and Goodnow (1987), in a study of Sydney families, found that parents’ friend networks, examined in terms of friend dependability, were positively related to their children’s social and emotional adjustment. In high risk neighbourhoods, and amongst parents with lower socioeconomic backgrounds, there was an over-representation of parents reporting no dependable friends, with the authors suggesting that even well connected parents in these circumstances may be affected by neighbourhood mobility and lower community efficacy, thus pushing the positive benefits of dependable social networks beyond the reach of such families. Further, the socioeconomic status of the area in which families lived had an effect over and above social network variables, where children from high risk neighbourhoods had similar correlation patterns to children whose parents reported limited social networks.

Even where social ties exist, and residents report feeling they have social support, neighbourhood affects the influence of this support. Ceballo and McLoyd’s (2002) study demonstrated that neighbourhood quality moderates the relationship between social support and parenting behaviours associated with the reduction of antisocial behaviours in children. Whereas parental emotional support was linked to more nurturing parenting, and instrumental support was linked to the reduced use of punitive punishment strategies, a significant interaction of neighbourhood on the relationships between both emotional support and nurturing and instrumental support and punitive
punishment was found, showing that in disadvantaged neighbourhoods with high rates of crime, the effects of these relationships were far weaker than they were in advantaged neighbourhoods (Ceballo & McLoyd, 2002). The authors concluded that the benefits to parenting practices as a consequence of parental social support wane in the face of environmental stressors associated with disadvantage.

3.2.4.2 Norms and Collective Efficacy

In their discussion of the ways in which neighbourhood socialisation influences community norms and therefore resident behaviour, Jencks and Mayer (1990) distinguish between models of neighbourhood effects, where the behaviour of resident adults is key in explaining the behaviours of young people, and epidemic models, which focus on neighbourhood peer influences. Both approaches suggest that modelling and reinforcement result in the uptake of neighbourhood specific beliefs which exist in the community as norms for behaviour.

Weatherburn and Lind (2000) outline the epidemic model as beginning with economic stress that results in parents being neglectful, abusive or engaging in inappropriate disciplinary tactics with their children. These problems are exacerbated in situations where parents lack social supports or experience further parenting stressors such as parenting alone or parenting a large family. The consequent poor parent-child relationship results in children gravitating away from parents and towards peers. When these peers tend to be deviant, these children who lack strong parental bonds will be susceptible to their influence (Weatherburn & Lind). At the core of epidemic models therefore are social learning theories such as differential association theory that explain the influence of neighbourhoods on children's behaviours based on contagion effects, as a result of exposure to peers within the neighbourhood (Curley, 2005). In terms of
crime, epidemic models suggest that it is association with ‘bad’ youth that lead other young people to engage in ‘bad’ behaviours, meaning that children who grow up in neighbourhoods that have high rates of crime are more likely to be exposed to the antisocial behaviours of their peers and will thereby learn and mimic criminal acts.

The influence of exposure to antisocial youths within the neighbourhood is shown through research based on the Seattle Social Development Project, such as Hill, Lui and Hawkins' (2001) investigation into childhood predictors of gang membership which demonstrated that young people who reported living in neighbourhoods where local youth 'got in trouble' were 3 times more likely to join and to remain a member of a gang. Further, in terms of youth violence, a multivariate logistic regression using demographic, individual, peer, school and neighbourhood variables showed that living in a neighbourhood with antisocial youths at ages 10 to 12 significantly increased the likelihood of violence at ages 13 to 14 by 1.7 times, making the influence of neighbourhood antisocial youth one of the strongest predictors of adolescent violence (Herrenkohl et al., 2012).

This ongoing pattern of exposure and consequent mimicking means that neighbourhoods possess dominant norms in terms of behavioural expectations, and youth within neighbourhoods are largely homogenous in their beliefs and behavioural choices (Jencks & Mayer, 1990). While young people in high crime neighbourhoods are still exposed to conventional norms for behaviour as well as peer norms, Small and Newman (2001) argue that in neighbourhoods where opportunities to meet conventional goals are perceived to be limited, young people will instead gravitate towards behaviours dictated by street norms. Thus, based on epidemic theories, in disadvantaged neighbourhoods, where crime rates are generally higher and opportunities for
conventional success are lower, young people will be more inclined to conform to peer modelled norms of antisocial activity, resulting in their own antisocial involvement.

*Collective socialisation* theories of neighbourhood effects extend the notion of modelling to include the passing on of beliefs and behaviours of adults in the community. The influence of concentrated disadvantage in neighbourhoods is theorised to become stronger as generations pass and norms are reinforced. Families in neighbourhoods contribute to a process defined as collective socialisation, through which children learn acceptable standards of behaviour (Kalil & Kutz, 1999). Collective socialisation models focus on resident adults in the neighbourhood, who are theorised to act as both role models for youth, as well as enforcers of public order (Jencks & Mayer, 1990). Children in neighbourhoods characterised by concentrated disadvantage are exposed to models that fail to reinforce mainstream societal norms and values in regard to family dynamics, employment and education, as espoused by working, middle and upper class citizens (Curley, 2005), maintaining a cycle of social isolation throughout the generations. The lack of exposure to successful adult role models inhibits the ability of children to aspire to success themselves and increases the likelihood of young people failing to complete schooling, becoming unemployed, and having children outside of marriage (Small & Newman, 2001).

In a sample of 199 US cities, Parker and Reckdenwald (2008) found that concentrated disadvantage in a neighbourhood (a measure incorporating: poverty, intraracial income inequality, single parent homes, and racial residential segregation), was negatively correlated with a traditional male role model index that included the percentage of males over 35 who were married, and the percentage of males aged 35 to 64 who were employed. Using negative binomial regression, the authors found that the impact of concentrated disadvantage on African American juvenile violence was
mediated by this lack of male role models. Specifically, before the inclusion of the male role model measure, concentrated disadvantage significantly predicted arrests for violence amongst African American youths, but after the inclusion of the male role model measure concentrated disadvantage was no longer significant. Instead, the male role model index in the final regression equation was found to significantly predict arrests for violence (Parker & Reckdenwald).

While neighbourhoods might convey norms for acceptable behaviours, it is informal social control—the process of community enforcement—that influences the enactment of norms into behaviour. Theories that explain the link between neighbourhood characteristics and crime based on social control are not new. As early as the 1930's researchers such as Shaw and McKay were exploring the ways in which neighbourhood affects outcomes for residents. Their Chicago study suggested that neighbourhoods differed systematically not only in regard to the composition of residents and their economic status, but that variations also existed in regard to dominant norms, values and behaviours observed (Shaw & McKay, 1969). Thus, a theory emerged that neighbourhood characteristics operate at an aggregate level, to affect the behaviours of residents. Specifically, certain neighbourhood characteristics, such as high rates of poverty and transience, were theorised to weaken processes of social control and result in socially disorganised neighbourhoods with consequent higher rates of crime and deviance (Anderson, 2014).

Building on the notion of social disorganisation, and particularly important to the concept of social control, is what Sampson and colleagues term collective efficacy. This reflects the willingness of residents to intervene in matters affecting the wellbeing of the neighbourhood itself, and to perceive that people in the area are socially cohesive and trust each other (Sampson, Raudenbush & Earls, 1997). Collective efficacy is a form of
social organisation that goes beyond social ties amongst residents (Anderson, 2014). It depends on mutual trust between residents (cohesion), and the sharing of clear expectations regarding what behaviours are acceptable (Sampson et al., 2002).

Collective efficacy operates as a method of regulation through which people in the neighbourhood, particularly children and adolescents, are monitored and controlled. Research suggests that disorganised neighbourhoods have lower levels of collective efficacy and thus weaker social controls, resulting in higher rates of antisocial behaviour and crime (Small & Newman, 2001). For example, Sampson, Raudenbush and Earls (1997) demonstrated that when controlling for concentrated disadvantage, collective efficacy was negatively related to neighbourhood violence as well as homicide and violent victimisation, where each 2 standard deviation increase in efficacy reduced the expected homicide rate by 32.7% and the odds of victimisation by 30%.

Further, this link between collective efficacy and crime appears to transcend issues of the socioeconomic status of residents, where even in neighbourhoods characterised by poverty, stronger social organisation and efficacy result in lower rates of criminal activity (Small & Newman, 2001). In addition, neighbourhood efficacy has been linked to internalising behaviours. For example, Ahern and Galea (2011) found evidence to suggest that higher levels of collective efficacy in neighbourhoods was also related to lower levels of depression, particularly for older adults (65 years+). Rates of depression in high-efficacy neighbourhoods were around 2%, but those in lower-efficacy neighbourhoods were estimated at 8.2% (Ahern & Galea). Maimon, Browning and Brooks-Gunn’s (2010) study into adolescent suicide attempts noted that characteristics of the neighbourhood, such as concentrated poverty and residential instability, contributed to differences in rates of suicide attempts, but collective efficacy was noted to play a key moderating role in terms of protective factors. The effect of family
attachment in reducing the probability of adolescent suicide attempts was moderated by
neighbourhood collective efficacy, where attachment had no significant effect on
suicide attempt probability for families living in neighbourhoods with low collective
efficacy, but for families in neighbourhoods with high collective efficacy, the effect was
significant (Maimon et al., 2010).

Rukus and Warner (2013) suggest that the physical characteristics of the
neighbourhood can encourage the emergence of collective efficacy amongst residents,
thereby affecting resident outcomes. Planning which focusses on making cities more
family friendly and encourages family participation may be key to raising levels of
neighbourhood collective efficacy and thereby reducing crime rates. For example,
having pedestrian-friendly streetscapes was theorised to increase the presence of
families in the neighbourhood, and thereby decrease the opportunity for antisocial
behaviours in public areas (Rukus & Warner, 2013). Using negative binomial
regression and controlling for demographic variables, Rukus and Warner found that
community disorder (a measure comprising rates of high school dropout,
unemployment, poverty, and public assistance in the community) was positively
associated with both violent crime and property crime. Of the factors theorised to
contribute to collective efficacy, impact fees (that is, fees imposed by Government that
require developers to contribute to some/all of the costs of providing public services
such as recreation areas and community facilities) were a significant negative predictor
of both kinds of crime. These fees, most commonly applied in this study to parks and
recreation (47%) as well as community centres (17%), ensure that adequate facilities are
built quickly in a community, with the authors proposing that this kind of socially
oriented infrastructure reduces crime in a neighbourhood due to the fostering of
community efficacy (Rukus & Warner).
These kinds of physical changes to neighbourhood may be particularly important in disadvantaged communities, given that residents of low SES neighbourhoods often perceive their community as not being a family-friendly or accessible environment. For example, Lovasi et al.’s (2009) review of the effects of neighbourhood on physical activity found that residents in low SES neighbourhoods perceive their neighbourhoods as having more barriers to enjoying time outdoors, such as noise, disorder and crime within the neighbourhood, heavy traffic, the presence of strangers' dogs and a lack of sidewalks, streetlights and/or places to be physically active. Without sufficient city planning to ensure funding of services such as recreation centres, child care centres, and libraries, the physical environment of a neighbourhood may actually encourage crime (Rukus & Warner, 2013).

3.2.4.3 Institutional Resources

Institutional models of neighbourhood influences suggest that variations exist between neighbourhoods in regard to the "availability, accessibility, affordability, and quality of learning, social, and recreational activities, child care, schools, medical facilities, and employment opportunities present in the community" (Leventhal & Brooks-Gunn, 2000, p. 322). As Sampson, Morenoff and Gannon-Rowley (2002) point out however, it is not merely whether institutional resources are present or not present in neighbourhoods that is important, -- also relevant is whether residents participate in or utilise such resources when they are available. Concentrated disadvantage in a neighbourhood affects the functioning of community institutions which often fail to thrive or even exist due to the lack of working and middle-class families, whose involvement maintain such organisations (Curley, 2005).
While institutional resources may not be a strong direct predictor of improved outcomes in neighbourhoods, they do play a key role in relation to other mediators of neighbourhood influence. Well-functioning institutions within neighbourhoods are important for several reasons: not only do they provide residents with places to come together, thereby strengthening social bonds, increasing community social controls and giving an opportunity for exposure to appropriate role models, they also provide direct control by offering organised, supervised activities for young people (Peterson et al., 2000).

Institutional resources are particularly important as a protective factor in disadvantaged communities. For example, Peterson, Krivo and Harris (2000) found that while institutional mechanisms were unable to explain the association between low SES neighbourhoods and crime, access to institutional resources had a stabilising effect on reducing violent crimes in disadvantaged neighbourhoods, with a significant interaction found between economic deprivation and the presence of recreation centres. A lack of institutional resources also increases the difficulties parents face in raising their children effectively and in communities where parents are already struggling, having access to institutional resources is an important source of support.

Perhaps the most crucial of all institutional resources are those of child care and schooling. Availability of quality child care is important for early learning and socialisation experiences, and has been demonstrated to have an influence on both short and long term developmental outcomes including health, cognitive and educational outcomes, social and emotional wellbeing and antisocial behaviours (Karoly et al., 2006). Access to quality early childhood services is particularly important for children from low SES families, who otherwise often begin school lacking the basic skills necessary for success, particularly in regard to literacy (Karoly et al., 2006). However
studies such as Ishimine and Evans’ (2007) investigation into child care quality in Sydney found that child care centres located in disadvantaged suburbs were of a lower quality "in terms of personal care, activities, interactions and diversity" (p. 319) than centres in less disadvantaged areas.

For older children and adolescents, schools have a significant impact on numerous outcomes, but school environments are often influenced by neighbourhood characteristics, for example in relation to resources available within schools as well as mean student achievement levels (Leventhal & Brooks-Gunn, 2000). While academic achievement cannot be directly attributed to the schools themselves, mean achievement levels of students dictate the pace at which teachers can move through the curriculum. Further, student achievement is affected by the amount of time teachers are able to spend educating as opposed to disciplining students or dealing with crises, and schools in disadvantaged neighbourhoods are more likely to have staff "involved in daily 'firefighting'" (Lupton, 2005, p. 591) resulting in less time for more important learning based activities. Lupton's qualitative study investigating four British secondary schools situated in highly disadvantaged neighbourhoods found that schooling was impacted by issues such as material poverty resulting in a lack of uniforms, schooling and extra-curricular equipment, and even adequate food for the school day. Teachers reported lower rates of student attendance, ability, and disruptive behaviours, and stated that the increased levels of emotional disturbance amongst the students resulted in an unpredictable working environment, in which teachers functioned in more of a social work role than a teaching role, which affected their ability to perform at optimal levels. In addition, expectations for student achievement and success from school staff drop, while parents in disadvantaged neighbourhoods do not demand that local schools meet
high standards of teaching and student achievement to the same degree that parents in more advantaged neighbourhoods do (Jencks & Mayer, 1990).

Institutional models of neighbourhood influences also consider the impact of non-resident adults who work within the neighbourhood on the community, suggesting that particularly in countries such as the US, disadvantaged neighbourhoods will tend to attract poorer quality teachers and other professionals in comparison to advantaged neighbourhoods (Jencks & Mayer, 1990). Non-resident adults working in the community, such as police, are theorised to treat young people differently based on the neighbourhood they reside in. This means that youths in disadvantaged neighbourhoods face stricter policing methods and will be more likely to receive formal sanctions resulting in a criminal record (Jencks & Mayer, 1990). These issues were noted in Homel, Herd and Lincoln's (1999) discussion of policing in Aboriginal communities where over-policing was strongly evident, including increased rates of charges for offences such as 'resisting arrest' or 'hindering police', responses to fighting or disturbances that exacerbate situations, as well as legislation specifically targeting Aboriginal people.

3.2.4.4 Routine Activities

The final way through which neighbourhood is theorised to influence outcomes for residents is through routine activities. This school of thought suggests that the activity patterns of young people in particular vary as a consequence of the neighbourhood in which they live. The ways in which land is used, and the relative locations of utilities such as schools, train and bus stations, and social hubs such as bars and malls within the neighbourhood greatly impact on the routine activities of young people, as they affect how and when they come into contact with peers (Sampson et al., 2002). For example,
Ouimet (2000) examined the influence of criminal opportunity variables in a study of official juvenile crime rates across 495 census tracts within Montreal. In a multiple regression that included demographic variables (single parents, mobility, immigrants, blacks), the number of violent crimes committed by juveniles was predicted by the presence of a bar, subway station or shopping mall in that region (Ouimet, 2000), and the presence of a bar or shopping mall significantly predicted non-violent crimes. While Ouimet concedes that the absence or presence of bars, subway stations and shopping malls in an area may not be the most appropriate measure to capture criminal opportunity, the findings do suggest that opportunities for crime are influenced by neighbourhood amenities.

In many ways, the routine activities explanation of the link between neighbourhood and outcomes is related to the institutional resources that are available. For example, neighbourhoods that do not offer opportunities for young people to engage in safe or organised activities results in an increased likelihood of young people seeking out their own entertainment, which may consist of activities that are less than desirable. Neighbourhood socioeconomic conditions affect the life options and opportunity costs perceived by adolescents and consequently can increase their participation in risky or problem behaviours. Living in a community characterised by high rates of criminal activity such as drug trafficking or gang violence will increase the likelihood of young residents coming into contact with these activities (McBride Murry et al., 2011), either as a participant or as a victim. Furthermore, as a young person living in a community where involvement in risky behaviours is not only respected but expected, refusing to be involved may result in being ostracised or targeted. For example, in a discussion of the ways the societal access routes influence developmental pathways, France and Homel (2007) provide the example of James, who as a young person living in a poor
neighbourhood, looked for no-cost ways in which to pass his spare time. Moving a
dumped engineless car to a location where he and his friends could have 'a bit of fun'
seemed a reasonable option to James (particularly when non-involvement would result
in social exclusion), but the formal consequences of this were criminal charges from the
police who accused the group of stealing the vehicle.

3.2.5 Socioeconomic Status

SES has long been noted in the psychological and criminological literature as a key
variable associated with increased likelihood of poor outcomes. Family poverty has
been linked in studies to such consequences for children as increased likelihood of
physical disorders and poor general health (Chen & Ravallion, 2004; Starfield et al.,
2002), poorer mental health (Evans & English, 2002; Moore et al., 2000), and lower
psychosocial competence (Brody & Flor, 1998), as well as increased levels of learned
helplessness behaviours, and decreased levels of self-regulation (Doan et al., 2012). In
terms of educational outcomes, children from low SES families tend to show lower
levels of academic achievement (Sirin, 2005), and are more likely to experience
learning difficulties (Jordan & Levine, 2009), suffer poor cognitive development
(Hackman & Farrah, 2009), and drop out of high school (Moore et al., 2000).

Compared to young people in advantaged families, adolescents from poor families have
an increased likelihood of experiencing teen pregnancy, early parenting, or contracting
HIV/AIDS (Imamura et al., 2007).

In addition to these poor outcomes, SES is linked in the research literature to an
increased likelihood of behaviour problems such as crime. Braithwaite's (1981)
investigation into class differences in criminality reviewed 100 studies on social class
and juvenile offending, 46 official record studies of social class and adult offending and
78 neighbourhood studies exploring place of residence SES and crime, and concluded that significant class differences exist in terms of the proportion of antisocial acts performed, which cannot be explained by random chance, or as a facet of class bias. Most crucially however, poverty tends to have a generational effect, where children growing up in low SES families experience consequences that impinge on their own successful outcomes and ultimately increase the likelihood that they themselves will raise their families in poverty (Yoshikawa, Aber & Beardslee, 2012). This means that the cycle of poverty and poor outcomes continues.

While correlations between poverty and poor outcomes are consistently noted, the direct association between family SES and antisocial behaviour is in fact weak (Hawkins et al., 1998). As Wikstrom (2006) argues "the commonly accepted 'fact' that criminal behaviour is strongly and negatively correlated with social class has frequently refused to reveal itself in empirical studies" (p.59). Consequently, explanations of the relationship between low SES and poor outcomes such as antisocial behaviours point to mediating and moderating effects.

Longitudinal studies examining families that move out of poverty provide an opportunity to theorise about processes of social selection versus processes of social causation as explanations for how SES operates. Social causation explanations suggest that the social relationships and settings in which individuals engage influence outcomes, whereas theories based on social selection suggest that characteristics of the individual come first, and determine their social settings as well as outcomes (Wright et al., 1999). In terms of SES and outcomes, social causation explanations would be most apt where poverty influenced behaviours due to its contextual influence, whereas social selection explanations would posit that individual characteristics increase the likelihood of poverty as well as its related outcomes.
Costello, Compton, Keeler and Angold (2003) investigated the relationship between poverty and mental health in a longitudinal study which explored children’s outcomes in families who moved out of poverty. Their naturalistic study was made possible when poor families (25% of which were American Indian) became recipients of income due to the opening of a casino on their reservation. Before the casino income was received, children from families classified as poor had more psychiatric symptoms than children who were never poor, but 4 years after the casino opened, children in families who moved out of poverty due to the casino income showed a significant decrease in the number of mental health symptoms reported, with the ex-poor children now exhibiting the same (smaller) number of symptoms as the never-poor children (Costello et al.). An exploration of differences according to types of behavioural outcomes showed that while escaping poverty had no significant effect on internalising disorders (such as depression and anxiety), the changes were strongest for externalising behaviours (including Conduct Disorder and Oppositional Defiant Disorder), with a 40% decrease in these behaviours of ex-poor children (Costello et al.).

The authors of this study suggested that these results support an argument of social causation for behavioural problems. They argued that an interaction between (genetic) vulnerability for externalising disorders was set off by an environmental cause (in this case the stress associated with poverty), rather than behavioural problems being the result of social selection, where genes and environment are correlated such that genetics impedes the ability to escape from poverty (Costello et al., 2003). Further analyses in this study showed that parental supervision levels mediated the relationship between moving out of poverty and improved behavioural outcomes, with the authors suggesting that financial circumstances may have affected the ability of parents to dedicate time to this task.
Stress as a result of financial hardship that mediates the influence of SES on outcomes is one explanation of the way poverty exerts its effect (McLoyd, 1998). Increased stress as a consequence of living in poverty affects all members of the family, but parents who are responsible for the care of their children, and must find ways to survive financially, are hardest hit. Higher levels of stress arising from the strains of coping with inadequate income or the lack of stable employment affect the mental health of parents in low SES families, resulting in poorer mental health and increased feelings of frustration and helplessness (Brody & Flor, 1998; Doan et al., 2012).

The effects of stress arising from living in poverty have also been linked to other proximal processes in an attempt to explain the ways in which family SES exerts an effect on children. In particular, stress is theorised to affect parenting practices due to increased levels of depression, anxiety and/or hostility in parents (Conger & Donnellan, 2007; Evans & English, 2002; Woodward & Fergusson, 2002). This impacts on the adequacy of parent-child relationship factors such as maternal involvement. For example parents who experience increased levels of stress are less likely to be involved with their children's schools (Brody & Flor, 1998). Higher levels of stress within the household often result in strained family relationships and intra-family conflict (Brody & Flor, 1998; Doan et al., 2012). Parents who earn low incomes often work in demanding, labour-intensive roles (Brody & Flor, 1998) thereby limiting time and energy available to interact with their children at the end of each day.

Adding to the consequences of enduring multiple stressors is an increased inability for poor families to access both formal and informal support (Brody & Flor, 1998; Rodrigo et al., 2007), whether due to a lack of availability in neighbourhoods where low SES families tend to reside, or as a consequence of not possessing the necessary skills and knowledge to find available assistance (Doan et al., 2012). As Lawrence (2006)
states: "better financial resources may be able to buffer some of the consequences of negative temperament or poor intellectual skills, while poverty exacerbates the deficits by denying access to appropriate buffering factors such as counselling or coaching"
(p.314). For teenagers in particular, who are already being challenged by the multitude of physical, cognitive and emotional changes associated with adolescence, a lack of resources, opportunities and support can have a significant impact on development (McBride Murry et al., 2011).

Sampson and Laub (1993) in their age-graded theory of crime, placed heavy emphasis on family context (for example: harsh/punitive discipline, low supervision, parental rejection, poor attachment) as a crucial influence on youth delinquent behaviours, but they acknowledged the key role that structural background factors play in this relationship. Factors such as SES were noted to affect the aforementioned social control mechanisms through avenues such as poverty increasing difficulties experienced by parents thus undermining their parenting abilities, as well as causing them to have fewer available resources on which to draw (Sampson & Laub, 1993). Sampson and Laub's analysis of the Glueck data showed that while there was no direct relationship with delinquency outcomes, family SES significantly predicted erratic and harsh discipline by both mother and father, as well as mothers' supervision, parental rejection, and attachment to parents. Each of these parenting traits was found to be a significant influence on levels of children's delinquency. Even when controlling for childhood selection effects such as early childhood difficulties (children who parents reported as restless, irritable and prone to tantrums and aggressiveness) and previous antisocial behaviour, these significant findings still held. Sampson and Laub concluded that even though the direct effects of structural background characteristics such as SES are weak or inconsistent, these variables have an important indirect role, with the family process
variables explored during their analysis of the Glueck data mediating around 75% of the effect of the structural background characteristics included in the study.

Evans, Gonnella, Marcynyszyn, Gentile, and Salpekar, (2005) used the concept of 

*chaos* to explain the relationship between low SES and poor outcomes, arguing that low income children were more likely to experience chaotic living conditions such as housing that is crowded, noisy and below standard, resulting in high levels of ambient stimulation. In addition they had parents with less time available for them, leading to a lack of routines and structure within the home and a life that was unpredictable. Theorised consequences of this chaos included an inability to self-regulate and manage behaviours and emotions, poorer school achievement, lower levels of satisfaction with family, and possible psychological distress. In a two-wave longitudinal study, Evans and colleagues found that when chaos was included into the regression, the previously significant effect of income on both learned helplessness and psychological distress became non-significant, and the effect of income on self-regulatory behaviours was substantially reduced. The authors concluded that chaos functioned as a mediator between poverty and socio-emotional outcomes in children.

In line with the notion that SES exerts its influence through the experience of increased stress, or due to the chaos associated with poverty, Sameroff, Seifer, Zax & Barocas, (1987) argued that socioeconomic status often emerges as the strongest independent predictor of poor outcomes for children when other variables are held constant, simply because of the numerous associated risks, across different domains, that occur most frequently in low income families. In this sense, SES reflects multiple risk rather than merely income itself.

Evans and English (2002) proposed that it is the exposure to multiple environmental risks, experienced as part of living in poverty, including physical living conditions as
well as factors such as violence, family conflict and family-child separation, that results in socioemotional difficulties for children. When comparing the number of stressors encountered according to family earnings, Evans and English found a substantial difference - while middle income families tended to report between zero and two stressors, low income families typically reported around three. Furthermore, their study showed that the 'intensity of the exposure' was also far greater in low income than middle income children (Evans & English). The authors concluded that exposure to multiple strains as a result of poverty explained much of the relationship between SES and socioemotional health (Evans & English).

3.2.6 Summary of Sociodemographic Risk Factors

While their direct effect may not be strong, the influence of socio-demographic risk factors on outcomes cannot be denied. The impact of structural characteristics of families, such as family size, structure and SES are mediated through parenting practices including disciplinary techniques, levels of supervision, and parent-child attachment relationships, thereby influencing the experiences and behaviours of adolescents. Social supports and available resources are often lacking for low SES families, as well as for those in disadvantaged neighbourhoods, however these families report a greater number of stressors in their lives. Families who cannot afford to secure adequate stable housing are the most mobile, and suffer the consequences of that mobility including poorer attachments to schools and the loss of friendship networks and employment. Living in disadvantaged neighbourhoods, particularly those with concentrated populations of at-risk people, increases the likelihood of exposure to deviant role models and limits upward mobility due to difficulties in creating and maintaining social ties with 'conventional' others. The lack of quality institutional
resources in these neighbourhoods, alongside limited opportunities for socialising with conventional others and stricter policing methods greatly increase the likelihood of adolescents coming into contact with the criminal justice system. Those who are caught in the cycle of socio-demographic risk find it difficult to escape - disadvantage appears to maintain its influence across generations. Finally, socio-economic risk factors tend to co-exist, meaning that at-risk individuals face a multitude of these problems simultaneously. This phenomenon, known as multiple risk, is explored in the following section, where the cumulative influence of multiple risk is discussed.

3.3 Multiple Risk

It is quite rare for risk factors to exist in isolation. More often risks co-occur, with families facing multiple stressors simultaneously (Popp et al., 2008). Such multiple risk occurs frequently in the general population, and is not confined to clinical samples (Forehand et al., 1998). Children in families characterised by multiple risk experience poorer outcomes than those in families with fewer risks, with the severity of outcomes becoming more detrimental as the number of risks increases (Evans et al., 2013; Perkins et al., 1998; Rutter, 1987; Sameroff et al., 1987). Research consistently demonstrates that greater numbers of risk factors in a young person's life are linked with increases in the likelihood of poor outcomes, such as lower IQ scores (Liaw & Brooks-Gunn, 1994; Sameroff, et al., 1987), lower academic achievement (Forehand, 1991; Luster & McAdoo, 1994), increases in problematic externalised behaviours (Doan et al., 2012, Liaw & Brookes-Gunn, 1994; Stoddard et al., 2012; Trentacosta et al., 2008) and internalised problems (Doan et al., 2012; Rutter, 1979; Sameroff et al., 1987). Further, risk has a snowball effect, whereby exposure to several stressors simultaneously often
results in related stressors emerging. This is particularly the case for individuals experiencing sociodemographic risk factors.

As demonstrated in the previous discussion on the effects of low SES and poverty on outcomes, exposure to sociodemographic risk factors frequently results in the co-occurrence of risk factors across other realms. Within the familial realm particularly, parents with lower levels of education and poorer educational achievement are more likely to be unemployed, or work in lower paid jobs, creating stress related to meeting the cost of living. In addition, these parents more often live in disadvantaged suburbs, have less successful intimate relationships, and are more likely to struggle with drug/alcohol or mental health issues (Evans, 2004; Evans & English, 2002; Salom et al., 2014). These contextual risk factors increase the likelihood of risk in other domains, including the proximal processes of parent-child relationships, as well as social relationships. In this way, families who are at-risk due to socio-demographic factors such as low SES, large families, or those that live in disadvantaged neighbourhoods, also face a greater risk of experiencing multiple stressors across other domains at the same time, thereby increasing the likelihood of poor outcomes for children. While youths with one known risk factor are frequently observed to differ little from those with no risks in regards to outcomes, when there are two or more risks, the combined impact of these stressors can have adverse consequences for psychosocial health (Evans & English 2002).

3.3.1 Cumulative Risk

Individual stressors, such as dysfunctional family relationships or parental divorce, do not have a strong direct impact on adolescent psychosocial health, but the impact of several stressors simultaneously is far greater (Forehand et al., 1998). That the
experience of multiple risk factors during childhood and adolescence is related to poor outcomes is not surprising- it makes sense that the more difficulties one faces in life, the greater the likelihood of unfavourable outcomes. What is more interesting about the notion of multiple risk factors is the way in which they operate to affect development.

The most frequent method of investigating the effects of multiple risks on developmental outcomes, particularly since the late 1980's, has been to utilise a cumulative risk model (Evans et al., 2013). Rather than including each separate risk factor in the analysis, such studies use a methodology that assigns a score of zero (absence) or 1 (presence) for each risk considered, with scores then added to form a total, thereby producing a single measure of cumulative risk. All risks included in a cumulative risk index are evenly weighted and considered equally important. The main premise is that it is the total number of risks an individual experiences that has an effect on outcomes, due to the overwhelming of individual or family coping abilities, and it is of no consequence what those specific risks, or combinations of risks experienced are (Flouri, 2008). The use of a cumulative risk index has some analytical benefits. For example, combining variables into a single measure provides an option for dealing with the covariance of related risk factors (Sepanski Whipple et al., 2010).

Despite research on cumulative risk becoming more prevalent in recent times, most studies fail to assess the shape of the relationship between cumulative risk and outcomes (Flouri, 2008). Evans, Li and Sepanski Whipple’s (2013) review of the cumulative risk literature examined 196 research papers, and found a roughly equal proportion of linear and non-linear effects of cumulative risk, although due to the frequent absence of formal tests of linearity, these conclusions were based on judgements of interval change similarities presented in tables or graphs. The effects of cumulative risk on outcomes are of course relative to the outcomes being examined. In Evans, Li and Sepanski
Whipple's review, around one third (32%) of studies that used a cumulative risk index to predict multiple dependent outcomes found both linear and non-linear effects, depending on which outcome was considered.

Some studies of cumulative risk demonstrate that when there are numerous risks, stressors tend to interact with each other, exacerbating the effect on outcomes, meaning that the influence of multiple risk factors is far stronger than the additive effect of each risk factor alone. That is, these studies find a curvilinear effect of risk on outcomes, where the difference in strength or degree of poor outcomes becomes larger as levels of risk increase. Rutter's seminal Isle of Wight study, beginning in 1964, is most often credited with providing the first empirical evidence for the curvilinear nature of cumulative risk. Using risk variables of large family size, parental criminality, low social status, maternal psychiatric condition, severe marital discord, and parental admission into local authority care, Rutter (1979) found that while each risk factor individually failed to significantly predict childhood psychiatric problems, the experience of multiple risks dramatically increased the likelihood of poor outcomes. Compared to children with no risk, children from families with 2 risk factors were up to 4 times more likely to exhibit behavioural problems, and children from families with 4 or more risks exhibited incidences of child maladjustment that were up to 10 times greater than those not at-risk.

Other studies find that cumulative risk has a threshold effect on outcomes, where a certain number of risks constitute a ‘saturation point’, after which additional risks have little further effect (Gerard & Buehler, 2004). Thus, a linear relationship might be observed for low levels of risk, but at some point increases in the number of risks no longer corresponds to substantial increases in the severity of outcomes. For example, Morales and Guerra (2006) examined the effects of cumulative stressors on children's
adjustment using the outcome measures of academic achievement in maths as well as reading, depression and aggression. A linear relationship with poorer outcomes in maths achievement, reading achievement and depression was observed for children with zero to 3 stressors, with a levelling off in those outcomes for children experiencing between 3 and 5 stressors. For the outcome of aggression, the linear effect continued to a threshold of 5 stressors, with little increase in aggression levels for additional stressors beyond this.

Regardless of whether exposure to numerous concurrent risks is examined as a single cumulative index, or as a block of individual risk factors, there is strong evidence that multiple risk is related to poorer outcomes and that the relationship is non-linear. The following section provides a review of selected studies of multiple and cumulative risk across childhood and adolescence.

3.3.2 Multiple Risk during Childhood

For children, multiple risk has been linked to poorer psychological functioning. Evans (2003) investigated risk across three domains: physical risks (housing quality, noise and crowding), demographics (poverty, single parenthood, high school dropout of mother) and psychosocial (family turmoil, exposure to family violence, child separated from family). He also examined the relationship with physical and emotional outcomes in rural children. Results showed that children's psychological distress as reported by mothers increased in line with the number of risks experienced, and a significant inverse relationship was noted between an accumulation of risk factors and both children's perceptions of self-worth, and their self-regulatory behaviour as measured by delayed gratification time. Further, learned helplessness in children was seen in the study to be related to cumulative risk, whereby children with more reported risks persisted at a
puzzle task for less time, with the authors suggesting that the experience of cumulative risk during childhood might decrease children's motivation and affect their ability to develop feelings of mastery.

Similarly, the Rochester Longitudinal Study investigated wellbeing outcomes in children of mentally ill mothers, finding that cumulative risk was a stronger predictor of poor functioning in children of schizophrenic mothers than any mental illness measures (Sameroff et al., 1987). Children were divided into high risk and low risk categories, according to the number of risks on a 10 variable risk index: history of maternal mental disorder, high maternal anxiety, rigid parental attitudes, few positive parent-child interactions, unskilled occupational status, low maternal education, disadvantaged minority status, single parenthood, stressful life events, and large family size. High risk children had socio-emotional outcomes almost three times poorer than low risk children, with the relationship between increased number of risks and poorer outcomes remaining even when children were examined within SES subgroups. Further, results of a cluster analysis showed that the effect on a child's socio-emotional competence was a result of no single risk factor, but rather was due to the accumulation of risks, with the number of risk factors being a better predictor of outcomes than any single risk factor. The authors suggested that it is the *load on the developmental system* which results in poor outcomes for children facing multiple risks.

The effects of multiple risk factors during childhood are frequently intertwined with poor parenting practices. Children living in low SES families within poor neighbourhoods have an increased likelihood of also experiencing unfavourable parenting (Evans, 2004; Popp et al., 2008). Poor parenting practices have been observed to mediate the effect of risk factors on child wellbeing (Doan et al., 2012, Sampson & Laud, 1993). For example, parenting was seen to mediate the relationship
between accumulation of risk, using seven risk factors (neighbourhood quality, single adult status, caregiver educational status, overcrowding, adolescent parenthood, legal convictions, drug/alcohol problems) and internalising and externalising problematic behaviours in toddlers (Trentacosta et al., 2008).

The experience of multiple risk factors also increases the likelihood of being exposed to abusive treatment by parents (Popp et al., 2008). In their Christchurch Health and Development Study, Woodward and Fergusson (2002) found evidence for the effects of experiencing multiple risk on the likelihood of physical punishment and maltreatment of children. Data collected over an 18 year longitudinal study showed that numerous stressors, across domains of maternal characteristics, child characteristics and environmental factors (socio-demographic and familial) all contributed uniquely to the prediction of outcomes, with increases in the number of risk factors experienced related to increases in the likelihood of children being physically punished and/or abused by parents (Woodward & Fergusson). In particular, sociodemographic characteristics, such as poverty, below average living conditions, and mother's age at birth, as well as family context variables such as inter-parental violence and marital conflict were seen to have strong associations with child physical punishment, with the authors suggesting that the additional stress these factors place on families may play a role in this relationship.

Multiple risk during childhood may also influence longer term outcomes. In the Kauai Longitudinal Study, two out of three children who at age 2 possessed four or more risk factors (out of 12 variables assessed) exhibited serious learning and/or behavioural problems at the age of 10, and at age 18 reported delinquency, teenage pregnancy and/or mental health problems (Werner, 1993). The longitudinal effects of experiencing multiple risks including abuse, inter-parental violence, family disruption, maternal life stress and socioeconomic status, was investigated by Appleyard, Egelund,
van Dulmen and Sroufe (2005), who found that early cumulative risk before 64 months of age predicted externalising problems at age 16.

Doan, Fuller-Rowell and Evans (2012) investigated cumulative risk using a nine-factor instrument that assessed demographic variables (income, high school drop-out, single-parent), environmental variables (quality of housing, residential density, noise levels) and familial variables (separation from family, exposure to violence, family turmoil). Results showed that risk affected children's self-regulation abilities 4 years later, both directly (due to biological/neural factors) and indirectly, through ineffective parenting such as a lack of maternal responsiveness. Self-regulation was itself linked to externalising behaviours of children 4 years later in adolescence, suggesting that experiencing multiple risk factors in early childhood may have effects that emerge many years later in adolescence.

3.3.3 Multiple Risk during Adolescence

There are fewer studies examining the effects of multiple and cumulative risk specifically during the teenage years. The limited evidence suggests that for adolescents, who are undergoing a developmental phase characterised by confusion and often conflicting pressures, exposure to multiple stressors exacerbates their challenges and introduces further risks. For example, using variables related to the mother (physical health issues, depression, mother-adolescent relationship) as well as divorce status and inter-parental conflict, Forehand, Biggar and Kotchick (1998) investigated the effect of cumulative family risk on adolescent problematic behaviours and academic achievement. Using a one way analysis of variance with five levels (zero risk factors to four risk factors) they found that adolescents faced with multiple risks exhibited more internalising and externalising problem behaviours than those with fewer risks, but
differences were only significant on outcomes 6 years later. Specifically, there was a significant effect of having four (compared to three) risks on both internalising and externalising problems reported in young adulthood. The effect of cumulative risk on academic achievement however was both concurrent and delayed, possibly as a result of homes lacking resources (both physical and in terms of parental assistance), and due to exposure to increased distractions such as parental conflict.

Exposure to multiple risk factors has also been shown to be related to adolescent sexual behaviour, with the likelihood of becoming sexually active increasing in line with the number of risks the adolescent is exposed to across domains of individual, family and community, as well as through cultural beliefs and other macro level systems (Small & Luster, 1994). In Small and Luster's study, differences in sexual activity according to risk factors were seen for both males and females, with 1% of girls and 15% of boys reporting no risk factors being sexually active, compared to 80% of girls with 8 or more risks, and 93% of boys with 5 or more risks. In an investigation into non-marital childbearing, Price and Hyde (2009) investigated sexual activity in 273 adolescents, based on the presence or absence of 12 associated risks, including individual factors, such as pubertal development, self-esteem and viewing of mature content on television; family relationships; and parental education levels. Compared to youths with no risks, the presence of each additional risk meant that girls were 1.6 times and boys 1.9 times more likely to engage in sexual behaviours before the age of 15. Kalil and Kuntz (1999), using a socio-demographic cumulative risk index including variables such as family income, residential characteristics, and number of siblings, found that adolescents with only one risk factor were highly unlikely to have a child (2%), whereas over a third (32%) of participants with five or more risk factors became
adolescent mothers. The cumulative risk index explained around 10% of the variance in adolescent childbearing, with a notable increase among girls with more than three risks.

Multiple risk during childhood and early adolescence has been shown to influence welfare receipt. Seth-Purdie (2000) investigated the relationship between multiple risk (using risks related to perinatal difficulties, family economic circumstances, family stability and functioning, cognitive/educational difficulties as well as previous antisocial behaviours) experienced from birth to age 15, and welfare receipt during early adulthood. She found that young women aged 16 to 21 receiving welfare were far more likely to have experienced a high number of risks than women not receiving welfare. Just over 3% of the sample were identified as having 14 or more risks, and 9 out of 10 of these women had received welfare during some point of their life, and 57.6% had been unemployed for a period of 2 years or more (compared to 35.6% and 5% respectively of women with 0 to 2 childhood risk factors).

3.3.4 Protective Factors for Multiple Risk

While research on promotive and protective factors for children and adolescents is fairly abundant, there are fewer studies examining factors that reduce the likelihood of poor outcomes amongst youths experiencing multiple risk, particularly when multiple risks are considered in a cumulative context (Fergus & Zimmerman, 2005; Flouri, 2008). Fewer still are studies examining cumulative protection (Flouri, 2008). The scarcity of research, combined with differences in both methodologies and variables included as risk or protective factors across studies, makes it difficult to draw firm conclusions with respect to the ways in which risk and protection interact. However, those studies that investigate cumulative protective influences for at-risk youths suggest
that the presence of multiple risks when combined with the absence of protective factors results in more severe outcomes for adolescents.

Research mostly explores the influence of singular or a few protective factors on the relationship between multiple risk and outcomes (Fergus & Zimmerman, 2005). These studies report individual characteristics such as socioemotional competence and self-worth, positive family dynamics, and low levels of association with antisocial peers are related to better outcomes amongst at-risk youths. For example, Evans, Kim, Ting, Tesher and Shannis (2007) found that maternal responsiveness buffered the influence of cumulative psychosocial and physical risk (absence or presence of 9 risk factors: residential density, housing quality, noise levels, poverty, single parent family, maternal high-school dropout, family turmoil, child-family separation, exposure to violence) on allostatic load -- the wear and tear on the body as a consequence of chronic environmental stress (McEwen, 1998). Allostatic load was elevated by increases in cumulative risk, but only for adolescents with low levels of maternal responsiveness (Evans et al., 2007).

Loukas and Prelow (2004) showed that socioemotional competence played a promotive role against externalising problems such as fighting, property damage, and disobedience amongst Latino early adolescents. Youths who were rated by their mothers as well liked, helpful, and cooperative were less likely to engage in problem behaviours regardless of their levels of risk. In addition, the effects of cumulative risk (absence or presence of: neighbourhood problems, perceived financial strain, single parent household, maternal psychological distress) on externalising behaviours was moderated by maternal relationships for boys, and family routines for girls, with the association between cumulative risk and externalising problems becoming non-significant for boys rated as highly competent and/or with strong mother-child
relationships, and for girls reporting greater consistency in daily routines. Self-concept moderated the influence of cumulative risk (absence or presence of: substance abusing parent, repeating a school grade, previous arrests, family receipt of public assistance, and seven or more people in the home) on violent behaviours amongst a sample of adolescents referred for mental health treatment, where adolescents with higher self-concept scores were found to be more resilient in the face of cumulative risk (Youngstrom et al., 2003).

However, investigation of singular protective factors against cumulative risk fails to consider that protective influences might operate in a similar way to risks, that is, that the possession of multiple protective factors may have a non-linear cumulative effect (Ostaszewski & Zimmerman, 2006). Turner, Hartman, Exum and Cullen (2012) found that while singular protective factors had only small effects on the relationship between risk and delinquency, a cumulative protection index had a much stronger influence. This was also demonstrated in Fergusson and Horwood's (2003) investigation into the influence of protective factors (referred to in the study as resilience factors) on externalising behaviours, using data from the Christchurch Health and Development Study (CHDS). A childhood adversity score was created by counting the number of risks (including socioeconomic adversity; parental change, conflict, substance use and criminality; and childhood abuse) experienced during the first 16 years of life. Analyses showed significant main effects for the childhood adversity score, gender, and resilience factors of low association with deviant peers, low novelty seeking and self-esteem, but no adversity/resilience interaction terms were significant. However when the regression coefficients were used to weight each resilience factor, and then added to create a total resilience score which was subsequently divided into quartiles ranging from low to high resilience, cross tabulations showed that of those exposed to high
levels of family adversity during childhood, only 18% of individuals with high resilience scores developed problematic externalising behaviours, in contrast to 70% of those with low resilience. Specifically, an accumulation of low novelty seeking, high self-esteem, low levels of delinquent peer association, and being female were noted to mitigate the effects of exposure to childhood adversity, with the authors suggesting that resilience due to these factors may be the result of an increased threshold at which individuals react to risk, or otherwise that these combined protective factors might influence choices and behaviours that result in the avoidance of problem outcomes.

Exploring the ways in which cumulative protection works is vital to informing intervention practice (Andershed et al., 2016). Research generally demonstrates that cumulative risk has a stronger influence over outcomes than cumulative protection, and accounts for more explained variance. For example, Bowen and Flora (2002) summarised 4 studies on externalising behaviours and concluded that cumulative risk accounted for up to 22% of the variance, whereas cumulative protection only accounted for up to 1.3%. Dekovic's (1999) exploration of the influence of cumulative risk and protection on problem behaviours during adolescence, found no significant main effect for a protection factor index, with the authors concluding that the number of promotive factors an adolescent experiences is less consequential than the number of risks faced. In addition, an interaction term (Risk Factor Index X Protective Factor Index) also failed to contribute to the outcome once risk was taken into account, suggesting that the impact of protective factors in problem behaviours did not vary according to the level of risk an individual experienced. However, as Ostaszewski and Zimmerman (2006) point out, while the compensatory effects of cumulative promotive factors may be small in magnitude in comparison to the effects of cumulative risk, for problem behaviours such
as adolescent substance use which are difficult to change, the value of even modest effects should not be underestimated.

In terms of intervention planning, protection is key when dealing with populations facing a high number of risk factors, particularly when some risks are fixed or difficult to change. Further, when sample populations are non-normative, the strength of cumulative protection effects increases (Bowen & Flora, 2002). In contrast to studies demonstrating stronger effects for risk, research focused on high-risk populations sometimes finds cumulative protection to be more influential. For instance, Bowen and Flora found that cumulative protective factors performed better than cumulative risk measures in predicting aggression in high-risk adolescents with serious emotional difficulties. Risk on its own was found to have non-significant or very small effects. Whitson, Bernard and Kaufman's (2013) study on Latino and African American children with severe emotional disturbances, found that only the cumulative protection index and not the cumulative risk index was significant in predicting the likelihood of externalising problem behaviours, with likelihood reducing as the number of protective factors increased. Results such as these might be explained by a threshold effect, where the characteristics of the sample might already place youths at high degrees of risk, with additional risk factors having little influence. Thus, the Whitson study featured minority students with mental health problems, while in Bowen and Flora's sample "risk exposure would have to be reduced by an average of nine risk factors before adolescents in the sample would be below the level of four risk factors considered damaging in a normative population" (p. 535). Therefore it seems that clinical or high-risk samples may be more influenced by protective factors, while community samples may be more affected by risk (Bowen & Flora, 2002; Whitson et al., 2013).
Other research suggests an intricate interplay of risk and protection, where the ratio of risk to protective factors appears critical. Such studies frequently utilise a strategy to measure the buffering effect of protective factors, of subtracting the number of promotive factors from the number of risk factors (or vice versa) to demonstrate how the balance of risk and protection affects outcomes (Baglivio et al., 2017). As is the case with risk, increases in the number of protective factors tend to be related to more positive outcomes. For example, Smith, Lizotte, Thornberry and Krohn (1995) showed that resilience against delinquency and drug use was four times more likely amongst adolescents with at least 8 protective factors, compared to those with 4 protective factors. Protection in the absence of risk (or what should really be referred to as promotive factors in the absence of cumulative risk) of course predicts the best outcomes. For example, Andershed, Gibson and Andershed's (2016) longitudinal research investigating the influence of cumulative childhood risk at age 10 on male violent offending in adulthood suggested that the number of promotive factors within the individual and family realms had a stronger effect for those with no risk factors in childhood than those considered at high-risk.

