What Makes Nurses Intend To Leave Their Profession? International Comparison

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Abstract

Background

The nurse shortage is an increasing problem worldwide, which has significant impact on quality of care and patient safety. It has been reported that most industrialized countries in America and Europe are or will be facing nursing shortages. However, the nurse shortage happens not only in developed countries, but also in developing countries, such as in China. In addition, the international East-West migration of nurses makes the situation worse in the less developed and developing countries. On the other hand, the premature departure increases the loss of nursing staff. What makes the nurses want to leave their profession?

Objectives

This study was to examine the impact of two established models of psychosocial stress at work (i.e. Job Strain model and Effort-Reward Imbalance model), together with job alternatives in labor market (employment opportunity) and individual resources (including age and health), on the newly developed intention to leave the nursing profession, using a prospective design of an international comparative study, the Nurses' Early Exit (NEXT) Study.

Methods

7990 registered female nurses working in hospitals from eight countries (Germany, Italy. France, the Netherlands, Belgium, Poland, Slovakia, and China) who did not have intention to leave the nursing profession (ITL) at baseline were followed up one year, the logistic regression at both individual level and country level (multilevel modeling) was applied for data analyses.

Results

Generally, in the Netherlands and Belgium (the social-democratic European regime), nurses had lowest work stress, highest employment opportunity, best health condition, and lowest ITL; in Poland and Slovakia (the post-communist European regime), nurses reported highest work stress, lowest employment opportunity, worst health condition, and relative low ITL; while nurses from Germany, France, and Italy (the conservative-corporatist European regime) and China had relative high work stress, relative high employment opportunity, relative good health condition, and highest ITL. After controlling the differences between countries, it was found that young age, being single, poor health, effort-reward imbalance, and employment opportunity all

significantly predicted an elevated risk of ITL. In country-specific analyses, the obvious divergence was observed. In the post-communist European regime, nurses had to stay at their current profession due to lack of employment opportunity in the market (so-called ‘locked-in’ situation); nurses from the social-democratic European regime, in contrast, reported good quality of psychosocial working conditions with easily available employment opportunity, thus weakening a link between stressful work and ITL; while in the conservative-corporatist European regime and China, both work stress and poor health contributed to nurses’ ITL. Notably, effort-reward imbalance played an important role in explaining the premature departure in nurses.

Conclusions

Findings suggest that improving the psychosocial work environment and health status may be helpful in retaining nurses, and consequently towards tackling nursing shortage internationally.

Key words: Risk factors; Work stress; Employment opportunity; Self-rated health; Intention to leave; Nursing shortage; International comparison; Longitudinal study

Zusammenfassung

Hintergrund
Der Mangel an Pflegekräften entwickelt sich weltweit zu einem immer größer werdenden Problem, das erhebliche Auswirkungen auf die Sicherheit und die Qualität der Versorgung der Patienten hat. Es hat sich gezeigt, dass die meisten industrialisierten Länder in Amerika und Europa von einem Mangel an Pflegepersonal betroffen sind oder sein werden. Jedoch sind nicht nur Industrieländer von einem Mangel an Pflegepersonal betroffen sondern auch Schwellenländern, wie z. B. China.
Darüber hinaus wird die Situation in den Entwicklungsländern durch die internationale Ost-West-Migration von Pflegekräften verschlimmert. Andererseits erhöht der vorzeitige Berufsausstieg den Mangel an Pflegepersonal. Was bewegt die Pflegekräfte zur vorzeitigen Berufsaufgabe?

Ziele
Diese Studie untersuchte anhand eines prospektiven Designs an einer internationalen Vergleichsstudie, der Nurses´ Early Exit (NEXT) – Studie, die Auswirkung von zwei fundierten psychosozialen Stressmodellen bei der Arbeit (d. h. Arbeitsbelastungs-Modell und Effort-Reward Imbalance-Modell) in Verbindung mit Beschäftigungsalternativen auf dem Arbeitsmarkt (Beschäftigungschancen) und individuellen Ressourcen (wie Alter und Gesundheit) auf die sich entwickelnde Absicht, den Pflegeberuf zu verlassen.

Methoden
7990 beschäftigte weibliche Pflegekräfte, die in Krankenhäusern in acht Ländern (Deutschland, Italien, Frankreich, den Niederlanden, Belgien, Polen, der Slowakei und China) tätig waren und bei der Erstbefragung keine Absicht zeigten den Pflegeberuf zu verlassen, wurden ein Jahr später erneut befragt.
Für die Analyse der Daten wurden logistische Regressionen auf beiden Ebenen, auf individueller und Länderebene (Mehrebenenmodelle) angewandt.

Ergebnisse
Im Allgemeinen haben Pflegekräfte in den Niederlanden und in Belgien (sozialdemokratische europäische Regierungsformen) die niedrigste Arbeitsbelastung, die größten Beschäftigungschancen, den besten Gesundheitszustand und die niedrigsten Ausprägungen, den Beruf zu verlassen. In Polen und der Slowakei (postkommunistische europäische Regierungsformen) berichteten die Pflegekräfte

über die höchste Arbeitsbelastung, die niedrigsten Beschäftigungschancen, den schlechtesten Gesundheitszustand und über relativ niedrige Ausprägungen, den Pflegeberuf zu verlassen. Während Pflegekräfte aus Deutschland, Frankreich und Italien (konservative europäische Regierungsformen) sowie China eine relativ hohe Arbeitsbelastung, relativ hohe Beschäftigungschancen, einen relativ guten Gesundheitszustand und den höchsten Anteil von Pflegenden aufweisen, die den Beruf verlassen möchten. Nach der Kontrolle der Unterschiede zwischen den Ländern wurde festgestellt, dass ein junges Lebensalter, Single-Dasein, schlechter Gesundheitszustand, Ungleichgewicht zwischen Arbeitsaufwand und Belohnung sowie Beschäftigungschancen signifikante Faktoren in der Vorhersage für ein erhöhtes Risiko für den Berufsausstieg darstellen. In länderspezifischen Analysen wurde die offensichtliche Divergenz beobachtet. In den postkommunistischen europäischen Ländern mussten die Pflegekräfte in dem ausgeübten Beruf bleiben, weil es an Beschäftigungsalternativen auf dem Arbeitsmarkt fehlte (so genannte "locked-in"-Situation); Pflegekräfte aus sozialdemokratisch regierten europäischen Ländern hingegen berichteten von einer guten Qualität der psychosozialen Arbeitsbedingungen mit hohen Beschäftigungschancen, welche die Verbindung zwischen hoher Arbeitsbelastung und dem Wunsch, den Beruf zu verlassen abschwächen. In den konservativ regierten europäischen Ländern und China trugen sowohl die Arbeitsbelastung als auch ein schlechter Gesundheitszustand dazu bei, den Pflegeberuf zu verlassen. Bemerkenswert ist, dass das Ungleichgewicht zwischen Arbeitsleistung und Entlohnung eine wichtige Rolle bei der Erklärung des vorzeitigen Berufsausstiegs von Pflegekräften spielte.

Schlussfolgerungen

Die Ergebnisse legen nahe, dass die Verbesserung der psychosozialen Arbeitsumgebung und des Gesundheitszustandes hilfreich sein kann, um Pflegekräfte zu halten und folglich den internationalen Mangel an Pflegekräften zu bewältigen.

Schlüsselworte

Risikofaktoren; Arbeitsbelastung; Beschäftigungschancen; subjektiver Gesundheitszustand; Berufsausstieg; Pflegekräftemangel; internationaler Vergleich; Längsschnittstudie

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1. Introduction

Across western to eastern societies, developed to developing countries, nursing shortage and understaffing is an international problem with growing concern (West, et al, 2007), which is indicated with robust evidence to have significant impact on quality of care and patient outcomes (such as hospital length of stay, nosocomial complications and mortality) (Dall, et al, 2009; Kane, et al, 2007; Twigg, et al, 2010).

Theoretically, there are four ways in which the pool of active nurses might be increased (Figure 1, Hasselhorn, et al, 2005, 2006). The input may be increased by providing more education facilities at nursing schools. However, currently, it seems unlikely, that an increase in provision of nursing training alone will solve the future demands for nursing staff. Among other reasons this is due to the relative unattractiveness of the nursing professions to young people in many countries. Another way of increased input would be through immigration of nursing staff from other countries. Currently nurse migration mainly occurs in an East-West direction, so that the input side in low-income countries could, perhaps, not improve the situation much. On the output side, raising the retirement age may be regarded by some as a solution to the problem of a shortage of nurses. However, in many countries such as Germany, Italy, and France, there are only a few nurses who are still active in their profession until regular retirement age. As a result, the most effective way of assuring nursing in the future seems to be to promote the retention of existing nursing staff.

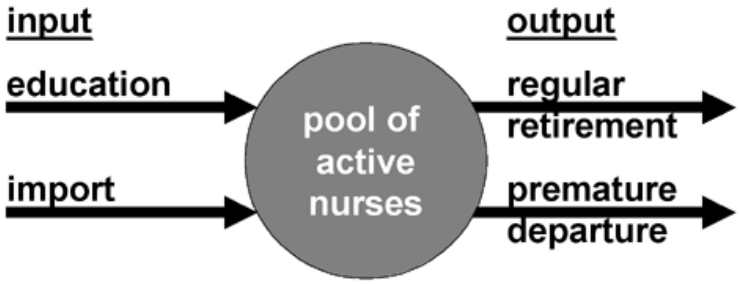

Figure 1 Factors increasing and decreasing the pool of active nurses (Hasselhorn, et al, 2005, 2006)

Therefore, to response to the undesired situation of nursing shortage, while solid recruitment is needed, healthcare management lately put more emphasis on retention as one key strategy to reduce the professional turnover, or its predecessor turnover intention, that is, nurses who (consider to) leave nursing to work in other professions

(Gullatte, et al, 2005). To this end, quality of work and employment needs to be critically improved. In order to promote these aims, the availability of detailed research findings from organizational and occupational sciences seems crucial as they can guide targeted interventions and the development of strategies of organizational change. A number of studies have been performed in recent years to tackle this problem by identifying work- and employment-related determinants of nursing turnover, intention to leave the nursing profession, and early exit from the labor market (Flinkman, et al, 2010; Hayes, et al, 2006). One such investigation, the Nurses' Early Exit (NEXT) Study, explicitly addressed the role of adverse work conditions in explaining professional turnover and intention to leave the profession in a comparative perspective across nursing staff from a variety of countries reaching from Europe to China (Hasselhorn, et al, 2005; Li, et al, 2010).

