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Sampling from one nursing specialty group using two different approaches

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Specialty group
Professional association
Probability sample
Purposive sample
External validity

Background: The use of probability sampling is the benchmark of survey research as it increases the likelihood of obtaining results which can be generalised. However, fleeting attention has been given to using a probability sample drawn from professional associations; in this instance, nurses who belong to particular specialty groups. Currently, there is little research which has highlighted sample differences within a specific target population associated with the use of two different sampling approaches in one study. **Objective:** This paper presents a secondary analysis of the results of an Australian study that measured general self-efficacy, perceived competence, trait hope, peer support, collaboration with medical staff, cohesion among nurses, managing stress, planful coping, and resilience in two samples of operating room nurses. The first sample was drawn using systematic random sampling from a professional association, and the second was drawn using a purposive sample of hospital nurses to illustrate significant differences in demographic characteristics and scale scores across these two samples. **Methods:** The target population of this study included all operating room nurses practising in this speciality in all Australia states and territories. Based on this, two accessible populations were delineated. The association sample ($n = 772$) was randomly drawn from a national association of Australian operating room nurses, whilst the hospital sample ($n = 124$) consisted of all operating room nurses from two large tertiary hospitals in Queensland, Australia. **Results:** Significant differences between the association and hospital samples were identified. Nurses in the association sample were older, more experienced and a considerably higher proportion of nurses in this sample possessed specialty qualifications than their counterparts in the hospital sample ($p < 0.0001$). Additionally, there were differences between these two samples in seven out of the nine scales used in this study. **Conclusions:** In this study, the use of a professional specialty association allowed a national random sample; nevertheless, this sample was not similar to the operating room nurses practising in one state. However, detection of such differences may not have been apparent if one sampling method had been used exclusively. The results of this study highlight the context that local level purposive samples add to information gained through probability sampling of large national broader level contexts.

Introduction

Sampling is the process of selecting a proportion of the population to represent the entire population, and is a critical aspect of design in quantitative research especially survey research (Lohr 1999). Therefore, the hallmark of a good sampling design is one that is representative so that results may be generalised to the larger target population. There is much research literature that supports the notion of using probability sampling methods as the 'gold standard' to achieve this. However, little attention has been given to issues associated with using a probability sample drawn from professional associations, such as national nursing specialty associations.

Background

The two purposes of sampling are to obtain an estimate of some population characteristic along with information about the variability of the estimate (Stuart & Ord 1987). Any sample from a well-defined target population may be used to estimate the population characteristics; nevertheless, only estimates from random samples have distributions with known probability theory-based expectations and variability. Thus, random selection is integral and is seen as the gold standard. Probability sampling theory is based on the premise that everyone in a particular target population has a known chance of being selected in the survey sample, thus ensuring that every component of the population is adequately represented (Lohr 1999). Yet, sampling from a professional specialty association drawn from the target population may also differ significantly from the target population in respect to the variables of interest.

Sampling from professional specialty associations: benefits and compromises

Using a professional specialty association represents an inexpensive, time efficient means of sampling for the purposes of conducting a large survey. The researcher has the advantage of accessing a large pool of potential participants from a widespread geographic area, which lends itself well to maximizing sample size and using a probability-based sampling design. Samples drawn from associations may be homogenous because members share similar professional interests and goals which are concerned with professional practice issues, and voluntary membership to the association indicates commitment to the profession.

Notwithstanding the benefits of drawing from professional associations, there are some compromises that must be considered. For instance, the deliberate selection of participants who are members of a

professional association may give rise to selection bias (Lohr 1999); that is, the systematic over-representation or under-representation of some segment of the target population in relation to crucial characteristics being measured. This may impact on external validity, as the results of the study using participants drawn from professional associations may be difficult to generalise on the basis of such differences. Consequently, in order to draw inferences based on the characteristics of an association sample (i.e. accessible population) and apply these to the larger target population, it may be necessary to sample from another facet of the target population (not in the association) to address selection bias. The validity of the inferences made in relation to the study results depends on the similarity of characteristics in these two populations (Babbie 2004).

