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Mortality among Icelandic nurses

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Objective The goal of the study was to investigate the mortality pattern of female nurses in a retrospective cohort study with special focus on suicide.

Methods The mortality of nurses was compared with that of the general female population. The main outcome measure was the standardized mortality ratio (SMR). The participants were 2159 female nurses (ie, all registered nurses in Iceland between 1920—1979).

Results A long-lasting healthy worker effect was found in the cohort. A moderate excess of suicide was observed. A deficit was found for stomach cancer, ischemic heart disease, and respiratory disease. When the cohort was divided according to employment time, there was an excess of brain cancer among those with an employment time of less than 20 years, and all the suicides occurred in that group. The deficit of ischemic heart disease and respiratory disease was more pronounced in the group employed more than 20 years.

Conclusions It was concluded that nurses, primarily those with a long employment time, enjoy the benefits of their initial good health, but the moderate excess of suicide could be associated with stress and frustration, which the nurses relate to their work situation.

Key terms females, healthy worker effect, longevity, stress.

Nurses are exposed to a variety of occupational health hazards in their work environment, including ionizing radiation, cytostatic drugs, anesthetic waste gases, viruses, a variety of chemicals, and stress (1—3).

A proportional mortality study among nurses in Wisconsin (4) found an elevated risk for cancers of the breast and the nervous system but a deficit for cancer of the cervix when the nurses were compared with all female workers. These effects declined, however, when the reference group was female professional workers. This study also found an elevated risk of death by suicide, and the excess remained statistically significant when compared with the mortality of other professionals.

An excess of suicide has been found among nurses in census studies in England and Wales (5) and among female medical and nursing personnel in the Nordic countries. However, there was a substantial difference between these countries (6). A census study of health care occupations and suicide in Sweden in 1961—1985 (7) showed that the risk of suicide among registered nurses dropped, from a high rate in 1961—1965 and the 1970s to a level equal to that of the total female working population in the 1980s.

In a study done in 1991 with a sample of 935 Icelandic nurses, approximately 23% of the nurses reported a very high or high level of stress, which they related to their work situation (8). The most negative factors connected with the job were the feeling of stress and limited opportunities to advance in their professional career (8). According to another study among Icelandic nurses, this occupational group has served for a long time as “silent partners in health care”; they often feel frustrated; they do not like to be put down by others or work through others; they are often dissatisfied with their role in the health team and experience social devaluation of nursing care and lack of mutual respect and kindness between different work groups and different units (9).

Few studies have been done on occupational groups of women, and most of the ones that have been done have been based on census information. Nursing has been one of the few skilled occupations that is female dominated. The aim of this study was to investigate the mortality pattern of nurses with special focus on suicide that could be related to the occupational stress and frustration felt by this group.

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Subjects and methods

This was a retrospective cohort study. The subjects comprised 2159 female nurses registered as nurses in 1920–1979. To assemble a homogeneous group, we omitted men, nuns, and nurses born and educated abroad from the study. Information on the nurses was obtained from books on nurses published by the Association of Icelandic Nurses (10–12). These publications include all nurses registered in Iceland from the time the Association began until 1979. The Association was founded in 1919; hence the year 1920 was chosen as the first year of study.

The books on nurses include, among other information, data on date of birth and date of death (if deceased), the nurses' education, and employment time. According to the editors, the books contain information on all registered nurses in Iceland from the schools from which the nurses graduated and from the files of the two nurses' associations in the country. The editors obtained further information from the nurses themselves or near relatives with the aid of a postal questionnaire and personal contact if necessary. The smallness of the group enabled personal knowledge to be gained and the possibility to obtain information about everyone. The information on the specific job categories and tasks of the individuals was not, however, considered reliable enough and was thus omitted from the analysis. More than one-half, or 1257 (58%), of the nurses graduated in 1970 or later, 389 (18%) graduated in 1960–1969, 246 (11%) in 1950–1959, and 268 (12%) before 1950. The year of graduation from nursing school or the university determined the year of each person's entry into the study. The education of the nurses comprised three years of nursing school until 1973, when a four-year program was begun at the University of Iceland. Since 1986 all nurses in Iceland graduate with a bachelor of science degree.