2. Literature Review

2.1. Nursing shortage

Nursing shortage is reported to be an increasing problem worldwide. In a recent international survey in 69 countries, 90 out of 105 (86%) nursing unions and organizations reported shortage of nursing personnel and its impact on health care delivery (Clark, et al, 2003; Lynn, et al, 2005). In 2010 it was reported that most industrialized countries have been facing nursing shortages for decades (ICN, 2010). Estimations from the US Bureau of Labor Statistics in 2001 indicate that in the USA more than one million new nurses will be needed by the year 2010. Shortages are expected to grow to 30 percent by the year 2020 (van Eyck, 2003). High-income countries, such as OECD member countries, are also reporting nursing shortages (Simoens, et al, 2005). In a recent report on health systems, the OECD highlighted that, “There are increasing concerns about nursing shortages in many OECD countries… Nursing shortages are expected to worsen as the current workforce ages.” (OECD, 2004).

According to the World Health Statistics 2006 – WHO, the average density of nurses per 1000 throughout the world is 4.06 (WHO, 2006). In most European countries, the situation looks better than many other countries, however, a large proportion of nurses are actually imported from overseas, and the aging / aged societies also increasing the needs of nursing in Europe. The nurse shortage happens not only in developed countries, but also in developing countries, such as in China, whose density of nurses per 1000 in China is only 1.06, ranking 133 out of 191 WHO member countries (WHO, 2006) (Table 1). The Nursing Development Plan in China (2005-2010) released from the Ministry of Health (2005) indicated clearly: “the nurse shortage has great influence on clinical nursing quality and the development of nursing workforce.” One of the key aims in the future is “to increase the number of nursing positions, and to promote the retention of existing nursing staff”.

Table 1 Global Brief Data of Nursing Workforce

	Number of nurses	Density of nurses per 1000 inhabitants	
World	16226175	4.06	
the Netherlands	221783	13.73	(6th among 191 WHO member states)
Germany	801677	9.72	(15th)
France	437525	7.24	(32nd)
Slovakia	36569	6.77	(35th)
Belgium	60142	5.83	(42nd)
Italy	312377	5.44	(45th)
Poland	188898	4.90	(52nd)
China	1349589	1.06	(133rd)

2.2. Nursing shortage and patient safety

Nursing care is an essential part of the healthcare system, which can have great impact on population health (Dall, et al, 2009). Using data from the World Health Organization (2006) and the United Nations (2006), there is no doubt that the nursing density has obvious relation to the life expectancy at birth in eight selected countries. The general pattern demonstrates three distribution groups: China, Eastern Europe, and Western Europe, e.g. the higher nursing density, the longer life expectancy. For example, the nursing density in China is only 1.05 per 1000, the life expectancy at birth is as low as 73.0 years; meanwhile, Polish people can live as long as 75.6 years with 4.90 nurses per 1000; on the other hand, the life expectancy at birth in the Netherlands is quite high (79.8 years) and the nursing density is also high (13.73 per 1000).

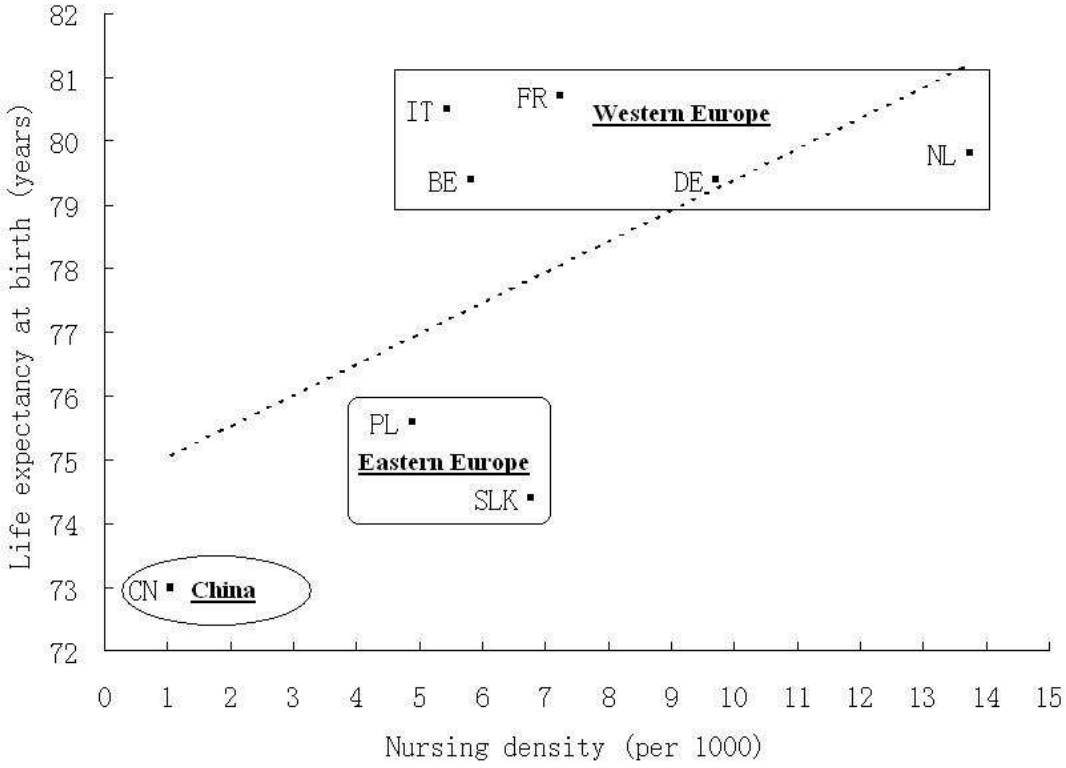

Figure 2 Nursing density and life expectancy at birth in selected countries

(BE: Belgium; CN: China, DE: Germany; FR: France; IT: Italy; NL: the Netherlands; PL: Poland; SLK: Slovakia)

Research on the relation between nursing staffing / shortage and patients' outcomes has been conducted intensively in the past decade. Robust evidence has found clearly that there was a 3-12% reduction in adverse outcomes (including hospital acquired pneumonia, unplanned extubation, respiratory failure, cardiac arrest and failure to rescue), shorter length of stay in hospital by 24-31%, and a 6-16% reduction in the risk of mortality in patients with higher registered nurse staffing. The findings indicate that increased nurse staffing in hospitals is associated with better patient safety outcomes. Policy makers should take the issue of sufficient registered nurses seriously into account to guarantee patient safety (Cho, et al, 2003; Kane, et al, 2007; Meyer, et al, 2009; Needleman, et al, 2002; Penoyer, 2010; Sasichay-Akkadechanunt, et al, 2003; Twigg, et al, 2010). In addition, some recent studies indicate that working conditions of nurses would affect all patient safety outcomes directly (Stone, et al, 2007; Virtanen, et al, 2009), or have indirect effect via decreased nursing staff / nursing shortage (see above).

2.3. Determinants of nurses' intention to leave the profession

Nursing under-staffing and turnover have significant implication to the healthcare system linked to quality of care and patient outcomes (Dall, et al, 2009; Kane, et al, 2007; Twigg, et al, 2010). At the critical time of nursing shortage worldwide, it is of importance to understand the reasons why nurses intend to leave the profession (ITL) in order to keep the existing nursing workforce (Flinkman, et al, 2010; Hayes, et al, 2006). Therefore a literature review was conducted.

2.3.1. Search methods

The following literature databases were used: MEDLINE (Medical Literature Analysis and Retrieval System Online), PSYCHOINFO (Psychology Information), and CNKI (China National Knowledge Infrastructure), with the period of 25 years (from 1 January 1986 to 31 December 2010). The following key words were used to search the relevant studies: Nurs* AND (Personnel Turnover OR Career Mobility OR Intent* OR leav*). We set several inclusive criteria to select most relevant studies: (1) quantitative studies based on empirical data analysis with respect to nurses' intention to leave the profession; (2) RNs or nurses with different educational background (not nursing students), (3) the language had to be English or Chinese. Finally a total of 59 articles were included in our review (see Table 2).

Table 2 Literature review on intention to leave the nursing profession

Authors (year)	Country	Setting	Study design	Sample size	ITL outcome	Risk factors
Andrews, et al. (2009)	USA	Hospital	Cross-sectional study	1235 (91.60% women)	Mean 1.09 (range 1.00-4.00)	Poor mental health, poor coping behaviour.
Barriball, et al. (1996)	UK	Hospital, community	Cross-sectional study	422 (85.31% women)	Prevalence rate: 4.50%	Nursing not a childhood occupational choice.
Barron, et al. (2005)	UK	No information	Panel study (10-year interval)	No information	No information	Being men, being younger, having degree, having been born in UK, low pay, managerial responsibility, full-time work, lack of opportunities to use initiative.
Borkowski, et al. (2007)	USA	Hospital	Cross-sectional study	284 (89.44% women)	Prevalence rate: 45.77%	Being men, being White-non-Hispanic, having less than master's degree, low salary, unfavorable policy and administration, lack of recognition.
Brooks, et al. (2002)	UK	Hospital, care home, hospice.	Cross-sectional study	2987 (92.00% women)	Prevalence rate: 28.11%	Night shift, low influence over shift pattern, failure of preferred shift pattern, low career development opportunities.
Cai, et al. (2009)	Mainland, China	Hospital	Cross-sectional study	198 (all women)	Mean 3.39 (range 1.00-5.00)	Low structural empowerment, low job satisfaction.
Camerino, et al. (2006)	10 European countries	Hospital, nursing home, home care	Cross-sectional study	25976 (89.20% women)	Prevalence rate: 15.66%	Young age, low work ability.