When risk outweighs protection, outcomes become increasingly negative. Using data from the Denver Youth Survey, Browning and Huizinga (1999) found that when the number of risks faced was greater than the number of protective factors, youths were highly unlikely to meet criteria for positive adolescent development (minimal serious delinquency and problematic drug use; age-appropriate grade in school or graduated; good self-esteem/self-efficacy). Stouthamer-Loeber, Loeber, Wei, Farrington and Wikstrom's (2002) analysis of Pittsburgh Youth Study data on serious persistent juvenile offending for boys aged 7 to 13 and 13 to 19 showed that when the number of risks outweighed the number of promotive factors adolescents were much more likely –

91
11.24 times more likely for the youngest group, and 6.47 times more likely for the oldest group – to be seriously delinquent. When risks outnumbered protective factors by 4 or more, three quarters of older boys were serious persistent offenders (Stouthamer-Loeber et al.). Using a risk-promotive factors score that ranged from -3 to 3, van der Laan, Veenstra, Bogaerts, Verhulst and Ormel (2010) found that when more domains were characterised by risk, adolescents were more likely to be serious delinquents, whereas having a greater number of promotive factors across domains increased the likelihood of non-delinquency. For example, amongst adolescents with a score of -3, indicating greater promotive effects, just under half of participants were non-delinquent, and fewer than 5% were serious delinquents. In contrast, amongst adolescents with a score of 3, indicating greater risk effects, only 8% were non-delinquent, and more than 2 in 5 were involved in serious delinquency.

Most concerning of all is a lack of protective factors amongst those facing high levels of risk. For low risk youths, having few or no promotive/protective influences often makes little difference to outcomes, but protective factors are highly influential in determining outcomes for high-risk youths (Bowen & Flora, 2002). For example, Stoddard and colleagues (2013) showed that when cumulative risk was low, cumulative protection made little difference to violent outcomes for adolescents, but for youths with high levels of risk, violent behaviours were greatly reduced in the presence of protective factors. Ostaszewski and Zimmerman (2006) found that while protective factors made little difference in levels of polydrug use (cigarettes, alcohol and marijuana) for youths with low levels of risk, cumulative protection had a far greater influence on preventing substance use amongst high-risk adolescents.

In Lodewijks, Ruiter, and Doreleijers’ (2010) study of recidivism amongst adolescent offenders, the absence of protective factors led to significantly higher rates
of violent reoffending for youths of medium to high risk. However, even for low risk adolescents the presence of two or more protective factors reduced recidivism from 38% to 0%. Log odds of the cumulative protective factor index in Turner, Hartman, Exum and Cullen’s (2012) study showed that for high risk youths, each additional protective factor they possessed accounted for an additional 36 percent chance of being resilient. Results suggested that having at least 3 protective factors was necessary for high risk adolescents to counter the effects of cumulative risk on delinquency. Jessor, Van Den Bos, Vanderryn, Costa, and Turbin's (1995) study found that higher levels of cumulative risk were only related to increased antisocial behaviours when few or no protective factors were present. High-risk adolescents with a high number of protective factors were no more likely to behave antisocially than low-risk youth. A longitudinal element of their study suggested that cumulative risk was more influential in predicting involvement in antisocial behaviours, but cumulative protection had a stronger effect on reducing levels of involvement.

Multiple and cumulative risk pose conceptual and methodological problems which require more research. In particular, an understanding of the effects of, and processes through which protection against cumulative risk works is crucial for high-risk populations. However, one difficulty in assimilating the literature around cumulative risk and protection is the variation in the choice of variables used to create indices, and the frequent absence of theoretical frameworks to aid in the interpretation of results. As discussed in the following section, isolating cumulative risk within one domain creates an opportunity to explore avenues of mediation and moderation through which risk affects outcomes. Given the all encompassing influence of sociodemographic risk factors, as well as the tendency for sociodemographic risks to coexist in the fashion of cumulative risk, it is argued that exploring the effects of cumulative sociodemographic
risk factors as a discrete set, is a much needed area of research to improve understanding of developmental outcomes.

### 3.3.5 Cumulative Socio-demographic Risk

One characteristic of cumulative risk research that is problematic is the lack of consistency in regard to which specific risks are included in indices. Flouri (2008) laments that "the variability in cumulative stressor measurement is often such that makes comparisons of studies almost meaningless" (p. 916). Many studies utilise existing data sets and are therefore limited to what variables are available, rather than selecting factors for inclusion based on ideas around the processes through which risk and protective factors work. Even when studies are designed specifically to measure the influence of cumulative risk on developmental outcomes, theoretically-driven relationships are seldom tested (Evans, Li, & Whipple, 2013).

Another concern is that cumulative risk indices frequently include risks drawn from different domains grouped together, making it difficult to explore and understand the processes through which stressors operate. As Grant and colleagues (2003) explain, "reliance on a model of stress that “lumps” potential mediating and/or moderating processes...in with stressors is conceptually unclear and empirically problematic" (p. 449). Instead, they argue, a focus limited to external environmental events or chronic conditions allows for best exploration of stressors on the physical and psychological wellbeing of individuals. While cumulative risk measures frequently include some environmental elements, such as demographic and contextual factors, it is rare to find studies that limit indices to these domains only. Those studies that do focus on environmental risk tend to mix demographic variables with those of family context. One problem in mixing domains in this way is its implications for planning of intervention strategies.
For example, MacKenzie, Kotch and Lee (2011) explored the role of cumulative ecological risk in child maltreatment using an index consisting of 10 risk variables: maternal education, family size, family structure, maternal age, maternal abuse history, social assistance, low household income, maternal depression, low self-esteem, and unsafe neighbourhood. They found that greater levels of ecological risk were related to increased likelihood of maltreatment. When the child reached four years, risks of maltreatment ranged from 11.1% in the low-risk group (0 to 2 risks), to 34.7% in the medium risk group (3 to 5 risks) and 53% in the high risk group (6 or more risks).

While the main premise of cumulative risk research is that the number of risks is of more importance to outcomes than the specific risks themselves, disentangling the effects of types of risks makes it easier for research to inform practice when designing interventions. For example, of the medium risk mothers in MacKenzie, Kotch and Lee's research, quite different strategies might be appropriate for helping mothers whose risks are maternal abuse history, maternal depression and low self-esteem, as opposed to those whose risks are sociodemographic in nature (eg. maternal education, family size, family structure, social assistance, low household income, and unsafe neighbourhood).

Flouri (2008) provides a summary of these issues, and argues for the exploration of risks from single domains, in order to isolate the ways in which this type of risk affects other domains, as well as outcomes:

studies looking at family contextual risk particularly should disentangle the family-wide from the child-specific risk factors... even studies on family contextual risk that disentangle the family-wide from the child-specific risk factors often group together factors from theoretically dissimilar domains without justifying the decision behind their particular choice. Although this might seem to be in line with the cumulative index approach that the number is more important than the type of risks, if the selection of risk factors is not carefully justified but instead represents little more than a haphazard choice of variables then neither can the field move theoretically nor can prevention or intervention be discussed (p. 916)
One approach to overcoming the problem of disparate risk types within domains and indices is to use separate measures of risk, within different domains. For example, Saner and Ellickson (1996) investigated adolescent involvement in violence by using 4 separate cumulative risk indices, one for each domain of: demographic risk (gender, SES, parental education and high mobility, disruptive family- not living with both biological parents); behavioural risk (covering different dimensions of problem behaviours such as drug use, minor delinquency, school dropout and so on); environmental risk (parental drug use, lack of parental affection, poor peer relations, low religiosity and so on); and negative life events. The likelihood of engaging in all levels of violent behaviours increased in line with the number of risk factors experienced within each domain. While the use of separate indices was useful in terms of isolating the effects of different domains on outcomes, there was no exploration of the processes through which domains of risk operate, or how these processes may vary for different groups of the population.

Despite an abundance of research demonstrating poorer outcomes for poor and disadvantaged families (Moore et al., 2006), there are remarkably few studies which examine multiple or cumulative risk using only sociodemographic variables. This is perplexing, given the fixed nature of sociodemographic variables which (in most cases) cannot be altered by intervention practices. Isolating risk factors that are beyond the ability to change from the proximal processes through which their effects are carried not only allows exploration of pathways through which contextual risk affects outcomes, but also provides for best practice in terms of informing intervention strategies (Kim et al., 2003; Sepanski Whipple et al., 2010).

A focus on sociodemographic risk factors alone has the additional benefit of providing an understanding of how risk operates within specific population groups. As
Wilson, Hurtt, Shaw, Dishion and Gardner (2009) argue, "although there is a need to determine some invariant predictors that are usable in large scale research and intervention studies, it is equally vital to understand the context-specific aspects of risk factors" (p. 354). Risk and protective factors are not the same in all demographic settings. For example, authoritative parenting, which is related to best outcomes for children from middle-class populations, is less successful within poor inner-city families than stricter parenting with high levels of monitoring (Luthar, Cichetti & Becker, 2000). Without acknowledgement of the settings within which risk and protection operate, conclusions drawn from studies may be incorrectly generalised to larger populations.

Those few studies which do isolate cumulative sociodemographic risk reinforce the need to explore this phenomenon further. For the most part, research seems to focus on parenting and outcomes during infancy and early childhood. For example, Popp, Spinrad and Smith (2008) found that cumulative demographic risk (income, marital status, ethnicity/race, family size, maternal education, mother's age at birth, mother's occupational status) directly influenced maternal parenting behaviours, with lower levels of responsivity and higher levels of control as cumulative demographic risk increased. Trentacosta and colleagues (2008) added parental substance use to their cumulative sociodemographic measure (teen parent, education level, single adult in household, overcrowded household, household member legal conviction, parent/carer with drug or alcohol problem, neighbourhood dangerousness) and found that the effects of cumulative sociodemographic risk on internalising and externalising problems at age 4 was mediated by levels of nurturance and involvement during parenting.

Studies exploring later childhood and adolescence are rarer. In Saner and Ellickson's (1996) study on adolescent violence (discussed earlier), 6% of those with no
demographic risk factors had been involved with serious violence, whereas close to half (46%) of those with 5 demographic risks had been seriously violent in the previous year. Sepanski Whipple, Evans, Barry and Maxwell (2010) explored children's academic achievement using 2 separate cumulative risk measures across the ecological domains of neighbourhood and school. Both cumulative school risk (student mobility, school building quality, as well as items related to experience, absence and turnover of teachers) and cumulative neighbourhood risk (neighbourhood poverty, proportion of single female headed households, mothers without a high school degree, physical characteristics of the neighbourhood such as crowded households, vacant buildings and units with housing problems) were related to academic achievement, with higher levels of risk predicting poorer performance. School risk accounted for 15% of the variance in achievement, and neighbourhood risk accounted for 30%, in analyses which controlled for the other. Further, a school- neighbourhood interaction term was created with regression results showing that the effects of cumulative school risk on academic outcomes were exacerbated in moderate risk neighbourhoods (1-2 risks), although less influential in high risk (3 or more risks) neighbourhoods. These findings demonstrate that even before considering individual or family level risk factors of children, ecological contexts have a powerful influence, with the combined main and interaction effects of school and neighbourhood environments accounting for around 40% of variation in academic achievement across schools.

The influence of contextual risk on youth outcomes 4 years later was investigated by Kim, Brody and Murry (2003) in a sample of 139 African American families with a child (mean age of 11). Family contextual risk (maternal age at birth of first child, family income, maternal education level and employment status, and family size, adequacy of both money and daily necessities) was seen to affect parenting through
lower levels of support, involvement and monitoring, and higher levels of parent-child arguments. In addition, family contextual risk had an effect on youth self-regulation which was mediated through parenting practices. Low self-regulation was a significant predictor of later child conduct problems. The authors concluded that while family contextual risk factors were not directly causal of youth behaviour problems, their influence on parenting practices, and the consequent influence of parenting practices on self-regulation demonstrated the pathways through which environmental contexts affect youth outcomes. Had poor parenting practices been included as part of a risk index, as is often the case in cumulative risk studies, these important processes of mediation would not have been identified.

Studies examining protective factors in the face of cumulative sociodemographic risk are more difficult to locate. Kalil and Kutz (1999) investigated the protective roles of self-esteem, educational expectations, and verbal and mathematics skills in reducing the effect of cumulative risk on adolescent pregnancies. The cumulative risk index used was mostly sociodemographic—residing in an urban area, percentage of single female headed households in the county, residing in a female headed household, low SES, mother's education level, ethnic minority status, number of siblings—but also included availability of reading materials in the home. Results showed that close to one third of adolescents with 5 or more risk factors experienced non-marital childbearing. High educational expectations were seen to buffer the influence of cumulative risk on pregnancy, but their effect reduced dramatically for adolescents with more than 3 risks, such that 'high-expectations' girls in high-risk conditions were faring worse than 'low-expectations' girls in low-risk conditions” (Kalil & Kutz). No protective influence of self-esteem or verbal/maths skills was found.
With the exception of these few studies, research examining cumulative sociodemographic risk, without the inclusion of additional individual, family or peer level risk factors is absent from the literature. This is despite the recognised need to explore environmental stressors separately to the processes through which they have their effects carried, meaning that the processes of mediation and moderation in regard to cumulative sociodemographic risk are yet to be adequately explored. Factors that increase resilience in the face of sociodemographic risk also require investigation -- no studies were identified that investigated protective factors and/or cumulative protection in the face of cumulative sociodemographic risk alone. These findings highlight the need for further research in this area.

3.3.6 Summary of Multiple Risk

While studies investigating multiple risk vary widely in regard to which risk factors are selected for examination, the consensus remains that as the number of risks experienced increases, so too does the likelihood of poor outcomes, as well as the severity of these outcomes (at least until some threshold is met). The notion of cumulative risk carries with it the implication that regardless of which risks are included in a multiple index, the effect of the number of risks experienced outweighs the effect of any individual risk factor due to the cumulative effect of experiencing multiple risks (Forehand et al., 1998; Gerard & Buehler, 2004; Jessor et al., 1995). This is especially the case where the numbers of risks outweigh the number of protective factors present (Stouthamer & Loeber 2002). One positive element, however, are studies suggesting that cumulative protection can buffer or mitigate the effects of cumulative risk (van der Laan et al., 2010), highlighting the importance of this as an area of research for informing intervention strategies within high-risk populations.
What is noted in research on multiple and cumulative risk is that socio-demographic risk variables are almost always included. It would seem that sociodemographic variables are crucial to multiple risk indices due to the fact that these contextual level risk factors are responsible for the increased likelihood of risk factors existing within other domains. While sociodemographic risk variables feature often in cumulative risk indexes, it is less common to find indices that utilise these contextual factors only, in the absence of risk variables from other domains. Investigating cumulative risk restricted to sociodemographic variables only allows for exploration of the processes of mediation and moderation to best understand the pathways by which contexts affect outcomes. The absence of such research is a significant gap in the literature that is important to address.

3.4 Summary of Cumulative Sociodemographic Risk

An in-depth exploration of sociodemographic risk factors, reviewing family size, structure, mobility, socioeconomic status and neighbourhood, demonstrated the pervasive impact of environmental contexts. Children from large, highly mobile families exhibit poorer outcomes. Disadvantage due to being part of a family headed by a single parent, low SES, or residing in disorganised neighbourhoods means a greater likelihood of problem behaviours. While sociodemographic risk factors do not generally have strong direct effects on outcomes, they exert their influence through multiple processes. Crucially, sociodemographic risk factors tend to co-exist, meaning that adolescents who experience one sociodemographic risk factor are highly likely to simultaneously experience others. In addition, sociodemographic risk has a snowball effect, in that risks across other domains of life are triggered due to sociodemographic context.
The observed co-occurrence of sociodemographic risks is concerning in the light of research on multiple risks, which demonstrates that individuals who experience multiple risk factors simultaneously experience poorer outcomes. Studies of cumulative risk show that the cumulative effect of multiple risks can work in a non-linear fashion, to have an overall influence that is greater than the effect of each individual risk factor added together. In such cases the specific risks factors themselves are less important than the number of risks in total, due to risks overloading developmental systems. It follows that cumulative sociodemographic risk must have a substantial effect on adolescent outcomes, due to the pervasive impact of contexts on proximal relationships, as well as the tendency for sociodemographic risk to result in related risks emerging in other domains. No other stressors perform the function of cumulative risk better than sociodemographic risk factors.

While there is a considerable literature exploring multiple and cumulative risk, most often studies include risk factors from a variety of domains, combining sociodemographic variables with family as well as individual factors when constructing cumulative risk measures. This makes it difficult to separate out the ways in which contextual variables influence and interact with more proximal processes. Few studies have examined the influence of cumulative risk during adolescence using sociodemographic variables only, meaning the ways in which the contextual effects of cumulative socio-demographic risk operate for young people are not clearly understood. Also missing in the literature are studies of protective influences against cumulative sociodemographic risk, particularly cumulative protection. Such research needs to be conducted in line with a clear theoretical framework, in order to interpret findings in a useful manner. These are gaps in the literature worthy of further research.
Chapter 4 proposes two theories appropriate for exploring the impact of cumulative sociodemographic risk. Bronfenbrenner's Ecological systems theory is discussed as a framework through which to understand the influence of contextual variables on proximal processes. Agnew’s General Strain Theory (GST) offers an explanation for the process through which cumulative sociodemographic risk affects outcomes. In addition, a GST framework provides an opportunity to examine the performance of protective factors in buffering risk.
CHAPTER 4: THEORETICAL FRAMEWORKS—
Ecological Systems Theory and General Strain Theory

4.1 Introduction

Chapter 3 highlighted the need to examine cumulative risk limited to socio-demographic variables in order to address a significant gap in relation to risk's effect on both outcomes and proximal processes related to outcomes. Specifically, it was proposed that adolescents experiencing multiple concurrent risks related to socioeconomic status, family structure, size and mobility, as well as neighbourhood, will be more vulnerable to poor outcomes as a consequence of cumulative sociodemographic risk. In addition, the need to examine protective processes that buffer or alleviate cumulative sociodemographic risk was noted. Because sociodemographic risks are mostly fixed, and therefore unable to be altered through intervention, an understanding of factors that reduce their effect is essential for helping high-risk populations avoid problematic outcomes. A core argument of Chapter 3, however, was the need to explore the influence of cumulative risk within an appropriate theoretical framework, so as to facilitate interpretation of findings and enhance their relevance to policy and practice. To this end, this chapter outlines two theoretical frameworks for understanding the influence of contextual environments on adolescent antisocial behaviours, on which the proposed study of risk and protection builds.

The chapter begins with a discussion of Bronfenbrenner's Ecological systems theory, which highlights the interconnections between different realms of human experience, making it useful for understanding how environments influence outcomes. According to ecological theory, the experiences of adolescents will vary in accordance with their environments. In addition, environmental context will affect the influence of proximal risk and protective factors on adolescent antisocial behaviours. Ecological
systems theory therefore provides a framework through which to explore the impact of cumulative sociodemographic risk on proximal processes that increase or decrease the likelihood of adolescent antisocial behaviours.

The second theory discussed in this chapter, General Strain theory (GST), proposes that poor outcomes are a consequence of experiencing strain. GST suggests that subjective emotional reactions to exposure to stressors during adolescence mediate the likelihood of outcomes including deviant behaviour. I argue that cumulative sociodemographic risk can be considered as strain, meaning that adolescents who have an adverse subjective reaction to the experience of cumulative sociodemographic risk will be more likely to engage in more serious deviant behaviours, more often. GST however proposes that some factors moderate the influence of strain. Specifically, aspects of the individual, family dynamics, and social ties are theorised to reduce the effects of strain on outcomes. Given that one criticism of cumulative risk research is the need for a theoretical framework to explain why and how cumulative risk influences outcomes (Evans et al., 2013), GST provides an opportunity to test a theory-based model which suggests pathways through which risk, and associated protective factors, operate.

4.2 Ecological Systems Theory

While a vast history of theorising and writing paved the way for the emergence of ecological systems theory, Bronfenbrenner's work (1972; 1975; 1976; 1979), which built on many decades of developmental research, is credited as being the catalyst which sparked a widespread interest in the application of ecological principles to the experience of human development. Before Bronfenbrenner “child psychologists studied the child, sociologists examined the family, anthropologists the society, economists the
economic framework of the times and political scientists the structure" (Ceci, 2005, para. 4). Ecological systems theory was an attempt to synthesise these influences within a single framework and explicate their interconnections. In short, ecological systems theory proposes that the experiences of each person throughout life are affected by factors (and the interactions of these factors) ranging from individual and biological variables, to environmental influences such as neighbourhood through to social and political climate. The theory suggests that consideration of contexts or environments is as important to understanding development as individual characteristics and experiences.

Bronfenbrenner’s initial ecological model proposed that environmental contexts exist in a nested fashion, with each realm situated in a greater ecological realm “like a set of Russian dolls” (Bronfenbrenner, 1979, p. 4). The individual at the core of the model is firstly nested within a microsystem - a realm where the individual has face to face contact with the immediate environment. Thus, at the microsystem level, the individual has reciprocal interactions with other family members including parents, as well as with peers and friends, and the school or workplace. This means that not only is the individual affected by the beliefs and behaviours of family or friends, but that also family and friends are affected by the beliefs and behaviours of the individual. Interactions at the microsystem level are proximal processes, because they occur in the immediate environment (Brofenbrenner & Ceci, 1994). Consequently, they have the strongest and most direct effect on developmental outcomes.

The microsystem is nested within the mesosystem, which represents interactions between settings which affect the individual's development, but in which the individual is not personally involved. These are relationships between microsystem level systems, for example the interaction between parents and a child's school. While the individual is
not directly involved at the mesosystem level, the intersection of social microsystems is still influential on that individual's experiences. For example, cooperation, involvement and consistency in expectations between parents and schools is highly beneficial for children's development and academic performance, in contrast to conflict between parents and schools.

The third level of the ecosystem is the *exosystem*. Bronfenbrenner (1979) describes this realm as an extension of the mesosystem which consists of the external contexts in which more immediate settings are embedded. The exosystem is made up of people and places that the individual does not have direct contact with, but which still have some level of influence over their lives. For example, the parent's workplace is part of the exosystem, and while it has no direct effect on children's outcomes, it is influential in that it provides the context in which proximal processes occur -- if a workplace is highly demanding and a parent works long hours, this will have an effect on parent-child relationships; if a parent loses their job this can affect the child on multiple levels. Exosystem variables also influence what immediate settings the individual finds him or her-self in (Bronfenbrenner, 1979). For example, things such as neighbourhood characteristics and informal social networks affect interactions and opportunities.

The *macrosystem* is the overarching ecological level which encompasses the "economic, social, educational, legal, and political systems, of which micro-, meso-, and exosystems are the concrete manifestations" (Bronfenbrenner, 1977, p.515). This realm holds prototypes or 'blueprints', which represent societal expectations and beliefs relevant for particular cultures and subcultures. The effects of the macrosystem are not direct, and it is the way in which these prototypes influence other ecological realms that carries its influence. For example, cultural values or religious beliefs dictate expectations for everyday behaviours, as well as interactions with others. Economic
processes that shape a family's socioeconomic status are an example of a macrosystem factor which has an influence on all other domains, as demonstrated in Chapter 3.

Finally, all of the nested ecosystems exist within the chronosystem, described by Bronfenbrenner as “movement through ecological space” (1979, p. 26) which represents the development of individuals as a function of the time in which they live- both historically, and in terms of the individual's specific life course. Development is not static, and the effects of systems change over time. For example, expectations of women that form part of the macrosystem, and influence behaviours at other levels, are dramatically different in modern times to what they were historically, at least in Western countries. As well as this external influence of time, the chronosystem includes internal influences, such as differences in experiences due to the age of the individual.

Bronfenbrenner’s ecological theory itself continued to develop over time. While the 1979 publication, *The Ecology of Human Development*, embodied his initial (and perhaps most reproduced) conceptualisations about these ecological nested levels, his later writings shifted emphasis from a focus on the influence of context on the individual to a recognition of the role played by the person in his or her own development (Tudge et al., 2009). This ‘mature’ form of Bronfenbrenner’s theory was more often referred to as bioecological theory, to recognise the increased importance placed on the individual. While aspects of the individual increased in importance in these later revisions, the role of environments was still acknowledged. In particular, Bronfenbrenner’s model of human development evolved to become a Process-Person-Time-Context (PPCT) model which emphasised processes- explained as connections between environment and aspects of the individual. Thus Bronfenbrenner’s later bioecological theory presents “an active person enmeshed in an active, dynamic, social-
ecological system” (Weisner, 2008, p. 258) where processes, or interactions between contexts and the characteristics of the person, are the key drivers of developmental outcomes.

Central to Bronfenbrenner's bioecological model of development are two propositions. The first proposition states that human development occurs as a result of proximal processes, that is "complex reciprocal interaction(s) between an active, evolving biopsychological human organism and the persons, objects, and symbols in its immediate external environment" (1999, p. 5), with these interactions occurring regularly over time. These proximal processes have the strongest effect on outcomes. The second proposition states that the "form, power, content and direction of the proximal processes affecting development vary systematically" (1999, p.5) as a consequence of environmental influences (both proximal and distal), as well as in relation to the outcome being measured and taking into consideration the influence of time both on a personal and historical level (Bronfenbrenner, 1999). Thus Bronfenbrenner highlights the numerous interactions between contextual realms and more immediate processes.

This theorised connection between contextual and proximal processes suggests the need to consider contextual factors when examining microsystem level relationships. For example, while the interactions between a parent and child (a proximal process) may directly affect the child's wellbeing, the environmental context of low SES may influence the way in which the proximal interaction operates, such as by influencing the strength of that proximal interaction in affecting the outcome, or possibly even the direction of the relationship (Bronfenbrenner, 1999).

Bronfenbrenner provides an illustration of this from a study examining the effect of parental monitoring (operationalised as keeping informed about, and setting limits on,
children's activities outside the home) in conjunction with mother’s education on child academic achievement. The influence of these variables was examined for two-parent families, single parent families and families with a mother and step-father. The proximal process itself (parental monitoring) was stronger than the environmental influences (family structure and mother’s education) on the outcome, but a moderating effect was evident where the effect of this proximal process was seen to vary according to environmental context.

Specifically, in families with two parents, where the mother had qualifications beyond grade 12 (that is, in the most advantaged circumstances), monitoring was seen to have a much greater impact on children's GPA as compared to one parent or step-parent families, and/or where the mother had no qualifications beyond year 12 (Bronfenbrenner, 1999). Further, while higher levels of mother's education were related to improved academic outcomes for 2 parent families at all but the lowest levels of parental monitoring, education beyond Year 12 made a much smaller difference to single parent and step-parent families. Bronfenbrenner concluded that while parental monitoring may ensure children have time and a place to devote to academic learning, the effects of this proximal process will be strongest in environments that guarantee the presence of other factors necessary for academic success. It might also be said that advantages such as being a parent with higher education may only be beneficial in environments where challenges to successful outcomes are minimal.

Research on adolescent antisocial behaviours confirms the moderating role of environments. For example, Wikstrom and Loeber (2000) explored the relationship between individual characteristics and neighbourhood settings while investigating serious male juvenile offending. While antisocial behaviours amongst boys with high levels of individual risk were not affected by neighbourhood, the socioeconomic context
of where boys lived did influence offending for boys with a balance of risk and protective factors, or where protection outweighed risk. Specifically, living in a disadvantaged public housing neighbourhood more than doubled the likelihood of serious violent offending amongst boys with a balance of risk and protective factors, and more than tripled it amongst those with more protective than risk factors, when compared to boys living in advantaged neighbourhoods. Thus, with the exclusion of high-risk boys, the relationship between risk and protective factors for violent offending was demonstrated to be context specific. Wikstrom and Loeber theorised that disadvantaged neighbourhoods provide greater temptation, provocation and opportunity for antisocial involvement, meaning that levels of protective factors needed to overcome such challenges are not the same as those sufficient in less demanding environments.

In addition to environments moderating the relationship between risk and protective factors and outcomes, the way the specific outcome of interest is framed also plays a role in the interaction. Bronfenbrenner (1999) explains that when considering the influence of environments “the effect of proximal processes will vary systematically as a function of the nature of the developmental outcome under consideration” (p.8). Proximal processes within negative environments will most strongly influence negative outcomes, whereas those in positive environments will most strongly influence positive outcomes. Therefore, for children growing up in disadvantaged neighbourhoods or poor families, proximal processes will impact most greatly on dysfunctional outcomes such as delinquency, whereas for children growing up in advantaged and stable environments, proximal processes will have the greatest impact on competence outcomes such as social skills and academic achievement (Bronfenbrenner, 1999).

This theorisation is based on the proposition that in poorer environments, dysfunction is more common and more extreme, requiring greater parental involvement
and attention to achieve normal outcomes or avoid pathological outcomes whilst in advantaged and stable environments, manifestations of dysfunction are minimal, and parents therefore are more likely to respond to signs suggesting the development of a child's knowledge and skills (Bronfenbrenner, 1999). Further, parents from poorer environments may lack the skills and knowledge necessary to foster competence in their children (Bronfenbrenner, 1999). In addition, such parents might also lack access to resources that would provide these skills. In sum, differences in the impact of proximal processes across different environments are explained by contextual level variations in resources, knowledge and skills, as well as in relation to the way outcomes are operationalised (that is, competence versus dysfunction).

Motivated by Bronfenbrenner's early ecological theories, research investigating child-environment relations thrived during the 70's and into the '80's, and numerous studies stressed the importance of exploring contextual level influences on both family processes, and child and adolescent development. Particularly in the realm of psychology, which tended to focus on the individual and his/her interactions with others, the need to consider contextual influences on thoughts and behaviours became paramount in the minds of researchers. Hart (1998) stressed the need for this more holistic exploration of child development, stating "Without detailed study of children in the context of their everyday lives, social scientists are unlikely to generate the rich theory that they need" (p. 1).

4.2.1 The Need to Consider Context

While Bronfenbrenner's ecological theory provides a clear framework on which to explore the impact of environments, the interest in contextual influences was not confined to his work, and certainly began much earlier. Fisher (2008) suggests that the
emergence of positivism and its search for 'causes' of behaviour paved the way for consideration of influences beyond the individual. Durkheim's (1897) study of suicide, although criticised for some methodological problems, introduced the idea of influences at the level of the social environment to sociological studies of behaviour, with Durkheim concluding that the difference in suicide rates between Catholics and Protestants was due to stronger social controls within the Catholic faith and communities (Durkheim, 1897/2005). Robert Park's (1915) interest in social disorganisation heralded the beginnings of the Chicago School of Sociology's investigations into the effects of neighbourhood on outcomes (Roberts, 2015), leading to an abundance of ecological level explanations of behaviours such as crime and deviancy. Psychology incorporated contextual level influences into psychological research, through theorists such as Kurt Lewin, known as the father of social psychology. As part of his field theory, which suggests that one's life space influences experiences, Lewin (1936), proposed an equation for behaviour that reflected an interaction between individuals and environments \( B = f(PE) \), where \( B \) is the behaviour, \( P \) is the person and \( E \) the environment).

The language used to describe these factors varies frequently in the literature, including references to ecological risk, contextual risk, environmental risk, macro level influences and other similar terms. What is common to all these terms is the idea that these risks arise from background circumstances, rather than being immediate to the individual experiencing them. More recently, the different spheres of influence on individual behaviours have been discussed using the typology of proximal and distal factors, borrowed from public health discourse (Kreiger, 2008). This typology suggests that risk factors exist on a continuum ranging from close and immediate (proximal) influences with a direct effect, to those that are further away (distal), with distal factors
exerting their influence indirectly through proximal processes (Swart et al., 2015). The difference between proximal and distal influences can also reflect timing of risks, with distal factors being those that occur some time before the behaviour in question (Morizot & Kazemian, 2015).

Frequently recognised proximal influences that increase the likelihood of involvement of adolescents in antisocial behaviours include attributes of the individual – attitudes, beliefs, behaviours, intelligence and school achievement– as well as immediate interactions with family (eg. parenting behaviours) and peers. Distal factors such as economic pressures including poverty, cultural status, neighbourhood of residence, family characteristics (e.g. parental education, family criminality) and structure, gender and demographics are also commonly associated with delinquent behaviours (Day & Wanklyn, 2016; Stouthamer-Loeber et al., 2002).

Regardless of the terminology used, theories and research around contextual influences on development lead to several conclusions. Most obviously, where environmental risk exists, there is a greater likelihood of poor outcomes. In addition, such risk increases the probability of experiencing other associated risk factors. Proximal risk factors, particularly those related to the individual and his/her recent experiences, may have the most powerful and direct influence on outcomes, but the impact of distal variables on outcomes, while indirect, can be pervasive (Baldwin et al., 1990). Most often the effects of contextual factors are mediated through other processes. For example, poverty is a distal variable that may affect family life through more proximal influences such as higher parental stress and frustration (Doan et al., 2012), or levels of community violence may influence parental beliefs about child aggressive behaviours and thereby affect the way the parent manages that child's behaviours (Wachs & Shpancer, 1998). Further, contextual risk may be mediated
across several realms (for example working conditions affect a mother's social support network which affects the quality of her parenting) (Wachs & Shpancer, 1998). Chapter 2 provided a review of the literature illustrating some of these processes.

Not only do contextual variables affect outcomes through processes of mediation, environments also affect the ways in which other relationships operate, by moderating those relationships. For example, the relationship between parenting style and high school academic achievement differed according to ethnicity in Park and Bauer's (2002) study, with authoritative parenting only beneficial for students from non-minority families. Similarly, the proximal family variables related to successful outcomes may differ according to family contextual risk, that is, the level of environmental risk the family experiences (Baldwin et al., 1990). This was observed in Griffin and colleagues' (2000) study which found that the practice of eating dinner together as a family was a stronger protective influence against delinquency for youths in single parent families compared to two parent families, and the checking of homework was associated with lower teen alcohol use amongst two parent families but not in single parent families. Such findings demonstrate that parenting strategies need to be adapted to suit the environment in which the family lives:

Family processes that will shield a child from noxious elements in a high-risk environment may unnecessarily limit a child's opportunities in a low-risk environment. Similarly, encouraging what would be reasonable self-reliance for a child in a low-risk environment might overwhelm the coping abilities of a child living in a high-risk environment. To truly understand family processes, it is essential to recognise the nature of the environment (Baldwin et al., 1990, p.259).

Links between environments and consequences are, of course, not inevitable. While environmental risk increases the likelihood of poor outcomes, proximal protective factors have the ability to counteract such risk. An investigation of environmental influences on individual outcomes should therefore not only address risk.
It is equally (and possibly more) important to also identify factors which offer protection from contextual level vulnerability.

Not only do environments have an effect that is mediated through other processes, they also act as moderators, resulting in differences in strength and sometimes even directions of relationships between risk and protective factors and outcomes. Unfortunately, research not only frequently fails to consider contextual influences, it often controls for macro level variables, meaning that their influence is eliminated. The consequence is that effects on outcomes may be changed or masked as a consequence of assumed homogeneity inherent in linear regression methods. For example, in Bronfenbrenner's example of the parental monitoring study, applying a regression model that controlled for social class and family structure would have "appreciably overestimated the power of parental monitoring in single-parent families (particularly those in which the mother had had no education beyond high school) while considerably underestimating the effect of the same degree of monitoring in well-educated two-parent families" (Bronfenbrenner, 1999, p. 11). The ecological systems theory framework therefore posits that it is crucial to consider contextual influences to truly understand how developmental pathways are created and maintained.

The need to consider context might be best summed up in the words of Eisenberg's (1999) declaration that "it is high time to replace the false dichotomy between nature versus nurture by a more inclusive trio: nature, niche, and nurture" (p. 1041). Niche consists of ecological settings and social environments which interact with both nature and nurture to mould human development. It represents the "envelope of life chances" (p. 1042) given that opportunities and experiences encountered by an individual throughout life are very much a facet of the environment in which he or she lives. Only by considering the influence of niche can one truly understand the interplay between
individual characteristics, parenting behaviours and social interactions on youth outcomes, as all these factors are inextricably intertwined.

**4.2.2 Ecological Systems Theory and Cumulative Sociodemographic Risk**

Ecological systems theory provides a theoretical rationale for the importance of exploring the influence of contextual influences on developmental outcomes. Chapter 3 provided an empirical discussion of research illustrating the pervasive influence of sociodemographic risk factors on child and adolescent wellbeing. Further, ecological theory proposed that cumulative sociodemographic risk, in the manner of cumulative risk, would have an even more influential effect on outcomes than singular risk factors. When the empirical research findings discussed in Chapter 3 are considered in combination with theoretical arguments based on ecological theory, a compelling argument emerges for an exploration of the contextual influence of cumulative sociodemographic risk on adolescent antisocial behaviours. While individual and family level risk factors for adolescent delinquency have been well explored, the ways in which cumulative sociodemographic risk affect adolescent life experiences, as well as the differences in risk and protective factors within populations of adolescents who are, and are not vulnerable due to cumulative sociodemographic risk, are yet to be fully investigated. This study therefore aims to address these gaps in the literature by examining cumulative sociodemographic risk as a contextual moderator, exploring differences in proximal processes of risk and protection, as they vary by levels of sociodemographic risk.

Ecological systems theory provides the framework for an argument that cumulative sociodemographic risk will strongly influence adolescent outcomes due to its recognition of the role of contexts on human development. However, ecological theory
does not offer a specific testable theory of the mediation and moderation pathways through which environments might have an impact on outcomes. For such a theory we turn in the next section to General Strain Theory.

4.3 General Strain Theory

General Strain Theory (GST; Agnew, 1992) provides a theoretical explanation of how the experience of increased exposure to stressors in life is related to poor outcomes. Given that a core characteristic of youths experiencing cumulative sociodemographic risk is the higher likelihood of becoming involved in crime, experiencing negative life events, victimisation, family dysfunction and so on, GST is a valid framework for exploring a theorised pathway through which cumulative risk increases adolescent antisocial behaviours. Following is an overview of the key facets of GST, including theorised processes of mediation and moderation.

Strain theory in its classical form, as framed by theorists such as Merton (1948) and Cohen (1955), proposed that the impetus for crime lay in the gap between aspirations and expectations, particularly in regards to an individual's inability to realise monetary or status goals (Broidy & Agnew, 1997). The pressures resulting from this inability to succeed meant that individuals would engage in criminal activities, both as an expression of frustration and also as a means of achieving goals (for example, improving finances through theft). This focus on strain as a consequence of blocked pathways to success meant that traditional strain theories were often limited in application to the criminal activities of low SES (usually male) offenders. The decline in popularity of strain theory during the 1970's was attributed to this theoretical oversimplification as to methodologically flawed early research which suggested a lack of empirical support (Froghio & Agnew, 2007).
The strain perspective regained popularity following the revisions proposed by Agnew (1992) in his General Strain Theory (GST). In addition to offering suggestions for more methodologically sound research strategies, Agnew's revision moved the notion of strain from a structural explanation of offending to an explanation based on the psychosocial experience of strain (Broidy, 2001). Thus GST extended the concept of strain beyond blocked opportunities alone to include a broader consideration of strain related stressors. This new vision of strain transcended the universality of goals implicit in traditional strain theory, making GST more amenable to individual differences in aspirations, as well as those related to gender, class and cultural differences (Broidy, 2001). In addition, GST improved the flexibility of the application of strain to outcomes beyond criminality, resulting in it being supported by sound empirical research investigating problem behaviours such as eating disorders as well as crime and delinquency (Froghio & Agnew, 2007).

Central to GST is the influence of negative relationships and the consequent psychosociological pain these cause. These relationships may be with other people, or societal relationships, but in each case the individual experiences being treated in ways he/she does not wish to be treated (Froghio & Agnew, 2007). Agnew (1992) proposed three major avenues through which these negative relationships operate: "(1) strain as the actual or anticipated failure to achieve positively valued goals, (2) strain as the actual or anticipated removal of positively valued stimuli, and (3) strain as the actual or anticipated presentation of negatively valued stimuli" (p.47). Important to all sources of strain is the recognition of anticipated outcomes being as influential as actual outcomes. While these three categories are identified as the major sources of strain they are not in reality exclusive. Agnew stresses that this overlap is not problematic as the aim is not to categorise strains but to ensure that all types of strains are recognised.
The first category of strain, failing to achieve positively valued goals, is reminiscent of traditional strain theory, but rather than focussing on goals related to financial success or social status only, Agnew (1992) extended this criterion to include any goals positively valued by an individual. Failure to achieve positive goals includes a disjunction between aspirations and expectations, as well as a disjunction between expectations and actual achievement, with the latter suggested to be more likely to result in heightened emotions given it is based on reality (actual achievements) rather than ideals (aspirations). In addition, failure to achieve positive goals incorporates a disjunction between fair outcomes and actual outcomes, whereby perceived inequity of income/outcome ratios (distributive justice) may result in individuals engaging in delinquency as a means of restoring equity (Agnew, 1992).

The second and third sources of strain - loss of positive stimuli and presentation of negatively valued stimuli- have long been linked with antisocial outcomes in the research literature exploring the influence of stressful life events (Agnew, 1992). Loss of positive stimuli refers to the removal of valued relationships, which for adolescents may include the loss of a positive parental relationship due to divorce or death, the loss of a girlfriend/boyfriend when a relationship ends, or the loss of a positive connection to school due to suspension/expulsion, or moving to a new school. The presence of negative stimuli includes negative life events such as experiencing abuse/neglect, victimisation, exposure to violence and even negative peer and school relationships. Agnew (1992) suggests that negative stimuli result in adolescent delinquency when a young person (1) tries to escape or avoid it, (2) tries to stop or alleviate it, (4) seeks revenge for it, or (4) uses illicit substances to manage the effects of it. Negative stimuli are not necessarily psychological only, and may include such environmental influences as noise pollution, overcrowding, excessive heat and so on.
Magnitude, duration, recency and centrality of strain are important factors in determining its impact. The more severe strains are (magnitude), the stronger the effects of experiencing them are theorised to be. When strains are particularly high in magnitude, the perceived costs of coping through criminal means are minimised (Baron, 2004). In terms of duration, ongoing strains that occur over a period of time (chronic stressors), or strains that recur frequently will be more influential than those experienced occasionally, particularly if the ongoing/frequent strains remain unresolved (Agnew, 2001). The impact of strain decreases as time goes by (Agnew, 1992). While strains which occurred some time before (eg. child abuse) may continue to exert an influence over outcomes, those experienced most recently will have the strongest influence on decision making and behavioural responses (Baron, 2004). Lastly, it is the centrality of the strain, that is the extent to which the strain threatens "the core goals, needs, values, activities, and/or identities of the individual" (Agnew, 2001, p. 444), that determines how strongly an individual will react to it.

Numerous studies investigating the influence of strain during adolescence have found a relationship with antisocial outcomes. For example, Paternoster and Mazerolle (1994), using two waves of data from the National Youth Survey, found that strains of negative life events, negative adult relationships, school/peer problems, and neighbourhood problems were significantly related to adolescent delinquency, even when controlling for variables related to differential association and social control theory. Piquero and Sealock (2000) investigated the effects of negatively valued stimuli, namely physical and emotional abuse, on youths detained in juvenile detention facilities and found a significant association between strain and both property offending and interpersonal aggression.
Using data from the National Survey of Children, Agnew, Brezina, Wright and Cullen (2002) showed a significant increase in the number of delinquent acts amongst young people experiencing family, school and neighbourhood strains. Baron (2004) explored the influence of strain on a sample of 400 homeless street youth, with results demonstrating that 8 out of the 10 types of strain included predicted criminal behaviours. Maschi (2006) investigated exposure to traumatic experiences during the preceding year, consisting of violent victimisation, exposure to violence and stressful life events, and found that experiencing one major, or an accumulation of several minor negative life events increased the likelihood of engaging in delinquency. In particular, experiencing stressful life events such as parental separation/unemployment or changing homes/school (loss of positively valued stimuli) as well as school suspension or failure (blockage of positively valued goals), were found to increase the risk of adolescents engaging in both violent offending and offences against property (Maschi, 2006). While the link between the experience of strain and subsequent problematic behaviours appears quite clear, research regarding the mechanisms through which strain influences outcomes is less conclusive, particularly when exploring processes of mediation and moderation.

4.3.1 Mediators of Strain

Important to GST is the distinction between *objective strain*, which is the experience of events or conditions which are presumed to be disliked by the majority of a group, and *subjective strain*, in which the individual's dislike of the conditions he/she is experiencing is known (Broidy & Agnew, 1997). Individual characteristics may result in different subjective experiences of objective strains, meaning that a life event which is considered negative for one person may be neutral (or perhaps even positive) for
another person. Subjective strain is theorised to be more strongly correlated with antisocial behaviours than objective strain due to the negative emotions that occur as a consequence (Froghio & Agnew, 2007), with these negative emotions being key to explaining the link between strain and outcomes. For this reason when conducting research investigating the effect of strain on outcomes, consideration of the subjective experience of strain on the individual and his/her affective response to strain, is paramount.

Traditionally, strain research has focussed on anger as an affective mediator, theorised to be the strongest emotive link due to its characteristics. Anger often occurs when the individual holds others to blame, it lowers inhibitions and creates a desire to enact revenge - all things which encourage criminal activity (Agnew, 1992). Most often, research finds anger to be influential in the relationship between strain and violent, aggressive offending. For example, while Piquero and Sealock (2000) found no significant relationship between strain, anger and property offending, they found anger did predict interpersonal violence. Aseltine, Gore and Gordon (2000) found that anger as a consequence of negative life experiences predicted aggressive delinquent behaviours, but not non-aggressive delinquency or drug use. Situational anger as a consequence of strain predicted fighting (but not DUI or shoplifting) in a sample of University students (Capowich et al., 2001). However Hay and Evans (2006) did demonstrate the role of anger in linking strain with antisocial outcomes, including anger mediating the influence of victimisation on both delinquent behaviours and substance use.

Other studies do not find anger to be significant as a mediator of strain regardless of the antisocial outcome investigated. For example, in an examination of 264 high school students, Mazerolle et al. (2000) found no significant mediating effect of anger between
strain and the outcomes of violence, school deviance and drug use. Instead, the relationship may in fact have been reversed, with angry youths more likely to experience strains and consequently engage in violence (that is, strain was seen to mediate the relationship between anger and violence rather than anger mediating the relationship between strain and violence).

While Agnew (1992) highlighted anger as an obvious link between strain and delinquency, GST does recognise that other negative emotions such as sadness, disappointment, and frustration are also experienced as a consequence of strain (Paternoster & Mazerolle, 1994). Disappointment or despair may not strongly predict vengeful crimes, but the pressure to take corrective action for these negative emotions may equally result in other antisocial behaviours such as drug use or strategies to avoid strain, such as running away from home or not attending school. As research is expanded to investigate outcomes beyond criminal behaviour, the role of these negative affective states in mediating strain may become more apparent. The existing research investigating strain and negative affect is far smaller than that investigating anger, but the findings are similarly mixed.

For example, Aseltine, Gore and Gordon (2000) found no effect of anxiety in the relationship between negative life experiences and delinquency. Using a cumulative measure of negative emotions, Broidy (2001) failed to find a significant mediation effect between strain, operationalised as failure to achieve goals, loss of positively valued stimuli and presence of negatively valued stimuli, and delinquent behaviours. While Piquero and Sealock (2000, 2004) found that strain due to abuse predicted depression for males (but not females), they failed to find depression significant in mediating the relationship between abuse and juvenile property offending or interpersonal aggression, as no influence of depression on outcomes was significant.
Similarly, Maschi, Bradley and Morgene (2008) found that while trauma due to stressful life events and exposure to violence predicted depression, there was no relationship between depression and property offences and violent offending.

In contrast, two studies examining strain amongst samples of African American youth did find that negative emotions predicted antisocial behaviours. Jang and Johnson (2003) demonstrated a mediating effect of both anger and depression between strain due to personal problems and the outcomes of fighting and drug use. Similarly, Simons, Chen, Stewart and Brody (2004) found depression mediated the effect of experiencing discrimination on delinquency. Using data from the National Longitudinal Study of Adolescent Health, Watts and McNulty (2014) found that depression mediated the effects of strain (childhood abuse) on delinquent behaviours for both male and female youths who had experienced physical (but not sexual) abuse during childhood.