Non-profitability sampling

The essential difference between probability and non-probability sampling is the notion of random selection (Babbie 2004). Consequently, non-probability samples cannot depend upon the rationale of probability theory, and therefore may or may not represent the population well, which is often difficult to establish. Purposive sampling, a form of non-probability sampling, targets a particular group of people, and entails selection of population elements on the basis of the researcher's judgement that they are representative of the larger population of interest. It thus assumes homogeneity (Lohr 1999). Purposive sampling is useful for situations where sampling for proportionality is not the primary concern. However, an unknown proportion of the population may be excluded (i.e. those who declined to participate). Moreover, using purposive sampling in heterogeneous populations carries a high risk of sampling bias because participants are self-selected, and may be atypical of the population of interest in relation to critical variables (Babbie 2004).

Methods

Aim

The aim of this paper is to report demographic and scale score differences in two samples of OR nurses, one drawn using systematic random sampling from a specialty association (see Gillespie et al 2007), and the other using a purposive sample of hospital nurses to illustrate the potential for sampling bias. To this end, a secondary analysis of the results of an Australian study that measured resilience in two samples of OR nurses is presented. To date, there is little research which has highlighted sample differences within a specific target population associated with the use of two different sampling approaches in one study.

Participants

The target population for this study was all practising OR nurses working across states and territories across Australia. At the time this study was conducted, the national target group consisted of 16,158 practising OR nurses (Australian Institute of Health & Welfare 2004). Based on this, the accessible population identified were nurses from the Australian College of Operating Room Nurses (ACORN) association. During the study period, there was a total of 2,860 operating room (OR) nurses who were members of this professional association. Since not all Australian OR nurses were members of the ACORN association, a hospital sample was used to assess selection bias and consisted of nurses working in the operating room departments of two Queensland hospitals. Inclusion of a hospital sample allowed group comparisons in respect to important background variables.

The association sample was randomly drawn using systematic sampling, from those nurses who were members of the ACORN association across Australia. Sampling using this design involved selection of every second member listed on the ACORN database. The first component in the sample was drawn randomly from the computer-generated list, and then every second number that followed this was selected. As a form of probability

sampling, it was considered representative of the accessible population, the ACORN sample. Inclusion criteria for this association sample were: membership of a state ACORN branch, OR registered and enrolled nurses working full-time and part-time, and OR nurses employed on a casual basis or with an agency.

For the hospital sample, all nurses from the OR departments of two major Queensland public hospitals were invited to participate because of their relatively small numbers (i.e. a total of 300 OR nurses in these two hospitals). In this instance, purposive sampling was used. Inclusion criteria for the hospital sample were: state registration or enrolment with the Queensland Nursing Council, practising at the time as an OR nurse, and employed at the time on a full-time or part-time-basis in the OR departments at one of the particular hospital sites. Data from hospital respondents (A and B) were combined as there were non-significant differences in demographic characteristics (Table 1). Hospital nurses who were ACORN association members were excluded because there was the potential for them to be randomly selected in the association and be surveyed twice. In total, 1,730 OR nurses were invited to participate (1,430 association nurses and 300 hospital nurses).

Table 1 Age, OR experience, Years of employment across Hospitals A and B

Demographic Characteristic	Hospital A *n = 75 Mean (SD)	Hospital B *n = 49 Mean (SD)	Result
Age	40.6 (10.3)	40.5 (8.9)	t = 0.057 df = 121 p = 0.955
OR experience	11.1 (8.4)	11.9 (9.0)	t = -0.475 df = 121 p = 0.636
Years of employment	6.7 (5.9)	7.4 (6.3)	t = -0.558 df = 121 p = 0.578

* Numbers may vary slightly due to missing values for individual variables.

Ethical considerations

Permission to conduct the survey was granted by the University's and hospitals' Human Research Ethics Committee. An information sheet explained the nature of the project and respondents were assured of their voluntary participation and anonymity. Consent was implied by the return of the completed survey form in the replied paid envelope. Reminder notes were sent to

all participants two weeks following the initial mail out to maximise response rates.