The Nursing School in Iceland, which most of these nurses attended, required that its students be in good physical condition. Applicants were obliged to submit a certificate of good health before being accepted to the school. Those who were delicate or had health problems were encouraged not to enter this profession.

The results from a small study in 1991 among clinical chief nurses showed that 42% reported that they smoked daily or "sometimes" (13). According to a survey made in 1994 in a random sample of Icelandic nurses, only 15% smoked daily or "sometimes" (14). The corresponding figure for Icelandic women aged 18–69 years in a survey made in 1990 was 35% (15).

Person-years were counted for each nurse from her graduation year to 1 December 1989 or to the date of her death or emigration, whichever came first. The follow-up covered the years from 1951 to 1989. Before the year 1951 the information on the cause of death from the death certificates was considered not reliable enough.

Several different revisions of the International Classification of Diseases have been in use during the study period. The certified causes of death were reclassified according to the seventh revision because the Icelandic Cancer Registry uses this version (16) and it has been used in former mortality studies in Iceland (17). Through the date of birth and the personal identification number, the study population was record-linked with the files of the National Register, the Register of Deceased, and the Register of Cause of Death, all kept by the Statistical Bureau of Iceland. Vital status was ascertained for everyone in the cohort. Information on cause of death was obtained from death certificates. In the study group 138 were deceased.

The expected number of deaths was calculated on the basis of person-years of observation within five-year age categories during the respective single calendar years of the study period, multiplied by death rates specific for cause and calendar year for Icelandic women. The standardized mortality ratio (SMR) was calculated with the 95% confidence intervals and two-tailed P-values, on the assumption of a Poisson distribution if the observed number was less than 100; otherwise a normal distribution was assumed (18).

The cohort was first analyzed as a whole and then 10, 20, 30, and 40 years were allowed to elapse from the date of each person's entry into the study before the counting of person-years began (18).

The cohort was subsequently divided according to cumulated years of employment as reported in the previously mentioned books on nurses. Any period of work during a calendar year was considered as a whole year of employment. The employment years were not necessarily continuous. Those who had been nurses for less than 20 years formed one group, and those who had been nurses 20 years or longer formed another.

Results

A deficit was seen in the total cohort, mainly due to the low SMR values for cancer of the stomach, cervix and ovary, ischemic heart disease, and respiratory disease. Suicide was in excess. The SMR values for tuberculosis, cancer of the colon, uterus, kidney, bladder, brain and thyroid gland, and leukemia were elevated (table 1).

Table 2 shows the results for selected causes of deaths when 10, 20, 30, and 40 years were allowed to elapse before the study period began. There was a deficit of all causes and all cancers in all the groups except all cancers when 40 years were allowed to elapse before the study period began. The SMR values for stomach cancer, ischemic heart disease, and accidents were low in all of the groups. The deficit for ischemic heart disease was

Table 1. Observed and expected numbers of deaths, standardized mortality ratios, and 95% confidence intervals for 2159 nurses (43 908.5 person-years) through 1951–1989.