The effect of negative emotions such as depression as a mediator of strain may depend on both the type of strain being investigated, as well as the outcome. In Ostrowsky and Messner's (2005) study into the role of depression as a mediator of strain no relationship was found between depression and traditional indicators of strain- namely blocked opportunities and discrepancy between aspirations and outcomes- but strain as a consequence of victimisation, life hassles and those strains associated with neighbourhood of residence were significantly and positively related to depression (Ostrowsky & Messner, 2005). In regard to the relationship between depression and criminal outcomes, for violent offending, depression was found to predict participation, the frequency (rate) of offending and also offending versatility (participating in numerous forms of each offence type), but for property offences, only the frequency of offending was influenced by depression.
Brezina (1996) proposed an alternate explanation for the relationship between strain and depression. In a study of adolescents drawn from the Youth in Transition survey (YIT), strain due to poor family and school relationships was found to result in a variety of negative emotions, including resentment, anxiety and depression as well as anger. When exploring the relationship between strain and delinquency, the influence of strain on negative emotions (although always remaining significant) was seen to decrease as levels of delinquency rose using cross-sectional data. In the longitudinal data however, there were no significant interactions. Brezina concluded that while in the long-term delinquency may exacerbate negative emotions related to strain, in the short-term reacting to strain with delinquency proves to be an effective coping mechanism that provides some relief.

Jang, Ferguson and Rhodes (2014) provided further evidence to support the idea of delinquency as a moderator of strain in their study using two waves of the National Longitudinal Study of Adolescent to Adult Health (Add Health). When examining the sample separately for males and females, heavy drinking was demonstrated to reduce the emotional effects of strains associated with health and emotional problems for girls, and engaging in property offending was demonstrated to buffer feelings of depression and anxiety as a consequence of strain for males. Therefore, delinquency may in fact moderate the short-term effects of strain, with mediating effects being more influential over time.

4.3.2 Moderators of Strain.

While affective states are most often theorised to operate as mediators of strain, GST suggests that the effect of strain on behaviours is also moderated, or conditioned, by a variety of influences. GST proposes that the pressure caused by experiencing negative
affective states as a consequence of strain motivates involvement in antisocial behaviours as a coping mechanism (Baron, 2004), meaning this relationship should be stronger for those individuals who lack legitimate/more acceptable coping strategies (Broidy, 2001; Froggio & Agnew, 2007). Both individual resources, such as esteem, self-worth, and self-efficacy as well as individual characteristics that influence coping resources, such as intelligence, creativity and problem solving skills, are theorised to play a role in conditioning the relationship between strain and antisocial outcomes (Agnew, 1992; Broidy, 2001). Further, being "disposed to crime" (Agnew, 2001, p. 424), presumably due to temperament variables such as low self-control (Paternoster & Mazerolle, 1994), as well as possessing more lax moral beliefs, influence decision making when considering criminal coping strategies.

One of the most investigated moderators of strain has been self-efficacy. Agnew and White (1992), the first researchers to investigate moderation effects in the relationship between strain and delinquent outcomes, found that self-efficacy interacted with strain in affecting delinquency (but not drug use), with higher levels of individual self-efficacy weakening the relationship. Paternoster and Mazerolle (1994) also found a significant moderation effect for self-efficacy on delinquency in their longitudinal study of data drawn from the National Youth Survey (NYS), but in contrast to Agnew and White's (1992) cross-sectional findings, youths with higher (rather than lower) levels of self-efficacy were demonstrated to exhibit a stronger relationship between strain and delinquent outcomes. While the interaction was significant, the interaction term added no explained variance to the model, leading Paternoster and Mazerolle to suggest that the result offers little support for the theory.

The moderating influence of self-efficacy in models of strain which include an affect-related mediator have also been investigated by Aseltine, Gore and Gordon
Both studies suggested that efficacy played a role in the pathway between strain and emotional responses by reducing effects on negative emotions outwardly expressed emotions such as temper. However, efficacy did not affect the pathway between emotional responses and outcomes. In Jang and Johnson’s study, self-esteem was also a significant moderator, on both the pathway between strain and emotional response, as well as emotional response to outcome, but the direction of the relationship was opposite to what was hypothesised based on GST theory (a positive interaction term instead of negative). In comparison to these findings, Hoffman and Cerbonne’s (1999) study on the influence of stressful life events on delinquency using growth curve modelling found no significant differences in delinquent participation according to levels of self-efficacy or self-esteem.

Self-control was not found to be a significant moderator of strain in Paternoster and Mazerolle’s study, but Agnew, Brezina, Wright and Cullen (2002) found that individuals high in negative emotionality and low in constraint were more likely to engage in delinquency following the experience of strain, although when strain was low, there was virtually no effect of these characteristics on outcomes. Agnew and colleagues theorised that high negative emotion/low constraint personality characteristics increase the likelihood of intense emotional reactions to strain and decrease the ability to cope in non-criminal ways. Similarly, Hay and Evans (2006) found that self-control moderated the relationship between victimisation and both general delinquency and substance use, with children low in self-control more likely to respond to victimisation with these behaviours. The authors argued that stable character traits may be the most important moderators of strain, and more influential as conditioning factors over social relationships given that these traits often influence social relationships themselves (Hay & Evans).
Other individual factors such as prosocial beliefs have not exhibited moderation effects in strain models. Both Paternoster and Mazerolle (1994) and Mazerolle and Piquero (1997) failed to find differences in consequences of strain based on levels of moral beliefs. In Jang and Johnson’s (2003) study however, religiosity made no difference to the effect of strain on negative emotions or deviant coping, but buffered the effect of negative emotions (experienced as a consequence of strain) on deviant behaviours.

In addition to individual level variables, the effect of strain on delinquent outcomes is also theorised to be influenced by social factors, including social connections, and perceptions of social support (Agnew & White, 1992). The extended social environment influences goals and values, such as the importance of money and status (Agnew, 1992) as well as the acceptability of specific behaviours (Agnew & White, 1992). Delinquent peers are identified as conditioning variables as they not only function as role models for deviant behaviours, but also provide the opportunity for involvement in antisocial acts (for example, through supply of illegal drugs) (Agnew & White, 1992). The role of social controls as constraints to delinquent coping is also recognised (Agnew, 1992), where strains related to low social controls, such as poor attachment to parents or inadequate disciplinary techniques, are theorised to be more influential in affecting delinquent outcomes due to damaged relationships with conventional or prosocial others (Agnew, 2001).

Research investigating social connections as moderators of strain produce mixed results. In terms of social controls, Paternoster and Mazerolle (1994) failed to find a significant interaction between strain and family attachment in predicting delinquency, just as Hay and Evans (2006) found that parent-child attachment levels were not significant in moderating the influence of strain (operationalised as victimisation) on
antisocial outcomes. However, Aseltine, Gore and Gordon (2000) found that levels of family attachment moderated the path between anger experienced as a consequence of strain and delinquency and Agnew, Brezina, Wright and Cullen (2002) found that young people with low levels of attachment to school showed a stronger relationship between strain and delinquency than those with mean levels or above. When investigating social bonds as a composite measure, Mazerolle and Maahs (2000) found that social bonds (attachment to parents and to school, commitment to conventional activities, and moral beliefs) interacted with strain in predicting drug use, with a lesser effect of strain when bonds were strong. However, no moderating effect was found for outcomes of violence or school-related deviance.

Associating with delinquent peers strengthened the influence of strain on both delinquent acts and drug use in Agnew and White's (1992) study and on violence and drug use (but not school deviance) in the (2000) study by Mazerolle and Maahs, but no significant moderating relationship was found for strain and deviant associations in Paternoster and Mazerolle's (1994) study of delinquency, or Mazerolle and Piquero's (1997) study of violent offending. Aseltine, Gore and Gordon (2000) found that peer deviance moderated the influence of strain measured as stressful life events on delinquency, but the direction of the effect was opposite to what theory would suggest, with stronger associations between stressful experiences and antisocial behaviours amongst those with conventional peers. In the same study, when strain was operationalised as family conflict, more frequent association with delinquent peers increased levels of anger as a consequence of strain, but played no role in the pathway between anger and antisocial outcomes (Aseltine et al.).

In addition to social controls and peer association, individual perceptions of social support have been investigated as moderators of strain. Capowich, Mazerolle and
Piquero (2001) found that perceived social support did not influence the effect of strain on antisocial behaviours of fighting and DUI, but was significant in moderating the relationship between strain and shoplifting. Rather than limiting this antisocial act however, individuals who reported high levels of perceived social support engaged more frequently in theft, suggesting that social support acts as an encouraging factor when considering shoplifting, rather than as a control (Capowich et al., 2001).

4.3.2.1 Gender as a Moderator of Strain

One advantage of GST lies in its ability to effectively account for the differences in antisocial activities according to gender. While the gender difference in offending cannot be explained as a consequence of males experiencing a greater number of strains than females, Broidy and Agnew (1997) propose that gender differences in the types of strains experienced, as well as in reactions to strain, explain the predominance of male over female offending.

In terms of types of strain, males are theorised to be more likely to experience strains related to material considerations, and overt victimisation (Broidy & Agnew, 1997), whereas females are most affected by stressors related to the establishment and maintenance of relationships with others (Belknap & Holsinger, 2006; Garcia & Lane, 2012). In addition, females are more likely than males to experience negative life events such as abuse and victimisation (Broidy & Agnew, 1997). For example, Jang (2007) found that African American women tended to report strain related to physical health and interpersonal relations, while males were more affected by stressors within the work environment, including racial and job strain. In addition, males may be more likely to experience those specific stressors that are most predictive of delinquency. Hay (2003) found that amongst adolescents, males were significantly more likely than
females to experience types of strain such as physical punishment, which was one of the strains most strongly related to delinquent involvement in his study.

These differences in the types of strains experienced, in combination with gendered norms, influence the emotional reactions to and expressions of strain. Females are more likely than males to respond to strain with internalised emotional reactions (Broidy, 2001; Hoffmann & Su, 1997; Jang, 2007) and therefore tend to engage in more self-destructive behaviours such as drug use or eating disorders (Broidy & Agnew, 1997). While it is theorised that depression as a consequence of exposure to strain will be found more often amongst females (Broidy & Agnew, 1997), the research does not always find this to be the case (eg. Piquero & Sealock, 2004). In addition, the research does not conclusively find that males are more likely than females to experience anger as a consequence of strain (eg. Mirowsky & Ross, 1995; DeCoster & Zito, 2010).

Although it is proposed that there may be a qualitative gender difference in the way that anger is experienced, with female anger being more long lasting (Piquero & Sealock, 2004) as well as incorporating a mix of feelings such as fear, shame and guilt that results in the anger being self-directed (Broidy & Agnew, 1997; Hay, 2003).

DeCoster and Zito (2010) propose that the key gender difference in the strain-delinquency relationship relates more to the expression of emotions than the experience of them, suggesting this is the consequence of outward expression of emotions being more consistent with expectations of masculinity as opposed to femininity. In line with this, male expressions of strain are often found to be externalised acts that express their anger, such as theft and property crime as a reaction to material strains, and serious violence as a reaction to victimisation (Broidy & Agnew, 1997; Piquero & Sealock, 2004). Broidy and Agnew (1997) propose that the lack of coping mechanisms more commonly found amongst females, such as lower levels of both self-mastery and self-
esteem, may make them less likely to engage in traditionally unacceptable female behaviours such as serious crime.

Other moderators of strain, such as individual characteristics and coping strategies, may play a role in gender differences within the strain-delinquency relationship. For example, Cheung and Cheung (2010) found that high levels of self-control reduced the influence of strain on delinquency for female Chinese adolescents, but not for males, and Jennings, Piquero, Gover and Perez (2009) found that religiosity and/or spiritual coping was a protective factor in the relationship between strain and property offending for Mexican American adolescent girls, but not for boys. Baron's (2007) investigation into the relationship between financial strain (homelessness, monetary dissatisfaction, and relative deprivation), anger and crime amongst 400 homeless youths showed that low self-efficacy was related to a stronger likelihood of experiencing anger as a consequence of strain for females than males. Examination of interaction effects showed that property crime was more likely for males only when homelessness was combined with high levels of deviant attitudes and low levels of self-esteem, or when relative deprivation was combined with external attributions of blame for strain. For females, both relative deprivation and monetary dissatisfaction were stronger predictors of violent crime, when experienced in conjunction with deviant attitudes and deviant peers (respectively). Baron concluded that "financial strain has an impact on the crime of both males and females but the impact is moderated by different factors depending on one’s gender" (p. 296).

Social supports, peer associations and social controls may also be influential moderators, with females more likely to have stronger social controls that inhibit offending behaviours, even if these are children or family members for whom they are caring (Broidy & Agnew, 1997). Peer rejection was found to be far less influential for
females than males in Higgins, Piquero and Piquero's (2011) study, where high levels of peer rejection over time were significantly associated with increased participation in crime for males only. In Jenning and colleagues’ (2009) study, a difference in the strength and direction of peer influence according to gender was noted. While higher levels of peer support buffered the likelihood of females participating in property crimes, male property offending increased significantly in line with levels of perceived acceptance and support from peers. Broidy and Agnew (1997) suggest that males tend to have larger peer groups with an emphasis on competition and physical interactions, whereas females prefer smaller, more intimate friendship groups which emphasise cooperation. These qualities may account for differences in the ways in which peer associations moderate the influence of strain on outcomes.

As Garcia and Lane (2012) point out, research examining gender differences according to GST sometimes produces conflicting findings, but there is sufficient evidence to conclude that there are qualitative differences in the strain experience for males and females. Research examining moderation effects according to gender in the strain-delinquency relationship is "especially limited and inconsistent in its findings" (Moon & Morash, 2017, p. 488), suggesting that this is an area where further study would be highly beneficial. The usefulness of GST as a theoretical explanation of delinquent involvement lies in its capacity to include different kinds of stressors, therefore allowing it to identify strains particular to both genders.

4.3.2.2. Macro Influences on Strain

While GST research tends to emphasise individual level differences in the experience of strain and consequent poor outcomes, Agnew (1999) argues that as an explanation for motivation towards deviant behaviours, GST extends to include macro-level influences,
such as economic deprivation and neighbourhood disadvantage. In particular, GST "explains community differences in strain, and in those factors that condition the effect of strain on crime" (Agnew, 1999, p. 126).

Negative community characteristics therefore directly increase individual experiences of strain as a result of greater exposure to negative events and reduced ability to achieve goals, but also indirectly magnify the impact of strain due to increased likelihood in disadvantaged communities of individual and social risk factors that interact with strain to amplify its effect. Such effects should also hold true for other macro influences, such as low SES, as argued by Hoffman and Cerbone (1999) who assert that "experiencing stressful life events may have a stronger impact on those from lower-income families since they may have fewer material and social support mechanisms to rely on" (p. 350).

Despite Agnew's recognition of macro influences on strain and delinquency, there is little research investigating the impact of contextual factors on this relationship. A few studies have considered community influences, but the findings tend to be mixed. For example, Warner and Fowler (2003) used a GST model of crime to explore differences across 66 US neighbourhoods. Violence (the outcome measure) as well as strain (measured as verbal threats or insults, feeling cheated by someone, and harassment by police), were seen to vary substantially across neighbourhoods, with neighbourhoods characterised by high poverty, residential instability, low education levels, female headed households and higher proportions of African American families having significantly higher levels of both. In a test of the moderating effect of neighbourhood informal social control, despite higher levels of strain and violent outcomes in neighbourhoods with low levels of informal social controls, the effect of strain on violence was not significant for these communities. In contrast, contrary to
what GST would hypothesise, strain only increased violence in neighbourhoods with high levels of social control. Neighbourhood social support/social capital did moderate strain's effect on violence however, with high levels of support/capital buffering the influence of strain.

Hoffmann (2003) investigated whether macro-level variables representing community characteristics (percent of female headed households, percent of unemployed males, percent below poverty threshold and degree of racial segregation) played a role in moderating the impact of individual characteristics on delinquent outcomes. The influence of stressful life events on delinquency was seen to vary according to community attributes. Specifically, in communities with high numbers of unemployed males, adolescents with higher than average exposure to stressful life events were more likely to be involved in delinquent behaviours than equivalent adolescents in communities with low numbers of jobless males. No other community characteristics were significant as moderators of strain however.

Wareham, Cochrane, Dembo and Sellers (2005) used a multi-level approach in exploring the influence of neighbourhood context on the relationship between strain and delinquency, mediated by negative affect. Using a HLM model, community disadvantage was not related to a significant difference in explained variance of delinquency after individual characteristics were taken into account. A supplementary analysis, where youths were classified as living in disadvantaged and non-disadvantaged communities, according to falling below or above (respectively) the median score for community disadvantage, did suggest some between group differences in the strain-negative affect-delinquency relationship. In non-disadvantaged communities, strain predicted delinquency both directly, and indirectly through negative affect, but in disadvantaged communities, only the direct pathway between strain
(measured as removal of positive stimuli and unfair teacher/peer relations) and delinquency was found.

While the results around macro-influences as moderators of strain do not provide consistent answers, they do suggest a need to further investigate how relationships between strain and outcomes differ according to contextual factors. Some of the inconsistencies in drawing conclusions about moderators of strain may simply be due to the statistical difficulties inherent in identifying interaction effects. This is particularly the case when data analysis tends to be more exploratory than specific. For example, in Aseltine, Gore and Gordon's (2000) study exploring the impact of youths' personal and social resources as moderators of the relationship between family conflict, peer conflict and stressful life events, and delinquency (discussed earlier), a total of 96 different interaction terms were tested and results were mixed, with only 10 providing evidence of significant moderation, and only 6 of these supporting GST. Determining whether theory is supported by findings such as these becomes difficult in light of the fact that such results are only slightly better than what might be expected due to chance.

The use of alternate statistical methods may offer some solution here. Early research suggested a lack of evidence to support assertions about moderators included in analyses as interaction terms. Rather than using interaction terms in a multiple regression equation, Mazzerole and Maahs (2000) performed a series of contingency-table analyses to explore data drawn from the National Youth Survey by investigating the interactions of three categories (high, medium, low) of strain, as well as each conditioning factor of antisocial beliefs, association with delinquent peers, and delinquent dispositions. Results showed that as levels of each conditioning factor increased, so too delinquent outcomes increased in a linear manner (for all categories of strain). Further, when both strain and the conditioning factor co-existed at high levels,
often more than 90% of respondents reported delinquent behaviours, highlighting the difficulty of pro-social choices under these circumstances. These effects were found when the data was examined cross-sectionally, as well as longitudinally with a one year lapse between waves. These results suggest that utilising multiple strategies when examining moderation effects may be necessary in order to discover the ways in which individual, social and macro factors interact within the strain-delinquency relationship.

4.3.2.3 Summary of Moderators of Strain

It is difficult to draw definitive conclusions about moderators of strain and delinquent outcomes given the many variations in the ways that strain is operationalised in previous research, as well as the inconsistent results found. While there is evidence to support the primary assertion of GST - that the experience of strain is related to delinquent outcomes- hypotheses based on the influence of conditioning factors are less consistently supported, possibly due to the intrinsic difficulty in detecting moderation effects (Mazerolle & Maahs, 2000). In summing up moderators of strain, Paternoster and Mazerolle (1994) explain that strain "is likely to lead to a delinquent solution where it cannot be managed, when constraints to non-delinquent solutions are strong, and when constraints to delinquent solutions are weak" (p. 248). Based on the available research, it appears that individual level factors, particularly those related to temperament and beliefs, have the strongest influence as moderators. While social influences, such as exposure to delinquent peers and/or social controls, may play a role in strengthening (or weakening) the effects of strain, it appears that at high levels of strain, these factors may be less influential.
4.3.3 General Strain Theory and Cumulative Sociodemographic Risk

In all the research examining GST, strain has been conceptualised and measured in a variety of forms, ranging from counts of negative events, to specific experiences such as parental or teacher conflict. Given the pervasive influence of cumulative sociodemographic risk discussed in Chapter 3, this study aims to examine the utility of a GST model for explaining the influence of this risk on adolescent outcomes. It is argued that GST provides a suitable framework for exploring cumulative sociodemographic risk due to its recognition of the effects of macro variables in moderating strain experiences. While the central tenet of GST is individual psychological reactions to stressors, the theories from which GST arose were sociological explanations of crime (Agnew, 2014) and it is therefore not surprising that environmental and structural factors play a key role in strain-related explanations of behaviours.

Agnew (1992; 2014) emphasised four factors as being crucial to strain: magnitude, duration, clustering, and recency. Based on these factors, cumulative sociodemographic risk is theorised to be an appropriate conceptualisation of strain. Magnitude, that is, strains being higher in severity or frequency is evidenced through children and adolescents with higher levels of sociodemographic risk being more likely to experience increased amounts of negative stimuli, given associations between sociodemographic risk and problematic parenting, victimisation and exposure to crime, poor housing and overcrowding, and other poor outcomes. Not only are strains more often experienced by those living in environments characterised by disadvantage and poverty, but those living in these conditions are more likely to possess characteristics noted to increase the effects of strain and less likely to have access to support and resources which reduce the effects of strain. Agnew (1997) proposed that this leads to a reciprocal relationship between stressors and antisocial behaviours, thus contributing to the stability of criminal
behaviours. Thus, cumulative sociodemographic risk also assures duration of experiencing strain, particularly given that sociodemographic risk factors have been shown to be largely stable over time (Dannefer, 2003; Moore et al., 2006).

For example, Slocum (2010) argues that exposure to aversive environments not only increases the probability and magnitude of stressors experienced, but also increases the likelihood of possessing those individual characteristics such as negative emotionality and low constraint, that moderate the influence of stressors. Further, individuals facing circumstances such as persistent poverty have fewer resources with which to counter these increased stressors, and instead respond with behaviours that ultimately result in a mutually reinforcing cycle of exposure and reaction to strain, which she describes as a "deviance–stressor amplification process" (Slocum, 2010, p. 211).

In accordance with the research literature on stress, GST posits that single stressful events are less likely to induce feelings of strain in comparison to an accumulation or clustering of stressors, with Agnew (1992) suggesting that strain is best investigated using a composite index or by examining interactions between sources of strain. Sociodemographic risk factors tend to co-occur, and in line with cumulative risk measures, the notion of cumulative sociodemographic risk captures this element of multiple concurrent stressors which result in outcomes being reinforced and amplified.

While experiencing chronic or repeated strain increases the likelihood of poor outcomes, Agnew also emphasises the need to explore strains which are recent, as the consequent experience of negative emotions arising from exposure to strain is considered to be fairly proximate (Broidy, 2001). The measure of cumulative sociodemographic risk to be used in this study meets this recency requirement, because it does not quickly change.
4.4 Summary of Theoretical Frameworks

Ecological systems theory, which depicts development as a process that takes place within domains of overlapping realms of influence, provides a useful framework for exploring the influence of cumulative socio-demographic risk. Environmental context has an influence on the experiences of children and young people, resulting in key differences in more immediate interactions with family and peers (proximal processes). For example, characteristics of parent-child relationships found amongst families living in situations of disadvantage may differ from those typically observed amongst more well-resourced families. In addition, socioecological theory posits that contexts often moderate the influence of proximal processes on outcomes. Thus, the environment within which families live may dictate the most effective parenting strategies— a certain level of parental monitoring may have a different degree of success in preventing antisocial outcomes depending on the neighbourhood in which the family lives.

One criticism of research on cumulative risk has been the lack of focus on the processes through which risk influences outcomes. General Strain theory suggests that exposure to stressors results in an increased likelihood of poor outcomes. Cumulative sociodemographic risk is appropriate to explore as strain in a GST model because it satisfies conditions provided by Agnew as central to a relationship between strain and poor outcomes: magnitude, duration, clustering and recency. GST therefore provides a framework that is useful for exploring the pathways through which the experience of cumulative sociodemographic risk can have an effect on adolescent antisocial behaviours. Its focus on subjective experiences of strain as central to this relationship provides the opportunity to test a model of cumulative risk that includes mediation through affective responses to strain. In addition, a GST provides the opportunity to explore moderators of strain, including individual characteristics, social ties and gender.
Before exploring cumulative sociodemographic risk according to a GST model, some problems typical of the kind of count data used in this study must be addressed. The next chapter outlines difficulties associated with analysing count data and some strategies for overcoming these issues.
CHAPTER 5: METHODOLOGICAL ISSUES WITH COUNT DATA

5.1 Introduction

Data on counts of infrequent events, such as reported number of antisocial acts, is particularly problematic when it comes to data analysis strategies. The characteristics of such data means it violates many of the assumptions associated with linear modelling techniques, necessitating consideration of potentially very complex alternatives. Frequently utilised solutions to this problem include transformations of the data itself, as well as reformatting of outcome variables into dichotomous or categorical measures. Alternate distributions, such as Poisson, negative binomial, and zero-inflated models also offer practical solutions. Decisions in regard to data analysis strategies however must be guided not only by statistical considerations, but also by theoretical frameworks and hypotheses. This chapter outlines the issues specific to count data outcomes, and explores strategies for analysing such data in light of these difficulties. I highlight the need to actively contemplate data analysis issues rather than select the first seemingly appropriate solution, and propose that regardless of which specific analytic strategy is selected, it is essential to thoroughly explore statistical challenges within a clear theoretical framework.

5.2 Issues with Modelling Count Data

Data collected on criminal offences or antisocial acts often poses significant challenges in terms of statistical modelling and interpretation. This is particularly the case with count data, consisting of non-negative integers, that typically examines the number of occurrences of a particular phenomenon during a specific period. Studies utilising count data may investigate things such as the number of times a nominated offence has been committed (for example, the number of drink driving offences within
the last 5 years), or as is the case with this study, may have participants respond discretely (yes/no) as to whether they have engaged in acts from a list of behaviours during the set period, with the number of positive responses tallied to form a total count of acts committed. The inherently difficult nature of the distribution of count data requires quantitative researchers to pay close consideration to their methods, with a heightened focus on model specification and tests to evaluate goodness of fit (Cameron & Trivedi, 1986). A key aim in this research project therefore, is to thoroughly examine the characteristics of adolescent antisocial behaviour self-report count data, and explore the most appropriate methods for analysing it.

The difficulty arising from self-report count data is that unless the study is limited to a set of participants likely to report high frequencies of the outcome variable (such as experiences of mental health symptoms within a clinical inpatient facility), the infrequency of antisocial and criminal acts within the general population and even in relatively high-risk samples (as in this study), will result in a large proportion of participants reporting very few, and often no antisocial/criminal acts. The result is that typically, measures of offences or self-reported data of offending, feature highly skewed distributions with a large proportion of respondents reporting no delinquent acts. As a result, the mode of the distribution falls at the minimum value (zero), while the upper range representing the most deviant respondents is typically widely scattered (Osgood et al., 2002). Distributions like this violate many of the assumptions associated with linear regression models (De Michele & Payne, 2013) and therefore, using methods like OLS regression on such data will mean that results are likely to be inaccurate and possibly misleading (Walters, 2007).
OLS regressions is not adequate for assessing count data due to the violation of three fundamental assumptions. Count data violates:

- the normality assumption,
- the linearity assumption, and
- the assumption of homoscedasticity, because of wide variations in error variance across the range of observations (Walters, 2007).

These assumptions become most problematic for OLS regression applied to count data when the mean of the outcome variable is low (generally less than 10 as a rule of thumb) (Coxe et al., 2009). Count variable distributions also tend to be kurtotic, with sharp peaks and long tails (Atkins et al., 2013). Histograms of count data make their non-normality quite evident.

A standard linear model assumes that distributions are homoscedastic, that is, that the residual variance is constant at all levels of the predictor variable (Osgood, 2000). This means there are no systematic discrepancies between the fitted values produced by the model, and the means of the actual data, across all values of the outcome variable (Osgood et al., 2002). Count variables usually violate this assumption, with distributions that are increasingly heteroscedastic, where conditional variance increases in line with increases in the value of the predictor (Aiken et al., 2015; Coxe et al., 2009).

In addition, in the case of highly skewed data, units of difference in the lower ranges are more difficult to achieve and are conceptually more meaningful, than units of difference in the upper ranges of the distribution. As Osgood, Finken and McMorris (2002) explain, in the lower ranges, cases crowd around zero and therefore are mathematically less able to exhibit differences than in the upper ranges where dispersion is greater. The meaning conveyed by differences between values varies according to where on the range the values are found. For example, on a scale measuring a count of antisocial
behaviours, "the gap between zero and two is the difference between strict conformity and a modest level of deviance, while the gap between twenty and twenty-two is a trivial distinction between almost identically high rates of offending" (Osgood et al., p. 324).

Researchers using OLS regression methods, despite violations of assumptions, often invoke the central limit theorem in their defence, but regardless of an argument that the distributions of parameter estimates will become more normal as sample sizes increase, the size of a sample required to avoid Type 1 errors is often unclear. Furthermore, such arguments do not address reductions in power to detect true effects, as a consequence of assumption violations (Atkins & Gallop, 2007).

While OLS regression methods are in many ways robust to violations of their assumptions, using linear methods with ill-fitting data affects the reliability of outcomes. Highly skewed data that is analysed with OLS regression may generate predicted values that do not even fall within a meaningful range. For example, analysis of self-reported crime data may result in predicted values suggesting a negative number of acts (Osgood et al., 2002). The heteroscedastic nature of count data, with greater dispersion at higher levels of the predictor, also affects the accuracy of fitted values at these levels (Osgood, 2000), and consequently biases standard errors and significance testing when employing OLS regression techniques (Aiken et al., 2015). This makes it difficult to accept any findings that are not strong and unambiguous.

Perhaps most concerning, the use of OLS regression for count outcome data can produce results which may result in drawing false conclusions, as with, for example, confidence intervals and $p$ values (Atkins et al., 2013). This was demonstrated in a study by Neal and Simons (2007) using data on alcohol use amongst 206 college students. OLS regressions in comparison to Generalised Linear Modelling (GzLM)
failed to identify significant relationships between predictors and three highly skewed outcome measures. These regressions also identified as significant 2 of 5 explanatory variables for the outcome of blood alcohol content, 3 of 5 explanatory variables for the outcome of participant reported numbers of binge drinking episodes, and 6 of 7 predictors of scores on the Rutgers Alcohol Problem Index. In contrast, GzLM identified 4, 4, and 7 significant predictors respectively. Plots of model fit (residual normal-quantile plots, and residual vs fitted value plots) showed a more normal distribution of deviance residuals for the GzLM model than the OLS model for all three outcomes (Neal & Simons, 2007). It was not just the case that OLS regression identified fewer significant predictors; one specific explanatory variable -- positive reinforcement motives — was only found to be significant on outcomes when using GzLM. This was not due to small differences around a cut score for significance, as the \( p \) values ranged from .178 to .879 for the OLS model and .016 to .046 for the GzLM (Neal & Simons). Thus, traditional hypothesis testing using an OLS model would lead researchers to conclude, wrongly, that positive reinforcements such as drinking to celebrate or to be sociable are not significant motivators of drinking related behaviours.

Possibly more problematic than failing to identify significant predictors of outcomes, is falsely identifying them. Using OLS methods with skewed data may also produce results indicating the existence of complex relationships between variables that are in fact no more than a consequence of an inappropriate analytical strategy. Osgood, Finken and McMorris (2002) explain that:

Applying least squares statistics to unsuitable data may reveal complexity in the form of interactions among explanatory variables and curvilinear relationships with the dependent variable... (that)...is not necessarily substantively meaningful (and) instead reflects a mismatch between the additivity assumption of a linear model and the skewed response scale, in which case all variables strongly related to the outcome will interact with one another (p. 321).
It is therefore clear that utilising a poorly fitting regression model such as OLS, with a skewed data set such as the count data on adolescent antisocial behaviours used in this study, makes it difficult to have faith in standard statistical findings. It is imperative that the goodness of fit of a model be established before interpreting analyses on any kinds of outcome data, particularly such problematic data as counts.

It is possible to transform the data of highly skewed distributions, for example through logarithmic or square-root transformations, in an attempt to reduce the skewness and allow the use of linear regression techniques. This is problematic however when skewness is due to a high zero count (for example, the log of zero is minus infinity) (Aiken et al., 2015; Karazsia & van Dulmen, 2008). While this is usually overcome by adding a small positive constant to each score before transforming (Feng et al., 2014), logarithmic transformation remains ineffective for outcomes with a narrow range, and the transformed outcome will still be affected by the large proportion of low values (Coxe et al., 2009). Through transformation, the distribution of the residuals may be normalised, but at the same time assumptions about equality of variance will almost certainly continue to be violated (Aiken et al., 2015; Atkins & Gallop, 2007). In fact, the problem of heteroscedasticity can become worse, with error variances being even more affected in smaller samples (Osgood, 2000).

Feng and colleagues' (2014) study using simulated data to test results of analyses using log-transformed data showed that standard statistical tests often produced results that lacked relevance for the original non-transformed data. They argued that in hypothesis testing, rejecting the null hypothesis based on log-transformed data does not mean that a difference exists between the means of the original data, unless the two samples have equal variances (Feng et al.). Similar arguments apply for square-root transformations, which not uncommonly result in the prediction of meaningless values.
(for example negative counts) (Karazsia & van Dulmen, 2008). Thus alternate ways of modelling highly skewed count data must be explored.

5.3 Analytical Responses to Problematic Count Data

Count data has been used in criminological research for quite some time. In light of the documented problems in analysing this data, over the years different strategies have emerged. Walters (2007) reviewed 158 empirical articles published in three highly rated crime-psychology journals during 2005 and 2006, noting that 43 studies (27.2%) utilised count data as an outcome variable. Several studies used linear models (such as OLS regression) to analyse the data, with the count outcome treated as a standard continuous variable, despite the limitations of such an approach as discussed above. The majority of these studies however (n = 35), recognising the difficulties inherent in count data analysis, attempted to compensate by categorising the outcome variable in some way and analysing the categorised outcome with an appropriate analytical strategy. While categorising an outcome variable overcomes some of the issues associated with count data outcomes, this approach does have major disadvantages.

5.3.1 Transformations into Categorical or Binary Variables

Reformatting count data into a categorical form, such as 0-5; 6-10; 10+, allows the use of methods such as contingency table analyses (Gardner et al., 1995). Similarly, ordinal regression may be utilised to examine relationships between dependent variables and count data transformed into categories (for example, mild offending; moderate offending; severe offending). A common analytical strategy is to dichotomise a count outcome variable, following selection of a specific cut-point, and to analyse the data using a binary outcome variable (antisocial/ not antisocial). However, as pointed out by
Gardner, Mulvey and Shaw (1995), the choice of cut-point to define categories can strongly affect results as well as influence their interpretation. In addition, transforming a continuous variable into a categorical variable results in considerable loss of information.

5.3.2 Logit, Probit and Tobit models.

Of the 43 studies with count data reviewed by Walters (2007), the most popular analytical strategy (used for 35 of them) after dichotomising the variable was to perform a logit or probit regression. These methods avoid the violation of assumptions related to linear regression (Walters, 2007) and are widely used. Methods of dichotomising the count outcome variable differ, but commonly categories of "zero", and "not zero" are used. For example, Nagin and Paternoster (1991) used a Probit model to explore the relationship between past and present delinquency, measured across three waves of data, with participants who reported engaging in any of three types of property crime during each wave being classified as delinquent (coded as 1). The remainder were classified as non-delinquent (coded as 0).

Classification on the dichotomous outcome may be determined by arbitrarily selecting a cut point on the basis of statistical information. Piquero, Gibson and Tibbetts' (2002) study, where a Probit regression was used to investigate the associations between self-control and risky behaviours such as binge drinking, classified the number of drinks reported during a "binge" as either 0 (four drinks or less on average) or 1 (five or more on average). The Mater University Study of Pregnancy (MUSP), an Australian longitudinal study into the health and development of Australian women and children, conducted a 2006 analysis investigating early childhood indicators of adolescent antisocial behaviour, using as an outcome variable the delinquency
subscale of the Child Behaviour Checklist (CBCL) with responses on 13 items (reported as ‘often’, ‘sometimes’ or ‘rarely/never’) (Bor et al., 2004). Scores on all items were summed and used to designate participants as 'antisocial' or 'not antisocial', based on a threshold of the highest decile. This dichotomised outcome variable was investigated through a series of logistic (Logit) regressions.

An extension of the Probit model, the Tobit regression model (Tobin, 1958), seeks to address the skewed nature of self-report data by censoring minimum scores. This means that scores falling below a specified cut-point are still included in the model, but their values on the outcome variable are treated as though they are unknown, while the values above the nominated threshold take on a normal continuous value (Osgood et al., 2005). For example, Wang, Selman, Dishion, and Stormshak (2010) utilised a Tobit regression model to explore the relationship between perceived school climate and adolescent problem behaviours. Their outcome measure consisted of the number of problem behaviours exhibited in the past 3 months, but treated adolescents who had experienced problems prior to this (but not during this 3 month period) were classified as being without any problem behaviours. The use of a Tobit model allowed for this censoring process.

A shortcoming of the Tobit method is that it specifies a linear model which relies on the assumption of a normal error distribution, and therefore it is not suitable for summative count measures (Osgood et al., 2005). Nor should it be used when zero values reflect a discrete decision rather than being due to censoring of data (Green, 2003). Osgood, and colleagues suggest that transformation of scores, such as through Item Response Theory methods, is necessary for accurate results in Tobit analyses, while Roncek (1992) argues that the biggest limitation to using a Tobit regression method is in its interpretation, since despite the theoretical notion that there are two
types of cases included in the data set, output from a Tobit analysis provides only one coefficient for each independent variable.

5.3.3 Arguments against the use of Categorical and Binary Variables

On balance, the statistical problems entailed in a categorical approach to count outcome data suggest it is not the best strategy for analysis (DeMichele & Payne, 2013), regardless of which method of analysis is employed. However, the main objection to reducing a continuous score to a categorical or dichotomised variable is the effect that such a transformation has on the richness of the data. Potential variation across a range of values of the outcome variable may be missed when the variable is reduced to one or two values (Altman & Royston, 2006), with information about individual differences in the data lost (MacCallum et al., 2002). The process may also reduce statistical power (Altman & Royston, 2006; Gardner et al., 1995), possibly increasing the likelihood of Type II errors; that is, accepting the null hypothesis when in fact there is a significant relationship between the predictors and outcome (Britt & Weisburd, 2013). Further, the purpose of the analysis must be considered, since reducing outcomes to categories may impede the researcher's ability to effectively answer their research questions. As explained by Gardner, Mulvey and Shaw: "The researcher may be seeking to predict how many items will be recalled, how many target behaviours will occur, or how many felonies will be committed as opposed to, say, simply whether these events will occur" (p. 392).

In this research project, transformation of the number of antisocial acts into a binary outcome variable of never antisocial/sometimes antisocial would fail to discriminate between those adolescents who engaged in a large variety and number of antisocial acts, and those who may have dabbled in one or two antisocial behaviours. Hence, a binary
antisocial behaviour outcome measure would consider all adolescents who have responded positively to antisocial acts equally, regardless of the extent or nature of their involvement in these behaviours. This is problematic given that the antisocial behaviours explored in this study range from not paying an admission fee to physically assaulting another person, or committing arson.

The use of categorical outcome categories also raises difficulties, such as how categories are determined and where cut-offs lie. With no clear theoretical guidelines for this decision-making, choices would need to be made based on observations of the data itself, which raises questions about the interpretation of findings. As Altman and Royston (2006) argue, "Individuals close to but on opposite sides of the cutpoint are characterised as being very different rather than very similar" (p. 1080), but the difference between an adolescent reporting 5 antisocial acts during the previous year, and one reporting 6 antisocial acts (for example) appears quite arbitrary. It is apparent that for those adolescents reporting at least some antisocial behaviours during the previous year, a statistical method that allows this count to be investigated as a continuous measure is necessary.

5.4 Alternative Models for Count Data

5.4.1 Poisson Regression

Statistical methods for effectively dealing with the issues resulting from count data have a long history. Poisson proposed his namesake distribution as early as 1837, with Bortkiewicz utilising it in 1898 to assess annual Prussian army deaths due to mule kicking (Cameron & Trivedi, 1998). While the Poisson distribution resembles a normal bell-curve (Gaussian distribution) as the mean count values increase, it incorporates the fact that counts of events during a set period often result in an abundance of infrequent
occurrences (Walters, 2007), making a Poisson distribution more suited than a Gaussian distribution for dealing with this phenomenon. Winkelmann and Zimmerman (1995) state that "in many ways the Poisson model is as relevant for count data as ordinary least squares is for continuous data" (p.2). Poisson regression uses the maximum likelihood approach for skewed datasets, making this method superior to OLS with overdispersed data (since maximum likelihood only yields OLS with normal distributions).

The emergence of Poisson modelling techniques allowed researchers to re-examine existing theories of crime-related behaviours. As Piquero and colleagues (2012) point out, when introduced, theories such as Moffitt's (1993) two-group typology of offenders were unable to be investigated due to a lack of suitable statistical methods. However Nagin and Land's (1993) semi-parametric Poisson model provided the opportunity to apply trajectory methods to these kinds of data sets, resulting in the discovery that some trajectories do not fit Moffitt's typology, and that results vary according to such factors as mode of reporting (self-report or official), type of sample, length of follow up, and so on.

However the Poisson distribution, while offering a solution to the natural tendency for events to be infrequent within a set period, is not itself without limitations. Poisson regression models may be inaccurate in cases with an excess of zeroes (Walters, 2007) as well as in instances where the sample being analysed includes a number of individuals who were unable to, or who would never, engage in the specific behaviour being investigated (Coxe et al., 2009). In both cases, a zero-inflated model would be a logical option to explore, for reasons to be discussed later.

The Poisson model does not allow for unobserved heterogeneity (Winkelmann & Zimmerman, 1995) and instead assumes that all meaningful variation within the model
can be accounted for by the explanatory variables entered (Osgood, 2000). If an important predictor is left out of a Poisson regression, the model may not account for all individual differences (Coxe et al., 2009) and unobserved heterogeneity will mean that the difference between the fitted and true rates will inflate the variance of the residuals.

Poisson regression models are also restrictive due to their fundamental assumption that events occur independently. Experience in the real world suggests that the occurrence of one event may often increase the likelihood of further events, a phenomenon described as a 'contagion effect' (Cameron & Trivedi, 1986). Dependence (an increase in the probability of committing further crime due to committing a first crime) may occur in cases where an individual has gone on a 'crime spree', or where multiple offenders are arrested for the same incident (Osgood, 2000). In terms of count data measuring numbers of antisocial acts, it may be argued that participation in one type of behaviour will increase the likelihood of being involved in another type, for example the act of robbery may next time include the use of a weapon, and/or violent assault.

Positive contagion and unobserved heterogeneity violate the variance assumptions of the Poisson distribution, resulting in what is termed 'extra-Poisson variation', or more commonly, overdispersion (Winkelmann & Zimmerman, 1995; Coxe et al., 2009), where the variance of the data exceeds the mean. Poisson regression assumes equidispersion - that is, that the conditional mean and the conditional variance are roughly the same. Analysing overdispersed data with a Poisson regression model is likely to result in conclusions that are inaccurate and misleading (Gardner et al., 1995), due to underestimation of the standard errors of predictor variables (Coxe et al., 2009; Greene, 2003), overly large parameter test statistics, inflated significance test results (i.e. excessive Type 1 errors), and confidence limits that are too small (Coxe et al.,
Overdispersion can be compensated for within a Poisson model by introducing additional parameters, such as those that result in the negative binomial model (Gschlößl & Czado, 2008), one of the methods used in the present study.

5.4.2 The Negative Binomial Regression

In the 1920's a generalisation of the Poisson distribution, the negative binomial distribution, was developed by Greenwood and Yule (1920) and Eggenberger and Polya (1923) (Cameron & Trivedi, 1998). While Poisson and negative binomial distributions feature in research literature throughout the 1930's and 40's, these studies were mainly univariate, and it wasn't until the 1970's, as part of the rise of generalised linear models, that Poisson distributions for regression analyses were explored. More recently, negative binomial models have been utilised to explore criminological data, often re-examining well utilised data sets. For example, Broidy and colleagues' (2003) examined the link between childhood aggression and adolescent violent offending by using negative binomial regressions in an exploration of six longitudinal data sets, including the Christchurch Health and Development Study, the Pittsburgh Youth Study, and the Child Development Project. Other recent uses of negative binomial models to explore delinquency outcomes include Demuth and Brown's (2004) investigation into family structure, family processes and adolescent delinquency; Watts and McNulty's (2014) study exploring the integration of biosocial factors with social learning characteristics in delinquent-peer relationships; and Schubert, Mulvey and Glasheen's (2011) exploration of the relationship between mental health conditions and antisocial outcomes.

Negative binomial models assume that unexplained variability will exist amongst individuals with the same predicted value, which allows the outcome distribution to
have greater variance than the Poisson model, without affecting the mean (Coxe et al., 2009). The negative binomial model estimates a dispersion parameter, to compensate for unobserved heterogeneity, which means it provides more conservative estimates of significance levels when compared to a Poisson model, and generates fewer false positives (Walters, 2007). While Poisson models are based on an assumption of events occurring independently, negative binomial models allow for contagion, that the likelihood of an event occurring can be affected by previous events.

Long (1997) provides the example of two scientists with identical characteristics including initially equal productivity rates. Should one scientist publish an article however, this may result in additional resources which increase that scientist's productivity, and increase future publishing rates; thus productivity is influenced by a 'true' contagion effect. Negative binomials are 'apparent contagion models' rather than 'true contagion models' (Cameron & Trivedi, 1986). This means that they assume that individuals have an unequal, but constant, likelihood of experiencing the specific event, with contagion resulting as a consequence of heterogeneity of the data.

Cameron and Trivedi (1998) explain that apparent contagion means: "for a given individual, occurrence of [an event] does not make it any more or less likely that another [event] will occur. But aggregation across heterogeneous individuals generates the statistical finding that occurrence of [an event] increases the probability of another [event]" (p. 106). The ability of negative binomial models to take into account apparent contagion makes them more suitable than Poisson models for counts of events such as antisocial behaviours or crime events, where heterogeneity is frequently an issue.
5.4.3 Zero Inflated Models

While negative binomial models fare better with excess zeros and heterogeneity than Poisson models, there are times when the number of zeros exceeds what even the negative binomial predicts (Walters, 2007). In such cases, a zero-inflated model may be the best option. The notion of zero-inflated distributions emerged in the early 1960's from the work of researchers such as Cohen (1963) on mixed Poisson distributions, but the actual use of zero-inflated count models began with Lambert (1992) and became more common across various disciplines towards the end of the 90's and into the 2000's (Lord et al., 2005).

Zero-inflated models allow for a higher number of zero values than standard models, which allows for a better fit of the model to the data in instances where events are infrequent. However, an important consideration when determining whether to use a zero-inflated model relates to the nature of the zeroes involved (Walters, 2007). Lord, Washington and Ivan (2005) describe zero-inflated models as reflecting a dual state process. This means that the observed count "can either be located in a perfect state or in an imperfect state, with the mean $\mu$" (Lord et al., p 39). In simple terms, this means that a zero-inflated model is based on the assumption that the data generated contains an excess of zeroes because those zeroes are a product of one of two distinct causes. It is therefore important that the use of a zero-inflated model is backed by theoretical reasoning that supports the notion that the excess of zeroes is a result of dual sources.

Based on this dual source assumption, the zeroes in a zero-inflated regression are divided into two distinct groups and modelled in separate ways. One group is modelled as a binary variable, representing the presence or absence of a specific outcome (Atkins & Gallop, 2007), and a second set of zeroes is modelled as a continuous variable. Without adequate theoretical justification for the choice of a zero-inflated model on the
basis that two separate, identifiable sources of zeroes exist, the results are difficult to interpret.

The Institute of Digital Research and Education (2011) provide a clear example of a study in which a zero-inflated negative binomial model is the best option due to theoretical considerations:

The state wildlife biologists want to model how many fish are being caught by fishermen at a state park. Visitors are asked how long they stayed, how many people were in the group, were there children in the group and how many fish were caught. Some visitors do not fish, but there is no data on whether a person fished or not. Some visitors who did fish did not catch any fish so there are excess zeros in the data because of the people that did not fish (paragraph 4).

In the case of this example, it is apparent that a 'true zero' exists (the absence of the outcome due to those participants who did not fish), as well as a zero which should be modelled continuously (ranging from zero to the highest value), for those participants who did fish and yet caught nothing. While having a theoretical reason for using a model that posits two separate sources of zeroes seems fundamental, criminological studies that provide a theoretical basis for the use of a zero-inflated negative binomial model are less easy to find than those employing this regression technique on purely statistical or data-driven grounds.

For example, a zero-inflated negative binomial regression model was used by Mersky, Topitzes and Reynold (2012) in their analysis of youth maltreatment and subsequent offending using data from the Chicago Longitudinal Study, while Pardini, White and Stouthamer-Loeber's (2007) exploration of the relationship between conduct disorder as a youth and alcohol use disorder in young adulthood, using data from the Pittsburgh Youth Study, utilised zero-inflated Poisson regression. In both cases, the decision to use a zero-inflated model over an ordinary negative binomial or Poisson model was based on Vuong's test results which showed the zero-inflated model to be a
better fit to the data. In both cases, there was no theoretical justification for the use of a zero-inflated model, and no explanation for why the researchers might believe that the excess of zeroes in these datasets was the consequence of two distinct, identifiable processes.