Data analysis

Data were analysed using SPSS, Version 13® (Chicago IL). Analysis procedures included descriptive and inferential statistics. Comparisons in sample characteristics between

the association and hospital samples were assessed using Chi-square tests (dichotomous data) and t-tests. Demographic data in relation to gender and levels of education were coded as '0' no, and '1' yes. For comparisons using continuous data, Student's t-tests for independent samples (association versus combined hospital samples) were used to detect differences in relation to age, OR experience, and years of employment. Student t-tests were also used to compare for differences between the ACORN and hospital samples in relation to the nine validated scales used to measure trait hope (Snyder 2000), general self-efficacy (Schwartz & Jerusalem 1995), peer support (Gillespie et al 2007), perceived competence (Gillespie et al 2007), cohesion among nurses (Adams et al 1995), collaboration with medical staff (Adams et al 1995), managing stress (Gillespie et al 2007), planful coping (Lazarus & Folkman 1984), and resilience (Connor & Davidson 2003).

Results

A total of 896 OR nurses responded to the mailed survey, with an overall return rate of 51.7%. Of those, 772 nurses (53.9% of the potential total sample) were in the ACORN sample, while 124 (41.3% of the potential total sample) were hospital nurses (as a combined sample from Hospitals A and B). Table 2 details the response rate percentages for the two samples; notably, differences between samples were significant ($p < 0.0001$). Four respondents reported that they had received two survey forms (because of their shared association with ACORN and employment at one of the hospitals), and had completed the first one they had received (the ACORN form). Consequently, they were excluded from the analysis. The higher response rate of the association sample suggests that OR nurses who voluntarily become members of professional associations are more likely to respond to a survey of this nature than those who are not members. The difference in response rate between these samples suggests that there were characteristic differences in the individuals who responded in each sample.

Table 2 Differences in sample response rates

Group	Potential sample	Response rate n (%)	Result
ACORN	1,430	772 (53.9)	$\chi^2 = 607.95$ df = 1 $p < 0.0001$
Hospital	300	124 (41.3)	

Tables 3 and 4 present the comparative demographic data between the association and the hospital samples. Most of these demographic differences were statistically significant. Again, these data exemplify the characteristics

of, and highlight the variation in, individuals who are members of a professional association, as opposed to those who are not.

Table 3 Age, Experience and Years of employment of the ACORN and Hospital samples*

Demographic Characteristic	*ACORN	*Hospital	Result
	Mean (SD)	Mean (SD)	
Age	46.1 (9.2)	40.6 (9.8)	t = 6.09 df = 867 $p < 0.0001$
OR experience	17.8 (9.4)	11.4 (8.6)	t = 7.02 df = 872 $p < 0.0001$
Years of employment	8.4 (7.3)	7.3 (6.0)	t = 2.02 df = 884 $p = 0.044$

* Numbers vary slightly due to missing values for individual variables.

Table 4 Other demographic characteristics of the ACORN and Hospital samples*

Demographic Characteristics	ACORN *n (%)	Hospital *n (%)	Result
Gender Female	707 (91.6)	113 (91.1)	$\chi^2 = 2.17$ df = 1 $p = 0.140$
Education Hospital certificate	553 (71.6)	73 (58.9)	$\chi^2 = 11.10$ df = 1 $p = 0.001$
Degree	311 (40.3)	81 (65.3)	$\chi^2 = 25.27$ df = 1 $p < 0.0001$
Postgraduate certificate	398 (51.6)	35 (28.2)	$\chi^2 = 25.74$ df = 1 $p < 0.0001$
Specialty qualification	550 (71.2)	49 (39.5)	$\chi^2 = 48.26$ df = 1 $p < 0.0001$
Nursing category RN Clinical nurse Consultant Educator	255 (33.0) 296 (38.3) 173 (22.4)	99 (79.8) 20 (16.1) 4 (1.6)	$\chi^2 = 98.77$ df = 2 $p < 0.0001$

* Numbers vary slightly due to missing values for individual variables.

In relation to the survey results, there were significant differences between the association and hospital samples in seven out of the nine scales used in this study. Table 5 details these comparative data. Nurses who belonged to the association reported higher scale scores in relation to trait hope ($p < 0.033$), general self-efficacy ($p < 0.021$), peer support ($p < 0.0001$), perceived competence ($p < 0.0001$), nurse cohesion ($p < 0.001$), collaboration with medical staff ($p < 0.01$), and resilience ($p < 0.0001$). Therefore, it appears that the differences between the association and hospital samples were not restricted to demographic characteristics; they were also evident in the ways in which respondents from each sample answered the survey questions. There were non significant differences between the two samples in relation to managing stress and playful coping.