Cause of death ^a	Observed deaths (N)	Expected deaths (N)	Standardized mortality ratio	95% confidence intervals
Tuberculosis (001–008)	3	0.70	4.29	0.88–12.53
All cancers (140–205)	49	56.07	0.87	0.65–1.16
Stomach (151)	1	5.58	0.18*	0.00–1.00
Colon (153)	6	4.05	1.48	0.54–3.22
Rectum (154)	1	1.16	0.86	0.02–4.80
Pancreas (157)	2	3.06	0.65	0.08–2.36
Lung (162)	5	6.74	0.74	0.24–1.73
Breast (170)	10	10.49	0.95	0.46–1.75
Cervix (171)	1	2.24	0.45	0.01–2.49
Uterus (172)	3	2.42	1.24	0.26–3.62
Ovary (175)	2	3.80	0.53	0.06–1.90
Kidney (180)	3	1.78	1.69	0.35–4.93
Bladder (181)	2	1.03	1.94	0.24–7.01
Brain (193)	4	1.92	2.08	0.57–5.33
Thyroid gland (194)	1	0.71	1.41	0.04–7.85
Leukemia (204)	3	1.92	1.56	0.32–4.57
Other cancers	5	7.52	0.66	0.22–1.55
Cerebrovascular disease (330–334)	23	21.50	1.07	0.68–1.61
Ischemic heart disease (420)	21	36.96	0.57***	0.35–0.87
Respiratory disease (470–527)	11	18.41	0.60	0.30–1.07
Accidents, poisoning, violence (E800–E985)	11	11.61	0.95	0.47–1.70
Suicides (E963, E970–E979)	5	3.16	1.58	0.51–3.69
Suicide by medical, solid or liquid substances (E970, E971)	5	1.09	4.59**	1.49–10.70
All other causes	20	34.91	0.57**	0.35–0.88
All causes (001–E985)	138	180.16	0.77**	0.65–0.90

^a Code of the International Classification of Diseases, seventh revision, in parentheses.* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.**Table 2.** Standardized mortality ratios (SMR) and 95% confidence intervals (95% CI) for nurses when different amounts of time were allowed to elapse before the study period began.

Cause of death ^a	Time elapsed before the study period began							
	10 years (N = 1668)		20 years (N = 920)		30 years (N = 500)		40 years (N = 247)	
	SMR	95% CI	SMR	95% CI	SMR	95% CI	SMR	95% CI
Tuberculosis (001–008)	5.77	1.19–16.86	5.00	0.60–18.06	6.45	0.78–23.30	8.33*	1.01–30.10
All cancers (140–205)	0.91	0.67–1.20	0.96	0.70–1.29	0.97	0.67–1.35	1.21	0.79–1.77
Stomach (151)	0.18	0.00–1.02	0.20	0.01–1.09	0.24	0.01–1.32	0	.
Lung (162)	0.75	0.24–1.76	0.83	0.27–1.94	1.10	0.36–2.57	1.12	0.23–3.28
Breast (170)	1.03	0.49–1.89	1.31	0.63–2.41	1.00	0.32–2.32	1.16	0.24–3.39
Brain (193)	1.92	0.40–5.62	0.88	0.02–4.89	1.28	0.03–7.14	2.33	0.06–12.96
Cerebrovascular disease (330–334)	1.10	0.70–1.66	1.05	0.65–1.60	1.10	0.67–1.69	1.15	0.67–1.84
Ischemic heart disease (420)	0.57	0.35–0.87	0.58	0.36–0.89	0.56	0.34–0.87	0.65*	0.38–1.02
Respiratory disease (470–527)	0.61	0.30–1.09	0.63	0.31–1.12	0.66	0.33–1.18	0.68	0.33–1.25
Accidents, poisoning, violence (E800–E985)	0.81	0.32–1.66	0.83	0.27–1.93	0.49	0.06–1.75	0.39	0.01–2.17
Suicides (E963, E970–E979)	1.32	0.27–3.85	1.33	0.16–4.82	0	.	0	.
Suicides by medical, solid or liquid substances (E970, E971)	3.90	0.80–11.39	4.55	0.55–16.42	0	.	0	.
All causes (001–E985)	0.78**	0.66–0.93	0.79**	0.66–0.94	0.79*	0.65–0.96	0.87	0.70–1.07

^a Code of the International Classification of Diseases, seventh revision, in parentheses.* $P < 0.05$, ** $P < 0.01$.

Table 3. Observed and expected numbers of deaths, standardized mortality ratios (SMR), and 95% confidence intervals (95% CI) for selected causes of death, according to employment time.