Camerino, et al. (2008)	Italy	Hospital, nursing home, home care	Longitudinal study (1-year follow-up)	3329 (74.05% women)	Incidence rate: 9.58%	Young age, managerial position, employment availability, low institutional commitment, low job satisfaction, low work ability.
Chan, et al. (2009)	Macao, China	Hospital	Cross-sectional study	426 (no information on gender)	Prevalence rate: 38.97%	Young age, long work experience, working in surgical and outpatient departments, job dissatisfaction with pay and benefits.
Chang, et al. (2006)	Taiwan, China	Hospital	Cross-sectional study	330 (no information on gender)	Prevalence rate: 26.36%	Low occupational commitment, low organizational commitment.
Chiu, et al. (2009)	Taiwan, China	Hospital	Cross-sectional study	373 (all women)	Mean 1.42 (range 0.00-3.00)	High job demand, low job control, job strain, low job-related social support.
Collette. (2004)	Australia	Hospital	Intervention study (18-month follow-up)	No information	Prevalence rate at baseline: 41%	Low reward and recognition, bullying.
Collins, et al. (2000)	UK	No information	Cross-sectional study	452 (90.55% women)	Prevalence rate: 28.54%	Low job satisfaction, lack of career prospects or financial reward, job related stress, low morale.
Cowin. (2002)	Australia	No information	Longitudinal study (8-month follow-up)	1034 (89.65% women)	Mean 10.00 (range 8.00-56.00)	Low job satisfaction with pay and autonomy.
DiMattio, et al. (2010)	USA	Hospital	Cross-sectional study	169 (no information on gender)	Prevalence rate: 27.81%	Further education/new job opportunities, burnout/stress, long work hours, lack of administrative support/respect, poor

						pay/benefits, and family demands.
Estryn-Behar, et al. (2008)	10 European countries	Hospital, nursing home, home care	Cross-sectional study	19190 (89.81% women)	Prevalence rate: 14.15%	Male gender, young age, violence from patients or relatives, low quality of teamwork
Estryn-Béhar, et al. (2007)	10 European countries	Hospital	Cross-sectional study	28561 (87.99% women)	Prevalence rate: 16.50%	Low quality of teamwork, poor interpersonal relationships, poor career development opportunities, uncertainty regarding treatment, low influence at work, work-family conflicts, low satisfaction with pay, burnout.
Fitzpatrick, et al. (2010)	USA	No information	Cross-sectional study	6589 (89.98% women)	Prevalence rate: 6.87%	Low empowerment (opportunity, information, support, resources, formal power, informal power)
Flinkman, et al. (2008)	Finland	Hospital	Longitudinal study (1-year follow-up)	147 (93.20% women)	Incidence rate: 25.85%	Young age, burnout, poor opportunity for development, low professional commitment, low job satisfaction, work-family conflicts, high quantitative work demands.
Fochsen, et al. (2005)	Sweden	Hospital	Cross-sectional study	158 (83.54% women)	Prevalence rate: 10.48%	Unsatisfactory salary, lack of professional opportunities, restricted professional autonomy.
Hart. (2005)	USA	Hospital	Cross-sectional study	463 (93.95% women)	No information	Unfavorable ethical climates, high patient load, low control over practice.
Hasselhorn, et al. (2008)	8 European countries	Hospital	Longitudinal study (1-year follow-up)	11606 (88.10% women)	Incidence rate: 13.90%	Emergent job strain, cumulative job strain.
Hasselhorn, et	9	Hospital,	Cross-sectional	28561 (all	Prevalence	Young age, lack of professional

al. (2006)	European countries	nursing home, home care	study	women)	rate: 16.50%	opportunities, unfavourable work organizational factors, poor health.
Hasselhorn, et al. (2004)	7 European countries	Hospital, nursing home, home care	Cross-sectional study	21729 (no information on gender)	Prevalence rate: 16.50%	Effort-reward imbalance, high overcommitment.
Ingersoll, et al. (2002)	USA	Hospital, nursing home, others	Cross-sectional study	1853 (no information on gender)	No information	Low job satisfaction, low organizational commitment.
Jourdain, et al. (2010)	Canada	Hospital	Cross-sectional study	1636 (91.99% women)	Mean 2.04 (no information on range)	High job demands, low job resources, burnout (emotional exhaustion, depersonalization), psychosomatic complaints, low professional commitment.
Kivimäki, et al. (2007)	Finland	Hospital	Prospective study (2- to 4-year follow-up)	5098 (89.11% women)	Incidence rate: 38.00%	Low team climate (clear and shared goals, participation, task orientation and support for innovation).
Krausz, et al. (1995)	Israel	Hospital	Longitudinal study (1-year follow-up)	146 (no information on gender)	Mean 1.86 (range 1.00-5.00)	Young age, burnout.
Kuokkanen, et al. (2003)	Finland	Hospital, health center	Cross-sectional study	416 (69.71% women)	Prevalence rate: 23.80%	Young age, short working history, low job satisfaction, feeling job strain.
Lane, et al. (1988)	USA	Hospital	Cross-sectional study	381 (no information on gender)	No information	Differential attitude, subjective norm, moral obligation, likelihood of changing occupations, attitude towards another occupation.
Lavoie-Trembl	Canada	No	Cross-sectional	309 (96.44%	Prevalence	Effort-reward imbalance, high job

ay, et al. (2008)		information	study	women)	rate: 12.62%	psychological demands, job strain.
Leiter, et al. (2009)	Canada	Hospital	Cross-sectional study	667 (91.30% women)	Mean 2.22 (range 1.00-5.00)	Value conflicts, inadequate rewards, cynicism.
Lu, et al. (2002)	Taiwan, China	Hospital	Cross-sectional study	2197 (all women)	Mean 2.59 (range 1.00-4.00)	Low professional commitment, low job satisfaction.
Lum, et al. (1998)	Canada	Hospital	Cross-sectional study	466 (96.90% women)	Mean 2.10 (range 1.00-5.00)	Pay dissatisfaction, job dissatisfaction, low organizational commitment, shift work.
Lynn, et al. (2005)	USA	Hospital	Cross-sectional study	787 (90.98% women)	No information	Low professional satisfaction, low satisfaction with intrinsic rewards, poor financial situation.
Milisen, et al. (2006)	Belgium	Hospital	Cross-sectional study	9638 (83.90% women)	Prevalence rate: 2.60%	Low quality of leadership and management, insufficient staff, time demands, stressful work environment.
Nogueras. (2006)	USA	Hospital, inpatient, others	Cross-sectional study	908 (91.96% women)	No information	Low occupational commitment, young age, short experience, low education.
Parry. (2008)	Australia	No information	Longitudinal study (6-month follow-up)	131 (93.13% women)	Mean 2.57 (range 1.00-6.00)	Low professional commitment and organizational commitment.
Piao. (2007)	Mainland, China	Hospital	Cross-sectional study	392 (all women)	Mean 15.95 (range 4.00-20.00)	Low organizational commitment.

Robinson, et al. (1997)	UK	Hospital, community, others	Cross-sectional study	1015 (no information on gender)	Prevalence rate: 14.00%	No information.
Robinson, et al. (2005)	UK	No information	Longitudinal study (6-month follow-up)	444 (70.04% women)	Incidence rate: 1.15%	Male gender, non-British or non-Irish ethnicity, dissatisfaction with pay, high paperwork, lack of continuing education opportunities.
Shields, et al. (2001)	UK	Hospitals	Cross-sectional study	9625 (91.80% women)	Prevalence rate: 51.18%	Job dissatisfaction (particularly dissatisfaction with promotion and training opportunities).
Shindul-Rothschild, et al. (1996)	USA	Hospital, home / community care, others	Cross-sectional study	7560 (no information on gender)	Prevalence rate: 12.60%	No information
Simon, et al. (2004)	8 European countries	Hospital, nursing home, home care	Cross-sectional study	27603 (89.00% women)	Prevalence rate: 14.30%	Work-family conflicts.
Simon, et al. (2010)	Germany	Hospital	Cross-sectional study	2119 (80.84% women)	Prevalence rate: 17.88%	Young age, low professional commitment, low job satisfaction, burnout.
Stone, et al. (2006)	USA	Hospital, critical care unit	Cross-sectional study	2323 (88.94% women)	Prevalence rate: 16.83%	Young age, lack of professional practice, low nurse competence.
Takase, et al. (2006)	Australia	Hospital	Cross-sectional study	346 (91.33% women)	Mean 2.37 (range 1.00-6.00)	Low self-image and perceived public images of leadership and caring.
Takase, et al.	Japan	Hospital	Cross-sectional	319 (98.70%	Mean 4.17	Lack or excess of clinical challenges, lack of

(2008)			study	women)	(range 1.00-7.00)	opportunities in clinical challenges, low organizational commitment.
Tang. (2007)	Mainland, China	Hospital	Cross-sectional study	435 (all women)	Mean 19.90 (range 6.00-30.00)	Low job satisfaction.
Tei-Tominaga, et al. (2010)	Japan	Hospital	Longitudinal study (6-month follow-up)	301 (92.69% women)	Mean 12.21 at baseline, 14.06 at follow-up (range 6.00-24.00)	Low coworker support, low job control, cumulative fatigue, bad interpersonal relationships, not being personally suited for nursing work, small size hospital.
Tsai, et al. (2010)	Taiwan, China	Hospital	Cross-sectional study	237 (97.89% women)	Mean 3.17 (range 1.00-5.00)	Young age, low position rank (general nurse), poor organisational citizenship behaviour, low job satisfaction.
Tzeng. (2002)	Taiwan, China	Hospital	Cross-sectional study	648 (all women)	Mean 3.02 (range 1.00-5.00)	Low general job satisfaction, low general job happiness, low satisfaction with salary and promotion, having young child.
van der Heijden, et al. (2010)	8 European countries	Hospital	Cross-sectional study	17524 (all women)	Mean 1.70 (range 1.00-5.00)	Young age, low job satisfaction, low social support from colleague, low social support from superior.
Widerszal-Bazyl, et al. (2008)	6 European countries	Hospital	Cross-sectional study	16052 (all women)	Mean 1.80 (range 1.00-5.00)	Young age, high demands, low control, low social support, good employment opportunities.
Wu, et al. (2000)	Mainland, China	Hospital	Cross-sectional study	382 (all women)	Mean 14.71 (range 0.00-45.00)	High work stress (low social status, low pay, high workload).
Yang, et al.	Mainland,	Hospital	Cross-sectional	250 (all	Mean 2.63	Young age, low pay, poor organizational

(2006)	China		study	women)	(range 1.00-5.00)	management.
Yeh, et al. (2009)	Taiwan, China	Hospital	Cross-sectional study	146 (all women)	Prevalence rate: 31.51%	High job stress, poor roles / interpersonal relationships, not having had a clinical practicum.
Zeytinoglu, et al. (2006)	Canada	Hospital	Cross-sectional study	1369 (96.71% women)	Mean 2.22 (range 1.00-5.00)	Low pay, low peer support, low career commitment, perceived high stress.
Zurmehly, et al. (2009)	USA	No information	Cross-sectional study	1231 (95.78% women)	Mean 2.00 (range 1.00-4.00)	Low empowerment (opportunity, information, support, resources, formal power, informal power)

2.3.2. Summary of existing evidence

Countries

Twelve reports were from the USA, twelve from China (including 5 from Mainland, 5 from Taiwan, and 2 from Macao), seven from the UK, five from Canada, four from Australia, three from Finland, two from Japan, and one from Germany, Italy, Belgium, Sweden, and Israel. Nine reports involved in multinational data were from the European Nurses' Early Exit (NEXT) Study which conducted in ten European countries (Belgium, Finland, France, Germany, Great Britain, Italy, the Netherlands, Poland, Sweden and Slovakia) (Hasselhorn, et al, 2005).

