Work/life balance and health: the Nurses and Midwives e-cohort study

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Background: Nursing and midwifery are demanding professions. Efforts to understand the health consequences and workforce needs of these professions are urgently needed. Using a novel electronic approach, the Nurses and Midwives e-cohort Study (NMeS) aims to investigate longitudinally Australian and New Zealand nurses’ and midwives’ work/life balance and health. This paper describes NMeS participation; provides key baseline demographic, workforce and health indicators; compares these baseline descriptions with external norms; and assesses the feasibility of the electronic approach.

Methods: From 1 April 2006 to 31 March 2008, nurses in Australia and New Zealand, and midwives in Australia were invited to participate. Potential participants were directed to a purpose-built NMeS Internet site, where study information was provided and consent sought. Once obtained, a range of standardized tools combined into one comprehensive electronic questionnaire was elicited.

Results: Overall, 7633 (2.3%) eligible nurses and midwives participated (6308 from Australia and 1325 from New Zealand) from a total pool of 334 400. Age, gender, occupational and health profiles were similar between countries and to national figures. However, some differences were noted; for instance, Queensland participants were over-represented, while Victorian and South Australian participants were under-represented, and 28.2% of Australians were in high strain positions compared with 18.8% of New Zealanders.

Conclusions: Using an internationally novel web-based approach, a large cohort, which appears generally similar to population norms, has been established. Provided participant retention is adequate, the NMeS will provide insight into understanding the drivers of nurses’ and midwives’ workforce retention and work-related factors associated with their health.

Keywords: Australian and New Zealand Nurses and Midwives, Cohort Study; Epidemiology; Health and Well-being; Workforce Recruitment and Retention

Introduction

Nursing and midwifery are demanding professions. They carry high levels of public and professional performance expectations despite the long and irregular hours of work fundamental to the provision of care. This demand can come at a high personal cost.
Job stress is well recognized as a major contributor to nurses’ and midwives’ poorer health status and attrition from their professions (McNeely 2005), yet translation of this knowledge into practices that attempt to moderate, minimize or eliminate stressors remains limited (Edwards & Burnard 2003). Nurses and midwives also face occupational health hazards that include exposure to infectious diseases, biological hazards and carcinogens; psychological demands; and shift work (Triolo 1989a, b). Working night shifts can disrupt circadian rhythms, leading to increased risks for sleep disturbances, accidents and injuries, social isolation and various deleterious physiological effects (Berger & Hobbs 2006). Over and above their demanding professions, many nurses and midwives are primary caregivers for family members, including children, parents, spouses and children. The impact of these caregiving roles and responsibilities also has important implications for the health of nurses and midwives, and their ability to perform professionally (Killien 2004).

Despite critical shortages of nurses, midwives and other health practitioners currently being experienced globally (World Health Organization 2006), few studies explore the association between the ongoing nature of nursing and midwifery work and the status of nurses’ and midwives’ health (McNeely 2005). Efforts to predict and address workforce needs are hampered by the complexity of the problem and the generally insufficient available information (Canadian Nurses Association 2002). The Nurses and Midwives e-cohort Study (NMeS) is one response to assist in improving future efforts (Turner et al. 2009). The purpose of this electronic, longitudinal, population-based study is to examine factors associated with both workforce and health outcomes in a cohort of nurses within Australia and New Zealand and midwives in Australia recruited during 2006–08. The study was later extended to include United Kingdom (UK) nurses, which are treated as a separate but parallel cohort and will not be discussed further in this paper. The NMeS has two broad content themes: 1 Work/Life Balance, which describes and quantifies the factors associated with retention of the existing nursing and midwifery workforce, patterns of employment and retention in the workforce; and 2 Staying Healthy, which measures the prevalence, incidence and associated risk factors of musculoskeletal disorders and work-based injury outcomes within the cohort, together with physical health, mental health and health behaviour measures.

In line with these broad content themes, this paper aims to: define NMeS participation and present final participant counts; provide a baseline description of demographic, workforce and key baseline health indicators; and compare these baseline descriptions with appropriate external norms (that is, reference populations and published data for nurses and/or midwives), where such norms exist.