Mann and Reynolds (2006) used a zero-inflated negative binomial model in their study investigating whether early intervention prevented juvenile offending in participants from the Chicago Longitudinal Study. They theorised that adolescents with no official records of arrest were fundamentally different to adolescents with one or more arrests, and argued that this state dependence makes the zero-inflated model more suitable for their data, due its estimates being more conservative. While the researchers therefore provided an argument for using a zero-inflated model, they nevertheless failed to outline the two distinct sources of zeroes that zero-inflated models assume are the cause of the excess of zeroes.

In contrast, Savolainen (2009) carried out a study which explored criminal desistance based on an age-graded theory of crime (as proposed by Sampson and Laub, 1993). Savolainen utilised zero inflated negative binomial models to examine how work, parenthood and marriage influence non-offending. He argued that the over-abundance of cases with reported non-offending could be explained by two factors. Firstly, some participants were unable to offend due to a long prison sentence at the time that tracking began, which therefore inhibited recidivism at the time when data collection occurred. Secondly, older participants had “aged out of their criminal careers” (p. 297) by the time tracking began, making them more likely than younger offender to report zero offending. In this case, a zero-inflated model appears to be theoretically, as well as statistically sound, and therefore an appropriate model to select.
Unfortunately, sound theoretical explanations for the selection of zero-inflated models are the exception rather than the rule.

### 5.5 Selecting an Analytical Strategy

It is apparent that selection of an appropriate analytical strategy for exploring skewed count data is critical to producing meaningful and robust results. Statistical issues, particularly related to the inherent distributional attributes of count data, mean that care must be taken to ensure that data is not analysed using methods whose assumptions are violated, or that steps are taken to compensate for such violations. In addition to ensuring that analyses are statistically appropriate (that is, that the model fits well), it is equally as important that methods selected are theoretically valid, otherwise interpretation of results will not be meaningful. This includes consideration of the intention of the research, as defined by the specific research questions, to ensure that methods are fit for purpose. *In short, an iterative approach to modelling seems essential, moving over the course of an analysis between statistical fit and theoretical framework.*

In this study, both model selection and the evaluation of model fit were prioritised as essential steps prior to addressing the research questions. Due to the inherent nature of the instrument used for data collection, the outcome variable antisocial behaviour was expected to produce an over-dispersed, skewed distribution, with an abundance of zero values. Ensuring an adequately fitted model for this dataset was considered especially important given that the theoretical frameworks of ecological theory and GST discussed in Chapter 4 necessitate the exploration of processes of mediation and moderation.
Chapter 7 therefore presents an in-depth exploration of the characteristics of the data set used in this study, as well as the results of analyses exploring the fit of Poisson, negative binomial, and zero-inflated models to this data. It outlines the iterative process through which statistical fit and theoretical frameworks were considered in order to select the most appropriate model for the data. The research attempted to ensure that not only were questions related to the nature of adolescent antisocial behaviours addressed, but also that questions related to the choice of the best methodological strategies were given equal priority.

5.6 Summary of Methodological Issues with Count Data

Count data, such as reports of antisocial acts, often entails methodological challenges in terms of statistical modelling and interpretation. Due to the infrequency of antisocial behaviours in the population, a large proportion of participants report very few, and in particular, no antisocial/criminal behaviours. Consequently, such measures frequently result in a highly skewed distribution, with an overabundance of zeroes within the data. These distributions violate linear regression assumptions, including the assumptions of normality, linearity and homoscedasticity. Using linear regression methods such as OLS with highly skewed data affects the reliability of outcomes, with possible repercussions including generation of predicted values that do not even fall within a meaningful range, biased standard errors and significance testing, or the apparent presence of relationships between variables that are really the consequence of an inappropriate analytical strategy. Transformations of the data, such as square root transformations or logarithms, do not solve the problem of high zero counts (log of zero is infinity) or large proportions of low values, and are often ineffective in addressing heteroscedasticity.
Strategies to compensate for highly skewed datasets commonly include reformatting outcome variables to be dichotomous or categorical, and using logit, probit or ordinal regression, but choice of cut-points to define categories is frequently arbitrary and can strongly affect results as well as influence their interpretation. Ultimately the transformation from continuous to categorical results in considerable loss of information and may not only reduce statistical power, but can also mean that potential variation across the range of outcome values is overlooked.

Alternative models for retaining a continuous outcome variable include Poisson and negative binomial regression. Negative binomial regression offers an advantage over Poisson for over-dispersed data due to additional parameters in the model. In addition, as apparent contagion models, negative binomials are appropriate for modelling heteroscedastic data. Research on very infrequent events however, which results in datasets with an extremely high number of zeroes, may necessitate the use of a zero-inflated model. While zero-inflated models may statistically provide a better fit, they are based on the premise that the excess of zeroes in a data-set is the consequence of those zeroes coming from two separate sources. A sound theoretical rationale for these separate sources of zeroes is therefore crucial for use and interpretation of zero-inflated models.

Overall, it is clear that the problematic nature of count data means careful consideration must be given to the best strategy of data analysis. Both statistical fit and theoretical framework must be considered during the decision process if results are to be both sound and meaningful. These considerations are explored in depth in Chapter 7.
CHAPTER 6: METHODOLOGY

6.1 Introduction

This research was a cross-sectional quantitative study, with information collected from participants in survey format. Participants were sourced in three ways: by advertising the study and offering a raffled prize; through a survey recruitment company in which participants were paid in 'credits'; and through support services for 'at-risk' adolescents, namely two youth centres and an alternate schooling venue. Participants recruited through advertising and through the survey company completed the survey instrument, titled the Youth Experience Study, in an on-line format, while the 'at-risk' participants completed a paper version of the same instrument. An index was created to identify cases within the sample experiencing multiple sociodemographic risk factors, with these cases classified as 'vulnerable' due to cumulative structural risk. Of the total 524 complete and accurate cases in the sample, 116 (22.1%) cases were identified as vulnerable. Analyses were conducted to compare this vulnerable group to the remainder of the sample (the 'not-vulnerable' group), in order to ascertain whether proximal processes associated with antisocial behaviours differed between these two groups.

This chapter outlines the survey instrument used to collect data, describing the scales used to measure each variable. It then describes the participants and methods of their recruitment. Finally, a description of the processes involved in creating the index to identify cumulative structural vulnerability is provided, along with an exploration of this variable.
6.2 The Youth Experience Study

Ethical clearance for this study to be conducted as an anonymous survey, with adolescents providing their own consent for participation was granted by the Griffith University Human Research Ethics Committee on 1/09/2011 (GU Reference Number: LEJ/02/10/HREC). Data for the study was collected through a self-report survey titled the Youth Experience Study. The survey consisted of 25 questions, (some single item questions but more commonly each question consisted of several items drawn from a pre-existing scale), the majority of which were answered by ticking/checking the appropriate box from a number of answer options. In addition, there were a small number of questions requiring a written answer, such as which school the participant attended. The survey was delivered in both an on-line version, and as a shorter version delivered in a face-to-face format to youths already in contact with youth agencies for various reasons (referred to as Youth Agency study participants). For these Youth Agency respondents, data was collected in a one-on-one or small group environment (1 to 3 participants and the researcher), with the researcher reading the questions to the participant and the participant selecting his/her response on a pen and paper copy of the survey instrument.

6.3 Measurement of Variables

With the influence of structural background characteristics being a key question in this study, information was collected on several demographic and background variables. The age and gender of the participant was recorded, along with the cultural/ethnic group with which they personally identified. Family characteristics assessed included the number of siblings, and the participant’s birth order within the family. Participants reported the name of the school they attended and the postcode of the home in which
they lived, as well as which adults they lived with (with response categories of: both birth parents; a birth parent and a step parent; sometimes mum and sometimes dad; one parent only; foster parents; other - say what). Information was also collected regarding the country in which their father and mother were born, and their father and mother's occupations. Finally, participants reported the number of times they had changed homes since starting Grade 1.

To test the influence of structural characteristics on adolescent behaviours and experiences, the Youth Experience Study survey collected information on the outcome variables of antisocial behaviour and substance use. In addition to outcomes, information on a number of other variables, drawn from different realms of adolescent life, was collected.

Firstly, individual characteristics which have been identified in the research literature as having an influence on antisocial behaviour were investigated. Self-control and prosocial beliefs, two characteristics consistently linked with antisocial outcomes (Gottfredson & Hirschi 1990; Wikstrom & Treiber, 2007) were included. Empathy, whilst not as closely associated with the outcomes directly, was included as a variable due to research suggesting it motivates prosocial behaviour (Eisenberg et al., 1993; Marshall & Marshall, 2011). In addition to these individual characteristics, variables assessing individual psychological wellbeing were included. Due to the tendency for a co-occurrence of internalising and externalising disorders (Reinke et al., 2012; Ritakallio et al., 2010) depressed feelings were included, as well two of the correlates of this: self-esteem and self-worth. Life satisfaction was also measured based on the hypothesis that it might be a mediator of contextual variables on outcomes, in line with General Strain Theory, which suggests that affective reactions to the experience of strain mediate individual responses to it (Agnew, 1992).
In addition to individual level variables, information was collected on parenting and the social characteristics of each participant. The quality of the parent-child relationship has long been accepted as strongly influencing adolescent outcomes, therefore parental availability and attachment were included to measure aspects of this relationship. Parental monitoring was included due to its frequent association in the literature with antisocial behaviours (Murray & Farrington, 2010; Neumann et al., 2010), as well as parental knowledge of what is happening in the adolescent's life (for example, who their friends are and what is important to them). Social relationships beyond the family were explored through the inclusion of perceived social acceptance, as well as the reporting of antisocial behaviours engaged in by peers during the previous year. School membership, referring to feelings of belonging to a school community, has been shown to be an important correlate of both antisocial behaviour (Dornbusch et al., 2001) and depressed feelings (Bond et al., 2007) so it was also included. Table 6.1 summarises the variables measured through the Youth Experience Survey.
Table 6.1
Variables measured through the Youth Experience Survey

<table>
<thead>
<tr>
<th>Realm</th>
<th>Variable</th>
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<tbody>
<tr>
<td>Demographic/Contextual</td>
<td>Age</td>
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<td></td>
<td>Gender</td>
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<td></td>
<td>Cultural status/ethnicity</td>
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<td></td>
<td>Birth order</td>
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<td></td>
<td>Number of siblings</td>
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<td></td>
<td>Home living situation</td>
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<td></td>
<td>Occupation of mother/father</td>
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<td></td>
<td>Birth place of mother/father</td>
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<td></td>
<td>Postcode of residence</td>
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<td></td>
<td>Number of home changes (since year 1)</td>
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<tr>
<td>Individual</td>
<td>Self-control</td>
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<tr>
<td></td>
<td>Pro-social beliefs</td>
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<td></td>
<td>Empathy</td>
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<td>Emotional wellbeing</td>
<td>Self esteem</td>
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<td></td>
<td>Self-worth</td>
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<td></td>
<td>Life satisfaction</td>
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<td></td>
<td>Depressed feelings</td>
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<td>Parental</td>
<td>Parental attachment style</td>
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<td>Parental knowledge</td>
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<td>Parental monitoring</td>
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<td></td>
<td>Parental availability</td>
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<td>Social</td>
<td>Social acceptance</td>
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<td></td>
<td>Peer antisocial behaviour</td>
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<tr>
<td></td>
<td>School membership</td>
</tr>
<tr>
<td>Outcome</td>
<td>Antisocial behaviour (self)</td>
</tr>
<tr>
<td></td>
<td>(including substance use)</td>
</tr>
</tbody>
</table>

6.4 Instrumentation

6.4.1 Outcome Variable - Antisocial Behaviour

Antisocial behaviour of both self and friends was assessed using the 24-item scale utilised in the Australian Healthy Neighbourhoods Study (2006) and adapted for Australian participants from the Communities That Care questionnaire (Arthur et al., 2002). Items assess antisocial behaviours, engagement in risk taking behaviours (such as drug and alcohol use) and deviant/criminal behaviours (such as truancy, theft,
physical violence). Respondents indicated whether they had done any of the 24 listed things in the past 12 months, by selecting yes or no. A score of zero was assigned when ‘no’ was selected and a score of one was assigned when ‘yes’ was selected, resulting in an overall possible range of 0 to 24. Internal reliability for the total antisocial behaviour scale, using Cronbach’s alpha, was .93.

6.4.2 Individual Variables

6.4.2.1 Self-control

Self-control was measured using Wikstrom and Butterworth’s (2006) adaptation of the construct developed by Arneklev, Grasmick, Tittle, and Bursik (1993). This measure attempts to capture self-control as conceptualised by Gottfredson and Hirschi (1990). Individuals with higher levels of self-control are more likely to resist temptation and provocation, whereas those with lower levels of self-control are more likely to act impulsively and give in to temptation. Low self-control is strongly associated with an increased likelihood of offending (Wikstrom & Butterworth). Wikstrom and Butterworth investigated the convergent validity of the scale by comparing responses on it to responses to other specific questions, and found that respondents with lower levels of self-control reported higher levels of being tempted to steal, being provoked by and becoming angry at others, and they indicated a tendency to prefer immediate gratification rather than delayed (they would prefer £50 today rather than £200 in one year).

The self-control measure consists of 13 statements, 4 of which are reversed, to which the respondent selects either agree or disagree. Sample items include "When I am angry, other people better stay away from me" and "Sometimes I will take a risk, just
for the fun of it". Higher scores on the scale indicate higher levels of self-control. In this study, the self-control scale had an internal reliability of $\alpha = .63$.

6.4.2.2 *Prosocial Beliefs*

Prosocial beliefs were measured using Wikstrom's Generalized Morality Scale, which is itself an adaptation of the prosocial values scale used by Loeber in the Pittsburgh Youth Study (Wikstrom et al., 2012). This scale asks respondents how wrong they consider 16 items to be, on a 4-point scale ranging from 'not wrong at all' (scored 0) to 'very wrong' (scored 3). Higher scores on this scale indicate higher levels of perceived wrongfulness of antisocial actions, and therefore more prosocial beliefs. Sample items include "How wrong do you think it is to skip school or work without an excuse?" and "How wrong do you think it is to hit another young person who makes a rude comment?"

Wikstrom and colleagues (2012) used the Generalized Morality Scale in the Peterborough Adolescent and Young Adult Study (PADS+). They found that prosocial beliefs decreased in intensity between the ages of 13 to 16, particularly in regard to cigarette, drug and alcohol use and for less serious antisocial acts, and then stabilised at the age of 17. In the PADS+ study, the reliability of the scale was highly satisfactory, with alphas ranging from .88 to .90 depending on participant age category. In this study, the scale had a total alpha of .87.

6.4.2.3 *Empathy*

The Basic Empathy Scale (BES) as developed by Jolliffe and Farrington (2006) is a 20-item scale based on Cohen and Straher's (1996, as cited in Jolliffe & Farrington, 2006) definition of empathy as “the understanding and sharing in another’s emotional
state or context” (p. 523). The BES aimed to improve on previous one-dimensional empathy measures by assessing not only affective empathy (defined as congruence of emotion), but also cognitive empathy (defined as an understanding of another's emotions) which had not been effectively measured in traditional instruments (Jolliffe & Farrington). Responses on the BES are scored on a 5-point scale, ranging from strongly disagree to strongly agree, with items such as: "I often become sad when seeing sad things on TV or in films" (affective item) and "I can often understand how people are feeling even before they tell me" (cognitive item). In the initial validation of the instrument, a correlation of 0.41 for males and 0.43 for females between the affective and cognitive scales showed that while these two facets of empathy are significantly related, there are still differences in the constructs which they are measuring (Jolliffe & Farrington). Internal reliability of the BES in this study was α = .84.

6.4.3 Emotional Wellbeing Variables

6.4.3.1 Depressed Feelings

The Centre for Epidemiological Studies Depression Scale for Children (CES-DC) was used to assess adolescent psychological health. This scale mirrors the Centre for Epidemiological Depression Scale (CES-D), with slight wording changes to make the questions more relevant for children and adolescents. Not only is the CES-D a briefer measure than many other scales measuring depression (20 items), but also it focusses on the measurement of affect and behaviour, as opposed to cognitive aspects. Consequently, this scale provides a general measure of depressed feelings, rather than a clinical evaluation of pathological suffering or diagnosis of a depressive disorder. Participants are asked how often they have had certain experiences within the past week, for example, "I felt like I couldn't pay attention to what I was doing", and "I didn't
sleep as I usually sleep". Responses to items on the CES-DC are on a 4-point scale, ranging from ‘not at all’ (0) to ‘a lot’ (4), with 4 reversed items. Total scale scores range from 0 to 60, with higher scores indicating more symptoms suggestive of possible depression. The creators of the CES-D suggest a cut score of 15 to indicate the existence of depressive symptoms (Radloff, 1977), but other studies find that scores between 16 and 26 suggest minor depression and scores above 27 are more useful for identifying possible major depression (Ensel, 1986; Geisser et al., 1997; Logsdon et al., 1994; Zich et al., 1990).

The CES-D is frequently used in research and correlations with other self-report depression measures have shown the measure to be valid across a variety of populations, including African American, French, Japanese and Yugoslavian participants with internal reliability of the scale ranging from $\alpha = .85$ in the general population to $\alpha = .90$ in a patient sample (Rush et al., 2000). The CES-DC shows similar reliability. For example, Costello and Angold (1988) show that for adolescents, the CES-DC correlates with other measures of childhood depressed feelings, including the Children’s Depression Inventory ($r = .61$). In this study, internal reliability for the CES-DC was $\alpha = .91$.

6.4.3.2 Self-esteem

In this study, self-esteem was measured using Rosenberg’s (1965) 10 item self-esteem scale, due to both the extensive utilisation of this scale in the research literature, and the brevity of the scale itself. Further, the scale was designed specifically for adolescents (Butler & Gasson, 2005). Rosenberg designed the scale as a unidimensional, face valid measure of an individual’s attitude towards him or herself, encompassing levels of self-respect and worth (Rosenberg, 1979). Sample items
include "All in all, I am inclined to feel that I am a failure" and "On the whole, I am satisfied with myself", with half of the questions worded in a positive direction, and half worded in a negative direction. Respondents select from a 4-point scale ranging from \textit{strongly agree} to \textit{strongly disagree}, with higher scores on the scale indicating stronger feelings of self-esteem. Studies such as Kunz and Kalil (1999) used Rosenberg's self-esteem scale when investigating esteem as a protective factor, with average scores in the top quartile of the distribution considered to demonstrate possession of protective levels of esteem. Schmitt and Allik (2005) conducted a study testing the characteristics of Rosenberg's self-esteem scale in samples across 53 nations, and found reliability to be .90 in the United Kingdom, .88 in the USA and .89 in Australia. In this study, internal reliability was $\alpha = .89$.

\subsection*{6.4.3.3 Self-worth}

Self-worth was measured using an adapted version of the 5-item general self-worth subscale from Harter's Self-Perception Profile for Adolescents (SPPA; Harter, 1988), with self-worth defined by Harter as "the extent to which the adolescent likes oneself as a person, is happy with the way one is leading one's life, and is generally happy with the way one is" (Harter, 1988, p.3).

The SPPA is consistently used in research, and has been found to be a valid and reliable measure of self-worth. However, one criticism of the SPPA has been in regards to the formatting of the scale, since the original format (where the answer key consists of two contrasting responses, each with two levels, and the respondent selects one of these four options) is time consuming in delivery and confusing to participants, often resulting in invalid responses (Wichstrom, 1995). To counter this possibility, rather than presenting the traditional SPPA question format and answer key, the scale was
reformatted so that respondents indicated how well 5 statements described them, using a 4-point scale ranging from A lot like me to Not at all like me. Three scale statements were in a positive direction, including "I like the way I am leading my life", and the 2 remaining statements were negatively phrased, such as "I often wish I were someone else". Higher scores on the scale indicated greater feelings of self-worth in participants. The internal reliability of the SPPA self-worth scale in this study was α = .85.

6.4.3.4 Life Satisfaction

Life satisfaction has been described as a cognitive evaluation of a person's happiness (Pavot et al., 1991) and has been seen to correlate with a variety of psychological, social and academic outcomes. In this study, the 6 item Brief Multidimensional Student's Life Satisfaction Scale (BMSLSS; Huebner et al., 2004) was used to assess participants' happiness with their lives. The instrument asks "I would rate my satisfaction as" with responses provided on a 7-item scale ranging from 1 (terrible) to 7 (delighted). Five items measure satisfaction within specific life domains: family, friends, school, self and living environment. A sixth item asks about overall satisfaction and is included as a validity check. Huebner and colleagues (2011) investigated the predictive validity of the BMSLSS in a group of 284 US secondary school students and found it to be significantly (but moderately) related to measures of school engagement, including individual and interpersonal variables, as well as GPA and school completion. Studies such as Siyez and Kaya (2008) have found the BMSLSS to be reliable and consistent with a reliability alpha of .89 and a test-retest correlation of .82. In this study, internal reliability for the BMSLSS was α = .83.
6.4.4 Parenting Variables

6.4.4.1 Parental Attachment

Attachment to Parents was assessed using the Inventory of Parent and Peer Attachment (IPPA), as developed by Armsden and Greenberg (1987). The IPPA is a 28-item scale designed to measure the quality of parental attachment in regard to trust, communication and alienation, providing a summary score of quality of attachment. Responses are on a 5-point scale, ranging from 1 (almost always or always true) to 5 (almost never or never true). The IPPA has been extensively utilised in researching parental attachment, has been demonstrated to be reliable, and it is well validated in the research literature. A shorter 14-item version of the IPPA, as developed by Vignoli and Mallet (2004) was used in this study. Initial validation of this short version yielded total scale internal consistency scores of .89 for mother and .89 for father. In this study participants were asked to complete the IPPA measure in regard to the parent or carer they feel closest to, thereby removing the need to complete the scale for each parent, but still capturing the most influential parental attachment relationship. This ensured that data collected from adolescents in single parent families would be equally relevant. In this study, full scale internal reliability was $\alpha = .91$.

6.4.4.2 Parental Knowledge

An original scale of 8 items was used to assess parental knowledge of things central to the adolescent's life and day to day functioning, with participants' nominated answers ranging from *nothing* to *everything*, on a 5-point scale. This measure consisted of 4 items asking about parental knowledge of such things as "where you are after school" and "who your friends are", as well as 4 items investigating parental knowledge of "what is important to you" and "problems you are having". Total scale scores range
from 0 to 32. Higher scores on the parental knowledge scale reflect more parental knowledge of issues concerning the adolescent him/herself, and the activities he or she engages in, suggesting stronger involvement of the parent in the adolescent's everyday life. Reliability for the scale was $\alpha = .84$.

Parental knowledge scores were correlated with scores on parental monitoring ($r = .60$), at a level that suggests the parental knowledge measure is assessing more than just knowledge of the adolescent’s whereabouts and activities. Correlations between parental knowledge and parental attachment were higher ($r = .68$), suggesting the parental knowledge measure captures an element of the closeness of the relationship between adolescent and parent. However, a point of difference still remained between parental knowledge and attachment -- strong bonds (attachments) between adolescents and carers does not always mean that the parent has a good knowledge of problems the adolescent is experiencing, or how their friendships are progressing.

6.4.4.3 Parental Monitoring

Three questions were used to assess parental monitoring. Respondents were asked whether their parent/s knew where they were, who they were with, and what they were doing, when out unsupervised. Responses were made on a 4-point scale with participants selecting from: always; usually; sometimes; rarely/never. Scores range from 0 to 9, with 9 indicating high levels of parental monitoring and 0 indicating minimal parental monitoring. This measure of parental monitoring is based on the one created by Wikstrom (2006) for the Peterborough Youth Study. He found that lower levels of parental monitoring as measured by this scale correlated with weak family bonds ($r = .46$) as well as with increased frequency of physical punishment. Reliability of the parental monitoring scale in this study was $\alpha = .88$. 
6.4.4.4 Parental Availability

As part of the measurement of quality of parent-child relationships, an instrument was created to measure the level of parent availability, as perceived by the participant. The parental availability measure consisted of eight items with responses made on a 5-point scale ranging from always (5) to never (1), so that higher overall scores reflected greater availability. Six of eight items on the scale measured physical availability of a parent, such as whether a parent or carer was present in the home and available to the young person at key times - when waking in the morning, before school, after school, when doing homework, at dinner time, and when they go to bed. The remaining two items on the scale asked about emotional availability of a parent "when you need someone to talk to" and "when you feel like spending time with them". The total parental availability reliability was $\alpha = .90$.

6.4.5 Social Variables

6.4.5.1 Social Acceptance

An adapted version of the 6-item social acceptance subscale, from Harter's Self-Perception Profile for Children (SPPC; Harter, 1985) was used to assess participants' perceptions of their acceptance by peers. In line with the SPPA Self-worth subscale, the original question format and answering key were altered to improve the validity of responses. Respondents were asked to rate how well 6 statements described them, with responses ranging from A lot like me to Not at all like me. Half of the statements were positively worded, e.g. "I am popular with others my age", and half were worded negatively, e.g. "I wish that more people my age liked me". The social acceptance subscale of the SPPC has been frequently utilised in assessments of adolescent wellbeing and has been found to be both a valid and reliable measure. For example,
Muris, Meesters and Fijen (2003) investigated the psychometric qualities of the SPPC in a sample of 1143 children aged 8 to 14 and found the social acceptance subscale to have a reliability of .80, and a satisfactory correlation ($r = -.33$) with the social problems subscale of the Child Behaviour Checklist (CBCL). Internal reliability for the SPPC social acceptance subscale in this study was $\alpha = .75$.

### 6.4.5.2 Peer Antisocial Behaviour

Peer antisocial behaviour was measured using the same instrument which assessed respondent's own antisocial behaviour. The peer antisocial behaviour scale asked respondents to report whether their friends had engaged in any of the behaviours listed, in the previous year. Reliability of the peer antisocial behaviour scale in this study was 0.94.

### 6.4.5.3 School Membership

The Psychological Sense of School Membership (PSSM) scale (Goodenow, 1993) was used to investigate how connected adolescents felt to their high school. This 18-item scale focuses on the individuals' feelings of being accepted and valued by peers, teachers, and other adults at school, as well as their liking of, and pride in the school. Responses are on a 5-point scale, ranging from not at all true (1) to completely true (5). The validation study of the PSSM scale showed internal consistencies of .8 and above across 3 different applications of the English version, showing it is highly reliable (Goodenow, 1993). It has been demonstrated to have good construct validity and has been extensively utilised in the research literature. Internal validity of the PSSM in this study was found to be $\alpha = .93$. 
6.5 Participants

6.5.1 Recruitment

This study was based on data collected from adolescents aged 13 to 17 (inclusive). Three groups of adolescents make up the entire sample. Two groups took part in an online survey (delivered in two ways), and a smaller, third sample consisted of adolescents already in contact with a youth service of some kind. The total original sample consisted of 782 cases, but following removal of incomplete or unusable surveys, 524 cases remained. Of the 258 surveys that were removed from the sample, over 90% were surveys where the amount of missing information was such that the data was not useable. In most cases, only a few survey questions had been responded to before the participant ceased answering. Further details of removed surveys follow, with discussion of participants according to how they were recruited.

6.5.2 On-line Study Participants

On-line participants for this study were recruited in two ways. Both groups completed the same survey instrument, which was created using Qualtrics, which is an online survey platform that allows the user to create a survey instrument and host it on the Web. All participants accessed the survey anonymously online.

6.5.2.1 On-line group 1- Advertised Study Participants

The first group of on-line participants was recruited through a variety of advertising strategies. This included providing schools with advertising materials to pass on to students and/or information to be placed in school newsletters (however, of over 50 schools contacted, only 2 agreed to advertise the study); advertising the study on Government websites such as youth.gov.au and youthleadership.org.au; handing out
business cards advertising the study website in shopping centres; and promoting the study with the assistance of organisations such as headspace Australia and Student Edge.

headspace Australia is a product of the National Youth Mental Health Foundation, funded by the Australian Government Department of Health and Ageing, and is an organisation which at the time of the study operated 68 centres around Australia through which young people aged 12 to 25 could access mental health advice and/or services. In addition to the physical centres, headspace Australia operate a webpage which provides information and services to young people in relation to general health, mental health and wellbeing, education, employment and alcohol and drug services (www.headspace.org.au). It also maintains a Facebook page, which at the time of the study had over 8500 'likers'. While headspace provides a source of support for young people struggling with mental health issues, it also promotes a preventative framework and reaches out to youth having a 'tough time' as opposed to focussing only on clinical levels of distress. In addition, headspace provides information for young people who may be concerned about their friends or relatives, in their "we've got your back" campaign. For these reasons, visitors to the headspace webpage and Facebook page are not limited to those seeking mental health assistance. headspace Australia advertised a link to the survey for this research study on its webpage, Facebook page, and also on its Twitter account.

Student Edge is an organisation to which full and part-time secondary and tertiary students can apply for membership. Members receive a membership card which entitles them to discounts at various businesses. Student Edge operates a webpage which outlines current discounts/offers, runs competitions which members can enter, lists current events across Australia, and provides information about training and job
opportunities. In addition, Student Edge maintain a Facebook page and Twitter account. At the time of the survey, Student Edge had over 350,000 members, and the Student Edge Facebook Page had over 62,300 ‘likers’. The research study was advertised twice on the Student Edge Facebook page, in December 2011 and January 2012, with an outline of the study posted on the page and a link to the survey provided.

Participants who were recruited for the study through advertising accessed the survey via a link which took them to a dedicated webpage (www.youthexperiencesstudy.com) that provided information for participants and their parents. The survey ran from 7/11/2011 to 13/01/2012. Participants who completed the survey were offered the opportunity to enter a raffle for one of five $50 Coles group gift cards. In total, 372 responses were recorded, but a large number of surveys were incomplete, and in most of these cases only a few questions had been answered before the adolescent ceased participating, making the data unsalvageable. After removing invalid and/or incomplete surveys, 183 cases remained and were utilised in this study. Table 6.2 shows the breakdown of how participants recruited through advertising reported being made aware of this study. An overwhelming majority of participants reporting Facebook, but in most cases the participant's response to the question "how did you become aware of this study?" did not clarify whether they had viewed the advertisement for the study on the headspace Facebook page, the Student Edge Facebook page, or on a friend's Facebook page. Of those that did provide further information as to which Facebook page made them aware of the study most stated the Student Edge page.
Of the 183 valid surveys completed by adolescents recruited through advertising, approximately twice as many were completed by females than by males. Table 6.3 shows the age/gender breakdown for this group of on-line survey respondents.

Table 6.3  
**On-line participants recruited through advertising by age and gender**

<table>
<thead>
<tr>
<th>Age</th>
<th>Male (N)</th>
<th>Female (N)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>13yrs</td>
<td>6</td>
<td>16</td>
<td>22 (12%)</td>
</tr>
<tr>
<td>14yrs</td>
<td>9</td>
<td>20</td>
<td>29 (15.8%)</td>
</tr>
<tr>
<td>15yrs</td>
<td>21</td>
<td>21</td>
<td>42 (23%)</td>
</tr>
<tr>
<td>16yrs</td>
<td>13</td>
<td>40</td>
<td>53 (29%)</td>
</tr>
<tr>
<td>17yrs</td>
<td>12</td>
<td>25</td>
<td>37 (20.2%)</td>
</tr>
<tr>
<td>Total</td>
<td>61 (33.3%)</td>
<td>122 (67.7%)</td>
<td>183</td>
</tr>
</tbody>
</table>

6.5.2.2 **On-line Group 2 - Paid Study Participants**

The second group of on-line participants was sourced through a survey recruitment company. These were adolescents who had signed up to receive regular invitations to
complete surveys and provide opinions in regard to market research. Participants earn between 20 to 500 points for completing a survey, depending on the length, and these points can be converted into rewards, including cash payments (6000 reward points = $50). These participants received information about the study, and an invitation to participate, through the survey recruitment company. In total, 346 adolescents responded to the survey invitation over a three-day period. After incomplete and/or invalid surveys were removed, 279 cases remained. The age/gender breakdown of these participants is shown in Table 6.4.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Male (N)</th>
<th>Female (N)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 yrs</td>
<td>1</td>
<td>1</td>
<td>2 (.7%)</td>
</tr>
<tr>
<td>14 yrs</td>
<td>9</td>
<td>18</td>
<td>27 (9.7%)</td>
</tr>
<tr>
<td>15 yrs</td>
<td>19</td>
<td>43</td>
<td>62 (22.2%)</td>
</tr>
<tr>
<td>16 yrs</td>
<td>40</td>
<td>47</td>
<td>87 (31.2%)</td>
</tr>
<tr>
<td>17 yrs</td>
<td>33</td>
<td>68</td>
<td>101 (36.2%)</td>
</tr>
<tr>
<td>Total</td>
<td>102 (36.6%)</td>
<td>177 (63.4%)</td>
<td>279</td>
</tr>
</tbody>
</table>

### 6.5.3 At-risk Study Participants

The third group of study participants consisted of a smaller sample of adolescents deemed to be already at risk of poor outcomes. These were adolescents exhibiting problematic behaviours and/or experiencing difficulties of some kind, to a level requiring assistance, resulting in them either being in contact with a Youth Service Agency, or attending an alternate schooling program. It was recognised that this group of participants might not be effectively represented in the on-line sample due (amongst other things) to a lack of access to computers. Furthermore, below average reading
abilities for many of these participants meant that the survey in its original on-line form would be too long and in many cases too difficult. For these reasons, information from the at-risk group of participants was collected through the use of a survey instrument that included most (but not all) of the measures in the on-line survey. The survey was completed in groups of 1 to 3 participants at a time, and was tailored to the participants' needs. In some cases this entailed the researcher reading through each question with a single participant, allowing him/her to select a response, and in other cases small groups of participants completing the instrument themselves, with the researcher overseeing and answering any questions. Of the 64 surveys completed in this way, only two were not valid, resulting in a total of 62 youth agency sourced surveys.

The at-risk sample was created through the combination of three groups of participants. Two groups were drawn from youth agencies (The Base-Goodna, and Youth Family Services (YFS) - Logan) to which the adolescents had been referred for a variety of reasons such as receiving counselling or taking part in intervention activities. These two groups of participants were compensated for their time with a payment of $20. It is important to note that while some of these adolescents had been referred to these centres due to behavioural issues at home or school, there were also others who were referred due to issues such as having been bullied at school, having suffered abuse of some description, and/or due to their status as a foster child. The reasons for referral to the youth services were not discussed with participants (although sometimes volunteered during the data collection) and not recorded in the data, as this was beyond the scope of the ethics permission as well as the agreement with each agency.

The third group of at-risk participants was sourced through the Edmund Rice Flexible Learning Centre at Kingston, which is an alternative school for young people who have disengaged from traditional education. Respondents came from one of two
classes: a class of year 11 students, and a senior class of Indigenous and Maori students. Participants sourced through the Edmund Rice School were able to use their participation in the survey to meet assessment requirements for schooling.

In total, 48 males and 14 females comprised the Youth Agency group of participants. Table 6.5 summarises the at-risk participants according to source, and Table 6.6 presents the combined sample of at-risk participants, according to gender and age.

Table 6.5
*Sources of at-risk participants*

<table>
<thead>
<tr>
<th>Source</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Base Youth Agency - Goodna</td>
<td>15</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Youth Family Services (YFS) - Logan</td>
<td>25</td>
<td>3</td>
<td>28</td>
</tr>
<tr>
<td>Edmund Rice Flexi School - Kingston</td>
<td>8</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>48</td>
<td>14</td>
<td>62</td>
</tr>
</tbody>
</table>

Table 6.6
*Combined at-risk participants by age and gender*

<table>
<thead>
<tr>
<th>Age</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>8 (16.7%)</td>
<td>2 (14.3%)</td>
<td>10 (16.1%)</td>
</tr>
<tr>
<td>14</td>
<td>12 (25%)</td>
<td>2 (14.3%)</td>
<td>14 (22.6%)</td>
</tr>
<tr>
<td>15</td>
<td>15 (31.3%)</td>
<td>5 (35.7%)</td>
<td>20 (32.3%)</td>
</tr>
<tr>
<td>16</td>
<td>8 (16.7%)</td>
<td>4 (28.6%)</td>
<td>12 (19.4%)</td>
</tr>
<tr>
<td>17</td>
<td>5 (10.4%)</td>
<td>1 (7.1%)</td>
<td>6 (9.7%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>48</td>
<td>14</td>
<td>62</td>
</tr>
</tbody>
</table>
6.6 Data Screening and Preparation

6.6.1 Missing Values

As described previously, data was screened for missing values within each of the three group of participants (on-line advertised; on-line paid; "at-risk"). For participants completing the on-line version of the survey, due to the way that the survey was created, it was not possible to proceed to the next question without providing an answer for the current question. Therefore, in the majority of instances where data was missing in the on-line surveys, large portions of it was missing, to such an extent that the case was not able to be used in the final sample. Most often this was found in the sample of participants recruited through advertising, where it appeared that participants would begin the survey, but decide to cease participating several questions in. Consequently, of the 372 surveys accessed by this group, more than half (189 cases) needed to be removed from the sample.

Of the paid study participants completing the on-line instrument, 67 cases were removed from an initial 346 responses. There were two main reasons for removal of cases from this group of participants. Firstly, it appeared that some respondents had taken the survey several times, made evident by the fact that responses for each question (including those requiring a written response, such as postcode, parents’ occupations and school attended) were identical for several sets of surveys (often 4 to 5 at a time). Further, the identical surveys tended to be completed one after the other, therefore making their duplication more evident as when viewed they appeared sequentially. It appears that as these respondents earn points for completing surveys, many try to take the same survey several times in order to maximise their rewards. When such cases were identified, one completed survey was retained, and the remaining duplicates were deleted from the sample. Secondly, in a number of surveys, respondents completed the
survey instrument in a manner that suggested their responses were invalid. In these cases, respondents frequently answered all items within each scale (and often every item within every scale) with the same answer from the response key, despite the fact that some items were reversed. In addition, the questions requiring written answers were responded to with unusable responses (for example: "aaaaaaaaaaaaaaaaaaaa" for all responses). It was concluded that the data drawn from such surveys would not be reliable, and therefore these surveys were also removed from the sample.

Due to the method of administering the survey to participants from the at-risk sample in small groups or one-on-one, almost of all these completed surveys were retained for the final sample. As stated previously, only 2 of the 64 surveys administered to this group were removed. In both cases, this was because the participants did not complete the entire survey and entire scales were not responded to.

In all, 258 out of 782 (33%) cases were removed from the sample. While this rate is quite high, it reflects the nature of the way in which data was collected, where for the majority of invalid surveys, the reward of being entered into a raffle for a $50 gift card (the largest prize allowable under ethics guidelines) did not provide adequate motivation for participants to spend half an hour or more completing the survey instrument. It was not possible to examine whether the removed cases differed from those retained in the sample in regard to age, gender or residential location, as most often demographic information was not provided. Similarly, as the outcome measure (antisocial behaviour) was the final scale on the survey instrument, excluded cases very seldom had completed this item, making it impossible to examine whether removed cases differed on this construct. With these invalid cases removed from the sample, a total of 524 complete and accurate responses remained.
6.6.2 Data Screening

For all retained cases, items were scored according to scale instructions and totalled to create variable scores for each scale. Data was then checked for outliers. Firstly, the outcome variable – antisocial behaviours – was screened for univariate outliers, defined as responses more than 3 standard deviations from the mean when examining z scores. Thirteen cases were identified as univariate outliers, with all cases reporting high levels of antisocial involvement during the previous year (that is, reporting that they had engaged in at least 19 of the 26 antisocial acts investigated). Of these, all but two cases were part of the at-risk group of participants, a scenario that was not unexpected given that this group was sourced through agencies catering for high risk adolescents. Given that this sample was specifically sought out for inclusion in this study due to the tendency of these individuals to deviate from the norm on certain characteristics and behaviours (particularly antisocial activities), their removal from the data-set seemed counter-intuitive.

As preliminary investigation of the data distribution confirmed a skewed non-normal distribution as a consequence of the count data, assessment of multivariate outliers through statistical methods, including Mahalanobis distance, Leverage, and Cook’s distance could not be considered reliable. Further, while the removal of multivariate outliers may make data analysis simpler, the exclusion of cases on the basis of statistical ease must be weighed against the loss of valuable information about more unique experiences, given that life does not always fit within certain parameters. Consequently, rather than removing outliers from the dataset, the fit of models to be used was carefully considered throughout analyses.
6.6.3 Characteristics of the Final Sample

In total, the Youth Experience Study yielded 524 complete and accurate cases, with more female respondents than male. Eighty percent of the sample was aged 15 to 17. Table 6.7 presents the breakdown of the total combined sample, according to gender and age.

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>13</td>
<td>15 (44.1)</td>
<td>19 (55.9)</td>
</tr>
<tr>
<td>14</td>
<td>30 (42.9)</td>
<td>40 (57.1)</td>
</tr>
<tr>
<td>15</td>
<td>55 (44.4)</td>
<td>69 (55.6)</td>
</tr>
<tr>
<td>16</td>
<td>61 (40.1)</td>
<td>91 (59.9)</td>
</tr>
<tr>
<td>17</td>
<td>50 (34.7)</td>
<td>94 (65.3)</td>
</tr>
<tr>
<td>Total</td>
<td>211 (40.3)</td>
<td>313 (59.7)</td>
</tr>
</tbody>
</table>

6.7 Creating a Cumulative Sociodemographic Risk Index

6.7.1 Identifying Vulnerable Adolescents

A key aim of this study was to investigate the ways that contextual level factors affect proximal risk and protective factors for antisocial behaviour during adolescence. Further, the focus of the study was not singular contextual risk factors, but rather the experience of an accumulation of such factors, described as cumulative sociodemographic risk. As justified in Chapter 3, ensuring that only sociodemographic factors were included in a cumulative risk measure allowed for exploration of the proximal processes through which contextual risk influences adolescent outcomes. Focussing on sociodemographic factors alone is a necessary process for separating
mediators of stress from sources of stress (Grant et al., 2003). To this end, an index was created with the intention of classifying young people as either vulnerable, or not vulnerable, to an increased risk of poor outcomes (antisocial behaviours) due to cumulative sociodemographic risk.

The decision to focus only on cumulative sociodemographic variables was made for several reasons. Firstly, most often these variables precede risks from other domains. For example, it is more likely that high levels of family conflict will occur in a household characterised by poverty or unemployment than for a family to become poor or a parent to be unemployed due to frequent family fights. Secondly, focussing only on sociodemographic variables brings the possibility of understanding the ways in which these background characteristics affect functioning. On their own, variables such as parental education, parental marital status, or family size do not directly affect outcomes. As theorised by Sampson and Laub (1993), it is the influence these background variables have on other aspects of life that influences functioning. For example, SES affects social control mechanisms when poverty increases stressors experienced by parents and limits resources available to them, which then impacts on their parenting abilities. The motivation for this study was therefore to gain a better understanding of the ways in which sociodemographic influences affect adolescent wellbeing.

Many multiple risk indices currently utilised in research include factors across different domains, but often these risks overlap, or the multiple risk index may include both risks, and the possible mediators of those risks. Doan Fuller-Rowell and Evans (2012) point out that "recent literature on cumulative risk supports the idea that family processes, particularly parenting, represent an important proximal process that mediates the relationship between risk factors and children's outcomes" (p. 1530). Despite this, it
is not uncommon for multiple risk indices to include parenting characteristics as part of the risk index, thereby making it difficult to fully understand the pathways via which sociodemographic variables affect functioning.

One benefit of limiting factors included in the index to sociodemographic variables is that while these sociodemographic factors themselves cannot be influenced by interventions, gaining an understanding of the ways in which cumulative structural vulnerability influences other proximal relationships related to antisocial outcomes does introduce the possibility of tailoring interventions to address population-specific pathways to poor outcomes.

Gerard and Buehler (2004) propose that the selection of risk factors for a cumulative index be based on theory. An examination of previous research identified several demographic risk factors which have been frequently correlated with antisocial behaviours in adolescence, as discussed in Chapter 3 (Page 38). While intercorrelation between the demographic variables is unavoidable due to the nature of disadvantage, each of the variables included in the index were considered to make a unique contribution to the outcomes examined. For reasons discussed extensively in Chapter 3, the cumulative sociodemographic risk index used in this study therefore included the following variables: family size, family mobility, living situation, parental employment, and neighbourhood disadvantage. Additionally, in recognition of the unique challenges and increased risk of conviction and imprisonment faced by Aboriginal and Torres Strait Islander populations (Allard, 2010; McGregor et al., 2010), the index also recognised Indigenous cultural status as a demographic risk factor.

When considering the best way to construct a cumulative risk index, three main methods were identified in previous research studies. The first method consists of allocating a score of either 0 or 1 for each variable in the index, according to the
absence (0) or presence (1) of certain identified risk factors. The number of risks is then summed to create a risk score. Such additive models of multiple risk are based on the assumption that cumulative risk has a linear relationship with outcomes, wherein no one risk factor is more important or influential than any other. This method of summing the total number of unweighted items was used by Evans (2003) in a study which theorised that the effect of cumulative risk is due to increased allostatic load (physiological effects on the body as a consequence of exposure to stress). In Evans' study, family poverty was considered to be equally as influential a risk as parental marital status and maternal high school education level, because the number of risks in total was seen to be of greater consequence than what the risks actually were.

While the simple summing method provides an indication of the number of risks each participant possesses, it fails to consider the level of severity of risk related to each factor when summing scores. Therefore, should the risk factor considered be, for example, abuse by a parent, then a child who has been abused on one occasion might be considered equally at risk as a child who has been abused on an ongoing and regular basis. Similarly, when considering a socio-demographic variable such as parental employment, a family with no parents working might be allocated the same score as a family with a low paid working parent. Gerard and Buehler (2004) used this binary approach in their cumulative risk index, wherein parents who had never attended school were considered equally at risk as parents who had completed grade 8 but not finished high school.

A second, similar method of creating a multiple risk index involves assigning risk scores of zero or one, but with those falling into the category of risk on continuous variables being determined by their position in the overall sample. For example, Forehand, Biggar and Kotchick (1998) used a measure of maternal depression in a
cumulative risk index, assigning participants a score of 1 if the scale score for maternal
depressive mood fell in the top 30% of the sample. Similarly, Gerard and Buehler
(2004) classified risk on their continuous variables as above the 75\textsuperscript{th} percentile (or
below the 25\textsuperscript{th} percentile), and Doan, Fuller-Rowell and Evans (2012) characterised risk
as being equal to or greater than one standard deviation above the mean on the variable
assessed. Stoddard, Zimmerman and Bauemeister (2012), and also Stoddard et al.
(2013) divided their sample into categories reflecting three levels of risk, determined by
being one standard deviation from the mean and resulting in classifications of: no risk
(assigned 0 points) - bottom 16% of the distribution; average risk (assigned 1 point) -
middle 68% of the distribution; and high risk (assigned 2 points) – top 16% of the
distribution. Statistically, the concept of risk when allocated in this way is highly
dependent on the sample being analysed and the cut-off chosen for continuous
variables, rather than being determined by a theoretically based notion of what levels of
specific variables constitute a threat to adolescent wellbeing.

The third approach to determining cumulative risk involves using a weighted index,
where scores vary according to the levels of each factor assessed. For example,
Kochanska, Aksan, Penney and Boldt (2007) created an index that assessed four
different aspects of demographic risk, with scores on each demographic variable being
higher when risk is greater. Parent education scores varied from 0 (completed college)
to 3 (did not complete high school); 6 categories of annual family income were awarded
corresponding points (> $10,000 received 5 points, through to > $50,000 received 0
points), and so on, resulting in a total demographic risk score that ranged from 0 to 20.
Kochanska and colleagues argue that such a graded approach to creating a multiple
demographic risk index results in a better distributed sample, particularly when the
majority of the sample is considered low-risk.
This approach to adolescent risk, where severity is considered alongside presence or absence, is found in well-utilised and validated Juvenile Justice risk assessment tools, such as the Structured Assessment of Violence Risk in Youth (SAVRY; Borum et al., 2002). The SAVRY assesses risk of violence based on 24 risk and 6 protective factors. When used as a research instrument, each risk is coded as high, moderate or low, and awarded a score of 2, 1 or 0 accordingly (Lodewijks et al., 2010). Research has shown the SAVRY to be reliable and valid in predicting future violence (Borum & Verhaagen, 2006), providing further support for a three-level risk coding structure.

For these reasons, when constructing the cumulative sociodemographic risk index for this study a weighted model was chosen, with the decisions for point allocation based on previous research and theory where possible, or else guided by statistical analysis. The following section provides a detailed discussion of the variables selected for inclusion in the cumulative sociodemographic risk index, as well as how points were allocated for levels of risk on each variable.