Settings

Fifty-one reports were based on hospital setting, eleven on home / community care setting, seven on nursing home setting (twelve reports were base on 2 or more settings), and eight reports did not provide information of setting.

Study designs

Most of reports (N = 48 / 59) were with cross-sectional design, only eleven reported applied longitudinal design, ranging from 0.5-year follow-up (Parry, 2008; Robinson, et al, 2005; Tei-Tominaga, et al, 2010) to 10-year follow up (Barron, et al, 2005).

Sample size

The sample size was varied from 131 (Parry, 2008) to 28561 (Estryn-Béhar, et al, 2007). A large proportion of nurses were women (at least 69.71%, Kuokkanen, et al, 2003).

Prevalence and incidence rates of ITL

Many different kinds of scales and questionnaires were used to measure intention to leave the nursing profession. The most widely used one was the one-item NEXT instrument (Hasselhorn, et al, 2005).

The country differences of ITL in nurses were obvious. The prevalence of ITL varied

from 2.60% (Milisen, et al, 2006) to 51.18% (Shields, et al, 2001), and the incidence of ITL varied from 1.15% (Robinson, et al, 2005) to 38.00% (Kivimäki, et al, 2007). However, it should be pointed out that the variation of ITL rates must be interpreted cautiously due to the different formats of ITL measurement.

Risk factors of ITL

Numerous variables were associated with nurses' intention to leave their profession. Here, we generally grouped these risk factors into two categories.

Socio-demographic characteristics:

- Young age (Barron, et al, 2005; Camerino, et al, 2006; Chan, et al, 2009; Estryn-Behar, et al, 2008; Flinkman, et al, 2008; Hasselhorn, et al; 2006; Krausz, et al, 1995; Kuokkanen, et al, 2003; Nogueras, 2006; Simon, et al, 2010; Stone, et al, 2006; Tsai, et al, 2010; van der Heijden, et al, 2010; Widerszal-Bazyl, et al, 2008; Yang, et al, 2006).
- Gender of male (Barron, et al, 2005; Borkowski, et al, 2007; Estryn-Behar, et al, 2008; Robinson, et al, 2005).
- Poor health (Andrews, et al, 2009; Hasselhorn, et al, 2006; Jourdain, et al, 2010).
- High qualification (Barron, et al, 2005; Borkowski, et al, 2007; Chan, et al, 2009).
- High or low position (Barron, et al, 2005; Tsai, et al, 2010).
- Nursing not a childhood occupational choice (Barriball, et al, 1996).
- Perceived stress / burnout (Collins, et al, 2000; DiMattio, et al, 2010; Estryn-Béhar, et al, 2007; Flinkman, et al, 2008; Jourdain, et al, 2010; Krausz, et al, 1995; Kuokkanen, et al, 2003; Leiter, et al, 2009; Milisen, et al, 2006; Simon, et al, 2010; Tei-Tominaga, et al, 2010; Yeh, et al, 2009; Zeytinoglu, et al, 2006).

Psychosocial work characteristics:

- High job demand / effort (Chiu, et al, 2009; Flinkman, et al, 2008; Hart, 2005; Hasselhorn, et al, 2008; Hasselhorn, et al, 2004; Jourdain, et al, 2010; Lavoie-Tremblay, et al, 2008; Milisen, et al, 2006; Robinson, et al, 2005; Widerszal-Bazyl, et al, 2008; Wu, et al, 2000).
- Low autonomy / control (Brooks, et al, 2002; Chiu, et al, 2009; Cowin, 2002; Estryn-Béhar, et al, 2007; Fochsen, et al, 2005; Hart, 2005; Hasselhorn, et al, 2008; Jourdain, et al, 2010; Lavoie-Tremblay, et al, 2008; Tei-Tominaga, et al,

2010; Widerszal-Bazyl, et al, 2008).

- Low possibilities for development (Barron, et al, 2005; Estryn-Béhar, et al, 2007; Flinkman, et al, 2008; Hasselhorn, et al, 2006; Robinson, et al, 2005; Stone, et al, 2006; Takase, et al, 2008; Yeh, et al, 2009).
- Low social support / teamwork / management (Borkowski, et al, 2007; Chiu, et al, 2009; DiMattio, et al, 2010; Estryn-Behar, et al, 2008; Estryn-Béhar, et al, 2007; Hasselhorn, et al, 2006; Jourdain, et al, 2010; Kivimäki, et al, 2007; Milisen, et al, 2006; Tei-Tominaga, et al, 2010; van der Heijden, et al, 2010; Widerszal-Bazyl, et al, 2008; Yang, et al, 2006; Yeh, et al, 2009; Zeytinoglu, et al, 2006).
- Low pay (Barron, et al, 2005; Borkowski, et al, 2007; Chan, et al, 2009; Collette, 2004; Collins, et al, 2000; Cowin. 2002; DiMattio, et al, 2010; Estryn-Béhar, et al, 2007; Fochsen, et al, 2005; Hasselhorn, et al, 2004; Jourdain, et al, 2010; Lavoie-Tremblay, et al, 2008; Leiter, et al, 2009; Lum, et al, 1998; Lynn, et al, 2005; Robinson, et al, 2005; Tzeng, 2002; Wu, et al, 2000; Yang, et al, 2006; Zeytinoglu, et al, 2006).
- Poor promotion prospects (Brooks, et al, 2002; Collins, et al, 2000; Fochsen, et al, 2005; Hasselhorn, et al, 2004; Lavoie-Tremblay, et al, 2008; Leiter, et al, 2009; Lynn, et al, 2005; Shields, et al, 2001; Tzeng, 2002).
- Lack of recognition (Borkowski, et al, 2007; Collette, 2004; Hasselhorn, et al, 2004; Lynn, et al, 2005; Takase, et al, 2006; Wu, et al, 2000).
- Low job satisfaction (Cai, et al, 2009; Collins, et al, 2000; Flinkman, et al, 2008; Ingersoll, et al, 2002; Kuokkanen, et al, 2003; Lu, et al, 2002; Lum, et al, 1998; Lynn, et al, 2005; Simon, et al, 2010; Tang, 2007; Tsai, et al, 2010; Tzeng, 2002; van der Heijden, et al, 2010).
- Low commitment (Chang, et al, 2006; Flinkman, et al, 2008; Ingersoll, et al, 2002; Jourdain, et al, 2010; Lu, et al, 2002; Lum, et al, 1998; Nogueras, 2006; Parry, 2008; Piao, 2007; Simon, et al, 2010; Takase, et al, 2008; Tsai, et al, 2010; Zeytinoglu, et al, 2006).
- Overcommitment (Hasselhorn, et al, 2004).
- Low empowerment (Cai, et al, 2009; Fitzpatrick, et al, 2010; Zurmehly, et al, 2009).
- Work-family conflict (DiMattio, et al, 2010; Estryn-Béhar, et al, 2007; Flinkman, et al, 2008; Simon, et al, 2004; Tzeng, 2002).
- Employment opportunity (DiMattio, et al, 2010; Widerszal-Bazyl, et al, 2008).
- Nigh shift (Brooks, et al, 2002; Lum, et al, 1998).
- Low work ability (Camerino, et al, 2006; Stone, et al, 2006).
- Bullying and violence (Collette, 2004; Estryn-Behar, et al, 2008).

2.3.3. Gaps in the evidence

According to the literature review, nurses' intention to leave their profession varies considerably across studies and countries. The variation might be due to different measures of ITL, and / or cultural, socioeconomic, and working conditions differences across countries.

A number of variables influencing nurses' intention to leave the profession were identified, including socio-demographic characteristics and psychosocial work characteristics. Younger nurses, male nurses, those with higher qualifications or poor health have intention to leave the profession, while the position rank shows mixed results. Concerning the psychosocial work conditions, high job demand / effort, low autonomy / control, low possibilities for development, low social support / teamwork / management, low pay, poor promotion prospects, lack of recognition, and overcommitment are identified as major risk factors, which are well captured by the two prevailing models of work stress, i.e. the Demand-Control-Support (DCS) model (also called Job Strain model) and the Effort-Reward Imbalance (ERI) model.

It was Karasek's original contribution to formulate a 2-dimensional concept of work stress (Karasek, 1979). In this model, job demand is related to other psychological stress models having to do with pressure and heavy demands. More importantly, Karasek proposed the concept of "lack of control" or "lack of decision latitude". It is assumed that the possibility for the employee to utilize and develop the skills (skill discretion) is closely related to his or her decision authority. It is supposed that skill discretion has to do with the employee's control over the use and development of his or her skills; whereas authority over decision has to do with the employee's control over decision making relevant to his or her work tasks.

There is an interaction between psychological job demand and decision latitude / control (Karasek, 1990). In such way, four combinations could be produced (See Figure 3). The high demand - low control, job strain, is regarded as the worst situation to illness development. The combination of high demand - high control is defined as active situation, where the worker can cope with high demand because he or she has more resources to make decisions. The low demand - high control, the relaxed one, is theoretically best one, whereas the low demand - low control, passive situation, may be associated with risk of loss of skills and to some extent psychological atrophy.