The Internet has only relatively recently been used for health research and appears to have many salient advantages and efficiencies (Huntington et al. 2009). However, few, if any, large-scale epidemiological studies have attempted systematically to sample, recruit and maintain a large cohort entirely via electronic methods. By design, this is a goal of the NMeS. As such, an additional broad aim of the NMeS and this paper is to assess the feasibility and utility of information technology to transform traditional longitudinal epidemiological study methods of recruitment and data capture.

Methods

Target population

There are approximately 290 000 registered and enrolled nurses and midwives in Australia and 44 400 nurses in New Zealand. Enrolled nurses are registered health practitioners who practise under the direction and delegation of registered nurses or registered midwives.

Design

This paper used a cohort study.

Recruitment

From 1 April 2006 to 31 March 2008, nurses in Australia, New Zealand and midwives in Australia were invited to participate. Queensland, Tasmania and New Zealand Nursing Councils included a hard copy invitation to participate with annual practising certificate renewal documents; Australian Capital Territory, New South Wales and Western Australia Nursing Councils used study funds to mail postcards to all practising nurses and midwives on their databases. Northern Territory, South Australia and Victoria Nursing Councils and the Midwifery Council of New Zealand refused our request to contact their members. Regular mass circulars to nurses and midwives were also targeted with advertisements and articles featuring the study and urging participation. None of the councils sanctioned targeted or personalized reminder protocols for non-responders.

Procedure

Invitations directed potential participants to a purpose-built Internet-based survey (see http://www.e-cohort.net). Upon entering the study website, detailed information was provided and consent requested. Once received, participants established their personal profile and completed the registration page, which requested baseline demographic, contact and work-related details. Participants were then directed to the baseline survey, which contained various standardized instruments around the Work/Life Balance and Staying Healthy study themes and took
approximately 40 min to complete. Prior to finalization, the baseline survey went through a two-stage pilot process where (i) NMeS research team members individually completed the survey online and reported issues to the NMeS Management Group for discussion and amendment; (ii) a convenience sample of non-eligible NMeS health professionals were invited to individually complete the updated online survey and identify any outstanding issues for further discussion and amendment. All pilot data were then downloaded and crude distributional checks of variables undertaken to ensure data integrity. The full baseline survey spanned 101 web pages, contained 108 question groupings and 551 individual questions. However, many question groupings had an initial screening question so that participants skipped non-applicable questions. Entered data were saved on a question-by-question basis, so that data re-entry was not required if the Internet connection was terminated. Participants received a welcome e-mail 2 weeks after registration, e-mailed birthday cards, various e-mail greetings (e.g. holiday, international nurses day), thank you e-mails for completing a survey and quarterly e-mailed newsletters. Participants with incomplete surveys were e-mailed reminders approximately 2, 4 and 6 weeks following initial registration with the NMeS study. Each subsequent contact, routine or otherwise, encouraged participants to complete their survey and to update contact details. Further details on the design, recruitment and procedures of the NMeS are provided elsewhere (Huntington et al. 2009; Turner et al. 2009).

Instruments (see Appendix S1 for greater detail)
The Work/Life Balance theme was captured using a broad range of factors describing work practices and stresses, family responsibilities and study, and employment status. From the broad range elicited, key workplace attributes selected and reported in this paper include: current employment position; workplace setting; usual work group or unit size; work time status; current shift work; provision of care for child(ren) or other(s); job stresses, captured by the Job Content Questionnaire (JCQ) (Karasek et al. 1998); the Effort-Reward Imbalance (ERI) scale (Siegrist 1996); and the Hostility Score (Koskenvuo et al. 1988). The JCQ is designed to measure the social and psychological characteristics of jobs; the ERI at work model assumes that the effort expended at work is part of a social contract of reciprocity, thus effort is exchanged for rewards such as money, esteem and career opportunities and job security; and the Hostility Score measures perceived workplace hostility. Details and psychometric properties of these scales appear in the Supporting Information.