(Table 5 is shown on page 83).

Discussion

The results of this secondary analysis highlight the sample differences within a specific target population associated with the use of two different sampling methods in one study. There were statistically significant differences between the association and hospital samples with regard to response rates and background characteristics, thus reflecting variations between these samples. Had the two samples' demographic characteristics been similar, then it could have been claimed that because the association sample was national, it did represent OR nurses in Australia, not simply those who had joined the association. However, because there were significant group differences in respect to age, experience, and education, findings could not be generalised to all Australian OR nurses. Consequently, data from the samples could not be combined for analysis, and separate analyses were undertaken.

While the association sample was drawn through a probability sampling method, the demographic data derived from this sample challenges commonly held

assumptions related to population demographics. Nurses in the association were older, more experienced, and had greater employment tenure than those in the hospital sample. A substantive proportion of respondents in the association sample held positions as nurse managers and educators, and did not reflect the demographic profile of nurses who work in many of the hospitals across Australia or south east Queensland in relation to census

data collected by the Australian Institute of Health and Welfare (Australian Institute of Health & Welfare 2008). Reasonably, demographic features may often mask differences in groups. Perhaps if we had been more selective in recruiting members of the ACORN association who were actively practising, and had controlled for age, years of experience and recency of experience, the samples may have been more similar.

Table 5 Summary of mean item scores for ACORN and hospital samples

Scale	*ACORN	*Hospital	Result
	Mean (SD)	Mean (SD)	
Perceived competence (12 items) (1 = strongly disagree; 5 = strongly agree)	4.3 (0.5)	4.0 (0.5)	t = 5.33 df = 868 p < 0.0001
Collaboration with medical staff (9 items) (1 = strongly agree; 4 = strongly disagree)	2.4 (0.4)	2.5 (0.3)	t = -2.59 df = 858 p = 0.01
Cohesion among nurses (10 items) (1 = strongly agree; 4 = strongly disagree)	2.4 (0.4)	2.3 (0.4)	t = 3.30 df = 863 p = 0.001
Peer support (1 = not at all true; 5 = true nearly all the time)	3.6 (0.7)	3.4 (0.9)	t = 3.24 df = 147.4 p = 0.001
Managing stress (1 = not at all true; 5 = true nearly all the time)	3.6 (0.3)	3.6 (0.3)	t = -0.115 df = 876 p = 0.909
General self-efficacy (10 items) (1 = not always true; 4 = exactly true)	3.1 (0.4)	3.0 (0.4)	t = 2.31 df = 870 p = 0.021
Trait hope (12 items) (1 = definitely false; 8 = definitely true)	4.3 (0.4)	4.2 (0.5)	t = 2.13 df = 853 p = 0.033
Planful coping (11 items) (0 = not used; 3 = used a great deal)	1.9 (0.4)	1.9 (0.5)	t = 1.73 df = 856 p = 0.082
Connor-Davidson resilience (25 items) (0 = not at all true; 4 = true nearly all the time)	3.0 (0.4)	2.8 (0.3)	t = 3.54 df = 852 p < 0.0001

* Missing values not replaced.

Nevertheless, association respondents appear to be similar to others who voluntarily join associations in relation to advanced age, education level, and higher occupational ranking (Cutler & Hendricks 2000). Conceivably, association respondents are highly motivated and view association participation as an important expression of their professional commitment, a notion supported elsewhere in the literature on professionalism in nursing (Hall 1982, Wynd 2003). Nurses who join specialty organisations do so for a myriad of reasons: increased networking opportunities locally, nationally, and internationally; greater access to national specialty journals; and better certification opportunities. Solidarity and social affiliation can also be derived from membership of professional associations (Hall 1982, Reed & Selbee 2000). Specifically, it appears that these goals become more meaningful when nurses are able to commit to a professional association.

The literature on nursing leadership suggests that they (these goals????) are more readily achieved when nurses join a professional/specialty association (Hall 1982, Wynd 2003). Professionalism is a long-term developmental process, guided by socialisation practices, and informed by career and work experiences with the adoption of professional role model attitudes and behaviours (Rutty 1998). Membership of a professional association has been previously correlated with age, higher levels of education, and seniority (Wynd 2003). Whilst four nurses in the hospital sample identified as ACORN members (and subsequently excluded from the analysis); the vast majority of the nurses surveyed in this sample were not members of the association. In this instance, it is reasonable to surmise that young specialist nurses may have more competing agendas in their lives than those who clearly view their professional role as a long-term commitment.