Cause of death ^a	Employment time less than 20 years (N = 1535)				Employment time 20 years or longer (N = 624)			
	Ob- served deaths (N)	Ex- pected deaths (N)	SMR	95% CI	Ob- served deaths (N)	Ex- pected deaths (N)	SMR	95% CI
Tuberculosis (001—008)	1	0.22	4.55	0.12—25.33	2	0.48	4.17	0.50—15.05
All cancers (140—205)	19	19.41	0.98	0.59—1.53	30	36.66	0.82	0.55—1.17
Stomach (151)	—	1.79	0		1	3.78	0.26	0.01—1.47
Lung (162)	2	2.12	0.94	0.11—3.41	3	4.61	0.65	0.13—1.90
Breast (170)	2	3.90	0.51	0.06—1.85	8	6.59	1.21	0.52—2.39
Brain (193)	4	0.84	4.76*	1.30—12.19	—	1.08	0	
Cerebrovascular disease (330—334)	6	6.81	0.88	0.32—1.92	17	14.70	1.16	0.67—1.85
Ischemic heart disease (420)	10	11.35	0.88	0.42—1.62	11	25.61	0.43**	0.32—0.77
Respiratory disease (470—527)	5	5.61	0.89	0.29—2.08	6	12.80	0.47*	0.17—1.02
Accidents, poisoning, violence (E800—E985)	9	5.04	1.79	0.82—3.39	2	6.57	0.03	0.04—1.10
Suicides (E970—E979)	5	1.35	3.70*	1.20—8.64	—	1.81	0	
Suicides by medical, solid or liquid substances (E970, E971)	5	0.45	11.11**	3.61—25.93	—	0.64	0	
All causes (001—E985)	60	60.05	1.00	0.76—1.29	78	120.11	0.65**	0.52—0.81

^a Code of the International Classification of Diseases, seventh revision, in parentheses.

* $P < 0.05$, ** $P < 0.01$.

statistically significant for all of the groups. An excess of tuberculosis was found.

When the cohort was divided according to employment time (table 3), the SMR values were generally higher in the group which had the shorter employment time. There was an excess of brain cancer and suicide in the group with the shorter employment time.

The three deaths from tuberculosis occurred among the nurses who entered the study in 1927—1942, and their employment time was 4, 35, and 37 years. Two of the three nurses died in 1984, one at the age of 80 and the other at the age of 88 years; the third died in 1957, at the age of 48 years.

The nurses who died of brain cancer entered the study in 1940—1974. Their employment time varied from 2 to 15 years, and they were 27—75 years of age at the time of their death.

As for the suicides, the data showed that four of the five cases occurred in 1961 or later, the women's employment time was from 4 to 19 years, and they were 25—47 years of age when they died. All the deaths were classified as E970—E971 or as suicide and self-inflicted poisoning by analgesic, soporific, or other solid or liquid substances.

Discussion

Nurses enjoy a long life as compared with other women and are at less risk of dying from most causes of death.

They are, however, more inclined to shorten their own lives by committing suicide.

The massive healthy worker effect found in this cohort can be attributed both to the known handicap from comparing an occupational cohort with the general population (19) and to the selection of women of above average physical condition into the occupation. Fox & Collier (20) discuss the possibility of such a selection of men into certain occupations, and this phenomenon could also be valid for women.

As good physical condition has earlier been a prerequisite for attending the nursing school in Iceland, this group could be seen as a low-risk population from the start. The low frequency of smokers found among the nurses (14) could indicate healthy behavior in this group. Before that conclusion can be drawn, however, it should be taken into account that, from 1 January 1991 on, it has been totally forbidden to smoke in Icelandic state hospitals, where most of the nurses work. This prohibition could have altered the smoking situation from what it was during the study period.

A deficit of circulatory disease, ischemic heart disease, and respiratory disease was also found among nurses in a longitudinal census study in England and Wales (5). In that study part of the initial health advantage diminished as the length of follow-up increased, although the mortality level was still low at the end of the study period.