The Staying Healthy theme was addressed by recording a range of physical and mental health attributes at baseline, using a number of validated instruments, and indicators of musculoskeletal disorders and injury outcomes. Measurement instruments included the International Physical Activity Questionnaire (IPAQ) (Craig et al. 2003), Centre for Epidemiologic Studies Depression (CESD-10) score (Radloff 1977), SF-36 (version 2) (Ware et al. 2000), the Australian Recommended Food Score (ARFS) (Collins et al. 2008), the modified Nordic Musculoskeletal score (Kuorinka et al. 1987), and the Pain Catastrophizing Scale (PCS) (Sullivan et al. 1995). The IPAQ was developed as a surveillance instrument to measure multiple domains of physical activity; the CES-D is used to screen for depression; the SF-36 is a multipurpose, short form health survey of functional health and well-being scores and physical and mental health summary measures; the ARFS is a recently developed self-rated index of diet variety and quality, reflecting adherence to the Australian Dietary Guidelines; the Nordic Musculoskeletal Questionnaire asks for lifetime experience and previous 12-month experience of neck troubles, upper back troubles and lower back troubles; and the PCS measures any exaggerated negative orientation to pain that includes performing cognitive activities that exacerbate the fearful aspects of pain experience. Details and psychometric properties of these scales also appear in the Supporting Information.

Following Australian national guidelines (National Health and Medical Research Council 2001), alcohol intake was categorized by long-term harm risk (abstainers, low risk, moderate risk and high risk drinkers). Alcohol intake was calculated using relative frequency of consumption and alcohol content over a number of beverage types. Smoking behaviour was measured from two questions (with Yes/No responses): ‘Are you currently a cigarette smoker?’ and ‘Have you ever smoked regularly?’

Follow-up
Follow-up surveys have taken place approximately bi-annually: the first opened on 30 August 2008 and closed 26 September 2009, and the second opened on 25 May 2010 and scheduled to close on 31 January 2011.

Data storage and security
Participants entered their data directly into a structured query language (SQL) database, via the NMeS website, secured with a Secure Sockets Layer, an encrypted protocol for transmitting private information over the Internet. All participants have a unique study ID, generated automatically at registration and used to link databases. Participants’ personal information is held in a registration database, separate from all other elicited information and accessible only to a core group of investigators; the integrity and security of the participant’s information are considered paramount. To access de-identified data, researchers.
must submit a detailed proposal to the NMeS Management Group for approval. Strict protocols have been developed and applied to the use, storage and reporting of any released de-identified data.

Data processing and statistical analysis
The SQL database was copied to SAS (SAS Institute Inc., Cary, NC, USA) datasets where cleaning and scoring were undertaken. Means between groups were compared using either analysis of variance or Student’s t-test and categories compared using Fisher’s exact test or Pearson’s χ² test. As answering questions was voluntary, the number of valid responses was provided when summary statistics were reported. All analyses were undertaken using SAS and a significance level of 5% was used.

Ethical approval
The NMeS was granted clearance by the University of Queensland’s Behavioural and Social Science Ethics Review Committee (No. 2005000696) and the Massey University Human Ethics Committee (Wellington: No. 05/71).

Results
In total, the NMeS had 10 721 registrations. However, six people who attempted to participate were unable to do so because of inadequate access to the Internet; 569 people were excluded because they ‘falsely’ registered, providing responses only to the compulsory data fields (names and e-mail address), likely motivated by the chance to win the monthly drawn enrolment prize of airfares between Australia and New Zealand; 34 people had duplicate registrations; 12 people had no country of registration; and 2127 people were registered outside Australia or New Zealand (most in the UK), leaving 7973 potential registrants. Of these, 298 (3.7%) had no nursing or midwifery qualification and 42 (0.5%) were registered as a midwife in New Zealand, so were excluded, leaving 7633 (95.7%) who were registered as a nurse or midwife in Australia or as a nurse in New Zealand included in this analysis. At the time of recruitment, there were approximately 334 400 eligible nurses and midwives (Turner et al. 2009), resulting in an overall NMeS response rate of 2.3%.