That the samples demonstrated statistical differences in all but two out of the nine scales further supports the proposition that the association and hospital samples were not similar. The commonality shared between respondents in both samples only extended to practising in the context of the OR. Therefore, the nurses randomly selected from the ACORN association were not representative of hospital nurses working in the OR specialty. If only the association sample was surveyed, spurious conclusions may have been drawn based on one element of the OR nurse population.

Study limitations

In discussion of this study's limitations, there are two issues that must be considered. First, the quality of the sampling frame in terms of capturing the target population (i.e. a members' list of a professional association versus hospitals where nurses practise at all

levels). Second, the quality of the sampling methods used (i.e. random versus purposive).

In this study, a population list of association members was available and used. Using a randomized sample limits the likelihood of selection bias, but it does not guarantee that all the elements of the target population will be adequately represented when professional associations are used. A substantial proportion of association respondents held roles in education and management, and thus is not representative of the target population of Australian OR nurses. In this instance, using samples from a national or state association may have introduced bias as those in the register may not be typical of the population. However, systematic random sampling enabled the findings to be generalised to members in the association. Selection bias is one of the most prevalent threats to external validity, therefore comparing groups in respect to important background variables such as age, education, experience and so on is essential (Babbie 2004).

The potential for selection bias through intentional selection of nurses who were members of a professional perioperative association was assessed in this study with the use of a hospital sample. Yet, using a purposive sample is problematic because not all elements of the target population are necessarily captured, thus the extent to which it represents the larger population cannot be known (Lohr 1999). Using a purposive sample hospital sample has limited the extent to which the results can be generalised in that the range of responses may have been restricted to respondents working at similar types of public hospital sites. Notwithstanding, the combined hospital sample was homogeneous in relation to important demographic variables as evidenced by the non-significant differences between the nurse respondents at Hospitals A and B (Table 1). Moreover, the majority of the nurses in the hospital sample worked in clinical roles as opposed to education and management roles. While the nurses in this combined hospital sample may be similar to other nurses who work in the Queensland public sector, this sample may not reflect possible variations in OR nurses working in the private sector or in other Australian states.

Nevertheless, including a hospital sample allowed comparisons to be made between the two groups in relation to the variables of interest. The differences identified between these groups could then be reported in relation to the limits they imposed on the extent to which the study results could be generalised. If there had been non-significant differences in background characteristics of each sample (i.e. association and hospital), this would have permitted the samples to be combined for data analysis, and findings may have been

generalised to all Australian practising OR nurses. However, this was not the case. As a corollary, study findings could not be generalised beyond the association from which the larger association sample was randomly drawn. To obtain a representative sample of all Australian OR nurses, it would be necessary to conduct a census of this specialty group.

Recommendations and conclusions

While the inclusion of two samples enabled demographic comparisons and partially addressed the issue of selection bias, it may be that some respondents were sampled twice, since some members of association may have worked at one of the two hospital sites. To address this issue, the researchers requested that potential hospital respondents complete only one survey form. Future researchers may choose to combine the names of potential respondents from several hospitals and a state or national perioperative association and randomly sample from one list, thereby eliminating the potential for repeated selection of the same participant. Nonetheless, this would require that the researcher have access to the names of potential participants.

Although different methods were used to sample the association and hospital samples, it appears that group differences (i.e. demographics and scale results) indicate genuine heterogeneity within the target population of OR nurses. In other methodologies, triangulation is the method used to adopt multiple perspectives (data, researcher, theoretical, methodological) (Denzin 1989). Hence, triangulation synthesises data from various sources. Triangulating sampling procedures have thus far been overlooked. Future researchers may consider using sampling triangulation, that is, employing two or more different sampling methods in the one quantitative study. The use of sampling triangulation may assist researchers to gain a more comprehensive picture of their sample and the potential for selection bias. Such differences may not be detected if one sampling method is used exclusively. The use of one sampling method does not necessarily ensure that every facet of the population will be presented. The results of this study illustrate that context local level purposive samples add to information gained through probability sampling of large national broader level contexts.

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