We are well aware of the weakness of our study, the smallness of the cohort, which results in low figures and

wide confidence limits. A positive factor is the comprehensiveness of the data from the books on nurses, which gave information on when the subjects commenced working and on their employment time, in contrast to census studies which usually have only "one point in time" observations on the information of occupation. Other advantages were that no individuals were lost from the follow-up and all death certificates were obtained; these factors further add to the quality of the study.

In this mortality study the excess of breast cancer was not as outstanding as that seen in other mortality and cancer incidence studies of nurses (4, 21, 22). The elevated SMR for brain cancer, in some of the subgroups, was, on the other hand, in accordance with what other researchers have found (4, 21). It was determined for the nurses who had less than 20 years of employment; thus we hesitate to consider this excess as due to chemical or other exposure in the job environment.

The excess of tuberculosis among the nurses who entered the study in 1927–1942 is noteworthy. Two of the three nurses died in 1984, but were then in their eighties. These two had an employment time of over 30 years. As the time of the initial infection is unknown, it cannot be excluded that they had contracted the infection at work.

The elevated risk of suicide found in this study is in accordance with what others have found (5–7), but the interpretation of these results must remain tentative. The number of suicides was small, and the confidence intervals wide. Thus it cannot be excluded that chance may have played a role. The excess of suicide found in the subgroup "by medical, solid or liquid substances" indicates that an easy access to drugs could account for a greater number of suicides by drug poisoning among nurses than among other women. Furthermore, there may be a greater readiness to state suicide as a cause of death rather than accidental poisoning among nurses. Knowledge of lethal doses could also lead to more successful suicidal attempts among nurses than among other people.

A study of job satisfaction among Icelandic nurses showed that they perceived job strain and felt subject to limited opportunities for promotion (8). They also feel frustrated in their occupational role (9).

Mental pressure was high among nurses in France (23), and nurses reported significantly more stress than did either pharmacists or physicians on a questionnaire in the United States (24).

Role ambiguity and role conflicts were experienced frequently among Finnish nurses (25). Responsibility was not thought to be a stress factor as such; unclear and ill-defined responsibilities were perceived as more problematic (25). The authors remarked that incongruence between the level of responsibility and the possibility of affecting decisions concerning work is a basic stress factor in any job (25). Karasek & Theorell (26) have

shown that men are far more likely than women to have a high degree of control over their work at the task level and the majority of women's jobs involving high psychological demand have a low decision latitude. According to these authors this situation is not valid for nurses. However, Icelandic studies indicate that it could apply to nurses (8, 9), an occupation that has been dominated by women.

In conclusion, nurses, primarily those with a long employment time, enjoy longevity. However, suicide occurs in moderate excess among them, and an elevated risk of suicide could be associated with the stress and frustration which the nurses relate to their work situation.