Nursing and midwifery labour force
Table S1 presents the demographics and labour force of study participants registered in Australia (n = 6308) and New Zealand (n = 1325). The 2005 Australian Institute of Health and Welfare (AIHW) Nursing and Midwifery Labour Force Census figures (Australian Institute of Health and Welfare 2008) revealed that: 7.9% of Australian nurses and midwives were male (cf. 8.6% in the study); 35.8% were aged ≥50 years (cf. 30.5% in the study); 69.0% were currently employed in clinical general, 9.1% in administration/manager roles and 10.7% were not in nursing/midwifery labour force (cf. 73.7, 9.4 and 3.4%, respectively, in the study); 67.2% were employed at hospital or care facilities, 4.8% in the community, 3.7% in clinic or medical practices and 0.8% in universities (cf. 70.4, 11.8, 3.8 and 3.0%, respectively, in the study); and 49.8% worked <35 h/week (cf. 43.3% in the study). It should be noted that the AIHW figures were based on a 55.0% response rate and may themselves be biased. Nursing Council information (The College of Nursing 2007) revealed some geographic differences, with 16.8% of Australian nurses and midwives practising in Queensland, 26.8% practising in Victoria and 8.9% practising in South Australia (cf. 28.4, 8.0 and 3.6%, respectively, in the study).

In a recent report to New Zealand’s Minister of Health (Cook 2009), figures revealed that 6.9% of New Zealand nurses were male (cf. 6.7% in the study); 34.5% were aged ≥50 years (cf. 33.5% in the study); 62.7% identified themselves as being New Zealand European, 6.3% as Maori, 2.7% as a Pacific Islander and 7.7% as Asian (cf. 67.9, 4.1, 0.8 and 1.4%, respectively, in the study); 76.8% were employed at hospital or care facilities or in clinic or medical practices, 13.4% in the community and 1.9% in universities (cf. 70.0, 12.7 and 4.6%, respectively, in the study); and that 50.5% worked <35 h/week (cf. 37.8% in the study). These New Zealand figures were largely derived from the Nursing Council Registration Database for 2008.

Nursing and midwifery health profile
A suite of baseline health indicators for participants, separated by country of residence, is presented in Tables S2 and 3. Table S2 houses key indicators of the Work/Life Balance theme whereas Table S3 groups together key indicators of the Staying Healthy theme.

In terms of Work/Life Balance, job strain was high for many nurses and midwives, with Australian participants reporting greater levels of high job strain (28.2%) than their New Zealand counterparts (18.8%). Moreover, co-worker and supervisor support was generally low (71.0 and 65.0% for Australian and New Zealand participants, respectively), and many perceived the effort outweighed the reward for the job (30.0 and 27.8% for Australian and New Zealand participants, respectively). However, the number of participants completing the ‘reward’ questions (1 745; 22.9%) was considerably smaller than those completing the ‘effort’ questions (5 895; 77.2%). Those completing the ‘reward’ questions had a mean ‘effort’ value of 17.1 (SD 5.1), a value significantly higher than the 14.3 (SD 4.7) of those failing to complete the ‘reward’ question (P < 0.001). Thus, the proportion of participants with observed ERI score >1.0 is likely to be higher than the true underlying population proportion. Lastly, over and above their professional duties, many nurses and
midwives in the NMeS provided care for child(ren) or others(s) outside their employment (44.5 and 42.8% for Australian and New Zealand participants, respectively).

With respect to the Staying Healthy theme, many participating nurses and midwives had no medical examination within the previous 2 years (23.9 and 30.0% for Australian and New Zealand participants, respectively), the number of usual sleep hours was <7 for 2092 (35.2%), few smoked cigarettes (14.6 and 11.6% for Australian and New Zealand participants, respectively), approximately 1 in 10 had a moderate or high risk of long-term alcohol intake risk, and current depressive symptoms were reported for approximately 22% of participants. Lower back troubles ever and within the last 12 months was common and indicated for the majority of participants, followed by neck troubles and upper back troubles. Of those participants answering all three lifetime occurrence musculoskeletal questions \((n = 5961)\), only 689 (11.6%) had never experienced neck, upper back or lower back troubles whereas 1567 (26.3%) had experienced troubles in all three body regions. The mean standardized SF-36 scores were all significantly different from the 1998 general population reference norm mean of 50 (all \(P < 0.01\)). Mental health measures, except for social functioning, appeared generally poorer among this sample of nurses and midwives but physical health measures, except for physical role function, were consistent with the population reference.

Given the significant geographical differences between Australian nurses and midwives representation noted above, all presented Work/Life Balance theme variables (Table S2) and Staying Healthy theme variables (Table S3) were compared across State to determine whether important differential patterns of response also occurred. For the Work/Life Balance theme, 17 separate tests were conducted and no significant difference between States was noted for 12 (71%). Similarly, for the Staying Healthy theme, 26 separate tests were conducted and no significant difference between States was noted for 19 (73%).