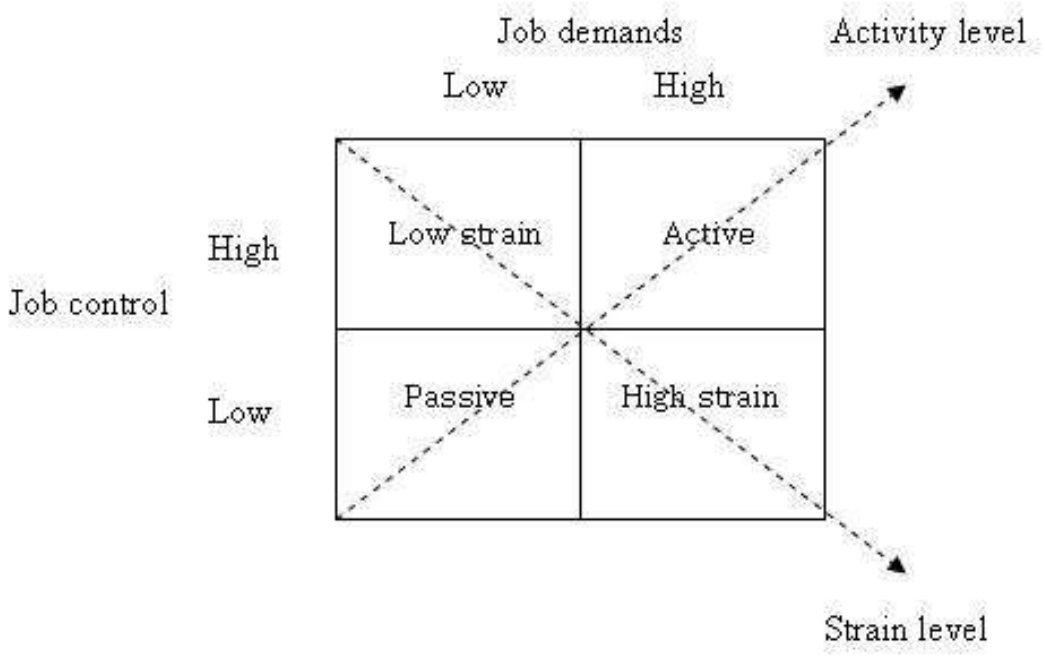

Figure 3 The Demand-Control model

Afterwards, the original demand-control concept was modified to include social support at work (from supervisor and from coworker) as a third dimension (Johnson, et al, 1988). It is suggested that people with low social support together with high demand and low control experience the highest risk for poor health, compared to the people in other combinations of demand - control and social support.

The Effort-Reward Imbalance model which proposed by Siegrist, focuses more explicitly on links between work tasks and labor market dynamics (Siegrist, 1996; Siegrist, 2002). The model maintains that the work role defines a crucial link between self-regulatory needs of a person (e.g. self-esteem, self-efficacy) and the social opportunity structure. Effort at work is spent as part of a socially organized exchange process to which society at large contributes in terms of reward. Reward is distributed by three transmitter systems: money and promotion, esteem, and job security. The ERI model claims that lack of reciprocity between costs and gains (i.e. high costs/low gains conditions) defines a state of emotional distress which can lead to the arousal of autonomic nervous system that, in the long run, contribute to the development of stress related diseases (See Figure 4). In addition to situational characteristics of job related effort and reward the model includes a person characteristic, a distinct pattern of coping with job demands termed overcommitment, which aggravates stressful experience at work.

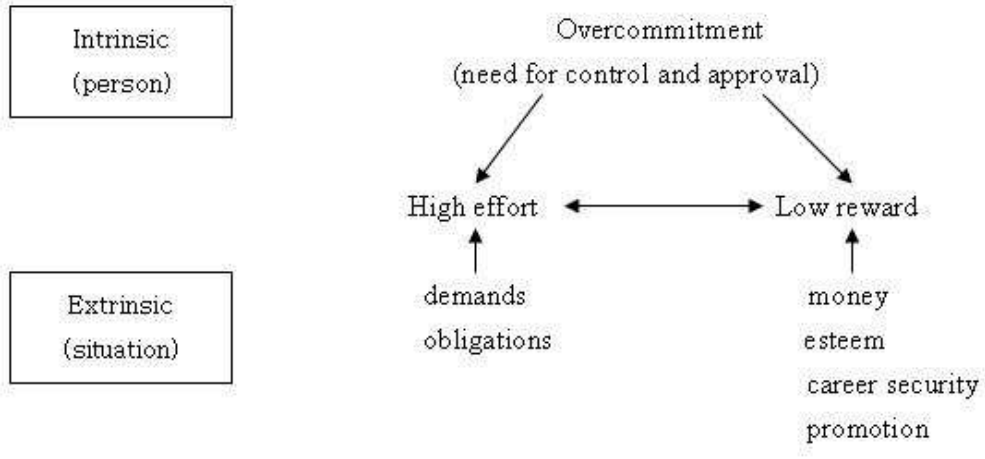

Figure 4 The Effort-Reward Imbalance model

It is important to note that the two models, the Demand-Control-Support model and the Effort-Reward Imbalance model, have some different aspects. First, the DCS model puts its explicit focus on situational characteristics of the work environment; while an explicit distinction between situational and personal characteristics in the ERI model. Second, components of the ERI model are linked to more distant macroeconomic labor market conditions; whereas the DCS model's major focus is on workplace characteristics. Third, the range of control over one's environmental situation at work is the core dimension in the DCS model; while in the ERI model, threats to, or violation of, legitimate rewards based on the assumption of reciprocity and fairness in social exchange represent the core dimension. On the other hand, the two alternative models overlap to some extent: esteem reward in the ERI model is similar to social support from coworker and supervisor in the DCS model, and effort in the ERI model overlaps the operationalization of job demand in the DCS model (Marmot, et al, 1999).

In addition, night shift work and work-family conflict are also associated with nurses' ITL. A series of variables (like job satisfaction, commitment, empowerment, and work ability) play as intermediate pathway between the psychosocial work environment and turnover intention. Interestingly, the opportunity structure of the job market has been identified as an important determinant of nurses' turnover intentions (DiMattio, et al, 2010; Lane, et al, 1988; Widerszal-Bazyl, et al, 2008). For instance, in some of the countries witnessing a rapid economic and socio-political transition, particularly in Eastern European nations, nurses exposed to high levels of work stress showed a low probability of intending to leave their profession. This finding is probably due to a

lack of alternative job opportunity, thus leaving them in a state of being professionally 'locked-in' (Widerszal-Bazyl, et al, 2008). So far, the impact of professional labour market factors on turnover intentions has not been carefully investigated (Muhonen, 2010).

We have to take more concerns on methodology into account. Firstly, majority of evidence relies on cross-sectional design which makes it impossible to draw any causal inference of the observed association. More well-designed longitudinal studies, randomized controlled trials, and intervention studies are needed since they could overcome some of the limitation. Secondly, the sample size of most studies is relatively small (hundreds of nurses), which makes the results less sound and confident. Thirdly, international comparative study is lacking except the NEXT study. Due to the huge differences of socio-demography, healthcare system, and working conditions across countries, it is unfair to compare the nurses' ITL and work characteristics directly. Increasingly, recent development of statistical modeling, especially multilevel approaches are seen as relevant to public health and epidemiological research (Diez-Roux, 2000; Leyland, et al, 2003), in particular, to the international comparative studies (Bobak, et al, 2007; Deveugele, et al, 2002; Grigoryan, et al; 2008). These techniques provide researchers with an appropriate analytical approach for the clustered structure of data with nested sources of variability - that is, involving units at a lower level (for example individuals) nested within units at a higher level (for example countries). Using the international substantial and large database from the NEXT study, we have the opportunity of exploring variations of intention to leave the profession across countries, and of studying the variations that exist at country and at individual level, by applying statistical modeling of multilevel analysis (Twisk, 2006).

3. Aims

In this study, we therefore set out to examine the impact of two established models of psychosocial stress at work (i.e. Job Strain model and Effort-Reward Imbalance model), together with job alternatives in labor market (employment opportunity) and individual resources (including age and health), on the newly developed intention to leave the nursing profession over a one-year observation period (see Figure 5), using a prospective design of an international comparative study (NEXT study).

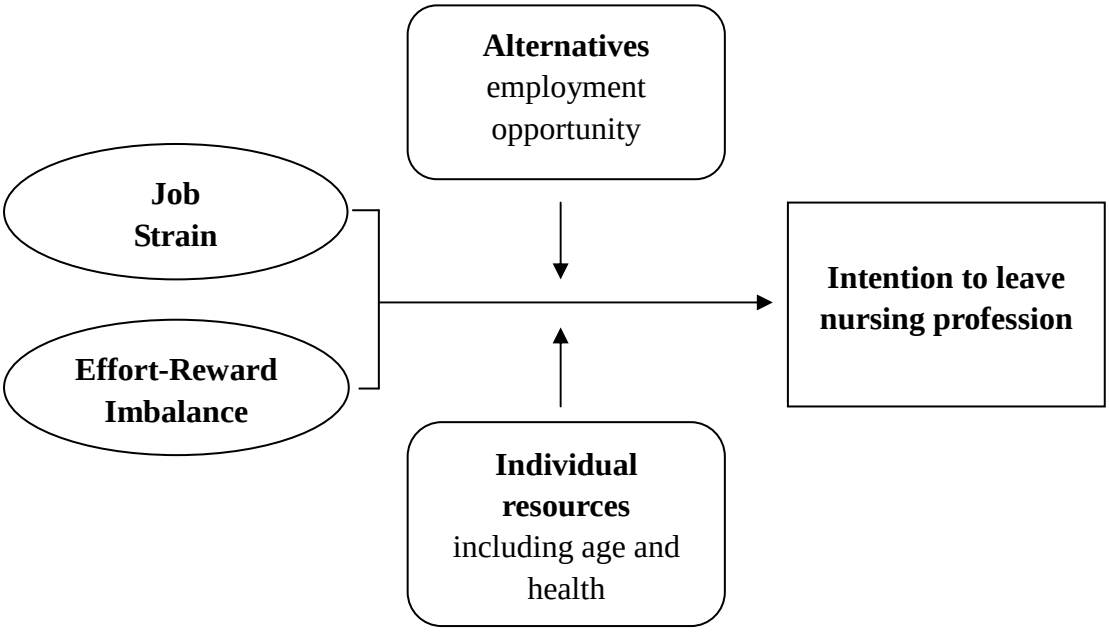

Figure 5 Research model of turnover intention from nursing

The specific aims for the study were:

(1) To detect the divergence and concordance of work stress, employment opportunity, individual resources, and intention to leave the nursing profession across eight countries (Germany, Italy. France, the Netherlands, Belgium, Poland, Slovakia, and China);
(2) To compare the contribution of work stress, employment opportunity, and individual resources, towards explaining nurses' intentions to leave their profession.
(3) To explore the consistency of associations across countries and to explain potential deviations from this pattern by referring to distinct macro-structural developments within respective nations.

4. Methods

4.1. Study design and population

The Nurses' Early Exit (NEXT) Study is a 1-year longitudinal questionnaire study which was approved by the Ethical Committee of the University of Wuppertal for European part, and by the Ethical Committee of the Fudan University for Chinese part (for details, please see Hasselhorn, et al, 2005, Li, et al, 2010). Our present investigation was restricted to 22378 (ranging from 1954 in Belgium to 3657 in France) registered female nurses working in hospitals in order to increase the homogeneity of the sample and the comparability among the participating countries (overall response rate at baseline survey: 56.17%, ranging from 41.30% in France to 89.95% in China). Among them, 9251 participated in the one-year follow-up survey (overall follow-up rate: 41.34%, ranging from 21.39% in Slovakia to 59.07% in Italy) (for details, see Table 3). We further excluded 1261 nurses who had the intention to leave (ITL) the nursing profession at baseline. Thus, 7990 registered female nurses working in hospitals in 8 countries (Germany, Italy, France, the Netherlands, Belgium, Poland, Slovakia, and China) were included in the prospective follow-up analysis.