References

1. Tan CC. Occupational health problems among nurses. *Scand J Work Environ Health* 1991;17:221–30.
2. Gestal JJ. Occupational hazards in hospitals: accidents, radiation, exposure to noxious chemicals, drug addiction and psychic problems, and assault. *Br J Ind Med* 1987;44:510–20.
3. Triolo PK. Occupational health hazards of hospital staff nurses: part I. overview and psychosocial stressors. *Am Assoc Occup Health Nurses J* 1989;37:232–7.
4. Katz RM. Causes of death among registered nurses. *J Occup Med* 1983;25:760–2.
5. Goldblatt P, editor. Longitudinal study: mortality and social organisation: England and Wales 1971–1981. London: Her Majesty's Stationery Office, 1990. OPCS series LS, no 6.
6. Nordic Statistical Secretariat. Occupational mortality in the Nordic countries 1971–1980: statistical reports of the Nordic countries. Copenhagen: Nordic Statistical Secretariat, 1988.
7. Stefansson C-G, Wicks S. Health care occupations and suicide in Sweden 1961–1985. *Soc Psychiatry Psychiatr Epidemiol* 1991;26:259–64.
8. Haraldsdóttir R, Siggeirsdóttir J, Thoroddsen Á. Könnun á högum hjúkrunarfræðinga og viðhorfum þeirra til starfa og náms: starfsánægja [Work organization and job-satisfaction of nurses in Iceland]. *Læknablaðið* 1992;78 suppl 22:97.
9. Björnsdóttir K. Private lives in public places: a study of the ideological foundation of nursing in Iceland [dissertation]. New York, NY: Columbia University, 1992: 218 p.
10. Hjúkrunarfélag Íslands. Hjúkrunarkvennatal [Nurses]. Reykjavík: Hjúkrunarfélag Íslands, 1969.
11. Hjúkrunarfélag Íslands. Hjúkrunarfræðingatal [Nurses]. Reykjavík: Hjúkrunarfélag Íslands, 1979.
12. Hjúkrunarfélag Íslands. Hjúkrunarfræðingatal III [Nurses III]. Reykjavík: Hjúkrunarfélag Íslands, 1992.
13. Blöndal Þ, Ísakssen H, Hafliðadóttir J. Reyklausir Ríkisspítalar: viðhorf til reykinga meðal sjúklinga og deildarhjúkrunarfræðinga [Smokefree state-hospitals: attitude to smoking among patients and clinical chief nurses]. *Læknablaðið* 1992; 78:309–12.
14. Kristjánsdóttir HK, Birgisdóttir H, Ólafsdóttir I, Hákonsen O, Guðbjartsdóttir R, Björnsdóttir K. Reykingar og tóbaksvarnir: könnun á viðhorfum og venjum hjúkrunarfræðinga á Íslandi [Smoking and the campaign against tobacco: a study of attitudes and smoking habits among Icelandic nurses] [baccalaureorum scientiarum paper]. Reykjavík (Iceland): University of Iceland, 1994.
15. Ragnarsson J, Blöndal Þ. Reykingavenjur 1989–1990.

- [Smoking habits in Iceland 1989—1990]. Reykjavík (Iceland): Tóbaksvarnarnefnd og Landlæknisembættið, 1990. Heilbrigðisskýrslur, Fylgirit no 5.
16. Bjarnason Ó, Tulinius H. Cancer registration in Iceland 1955—74. *Acta Pathol Microbiol Immunol Scand* 1983;91 suppl 281:1—120.
 17. Gunnarsdóttir H, Rafnsson V. Mortality among female manual workers. *J Epidemiol Community Health* 1992;46:601—4.
 18. Axelsson O. Epidemiologi för arbets- och miljömedicin [Epidemiology for occupational and environmental medicine]. Lund: Studentlitteratur, 1981:116.
 19. Wang J-D, Miettinen OS. Occupational mortality studies: principles of validity. *Scand J Work Environ Health* 1982;8: 153—8.
 20. Fox AJ, Collier PF. Low mortality rates in industrial cohort studies due to selection for work and survival in the industry. *Br J Prev Soc Med* 1976;30:225—30.
 21. Sankila R, Karjalainen S, Läärä E, Pukkala E, Teppo L. Cancer risk among health care personnel in Finland, 1971—1980. *Scand J Work Environ Health* 1990;16: 252—7.
 22. Gunnarsdóttir H, Rafnsson V. Cancer incidence among Icelandic nurses. *J Occup Med*. In press.
 23. Estryn-Behar M, Kaminski M, Peigne E, Bonnet N, Vaichere E, Gozlan C, et al. Stress at work and mental health status among female hospital workers. *Br J Ind Med* 1990;47:20—8.
 24. Wolfgang AP. Job stress in the health professions: a study of physicians, nurses and pharmacists. *Behav Med* 1988;14(1): 43—7.
 25. Leppänen RA, Olkinuora MA. Psychological stress experienced by health care personnel. *Scand J Work Environ Health* 1987;13:1—8.
 26. Karasek R, Theorell T. Healthy work: stress, productivity and the reconstruction of working life. New York, NY: Basic Books, 1990.

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