**Discussion**

The NMeS is a large, international, scientifically and methodologically novel longitudinal study that was designed to address urgently required workforce and health information deficits. While participant uptake in the study was low, with approximately 290,000 registered and enrolled nurses and midwives in Australia and 44,000 nurses in New Zealand potentially eligible (Turner et al. 2009), the distributions of Australian and New Zealand participants largely mirrored those available from national figures. The similarity between the age and gender distributions to the respective national figures is notable, as it might have been opined that older participants would have reduced access to, and have been less comfortable with, a fully electronic survey. However, the use of information technology is now considered a core aspect of modern practice and is a basic element in nursing and midwifery programmes (Huntington et al. 2009). Furthermore, Internet access at home is becoming commonplace. In 2008, 75% of Australian households had a computer and 67% had home Internet access, of which 78% was broadband (Australian Bureau of Statistics 2009). Internet penetration is likely higher in our target populations as rates increase markedly with higher incomes.

Some differences did exist between our sample distribution and the national figures. In both the Australian and New Zealand samples, part-time nurses and midwives were under-represented and university employed participants were over-represented. While no national ethnic data were readily available for the Australian workforce, New Zealand European participants were under-represented and Maori, Pacific and Asian participants were over-represented in the New Zealand sample. If these ethnic minorities are generally as willing as non-minority individuals to participate in health research (Wendler et al. 2006), then it is likely that reduced Internet access and increased competing demands may have resulted in these ethnic groups and part-time nurses and midwives having a reduced participation rate. Conversely, universal access to high-speed Internet service provided to university employed nurses and midwives is likely to have resulted in their higher participation rate. The higher response rate by university employees, particularly faculty members, may also reflect their recognition of the importance of research and commitment to research generally. Geographic differences in the Australian sample was also noted, with Queensland nurses and midwives being over-represented and Victoria and South Australian nurses and midwives being under-represented. These geographic differences are likely to be a direct consequence of the Nursing Council participation with the NMeS, with both Victoria and South Australian Nursing Councils refusing our request to contact their members.

In terms of Work/Life Balance indicators, occupational stress is increasing in many industrialized countries, and can lead to nurse burnout, job dissatisfaction and increased nurse turnover. In addition to the personal costs, this can impact negatively on an organization’s capacity to meet patients’ needs and provide quality care, and affect the morale and productivity of the remaining nurses (Huntington et al. 2008). While widely advocated and used, the JCQ measure employed in this study was internally defined, through median splits, making external comparisons difficult. However, longitudinal measurements of job strain will provide invaluable evidence in a population where its epidemiological effect is relatively poorly understood (Huntington et al. 2008). Within the cohort, the distribution of job strain appeared different at baseline between Australian and New
Zealand nurses and midwives; with 28.2% of Australians defined as being in high strain positions compared with 18.8% of New Zealanders. New Zealand nurses also reported a higher level of support of colleagues and supervisors.

An ERI score >1.0 indicates a high amount of effort spent that is not met by the rewards received or expected in turn. Approximately 30% of Australian and New Zealand respondents had an ERI score >1.0, considerably higher than the 3.5% reported in a nationally representative sample of working female Australians (Radi et al. 2007). This suggests that the demands of the nursing and midwifery professions may be relatively high in Australia and New Zealand compared with other professions. However, notably, the number of participants completing the ‘reward’ questions was considerably smaller than the number completing the ‘effort’ questions and those who completed the ‘rewards’ component were significantly more likely to have a higher ‘effort’ component score than those with a missing ‘rewards’ score ($P < 0.001$). This differential pattern of respond is likely to inflate the observed ERI score distribution, and so any findings from this scale must be considered very carefully in view of this limitation.

In terms of Staying Healthy factors, a study of 5139 Australian females in employment with an average age of around 40 years classified 76.1% as being long-term low risk alcohol drinkers, 9.7% as being moderate risk drinkers and 2.7% as being high-risk drinkers (Berry et al. 2007). These general population figures are similar to those observed within our cohort. Current smoking for Australian women aged ≥18 years in 2007 was reported by 18% (Winstanley & White 2009) and for New Zealand women aged 15–64 years in 2006 was reported by 22.9% (Ministry of Health 2007), higher than that observed within our cohort. However, in many developed countries, smoking behaviour is inversely related to socio-economic status, with disadvantaged groups in the population being more likely to initiate and continue smoking. Moreover, the attitudes of nurses and midwives, and the influence of working in a health profession, may also explain these lower smoking levels.