Table 3 Baseline response rates and follow-up rates of the study population

Variables	Germany	Italy	France	The Netherlands	Belgium	Poland	Slovakia	China	Total
Baseline participants (N)	2145	3452	3657	2186	1954	3171	2725	3088	22378
Baseline response rates (%)	54.98%	75.80%	41.30%	43.17%	60.39%	61.40%	53.21%	89.95%	56.17%
Follow-up participants (N)	1246	2039	892	696	591	1413	583	1791	9251
Follow-up rate (%)	58.09%	59.07%	24.39%	31.84%	30.25%	44.56%	21.39%	58.00%	41.34 %

4.2. Measurements

4.2.1. Socio-demographic characteristics

All socio-demographic characteristics, i.e. age, marital status, position rank, shift work, and self-rated health, were collected at baseline. Age was measured as continuous variable. Marital status was categorized into “single” (including being unmarried, divorced, separated, or widowed) and “cohabitated” (including being married or living together). High-ranking position referred to charge nurses while low-ranking position referred to ordinary nurses. Shift work in this study was categorized into “day shift” (including regular or irregular day shift) and “rotating shift” (including rotation schedules involving in night shift). The self-rated health was measured by a single question (“In general, how would you rate your health?”). The response categories were “excellent”, “very good”, “good”, “fair”, “poor”, and “very poor”. Subjects rating their health “poor” or “very poor” were considered as “poor self-rated health”, else as “good self-rated health”. Self-rated health has been widely used in epidemiological research (DeSalvo, et al, 2006), and nursing research as well (Griep, et al, 2011).

4.2.2. Psychosocial work characteristics

Job strain

In the baseline survey of the NEXT Study, two scales of ‘demand’ and ‘control’, derived from the Copenhagen Psychosocial Questionnaire (Kristensen, et al, 2005), and one scale of ‘social support’ (van der Heijden BI, et al, 2010) were used to measure the job strain model (Hasselhorn, et al, 2008; Li, et al, 2010). Job ‘demand’ is assessed with 3 items, while job ‘control’ includes ‘decision authority’ (4 items) and ‘skill discretion’ (2 items), and ‘social support’ includes ‘supervisor support’ (4 items) and ‘coworker support’ (3 items).

Demand:

- Do you have to work very fast?
- Is your workload unevenly distributed so that things pile up?
- How often do you not have time to complete all your work tasks?

Control:

Decision authority:

- Do you have a large degree of influence concerning your work?
- Can you influence the amount of work assigned to you?
- Do you have any influence on what you do at work?
- Can you decide when to take a break?

Skill discretion (Possibilities for development):

- Does your work require you to take the initiative?
- Do you have the possibility of learning new things through your work?

Social support:

Social support from superior:

- Is your immediate superior good at work planning?
- Is your immediate superior good at solving conflicts?
- How often do you get help and support from your immediate superior?
- How often does your superior talk with you about how well you carry out your work?

Social support from coworker:

- How often do you get help and support from your colleagues?
- How often do your colleagues talk with you about how well you carry out your work?
- Is there good co-operation between the colleagues at work?

Items are scored using a 5-point Likert scale from “hardly ever” to “always”. Consequently, the range of scores for the scale ‘demand’ is 3-15, for the scale ‘control’ 6-30, and for the scale ‘social support’ 7-35, with higher scores reflecting higher demand, higher control, and better social support. The overall Cronbach’s α coefficients of demand, control, and social support in this study were 0.52 (ranging from 0.31 in China to 0.77 in Belgium), 0.74 (ranging from 0.65 in the Netherlands to

0.81 in Italy), and 0.80 (ranging from 0.73 in the Netherlands to 0.86 in China), respectively (for details, see Table 4). The ratio between job demand and job control (weighted by item numbers) is used to define job strain (Li, et al, 2006). In this study, people in the upper tertile of scores of the demand-control ratio were defined as 'high job strain group', while people in the second tertile were labeled 'intermediate strain group', and people in the lowest tertile 'low strain group' (reference group).

Effort-reward imbalance (ERI)

The original 23-item ERI questionnaire was applied in the baseline survey of the NEXT Study (Siegrist, et al, 2004). The questionnaire consists of three scales termed 'effort' (6 items), 'reward' (11 items, including 4 items measuring promotion prospects and salary, 5 items measuring esteem at work, and 2 items assessing job security), and 'overcommitment' (6 items).

Effort:

- I am under constant time pressure due to the heavy work load.
- I have many interruptions and disturbances in my job.
- I have a lot of responsibility in my job.
- I am often pressured to work overtime.
- My job is physically demanding.
- Over the past few years, my job has become more and more demanding.

Reward:

Promotion reward:

- My job promotion prospects are poor.
- My current occupational position adequately reflects my education and training.
- Considering all my efforts and achievements, my work prospects are adequate.
- Considering all my efforts and achievements, my salary/income is adequate.

Esteem reward:

- I receive the respect I deserve from my superiors.
- I receive the respect I deserve from my colleagues.

- I experience adequate support in difficult situations.
- I am treated unfairly at work.
- Considering all my efforts and achievements, I receive the respect and prestige I deserve at work.

Security reward:

- I have experienced or I expect to experience an undesirable change in my work situation.
- My job security is poor.

Overcommitment:

- I get easily overwhelmed by time pressures at work.
- As soon as I get up in the morning I start thinking about work problems.
- When I get home, I can easily relax and "switch off" from work.
- People close to me say I sacrifice too much for my job.
- Work rarely lets me go, it is still on my mind when I go to bed.
- If I postpone something that I was supposed to do today I'll have trouble sleeping at night.

Responses to the items of 'effort' and 'reward' are based on a 5-point Likert scale in the European NEXT Study and on a 4-point Likert scale in the Chinese NEXT Study. In both studies, items of 'overcommitment' are based on a 4-point Likert scale. A score of 1 always indicates strong disagreement, and a score of 4 indicates strong agreement. As suggested by earlier international comparative studies (László, et al, 2010; Tsutsumi, et al, 2009), item responses were coded as binary disagreement vs. agreement, in order to achieve cross-cultural comparability. Thus, scores range from 6 to 12 for 'effort', from 11 to 22 for 'reward', and from 6 to 12 for 'overcommitment', with higher scores reflecting higher effort, higher reward and higher overcommitment. The overall Cronbach's α coefficients of effort, reward, and overcommitment in this study were 0.75 (ranging from 0.68 in France to 0.81 in China), 0.87 (ranging from 0.67 in the Netherlands to 0.80 in Slovakia), and 0.76 (ranging from 0.69 in Slovakia to 0.78 in Germany), respectively (for details, see Table 4). According to a predefined algorithm, a ratio between the two scales 'effort' and 'reward' (weighted by item numbers) was calculated in order to quantify the degree of mismatch between high 'cost' and low 'gain' (Siegrist, et al, 2004). Again, the scores of this ratio of effort-reward imbalance were grouped into tertiles, where people in the upper tertile

were labeled the ‘high stress group’, people in the second tertile ‘intermediate stress group’ , and people in the lowest tertile ‘low stress group’ (reference group). Finally, as justified in previous studies (Pikhart, et al, 2001; Li, et al, 2006), we additionally applied a logarithmic transformation of the continuous measures of the two ratios (demand-control ratio and effort-reward ratio). This latter procedure has the advantage of placing inverse strain or imbalance of the same magnitude in the same distance from 1 (when demand and control, effort and reward are equal, respectively).

Employment opportunity

At baseline, one item (“Is it difficult finding another job if you became unemployed?”) was used to measure the nurses’ alternative employment opportunity in labor market. The response categories were “no”, “yes” (Widerszal-Bazyl, et al, 2008).

4.2.3. Intention to leave the nursing profession (ITL)

At both baseline and follow-up, the intention to leave the nursing profession was measured by a single item (“How often during the course of the past year have you thought about leaving nursing?”). The response categories were “never”, “sometimes a year”, “sometimes a month”, “sometimes a week”, “everyday”. Nurses indicating to leave the profession “sometimes a month” or “sometimes a week” or “everyday” were considered to “have ITL” (Hasselhorn, et al, 2008; Li, et al, 2010).

Table 4 Internal consistency of psychosocial work stress scales (Cronbach's α coefficients)

Variables	Germany (N=1054)	Italy (N=1652)	France (N=773)	The Netherlands (N=646)	Belgium (N=527)	Poland (N=1281)	Slovakia (N=536)	China (N=1521)	Total (N=7990)
Demand	0.63	0.65	0.74	0.72	0.77	0.61	0.47	0.31	0.52
Control	0.72	0.81	0.75	0.65	0.71	0.72	0.71	0.65	0.74
Decision authority	0.78	0.84	0.81	0.72	0.77	0.81	0.81	0.64	0.79
Skill discretion	0.56	0.57	0.57	0.62	0.62	0.64	0.50	0.53	0.59
Social support	0.80	0.79	0.77	0.73	0.78	0.81	0.79	0.86	0.80
Social support form supervisor	0.84	0.85	0.84	0.81	0.84	0.87	0.79	0.88	0.85
Social support from coworker	0.77	0.74	0.73	0.65	0.74	0.73	0.76	0.77	0.74
Effort	0.72	0.75	0.68	0.69	0.74	0.70	0.70	0.81	0.75
Reward	0.74	0.75	0.74	0.67	0.76	0.76	0.80	0.74	0.87
Promotion reward	0.69	0.62	0.61	0.60	0.58	0.53	0.58	0.53	0.73
Esteem reward	0.70	0.73	0.73	0.55	0.70	0.77	0.77	0.68	0.82
Security reward	0.45	0.40	0.27	0.38	0.49	0.61	0.75	0.44	0.67
Overcommitment	0.78	0.70	0.75	0.75	0.76	0.73	0.69	0.73	0.76