6.7.2 Factors used to create a Cumulative Sociodemographic Risk Index.

6.7.2.1 Family Size

As discussed in Chapter 3 (Page 39), larger families mean available resources need to be stretched further (Blake, 1989). Increases in the number of siblings within the family have been found to be related to decreases in time available for parental involvement, and effective monitoring and supervision (Rutter et al., 1988). With less adult supervision and an increased likelihood of overcrowding in the home, modelling of sibling delinquency, and opportunities for co-involvement in antisocial acts rise (Snyder et al., 2005).
Research tends to suggest that risk increases when the number of children in the family reaches three or four. For example, Brown, Cohen, Johnson and Salzinger (1998) found that abuse and neglect were more likely in families with 3 or more children. In their study of multiple risk amongst African American students, Gutman, Sameroff and Eccles (2002) categorised families with two or fewer children as not at risk, and those with three or more (21% of their sample) as at-risk. Other studies such as the Cambridge Study and the Rochester Longitudinal Study, suggest that it is families with 4 or more children that are at an increased risk of poor outcomes (Mednick et al., 1985; Sameroff et al., 1987; West & Farrington, 1973). Thus, many studies use a cut of 4 children as the point for nominating increased risk due to family size (Gerard & Buehler, 2004; Kalil & Kunz, 1999; Trentacosta et al., 2008).

Factors such as the ability to monitor and supervise effectively, as well as the need to stretch resources across greater numbers of children would theoretically continue to increase as numbers of children increase beyond four. Despite the tendency for all families with four children or more to be categorised as one group, there is some evidence that very large family size may result in poorer outcomes -- at least in regard to academic outcomes. For example, Blake (1989) retrospectively examined total years of education achieved according to the number of siblings within the family during the period of 1972-1986 and despite finding little difference between families with one or two children, women from a 4-sibling family had 2 years less, and men had 2.6 years less of educational attainment. In families with 7 or more children, outcomes were considerably poorer. For example, in comparison to only-children, white men had 3.4 less years of educational attainment, and were around 1.5 times less likely to complete year 12.
In this study, participants were asked to nominate the number of brothers and sisters who live at home with them. Based on the trends in the research literature, the more conservative cut of 4 was selected to indicate presence of risk, with families of 4 to 6 (inclusive) children in the home (22.3% of the sample) awarded 1 risk point. To account for higher levels of risk amongst those from very large families, those with 7 or more children in the home (5.2% of the sample) were awarded 2 risk points.

Figure 6.1 illustrates the distribution of family size for the combined sample, with most families consisting of two or three children.

![Figure 6.1. Reported number of children in family.](image)

### 6.7.2.2 Family Mobility

Family mobility disrupts social ties in the community, and can lead to a loss of employment, social support, peer and friend networks and more (Scanlon & Devine, 2001; Stokols & Shumaker, 1982). Forced moves in particular, which are more frequent amongst disadvantaged populations, result in increased levels of stress which further tax already limited coping abilities (Wood et al., 1993). Instability in schooling as a
consequence of frequent relocation has been demonstrated to influence academic achievement of children and adolescents, as well as behaviour in the classroom (Nichols & Gault, 2003; Scanlan & Devine, 2001; Wood et al., 1993).

The most recent Australian data on housing mobility (ABS, 2009) showed an average of 1.7 moves during the previous 5-year period for persons aged 15 or over. During the 5-year reference period, 57% of households had never moved, 19% moved once, 8% moved twice and 15% moved three or more times (ABS, 2009). Australian families with dependent children moved less often as children grew older, possibly due to the desire to limit disruption to the schooling of older children. In the 2007/8 period, 72% of two-parent families with an eldest child aged under 5 had moved house, compared to 46% with an eldest child aged 5 to 14, and only 29% with an eldest child aged 15 to 24 (ABS, 2010). Mobility rates were higher for single-parent families.

Determining how many moves should indicate risk of poor outcomes is not straightforward, as research investigating highly mobile children lacks consistency when classifying youths. For example, in their summary of the mobility literature, Scanlon and Devine (2001) classify children who move homes three or more times as hyper-mobile students, and state that they have the highest levels of academic impairment. Simpson and Fowler (1994) also used a cut of 3 or more residential moves during the child's lifetime to determine highly mobile children, and found that compared to youths who had never moved, highly mobile children were 2.3 times more likely to exhibit emotional and/or behavioural problems, and almost twice as likely to be suspended or expelled from school. Mundy, Robertson, Greenblatt and Robertson (1989) used two separate categories of mobility -- moderate residential instability (0 to 1 move during the child's lifetime) and high residential instability (2 to 4 moves during the child's lifetime) -- when investigating mobility effects on adolescent inpatients aged
12 to 18. They found that both moderate and high residential instability were related to psychological and behavioural difficulties, but outcomes were considerably worse amongst those identified with high levels of mobility.

Changes in residential location often mean changes in school enrolment, which can exacerbate the effects of residential instability. In a small Australian study, Fields (1995) investigated outcomes for 40 highly mobile students, classified as those who attended 3 or more schools during a 2-year period. He found that more than 70% of highly mobile students met criteria for social and adjustment disorders, around half were rated by teachers as falling into the bottom third of their class in regard to academic functioning, and only 4 of the group of 40 scored at or above the mean rating for peer acceptance, as rated by classmates.

When determining risk according to residential mobility, the age of a child needs to be considered. A 17-year old who has moved a certain number of times cannot be considered equivalent to a 13-year old who has also moved the same number of times. Some researchers compensate for age variations when determining mobility classification. For example, Stokols, Shumaker and Martinez (1983) used the formula, number of lifetime moves/ respondent's age, to create a mobility score, and then divided their sample into two categories of low mobility, and high mobility. Wood and colleagues (1993) also adjusted their measure of mobility to account for variations in age across the sample by dividing the reported number of moves in the child's lifetime by their age. In their study of academic outcomes related to mobility, they used a cut score of the 90th percentile to designate high movers, which represented at least 6 or more moves during the child's lifetime.

Family mobility in this study was measured by asking participants the number of times they had moved homes since Grade 1. Figure 6.2 shows the reported frequency of
home changes, illustrating that over 30% of participants had always lived in the same home. To account for age-related differences, the number of moves since Grade 1 was divided by the adolescent's age in years, to provide a family mobility score, using a similar methodology to that used by researchers such as Stokels, Shumaker and Martinez (1983), and Wood (1993). A significant correlation between the number of home moves and the number of different schools attended since Grade 1 ($r = .73, p < .01$) indicated that moves to a new house frequently resulted in moving to a new school also. The distribution of the family mobility score is provided in Figure 6.3.

Risk due to family mobility was determined statistically at first, with consideration of what statistical categories meant in practical terms. One point for risk was allocated to youths whose residential mobility score fell above the 75th percentile (a score of .21 or higher), with 15.6% of the sample receiving this score. Youths with this score had lived in around 3 different houses since beginning primary school, with 17-year olds moving to a new home around once every 3 years, and 13-year olds moving to a new home around once every 2 ½ years. High risk due to family mobility (two points for risk) was determined by a cut at the 90th percentile, which was a family mobility score of .40 or higher, with 10.1% of the sample receiving this score. For youths in this category, a 13-year old would have moved house 5 times over a 7 year period. A 17-year old would have changed homes close to twice every three years.
6.7.2.3 Living Arrangements

The composition of the family home living environment has frequently been associated with a variety of adolescent outcomes. Many previous cumulative risk studies focus more on parental marital status than on living arrangements. For example,
in research using multiple risk indices, Gutman, Sameroff and Eccles (2002) rated any parent who was not married as at-risk, Gerard and Buehler (2004) gave participants 1 risk point if parents were single, never married, divorced or separated, and Forehand, Biggar and Kotchick (1998) only considered mothers married to biological fathers to not be ‘at-risk’ when scoring their index. However, with recent Australian statistics indicating that around one third (31.7%) of babies were born to unmarried parents (ABS, 2016), it is questionable in modern times whether marital status itself is the most important family structure variable related to risk. Increased risk for adolescents due to family composition in this study therefore focused on which adults were in the household, rather than on their marital status.

The additional psychological (Brody & Flor, 1997; Cairney et al., 2003) and financial (Brown & Moran, 1997; McLanahan & Sandefur, 1994) stressors experienced within single parent households, as well as limitations in regard to monitoring and supervision of children (Aquilino, 1996; Neumann et al., 2010), were acknowledged as likely to increase the risk of poor outcomes. Youths from single parent households who lived with one parent only were therefore awarded 1 risk point. Those who lived with one biological parent and one step-parent were not awarded this point for risk, nor were those who reported living sometimes with one parent and sometimes with another in a shared care arrangement, due to a lack of further information as to whether step-parents were present in either household. Youths from single parent households comprised 23.1% of the sample.

Living in households where no biological parents reside, whether with extended members of the family, with friends, or with foster carers, increases the likelihood of poor outcomes for adolescents. In most cases, the circumstances which have led to the absence of both biological parents will have been traumatic. Adolescents living in the
Foster Care system suffer both from histories of the abuse and neglect that necessitated their removal, as well as from the actual process of being separated from a biological parent/s, and frequently exhibit poorer performance across a variety of developmental outcomes (Bruskas, 2008). Increased rates of psychological difficulties have also been noted amongst children living with grandparents (Ghuman et al., 1999; Smith & Palmieri, 2007), or in kinship care (Billing et al., 2002; Dubowitz et al., 1994).

In this study, adolescents who did not live with either biological parent were considered to be at highest risk of poor outcomes and were awarded 2 risk points. In total, 23 participants (4.4%) reported not living with parents. Of these, 9 reported living with other relatives or extended family, such as a nanna or brother-in-law; 4 reported being in foster care; and the remaining 10 reported living in shared accommodation, or with friends or partners. Figure 6.4 illustrates reported living arrangements.

![Figure 6.4. Reported living arrangements](image-url)
Neighbourhood Disadvantage

Neighbourhood has an effect on adolescent life through the day to day situations a young person comes in contact with. Adolescents spend the majority of their free time in relatively close proximity to their own home, when travelling to and from school, or in spare time - whether in local shopping centres, parks or other recreational areas (Clampet-Lundquist et al., 2011). Therefore, adolescents living in neighbourhoods characterised by disadvantage are more likely to come into contact with less positive influences, such as unemployed adults, substance use and abuse, violence and general criminal activity (Curley, 2005; Hill et al., 2001; Parker & Reckdenwald, 2008).

Increased levels of contact heighten the risk of victimisation and/or involvement. Further, disadvantaged neighbourhoods may be affected by lower levels of community efficacy or the promotion of fewer pro-social norms (Anderson, 2014; Ross et al., 2000; Small & Newman, 2001), as discussed in Chapter 3 (Page 59).

It is not unusual for research to discuss the effects of living in disadvantaged neighbourhoods without defining the parameters of what ‘disadvantage’ means. This makes it difficult to draw from the literature when determining the level at which risk ends (or protection begins). The problem is exacerbated by the many elements that may be included in a measure of neighbourhood or community disadvantage, including economic factors, characteristics of residents (race, education, employment) as well as their perceptions of the neighbourhood, housing characteristics (overcrowding, rented versus owned), crime rates, residential instability, resource/institution availability, and also community beliefs and cohesion, to name just some.

Much research investigating the influence of neighbourhood variables utilise continuous measures of neighbourhood quality and compare high scores (advantaged neighbourhoods) to low scores (disadvantaged neighbourhoods). For example, Peterson,
Krivo and Harris (2000) created an index of neighbourhood economic deprivation by combining percentages of: population below the poverty line, families that were female headed, persons above 16 who were unemployed, and persons over 16 employed in professional or managerial occupations. In addition, a measure of residential instability was created by summing percentages of: renter occupied homes, vacant homes, and persons who had moved home in the previous 5 years. They found that both economic deprivation and residential instability significantly predicted violent crime in the neighbourhood.

Where research categorises neighbourhoods according to risk, no rules of thumb appear to exist, and processes of categorisation are sometimes not provided at all. For example, Maimon, Browning and Brooks-Gunn (2010) divided their sample into categories of low, medium and high SES when investigating neighbourhood characteristics that affect collective efficacy, but provided no details of the cut scores used to determine this classification. Other research simply divides at the mid-point. In a study of single, African American mothers, Ceballo and McLoyd (2002) constructed a measure of neighbourhood quality based on mothers’ ratings of neighbourhood quality (school, policing and public transport quality, as well as levels of crime, drug activity and community involvement), rates of violent crime sourced from official police records, and percentage of families living in poverty drawn from Census data. Their analysis dichotomised this measure of neighbourhood quality, by splitting at the median score into groups of “better neighbourhoods” and “worse neighbourhoods”.

Other studies which use composite measures of neighbourhood disadvantage create categories based on statistical properties of the sample. For example, Hou and Miles (2005) divided data reflecting neighbourhood economic conditions into 5 quintiles of low income, lower-middle, middle, upper-middle and high-income neighbourhoods.
Gerard and Buehler (2004) assessed neighbourhood context using a census based measure, which awarded 1 point (up to a total of 6) for each of the following neighbourhood conditions: majority Black residents, over 50% Hispanic residents, majority of residents never married, majority of individuals aged 25 or older have no high school degree, greater than 10.9% unemployment, and more than 23.9% of persons under the poverty line. Youths scoring higher than the 75th percentile on this score out of 6 (22.9% of the sample) were categorised as at-risk due to neighbourhood quality.

In this study, the level of disadvantage of the neighbourhood in which participants reside was ascertained using one of the Socio-Economic Indexes for Areas (SEIFA, 2011), provided by the Australian Bureau of Statistics. These are composite measures based on Australian census data that gives a neighbourhood a score based on variables including household incomes, employment status, occupation type, post school qualifications, household internet access, rent/mortgage costs, public/community housing and demographics such as one-parent families. They are therefore not a measure of individual or family socioeconomic status, but rather an overall representation of a neighbourhood that the ABS states represents “people’s access to material and social resources, and their ability to participate in society” (ABS, 2011, p.3). Study participants reported the postcodes in which they reside, and these were used to find the corresponding score on the Index of Relative Socioeconomic Advantage and Disadvantage. This Index is a continuum of scores ranging from advantage (higher scores) to disadvantage (lower scores), which presents an average of all people living in an area, defined by postcode. Crawford and colleagues (2008) used the SEIFA Index of Relative Socioeconomic Advantage and Disadvantage, determined by participant postcode, when comparing differences in features of open public spaces according to
neighbourhood socioeconomic status. Like Hou and Miles (2005), their classifications were statistically determined, with the sample divided into quintiles according to SEIFA scores. A similar strategy was employed in this study.

As the SEIFA Index is a continuum of relative advantage to disadvantage, low scores suggest that neighbourhood of residence is a risk factor for poor outcomes, while high scores suggest the neighbourhood may be a protective factor. In this study sample, those falling into the lowest three deciles (16.8% of the sample) on the SEIFA index were considered to be at high risk and awarded 2 risk points. Participants living in neighbourhoods below the median SEIFA decile score of 7 (those with a SEIFA decile of 4, 5 and 6 - 25% of the sample) were rated as having moderate neighbourhood risk and awarded 1 risk point. Figure 6.5 shows the frequency of SEIFA deciles in the sample, as ascertained through reporting of residential postcode.

Figure 6.5 Frequency distribution of SEIFA decile scores
6.7.2.5  Parental Employment

Socioeconomic status, and particularly family poverty, have long been recognised in the literature as strong influences on child and adolescent developmental outcomes (Doan et al., 2012; Evans & English, 2002; Moore et al., 2000; Sirin, 2005; Starfield et al., 2002). While measures of socioeconomic status differ from study to study, the construct reflects one's economic and social standing, frequently constituting three facets: levels of education, income or financial resources, and occupational status. Formulating a measure of SES from self-report data collected from adolescents is problematic given that youths are providing information about their parents' statuses (Merola, 2005), and may be uncertain or unaware of specific details. For this reason, parental employment type was used in this study to represent family SES.

Parental employment affects adolescent life in multiple ways. Most obviously, parental employment is related to family socioeconomic status, in regard to the amount of money paid for work. This affects quality of family life through physical and environmental avenues (such as the condition of the house lived in, and the neighbourhood in which one can afford to live); as well as in terms of material wealth, which is reflected in both comfort of living (driving a nice car, owning a big TV) and access to services (medical, dental, educational) and opportunities (having a computer and internet access for school research, affording to participate in team sports).

Employment type and status also indirectly affect family life through parental stress (Doan et al., 2012). Parents struggling to make ends meet due to low-paid employment may be faced with the need to work longer hours and skip holidays, thereby reducing time spent with children and creating issues related to supervision (Brody & Flor, 1998). Parental employment is closely linked to parental education, and therefore may...
also have an influence on aspirations of children in terms of career, as well as on academic effort and achievement.

Adolescents in this study reported whether their mother and father were working or not working, and for those listed as working, participants were asked to give their parent's job description. Job descriptions were then coded, using Australian and New Zealand Standard Classification of Occupations (ANZSCO) codes. ANZSCO codes reflect skill-based classifications of work and were developed to provide a national standard for organising information about occupations (ABS, 2009b). Once coded, the Australian Socioeconomic Index 2006 (AUSEI06- McMillan, Beavis & Jones, 2009) was used to convert the data into a continuous score ranging from 0 (lowest status) to 100 (highest status). The AUSEI06 considers both the level of education necessary for a job, as well as the salary expected to be earned, and therefore provides a more complete measure of human capital than either variable alone (McMillan et al., 2009; Milne, 2012), making it a suitable method of determining risk based on parental employment.

In this index, for adolescents with working parents, the occupation of the parent living with the child who earned the greatest amount was used to determine allocation of risk category, similar to the Rochester Longitudinal Study (Sameroff et al., 1987) which considered the occupation of the head of household when calculating risk status. Given the absence of guidance in the research literature when determining risk based on AUSEI06 classifications, this was determined statistically in this study. Families with a parent earning below 40 (the fourth decile) on the AUSEI06 were awarded one risk point. In total, this constituted 29.8% of the sample. Males falling into this category included those employed as factory workers, taxi and bus-drivers, gardeners, or those working trade-oriented occupations including plasterers, bricklayers, roofers, and
labourers. Females tended to be factory workers, house cleaners, waitresses, retail sales assistants or child/aged-care workers.

Households with no working parents were considered to be more at risk than those with a low paid working parent. Having no working parent in a household may indicate an ongoing dependence on welfare, or an attitude that does not value employment as a worthwhile venture. Alternatively, a household containing parents who are actively seeking work and are unable to find it, or a parent who has recently lost a job, may have an effect on parental stress levels, emotional wellbeing and mental health. Regardless of the reasons for having no working parent in the household, the financial consequences of having no working parent make it a greater risk than having a low paid working parent. Adolescents who reported having no working parents in the household (13.4% of the sample) were therefore awarded 2 points. Figures 6.6 and 6.7 illustrate the distribution of AUSEI06 scores for mother and father’s employment.

Figure 6.6 Frequency of AUSEI06 scores of occupations reported for fathers
As discussed in Chapter 3, it is rare for risk factors to exist in isolation, and where adolescents experience multiple risk factors simultaneously, research documents that outcomes are poorer. This research therefore investigated the experience of cumulative risk on adolescent experiences through the use of a multiple risk index. One advantage to using such a composite measure of risk is that it captures the multiple components that contribute to disadvantage, which single measures alone cannot.

A weighted cumulative risk index was used in this study, similar to that used by Kochanska, Aksan, Penney and Boldt (2007, discussed in Section 6.7.1 on page 193). Each case in the sample was allocated points in accordance with the criteria explained above, with a score of 0 for no risk, 1 for moderate risk and 2 for high risk. Participants who reported that they identified as Aboriginal or Torres Strait Islander ($n = 20$) were allocated an additional 2 points in recognition of the increased likelihood of poor
outcomes associated with this cultural status (also discussed in Section 6.7.1). Points were then summed for each case to create a total cumulative risk score.

Cumulative risk scores ranged from 0 to 11, out of a possible score of 12. The mean score was 2.26 (SD= 2.28) and median score was 2.0. Table 6.8 shows the at-risk index, associated scoring and percentage of the full sample allocated to each category. Table 6.9 provides the breakdown by gender of the number and percentage of participants receiving each total risk score. Figure 6.8 depicts the frequency distribution of cumulative vulnerability scores.

<table>
<thead>
<tr>
<th>Table 6.8</th>
<th>Allocation of risk points and risk category distributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk variable</td>
<td>High risk</td>
</tr>
<tr>
<td></td>
<td>+2</td>
</tr>
<tr>
<td>Family size</td>
<td>7 + children</td>
</tr>
<tr>
<td>Home changes since Gr 1</td>
<td>N Changes/Age ≥ .40</td>
</tr>
<tr>
<td>Living arrangements</td>
<td>Doesn't live with either parent</td>
</tr>
<tr>
<td>Neighbourhood disadvantage</td>
<td>SEIFA Decile 1, 2, 3</td>
</tr>
<tr>
<td>Parental employment</td>
<td>No working parent in household</td>
</tr>
<tr>
<td>Indigenous status</td>
<td>Indigenous/TSI</td>
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Table 6.9
Cumulative Risk Index scores

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<tr>
<th>Risk score</th>
<th>Males</th>
<th>Females</th>
<th>Total N</th>
<th>Total %</th>
</tr>
</thead>
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<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>43 (36.4)</td>
<td>75 (63.6)</td>
<td>118</td>
<td>22.5</td>
</tr>
<tr>
<td>1</td>
<td>50 (39.1)</td>
<td>78 (60.9)</td>
<td>128</td>
<td>24.4</td>
</tr>
<tr>
<td>2</td>
<td>34 (34.0)</td>
<td>66 (66.0)</td>
<td>100</td>
<td>19.1</td>
</tr>
<tr>
<td>3</td>
<td>23 (37.1)</td>
<td>39 (62.9)</td>
<td>62</td>
<td>11.8</td>
</tr>
<tr>
<td>4</td>
<td>19 (45.2)</td>
<td>23 (54.8)</td>
<td>42</td>
<td>8.0</td>
</tr>
<tr>
<td>5</td>
<td>9 (39.1)</td>
<td>14 (60.9)</td>
<td>23</td>
<td>4.4</td>
</tr>
<tr>
<td>6</td>
<td>10 (58.8)</td>
<td>7 (41.2)</td>
<td>17</td>
<td>3.2</td>
</tr>
<tr>
<td>7</td>
<td>11 (73.3)</td>
<td>4 (26.7)</td>
<td>15</td>
<td>2.9</td>
</tr>
<tr>
<td>8</td>
<td>1 (16.7)</td>
<td>5 (83.3)</td>
<td>6</td>
<td>1.1</td>
</tr>
<tr>
<td>9</td>
<td>2 (50.0)</td>
<td>2 (50.0)</td>
<td>4</td>
<td>0.8</td>
</tr>
<tr>
<td>10</td>
<td>4 (100.0)</td>
<td>0 (0)</td>
<td>4</td>
<td>0.8</td>
</tr>
<tr>
<td>11</td>
<td>5 (100.0)</td>
<td>0 (0)</td>
<td>5</td>
<td>1.0</td>
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<td>12</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0</td>
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</tbody>
</table>

Figure 6.8. Distribution of cumulative risk scores in the sample
Table 6.1 provides the correlations between sociodemographic markers of risk (which were utilised to create the Cumulative Risk Index), the overall cumulative risk score, and adolescent self-reported antisocial behaviours. All sociodemographic risk markers were moderately correlated with the overall risk score, with Pearson correlations ranging from .48 for Indigenous status, to .65 for parental unemployment. Intercorrelations between sociodemographic risk factors themselves were weaker, ranging from .14 to .46, indicating their diversity in capturing different facets of disadvantage. It was not unexpected that the strongest correlation was for the relationship between parental unemployment and low family SES, given the overlap between these two markers.

Examination of the relationship between sociodemographic risk factors and antisocial behaviour showed that single sociodemographic measures had moderately weak correlations with self-reported delinquency. Surprisingly, the strongest association with antisocial behaviour was found for family mobility \((r = .39)\) and the weakest for low SES \((r = .24)\). The utility of the total cumulative risk measure was demonstrated through its relationship with antisocial behaviour \((r = .50)\), which was stronger than any individual sociodemographic measure. These findings support the use of a cumulative risk index, over single measures of disadvantage when exploring adolescent antisocial behaviour.
Table 6.1
Correlations between cumulative risk, sociodemographic risk factors, and antisocial
behaviours

<table>
<thead>
<tr>
<th></th>
<th>CR</th>
<th>FS</th>
<th>FM</th>
<th>PU</th>
<th>SES</th>
<th>ND</th>
<th>IS</th>
<th>AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative risk (CR)</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family size (FS)</td>
<td>.57</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family mobility (FM)</td>
<td>.59</td>
<td>.35</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental Unemployment (PU)</td>
<td>.65</td>
<td>.30</td>
<td>.28</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES (SES)</td>
<td>.57</td>
<td>.19</td>
<td>.14</td>
<td>.46</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighbourhood disadvantage (ND)</td>
<td>.64</td>
<td>.29</td>
<td>.20</td>
<td>.25</td>
<td>.30</td>
<td>-</td>
<td></td>
<td></td>
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<tr>
<td>Indigenous status (IS)</td>
<td>.48</td>
<td>.33</td>
<td>.24</td>
<td>.20</td>
<td>.14</td>
<td>.23</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Antisocial behaviour (AB)</td>
<td>.50</td>
<td>.31</td>
<td>.39</td>
<td>.28</td>
<td>.24</td>
<td>.26</td>
<td>.31</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. All correlations significant at $p < 0.01$

6.7.3.1 Classifying Vulnerability due to Cumulative Risk

Wherever possible in this research, the cumulative risk score was used as a continuous measure. However, in order to compare risk and protective factors for adolescents, it was necessary to categorise participants according to risk status as either vulnerable, or not-vulnerable. Due to the many ways multiple risk indices are constructed, there is no guidance in the literature as to the best method for determining risk classification.

Some research simply divides the sample, without providing explanation or justification of cuts. For example, in an analysis of the Rochester Longitudinal Study, Sameroff, Seifer, Zax and Barocas (1987) allocated one point for risk on 10 variables, resulting in a score ranging from 0 to 8 (out of a possible 10). Families were then categorised as low risk (0-1), moderate risk (2-3) and high risk (4-8). Similarly, MacKenzie, Kotch and Lee (2011) investigated cumulative ecological risk using an index of 10 risk variables and classified children with 0-2 risks as low risk, 3-5 risks as medium risk, and 6-10 risks as high risk.
Several studies suggest that experiencing four or more risks results in increased likelihood of poor outcomes, with Bowen and Flora (2002, p. 528) describing four factors as the “‘normative’ definition of high risk”. In his Isle of Wight study, Rutter (1979) found that children with four or more risk factors had a sevenfold increase in the likelihood of child maladjustment. Similarly, in the Kauai Longitudinal Study, Werner (1993) showed that compared to children with fewer risks, 2-year old children with 4 or more risks (out of 12 investigated) exhibited poorer outcomes later in life, including serious learning and/or behavioural problems at the age of 10, and delinquency, teenage pregnancy and/or mental health problems at the age of 18. Forehand, Biggar and Kotchick (1998) found a significant effect of having four (compared to three) risks on both internalising and externalising problems reported later in young adulthood.

More recent research also embraces a cut of four or more factors as signifying at-risk status. Using data drawn from the National Longitudinal Survey of Youth, Turner, Hartman, Exum and Cullen's (2012) classified high risk youths as those with four out of seven risk factors (adolescent mother, large family size, parental deviance, single mother, family poverty, maternal smoking during pregnancy, low birth weight), and found a higher prevalence of involvement in both delinquency and drug use for these youths compared to those classified as not at risk (3 or fewer risk factors). In an analysis of the Pittsburgh Youth Study data on serious persistent juvenile offending for boys, Stouthamer-Loeber, Loeber, Wei, Farrington and Wikstrom's (2002) found that when risks outnumbered protective factors by 4 or more, three quarters of older boys were serious persistent offenders. Such research was taken into account when determining cuts for risk categories.

In the current study, classifying the vulnerable group as those with a cumulative risk score of four or more resulted in 77.9% of the sample being classified as not
vulnerable, and 22.1% classified as vulnerable. Due to the weighted risk index used, a cut score of four meant that vulnerable adolescents faced four risk factors in their lives, or two very high-risk factors (or one very high, and two moderate risk factors). A cut score of four therefore seemed appropriate for classifying vulnerable adolescents within this sample. In total, 116 participants (61 male and 55 female) were classified as vulnerable adolescents due to cumulative risk. Chapter 8 compares and contrasts the characteristics of vulnerable and not-vulnerable adolescents. Table 6.1 summarises the characteristics of the vulnerable and not-vulnerable groups, according to gender, age and recruitment method. Males (28.9%) were slightly more likely than females (17.6%) to be classified as vulnerable. Mean ages were highly similar for both groups. Unsurprisingly, the majority (88.7%) of those adolescents recruited through agencies servicing at-risk youths were classified as vulnerable due to cumulative sociodemographic risk.

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>Mean Age</th>
<th>Recruitment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>(yrs)</td>
<td>n (%)</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Advert</td>
</tr>
<tr>
<td>Vuln</td>
<td>61 (28.9)</td>
<td>55 (17.6)</td>
<td>15.24</td>
</tr>
<tr>
<td>Not-vuln</td>
<td>150 (71.1)</td>
<td>258 (82.4)</td>
<td>15.67</td>
</tr>
<tr>
<td>Total</td>
<td>211</td>
<td>313</td>
<td>183</td>
</tr>
</tbody>
</table>

6.8 Research Plan

6.8.1 Gaps in the Literature

This research adds to the literature on adolescent risk and protective factors for antisocial behaviour. In particular, it contributes to two areas of knowledge regarding
adolescent functioning: socio-demographic vulnerability, and cumulative risk. While there is a substantial literature on these two topics, they are re-examined here in a sample of contemporary Australian adolescents. Further, much cumulative risk research pertains to the field of health, or psychology in the case of the stress literature. Fewer studies examine the influence of cumulative risk on antisocial behaviours during adolescence.

The main contribution of the research however is in the combination of these areas of knowledge (socio-demographic vulnerability and cumulative risk), through exploration of the concept of cumulative sociodemographic risk. Very few studies examine the cumulative effects of sociodemographic variables alone, with other process-related variables (such as parenting styles, including attachment, parental relationships and so on) separated out. Combining the subject of interest (sociodemographic risk) with potential mediating and moderating variables in the one index disallows exploration of the ways through in which risk affects outcomes (Grant et al., 2003). In this study I isolate cumulative sociodemographic risk in order to examine how it interacts with risk and protective factors for adolescent antisocial behaviour, thereby furthering understanding of the processes whereby cumulative sociodemographic disadvantage affects antisocial behaviour.

In addition, research on cumulative risk has been criticised due to the lack of a theoretical framework to explain the processes through which risk influences outcomes. In this thesis I test the suitability of GST in accounting for the relationship between cumulative sociodemographic risk and antisocial behaviours. As discussed in Chapter 4 (Page 139), cumulative sociodemographic risk meets the requirements set out by Agnew as necessary for classification as strain. My second contribution to the literature is therefore a test of a moderated mediation GST model, in which the influence of
cumulative sociodemographic risk on antisocial behaviours is mediated by adolescent affective responses. Specifically, the model tests the mediators depressed feelings and life satisfaction. The model also assesses the effects of GST-related moderators of strain, including individual characteristics, social ties and gender.

A final contribution to the literature addressed through this research relates to analytical concerns. Through an in-depth examination of issues related to analysing count data (as explained in Chapter 5) and exploration of the success of numerous statistical approaches to modelling such data (Chapter 7), I explore best practice methods for the analysis of highly skewed count data. In particular, I emphasise the need for an iterative process that incorporates both theory and statistical considerations in analytical decision-making.

6.8.2 Research Questions

This study aims to address three research questions:

1. **How does cumulative sociodemographic risk influence adolescent lives?**
   - Are there differences in research-identified and acknowledged risk and protective factors for poor outcomes according to risk status?

2. **Do predictors of adolescent antisocial behaviour differ according to cumulative sociodemographic risk status?**
   - Within each vulnerability group, which specific risk and promotive/protective factors predict:
     - Absence or presence of antisocial activities during the previous year?
     - Extent or versatility of antisocial behaviours?
3. Can the relationship between cumulative sociodemographic risk and adolescent antisocial behaviour be explained with a General Strain Theory (GST) model?

- Is the influence of cumulative sociodemographic risk mediated through affective responses to this type of strain?
- Do those variables identified by GST as protective against strain reduce or buffer the influence of cumulative sociodemographic risk?

However before addressing each of these research questions, the issues discussed in Chapter 5, in relation to analyses using count data must be resolved. To this end, the next chapter explores the characteristics of the study dataset, and investigates strategies to identify suitable analytic strategies and an optimum distribution to be used in modelling.
CHAPTER 7: MODEL SELECTION

7.1 Introduction

Data collected on antisocial acts often entails methodological challenges in terms of statistical modelling and interpretation, particularly when count outcome measures are used, as outlined in Chapter 5. As discussed in Chapter 6, the outcome variable in this study--antisocial behaviour--was measured using an adapted version of Hawkins and Catalano's instrument where participants reported whether they had taken part in specific antisocial activities during the last year. As is the case where adolescent antisocial behaviours are measured using a count of events, it was anticipated that a majority of participants would report having participated in a small number of antisocial acts, resulting in a highly skewed distribution, and further, that a proportion of participants would report having not participated in any antisocial acts listed at all, therefore resulting in a high zero count in the data. Issues related to modelling such count data, and strategies for analysing it in light of these difficulties, were highlighted in Chapter 5, where I argued that due to violation of assumptions of normality, linear methods of regression are inadequate. Consequently, there is a need to investigate the best way to correctly model the data in this research in order to produce reliable and valid results.

As Hilbe (2011) states “a model that has not undergone an analysis of fit is, statistically speaking, useless” (p. 64). Fit statistics such as AIC and BIC provide useful information about the performance of models, but the best approach to model selection should ideally also include visual inspection of fit-related plots, particularly when the researcher wants to compare models from different families of probability distributions (Gelman et al., 2002; Hardin & Hilbe, 2018). The problem is that methodological difficulties and practical limitations, such as the lack of available software, make the
production of visual plots for non-linear distributions a difficult task for researchers unless analysts have the ability to write their own code. Researchers should however be adept in providing the third crucial element for model selection— theoretical understanding of the concepts being examined. Such theoretical considerations are especially important when selecting models for data containing an excess of zeroes. Selecting the optimal model therefore involves both an inductive process which focusses on specific observations about patterns, regularities and the ways in which the data performs, as well as a deductive process, based on a theory-driven understanding of predicted relationships between variables and outcomes (Jakeman et al., 2006).

In light of these considerations, this chapter steps through the processes undertaken to select an optimal model for exploring the highly skewed adolescent antisocial behaviour count data from this study. It begins by comparing the fit of commonly employed alternate distributions: the Poisson and Negative Binomial models, as well as their zero-inflated mixture model counterparts. Next, it explores a strategy to reduce the skewness of the data by identifying and removing structural zeroes through the use of classification trees. Finally, the utility of a hurdle model is examined. Wherever possible, plots of residuals are provided to illustrate model fit.

During this modelling exercise, results showed that the negative binomial (NBRM) and zero-inflated negative binomial (ZINB) regression models provided the best fit for the data. While statistically fit was slightly better for the ZINB, theoretical considerations suggested that the NBRM was the optimal choice for this specific dataset. The fit of the NBRM was improved both when some zero values were removed from the dataset following a classification tree analysis, and also when antisocial behaviours were examined in a hurdle model that assessed two separate facets of the outcome variable — presence of antisocial behaviour, and extent of antisocial
behaviours. I have used the results reported in this chapter to construct a moderated mediation model based on a General Strain Theory framework, to explore the influence of cumulative sociodemographic risk on adolescent antisocial behaviours. These analyses are reported in the Chapter 9.

7.2 Modelling Count Data

The benefits, as well as disadvantages of alternative distributions for modelling count data were discussed extensively in Chapter 5. In summary, Chapter 5 concluded that Poisson distributions offer an improved fit for highly skewed count data, but negative binomial models are useful where a Poisson estimation is unable to be used due to overdispersion; that is, where the variance is greater than the mean. In addition, when the number of zeroes in a dataset is very high, a zero-inflated model provides a good solution, but the selection of a zero-inflated model requires sound theoretical reasoning which suggests dual sources of zero values. With these considerations in mind, the optimal model for this study’s data was determined through investigation of statistical fit, as well as through theoretical reasoning.

The distribution of the response variable in this research (number of antisocial behaviours, ranging from a minimum of 0 to a maximum of 24) reflected many of the issues commonly found with count data outcomes. It was notably skewed, with youths more likely to report lower levels of antisocial activity than high levels (Figure 7.1). Overdispersion was also apparent with the antisocial behaviour variable having a variance of 18.65 and mean of 2.40, which suggested that a negative binomial model might be the most appropriate way to model the data. However, in addition, a large proportion of adolescents reported a complete absence of antisocial activity during the previous year, which indicated that a zero-inflated model might be necessary to
compensate for these excess zeroes. In fact, 256 adolescents (or 48.9% of the sample) reported no antisocial behaviours during the previous year. Based on these considerations there was evidently a need to investigate the optimal distribution for modelling the data.

![Distribution of antisocial behaviours during the previous year](image)

**Figure 7.1** Distribution of antisocial behaviours during the previous year

### 7.3 Statistical Assessment of Model Fit

When selecting between different types of models, the comparison of statistical criteria, including the Bayesian Information Criteria (BIC), Akaike Information criteria (AIC), and Vuong's closeness test are usually used to guide optimal model selection.

The AIC and BIC are comparative information criterion tests which do not dictate a cut-point at which models are accurate or not accurate, but rather can be used as a comparison between the success of different models. In both the AIC and BIC tests, smaller AIC or BIC values indicate a better fit of the model to the data (Tabachnick & Fidell, 2007).
The AIC, first developed by Akaike (1974), is a test of the degree of parsimony in a model, for models that utilise maximum likelihood estimates (Tabachnick & Fidell, 2007), such as Poisson regressions. The AIC test uses the formula:

\[ \text{AIC} = -2L + 2k = -2(L-k) \]

where \( L \) is the model log-likelihood and \( k \) is the number of predictors (Hilbe, 2011).

The BIC, also commonly referred to as the Schwartz Criterion, was first developed by Gideon Schwarz in 1978, and is based (as its name suggests) on Bayesian probability concepts (Hilbe, 2011), meaning that it utilises the Bayes factor to provide a measure of the likelihood of observing a set of data under one model when contrasted to another model (Bollen et al., 2014). The BIC test uses the statistic:

\[ \text{BIC} = -2L + k\ln(n) \]

where \( k \) is the number of predictors (including the intercept) (Hilbe, 2011). The benefit of the BIC is that it does not require specification of priors (Bollen et al., 2014); that is, there is no need to rely on prior probabilities that depend on external information.

Dziak, Coffman, Lanza and Li (2012) propose that preference between the AIC and the BIC as a test of fit may be a matter of whether sensitivity, defined as "having enough parameters to adequately model the relationships among variables in the population" (p2), or specificity, defined as "not overfitting a model or suggesting nonexistent relationships" (p2) is more important. The AIC is a more sensitive test that limits Type II errors (false negatives) but that tends to overfit (Dziak et al., 2012). These characteristics make it most useful for models that are focussed on prediction. In contrast, the BIC is a more specific test which identifies the most parsimonious model and limits Type I errors (false positives), but has a tendency to underfit (Dziak et al., 2012). The BIC is therefore a good test choice for models used in hypothesis testing when Type I errors (an incorrect statement) are more crucial to avoid than Type II
errors, and when too large a model is undesirable. These analytic properties are important should the AIC and BIC values indicate a preference for different models. Given the exploratory, rather than predictive nature of this research, specificity, and therefore the need to avoid identifying non-existent relationships, is a priority over sensitivity, which suggests that the BIC would be a more suitable measure of model fit than AIC.

Vuong’s closeness test uses the Kullback-Leibler Information Criterion to measure the fit of tested models (Vuong, 1989), using the test formula:

$$V = \sqrt{n\bar{u}}$$

$$\text{SD}(u)$$

where $u$ is the log ratio of the sum of probabilities, $\bar{u}$ is the mean of $u$, and $\text{SD}(u)$ is the standard deviation of $u$ (Hilbe, 2011). The basis of Vuong's test is to assess whether two models are equally close to the true model. Should the null hypothesis be rejected (that is, should one model be found significantly closer to the true model than the other), then the 'best' model is selected according to specific criteria (Pesaran & Weeks, 2001). Vuong’s test allows for the comparison of non-nested models in order to compare performance. Hilbe states that Vuong's test is the standard fit test for ZINB models, as it compares the fit of the ZINB model to another model, and determines whether the difference is statistically significant.

While statistical assessments of model fit are useful for determining the optimal model to use for analyses, ideally model selection should be guided by further visual inspection of residual plots. However, traditional residual plots (such as deviance residuals and Pearson’s residuals) are not suitable for assessing the fit of distributions such as negative binomials (Mi et al., 2015). Without the ability to write original code, producing suitable diagnostic plots for NBRM and ZINB distributions is very difficult.
These limitations mean that despite the desire to compare model fit visually, this research was limited to exploring plots available within current statistical software. Therefore, I present only visual plots for NBRM (and not ZINB) analyses.

7.3.1 Model Fit across Alternate Distributions

In order to investigate the best fitting model for the study data, the countfit command developed by Long and Freese (UCLA: Statistical Consulting Group, n.d.) was used in Stata (version 13) to compare the performance of four different models. Countfit compares residuals for a given response variable and set of predictors according to a Poisson (PRM), zero-inflated Poisson (ZIP), negative binomial (NBRM) and zero-inflated negative binomial model (ZINB). As it is developed for count variables which are frequently skewed, with an excess of zero values, countfit provides a comparison of performance that focuses on count outcome values of 0 to 9 (cases with outcome values of 10 or more are not considered in the analysis).

All variables to be used in the analyses – antisocial behaviour, cumulative sociodemographic risk, self-control, prosocial belief, empathy, self-concept (self-esteem and self-worth combined), life satisfaction, depression, positive parenting, parental monitoring, social acceptance, school membership and antisocial behaviour of friends -- were entered into the model. It was necessary to combine self-esteem and self-worth into positive self-concept, and parental knowledge, availability and attachment into positive parenting due to multicollinearity resulting from high correlations between these variables, which prevented a full model (with all variables entered singularly) from converging.

Countfit results suggested that of the four distributions, the negative binomial and zero-inflated negative binomial models offered the best fit. The countfit test provides a
comparison plot of the residuals (observed - predicted values) for count values of zero to nine on the antisocial behaviour response variable according to each model (see Figure 7.2). Lines closest to zero on the figure represent best-fitting models, with the least deviation. Both the PRM and ZIP models were outperformed by the negative binomial distributions, particularly at lower values. The ZINB model appears the most accurate predictor at values of zero and one, despite underpredicting at these values. While the NBRM underpredicts at values of zero, and overpredicts at values of one, it is the most accurate for values of two or greater.

Figure 7.2 Residuals according to model for count score values of zero to nine

These findings were confirmed through examination of fit statistics, as provided in Table 7.1. As previously stated, lower AIC and BIC values, and higher log-likelihoods, indicate a better fit of that model to the data. In this data set, the negative binomial
models performed better than the Poisson models. Fit statistics suggested that the ZINB model provided the best fit to the data according to all measures of fit, producing the lowest AIC (1444.50) and BIC (1558.30), and the highest log likelihood (-695.25). Nonetheless, the difference in values for NBRM and ZINB models is minor, particularly when comparing BIC scores. As the NBRM and ZINB models clearly provided a better fit to the data, only these models were explored further when examining model fit.

Table 7.1
Summary of model fit statistics

<table>
<thead>
<tr>
<th></th>
<th>Log likelihood</th>
<th>BIC</th>
<th>AIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRM</td>
<td>-865.08</td>
<td>1810.96</td>
<td>1756.17</td>
</tr>
<tr>
<td>NBRM</td>
<td>-752.78</td>
<td>1592.56</td>
<td>1533.56</td>
</tr>
<tr>
<td>ZIP</td>
<td>-771.67</td>
<td>1704.93</td>
<td>1595.35</td>
</tr>
<tr>
<td>ZINB</td>
<td>-695.25</td>
<td>1558.30</td>
<td>1444.50</td>
</tr>
</tbody>
</table>

A more in-depth examination of model performance is provided in Table 7.2, which provides the full count by count comparison of the NBRM and ZINB models for outcome values of 0 to 9. In addition, it provides the Pearson statistic for each count value (calculated in a given row as \(\frac{N(|\text{diff}|^2)}{\text{Predicted}}\)), which shows the contribution of that count value towards the Pearson Chi-Square statistic comparing actual values and those predicted by the model (UCLA: Statistical Consulting Group, n.d.). The sum Pearson statistic provides an overall indication of how close the predicted and actual proportions of each model are. As demonstrated in Table 7.2, summed absolute differences between actual and predicted values were very close for both the NBRM (0.108) and ZINB (0.090) models, however the NBRM model was more accurate in prediction for some count values greater than 1 (values of 2, 3, 5 and 9). The smaller
sum of the Pearson statistic seen for the ZINB model ($\chi^2 = 9.575$) suggested it had a marginally better overall fit when compared to the NBRM ($\chi^2 = 11.769$).

Findings from the countfit analysis of values to 9 therefore indicated that the negative binomial distribution, and its zero-inflated version, outperformed the Poisson distribution in accurately modelling the study data. The ZINB model compensated for the increased number of zero and one values in the count outcome, while the NBRM performed better for some values between 2 and 9. While the degree of improved accuracy overall was not extensive, the ZINB model provided the best overall fit to the data, with a significantly better fit than the NBRM, confirmed by a significant Vuong’s test ($LR = 6.86, p < .001$). Based on these statistical results only, the ZINB model was demonstrated to be the optimal choice for the data, although the NBRM performed at a standard which was still acceptable in comparison. Statistical fit is however, only one
aspect of model selection. Equally important are theoretical considerations in regard to how the data should be modelled.

7.4 Theoretical and Practical Considerations

Measures of statistical fit provide crucial information to guide the choice of models, but a further essential consideration when selecting the optimal distribution for modelling is related to the theoretical understanding of relationships within the data. Statistical models are usually created using a hypothetico-deductive approach, where predictive hypotheses are based on theoretical understandings (Overmars et al., 2007). This is particularly relevant when data contains an excess of zeroes, as the theoretical source of those zeroes has implications for distribution selection. Further, practical implications, such as the ability to run desired analyses with available software, and ease of interpretation, can be affected by model choice. For example, examining mediation processes using a ZINB model requires an approach that goes beyond standard approaches that are achievable using commonly employed software programs (Wang & Albert, 2012).

7.4.1 Identifying the Source of Excess Zeroes

While both the NBRM and ZINB distributions are useful for modelling data containing an excess of zeroes, inherent in the ways that these distributions do this are assumptions underlying the source of the zeroes. Therefore, identifying the theoretical sources of excess zeroes in a dataset is crucial when determining which statistical method is best to compensate for this problem. However, while recommendations for analysis based on sources of zeroes can be found throughout the research literature, there are no easily accessible and clearly defined guidelines.
As discussed in Chapter 5, zeroes in data sets can theoretically arise from two sources: "structural" zeroes, and "sampling" zeroes. Structural zeroes are those that are inevitable— they are a consequence of the structure of the data itself and represent participants who would always score zero on the response measure. In contrast, sampling zeroes are random, occur by chance, and reflect sampling variability (He et al., 2015). An example of a structural zero is data collected on risky sexual behaviours, where some participants have no partner or practise celibacy and are therefore unable to participate in such behaviours. Others with partners make a choice not to engage in risky behaviours, producing sampling zeroes (Hu et al., 2011). In a data set that contains an excess of zeroes, determining their source is an important step in developing an analytical strategy.

ZINB distributions assume dual sources of zero values. One source reflects an absence of a variable or behaviour that can be modelled continuously, and the second contains structural zeroes—null values that lack the ability to be non-zero (Atkins & Gallop, 2007; Lord et al., 2005). Treating a count outcome as a continuous variable for data that contains both structural and sampling zeroes means that the model fails to differentiate between two different sources (He et al., 2015).

However, in instances where zeroes within the data are not thought to have arisen from two separate sources but are only sampling zeroes, zero-inflated models are theoretically an incorrect choice, and a negative binomial distribution is often sufficient to model the abundance of zeroes (Rose et al., 2006; Warton, 2005). Further, being a simpler form of model, estimation and interpretation is easier for a NBRM than it is for a ZINB model (Allison, 2012).
7.4.2 Sources of Excess Zeroes in the Dataset

Participants in this research frequently reported an absence of any antisocial activity during the previous year. Given the theoretical underpinnings that General Strain Theory and cumulative risk bring to the research, the ‘cause’ of this lack of antisocial behaviour would be an absence of the experience of cumulative disadvantage and/or associated feelings of strain. There is no strong rationale to suggest that zeroes are from two different sources. There are no sample characteristics that would prohibit antisocial participation, because participants were recruited from the general population and there was no indication that they were exposed to circumstances during the previous year, such as youth detention or serious illness, that would have limited the ability to behave antisocially.