Within both Australian and New Zealand samples, current depressive symptoms were reported for approximately 22% of participants. While seemingly high, this prevalence is similar to the 20.7% indicated with depressive symptoms reported in the Australian Longitudinal Study on Women’s Health of 9207 middle-aged women using the same CESD-10 instrument (Brown et al. 2005). Nonetheless, the effect of depression in the nursing and midwifery professional should not be underestimated. In a review of common mental disorders in the workplace, including prevalence, participation, work disability and impact of quality of work, seven longitudinal studies showed a strong association between aspects of low job quality and incident depression and anxiety (Sanderson & Andrews 2006). Targeted efficacious clinical and preventive interventions have been advocated and demonstrated in the workplace.

Low back pain affects 60–80% of adults at some point in their lives and is one of the most common reasons individuals access healthcare services and take sick leave (Waddell & Burton 2001). Nurses are a high-risk population for back pain. Lifetime prevalence of low back pain affected 77.2% of Australian nurses and midwives and 73.5% of New Zealand nurses in the NMeS – many of whom will have many future years of exposure in the nurses’ and midwives’ environment. Overall, 88.4% of participants had experienced neck, upper back or lower back troubles at some time, and 26.3% had experienced troubles in all three body regions. Not only do these injuries adversely impacts on workforce productivity, but also their economic burden is substantial (Dagenais et al. 2008).

Increased levels of physical activity reduce the risk of premature death and disease in the general population and among female nurses (Hu et al. 2004). In the NMeS, 52.8% of participants had a high physical activity level and 37.2% had a moderate level, with little difference between countries. The proportion engaging in high physical activity level is similar to those reported in an international prevalence study on physical activity, with 51.4% of Australian women and 52.2% of New Zealand women aged 18–65 years in this category (Bauman et al. 2009). However, the moderate physical activity levels seen in the NMeS is higher than the 28.5% of Australian women and 31.3% of New Zealand women aged 18–65 years reported in the international study (Bauman et al. 2009). This is perhaps because of the relatively high amount of walking associated with nurses and midwives’ professional duties rather than derived through leisure-time activities. Regardless, health benefits accrue from all accumulated physical activity and it is immaterial whether it is through leisure-based or work-based activity.

SF-36 standardizations were made against the general US population as the study involves multiple countries each without standardized norms for version 2, and this standardization is a common choice in research. However, at baseline, statistical deviations from mean norm scores of 50 are by themselves of limited value. Rather, baseline ascertainment of the SF-36 profiles will be important in identifying changes over time in future measurement waves and relating them to specific health and workforce indicators.

Novel to large-scale epidemiological cohort research projects, the NMeS used entirely web-based recruitment and data collection techniques. Few, if any, large-scale studies have attempted systematically to sample, recruit and maintain a large cohort entirely via electronic methods; although existing studies, such as the Nurses’ Health Study II (http://www.channing.harvard.edu/
However, the associated impact of differential participation in reporting biases (Ekman et al. 2006; Richiardi et al. 2007). Rates, around 6.5 and 12.0%, which may introduce systematic web-driven population surveys have also yielded low response. A major limitation of this study was the low response rate. Past limitations (Galea & Tracy 2007). However, challenges remain, the most serious being decreasing participation rates; an issue facing most epidemiological designs (Galea & Tracy 2007).

Limitations
A major limitation of this study was the low response rate. Past web-driven population surveys have also yielded low response rates, around 6.5 and 12.0%, which may introduce systematic reporting biases (Ekman et al. 2006; Richiardi et al. 2007). However, the associated impact of differential participation in large-scale, multiple-domain, targeted population studies is likely to be small (Nohr et al. 2006). A notable feature was the different level of commitment and engagement given by the various Nursing Councils. The Northern Territory, South Australia and Victorian Nursing Councils did not provide rationales as to why they would not permit their members to be actively recruited into the study. Privacy concerns, database completeness and electronic system issues also resulted in reduced access to nurses and midwives from other jurisdictions. It is hoped that future researchers will find improved cooperation with one national registration authority in Australia from July 2010. In New Zealand, midwifery is a separate health discipline with its own regulatory body. At the time the Midwifery Council was approached, they were considering undertaking their own workforce research and did not feel it was appropriate to join the NMeS.