4.3. Data analysis

For the pooled data from eight countries, firstly, descriptive statistics were generated. Means and standard deviations (SDs) were investigated for continuous variables, and relative frequencies were examined for categorical variables. Secondly, we applied analysis of variance (for continuous variables) or Chi-square test (for categorical variables) to compare the differences of socio-demographic characteristics, psychosocial work characteristics, and nurses' intention to leave the profession among the participating countries (see Table 5). Thirdly, we applied Student's t-test (for continuous variables) or Chi-square test (for categorical variables) to compare the differences between nurses who participated only baseline survey and nurses who participated both baseline and follow-up surveys (see Table 6). Fourthly, given the clustered structure of the data, i.e. individuals (low level) nested within countries (high level), multilevel logistic regression was applied for prospective associations between socio-demographic characteristics, psychosocial work characteristics at baseline and newly developed ITL at follow-up. Multilevel modeling allows for an accurate adjustment for country affiliation, thus considering the dependence of the residuals within a country. Moreover, variations of ITL can be examined separately at the individual and at the country level (Twisk, 2006). Results are given as odd ratios (ORs) with 95% confidence intervals (CIs). Variability parameters between countries are calculated for the random component (Sigma u and Rho), and the model fit statistics (log likelihood, Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC)) are indicated. In our statistical analyses, we performed the following five steps. In model I, individual resources, i.e. socio-demographic characteristics such as age, marital status, shift work, position rank, and self-rated health, were entered into the regression model. In model II, both job strain and individual resources were entered into the regression model. In model III, both effort-reward imbalance and individual resources were entered into the regression model. In model IV, both employment opportunity and individual resources were entered into the regression model. In model V, job strain, effort-reward imbalance, employment opportunity, and individual resources were all entered the regression model, with mutual adjustment to estimate their independent effects on ITL. In view of the continuous measure of age, social support, overcommitment, and log-transformed ratios of demand/control and effort/reward, respective ORs were reported for an increase by 1 SD (see Table 7). In a further analysis, we examined the separate associations between each single dimension of the two models of an adverse psychosocial work environment at baseline with newly developed ITL at follow-up, to

explore the relatively strongest impact of these theoretically defined dimensions. The similar five steps were applied as above described. As all variables except marital status, position rank, shift work, self-rated health, and employment opportunity were measured on a continuous scale, the ORs were also presented for an increase by 1 SD (see Table 8). Given the small number of participating countries (8 countries), multilevel logistic regression models were conducted by the program 'xtlogit' in STATA, whose estimation methods (based on adaptive Gauss-Hermite approximations to the likelihood) seem more appropriate for estimating variance components, according to a recent methodological recommendation (Austin, 2010).

Finally, the data from each country were analyzed separately. Similarly, (i) we applied Student's t-test (for continuous variables) or Chi-square test (for categorical variables) to compare the differences between nurses who participated only baseline survey and nurses who participated both baseline and follow-up surveys (see Table 9 for Germany, 12 for Italy, 15 for France, 18 for the Netherlands, 21 for Belgium, 24 for Poland, 27 for Slovakia, and 30 for China). (ii) Multivariate logistic regression was applied for prospective associations between work stress, employment opportunity, and individual resources at baseline and newly developed ITL at follow-up (see Table 10 for Germany, 13 for Italy, 16 for France, 19 for the Netherlands, 22 for Belgium, 25 for Poland, 28 for Slovakia, and 31 for China). (iii) The separate associations between each single dimension of the two work stress models at baseline with newly developed ITL at follow-up were further examined (see Table 11 for Germany, 14 for Italy, 17 for France, 20 for the Netherlands, 23 for Belgium, 26 for Poland, 29 for Slovakia, and 32 for China). The similar five-step statistical modeling was also performed. Results are given as odd ratios (ORs) with 95% confidence intervals (CIs). We verified the overall model evaluations with likelihood ratio test, and the fit of the multivariate logistic regression models with the Hosmer-Lemeshow goodness-of fit test. In all cases, the overall tests are satisfactory ($p < 0.05$), and the models fit well ($p > 0.05$).

All analyses were conducted by the statistical programs SAS 9.2 (Allison, 1999), and STATA 11 (only for multilevel modeling) (Rabe-Hesketh, et al, 2005).

5. Results

5.1. All countries pooled data

Socio-demographic characteristics of study subjects at baseline

Table 5 gives information on the sample composition (means and percentages of socio-demographic and occupational characteristics) at baseline. The study subjects consisted of 7990 registered female hospital nurses from 8 countries, with the highest number of respondents in Italy and the smallest number in Belgium. The overall mean age was 36.66 years, while the Chinese nurses were youngest (30.79 years) and the Slovakian nurses were oldest (39.17 years). Generally, 83.08% nurses lived with partners, ranging from 61.93% in China to 95.63% in Poland. Very few nurses (2.01%) in the Netherlands occupied a high-ranking position, but the corresponding number in China was as high as 22.29%. The distribution of shift work in the 8 countries was uneven, only 33.12% French nurse had the duty of rotating shift, whereas 80.09% Polish nurses did so. About one fifth of all nurses rated their health as ‘poor’, ranging from 6.04% in the Netherlands to 33.21% in Slovakia.

Scores of psychosocial work characteristics at baseline

Demand was highest in Polish nurses and lowest in Dutch nurses (10.35 vs. 9.18), while the score of control was highest in France (20.92) and lowest in China (17.05). Consequently, the score of demand-control ratio was lowest in the Netherlands (-0.10) and highest in China (0.14). In addition, social support was highest in Chinese sample and lowest in Italian sample (26.15 vs. 22.73). Effort was highest in Chinese nurses and lowest in Dutch nurses (10.91 vs. 9.53), while the score of reward was highest in the Netherlands (19.54) and lowest in Poland (17.09). Accordingly, the score of effort-reward ratio was lowest in the Netherlands (-0.12) and highest in Germany (0.13). Besides, overcommitment was highest in Chinese sample and lowest in Dutch sample (9.90 vs. 6.97). Interestingly, it was difficult for most Polish and Slovakian nurses (88.60% and 75.56%, respectively) to have alternative employment opportunities, which is much easier for nurses from other countries. Differences between the countries were highly significant.

Intention to leave the nursing profession at follow-up

Among the 7990 nurses who did not have intention to leave the nursing profession at baseline, 702 nurses expressed their intention to leave in the follow-up examination after one-year (incidence rate 8.79%). Relatively highest rates were observed in France, China, Germany and Italy (>8%), substantially lowest rates in the Netherlands and Belgium (<6%), and rates between 6~8% in the remaining countries (Poland and Slovakia).

Differences of characteristics at baseline between nurses who participated only baseline survey and who participated both baseline and follow-up surveys

Compared to the 13127 nurses who participated only baseline survey, 9251 nurses who participated both baseline and follow-up surveys (41.34% follow-up rate) were significantly younger, had more single status of marriage, higher position, and more rotating shift work, with better health; they also had higher demand, lower control, higher social support, higher effort, and higher overcommitment; in addition, they had more employment opportunity (see Table 6).

Prospective associations of socio-demographic characteristics, psychosocial work characteristics at baseline with newly developed ITL at follow-up

As can be seen from Tables 7 and 8, significant, although small between-country variations were observed. The intra-class correlation ('Rho') indicates that about 1.8% of the total variance in newly developed ITL can be attributed to differences between the countries, after taking all relevant factors into account. Therefore, within our sample variations of ITL are largely explained at the individual level. As an additional finding, it should be noted that the model fit of the final model (V) has been improved (reduction of log likelihood, AIC, and BIC) if compared to the model fit of the previous models (I, II, III, IV).

Clear dose-response relationships were demonstrated by the findings displayed in Table 7. When analyzing the separate impacts of socio-demographic characteristics, job strain, ERI, and employment opportunity at baseline on newly developed ITL at follow-up, young age, being single, poor self-rated health, job strain, ERI, and employment opportunity were all significant, with relatively strongest effects exerted by ERI. However, when mutually adjusting the effects of these predictors on ITL, the odds ratios of young age, being single, poor self-rated health, ERI, and employment opportunity on ITL remained almost unchanged, whereas the odds ratio of job strain lost its statistical significance. Exploring the full information provided by the

continuous measures of the log-transformed ratios of demand/control and of effort/reward exhibited elevated explanatory power if compared with information based on tertiles.

The single psychosocial work dimensions were additionally examined. Similarly, when taking mutual adjustment for all characteristics into account, demand, control, and social support were no longer related to ITL, whereas young age, being single, poor self-rated health, reward (in particular, promotion reward), overcommitment, and employment opportunity were found to be consistently predictable to nurses' intention to leaving the profession (Table 8).

Table 5 Characteristics of study subjects at baseline

Continuous variables (Mean ± SD)	Germany (N=1054)	Italy (N=1652)	France (N=773)	The Netherlands (N=646)	Belgium (N=527)	Poland (N=1281)	Slovakia (N=536)	China (N=1521)	*p*	Total (N=7990)
Age (years)	38.00 ± 9.01	37.87 ± 7.38	37.90 ± 8.92	37.51 ± 9.52	38.24 ± 9.04	38.07 ± 6.96	39.17 ± 8.07	30.79 ± 7.97	< 0.0001	36.66 ± 8.64
Demand	10.15 ± 1.88	9.76 ± 2.13	9.90 ± 2.10	9.18 ± 1.70	9.93 ± 2.01	10.35 ± 2.01	9.96 ± 1.68	9.73 ± 1.76	< 0.0001	9.89 ± 1.96
Control	20.84 ± 3.86	19.34 ± 4.69	20.92 ± 4.06	20.24 ± 3.25	20.11 ± 3.59	19.14 ± 4.28	19.85 ± 4.26	17.05 ± 3.51	< 0.0001	19.38 ± 4.24
Decision authority	12.57 ± 3.25	12.50 ± 3.63	12.60 ± 3.39	12.71 ± 2.64	12.33 ± 2.96	11.63 ± 3.66	11.75 ± 3.70	9.64 ± 2.71	< 0.0001	11.79 ± 3.47
Skill discretion	8.27 ± 1.44	6.84 ± 1.79	8.32 ± 1.48	7.52 ± 1.53	7.78 ± 1.48	7.51 ± 1.68	8.11 ± 1.54	7.42 ± 1.55	< 0.0001	7.59 ± 1.68
Log (Demand/Control)	-0.03 ± 0.31	0.02 ± 0.39	-0.06 ± 0.34	-0.10 ± 0.27	-0.02 ± 0.33	0.08 ± 0.34	0.01 ± 0.31	0.14 ± 0.27	< 0.0001	0.02 ± 0.33
Social support	24.92 ± 4.94	22.73 ± 5.67	23.80 ± 5.17	23.92 ± 3.81	25.53 ± 4.88	23.52 ± 5.90	24.40 ± 5.35	26.15 ± 4.76	< 0.0001	24.30 ± 5.33
Social support form supervisor	13.84 ± 3.77	12.39 ± 4.33	12.30 ± 4.10	12.07 ± 3.08	13.99 ± 3.47	12.34 ± 4.43	13.87 ± 3.82	14.86 ± 3.30	< 0.0001	13.22 ± 4.04
Social support from coworker	11.07 ± 2.24	10.34 ± 2.60	11.50 ± 2.32	11.86 ± 1.67	11.54 ± 2.26	11.18 ± 2.63	10.54 ± 2.58	11.29 ± 2.08	< 0.0001	11.08 ± 2.40
Effort	10.79 ± 1.21	10.27 ± 1.41	10.34 ± 1.41	9.53 ± 1.30	10.30 ± 1.47	10.17 ± 1.23	10.05 ± 1.30	10.91 ± 1.40	< 0.0001	10.38 ± 1.40
Reward	17.46 ± 2.34	17.86 ± 2.44	18.67 ± 2.35	19.54 ± 1.86	18.54 ± 2.33	17.09 ± 2.34	17.12 ± 2.73	18.40 ± 2.20	< 0.0001	17.99 ± 2.44
Promotion reward	5.80 ± 1.13	5.84 ± 1.07	6.34 ± 1.16	6.62 ± 1.06	6.14 ± 1.08	5.69 ± 0.79	6.02 ± 1.14	6.06 ± 1.13	< 0.0001	6.00 ± 1.10
Esteem reward	8.39 ± 1.43	8.51 ± 1.54	8.67 ± 1.43	9.31 ± 1.00	8.76 ± 1.40	8.56 ± 1.57	8.51 ± 1.62	9.24 ± 0.97	< 0.0001	8.74 ± 1.42
Security reward	3.27± 0.64	3.50 ± 0.65	3.66 ± 0.52	3.61 ± 0.54	3.64 ± 0.60	2.84 ± 0.81	2.59 ± 0.78	3.09 ± 0.74	< 0.0001	3.26 ± 0.76
Log (Effort/Reward)	0.13 ± 0.20	0.05 ± 0.23	0.01 ± 0.22	-0.12 ± 0.19	0.02 ± 0.22	0.09 ± 0.22	0.08 ± 0.24	0.08 ± 0.22	< 0.0001	0.06 ± 0.23
Overcommitment	8.43 ± 1.84	8.64 ± 1.75	8.51 ± 1.82	6.97 ± 1.27	8.30 ± 1.80	8.49 ± 1.82	9.07 ± 1.74	9.90 ± 1.69	< 0.0001	8.69 ± 1.89