An argument could be made that an additional reason for the absence of antisocial behaviour during the previous year might be due to the sampling period failing to capture antisocial behaviour that did occur at other times. For example, in research exploring alcohol use during the previous month, Rose, Martin, Wannemuehler, and Plikaytis (2006) differentiated between zero alcohol use due to the participant choosing not to consume alcohol during that period (sampling zeroes), but who might consume alcohol at other times, and zero alcohol use reported by participants who never drink (structural zeroes). Thus, it could be argued that a distinction exists between youths who did not behave antisocially during the sampling period, although they had in the past and would possibly do so again in the future, and youths who never had, and never would behave antisocially. In this way the first group would be sampling zeroes, and the second structural zeroes. One year is however a better indicator of normal behaviour patterns than a one-month period, and it is likely that an antisocial adolescent would have engaged in at least one antisocial act during the previous 12 months.
While an argument could be made for the use of a zero-inflated model, there really is not a strong theoretical rationale to suggest two distinct sources of zeroes in the data. The NBRM is therefore the more theoretically sound model, and fit statistics suggest it is only marginally worse than the ZINB. With the NBRM being the optimal distribution for this dataset, strategies for improving the fit of this model were explored.

### 7.5 Improving NBRM model fit

In an attempt to improve the fit of the NBRM model, two strategies were employed—reducing the number of zero values, and utilising a hurdle model.

#### 7.5.1 Classification Tree to Remove ‘True’ Zeroes

It was theorised that reducing the number of zeroes in the dataset would improve the fit of the NBRM model by reducing the skewed nature of the response variable. To do this, a classification tree analysis was conducted in R to identify participants with shared sets of characteristics, who showed no participation in any antisocial behaviours. While not entirely the same as structural zeroes which reflect an inability to be a value other than zero, these participants could be argued to be ‘true zeroes’—representing a population who due to the nature of their shared characteristics that were never likely to act antisocially. Once removed from the dataset, fit statistics were re-calculated for the model, to determine whether it had been improved.

Classification trees work to explain the variation in a specific variable by splitting data repeatedly according to values of explanatory variables so as to best separate the data into homogeneous groups (DeÁth & Fabricius, 2000). While they feature frequently in ecological research (Edwards et al., 2006), their use in the criminological field has often been in relation to risk assessment, with researchers such as Nasridinov,
Ihm and Park (2013) proposing that when employed as a data mining technique, they would enable law enforcement agencies to identify characteristics common to specific crime types, and ultimately enable the prediction of future crime. Decision tree-based classification models have been used to predict recidivism amongst homicide offenders (Neuilly et al., 2011), as well as violent reoffending by both prisoners (Liu et al., 2011) and offenders on probation (Stalans et al., 2004). Other research has used classification trees to identify characteristics of specific offender typologies, such as risk and protective factors of recidivist juvenile offenders (Ortega-Campos et al., 2016) and factors which predict internalizing and externalizing behaviour problems amongst sexually abused girls (Hebert et al., 2006). Further criminology-based applications include Taxman and Kitsantas’ (2009) study, where classification trees were used to identify characteristics related to the availability and capacity of substance abuse programs in correctional settings.

In this analysis the classification tree was used to predict the binary outcome of no antisocial behaviour/some antisocial behaviour during the previous year. The classification tree identifies a cut score on the risk/protective factor variable that best distinguishes between these categories. This process is then repeated, several times over, according to the most discriminating variable for each cut. The result represented graphically is a tree-like figure with each node listing the number of participants in each of the binary categories (not antisocial/antisocial) within the group, thereby allowing for the identification of groups of participants reporting no antisocial acts, where the members of these groups share patterns of characteristics.

When utilising classification trees it is necessary to nominate a misclassification cost (Loh, 2011), that is, a penalty that weights the importance of avoiding false negative classifications. In this dataset it was important not to incorrectly identify
someone who was antisocial as someone who was not. Incorrect identification of such cases might affect the accuracy of later analyses and reduce the richness of the data due to smaller sample sizes, should these cases not reflect true zeroes, but rather individuals actually acting antisocially. While several levels of penalty were trialled, the classification tree used to identify non-antisocial cases for removal in this dataset was a penalty of 20. Not only was this penalty successful in identifying the most zeroes in the data set, but the patterns of characteristics which identified true zeroes did not change as the penalty was increased beyond 20. The final classification tree, with a penalty of 20 times for false negative classifications, is shown in Figure 7.3. Note that all variables used in the classification tree analysis were standardised, and therefore have a mean of zero and standard deviation of one.

![Classification tree](image)

**Figure 7.3.** Classification tree to identify ‘true’ zeroes with a 20 times false negative penalty
As demonstrated in the classification tree, two groups of participants (found on leaves 3 and 5) shared characteristics which made them never likely to have engaged in antisocial behaviours. Both groups reported lower than average levels of antisocial behaviours by peers ($< -0.71$). A group of 78 cases with high levels of parental monitoring ($\geq 0.86$) were identified as those who were not participating in antisocial activities. A further 45 cases with lower than average antisocial peers, but who lacked strong parental monitoring ($< 0.86$) were identified as not antisocial when they had higher than mean levels of life satisfaction ($\geq 0.38$) and self-control ($\geq 0.35$). In total the classification tree for the entire sample, when incorporating a penalty that deemed it 20 times worse to incorrectly categorise a participant as not antisocial when they were, than as antisocial when they were not, identified 123 cases that could be removed from the sample due to sharing characteristics that the data set indicates are related to not being antisocial.

The cases identified by the classification tree, considered to be true zeroes, were removed from the total dataset, so that variables influencing possible adolescent antisocial behaviour could be examined with participants excluded who would never commit any antisocial acts. The fit of the data was compared to the fit before removal, to determine the improvements gained through eliminating these zeroes (Table 7.3).

<table>
<thead>
<tr>
<th></th>
<th>Before removal of true zeroes</th>
<th>After removal of true zeroes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NBRM</td>
<td>ZINB</td>
</tr>
<tr>
<td>AIC</td>
<td>1533.6</td>
<td>1444.5</td>
</tr>
<tr>
<td>BIC</td>
<td>1592.56</td>
<td>1558.30</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-752.8</td>
<td>-695.3</td>
</tr>
</tbody>
</table>
As shown in Table 7.3, removal of true zeroes flagged by the classification tree did improve the fit of the model somewhat. In fact, both the AIC and BIC values suggest that the NBRM after removal of the true zeroes provided a better fit to the data than the ZINB regression which used the full data set. Given the limitations in using ZINB regression due to practical issues (such as an inability to run moderated mediation models with a ZINB distribution), and in light of the lack of strong theoretical backing for a ZINB model, removing these cases identified as ‘true’ zeroes offers an opportunity to empirically improve the fit of a NBRM model.

To further examine the improvement to model fit as a consequence of removing ‘true’ zeroes, Figure 7.4 presents residual and QQ plots of the outcome variable (adolescent antisocial behaviour) both before and after removal, for the NBRM. These plots were not possible to produce for the ZINB model due to software limitations.

As seen in Figure 7.4, removal of true zeroes results in a small improvement in model fit. In the residual plot, the strong diagonal lines on the left show that despite some zeroes being removed, enough remain to still affect normality of the data, for values of zero as well as low values on the response variable. In addition, the Quantile-quantile (QQ) plot demonstrates that skewness of the data is still problematic -- while higher values of the response variable are now fitted more adequately by the model, the steeper gradient for low values when compared to the 45º y=x line show that overdispersion still exists to a degree that is possibly worse than the initial model. This underfitting in the tail of the distribution affected by the excess zeroes would continue to affect the accuracy of analyses fitting the NBRM to the data. Overall, while the fit of the NBRM has been improved by removing some ‘true’ zeroes, the ability of the model to cope with the remaining excess zeroes is still dubious and the post-classification tree
model is not considered sufficiently improved to justify the removal of 123 cases identified as ‘true’ zeroes.

Figure 7.4. Fit plots of antisocial behaviour before and after removal of true zeroes identified by classification tree
7.5.2 Hurdle Model

A second strategy for improving the fit of the NBRM was to consider a hurdle model, which offers the ability to separate out the excess zeroes and model them separately. Drawing on elements of both truncation and mixture models, the hurdle model is a two-part model. The first part is a binary outcome which determines whether the observation crosses the threshold. In our case the threshold is the existence of some antisocial behaviour. The second part is a truncated count model where only those observations which cross the threshold are included (Cameron & Trivedi, 1998; McDowell, 2003). For an excess zero model of antisocial behaviour, the threshold for inclusion (the hurdle) can be reported engagement in at least one form of antisocial behaviour. One benefit of a hurdle model is the ability to estimate parameters separately for each part of the model, which is not possible in mixture models such as ZINB and ZIP (McDowell, 2003). Hurdle models can therefore be easier to interpret. In fact, Martin and colleagues (2005) suggest that in cases of uncertainty around sources of zeroes, the best strategy might be to use a truncated model that ignores all zeroes entirely and use models that count part of the data only.

The hurdle model was run using the initial dataset, without the true zeroes identified by the classification tree removed. A binomial logit model was used to explore absence or presence of antisocial activity during the previous year, with the data coded as 0 or 1. The truncated part of the model used data where cases reported involvement in 1 or more antisocial acts during the sample period (that is, no zero values were included). The truncated model was analysed using a negative binomial model due to the large proportion of low values within the data which meant that even without zero values the data was still highly skewed. As demonstrated in Table 7.4, the NBRM hurdle model showed a better fit to the data than the initial full NBRM analysis,
with an AIC value that indicated only a marginally poorer fit than the initial full ZINB model (Software limitations meant the BIC was unable to be calculated for the full hurdle model). These findings suggest that a truncated NBRM may be a useful analytical strategy, provided the constructs of absence/presence of antisocial behaviour and extent of antisocial behaviour are valid constructs to explore separately.

Table 7.4.
*Improved fit of hurdle model*

<table>
<thead>
<tr>
<th></th>
<th>Initial full models</th>
<th>Hurdle model truncated at 0 NBRM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NBRM</td>
<td>ZINB</td>
</tr>
<tr>
<td>AIC</td>
<td>1533.6</td>
<td>1444.5</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-752.8</td>
<td>-695.3</td>
</tr>
</tbody>
</table>

Figure 7.5 provides fit plots of the truncated section of the Hurdle NBRM (that is, for those youths engaging in some antisocial behaviour during the previous year), in comparison to the initial NBRM run with the full dataset. The improvement to fit when zeroes are not included is illustrated in the residual plot, although the effect of high proportions of other low values (for example 1 antisocial act during the previous year) is still evident. The QQ plot showed better performance for lower values, (not unexpected due to the removal of zero values in the truncated dataset), while the fit of higher values is comparable. These results suggest that where possible, the use of a hurdle NBRM would be advantageous.
Model selection is crucial to ensure that results obtained from analyses are relevant and accurate. While no model will ever fit a data set perfectly, exploring the fit of selected models is important to ensure there is no alternate model which would fit better. The data used in this research was clearly not normally distributed in regard to
the count outcome variable of antisocial behaviour due to a skewed distribution with an abundance of zero values. It was therefore necessary to carefully consider the appropriate model for this data to ensure results were robust and meaningful.

An examination of statistical fit, conducted using the Countfit command in Stata, compared the performance of four different models -- PRM, ZIP, NBRM and ZINB. The negative binomial distribution, and its zero-inflated version, provided a superior fit to the data in comparison to the Poisson and ZIP models. Overall, results of 3 tests of fit (AIC, BIC, and Vuong's closeness test), as well as analysis of Pearson's $\chi^2$, showed a preference for the ZINB as the best fitting model. However the NBRM performed adequately, with only a slightly poorer fit.

There are other considerations in the choice between NBRM and ZINB. Limitations in available statistical software when attempting to test moderated mediation models (the model to be used for one key analysis), as well as the ability to produce plots of model fit, and greater ease of interpreting results, favoured the choice of an NBRM over the ZINB model. With no compelling reason to suspect two separate sources of zero values in the data, the theoretical framework of the study also suggested a NBRM would be the more suitable model to use. While the fit of the NBRM was improved slightly following removal of ‘true’ zeroes, identified through the use of a classification tree, the improvement was not deemed sufficient for reducing the dataset by removing these cases. A second strategy for improving fit was through the use of a hurdle model with the truncated part modelled using a negative binomial distribution. This strategy offered some improvement over the initial NBRM model and will be employed where suitable in future analyses.

With the adequacy of model fit examined to the greatest extent possible in this thesis, the following two chapters are guided by results in this chapter when exploring
cumulative sociodemographic vulnerability. Chapter 8 examines the influence of vulnerability on the presence of risk and protective factors for antisocial behaviours, as well as participation in antisocial activities themselves through the use of ANOVA. In addition, a hurdle model (using a truncated NBRM) explores differences in predictors of both absence or presence, as well as extent of antisocial behaviour during the previous year, for at-risk, compared to not at-risk adolescents. Chapter 9 uses a GST framework to test a moderated mediation model of cumulative risk and its influence on antisocial participation. This analysis is somewhat more complicated given the need to use an NBRM to test processes of moderated mediation. Accordingly, it uses structural equation modelling (SEM) and utilises the full range of the antisocial behaviours outcome variable, including all zero values.
CHAPTER 8: THE IMPACT OF SOCIODEMOGRAPHIC VULNERABILITY DURING ADOLESCENCE

8.1 Introduction

This chapter examines the effects of sociodemographic vulnerability, and particularly its influence on adolescent antisocial behaviours. I present results from analyses exploring differences in risk and protective factors, as well as antisocial involvement for adolescents who are vulnerable and not vulnerable, due to cumulative sociodemographic risk. The aim of these analyses was to determine whether (and what) differences exist for adolescents, as a consequence of their cumulative sociodemographic risk status.

The chapter begins with an overview of the general characteristics of the dataset as a whole, including means scores and standard deviations of risk and protective factor variables as well as correlations between variables of interest. Group differences, based on cumulative risk status, are then examined in a variety of ways. Firstly, I explore differences in risk, promotive and protective factors, using a series of $t$-tests. Identified differences are explored further according to gender as well as vulnerability, using one-way ANOVA. Results from these analyses provide insight into how cumulative sociodemographic risk affects individual attributes as well as proximal processes related to antisocial behaviour for male and female adolescents.

Next, I explore group differences in types of antisocial involvement using antisocial categories identified by Principal Components Analysis (PCA). Determining differences in types of antisocial behaviours youths are likely to engage in based on cumulative sociodemographic risk status illuminates one avenue through which risk affects adolescent antisocial involvement.
Finally, I examine risk-based predictors of antisocial activity in the previous year. I use logistic regression to determine differences in predictors of any antisocial involvement (as compared to absence of involvement) for adolescents who are vulnerable due to cumulative sociodemographic risk, compared to those who are not vulnerable. I repeat this comparison using truncated regression to examine differences in the extent of antisocial involvement for these two groups. This exploration of risk-based predictors highlights the influence of cumulative sociodemographic risk as a moderator of antisocial behaviours.

In sum, these analyses suggest that sociodemographic risk influences adolescent life in a variety of ways. Differences were found in the presence of risk and protective factors for antisocial involvement identified from the literature. Adolescents who experienced cumulative sociodemographic disadvantage had higher mean levels of risks, and lower mean levels of protection. In addition, vulnerable adolescents were more likely to engage in all categories of antisocial acts than not vulnerable youths. While predictors of the absence or presence of antisocial involvement differed according to adolescents’ sociodemographic backgrounds, no similar differences were found when examining predictors of how extensive these antisocial behaviours were.

Some of these findings are not surprising, despite cumulative sociodemographic risk as a concept having been somewhat neglected in Criminological research. Disadvantaged adolescents have often been found to exhibit more risk factors, fewer protective factors, and to engage in more antisocial activities across a broad spectrum of delinquent behaviours than non-disadvantaged youth (McBride Murry et al., 2011; Piotrowska et al., 2015, Evans et al., 2013; Stoddard et al., 2012). What this chapter highlights however, is the pervasive impact of cumulative sociodemographic risk on the adolescent experience. Cumulative risk is shown to influence the presence of individual
characteristics that increase the likelihood of poor outcomes, and to affect proximal processes related to engagement in antisocial behaviours. When the extent of cumulative risk is included as a predictor of the absence or presence of antisocial involvement amongst at-risk adolescents, it has a stronger influence than all other risk and protective factors, with each 1 point increase in cumulative risk scores corresponding to an 8.4 times greater likelihood of engaging in some kind of antisocial activity. Such findings underline the importance of examining cumulative sociodemographic risk as a distinct construct (as argued in Chapter 3, Page 94), rather than using cumulative indices of risk that also include proximal processes/mediating factors such as parenting practices or social relationships.

8.2 Whole Sample Descriptive Statistics

There were 524 cases in the final study sample. Table 8.1 presents the descriptive statistics of this whole sample for predictor variables and the outcome variable of antisocial behaviour during the previous year. In general, mean levels of most variables (self-control, prosocial beliefs, empathy, self-esteem and worth, life satisfaction) were moderately high to high. The mean level of positive parenting as a combined measure was also high, although when considered separately the mean level of parental attachment was considerably lower than parental knowledge and availability, as well as parental monitoring. It is not surprising however, that as youths move into and through adolescence and gain autonomy, bonds with parents reduce in strength, while other parent-child relationships that might be characterised as more ‘distanced’ become stronger. The mean score for depressed feelings (23.12) was higher than anticipated, given that a score of 16 or higher on the CES-D indicates depressive symptomology (Roberts et al., 1990). In fact, according to this cut-score, around 71% of the sample
would be recommended to seek follow up, compared to 46% of boys and 58.6% of girls in Roberts’ and colleagues US study (although Roberts et al.’s study averaged prevalence over 4 separate trials, meaning that rates reflect depressed feelings over a 4 month period, rather than a 1 month period as in this study). Low mean rates of peer antisocial behaviours were reported, and even lower rates of antisocial behaviours of self. This low mean score of respondent’s own antisocial behaviour ($M = 2.40$) demonstrates the extreme skewness of this distribution, given that the range is from 0 to 23.

Table 8.1.
*Means and standard deviations* - Whole sample.

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Max</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
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<td>26</td>
<td>21.36</td>
<td>2.50</td>
</tr>
<tr>
<td>Prosocial beliefs</td>
<td>16</td>
<td>64</td>
<td>52.10</td>
<td>7.16</td>
</tr>
<tr>
<td>Empathy</td>
<td>42</td>
<td>100</td>
<td>73.35</td>
<td>9.78</td>
</tr>
<tr>
<td>Parental knowledge</td>
<td>8</td>
<td>32</td>
<td>22.91</td>
<td>5.42</td>
</tr>
<tr>
<td>Parental availability</td>
<td>8</td>
<td>40</td>
<td>33.22</td>
<td>6.44</td>
</tr>
<tr>
<td>Parental attachment</td>
<td>14</td>
<td>70</td>
<td>46.43</td>
<td>11.18</td>
</tr>
<tr>
<td>Positive parenting$^1$</td>
<td>38</td>
<td>142</td>
<td>102.55</td>
<td>19.52</td>
</tr>
<tr>
<td>Parental monitoring</td>
<td>3</td>
<td>12</td>
<td>9.66</td>
<td>2.14</td>
</tr>
<tr>
<td>Social acceptance</td>
<td>6</td>
<td>24</td>
<td>15.39</td>
<td>3.60</td>
</tr>
<tr>
<td>School membership $^2$</td>
<td>25</td>
<td>90</td>
<td>66.03</td>
<td>13.20</td>
</tr>
<tr>
<td>Peer antisocial behaviour</td>
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<td>24</td>
<td>4.76</td>
<td>6.02</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>10</td>
<td>40</td>
<td>27.54</td>
<td>5.51</td>
</tr>
<tr>
<td>Self-worth</td>
<td>5</td>
<td>20</td>
<td>14.14</td>
<td>3.51</td>
</tr>
<tr>
<td>Self-liking$^3$</td>
<td>17</td>
<td>60</td>
<td>41.68</td>
<td>8.56</td>
</tr>
<tr>
<td>Life satisfaction</td>
<td>6</td>
<td>35</td>
<td>25.44</td>
<td>5.07</td>
</tr>
<tr>
<td>Depressed feelings</td>
<td>0</td>
<td>56</td>
<td>23.12</td>
<td>11.79</td>
</tr>
<tr>
<td>Antisocial behaviour (self)</td>
<td>0</td>
<td>23</td>
<td>2.40</td>
<td>4.32</td>
</tr>
</tbody>
</table>

$N = 524$; $^1$Positive parenting = parental knowledge, availability and attachment combined; $^2$ $N = 500$; $^3$ Self-liking= self-esteem and self-worth combined
8.2.1 Correlations between Variables

Associations between variables were assessed through correlations (Table 8.2). Self-esteem and self-worth were combined in the correlation matrix to form self-liking, as very few differences in correlation strength and significance were found for these variables when their associations with other variables were explored separately. Overall, the correlation matrix showed no unexpected patterns of relationships. Amongst predictor variables, depressed feelings were strongly associated with negative self-liking ($r = -0.73$), and moderate to strong relationships were observed between depressed feelings, life satisfaction, positive parenting and school membership ($r$ ranging from -0.41 to .62).

Not surprisingly, self-reported antisocial behaviours were strongly correlated with antisocial behaviours of peers ($r = 0.73$). Self-control ($r = -0.44$) and prosocial beliefs ($r = -0.57$) both had moderately strong negative relationships with antisocial acts (as well as with peer antisocial behaviours: $r = -0.40$ and -0.47 respectively). Social influences such as school membership ($r = -0.31$) and positive parenting ($r = -0.28$) had a moderately weak negative association with antisocial behaviours, as did empathy ($r = -0.26$) and life satisfaction ($r = -0.28$), whereas parental monitoring had a moderately strong negative relationship ($r = -0.47$). While significant, only a weak relationship between social acceptance and antisocial behaviours was found ($r = 0.15$), but this association was positive, suggesting that adolescents engaging in more antisocial acts tend to think they are more socially accepted.

A moderately strong positive relationship was found between cumulative risk and both antisocial behaviours ($r = 0.50$) and peer antisocial behaviour ($r = 0.49$), demonstrating that committing delinquent acts, or having friends who did, was more likely to occur as sociodemographic risk increased. In addition, a weak to moderate
negative relationship with cumulative risk indicated that as levels of risk increased, levels of the personal attributes self-control \((r = - .30)\), prosocial beliefs \((r = - .25)\) and empathy \((r = - .27)\), as well as overall life satisfaction \((r = - .23)\) decreased. Although significant, the negative relationships between cumulative risk and positive parenting \((r = - .13)\), parental monitoring \((r = - .20)\) and school membership \((r = - .17)\) were weak.

<table>
<thead>
<tr>
<th>Table 8.2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correlations between key variables</strong></td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>PB</td>
</tr>
<tr>
<td>Self-control (SC)</td>
<td>-</td>
</tr>
<tr>
<td>Prosocial Beliefs (PB)</td>
<td>.46*</td>
</tr>
<tr>
<td>Empathy (E)</td>
<td>.37*</td>
</tr>
<tr>
<td>Positive parenting (P)</td>
<td>.30*</td>
</tr>
<tr>
<td>Parental monitor (PM)</td>
<td>.32*</td>
</tr>
<tr>
<td>Self-liking (SL)</td>
<td>.19*</td>
</tr>
<tr>
<td>Life satisfaction (LS)</td>
<td>.30*</td>
</tr>
<tr>
<td>Depressed feelings (D)</td>
<td>-20*</td>
</tr>
<tr>
<td>School m ‘ship (SM)</td>
<td>.27*</td>
</tr>
<tr>
<td>Social acceptance (SA)</td>
<td>.03</td>
</tr>
<tr>
<td>Antisocial peers (AP)</td>
<td>-.40*</td>
</tr>
<tr>
<td>Antisocial behav (AB)</td>
<td>-.44*</td>
</tr>
<tr>
<td>Cumulative risk (R)</td>
<td>-.30*</td>
</tr>
</tbody>
</table>

*Note. * \(p < .01\); † \(p < .05\)  

8.3 The Impact of Sociodemographic Vulnerability on Adolescents

A key aim of this research was to examine the influence of sociodemographic vulnerability on adolescents, and specifically the differences that exist between adolescents categorised as vulnerable due to cumulative socio-demographic risk, and those identified as not vulnerable. This section presents an overview of these group differences. First, differences in risk, promotive and protective factors within risk groups were identified. Next, the effect of sociodemographic risk on adolescent
involvement in antisocial activities was explored, with group-based differences across a variety of antisocial acts examined in depth. Finally, predictors of antisocial behaviours were compared across vulnerable and not vulnerable adolescents, to determine the strongest influences on antisocial involvement for both groups. This included an investigation of predictors of absence or presence of antisocial activity, as well as predictors of the extent of antisocial activity.

These analyses indicated that vulnerability due to sociodemographic risk results in, or at the least coincides with, the increased presence of recognised risk factors, and absence of protective factors. Both male and female vulnerable adolescents behaved more antisocially than not-vulnerable adolescents, across all categories of antisocial acts. When examining differences in predictors of antisocial involvement for both groups, many vulnerability-based differences were found for the absence or presence of antisocial involvement, but there were fewer differences for the extent of antisocial activity.

8.3.1 Differences in Risk, Promotive and Protective Factors

The two vulnerability groups for both male and female adolescents were compared in terms of the presence (or absence) of research-identified risk, promotive and protective factors for antisocial outcomes. With the exception of the peer antisocial behaviour variable, no problematic distributions were noted for any variables. Therefore, a series of t-tests were run to identify significant differences in self-control, prosocial beliefs, empathy, social acceptance, school membership, life satisfaction, self-liking, depressed feelings, positive parenting, parental monitoring, and antisocial behaviour of friends, according to vulnerability, with results presented in Table 8.3. To compensate for Type 1 errors as a consequence of the number of analyses performed, a
cut of $p < .01$ was used to determine significance when selecting variables for analysis in the one-way ANOVA.

Table 8.3
Mean differences according to sociodemographic vulnerability

<table>
<thead>
<tr>
<th>Variable</th>
<th>Vulnerable $(n = 116)$</th>
<th>Not –vulnerable $(n = 408)$</th>
<th>$t$</th>
<th>$df$</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
<td>$SD$</td>
<td></td>
</tr>
<tr>
<td>Self-control</td>
<td>20.06</td>
<td>2.71</td>
<td>21.73</td>
<td>2.30</td>
<td>6.05</td>
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<td>Prosocial beliefs</td>
<td>49.31</td>
<td>9.5</td>
<td>52.89</td>
<td>6.14</td>
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<td>Empathy</td>
<td>68.64</td>
<td>10.28</td>
<td>74.69</td>
<td>9.21</td>
<td>6.08</td>
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<tr>
<td>Life satisfaction</td>
<td>23.35</td>
<td>5.14</td>
<td>26.03</td>
<td>4.90</td>
<td>5.14</td>
</tr>
<tr>
<td>Self-liking</td>
<td>40.36</td>
<td>8.32</td>
<td>42.05</td>
<td>8.60</td>
<td>1.88</td>
</tr>
<tr>
<td>Depressed feelings</td>
<td>24.96</td>
<td>11.05</td>
<td>22.60</td>
<td>11.96</td>
<td>-1.90</td>
</tr>
<tr>
<td>Positive parenting</td>
<td>98.95</td>
<td>20.42</td>
<td>103.61</td>
<td>19.15</td>
<td>2.33</td>
</tr>
<tr>
<td>Parental monitoring</td>
<td>8.90</td>
<td>2.56</td>
<td>9.88</td>
<td>1.95</td>
<td>3.83</td>
</tr>
<tr>
<td>Social acceptance</td>
<td>15.69</td>
<td>4.24</td>
<td>15.31</td>
<td>3.39</td>
<td>-0.90</td>
</tr>
<tr>
<td>School membership</td>
<td>61.39</td>
<td>14.21</td>
<td>67.26</td>
<td>12.65</td>
<td>4.11</td>
</tr>
<tr>
<td>Peer antisocial</td>
<td>9.03</td>
<td>8.09</td>
<td>3.54</td>
<td>4.63</td>
<td>-6.99</td>
</tr>
</tbody>
</table>

Significant differences between vulnerable and not-vulnerable adolescents were explored further through one-way ANOVAs in which gender was included, as shown in Table 8.4. One-way ANOVA was selected rather than two-way ANOVA due to considerable differences in sample sizes between vulnerability groups, with which one-way ANOVA copes better (Sweet & Grace-Martin, 2011). Post-hoc tests were conducted using the Games-Howell technique to compensate for homogeneity violations when necessary, or when variables did not violate the assumption of homogeneity, Hochberg’s GT2 test was used given the unequal sample sizes between groups (Meyers et al., 2006).
As shown in Table 8.3 (on Page 251), no significant differences were found according to cumulative sociodemographic risk in levels of self-esteem and worth (self-liking), or in depressed feelings, but mean levels of life satisfaction did differ, with both male ($p < .05$) and female ($p < .001$) sociodemographically vulnerable adolescents having significantly lower levels of life satisfaction than their non-vulnerable counterparts. Figure 8.1 presents these mean differences in life satisfaction. The effect of vulnerability on life satisfaction was strongest for females, with vulnerable female adolescents having the lowest mean rates of life satisfaction of all groups.

<table>
<thead>
<tr>
<th>Vulnerable</th>
<th>Not Vulnerable</th>
<th>$F$</th>
<th>df</th>
<th>$p$</th>
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<tbody>
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<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
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<tr>
<td>Self-control</td>
<td>19.18±2.73</td>
<td>21.04±2.36</td>
<td>21.30±2.39</td>
<td>21.98±2.22</td>
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<tr>
<td>Prosocial beliefs</td>
<td>47.67±10.18</td>
<td>51.13±8.31</td>
<td>52.41±7.02</td>
<td>53.17±5.56</td>
</tr>
<tr>
<td>Empathy</td>
<td>63.95±9.01</td>
<td>73.84±9.07</td>
<td>70.65±8.24</td>
<td>77.04±8.94</td>
</tr>
<tr>
<td>Life satisfaction</td>
<td>23.46±5.00</td>
<td>23.24±5.33</td>
<td>25.65±5.16</td>
<td>26.25±4.74</td>
</tr>
<tr>
<td>Parental monitor</td>
<td>8.49±2.51</td>
<td>9.35±2.56</td>
<td>9.37±2.09</td>
<td>10.17±1.80</td>
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<tr>
<td>School m’ship</td>
<td>63.06±14.28</td>
<td>59.63±14.06</td>
<td>66.19±12.41</td>
<td>67.88±12.77</td>
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<td>Peer antisocial</td>
<td>10.44±8.16</td>
<td>7.47±7.79</td>
<td>3.70±3.62</td>
<td>3.45±4.52</td>
</tr>
</tbody>
</table>

$n = 61$  $n = 55$  $n = 150$  $n = 258$

*Note.* Welch’s $F$ used due to violations of homogeneity assumptions.
Differences in mean levels of the individual attributes of self-control, pro-social beliefs and empathy were also found between vulnerability groups. Sociodemographically vulnerable males had significantly lower levels of self-control than all other groups, including not only the not vulnerable adolescents ($p < .001$ for males and females) but also the vulnerable females ($p < .05$). Sociodemographically vulnerable female adolescents had lower levels of self-control than not vulnerable females ($p < .05$), but the differences between vulnerability groups in mean levels of empathy and pro-social beliefs were only present for males ($p < .001$). These differences, summarised in Table 8.4, are illustrated in Figures 8.2, 8.3, and 8.4.
Figure 8.2. Mean differences in self-control by gender and vulnerability status

Figure 8.3. Mean differences in prosocial beliefs by gender and vulnerability status

Figure 8.4. Mean differences in empathy by gender and vulnerability status
While no significant differences were found in levels of social acceptance, both male \((p < .001)\) and female \((p < .01)\) vulnerable adolescents had significantly more antisocial friends than their non-vulnerable counterparts. Vulnerable females had significantly lower levels of school membership \((p < .001)\) in comparison to non-vulnerable females, but no difference was found for males. These differences are shown in Figures 8.5 and 8.6.

**Figure 8.5.** Mean differences in peer antisocial behaviour by gender and vulnerability status

**Figure 8.6.** Mean differences in school membership by gender and vulnerability status
Despite significant group-based differences in parental monitoring indicated by the t-test, as well as a Welch test as part of the one-way ANOVA (due to violation of homogeneity assumption), when post-hoc analyses were run using the Games-Howell test to compensate for the unequal variance between groups, the significant difference was no longer found between male vulnerable and not vulnerables ($p = .084$) or female vulnerables and not vulnerables ($p = .111$). Instead, it was apparent that female adolescents are more closely monitored by parents than male adolescents, regardless of vulnerability status.

In summary, these analyses identified key differences between adolescents experiencing cumulative sociodemographic disadvantage and more advantaged youths. At-risk males exhibited lower levels of individual attributes associated with prosocial behaviour – self-control, empathy and prosocial beliefs. At-risk females also had lower levels of self-control than their not vulnerable counterparts, and in addition experienced lower levels of school membership, which is an important protective factor against poor outcomes (Bond et al., 2007; Hopson & Lee, 2011). Finally, the experience of cumulative sociodemographic risk affected levels of life satisfaction for both male and female adolescents and increased the likelihood of their interaction with other adolescents who were also behaving antisocially.

**8.3.2 Differences in Antisocial Involvement**

Cumulative sociodemographic risk was associated with higher likelihoods of engaging in antisocial activities for both male and female adolescents, as illustrated in Figures 8.7 and 8.8.
When examining the distributions of the reported antisocial behaviours variable, the differences in participation in delinquency between the sociodemographically vulnerable and not vulnerable groups was apparent (Figures 8.9 and 8.10), as confirmed by a significant Mann-Whitney test ($p < .00$). The highly skewed distribution of the
antisocial behaviour measure for not vulnerable adolescents demonstrated the tendency for these youths to report having not participated in any antisocial behaviour during the past year. In fact, 54.7% of not vulnerable adolescents reported no antisocial activities during the previous year, and cumulatively, 89% of not vulnerables reported having engaged in 3 or fewer antisocial acts. In comparison, only 28.4% of vulnerable adolescents reported no antisocial activity during the past year, and the distribution demonstrates a far greater variance (39.99) than that of the not vulnerable group (8.45).

Figure 8.9. Distribution of antisocial behaviours - Vulnerable adolescents

Figure 8.10. Distribution of antisocial behaviours - Not vulnerable adolescents
The influence of gender was investigated using a one-way ANOVA with four groups (vulnerability x gender), as one-way ANOVA copes better with differences in group size than two-way ANOVA (Sweet & Grace-Martin, 2011). The three items in the scale pertaining to substance use were analysed separately to the remaining antisocial behaviour items. Levene’s test revealed that both homogeneity assumptions were violated for both the measure of antisocial acts, and the measure of substance use, and therefore Welch’s test was used to determine whether there were significant differences between groups. Results, as displayed in Table 8.5 showed significant differences in both antisocial behaviours (Welch’s $F (3, 129.7) = 23.91, p < .001$) and substance use (Welch’s $F (3, 132.2) = 10.11, p < .001$).

<table>
<thead>
<tr>
<th></th>
<th>Vulnerable</th>
<th>Not vulnerable</th>
<th>$F$</th>
<th>df</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td></td>
</tr>
<tr>
<td>Antisocial acts</td>
<td>6.96±6.18</td>
<td>3.53±4.79</td>
<td>1.83±3.39</td>
<td>1.01±1.93</td>
<td>23.91*</td>
</tr>
<tr>
<td>Substance use</td>
<td>.61±.80</td>
<td>.30±.60</td>
<td>.17±.61</td>
<td>.09±.32</td>
<td>10.11*</td>
</tr>
</tbody>
</table>

* Welch’s F used due to violations of homogeneity assumptions

Post hoc tests for antisocial behaviour and substance use were conducted using Games-Howell, to compensate for the violation of homogeneity. Consistent with the research literature on gender differences in delinquency, males were significantly more likely than females to act antisocially, within both vulnerability groups ($p < .05$ for not vulnerables; $p < .01$ for vulnerables). Vulnerable male adolescents had the highest mean levels of both antisocial behaviours ($M = 6.96, SD = 6.2$) and substance use ($M = 0.61, SD = 0.8$) within the past year, and were significantly more likely ($p < .01$) than non-vulnerable males to engage in both types of antisocial activities. Vulnerable females
were significantly more likely ($p < .01$) to be antisocial than not-vulnerable females, but no significant difference in mean levels of substance use was found for females according to vulnerability status. Differences in mean rates of antisocial acts and substance use by vulnerability and gender are illustrated in Figures 8.11 and 8.12.

**Figure 8.11.** Mean differences in antisocial acts by gender and vulnerability status

**Figure 8.12.** Mean differences in substance use by gender and vulnerability status
8.3.2.1 Types of Antisocial Behaviours

While participation in antisocial acts was the outcome of interest in this study, such acts encompass a broad spectrum of behaviours. It was therefore considered important to explore rates of participation in different types of antisocial activities. First, the items related to substance use and abuse which were separated for the ANOVA were used to form one category of antisocial activity. The remaining antisocial items were then divided into categories using exploratory factor analysis (EFA). The EFA employed Kaiser’s criterion (Eigenvalue greater than one; Kaiser, 1960) to determine the number of factors retained, and oblimin rotation was used due to correlations between items which exceeded .32 (Brown, 2009; Tabachnick & Fiddell, 2007).

Results of the EFA however suggested only a single factor within the data, making it less than useful for exploring types of offending in further detail. As a solution to this, a Principal Components Analysis (PCA) was conducted instead, using Promax rotation to compensate for correlations between items. PCA encompasses the greatest diversity of underlying influences, thereby maximising extracted components (Hayton et al., 2004; Yong & Pearce, 2013). The sample was deemed adequate for the PCA analysis, with a significant Bartlett’s test ($p < .001$) and a Kaiser-Meyer-Olkin measure of sampling adequacy of 0.93, indicating relatively compact correlation patterns, supporting the ability to generate components which were distinct and reliable (Field, 2005).

Table 8.6 provides the initial Eigenvalues, and proportion of variance explained. Using Kaiser’s criterion, results suggested the existence of four components which in total accounted for 59.0% of the variance in scores. This four-component solution was confirmed through visual inspection of the scree plot (Figure 8.13).
Table 8.6
Eigenvalues and variance accounted for by components

<table>
<thead>
<tr>
<th>Component</th>
<th>Total Eigenvalue</th>
<th>Variance (%)</th>
<th>Cumulative variance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8.67</td>
<td>41.29</td>
<td>41.29</td>
</tr>
<tr>
<td>2</td>
<td>1.47</td>
<td>6.99</td>
<td>48.29</td>
</tr>
<tr>
<td>3</td>
<td>1.23</td>
<td>5.84</td>
<td>54.13</td>
</tr>
<tr>
<td>4</td>
<td>1.02</td>
<td>4.85</td>
<td>58.98</td>
</tr>
</tbody>
</table>

Note. Extraction method: PCA

Figure 8.13. Scree plot of PCA

Further details of the four-factor solution are provided in Table 8.7, which lists the unique contributions of each category of antisocial behavior, as measured by the pattern coefficients, as well as the common variance of each item. Component one contained items related to automotive-related crimes, including theft of cars or motorbikes (or parts of these), as well as racing, and operating vehicles after alcohol consumption. In addition, Component one also included an arson-related item which asked if the adolescent had in the past year “deliberately started a fire”. While it seems unusual that this item loads onto this component, it may be that the infrequent act (reported by 6.1%
of adolescents) of deliberately starting a fire occurs most often in conjunction with automobile theft, in an attempt to destroy evidence.

The second component reflected property damage and assault, with three items related to acts such as break and enter offences, as well as property damage and graffiti, and four items comprising fighting and acts of intimidation. Items related to minor delinquency made up Component three, including wagging school, skipping entrance fees, shoplifting and minor theft. The final component reflected use of alcohol, including purchasing of alcohol and drinking in public.

Table 8.7
Pattern coefficients and communalities of components

<table>
<thead>
<tr>
<th>Antisocial act</th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
<th>Extraction Communalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>driven a car/motorbike without a license</td>
<td>.396</td>
<td>.490</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>driven a car/motorbike after drinking alcohol</td>
<td>.763</td>
<td></td>
<td>.661</td>
<td></td>
<td></td>
</tr>
<tr>
<td>raced other cars/motorbikes</td>
<td>.655</td>
<td>.558</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>taken someone's car/motorbike without permission</td>
<td>.777</td>
<td>.632</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>stolen things or parts from a car or bike</td>
<td>.775</td>
<td>.709</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>deliberately started a fire</td>
<td>.649</td>
<td></td>
<td>.564</td>
<td>.564</td>
<td></td>
</tr>
<tr>
<td>broken into a house/building to steal things</td>
<td></td>
<td>.393</td>
<td>.503</td>
<td></td>
<td></td>
</tr>
<tr>
<td>deliberately damaged someone else's property</td>
<td></td>
<td>.574</td>
<td>.530</td>
<td></td>
<td></td>
</tr>
<tr>
<td>put graffiti on walls, toilet doors etc</td>
<td></td>
<td>.568</td>
<td>.560</td>
<td></td>
<td></td>
</tr>
<tr>
<td>taken part in a fight between 2 groups</td>
<td>.388</td>
<td></td>
<td>.643</td>
<td></td>
<td></td>
</tr>
<tr>
<td>deliberately hurt or beaten someone up</td>
<td>.782</td>
<td>.653</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>used anything as a weapon in a fight</td>
<td>.598</td>
<td></td>
<td>.641</td>
<td></td>
<td></td>
</tr>
<tr>
<td>forced someone to give you things</td>
<td>.910</td>
<td></td>
<td></td>
<td>.585</td>
<td></td>
</tr>
<tr>
<td>not paid an entrance fee</td>
<td>.351</td>
<td>.510</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>skipped class or wagged school</td>
<td>.441</td>
<td></td>
<td>.473</td>
<td></td>
<td></td>
</tr>
<tr>
<td>run away from home (overnight)</td>
<td>.456</td>
<td>.488</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shoplifted</td>
<td>.513</td>
<td></td>
<td>.567</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stolen money (less than $20) in one go</td>
<td>.941</td>
<td>.619</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>stolen money (more than $20) in one go</td>
<td>.830</td>
<td>.718</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bought beer, wine, spirits, or other alcohol</td>
<td></td>
<td></td>
<td>.809</td>
<td>.643</td>
<td></td>
</tr>
<tr>
<td>drunk alcohol in a public place</td>
<td></td>
<td></td>
<td>.818</td>
<td>.639</td>
<td></td>
</tr>
</tbody>
</table>
Based on these categories of antisocial acts, Figure 8.14 illustrates the frequency of involvement in antisocial behaviours, based on sociodemographic vulnerability status. Table 8.8 further breaks down these findings with a summary of adolescent antisocial behaviours according to group membership (vulnerable males; vulnerable females; not-vulnerable males and not-vulnerable females). These differences are shown in Figure 8.15.

![Figure 8.14](image_url)

*Figure 8.14. Adolescent involvement in different antisocial behaviours, by vulnerability status.*

**Table 8.8**  
*Antisocial acts during the past year by vulnerability and gender*

<table>
<thead>
<tr>
<th>Antisocial acts in past year</th>
<th>Vulnerable</th>
<th>Not Vulnerable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td>Automotive crime</td>
<td>52.5</td>
<td>20.0</td>
</tr>
<tr>
<td>Property crime &amp; assault</td>
<td>62.3</td>
<td>43.6</td>
</tr>
<tr>
<td>Minor delinquency</td>
<td>68.9</td>
<td>58.2</td>
</tr>
<tr>
<td>Alcohol use</td>
<td>37.7</td>
<td>23.6</td>
</tr>
<tr>
<td>Substance Use</td>
<td>44.3</td>
<td>23.6</td>
</tr>
<tr>
<td>No antisocial acts in past year</td>
<td>23.0</td>
<td>38.2</td>
</tr>
<tr>
<td>No substance or alcohol use in past year</td>
<td>45.9</td>
<td>69.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>61</td>
<td>55</td>
</tr>
<tr>
<td><strong>Total population</strong></td>
<td>150</td>
<td>258</td>
</tr>
</tbody>
</table>
Figure 8.15. Prevalence (%) of different antisocial behaviours: Vulnerability by gender.
While it sometimes argued that delinquent behaviours, particularly experimentation with drugs and alcohol, are a normative part of the adolescent experience, rates of antisocial behaviours were found to vary according to sociodemographic vulnerability, with youths from advantaged backgrounds more likely to abstain from illegal and delinquent behaviours. When considering not vulnerable males and females, over half of those sampled (53.3% of males and 60.5% of females) reported no involvement in antisocial activities in the past 12 months, and a large majority (83.3%) of both males and females reported no occasions of having bought or used alcohol in a public place, or having used substances. In comparison, fewer than a quarter (23.0%) of vulnerable males reported an absence of antisocial activity, and just under half of this group (45.9%) had not used substances or alcohol within the past year. While vulnerable females were less likely than their male counterparts to engage in antisocial activities (38.2%), they still did so at rates which exceeded that of not vulnerable females, and they were more likely than not vulnerable females to report involvement with alcohol and substances (30.9%).

Adolescents not experiencing sociodemographic risk who were antisocial during the previous year were most likely to report minor delinquent acts, with around a third of males (39.3%) and females (33.7%) reporting acts such as shoplifting, wagging school and not paying entrance fees. In comparison, rates of these kinds of behaviours were around 1.7 times higher for vulnerable adolescents (68.9% of males; 58.2% of females) with such acts being almost commonplace.

In addition, compared to not vulnerable males, sociodemographically vulnerable male adolescents were 2.7 times more likely to report involvement in both automotive crime (vulnerable 52.5%; not-vulnerable 19.3%), as well as property crime and assaults (vulnerable 62.3%; not-vulnerable 22.7%). Females from vulnerable backgrounds were
3 times more likely to report automotive crime (vulnerable 20.0%; not-vulnerable 6.6%) and 4.2 times more likely to report property crime and assaults (vulnerable 43.6%; not vulnerable 10.5%) than not vulnerable females.

The greatest influence of cumulative sociodemographic risk for males, was seen in the likelihood of substance use, with vulnerable males 4.7 times more likely than not vulnerable males to report having used substances such as marijuana, speed and pills during the previous year, and 3 times more likely to report alcohol use. Amongst females, sociodemographic vulnerability increased the likelihood of experimenting with alcohol by 1.8 times, and substances by 2.8 times. These findings highlight the increased likelihood of involvement in all varieties of antisocial behaviours for adolescents experiencing cumulative sociodemographic risk. The differences in proportions of adolescents engaging in different antisocial activities are illustrated in Figure 8.15.

8.4 Predictors of Antisocial Involvement According to Sociodemographic Vulnerability

There is an extensive literature on predictors of antisocial behaviours, reviewed in Chapter 2. While this research shows that sociodemographic risk factors increase the likelihood of adolescents behaving antisocially, the ways in which risk, promotive and protective factors differ between youths experiencing sociodemographic risk and those not, are less clear. To investigate this further, predictors of antisocial behaviours were explored separately within each risk group (vulnerable and not vulnerable adolescents).

Building on findings from the model fit analysis (Chapter 7), the skewness of the antisocial behaviour response variable was compensated for by using a hurdle model to investigate antisocial behaviours during the previous year in two separate stages. In the
first stage, a logistic regression determined predictors of the presence or absence of antisocial activities. Next, those cases which cleared the hurdle (that is, any cases not reporting zero antisocial acts) were included in a truncated negative binomial regression which assessed the extent of antisocial activity.