The different level of commitment and engagement given by the various Australian Nursing Councils is almost certainly likely to explain the different level of representation in each State. Although some differences would be expected in participants’ response profiles between States because of each having different regulatory environments, employment contracts and methods of organizing health care, for the majority of work/life balance and health variables investigated the pattern of response between States was non-significantly different. These findings suggest that the different response rate between States has not led to important differential patterns of question response and that the reported national findings are generally likely to be valid.

Another major limitation within the study was the New Zealand ethics requirement that no questions within the registration page were mandatory (except a valid e-mail address). As a result, many participants only partially completed the important socio-demographics and professional questions that are vital in describing the sample, act as confounders and used to provide workforce data. A core set of these variables has been selected for re-elicitation in future follow-up waves. However, the representativeness of those with missing baseline data is difficult to ascertain (especially if some of these participants attrite from the study or skip measurement waves), and change from baseline for time-dependent variables will not be able to be directly measured.

Low response rates for electronic studies could potentially be improved through better access from gatekeepers to the target population, in this case the Nursing and Midwifery Councils; use of electronic recruitment methods with direct links to the study websites/surveys, such as e-mail rather than hard copy invitations or postcards; and short but perhaps more frequent surveys with a maximum 10-min completion time. Additionally, completeness of data for electronic studies could be improved through less restriction from ethics committees on non-compulsory responses to questions and enabling full utility of the benefits of electronic data collection methods or building in a non-response item for each question as an option. The latter enables researchers to distinguish between an active ‘decline to respond’ choice made by the participant and missing data. Data integrity in the electronic environment is also vital for increasing completeness, as all participants enter their own data directly into an SQL database without any hard-copy record. Thus, ideally, most variable response option fields need to be tightly controlled, thereby reducing the data cleaning burden and the likelihood of ambiguous or erroneously data being mistakenly entered.

Set against these limitations, the electronic cohort study methodology has many salient advantages and efficiencies (Huntington et al. 2009), including cost. For the NMeS, there were significant upfront costs in designing and building the website which was as expensive, if not more so, than conducting a paper-based survey. However, once established, the ongoing contact opportunities and follow-up measurement of participants is substantially less expensive. The estimated continuing costs of operating an electronic cohort study the size of the NMeS is approximately two-thirds less than those associated with traditional paper-based methods.

Conclusions
In absolute terms, the NMeS cohort is large and generally reflective of each country’s population norms; both in terms of demographic and workplace characteristics. However, the low recruitment rate means that cross-sectionally ascertained prevalence estimates are likely to be biased. Nonetheless, providing participant retention is adequate; the acquisition and analysis of prospectively collected data measured over multiple waves is
likely to yield generalizable time-dependent relationships. Using a life-course epidemiological approach, specific foci within the broad NMES themes will be investigated in future research papers. The determinants and effects of occupational stress and job strain, back-pain and depression, among others, are areas of considerable interest, which have been captured in this cohort with sufficient numbers to allow rigorous investigation with good statistical power. The empirical evidence gleaned from these data will aid policy-makers and managers in making decisions that will improve individual-level and system-level components of the nursing and midwifery profession.

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Author contributions

PJS was responsible for the conception of this paper, statistical analysis and led the manuscript drafting and revision; CT was responsible for the study conception and design; CT, ADH, CJB and RJM had input into the study design and made critical revisions to the paper for important intellectual content; and CT and ADH obtained funding. All authors read and approved the final version of the manuscript.

References


**Supporting information**

Additional Supporting Information may be found in the online version of this article:

Appendix S1 Instruments: Work/Life Balance and Staying Healthy themes.

Table S1 Descriptive demographics and work characteristics of study participants registered in Australia (*n* = 6308) and New Zealand (*n* = 1325).

Table S2 Distribution of Work/Life Balance theme indicators for participants in Australia (*n* = 6308) and New Zealand (*n* = 1325).

Table S3 Distribution of Staying Healthy theme indicators for participants in Australia (*n* = 6308) and New Zealand (*n* = 1325).

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