The hurdle regression included risk and protective factors for antisocial behaviours and controlled for gender. A second regression was also performed, in which the continuous cumulative sociodemographic risk score was added, to determine whether the extent of cumulative sociodemographic risk changed the power or type of predictors. It was anticipated that cumulative sociodemographic risk would have minimal effect within the not vulnerable group, given that cuts on cumulative risk scores used to create both groups (score of 0-3 for not vulnerable group, and 4-12 for vulnerable group) resulted in a very limited range for not vulnerable youths. Results of the initial regression are provided in Table 8.9, and the regression including cumulative risk as a predictor in Table 8.10. Fit statistics for both models clearly demonstrated a better fit for vulnerable adolescents, compared to the non-vulnerable group. Model fit improved for the vulnerable adolescent group with the inclusion of cumulative risk, suggesting that the extent of risk does matter to some degree, but the opposite was true for the not vulnerable group.
Table 8.9
*Hurdle model for adolescent antisocial behaviour*

<table>
<thead>
<tr>
<th></th>
<th>Vulnerable</th>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>SE</td>
<td>Exp(B)</td>
<td>B</td>
<td>SE</td>
<td>Exp(B)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>ZERO HURDLE MODEL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-0.25</td>
<td>0.77</td>
<td>0.78</td>
<td>-0.15</td>
<td>0.29</td>
<td>0.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-control</td>
<td>-0.82</td>
<td>0.44</td>
<td>0.44</td>
<td>-0.35</td>
<td>*</td>
<td>0.16</td>
<td>0.71</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prosocial beliefs</td>
<td>0.11</td>
<td>0.42</td>
<td>1.12</td>
<td>-0.60</td>
<td>**</td>
<td>0.20</td>
<td>0.55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empathy</td>
<td>0.53</td>
<td>0.42</td>
<td>1.70</td>
<td>0.38</td>
<td>*</td>
<td>0.16</td>
<td>1.46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life satisfaction</td>
<td>-0.13</td>
<td>0.50</td>
<td>0.88</td>
<td>0.34</td>
<td>0.23</td>
<td>1.41</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-liking</td>
<td>-0.69</td>
<td>0.70</td>
<td>0.50</td>
<td>-0.07</td>
<td>0.23</td>
<td>0.93</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressed feelings</td>
<td>-0.71</td>
<td>0.47</td>
<td>0.49</td>
<td>-0.05</td>
<td>0.20</td>
<td>0.95</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Positive parenting</td>
<td>-0.55</td>
<td>0.51</td>
<td>0.58</td>
<td>-0.36</td>
<td>*</td>
<td>0.20</td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Parental monitoring</td>
<td>-0.35</td>
<td>0.42</td>
<td>0.71</td>
<td>-0.57</td>
<td>**</td>
<td>0.19</td>
<td>0.57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social acceptance</td>
<td>0.73</td>
<td>0.38</td>
<td>2.08</td>
<td>0.18</td>
<td>0.16</td>
<td>1.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>School membership</td>
<td>-0.28</td>
<td>0.45</td>
<td>0.75</td>
<td>-0.35</td>
<td>*</td>
<td>0.19</td>
<td>0.71</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer antisocial behaviour</td>
<td>1.57 **</td>
<td>0.56</td>
<td>4.83</td>
<td>1.66 ***</td>
<td>0.28</td>
<td>5.26</td>
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**MODEL STATISTICS**

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*Note.*** p < .001; ** p < .01; * p < .05; ^ p < .10*
### Table 8.10

**Hurdle model for adolescent antisocial behaviour with cumulative risk included**

<table>
<thead>
<tr>
<th></th>
<th>Vulnerable ( n = 116 )</th>
<th>Not-vulnerable ( n = 408 )</th>
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<td>Life satisfaction</td>
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<td>Parental monitoring</td>
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<tr>
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<td>0.45</td>
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<td>Cumulative Risk</td>
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<td>Empathy</td>
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</tr>
<tr>
<td>Life satisfaction</td>
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<tr>
<td>Self-liking</td>
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<td>0.10</td>
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<td>Depressed feelings</td>
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<td>Positive parenting</td>
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<td>0.08</td>
</tr>
<tr>
<td>Parental monitoring</td>
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<td>0.08</td>
</tr>
<tr>
<td>Social acceptance</td>
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<td>0.07</td>
</tr>
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<td>Peer antisocial behaviour</td>
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</tr>
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<td>Cumulative Risk</td>
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<td><strong>MODEL STATISTICS</strong></td>
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<tr>
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<tr>
<td>AIC</td>
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</tbody>
</table>

*Note.*** \( p < .001; ** \( p < .01; * \( p < .05; ^ \( p < .10*.*

### 8.4.1 Predictors of absence or presence of antisocial involvement

As shown in Table 8.11, not vulnerable adolescents were slightly less likely to report participation in antisocial activities than non-participation, but adolescents experiencing cumulative sociodemographic risk were twice as likely to behave antisocially than not. Results from the hurdle regression, as summarised in Table 8.9
showed differences for vulnerable and not vulnerable adolescents when considering predictors of the absence or presence of antisocial activities during the previous year.

### Table 8.11
*Proportion of absence or presence of antisocial behaviour for vulnerable and not-vulnerable adolescent groups*

<table>
<thead>
<tr>
<th></th>
<th>Vulnerable (%)</th>
<th>Not vulnerable (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absence of antisocial behaviour</td>
<td>31.4</td>
<td>54.7</td>
</tr>
<tr>
<td>Presence of antisocial behaviour</td>
<td>68.6</td>
<td>45.3</td>
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</table>

For adolescents not affected by cumulative sociodemographic risk, all three individual characteristics (self-control, prosocial beliefs and empathy) were significant predictors of antisocial behaviours, with higher levels of self-control and pro-social beliefs resulting in decreased likelihood of antisocial participation. The coefficient for empathy was positive, suggesting that the likelihood of behaving antisocially increases as levels of empathy increase, which appears counterintuitive. As the regression coefficient assesses the influence of empathy with all other variables held constant, this may be a statistical anomaly due to overlap between variables (multicollinearity), particularly given that a correlation matrix finds empathy and antisocial behaviours to be negatively correlated. Amongst the social relationship variables, lower levels of parental monitoring significantly predicted a greater likelihood of antisocial activity by not vulnerable adolescents, and both positive parenting and school membership neared significance ($p = .07$ and $.06$ respectively).

The model identified fewer predictors of antisocial behaviours for vulnerable adolescents. No individual characteristics were significant, although self-control bordered on significance ($p = .06$). Parental relationships and bonds to school did not have a protective influence on the likelihood of delinquency as they did for the not vulnerable group. Social acceptance, which was not a predictive factor for not
vulnerable youths, bordered on significance in predicting antisocial involvement for adolescents facing cumulative sociodemographic risk ($p = .051$). For both vulnerable and not vulnerable adolescents, the coefficient for social acceptance was positive, signifying that levels of social acceptance rise in relation to presence of antisocial behaviour. In fact, each 1-point increase in social acceptance, was related to youths being twice as likely to report antisocial behaviours during the previous year.

By far the most influential predictor for all adolescents regardless of risk status was peer antisocial behaviour. The likelihood of engaging in any antisocial activity increased around 5-fold for every additional antisocial act that their friends committed. Overall, the initial model suggested that when considering whether adolescents would, or would not participate in any antisocial activities, social factors were the most influential drivers for youths from vulnerable backgrounds, whereas for not vulnerable adolescents a broader spectrum of risk and protective factors operated.

When cumulative risk was included as a predictor variable (see Table 8.10), as anticipated, no differences were noted for the not vulnerable group of adolescents, with the exception of some minor changes to regression coefficients. In contrast, cumulative risk was a significant, and indeed the largest, predictor of the absence or presence of antisocial activity for vulnerable adolescents, showing that for youths facing sociodemographic disadvantage, the extent of risk mattered. In fact, each single unit increase in risk increased the likelihood of being antisocial by more than 8 times. This suggests that reducing levels of risk amongst those who are vulnerable can have important consequences in reducing the likelihood of those adolescents being involved in antisocial activities.

Controlling for the extent of cumulative risk in the regression model resulted in some differences for vulnerable youths. Peer antisocial behaviour still remained the
strongest predictor of delinquency (as it did for the not vulnerable group) but the odds ratios for the influence of peer antisocial behaviour increased in the vulnerable group, with each 1 unit increase in antisocial acts committed by friends increasing the likelihood of adolescents behaving antisocially by over seven times. Further, the inclusion of cumulative sociodemographic risk resulted in changes to predictors for the vulnerable group, with social acceptance no longer nearing significance as it did in the initial model, and self-liking becoming close to significant ($p = .070$).

Results of the initial model (which did not control for cumulative risk extent) may have been driven by youths with higher cumulative risk scores (e.g. scores of 8 or more), who were much more likely to report antisocial activity in the previous year (Figure 8.16). In fact, only one youth with a cumulative risk score of 8 or higher reported no antisocial behaviour in the previous year. Antisocial adolescents with high risk scores also reported higher than mean levels of social acceptance (Figure 8.17). However, the majority of vulnerable adolescents (83.6%) had cumulative risk scores between 4 and 7 (inclusive), and these youths not only had a more even spread of social acceptance scores but were more likely than highly disadvantaged vulnerable adolescents to have self-esteem and self-worth scores which fell below the mean score (Figure 8.18). Thus, it might be the case that as cumulative sociodemographic risk increases, the impetus for behaving antisocially changes. Those experiencing lower levels of sociodemographic disadvantage may be somewhat likely to behave antisocially in an attempt to alleviate feelings of low self-esteem and self-worth, whereas those experiencing high degrees of sociodemographic disadvantage might participate in antisocial behaviours due to the increased levels of social acceptance which result from it.
Figure 8.16. Absence or presence of antisocial behaviours according to level of cumulative sociodemographic risk, for vulnerable adolescents

Figure 8.17. Relationship between cumulative sociodemographic risk scores and social acceptance for vulnerable adolescents who were antisocial during the previous year

Figure 8.18. Relationship between cumulative sociodemographic risk scores and self-liking for vulnerable adolescents who were antisocial during the previous year
8.4.2 Predictors of the Extent of Antisocial Involvement

The second part of the hurdle model analysis was a negative binomial regression, performed in R, with the data truncated from a value of 1 (to a value of 24). This analysis therefore examined the extent or versatility of antisocial activity amongst youths who were behaving antisocially, by modelling the number of different antisocial acts reported during the previous year.

Fewer differences were apparent between vulnerable and not vulnerable adolescents when examining extent, rather than absence/presence of antisocial activity. Peer antisocial behaviour was still the strongest predictor of reported antisocial behaviour for both vulnerability groups, increasing the probability of antisocial behaviours by 1.4 times for vulnerable and 1.8 times for not vulnerable youths for every 1 unit increase in antisocial peer activity. Moreover, a significant predictor of antisocial behaviours for both vulnerability groups was parental monitoring, with higher levels of parental supervision predicting lower levels of antisocial activity. For not vulnerable adolescents, no other risk or protective factors were significant in the models, although self-control neared significance ($p = 0.08$). For vulnerable youths, prosocial beliefs were significantly related to antisocial activity, with adolescents with weaker prosocial attitudes behaved more antisocially.

Cumulative sociodemographic risk neared but did reach significance ($p = .088$) for prediction of antisocial behaviours amongst vulnerable adolescents when included in the model examining the extent of antisocial behaviour. Further, in contrast to the model examining absence/presence of antisocial activity, the inclusion of the continuous measure of cumulative risk in the model made very little difference to the performance of other risk and protective factors. In particular, odds ratios for the effect of antisocial peers did not increase when cumulative risk was controlled for. The only notable effect
of controlling for the degree of cumulative sociodemographic risk was that social acceptance neared significance \( (p = .068) \) in the model when cumulative risk was included. These findings suggest that while the degree of sociodemographic risk may be influential in affecting the absence or presence of antisocial behaviours, it appears less influential in affecting the extent of antisocial activity amongst youths engaging in it.

8.4.3 Hurdle Model using Alternate Measure of Peer Pro-sociality

Self-reported antisocial behaviours and peer antisocial behaviour are highly correlated \( (r = .73 \) in this dataset), with some researchers noting the methodological issues that arise youths provide information about delinquent activity of friends, where they might really be giving information about their own antisocial activity (Gottfredson & Hirschi, 1990; Haynie & Osgood, 2005). In the previous models, peer antisocial behaviour, which is a count measure of the number of antisocial acts committed by peers in the previous 12-month period, was overwhelmingly the strongest predictor of outcomes for all adolescents, regardless of sociodemographic risk (with the exception of the extent of cumulative risk for vulnerable adolescents). To ensure that this measure of peer antisocial behaviour was not overshadowing the influence of other predictors due to methodological issues around how this information was collected, the hurdle regression analysis was re-run using a variable that assessed peer pro-sociality in a different way.

Prosocial peers was a 6 item measure with participants responding on a 4 point scale as to whether they agree or disagree with items questions such as “my friends are polite and respectful to adults”, “the kids I hang out with usually don’t get in trouble”, “my friends sometimes break the rules (reverse scored)”, and “my friends are sometimes a bad influence on me (reverse scored)”. The prosocial peers measure
captures a different facet of peer pro-sociality than the antisocial peers behaviour variable. Whereas the latter is a count of antisocial acts allegedly committed by peers, and therefore reflects the degree to which friends are behaving delinquently, the former reflects the quality of behaviour of friends. This measure was moderately (and negatively) correlated with both self-antisocial behaviour ($r = -.47$) and antisocial behaviours of peers ($r = -.52$). Results of the logistic regression using prosocial peers is provided in Table 8.12.

Table 8.12
Alternate hurdle model for adolescent antisocial behaviour

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<td>Prosocial beliefs</td>
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<td>Empathy</td>
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<td>Prosocial peers</td>
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<td>* 0.51</td>
</tr>
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<td>COUNT MODEL</td>
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<td>Gender</td>
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</tr>
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<td>Self-control</td>
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<td>0.11</td>
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<td>Prosocial beliefs</td>
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<td>0.11</td>
</tr>
<tr>
<td>Life satisfaction</td>
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<td>Self-liking</td>
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<td>^ 0.12</td>
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MODEL STATISTICS

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Note. *** $p < .001$; ** $p < .01$; * $p < .05$; ^ $p < .10$
Having prosocial peers did not significantly predict absence/presence or extent of antisocial behaviours in the group of adolescents categorised as not vulnerable due to cumulative sociodemographic risk. Further, the inclusion of prosocial peers rather than peer antisocial behaviour resulted in minimal difference for this group. Significant predictors of absence/presence of antisocial activity remained the same, namely the individual characteristics of pro-social beliefs, self-control and empathy, as well as parental monitoring. When considering the extent of antisocial activity, parental monitoring remained the only significant predictor once the peer antisocial behaviour measure was removed, and self-control neared significance ($p = .075$), as both variables did in the earlier models. The only difference in significant predictors in the prosocial peers models for not vulnerable adolescents was that prosocial beliefs became a significant predictor of antisocial behaviour when antisocial behaviour of peers was removed.

For those adolescents categorised as vulnerable due to cumulative sociodemographic risk, having prosocial peers was a significant predictor of the absence/presence of antisocial involvement, but not for the extent of such involvement. As with the not vulnerable group of adolescents, few changes in predictors of the extent of antisocial behaviours were found for the prosocial peers model, with the only change being that social acceptance reached significance, as it did in the initial model when cumulative risk was controlled for. When antisocial peer behaviour was removed from the absence/presence part of the model self-control and social acceptance, which were nearing significance in the initial model, became significant for vulnerable adolescents, as did empathy.

Thus it appears that despite methodological concerns related to information about peer antisocial behaviour, replacing this measure of peer characteristics with an
alternate measure that focuses on peer quality made only one difference for not
vulnerable adolescents, which was prosocial belief becoming significant in predicting
the extent of antisocial activity. For vulnerable adolescents, the part of the model
examining the extent of antisocial activity produced the same significant predictors both
when cumulative risk was included in the initial model and when peer antisocial
behaviour was replaced with the prosocial peers measure. Using the alternate measure
of peer prosociality made a larger difference in the prediction of absence/presence of
antisocial activity amongst sociodemographically vulnerable youths. Whereas peer
antisocial behaviour (and cumulative risk when included in the regression) were the
only significant predictors initially, inclusion of the prosocial peers measure meant that
it, and three other risk factors (self-control, empathy, social acceptance) reached
significance. It may be the case therefore, that for vulnerable youths individual
characteristics related to antisocial behaviours are overshadowed by the strength of
association between peer antisocial behaviours and self-involvement in antisocial
activities.

8.4.4 Classifying Risk and Protective Factors for Adolescent Antisocial
Behaviour

While the hurdle model regressions identified variables significant in predicting
antisocial behaviours among adolescents, the ways in which these variables work to
influence outcomes can be further elucidated. As discussed in Chapter 2, factors which
influence the likelihood of future offending can be classified as risk factors, which result
in an increased likelihood of a poor outcome; promotive factors, which increase the
likelihood of good outcomes (or decrease the likelihood of poor outcomes) for all
individuals; and protective factors, which interact with risk in some way to buffer or
reduce its effect on outcomes. Risk, promotive and protective factors are not necessarily linearly related to outcomes (Loeber et al., 2008).

In order to understand the influence of cumulative sociodemographic vulnerability on risk, promotive and protective factors for adolescents, those variables identified as significant predictors in the truncated part of the hurdle regression models (that is, the regression investigating the extent of antisocial activity) were further investigated in line with Farrington and Ttofi’s (2011) study of the Cambridge Study in Delinquent Development. Significant variables were trichotomised into the worst quarter (risk), the middle half, and the best quarter (promotive/protective), and categorised as low, moderate and high levels of the variable. Low and high levels of each variable thus equated to risk or promotive/protective factors, depending on the direction in which variables were scored. For example high levels of peer antisocial behaviour were a risk factor, but high levels of parental monitoring were protective. For each variable, mean scores on antisocial behaviours (ranging from 0 to 24) were then plotted according to these categories (low, moderate and high).

Where the plot shows a generally linear relationship, with antisocial behaviour at both low and high categories of the variable differing from moderate levels, variables can be presumed to exhibit both risk and promotive/protective effects. When the plot shows a relationship that is non-linear, variables may either have a risk effect or a promotive/protective effect, depending on whether the change in the extent of antisocial activity occurs between low and moderate categories of the variable, or between moderate and high categories.

Each plot depicts the effect of the variable on antisocial behaviours for both vulnerable and not vulnerable adolescents in order to compare risk and promotive/protective influences according to sociodemographic vulnerability status.
Variables examined included peer antisocial behaviour, prosocial beliefs, self-control, and parental monitoring, which were significant predictors for both vulnerable and not vulnerable youths, as well as social acceptance, which was significant for vulnerable adolescents only.

Peer antisocial behaviours were by far the strongest predictors of antisocial involvement by both vulnerable and not vulnerable adolescents, and following Farrington and Ttofi’s rubric the variable was a strong risk factor. While only 8.2% of adolescents whose peers engaged in low levels of antisocial activity reported behaving antisocially themselves, 58.8% of adolescents with moderately antisocial peers, and 93.9% of those with highly antisocial peers, reported some antisocial involvement. As shown in Figure 8.19, when considering the total count of antisocial acts committed during the previous year, high levels of peer antisocial behaviour was a risk factor for adolescent antisocial activity for both adolescents facing cumulative sociodemographic risk, and for those not. In comparison, low levels of peer antisocial behaviour had minimal effect in reducing the mean number of antisocial acts for either vulnerability group, when compared to moderate levels of peer antisocial behaviour.

Figure 8.19. Antisocial behaviours according to levels of peer antisocial behaviour
Parental monitoring was significant in predicting the extent of antisocial activity for adolescents experiencing cumulative sociodemographic risk as well as for not vulnerable adolescents. In addition, it was a significant predictor of absence or presence of antisocial behaviours for the not vulnerable cohort. Overall, 81.2% of youths with low levels of parental monitoring engaged in some kind of antisocial activity, compared to 54.2% of those with moderate levels, and 23.7% of youths with high levels of parental monitoring. For not vulnerable youths, as shown in Figure 8.20, low levels of parental monitoring (compared to moderate) was a risk factor for antisocial behaviour, whereas minimal difference in antisocial activity between moderate and high levels of monitoring meant that high levels of parental monitoring did not offer additional protection for this group. In contrast, for vulnerable adolescents, both low and high levels of monitoring influenced the extent of antisocial activity (compared to moderate levels), meaning that parental monitoring operated as both a risk (at low levels) and protective (at high levels) factor.

Figure 8.20. Antisocial behaviours according to levels of parental monitoring
The hurdle model analyses showed that the individual characteristics of self-control, prosocial beliefs, and empathy were all significant in predicting absence or presence of antisocial activity for both vulnerable and not vulnerable adolescents, but when considering the extent of antisocial activity only prosocial beliefs was significant, for not-vulnerable youths.

Large proportions of adolescents with low self-control (76.6%) and low levels of prosocial beliefs (82.6%) behaved antisocially compared to those with moderate (48.1% for self-control; 47.4% for prosocial beliefs) and high (29.9% for self-control; 28.6% for prosocial beliefs) levels of these characteristics. Low levels of self-control and prosocial beliefs were risk factors for antisocial behaviour for all adolescents, regardless of vulnerability status (Figures 8.21 and 8.22). For vulnerable adolescents, high levels of self-control and prosocial beliefs had a protective influence.

Figure 8.21. Antisocial behaviours according to levels of self-control
As stated previously, peer prosociality and social acceptance were only significant when predicting outcomes for vulnerable adolescents. Social acceptance was a significant predictor for both absence/presence of antisocial activity, as well as extent of antisocial behaviour for these youths. The prevalence of some antisocial involvement was roughly equal for youths with low (47.8%) or moderate (49.4%) levels of social acceptance, but 61.3% of adolescents categorised with high levels of social acceptance exhibited some antisocial behaviour. As shown in Figure 8.23, for sociodemographically vulnerable adolescents, high levels of social acceptance as compared to moderate levels) were related to increased extent of antisocial activity, meaning that social acceptance was a risk factor for this group.

*Figure 8.22. Antisocial behaviours according to levels of prosocial beliefs*
Figure 8.23. Antisocial behaviours according to levels of social acceptance

8.4.4.1 Summary of Risk and Protective Factors for Adolescent Antisocial Behaviour

When significant predictors of adolescent antisocial behaviours were trichotimised and plotted to illustrate their performance as risk, promotive or protective factors, the differences between adolescents vulnerable due to cumulative sociodemographic risk, and not vulnerable youths was apparent. For not vulnerable youths, high levels of peer antisocial behaviours, and low levels of self-control, pro-social beliefs and parental monitoring were risk factors for increased antisocial involvement. No significant predictors were found to have a promotive effect (that is, lead to a decreased likelihood of antisocial behaviour) for not vulnerable youths. In contrast, many of the significant predictors of antisocial behaviours amongst vulnerable adolescents exhibited a mixed effect on outcomes, acting as both risk and protective factors. These variables included self-control, prosocial beliefs. and parental monitoring. High rates of peer antisocial behaviours, as well as higher levels of social acceptance were both risk factors for vulnerable adolescents, with no protective influence experienced at lower levels of these variables.
There were notable differences in mean levels of antisocial behaviours at moderate levels of many predictors, showing the need for much higher levels of positive influences to counter disadvantage associated with cumulative sociodemographic risk before outcomes might be equivalent to those amongst adolescents who were not vulnerable. However where protective factors for vulnerable youth were found, negative outcomes were sometimes reduced to rates similar to those not facing sociodemographic vulnerability (for example, with prosocial beliefs and parental monitoring) providing some evidence that the effects of sociodemographic disadvantage might be countered by bolstering protective influences in an adolescent’s life.

8.5 Summary of Impact of Sociodemographic Vulnerability on Adolescent Experiences and Outcomes

This chapter examined the influence of cumulative sociodemographic risk on the experiences and behaviours of adolescents. In particular, it focused on identifying ways in which risk and protective factors, as well as antisocial outcomes, differed for youths based on their level of sociodemographic vulnerability.

Sociodemographic vulnerability was demonstrated to increase the presence of risk factors and reduce the presence of protective factors for male and female adolescents. For example, both male and female at-risk youths had lower mean levels of life satisfaction than more advantaged adolescents, and the peers with whom they had contact were more often antisocial. Vulnerability also increased the likelihood of young people engaging in antisocial behaviours. While more than half (54.7%) of not vulnerable adolescents reported no antisocial activities during the previous year, only 28.4% of youths from socio-demographically disadvantaged backgrounds abstained from antisocial behaviours.
Male youths experiencing cumulative sociodemographic risk had lower mean levels of self-control, prosocial beliefs and empathy than non-vulnerables. In addition to the increased presence of these individual level risk factors, significant differences in rates of antisocial activity were noted, with at-risk males more likely to engage in all types of antisocial behaviours than not vulnerable males (1.7 times more likely to report minor delinquent acts; 2.7 times more likely for automotive crime and property crime and assaults). This increased antisocial involvement was particularly the case in regard to alcohol and substance use, where vulnerable male adolescents were 3 times more likely to report having used alcohol in the previous year, and 4.7 times more likely to report having experimented with substances.

In comparison to more advantaged youths, females experiencing cumulative sociodemographic risk had lower levels of self-control and also school membership, which is noted in the research literature to be an important protective factor. Vulnerable females did not participate in antisocial activities to the extent that vulnerable males did. When examining some categories of crime however, the increased likelihood of involvement for vulnerable females compared to not vulnerable females was greater than that between vulnerable males and not vulnerable males. Specifically, vulnerable female adolescents were 3 times more likely than not at-risk females to be involved in crimes including driving without a license and auto-theft, and were 4.2 times more likely to report property crimes or physical assaults (whereas vulnerable males were 1.7 times more likely than not vulnerable males to commit these acts).

When investigating predictors of antisocial behaviour, antisocial peer behaviour was the strongest predictor of both absence/presence and extent of antisocial behaviours for both vulnerability groups. When this measure was replaced with an alternate measure assessing peer quality rather than a count of the number of antisocial acts
committed by peers, predictors of antisocial behaviours did not change for not vulnerable adolescents, with the exception of prosocial beliefs becoming significant in predicting extent of antisocial activity. For vulnerable youths, the same predictors of the extent of antisocial activity were found when the peer antisocial behaviour variable was removed from the regression as when cumulative risk was included. In the absence/presence part of the hurdle however, replacing the peer antisocial behaviour variable with the prosocial peers measure resulted in additional risk and protective factors becoming significant. This suggests that the influence of peers behaving antisocially may overshadow other predictors of antisocial activities in the vulnerable group, or alternatively it might be the case that the peer antisocial behaviour measure is indeed methodologically problematic for this group.

While the significant risk and protective factors for antisocial behaviours differed between adolescents facing sociodemographic risk and not vulnerable youths, some commonalities were noted in terms of predictors of antisocial activity. In addition to peer antisocial behaviour, prosocial beliefs and parental monitoring were significant predictors amongst both cohorts of youths. Only one difference was found between vulnerability groups when predictors of the extent of antisocial behaviours were explored: for sociodemographically vulnerable adolescents, social acceptance was also a significant predictor of antisocial behaviours.

More differences were noted in predictors of the absence or presence of antisocial activity. All individual-level characteristics (self-control, prosocial beliefs and empathy) were significant in predicting engagement in antisocial acts by not vulnerable adolescents, along with parental monitoring. For adolescents vulnerable due to sociodemographic risk, only antisocial behaviour of peers, and cumulative risk when added to the model, were significant predictors. When peer antisocial behaviour was
replaced with the prosocial peers measure, empathy and self-control became significant, as did social acceptance.

Plots of significant predictors of the extent of antisocial behaviour according to sociodemographic vulnerability groups showed that high levels of peer antisocial behaviours, and low levels of self-control, pro-social beliefs and parental monitoring were risk factors for antisocial behaviours amongst not vulnerable youths. For adolescents experiencing cumulative sociodemographic risk, high levels of both peer antisocial behaviour and social acceptance were risk factors for antisocial behaviours, while self-control, prosocial beliefs and parental monitoring acted as both risk and protective factors. Where predictors were found to be protective for vulnerable adolescents, they often reduced levels of antisocial behaviours to rates similar to those found for not vulnerable youths.

Overall, this chapter makes the case that cumulative sociodemographic risk has an effect on adolescent experiences and outcomes. The increased likelihood of vulnerable youths being involved in antisocial behaviour results in part from the higher levels of risk factors within this group when compared to those not vulnerable, but even at equivalent average levels of risk vulnerable adolescents are more antisocial. Predictors of absence or presence, as well as the extent of antisocial behaviour behaved in a mostly similar way for adolescents regardless of sociodemographic status, but some key differences in the ways these factors affect outcomes were noted. In particular, the tendency for some predictors to act both as risks and protectively for vulnerable adolescents is an important finding.

Chapter 9 tests General Strain Theory as an explanation for why rates of antisocial behaviours increase so markedly with levels of cumulative sociodemographic disadvantage.
Chapter 9: General Strain Theory as an Explanation of the Relationship between Cumulative Sociodemographic Risk and Antisocial Behaviour during Adolescence.

9.1 Introduction

While the influence of sociodemographic risk on adolescent outcomes has been well documented in the research literature (as highlighted in Chapter 3), theoretically based explanations for the impact of cumulative socioeconomic disadvantage are less frequent. As discussed extensively in Chapter 4, General Strain theory (GST) offers a framework which can help explain the relationship between cumulative sociodemographic risk and antisocial behaviours during adolescence.

GST proposes that the pathway through which the experience of stressors increases the likelihood of negative outcomes such as participation in antisocial behaviours includes mediation by affective reactions to strain (Agnew, 1992; Froggio & Agnew, 2007). In this chapter I report a test of this strain pathway model using depressed feelings as a mediator of strain, based on previous research which has found depression to be significant in this pathway (Jang & Johnson, 2003; Simons et al., 2004; Watts & McNulty, 2014). I have also provided in this chapter a justification for investigating a second mediator, namely life satisfaction.

In addition to pointing to mediators, GST posits numerous moderators of the relationship between strain and negative outcomes. Based on this literature (reviewed in Chapter 4), individual resources such as self-esteem and self-worth are theorised to reduce negative reactions to the experience of strain, while characteristics such as prosocial beliefs, empathy, and self-control are proposed to play a role in determining whether an individual reacts to the emotional consequences of strain by engaging in antisocial behaviours. Further, social bonds have been proposed as influential on the strain-delinquency relationship, with good parenting relationships and school
membership reducing antisocial participation and peer antisocial behaviour increasing the likelihood of antisocial activities. In this chapter I report the results of adding these moderators to the mediation model in order to assess the conditional indirect effects of strain.

On the whole this chapter provides support for a GST explanation of the effects of cumulative risk on antisocial behaviours during adolescence, with the effects of cumulative risk (strain) mediated through feelings of life satisfaction. A mediation model exploring depressed feelings as an affective response to strain was not supported. Moderation effects were found for several risk and protective factors on different pathways of the mediation model. While these moderators did not always operate in ways that would be expected according to GST, the pattern overwhelmingly revealed through the moderated mediation analyses was one where the positive effects of factors that should be protective were eroded as levels of cumulative sociodemographic risk increased.

9.2 Moderated mediation model of strain

GST distinguishes between objective strain, which is the experience of unwanted conditions, and subjective strain, which incorporates the individual’s subjective reaction to stressors (Broidy & Agnew, 1997). A mediation model allows the opportunity to test the influence of affective responses to strain. Most often, research has focused on anger as an affective mediator, and violent, aggressive offending as the outcome of interest. This line of investigation has yielded mixed results. When research examines outcomes beyond violent offending anger is less useful as a mediator, and so other affective responses have been explored in studies examining more general antisocial behaviours. For example, a smaller body of research has explored the mediating role of negative
emotions such as depression and anxiety with various delinquent outcomes. Results from these studies have also been mixed.

While strain predicted depression, depressed feelings experienced as a consequence of strain did not predict juvenile property offending or interpersonal aggression in Piquero and Sealock’s (2000, 2004) studies, or property offences and violent offending in Maschi, Bradley and Morgen’s (2008) study. In contrast, other studies have shown that depression mediates the relationship between strain and drug abuse (Jang & Johnson, 2003), property and violent offences (Ostrowsky & Messner, 2005), and delinquency (Watts & McNulty, 2014; Simons et al., 2004). Exploring depressed feelings as a mediator of strain in this Australian sample of youths helps extend these research findings.

In addition to exploring depressed feelings as an affective mediator of strain this research examines the influence of life satisfaction. Life satisfaction is a general measure of subjective wellbeing that incorporates not only affective responses to life but also includes a cognitive component (Diener et al., 2009). The benefit of using life satisfaction over affective responses such as anger, anxiety or even depression is that it captures a wider range of emotional reactions. This means that it is able to compensate for different affective responses due to gender, culture, or individual differences. For example, Broidy and Agnew (1997) suggest that males will be more likely to experience feelings of anger in response to strain, while females will be more likely to experience internalised responses, such as sadness. In both cases, the adolescent is likely to experience less satisfaction with life, meaning that this measure will capture reactions to strain that might be missed if only anger or sadness were investigated.

Further, specific emotional reactions to strain are often linked to specific antisocial responses. For example, Piquero and Sealock (2000) found that anger due to strain
predicted interpersonal violence but not property offending. As a general measure of personal wellbeing life satisfaction lends itself to exploration of a wide range of antisocial behaviours of the kind incorporated in the outcome measure of this study, which includes acts ranging from truancy to shoplifting, drug use, and interpersonal violence.

9.2.1 Assessing Moderated Mediation in a Negative Binomial Model

Hypotheses concerning mediation effects are commonly tested within the research literature. Baron and Kenny’s (1986) four step process was long regarded as the quintessential strategy for assessing mediation effects. More recently, criticisms of this approach (for example, the idea that mediational processes may still take place in the absence of significant relationships between variables at each step) as well as the need to investigate more complex models, has led to alternate methods for identifying the operation of mediation (Mackinnon et al., 2007). These analytic strategies to produce direct, indirect and total effects are not difficult for linear models with normally distributed data but became much more complex when assessing mediation in non-normal models (Clough, 2012; Pearl, 2001).

On occasion it might be theorised that a mediation effect will vary across different subgroups, contexts, or even at different levels of the independent variable (Preacher et al., 2007). Such a conditional indirect effect requires examination through a moderated mediation model. Moderated mediation, a term coined by James and Brett (1984), refers to a situation where the strength or direction of a mediated effect is dependent on some other variable (the moderator) (Preacher et al., 2007). This relationship can take a number of different forms. When the moderator is a categorical variable assessing the influence of the mediator across groups is a relatively simple process of comparison.
When moderators are continuous however, more advanced methods are needed (Mackinnon et al., 2007). While the need to investigate conditional indirect effects has been noted for some time, it has only been since around 2005 that models for examining mediation and moderation effects simultaneously have been developed (Fairchild & MacKinnon, 2009). As Hayes (2018) points out, even the most recent analytical approaches focus on single moderator variables within basic models. As with testing for mediation alone, assessing moderated mediation in non-linear models, such as those needed to compensate for skewed, over-dispersed count outcome variables, is a much more complicated process due to difficulties in computing indirect effects (Pearl, 2001).

While GSEM in Stata allows for the exploration of pathway models in which moderators can be included, assessing mediation using a negative binomial model makes calculation of indirect effects problematic. As negative binomial models produce log-odds, calculation of indirect effects that involve products of coefficients is not possible using GSEM in Stata (J. Lin, Personal communication from IDRE Statistical Consulting Group: UCLA, 20 March, 2019). Further, any interpretation of results from analyses where units of change are measured in logits requires transformation back into the natural metric of the variable (Geldhof et al., 2018). These limitations in assessing moderated mediation in negative binomial models are reflected in the methods utilised for this analysis, as outlined in the next section.

9.3 Method

The analysis tested whether strain, represented by cumulative sociodemographic risk, had an effect on adolescent antisocial behaviours which was mediated by affective responses to strain. Two variables were assessed as mediators of strain: depressed
feelings and life satisfaction. Figure 9.1 illustrates the hypothesised mediated relationships.

![Diagram](image)

**Figure 9.1.** Theorised mediation of the influence of cumulative sociodemographic risk on antisocial behaviours

Based on findings from Chapter 7 on model fit, negative binomial regression was used for the parts of the analysis predicting antisocial behaviour. Cumulative sociodemographic risk and all moderator variables were standardised to reduce intercorrelations. Moderators were entered into the model one at a time as interaction variables, to test for a significant effect. Analyses were conducted in Stata version 13 using GSEM.

The analyses followed the guidelines provided by Hayes (2013, 2018) for testing moderated mediation effects. For Hayes however, a moderated mediation effect does not require significant associations in any parts of the regression, but rather is assessed by an index approach where model coefficients are multiplied by the moderator variable at mean levels, as well as 1 standard deviation above, and below the mean (Preacher et al., 2007). Such an approach is not possible with negative binomial models, because these produce log-odds. Therefore, the presence of a mediation effect in this study was

295
determined using a component (causal steps) approach. Moderated mediation was deemed to exist when an interaction variable (while controlling for the main effects of the variables included in the interaction) was significant in the pathway between the independent variable and mediator (first stage moderated mediation: Figure 9.2) or in the pathway between the mediator and the outcome variable (second stage moderated mediation: Figure 9.3). The dotted line in Figure 9.2 represents the influence of the first stage moderator on the direct effect between cumulative sociodemographic risk and antisocial behaviour.

Hayes (2018) suggests that theoretical considerations should guide decisions as to whether a significant direct effect (in addition to a significant indirect effect) is necessary to conclude that moderated mediation has occurred. I could find no previous research investigating GST-based moderated mediation models so I regard these analyses as exploratory in nature and have reported all significant moderating effects. First stage moderators with direct as well as indirect effects are noted.

Where moderated mediation was observed, the effect was further investigated by re-estimating the regression equation using high and low values of the moderator variable. From this, interaction patterns could be plotted to illustrate the influence of the moderators on the mediator (for first stage moderators) or on the outcome of antisocial behaviours (for second stage moderators). Second stage moderation effects were converted from the log scale (due to the negative binomial regression) before plotting.
Figure 9.2. First stage moderated mediation

Figure 9.3. Second stage moderated mediation

9.4 Results

9.4.1 The Mediation Model

Initial analyses tested the simple mediated relationship of cumulative sociodemographic risk and antisocial behaviours with life satisfaction and depressed feelings as mediators, as depicted in Figure 9.1.

The first mediation model tested depressed feelings as the affective mediator. As demonstrated in Table 9.1, while there were significant relationships between cumulative risk and antisocial behaviours as well as between depressed feelings and
antisocial behaviours, the relationship between cumulative risk and depressed feelings was not significant in this model. Further, there was no reduction in the influence of cumulative risk on antisocial behaviours when depressed feelings was added to the model.

The lack of a significant mediation effect between strain, negative emotions, and antisocial behaviours reflects the findings of other researchers including Aseltine, Gore and Gordon (2000), Broidy (2001), Piquero and Sealock (2000, 2004), and Maschi, Bradley and Morgen (2008) (discussed in Chapter 4 on page 124). However, in these studies strain was found to significantly predict negative emotions but the relationship between negative emotions and antisocial behaviours was not significant. The opposite is true in this study, in that there was a significant relationship between depressed feelings and antisocial behaviour but not between strain and depressed feelings. This may be due to strain in this model (cumulative risk) being a structural/macro level variable, whereas previous research constructed strain as reflecting more personal stressors such as negative life experiences, abuse, and exposure to violence.

In contrast to the depressed feelings mediation model, all pathways were significant in the mediation model exploring life satisfaction, and the coefficient for the effect of cumulative risk on antisocial behaviours was reduced when life satisfaction was added to the model. Life satisfaction was therefore deemed to partially mediate the relationship between cumulative risk and antisocial behaviours. As the life satisfaction model was the only one significant, further analyses exploring the full moderated mediation model used only this variable as a mediator.
Table 9.1  
*Mediation of the effect of cumulative risk on antisocial behaviour*

<table>
<thead>
<tr>
<th></th>
<th>Direct pathway:</th>
<th>Mediation model:</th>
</tr>
</thead>
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<td></td>
</tr>
<tr>
<td>Direct pathway:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative Risk</td>
<td>→ Antisocial behaviours</td>
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</tr>
<tr>
<td>Mediation model:</td>
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<td></td>
</tr>
<tr>
<td>Cumulative Risk</td>
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</tr>
<tr>
<td></td>
<td>→ Antisocial behaviours</td>
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</tr>
<tr>
<td></td>
<td>Depressed feelings → Antisocial</td>
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<tr>
<td><strong>MODEL 2</strong></td>
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<td></td>
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<tr>
<td>Cumulative Risk</td>
<td>→ Antisocial behaviours</td>
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</tr>
<tr>
<td>Mediation model:</td>
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<tr>
<td>Cumulative Risk</td>
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</tr>
<tr>
<td></td>
<td>→ Antisocial behaviours</td>
<td>0.557</td>
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<tr>
<td></td>
<td>Life satisfaction → Antisocial behaviours</td>
<td>-0.463</td>
</tr>
</tbody>
</table>

### 9.4.2 Moderated Mediation Models

With life satisfaction identified as a significant mediator of the effect of cumulative risk on antisocial behaviour, a series of analyses was performed to determine whether the risk and protective factors discussed in Section 9.3 acted as moderators of this relationship. Potential moderators were examined in both the first stage of the mediation process (to determine whether they moderated the relationship between cumulative risk and life satisfaction, as well as the direct relationship between cumulative risk and antisocial behaviour) and also in the second stage of the mediation process (to determine whether they moderated the relationship between life satisfaction and antisocial behaviour). In both cases moderators were entered in the regression one at a time, along with the variables from which their interaction was created.

In total 13 variables were tested as potential moderators in the model, namely self-esteem, self-worth, depressed feelings, prosocial beliefs, self-control, empathy, parental knowledge, parental attachment, parental availability, parental monitoring, social
acceptance, school membership, and peer antisocial behaviour. Significant interaction effects were found for 10 of these risk/protective factors. These interaction effects were categorised as:

**First-stage (only) moderators**: risk/protective factors that interact with cumulative risk to affect levels of life satisfaction, but do not directly influence antisocial behaviours;

**First-stage and direct effect moderators**: risk/protective factors that interact with cumulative risk to affect levels of life satisfaction and directly influence antisocial behaviours; and

**Second-stage moderators**: risk/protective factors that interact with life satisfaction to affect levels of antisocial behaviours.

Figure 9.4 presents the moderated mediation model, with those risk/protective factors found to be significant interaction variables highlighted according to the model pathway they influence.

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**Figure 9.4.** Significant moderators of the mediated relationship between cumulative risk and antisocial behaviours.
9.4.3 First-stage Moderators of the Mediated Relationship between Cumulative Risk and Antisocial Behaviours

Eight risk/protective factors were found to interact with cumulative risk to influence its effect on levels of life satisfaction. As shown in Figure 9.4, five of these variables (discussed first) only moderated the relationship between cumulative risk and life satisfaction and were not significant in the direct pathway between cumulative risk and antisocial behaviours. The remaining three variables moderated both the direct and mediation pathways in the model and are discussed after the first-stage indirect only moderators.

9.4.3.1 Moderators of the Mediation Pathway between Cumulative Risk and Life Satisfaction.

Two variables related to the individual—self-worth and self-control—as well as three parenting variables—parental attachment, availability and knowledge—were significant moderators (at $p < .05$) of the first-stage mediation pathway between cumulative risk and life satisfaction. As noted, none of these five factors had a significant moderating effect on the direct relationship between cumulative risk and antisocial behaviours. Table 9.2 provides the results of the analysis. On the left side of the table, cumulative sociodemographic risk and each moderator are regressed onto life satisfaction, with significant main effects found for all variables. The right side of the table shows results from the moderated mediation models where cumulative risk, each moderator, and the associated interaction term (moderator*cumulative risk) were regressed onto life satisfaction. Each moderator was tested singly.
9.4.3.2 Individual Characteristics: Self-worth and Self-control.

The individual characteristics of self-worth and self-control interacted with cumulative sociodemographic risk to affect levels of life satisfaction. Figures 9.5 and 9.6 show the changes in levels of life satisfaction in relation to increases in cumulative sociodemographic risk, at high and low values of each moderator variable. In general, higher levels of both self-worth and self-control were related to increased levels of life satisfaction, but both moderators had a reduced effect on life satisfaction as levels of cumulative risk rose. As demonstrated in Figure 9.5, adolescents with low levels of self-worth were dissatisfied with life, regardless of the extent of cumulative risk they faced. In fact, cumulative risk had very little impact on levels of life satisfaction for these youths. Amongst adolescents with high levels of self-worth however, life satisfaction decreased as cumulative risk increased.
As shown in Figure 9.6, youths with low self-control were generally dissatisfied with life, and certainly less satisfied than youths with a high degree of self-control. Regardless of the level of self-control, life satisfaction decreased as cumulative risk increased, but the influence of cumulative risk on life satisfaction was stronger for adolescents with high levels of self-control. While adolescents high in self-control were satisfied with life when cumulative risk was low, at high levels of cumulative risk life satisfaction for these youth was reduced to below mean levels.

Figure 9.5. Interaction of self-worth and cumulative risk on life satisfaction

Figure 9.6. Interaction of self-control and cumulative risk on life satisfaction
9.4.3.3 Parenting Characteristics: Parental Attachment, Knowledge, and Availability

Three parenting variables—parental attachment, knowledge, and availability—interacted with cumulative sociodemographic risk to affect levels of life satisfaction. Patterns of these relationships were similar across all three parenting variables, with better parental relationships related to higher levels of adolescent life satisfaction (Figures 9.7, 9.8, and 9.9). However as cumulative risk increased life satisfaction for those with strong parental relationships decreased.

For adolescents who reported low levels of parental attachment and knowledge, cumulative risk had minimal effect on life satisfaction, with these youths being consistently dissatisfied with life, regardless of their degree of risk. Some influence was observed in regard to parental availability, where adolescents not experiencing cumulative risk were less satisfied with their lives than at-risk adolescents, when parents were not available to them.

Overall, these results suggest that adolescents with well-functioning parental relationships have stronger feelings of life satisfaction in the absence (or at low levels) of cumulative sociodemographic risk. Thus, while healthy parental relationships protect against the effects of cumulative sociodemographic risk on life satisfaction, cumulative risk inhibits the protective capacity of strong parental bonds.

Figure 9.7. Interaction of parental attachment and cumulative risk on life satisfaction
9.4.4 Moderators of both the Mediation Pathway between Cumulative Risk and Life Satisfaction, and the Direct Effect between Cumulative Risk and Antisocial Behaviour

Three moderator variables – depressed feelings, parental monitoring and peer antisocial behaviour – interacted with cumulative risk to influence both the pathway between risk and the mediator life satisfaction, as well as the direct pathway between risk and antisocial behaviours. Table 9.3 presents results for these variables, with main effects of cumulative risk and each moderator variable on both life satisfaction and
antisocial behaviour on the left side. Moderated mediation results (run separately for each moderator tested), where cumulative risk, the moderator and the interaction term (moderator*cumulative risk) were regressed onto life satisfaction as well as antisocial behaviours are shown on the right side.

Table 9.3  
**Significant first-stage moderators: direct and moderated mediation effects**

<table>
<thead>
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<th></th>
<th>Main effects models</th>
<th>Moderated mediation models</th>
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<td></td>
<td>Life Sat</td>
<td>ASB</td>
</tr>
<tr>
<td></td>
<td>$B$</td>
<td>$SE$</td>
</tr>
<tr>
<td><strong>Cumulative Risk</strong></td>
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<td>.216</td>
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<tr>
<td><strong>Moderators</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressed feelings</td>
<td>-2.84**</td>
<td>.184</td>
</tr>
<tr>
<td>C Risk → L Sat</td>
<td>-.189**</td>
<td>.035</td>
</tr>
<tr>
<td>C Risk → ASB</td>
<td>.561**</td>
<td>.069</td>
</tr>
<tr>
<td>Parental monitor</td>
<td>1.97**</td>
<td>.205</td>
</tr>
<tr>
<td>C Risk → L Sat</td>
<td>-.188**</td>
<td>.041</td>
</tr>
<tr>
<td>C Risk → ASB</td>
<td>.543**</td>
<td>.068</td>
</tr>
<tr>
<td>Peer ASB</td>
<td>-1.56**</td>
<td>.211</td>
</tr>
<tr>
<td>C Risk → L Sat</td>
<td>-.163*</td>
<td>.048</td>
</tr>
<tr>
<td>C Risk → ASB</td>
<td>.257**</td>
<td>.065</td>
</tr>
</tbody>
</table>

*Note. Each moderator was tested separately in the model; $^1$ Cumulative risk x moderator  
** $p<.001$; * $p<.01$; * $p<.05$*

While depressed feelings was a significant direct predictor of life satisfaction, there was no significant main effect when regressed onto antisocial behaviours ($p = .10$). In the moderated mediation model however, its interaction with risk (cumulative risk*depressed feelings) was significant for both the pathway between cumulative risk and life satisfaction and the pathway between cumulative risk and antisocial behaviour. Parental monitoring and peer antisocial behaviour had a more pervasive influence within the analysis, with each having a direct main effect on antisocial behaviours as
well as interacting with cumulative risk to affect both life satisfaction (through the moderated mediation pathway), and antisocial behaviours (directly). In addition, parental monitoring and peer antisocial behaviour were significant second-stage moderators.

As the dependent variable for these analyses (antisocial behaviour) was presumed to be non-linearly related to the various moderators, in addition to the plots presented in the following sections I also created 5-point moderation plots. These plotted a high and low value of the moderator, as well as the mean value and 1 standard deviation above and below the mean (0 ± 1 as standardised scores were used). These additional plots did not reveal any new patterns and are therefore not included in the following discussion.

9.4.4.1 Depressed Feelings

The effects of the interaction of depressed feelings and cumulative risk on life satisfaction is shown in Figure 9.10. Not surprisingly, low levels of depressed feelings were related to higher life satisfaction overall in comparison to youths reporting high levels of depressed feelings. For adolescents reporting high levels of depressed feelings, cumulative risk had very little influence on levels of life satisfaction, with adolescents consistently reported below average levels of life satisfaction regardless of the level of cumulative risk faced. However when depressed feelings were at lower levels, life satisfaction declined to below the mean as cumulative risk increased. Thus, even when experiencing good levels of emotional wellbeing (as measured by low levels of depressed feelings), youths facing higher levels of cumulative sociodemographic risk felt less satisfied with their lives than average.
Figure 9.10. Interaction of depressed feelings and cumulative risk on life satisfaction

Figure 9.11 shows the moderating effect of depressed feelings on the direct pathway between cumulative risk and antisocial behaviours. The influence of cumulative risk on antisocial behaviours was greater for adolescents when depressed feelings were low, compared to those who reported high levels of depressed feelings. Youths with high levels of depressed feelings reported few antisocial acts during the previous year regardless of cumulative risk levels. When depressed feelings were low, adolescents low in cumulative risk also reported few antisocial acts, but antisocial behaviour increased as cumulative risk increased for this group.

Figure 9.11. Interaction of depressed feelings and cumulative risk on antisocial behaviour
These results suggest that in the absence of poor emotional wellbeing (measured as low depressed feelings) cumulative risk has the expected relationship with antisocial behaviours, where engagement in antisocial acts increases as risk increases. In contrast, higher levels of depressed feelings appear to buffer the effects of cumulative risk on antisocial behaviour, with minimal difference to antisocial involvement for these adolescents. Further, youths with high levels of depressed feelings reported few antisocial behaviours during the previous year (regardless of their degree of cumulative risk), thereby challenging theoretical positions such as the stability perspective which proposes a strong concurrent relationship between depression and antisocial behaviour, and acting out theory, which proposes that depressed children externalise underlying distress through antisocial displays (Chapter 2, Page 26). However the cross-sectional nature of the data set means it is not possible to draw firm conclusions about these relationships, as it could also be the case that adolescents experiencing increasing levels of cumulative risk alleviate feelings of depression through antisocial activity, with the degree of delinquency necessary to keep high levels of depressed feelings at bay increasing as cumulative risk increases.

9.4.4.2 Parental Monitoring

The interactive effect of parental monitoring and cumulative risk on life satisfaction is shown in Figure 9.12. For adolescents facing a high degree of cumulative risk, levels of parental monitoring had minimal effect on life satisfaction, but at lower cumulative risk levels differences in life satisfaction were evident in relation to monitoring by parents. When parental monitoring was low, there was minimal variation in levels of life satisfaction due to cumulative risk levels. At high levels of parental monitoring, adolescent life satisfaction decreased as cumulative risk increased (although youths
were always more satisfied with their lives when parental monitoring was higher). This pattern reflects that seen for other parenting variables (and indeed the majority of moderators investigated) with first-stage moderation effects.

![Figure 9.12. Interaction of parental monitoring and cumulative risk on life satisfaction](image)

The plot depicting the moderation effect of parental monitoring on the direct relationship between cumulative risk and antisocial behaviour (Figure 9.13) shows that higher levels of cumulative risk were related to increased antisocial activity for youths with both low and high levels of parental monitoring. Where parents more strictly monitored their children, the impact of risk on increased antisocial behaviour was smaller in magnitude. Lack of parental monitoring (when compared to high monitoring levels) increased antisocial involvement for all adolescents regardless of levels of risk. Where monitoring was at low levels, the extent of antisocial activity increased considerably as levels of cumulative risk increased.
Thus, low levels of parental monitoring resulted in increased life satisfaction for high-risk adolescents, as well as increased levels of antisocial activity (no doubt, to some extent as a consequence of increased opportunity due to the absence of parental monitoring). High levels of parental monitoring resulted in below-mean levels of life satisfaction for high-risk youths, but the extent of involvement in antisocial behaviours was restricted to levels only slightly higher than those reported by low-risk youths.

9.4.4.3 Peer Antisocial Behaviour

Figure 9.14 shows the interaction effect of peer antisocial behaviour with cumulative sociodemographic risk on life satisfaction. In general, adolescents were more satisfied with their lives when peers were not antisocial, but it was only at lower levels of cumulative risk that the positive influence of fewer antisocial peers resulted in above average levels of life satisfaction. As cumulative risk increased, youths with mostly prosocial peers became less satisfied with their lives, while youths with mostly antisocial peers became more satisfied. However, adolescents higher in cumulative risk
reported being dissatisfied with their lives (lower than average levels of life satisfaction), regardless of peer characteristics.

![Figure 9.14. Interaction of peer antisocial behaviour and cumulative risk on life satisfaction](image)

It was not surprising to find, when examining the direct effects of the interaction between risk and peer antisocial behaviour (see Figure 9.15), that adolescents with more antisocial peers committed more antisocial acts themselves compared to adolescents with mostly prosocial peers. When peers were mostly prosocial antisocial behaviours were uncommon, regardless of the levels of cumulative risk. Levels of cumulative risk had only a small influence on the relationship between adolescent antisocial behaviour and the antisocial behaviour of their peers, but it was interesting to note that associating with antisocial peers had a weaker influence on antisocial involvement for youths with high levels of cumulative risk.
These results suggest possible differences in the influence of antisocial peers depending on levels of sociodemographic disadvantage. In environments with low cumulative risk, being part of a prosocial peer group means high life satisfaction and a lack of antisocial activity, whereas those who associate with highly antisocial peers are the most dissatisfied with their lives and engage in the most antisocial behaviours. Thus, wellbeing (in terms of life satisfaction) and social interactions (in terms of having antisocial peers) appear to be connected in affecting antisocial behaviours amongst youths with low levels of sociodemographic risk. For example, low-risk adolescents may behave delinquently due to rejection from prosocial peer groups. At higher levels of cumulative risk the types of peers one interacts with (in terms of levels of peer antisocial behaviour) matter less for wellbeing because these youths are dissatisfied with their lives regardless of peer characteristics. The higher levels of antisocial activity for at-risk youths with highly antisocial peers might therefore be more a result of opportunity than dissatisfaction due to peer relationships.

Figure 9.15. Interaction of peer antisocial behaviour and cumulative risk on antisocial behaviour
9.4.5 Second-stage Moderators of the Mediated Relationship between Cumulative Risk and Antisocial Behaviours

A second set of moderated mediation analyses examined the second stage of the cumulative risk-life satisfaction-antisocial behaviour pathway. Seven variables were found to be significant moderators of the relationship between life satisfaction and antisocial behaviours (Table 9.4). These moderators included three variables related to individual wellbeing – self-esteem, self-worth and depressed feelings; two variables which reflected parenting characteristics – parental knowledge and parental monitoring; and two variables related to social relationships – school membership and peer antisocial behaviour.

Five of the seven significant second-stage moderators were also first-stage moderators. As discussed on pages 302 and 304 of this Chapter, self-worth and parental knowledge interacted with cumulative risk to affect levels of life satisfaction, and parental monitoring (see Page 309), peer antisocial behaviour (see Page 311), and depressed feelings (see Page 307) interacted with cumulative risk to affect both life satisfaction and antisocial behaviour. In contrast, self-esteem and school membership were second-stage moderators only (significantly interacting with life satisfaction to affect antisocial behaviours but having no significant interaction with cumulative risk to affect outcomes).

As with the plots examining moderation of the direct relationship between cumulative risk and antisocial behaviours, 5-point plots were also created to explore moderators of the life satisfaction-antisocial behaviours pathway. Again, these did not offer additional insight beyond the moderation plots presented in the following section and are therefore not discussed further.
Individual Wellbeing: Self-esteem, Self-worth and Depressed Feelings

Self-worth and depressed feelings influenced the relationship between life satisfaction and antisocial behaviours in very similar ways. As shown in Figures 9.16 and 9.17, adolescents who were highly satisfied with life engaged in few antisocial behaviours regardless of their levels of self-worth or depressed feelings. Life satisfaction did little to influence differences in antisocial activity when self-worth was low, or depressed feelings high. In this case it may be that poor emotional wellbeing overrides any effects of life satisfaction. In contrast, when emotional wellbeing is good, that is, when adolescents have high self-worth or low levels of depressed feelings, life satisfaction has a stronger influence on antisocial behaviour. In both cases, antisocial activity is considerably greater amongst adolescent who are dissatisfied with life and reduces in extent as youths become increasingly more satisfied.
While the relationship between life satisfaction and antisocial behaviour was similar for self-worth and depressed feelings, a very different pattern emerged when self-esteem was considered. As shown in Figure 9.18, the influence of self-esteem was essentially the opposite of that found for the other measures of wellbeing. High self-esteem had a minimal effect on the relationship between life satisfaction and antisocial behaviours (as opposed to low self-worth and low depressed feelings), and low self-esteem had a stronger influence. Specifically, for adolescents with low self-esteem, life satisfaction...
satisfaction increased as they behaved more antisocially. When adolescents were dissatisfied with their lives higher self-esteem was related to increased antisocial activity, but when life satisfaction was high youths were more antisocial when their self-esteem was low.

Figure 9.18. Interaction of self-esteem and life satisfaction on antisocial behaviour

These results suggest some critical differences in the ways in which emotional wellbeing affects the relationship between life satisfaction and antisocial behaviours. A possible explanation for these differences lies in the differentiation between self-worth and self-esteem, where self-worth refers to a stable measure of one’s inherent value over a long period while self-esteem captures more transient feelings about the self (Rosenberg, 1986). Based on these definitions, it could be argued that low self-esteem drives adolescents to behave more antisocially in order to feel more satisfied with their lives, but in the longer term, those with a sense of low self-worth and/or with high levels of depressed feelings are not more satisfied with life through increased antisocial behaviour. This hypothesis would need to be tested with longitudinal data.
9.4.5.2 Parenting: Parental Knowledge and Parental Monitoring

Two parenting characteristics—parental knowledge and monitoring—were significant moderators of the relationship between life satisfaction and antisocial behaviour. As shown in Figure 9.19, when parental knowledge was low levels of life satisfaction made a minimal difference to the extent of antisocial behaviour. When parental knowledge was at high levels however, life satisfaction had a stronger relationship with antisocial involvement. Adolescents reporting high parental knowledge engaged in few antisocial behaviours when they were satisfied with their lives, but as life satisfaction decreased the protective effect of high parental knowledge diminished, resulting in higher levels of antisocial behaviour. An unexpected finding was that at the lowest levels of life satisfaction, adolescents were more antisocial when their parents had a good knowledge of what was happening in their lives, compared to when parents had little knowledge.

![Figure 9.19. Interaction of parental knowledge and life satisfaction on antisocial behaviours](image)

The effect of parental monitoring on the relationship between life satisfaction and antisocial behaviour followed a broadly similar pattern, although the extent of influence
differed (Figure 9.20). When parental monitoring was low, life satisfaction increased in line with antisocial activity. When parental monitoring was high, adolescents engaged in few antisocial acts overall, and life satisfaction increased as antisocial behaviour decreased. Differences in levels of parental monitoring were less influential when life satisfaction was low than when life satisfaction was high. Thus, it appears that for the most part good parenting relationships reduce the antisocial activity of adolescents, but poorer life satisfaction reduces this influence.

![Figure 9.20. Interaction of parental monitoring and life satisfaction on antisocial behaviours](image)

9.4.5.3 Social Bonds: School Membership and Peer Antisocial Behaviour

Feelings of life satisfaction made little difference to antisocial activity when bonds to school were poor (Figure 9.21). When youths had strong bonds with school (high school membership) those with high levels of life satisfaction engaged in few (or no) antisocial behaviours. This is in line with literature that has noted school membership to be a protective factor against antisocial behaviour. When life satisfaction was low however, stronger feelings of school membership were associated with increased
antisocial activity. These findings initially appear counter-intuitive, but this could once again be a consequence of a different time-order. It is possible that youths who feel a strong sense of school membership but still engage in antisocial acts may experience reduced feelings of life satisfaction due to conflict between their antisocial activities and the expectations for conformity that school membership as a social control promotes.

![Figure 9.21. Interaction of school membership and life satisfaction on antisocial behaviours](image)

The impact of peer antisocial behaviour on the relationship between life satisfaction and antisocial behaviours is shown in Figure 9.22. As anticipated, adolescent antisocial behaviour was lowest when peer antisocial behaviour was also low, with a small increase in antisocial acts as life satisfaction decreased. The relationship between life satisfaction and antisocial behaviour was much stronger when youths were involved with a highly antisocial peer group. When life satisfaction was low, youths with highly antisocial peers participated in more antisocial acts than youths with more prosocial peers. Further, when their peers were highly antisocial adolescents engaged in increased levels of antisocial activity, and their life satisfaction increased substantially in line with their antisocial behaviour.
This chapter explored the utility of a GST model for explaining the influence of cumulative sociodemographic risk on adolescent antisocial behaviour. Specifically, analyses reported in this chapter examined whether (1) the influence of cumulative sociodemographic risk on antisocial behaviour was mediated through affective responses to this strain, and whether (2) risk and protective factors moderated the pathways through which cumulative sociodemographic strain exerted its influence.

Support was found for a strain model in which life satisfaction acted as a mediator of cumulative sociodemographic risk. Depressed feelings were not found to mediate the effects of cumulative risk on antisocial behaviours in this study. This was due to the lack of a significant relationship between cumulative risk and depressed feelings, because the second step of the mediation pathway (depressed feelings $\rightarrow$ antisocial behaviour) was significant. It is feasible that had the depressed feelings mediation...
model been explored separately according to gender, results may have differed. This will be explored in future analyses.

GST proposes that the relationship between strain and deviance varies according to personal and social resources, as well as social contexts (Aseltine et al., 2000). This study found that several risk and protective factors moderated the pathways between cumulative risk and life satisfaction (first-stage moderators), and between life satisfaction and antisocial behaviour (second stage moderators). In addition, some first stage moderators also had an interactive effect on the direct pathway between cumulative risk and antisocial behaviour. However not all significant interactions fitted with a GST framework. Longitudinal data may clarify the explanation of some of these theoretically anomalous relationships.

9.5.1 Individual Characteristics as Moderators

GST suggests that self-mastery, including a more positive self-view and emotional wellbeing, increases coping in the face of strain (Broidy, 2001; Froggio & Agnew, 2007). In addition, personal resources such as self-control should limit reactions to the emotional effects of strain (Agnew et al., 2002; Hay & Evans, 2006). Self-worth, self-esteem, depressed feelings, and self-control were all significant moderators in the model, but not always in the part of the mediation pathway predicted by GST.

This study did not find self-control to be influential as a second-stage moderator as anticipated, where youths with higher levels of self-control would be less likely to react with antisocial behaviours to affective stimuli experienced due to strain. In contrast, self-control was found to be a significant first-stage moderator, influencing the relationship between cumulative risk and life satisfaction. Adolescents with low self-control were dissatisfied with their lives, and far less satisfied than youths with high
self-control regardless of levels of risk. While life satisfaction decreased as cumulative risk increased for both groups, this effect was more pronounced for youths with high levels of self-control, who dropped from high levels of life satisfaction (at low cumulative risk) to below mean levels (at high cumulative risk).

Self-worth moderated both the first and second stages of the Cumulative risk-Life satisfaction-Antisocial behaviour pathway. While cumulative risk had little influence on the life satisfaction of youths with low self-worth, for youths with high self-worth, life satisfaction decreased as risk increased. Low self-worth also had no influence on the relationship between life satisfaction and antisocial behaviours, but when self-worth was high, antisocial behaviour of adolescents increased as life satisfaction decreased.

Depressed feelings was also both a first and second stage moderator, as well as having a moderating effect on the direct pathway between cumulative risk and antisocial behaviour. In all cases, it was low depressed feelings that was a significant moderator. When depressed feelings were at low levels, as cumulative risk increased, life satisfaction decreased, and antisocial behaviours increased. The influence of depressed feelings as a second stage moderator was equal to that of self-worth: the antisocial behaviour of adolescents with low levels of depression decreased as life satisfaction increased. In contrast, for adolescents with high levels of depressed feelings, cumulative risk and life satisfaction had little effect on antisocial behaviour.

Of all the individual-level variables, self-esteem (a second-stage moderator only) had a unique influence, in that high self-esteem had little effect on the relationship between life satisfaction and antisocial behaviours, but low self-esteem was more influential. Youths with low self-esteem became more satisfied with their lives as their antisocial activity increased.
The majority of these findings do not align with what might be expected from a GST model. Poor emotional wellbeing, such as is seen through low self-worth and high levels of depressed feelings, might intuitively be expected to increase the effects of cumulative risk on life satisfaction, or increase antisocial behaviour when life satisfaction is low. This was the case in Agnew, Brezina, Wright and Cullen’s (2002) study where negative emotionality (in combination with constraint) reduced the ability to cope with strain in non-criminal ways.

That self-control was a significant first-stage moderator (but not second stage) was interesting in itself, because GST would likely place self-control as more influential in determining whether youths acted on the emotional effects of strain (such as in Hay and Evans’ 2006 study) than in shaping the experience of those emotional consequences. In contrast, results in this Chapter show that higher levels of impulsivity (low self-control) actually worked as a protective factor to buffer the effects of cumulative risk on life satisfaction.

That adolescents with low self-esteem have higher life satisfaction when they behave more antisocially also suggests that the relationship between these variables may not operate in the direction set out in the GST mediation model tested. It seems more likely that adolescents with low self-esteem engage in antisocial acts as a strategy for improving life satisfaction, rather than esteem influencing the effect of life satisfaction on antisocial behaviour. The influence of self-esteem is therefore counter to what would be expected according to a GST framework, where higher levels of self-esteem are theorised to improve coping mechanisms and thereby reduce the likelihood of behaving antisocially (Agnew, 1992; Broidy, 2001).
9.5.2 Parenting Relationships as Moderators

All aspects of parenting relationships played some role in moderating the effects of cumulative sociodemographic risk in the GST model explored. In contrast to individual level variables, most often these relationships conformed to expectations based on GST. In the first stage of moderation (between cumulative risk and life satisfaction), higher levels of parental attachment, availability, knowledge and monitoring were related to increased life satisfaction overall (when compared to low levels of parenting variables), but this increased satisfaction diminished as cumulative risk increased. Parental monitoring also moderated the direct relationship between cumulative risk and antisocial behaviour. In this case, higher levels of monitoring resulted in decreased antisocial activity, although the effect was weaker for youths with higher levels of cumulative risk. The influence of these parenting variables within the mediation model was consistent with a GST theory which suggests that social supports such as stronger parenting relationships would reduce the emotional impacts of strain (Agnew & White, 1992).

Parental knowledge and monitoring were also second stage moderators of the relationship between life satisfaction and antisocial behaviour. High levels of parental knowledge reduced adolescent antisocial behaviour when life satisfaction was high, but when life satisfaction was low, high parental knowledge was related to a higher level of antisocial activity than when parental knowledge was low. Antisocial behaviours decreased as life satisfaction increased when parental monitoring was high, but when monitoring was low, antisocial behaviours increased as life satisfaction increased. These results again suggest that rather than life satisfaction having an influence on antisocial behaviour, it might be the case that antisocial involvement increases life satisfaction for these youths.
9.5.3 Social Relationships as Moderators

Two social relationship factors were significant moderators in the GST model. Peer antisocial behaviour moderated both the first and second stages of the model, as well as the direct pathway between cumulative risk and antisocial behaviour. Examination of the direct pathway showed that associating with antisocial peers was related to increased delinquency. However, high levels of peer antisocial behaviour had a stronger influence on adolescent antisocial activity for youths with low cumulative risk compared to those with high. This differs from what would be expected based on GST theory, where associating with antisocial peers should be related to increased antisocial behaviour as levels of strain (cumulative risk) become greater, as suggested by Agnew and White's (1992) study, as well as by Mazerolle and Maah’s (2000) study for the outcomes of violence and drug use.

In the mediated pathway, as cumulative risk increased, youths exposed to low levels of peer antisocial behaviour became less satisfied with life, while those exposed to high levels of peer antisocial behaviour were more satisfied with life. There was little difference in antisocial behaviours for adolescents with low peer antisocial behaviour, with minimal engagement regardless of risk. It might be the case however that the influence of peers is weaker for youths facing high levels of strain. This hypothesis is somewhat supported when the second stage pathway is examined. Here, high peer antisocial behaviour was related to much lower rates of adolescent antisocial behaviour when life satisfaction was low, compared to when life satisfaction was high. This result does not seem consistent with a GST model, and it is presumed that the temporal order of the relationships might be an explanation: when youths have highly antisocial peers, life satisfaction may increase as antisocial activity increases.
The influence of school membership is somewhat more easily aligned with a GST theory which proposes that social controls such as attachment to school reduce the effects of strain on delinquency (Mazerolle & Maahs, 2000). Strong feelings of school membership were found to be related to low levels of antisocial activity, but only when life satisfaction was high, as antisocial behaviour increased as levels of life satisfaction decreased. Low school membership made no difference to the relationship between life satisfaction and antisocial activity, in contrast to Agnew, Brezina, Wright and Cullen’s (2002) study which found that for young people with low levels of attachment to school strain had a stronger effect on delinquency than for those with higher than mean levels of school attachment.

9.5.4 The Utility of GST in Explaining the Relationship between Cumulative Sociodemographic Risk and Adolescent Antisocial Behaviour

Overall, GST provides a useful framework for explaining the processes through which sociodemographic risk, conceptualised as strain, leads to an increased likelihood of antisocial behaviour during adolescence. A relationship between cumulative sociodemographic risk and life satisfaction is evident, where satisfaction decreases as strain increases. The relationship between life satisfaction and antisocial activity appears to be more complicated, with reciprocal influences of these variables over time appearing highly feasible. Social controls such as those resulting from positive bonds to parents and school moderated the effects of strain in line with GST expectations, but other moderating variables, such as individual characteristics suggest the need to consider an extended GST model, or a model that integrates other theoretical positions with a GST framework.
With cumulative sociodemographic risk demonstrated to be an effective way of understanding how disadvantage affects the lives of adolescents, Chapter 10 provides a summary of central concepts related to this phenomenon. In addition, key research findings are reviewed, and conclusions regarding the importance of recognising the influence of cumulative sociodemographic risk, and responding to this accordingly, are made.
CHAPTER 10. SUMMARY AND DISCUSSION

10.1 Introduction

Research examining the effects of low SES, poverty and disadvantage are not uncommon in the research literature. Fewer studies focus on the cumulative nature of these sociodemographic challenges however, or explore the processes through which they influence outcomes. This research project aimed to address these gaps in the literature.

In this chapter I provide an overview of the research project, revisiting the project rationale and methodology, and reflecting on analysis findings. This chapter concludes that cumulative sociodemographic risk is related to increased presence of risk factors, decreased protective factors, as well as greater likelihood of antisocial activity, and more serious antisocial acts. A General Strain Theory framework is found to be useful for explaining the processes through which cumulative sociodemographic risk operates. Within this framework, the protective influence of individual characteristics, including emotional wellbeing, as well as strong bonds to parents and school are shown to be diminished for youths facing sociodemographic disadvantage. Ultimately, cumulative sociodemographic risk is determined to be a powerful influence in adolescent life, which must be acknowledged and addressed in order to promote positive outcomes for disadvantaged youth.

10.2 Why Sociodemographic Risk and Positive Adolescent Development Matter

The transition from childhood to adulthood is a critical developmental phase, often envisaged as the point at which pathways diverge for young people (Shaw & Dallos, 2005). Successful navigation of the adolescent period provides a solid foundation for a positive and productive adulthood. In contrast, poor decision making and adverse
experiences during adolescence can have far-reaching effects. While some degree of involvement in antisocial activity during the adolescent period is not uncommon, such activity is frequently experimental and transitory (Vassalo et al., 2002; Moffitt, 1993). Despite this, the risk of being caught in snares such as school dropout, unemployment, pregnancy, and dependence on substances makes any antisocial involvement potentially problematic (McGee et al., 2015; Moffitt, 1993). At the other end of the spectrum, extensive antisocial behaviour and serious offending can have grave consequences for young people, particularly when these behaviours lead to official contact with the criminal justice system (Gatti et al., 2009). The ramifications of serious delinquency extend beyond the individual, given the damage these lifestyles cause others and the financial burden to Governments for criminal justice, health, and human services. For these reasons it is important to build a sound understanding of factors contributing to the increased likelihood of antisocial behaviours during adolescence, with a focus on the processes through which such influences operate so that potential points for early intervention can be identified.

Numerous risk and promotive/protective factors have been identified by researchers. Often these are proximal influences, in that they have a strong, direct, and relatively immediate effect on outcomes (Weatherburn, 2001). Proximal factors affecting antisocial behaviours include individual attributes such as self-control, prosocial beliefs, and empathy; factors related to emotional wellbeing including self-esteem, self-worth, life satisfaction, and depressed feelings; parental relationships indicated by such perceptions as parent availability and the young person’s feelings of attachment, and parent knowledge and monitoring of their child’s activities; and social influences including social acceptance, peer deviance, and social bonds such as school attendance. While factors such as these are frequently noted in the research to influence
antisocial activity during adolescence, many studies neglect to investigate the specific nature of those relationships, that is, whether (and how) these variables operate as risk factors, protective (or promotive) factors, or both.

Both theory and empirical research underline the importance of distal risk factors as influences on the proximal processes that shape adolescent experiences and outcomes. Distal or social environmental factors capture aspects of a person’s ‘social address,’ such as neighbourhood of residence, family SES, and cultural background. For example, higher levels of impulsivity have been noted amongst adolescents from low SES families (Anokhin et al., 2011) as well as those from disadvantaged neighbourhoods (Teasdale & Silver, 2009). Similarly, levels of parental monitoring have been found to vary in accordance with measures of neighbourhood disadvantage and instability (Beyers et al., 2003), and family adversity has been demonstrated to increase a young person’s likelihood of associating with deviant peers when growing up in areas where such peers are in plentiful supply (Lacourse et al., 2006).

Ecological systems theory provides a framework for understanding how distal factors influence outcomes through the concept of domains of human experience arranged in a nested fashion “like a set of Russian dolls” (Bronfenbrenner, 1979, p. 4). Thus, individuals are influenced not only by proximal processes (typically dyadic interactions) within the microsystem but also by the contexts beyond the microsystem, including the mesosystem (interactions between microsystem level systems), the exosystem (external contexts in which more immediate settings are embedded), and the macrosystem (economic, social, educational, legal, and political systems). Ecological systems theory proposes that environment also plays a moderating role, with contextual factors influencing the operation of proximal interactions (Bronfenbrenner, 1999). For example, the protective effect of parental monitoring on children’s academic success
was found to be stronger in two parent families where the mother had qualifications beyond grade 12, compared to single or step-parent families with less well qualified mothers.

Sociodemographic characteristics, including socioeconomic status, family structure and mobility, neighbourhood of residence, and cultural background are key contextual influences consistently identified in research as being associated with poor outcomes including adolescent antisocial behaviours (Farrington, 2011; McBride Murry et al., 2011; Piotrowska et al., 2015). Rather than directly influencing outcomes, these contextual risk factors tend to have an indirect effect, exerting their influence through processes of mediation and moderation. A further characteristic of these risk factors is their tendency to co-occur: youths from low SES families frequently reside in more disadvantaged neighbourhoods and are more likely to experience family discord and be exposed to peer deviance (Eamon, 2002; Evans, 2004; Moss et al., 2003). This phenomenon is concerning in light of research which demonstrates that the risk of poor outcomes is exacerbated when multiple risks occur concurrently.

Studies of cumulative risk demonstrate that when numerous risks are experienced concurrently, stressors tend to interact with each other, exacerbating the effect on outcomes. This means that the influence of multiple risk factors is far stronger than the additive effect of each risk factor alone (Kalil & Kuntz, 1999; Price & Hyde, 2009; Rutter, 1979; Sameroff et al., 1987). Cumulative risk researchers most often count the number of risks present and use this number to represent the extent of risk. One characteristic of this research that is problematic however is the lack of consistency in regard to which specific risks are included in indices. Flouri (2008) argues that research exploring cumulative risk should focus on risks from a single domain to best understand the processes through which they operate. To fully explore the ways in which
cumulative sociodemographic risk affects individuals, it is necessary to separate it from factors which mediate its influence on outcomes (for example parenting characteristics or peer interactions). Despite this recommendation, there are remarkably few studies which examine multiple or cumulative risk using only sociodemographic variables.

10.3 The aims of this study

This study aimed to address two gaps in the literature. The first of these was related to the paucity of research examining how cumulative sociodemographic risk influences adolescent antisocial behaviours. Thus, my central aim was to shed light on the ways in which sociodemographic disadvantage affects the experiences and life outcomes of modern Australian adolescents. I drew on the explanatory power of General Strain Theory as a framework for understanding the processes though which cumulative sociodemographic risk operates. The second gap was related to methodological and modelling problems which have long been recognised as challenges when analysing count outcome variables but became acutely felt concerns during the course of this study. Because they are central to the probity of the empirical research upon which my thesis rests, I will address these modelling issues first.

10.3.1 Exploring Methodologies for Modelling Count Data

Analytic strategies for data on counts of infrequent events, such as the reported number of antisocial acts, are particularly difficult to get right. Distributions of such count data violate many of the assumptions that underpin linear modelling techniques, necessitating consideration of potentially complex alternatives (DeMichele & Payne, 2013; Osgood et al., 2002). Given the limitations of data transformations or the reformatting of outcome variables into dichotomous or categorical measures, the use of distributions such as Poisson and negative binomial (possibly in zero-inflated models)
offer practical solutions. However theoretical as well as statistical considerations must also guide decision making in relation to modelling strategies (Walters, 2007).

In this study, where the outcome variable (antisocial behaviour) had a large number of zero values, model selection and the evaluation of model fit were prioritised as essential steps prior to addressing the research questions. Through statistical modelling and examination of residual plots, the negative binomial (NBRM) and zero-inflated negative binomial (ZINB) regression models were demonstrated to provide the best fit for the data. Practical implications related to the ability to perform moderated mediation analyses with commonly employed software suggested that a NBRM model was the best option. In addition, examination of the antisocial behaviour construct provided no reason to presume, on the basis of any reasonable theoretical considerations, that the large number of zero values came from two separate sources ("structural" zeroes, and "sampling" zeroes), as is required when using ZINB regression (Lord et al., 2005).

While the NBRM fit was slightly improved with removal of some ‘true’ zeroes identified through Classification Tree analysis, the model was not improved sufficiently to justify reducing the dataset by removing these cases. After a long process of testing alternative approaches, a hurdle model was determined to be the best option. The hurdle model involves two steps. The first step uses logistic regression on a binary outcome which determines whether that observation crosses the threshold. In the case of this study, the threshold was the existence of *some* antisocial behaviour. The second part of the hurdle model is a truncated count model where only those observations which cross the threshold (that is, only youths who reported some antisocial activity) are included. Use of the hurdle model therefore enabled investigation into absence/presence of antisocial behaviour, as well as the extent of antisocial behaviour.
This exploration of model fit adds to the research literature by emphasising the need to put considerable effort into the choice of an appropriate model, in order to produce results that are robust and meaningful. While no model will ever fit a data set perfectly, exploring the fit of selected models is important to ensure there is no alternate model which would fit better. Such statistical exploration must however be undertaken in light of a theoretically informed understanding of the dependent variable and also respect the bounds of practicality in social science research.

10.3.2 Exploring the Influence of Cumulative Sociodemographic Risk

I sought in this study to explore the ways in which sociodemographic risk factors, when experienced cumulatively, affect adolescent experiences and outcomes. I found from the modelling that cumulative sociodemographic risk operated through a number of mediated and moderated pathways to have a pervasive effect on adolescent life.

*Cumulative sociodemographic risk increased the presence of recognised risk factors and reduced the presence of protective factors*

Males experiencing cumulative sociodemographic risk had significantly lower levels of individual attributes associated with prosocial behaviour, specifically self-control, empathy, and prosocial beliefs. Vulnerable females also had lower levels of self-control compared to not-vulnerable females and in addition experienced lower levels of school membership, which is an important factor that helps protect against poor outcomes. Cumulative sociodemographic disadvantage was related to decreased levels of life satisfaction for both genders, as well as with greater interaction with antisocial peers.
Parental relationships were not poorer due to cumulative sociodemographic risk

Contrary to the oft-voiced notion that parents living in disadvantaged settings engage in poorer quality parenting practices, no significant mean differences were found between socio-demographically vulnerable and not-vulnerable youths when parental attachment, knowledge, and availability were analysed. Differences in levels of parental monitoring were initially noted, but these were related to gender rather than disadvantage in that females (both vulnerable and not vulnerable) were monitored more closely than males. Thus it appears that despite the additional pressures related to parenting in a disadvantaged setting, the quality of the adolescent-parent relationship is equivalent to that found in less socio-demographically challenged families. It is likely the case however that the protective effects of positive parenting practices are less influential in disadvantaged settings than in advantaged. That is, disadvantaged children may require very strong relationships with parents in order to experience similar outcomes to not at-risk youths with parental relationships of average strength.

Cumulative sociodemographic risk increased the likelihood of youths being involved in antisocial behaviours

While cumulative sociodemographic risk and antisocial behaviours were moderately correlated \( (r = .50) \), the tendency for antisocial activity to increase in line with cumulative disadvantage was evident from plots of the relationship between these variables (see Page 257). For females, the relationship was mostly linear, with the number of reported antisocial behaviours during the previous year beginning to rise at cumulative sociodemographic risk scores of 4. For males, antisocial behaviours increased at risk scores of 3 and rose rapidly for scores of 6 after which delinquent involvement plateaued, suggesting a threshold of risk. Both male and female socio-
demographically vulnerable adolescents were significantly more likely to engage in antisocial behaviours during the previous year, compared to those not classified as vulnerable. Over half of the not vulnerable adolescents in the sample (54.7%) reported no antisocial activity during the previous year, in comparison to only 28.4% of vulnerable adolescents.

*For sociodemographically vulnerable adolescents, the extent of contextual risk and peer associations were strongly related to antisocial behaviour*

Peer antisocial behaviour was the only significant predictor of the absence or presence of antisocial activity for vulnerable youths, except that when the extent of cumulative sociodemographic disadvantage was included in the model the extent of risk became the strongest correlate of antisocial engagement. In contrast, for not-vulnerable youths the individual characteristics of self-control, prosocial beliefs and empathy, as well as parental monitoring and peer antisocial behaviour, were all significant in predicting the likelihood of behaving antisocially. Given that association with antisocial peers is more likely for youths living in disadvantaged neighbourhoods, one could almost assert that adolescents experiencing cumulative sociodemographic risk are ‘destined’ to be antisocial due to the social environments in which they find themselves. The individual characteristics of vulnerable adolescents appear to be overshadowed by socioeconomic context when predicting their likelihood of behaving antisocially. This suggests that programs targeting characteristics of vulnerable youths, such as impulsivity or prosocial beliefs, might be unlikely to prevent delinquency unless serious attention is paid to the consequences of their high levels of cumulative sociodemographic risk.
As cumulative sociodemographic risk increased, motivation for antisocial behaviour became less emotionally driven and more socially driven

Closer investigation of the predictors of absence/presence of antisocial behaviour for vulnerable youths showed that the small proportion of youths with high cumulative risk scores (for example, scores of 8 or more) were much more likely to report having behaved antisocially in the previous year. These antisocial adolescents with high risk scores also reported higher than mean levels of social acceptance. The great majority of socio-demographically vulnerable adolescents (83.6%) had cumulative risk scores between 4 and 7 (inclusive), and these youths not only had a more even spread of social acceptance scores but were more likely than highly disadvantaged vulnerable adolescents to have self-esteem and self-worth scores which fell below the mean. These results suggest that as the degree of cumulative sociodemographic risk increases the impetus for behaving antisocially changes. Those experiencing some degree of sociodemographic disadvantage may be somewhat likely to behave antisocially in an attempt to alleviate feelings of low self-esteem and self-worth, whereas those experiencing high degrees of sociodemographic disadvantage might participate in antisocial behaviours due to the increased levels of social acceptance they experience as a result.

Antisocial behaviours of adolescents facing cumulative sociodemographic risk were more serious in nature

Not only are vulnerable youths more likely to engage in antisocial activities, they are also more likely to commit serious antisocial acts. As might be expected, the rates of participation in antisocial behaviours according to cumulative sociodemographic risk status differed least for minor delinquency, including acts such as skipping classes,
minor shoplifting and stealing money, with vulnerable adolescents 1.7 times more likely than not vulnerable adolescents to report these activities. In contrast, vulnerable adolescents were around 3 times more likely to report automotive crime, property crime, and physical assaults than those not vulnerable. Use of substances and alcohol was more likely amongst the vulnerable cohort in comparison to those not vulnerable, but the difference was only significant for males. Vulnerable males were 4.7 times more likely than not-vulnerable males to report having used substances such as marijuana, speed, and pills during the previous year, and 3 times more likely to report alcohol use.

**Opportunity had the strongest influence on the number and variety of antisocial acts youths engage in, regardless of levels of cumulative sociodemographic risk**

Fewer vulnerability-based differences were apparent when examining the extent, rather than the absence/presence of antisocial activity. For all youths, parental monitoring and peer antisocial behaviour were the strongest predictors of engaging in a greater number and variety of antisocial acts. High levels of peer antisocial behaviour was a risk factor for both groups, although low levels were not promotive or protective for either (Figure 8.19, Page 281). Parental monitoring was a risk factor at low levels for not-vulnerable youths but operated both as a risk (at low levels) and protectively (at high levels) for adolescents with cumulative sociodemographic disadvantage (Figure 8.20, Page 282). This suggests that opportunity, provided through reduced monitoring or increased association with other antisocial youths, has the largest influence on levels of antisocial involvement, regardless of cumulative sociodemographic risk. It also indicates that the extent of antisocial behaviours in which vulnerable youths engage may be reduced through increased parental monitoring. While the degree of sociodemographic risk was influential in affecting whether vulnerable youths engaged
in any antisocial behaviours (presence of antisocial behaviour), it was not significant when predicting the extent of antisocial behaviour.

**Socio-demographically vulnerable populations appeared more accepting of antisocial behaviours**

Prosocial beliefs predicted the extent of antisocial activity for sociodemographically vulnerable youths. When the degree of cumulative sociodemographic risk was controlled social acceptance also became a significant predictor for this group. When the antisocial peers variable was dropped from the model, Table 8.12 (Page 277) shows that in contrast to the not vulnerable youths for whom levels of social acceptance were not associated with the number of antisocial acts, for vulnerable youths high levels of social acceptance was associated with increased numbers of antisocial behaviours. Antisocial behaviour may be more normative and socially acceptable amongst disadvantaged populations, possibly due to greater exposure to these kinds of acts and an absence of legitimate alternatives. This notion is in line with Strain theory, which suggests that blocked pathways as a consequence of socioeconomic context increases the likelihood of behaving criminally in order realise monetary or status goals (Broidy & Agnew, 1997).

**Self-control, empathy, and prosocial beliefs operated protectively against cumulative sociodemographic disadvantage**

Despite individual characteristics associated with prosocial behaviour not being significant predictors of antisocial activity when included in the full model, for vulnerable youths self-control and prosocial beliefs were noted to operate not only as risk factors at low levels, but also protectively at high levels (see Pages 283-4). In
contrast, while low levels of these variables were risk factors for not vulnerable youths, no promotive/protective influence was found at high levels for this group. Given that mean values of self-control and prosocial beliefs were significantly lower for vulnerable adolescents, this suggests an opportunity to bolster adolescents’ protective capacities by building these individual resources.

10.3.3 The Utility of a GST Model to explain Cumulative Sociodemographic Risk

Responding to Evans, Li and Sepanski Whipple’s (2013) criticism of the lack of theoretically-driven models exploring the pathways through which cumulative risk affects outcomes (see Page 94), I tested the utility of General Strain Theory in explaining the effects of cumulative sociodemographic risk on adolescent antisocial behaviours. While research has investigated strain contextualised in such guises as SES, poverty, and social status, there was an absence of studies that envisaged cumulative measures of sociodemographic disadvantage as strain. In addition, I explored strain as mediated through two measures of affect—depressed feelings and life satisfaction.

*Cumulative sociodemographic risk can be conceptualised as strain, with its effect on antisocial behaviours mediated by life satisfaction*

A General Strain Theory model, where the effects of cumulative sociodemographic risk on antisocial behaviour is mediated by feelings of life satisfaction, was demonstrated to be useful in explaining the relationship between risk and poor outcomes. In contrast, a model using depressed feelings as a mediator was not found to be appropriate, due to the lack of a significant relationship between cumulative sociodemographic risk and depressed feelings.
Risk and protective factors moderated the effects of strain on antisocial behaviours, concordant with a GST model, but protective effects reduced in the face of cumulative sociodemographic risk

Thirteen variables were tested as potential moderators in the GST moderated-mediation model, namely self-esteem, self-worth, depressed feelings, prosocial beliefs, self-control, empathy, parental knowledge, parental attachment, parental availability, parental monitoring, social acceptance, school membership and peer antisocial behaviour. Significant interaction effects were found for 10 of these risk/protective factors. While not all relationships observed to be significant in the moderated mediation model were consistent with a GST framework, a number of factors operated in ways theorised by a strain theory approach. In general, it was evident that some factors acted protectively to reduce the effects of strain (cumulative sociodemographic risk) as well as the affective consequences of experiencing strain (life satisfaction). These variables included strong parenting relationships, better emotional wellbeing, and bonds with school. In all cases however, the protective effect of these variables was reduced as cumulative risk increased and/or life satisfaction decreased. Associating with antisocial peers increased the likelihood of antisocial behaviour, but this effect was diminished as cumulative risk increased. Figure 10.1 presents statistically significant moderation relationships that fit within the GST framework of the model tested.
This research therefore adds to the existing General Strain Theory literature by demonstrating how strain affects adolescent outcomes. In general, the effect of strain in this study was consistent with most research which finds that the likelihood of negative outcomes increases as strain increases. Thus, cumulative sociodemographic risk can be considered an appropriate new way to conceptualise strain during the adolescent period. Envisaging strain in this way better allows for investigation of the proximal processes through which such strain operates, due to the separation of individual and family characteristics from contextual factors as well as the use of a moderated mediation model.

The influence of cumulative sociodemographic risk was shown to be mediated through affective responses to this strain in the case of life satisfaction (but not depressed feelings) where increased negative responses to strain were related to poorer
outcomes. While the findings on depressed feelings extend existing mixed results for this variable, life satisfaction had not yet been explored as a mediator in the Strain literature, and offers some advantages for use as a mediator due to greater flexibility as a measure of emotional reactions to strain.

Finally, this research has confirmed the moderating effect of several risk and protective factors highlighted in previous Strain research, including individual-level resources such as self-control and self-esteem, as well as social bonds to family, peers and school. Findings are consistent with GST’s proposal that the relationship between strain and deviance varies according to personal and social resources, as well as social contexts (Aseltine, Gore & Gordon, 2000). In addition to these relationships (outlined in Figure 10.1) however, results from analyses discussed in Chapter 9 suggest other associations which while not fitting well within the GST framework tested in this study, still provide insight into strain-related influences on antisocial activity.

**Antisocial behaviour may moderate the effects of strain (cumulative sociodemographic risk) on wellbeing outcomes.**

Results of analyses of the GST model suggested the existence of other relationships between cumulative sociodemographic risk and adolescent antisocial behaviour. It appears that adolescents cope with strain (and its consequences) resulting from cumulative risk by behaving antisocially. Such behaviour, as well as factors that allow/facilitate antisocial behaviour, result in increased happiness with life. For example, findings from the analyses in Chapter 9 suggest that behaving antisocially increases life satisfaction for youths with low self-esteem and increases self-worth and reduces depressed feelings for youths with low levels of life satisfaction. Low levels of parental monitoring, in association with increased antisocial activity, are also related to
higher life satisfaction. As cumulative risk increases youths with peers who are highly antisocial become more satisfied with life, and those with prosocial peers become less satisfied. Further, youths with highly antisocial peers experience greater life satisfaction as their own antisocial behaviour increases. Higher levels of antisocial involvement also appear to reduce depressed feelings amongst youths facing high levels of cumulative risk but increased antisocial behaviour amongst adolescents with strong school bonds results in lower levels of life satisfaction.

While such relationships have been noted throughout the adolescent antisocial behaviour research literature, they are unable to be adequately tested using the cross-sectional data available for this study. For example, some relationships suggest reciprocal effects that would operate over time. Further testing of these proposed relationships with a suitable data set would provide valuable insights into the consequences of cumulative sociodemographic risk during the adolescent period.

### 10.4 Limitations of this Study

Research examining adolescent antisocial behaviour and emotional wellbeing (depressed feelings) is often regarded as sensitive, resulting in barriers to data collection. Initial plans to collect data within school settings were not allowed, and consequently this research relied mostly on a convenience sample recruited through social media advertisements, as well through contact with a survey rewards company. Thus, it is possible that the sample may not be representative of the general population given that computer and/or internet access is required in both these cases, although the inclusion of an at-risk subsample was intended to ameliorate this bias.

Limitations arising from the use of a highly skewed count outcome variable have been identified throughout this thesis. These are in addition to the well-known limitations of cross-sectional data in investigating the time-ordering of relationships,
precluding any conclusions of a causal nature. While it is believed that the best attempts possible within the bounds of a non-statistical PhD were made, it is acknowledged that due to the problematic dataset, and the consequent complexities of modelling, many findings reported within this thesis should be regarded as exploratory rather than definitive.

10.5 Suggestions for Further Research

This study suggests that cumulative sociodemographic risk is a useful construct for exploring the impact of concurrent contextual and environmental disadvantages. Separating contextual risk from the proximal processes and characteristics which mediate its effects facilitates a focus on aspects of the relationship that can be changed or manipulated to help bring about better youth outcomes (Grant et al., 2003). Further investigation of factors which act protectively to reduce the effects of cumulative sociodemographic disadvantage should suggest strategies for intervention and prevention. While this research was limited to examining adolescent outcomes, the notion of cumulative sociodemographic risk is relevant across all stages of the life course, and further studies exploring its impact could compare effects throughout different life periods.

The scope of this research project meant that a number of relationships of interest were unable to be further investigated. One such is the role of gender, which has been noted to be influential in much Strain research (Broidy & Agnew, 1997; DeCoste & Zito, 2010; Jang, 2007). Further studies should investigate whether cumulative sociodemographic risk affects male and female adolescents differently, as well as how gender differences are related to moderation processes in a GST model.
10.6 Conclusions

Cumulative sociodemographic risk is a logical and useful way to frame concurrent contextual and environmental disadvantage in order to understand its impact and consider appropriate responses. Vulnerable adolescents face many additional challenges in order to achieve the same levels of success and wellbeing as not vulnerable youths. Sociodemographic disadvantage means that youths enter adolescence on the back foot, in that they face more risk factors and benefit from fewer protective factors. Similarly, the demands of their environments often mean that much higher levels of positive factors are required for a protective effect. While some factors were noted to be useful in reducing the extent of antisocial activity vulnerable youths reported, their likelihood of engaging in some (as opposed to no) antisocial activity was mostly determined by their exposure to antisocial peers and by cumulative sociodemographic risk itself.

The impact of cumulative sociodemographic risk fitted in this study within a GST framework, with strains experienced as a consequence of disadvantage reducing levels of adolescent life satisfaction and increasing the likelihood of antisocial behaviours. Thus the research provides a valuable contribution to criminological theory by introducing new conceptualisations, such as strain as cumulative sociodemographic risk, and life satisfaction as an affective mediator of strain. Findings reinforce existing literature demonstrating the effects of strain on adolescent outcomes. In addition, this research confirms that individual and social resources act as moderators of strain, although their effectiveness as protective factors is reduced as cumulative sociodemographic risk increases.

Findings of this research also have implications for social policy. In particular, they highlight the need to take seriously the pervasive influence of cumulative sociodemographic risk on adolescent outcomes. While youths behaving antisocially
must still be held accountable for their actions, it is evident that preventing or reducing antisocial activity for vulnerable youths requires effective strategies for addressing cumulative sociodemographic risk and its consequences. While there is much that can be done using data-driven, evidence-based strategies to tackle antisocial behaviour during the adolescent period, without some attention to the effects of structural and contextual factors these approaches are likely to fall short of their full potential. Further understanding of the processes through which cumulative sociodemographic disadvantage affects adolescents is essential to facilitate realistic and effective countermeasures for youths at the ‘sharp end’ of structural social inequality. At the least, bolstering those factors which act protectively in these circumstances through carefully targeted, evidence-based interventions might reduce the extent to which vulnerable youths engage in antisocial activities, particularly those of a serious nature.
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