Analysis of variance

Table 5 (continued) Characteristics of study subjects at baseline

Categorical variables (N (%))	Germany (N=1054)	Italy (N=1652)	France (N=773)	The Netherlands (N=646)	Belgium (N=527)	Poland (N=1281)	Slovakia (N=536)	China (N=1521)	*p*	Total (N=7990)
Marital status									<0.0001	
Single	222 (21.06)	197 (11.92)	114 (14.75)	90 (13.93)	64 (12.14)	56 (4.37)	30 (5.60)	579 (38.07)		1352 (16.92)
Cohabitated	832 (78.94)	1455 (88.08)	659 (85.25)	556 (86.07)	463 (87.86)	1225 (95.63)	506 (94.40)	942 (61.93)		6638 (83.08)
Position rank									<0.0001	
Low	857 (81.31)	1456 (88.14)	723 (93.53)	633 (97.99)	458 (86.91)	1128 (88.06)	459 (85.63)	1182 (77.71)		6896 (86.31)
High	197 (18.69)	196 (11.86)	50 (6.47)	13 (2.01)	69 (13.09)	153 (11.94)	77 (14.37)	339 (22.29)		1094 (13.69)
Shift work									<0.0001	
Day shift	426 (40.42)	681 (41.22)	517 (66.88)	159 (24.61)	246 (46.68)	255 (19.91)	186 (34.70)	549 (36.09)		3019 (37.78)
Rotating shift	628 (59.58)	971 (58.78)	256 (33.12)	487 (75.39)	281 (53.32)	1026 (80.09)	350 (65.30)	972 (63.91)		4971 (62.22)
Self-rated health									<0.0001	
Poor	174 (16.51)	354 (21.43)	208 (26.91)	39 (6.04)	81 (15.37)	304 (23.73)	178 (33.21)	244 (16.04)		1582 (19.80)
Good	880 (83.49)	1298 (78.57)	565 (73.09)	607 (93.96)	446 (84.63)	977 (76.27)	358 (66.79)	1277 (83.96)		6408 (80.20)
Employment opportunity									<0.0001	
Difficult	363 (34.44)	298 (18.04)	189 (24.45)	69 (10.68)	151 (28.65)	1135 (88.60)	405 (75.56)	575 (37.80)		3185 (39.86)
Easy	691 (65.56)	1354 (81.96)	584 (75.55)	577 (89.32)	376 (71.35)	146 (11.40)	131 (24.44)	946 (62.20)		4805 (60.14)
Intention to leave									<0.0001	
No	956 (90.70)	1510 (91.40)	681 (88.10)	610 (94.43)	502 (95.26)	1180 (92.12)	497 (92.72)	1352 (88.89)		7288 (91.21)
Yes	98 (9.30)	142 (8.60)	92 (11.90)	36 (5.57)	25 (4.74)	101 (7.88)	39 (7.28)	169 (11.11)		702 (8.79)

Chi-square test

Table 6 Comparison of characteristics at baseline between study subjects who participated only baseline survey and both baseline and follow-up surveys in nurses from 8 countries

	Study subjects who participated only baseline survey		Study subjects who participated both baseline and follow-up surveys		
Continuous variables #	N	Mean ± SD	N	Mean ± SD	*p*
Age (years)	13127	37.10 ± 9.09	9251	36.38 ± 8.61	<0.0001
Demand	13127	9.95 ± 1.99	9251	10.00 ± 1.99	0.0643
Control	13127	19.40 ± 4.22	9251	19.15 ± 4.31	<0.0001
Social support	13127	23.68 ± 5.40	9251	24.00 ± 5.41	<0.0001
Effort	13127	10.32 ± 1.41	9251	10.44 ± 1.39	<0.0001
Reward	13127	17.77 ± 2.64	9251	17.78 ± 2.49	0.7798
Overcommitment	13127	8.61 ± 1.90	9251	8.78 ± 1.91	<0.0001
Categorical variables ##	N	%	N	%	
Marital status					<0.0001
Single	1980	15.08	1657	17.91	
Cohabitated	11147	84.92	7594	82.09	
Position rank					<0.0001
Low	11979	91.25	8006	86.54	
High	1148	8.75	1245	13.46	
Shift work					0.0005
Day shift	5200	39.61	3453	37.33	
Rotating shift	7927	60.39	5798	62.67	
Self-rated health					<0.0001
Poor	3398	25.89	1983	21.44	
Good	9729	74.11	7268	78.56	
Employment opportunity					<0.0001
Difficult	5490	41.82	3619	39.12	
Easy	7637	58.18	5632	60.88	
Intention to leave					0.8785
No	11347	86.44	7990	86.37	
Yes	1780	13.56	1261	13.63	

Student’s t-test

Chi-square test

Table 7 Prospective associations of socio-demographic variables, job strain, effort-reward imbalance, employment opportunity at baseline with newly developed ITL at follow-up in nurses from 8 countries (OR, 95% CI) (N=7990)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.86 (0.79, 0.94) **	0.86 (0.79, 0.94) **	0.86 (0.79, 0.94) **	0.86 (0.79, 0.94) **	0.86 (0.79, 0.94) **
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.32 (1.07, 1.62) **	1.31 (1.07, 1.61) *	1.33 (1.08, 1.63) **	1.32 (1.07, 1.61) **	1.33 (1.08, 1.63) **
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	0.99 (0.77, 1.28)	0.95 (0.74, 1.23)	1.03 (0.80, 1.33)	1.01 (0.78, 1.30)	1.03 (0.80, 1.34)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	1.03 (0.86, 1.23)	1.01 (0.84, 1.21)	0.97 (0.81, 1.16)	1.03 (0.86, 1.24)	0.98 (0.82, 1.18)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.64 (1.37, 1.96) ***	1.54 (1.28, 1.84) ***	1.44 (1.20, 1.73) ***	1.66 (1.38, 1.99) ***	1.43 (1.19, 1.72) ***
Job strain						
Log (Demand / Control)	Low		1.00			1.00
	Intermediate		1.22 (0.99, 1.49)			1.11 (0.90, 1.36)
	High		1.30 (1.06, 1.60) *			1.08 (0.87, 1.34)
	Per SD		1.16 (1.07, 1.26) ***			1.07 (0.98, 1.18)
Social Support	Per SD		0.85 (0.78, 0.92) ***			0.89 (0.82, 0.97) **
Effort-reward imbalance						
Log (Effort / Reward)	Low			1.00		1.00
	Intermediate			1.18 (0.95, 1.45)		1.13 (0.91, 1.41)
	High			1.72 (1.40, 2.13) ***		1.55 (1.24, 1.94) ***
	Per SD			1.26 (1.16, 1.38) ***		1.18 (1.07, 1.30) ***
Overcommitment	Per SD			1.12 (1.03, 1.22) **		1.13 (1.04, 1.22) **
Employment opportunity						
Finding another job	Difficult				1.00	1.00
	Easy				1.21 (1.01, 1.45) *	1.25 (1.04, 1.50) *
Sigma u		0.24 (0.12, 0.48) ***	0.24 (0.12, 0.48) ***	0.24 (0.12, 0.48) ***	0.24 (0.12, 0.48) ***	0.24 (0.12, 0.49) ***
Rho		0.017	0.017	0.017	0.017	0.018
Log likelihood		-2342.77	-2328.00	-2316.82	-2340.65	-2309.58
AIC		4699.54	4676.00	4653.64	4697.30	4647.16
BIC		4748.44	4745.86	4723.50	4753.19	4744.96

Multilevel logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

Table 8 Prospective associations of socio-demographic variables, psychosocial work factors at baseline with newly developed ITL at follow-up in nurses from 8 countries (OR, 95% CI) (N=7990)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.86 (0.79, 0.94) **	0.86 (0.79, 0.94) **	0.86 (0.79, 0.94) **	0.86 (0.79, 0.94) **	0.86 (0.79, 0.94) **
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.32 (1.07, 1.62) **	1.31 (1.07, 1.61) *	1.32 (1.08, 1.62) **	1.32 (1.07, 1.61) **	1.32 (1.08, 1.62) **
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	0.99 (0.77, 1.28)	0.94 (0.72, 1.22)	0.99 (0.77, 1.29)	1.01 (0.78, 1.30)	0.98 (0.75, 1.28)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	1.03 (0.86, 1.23)	1.01 (0.84, 1.21)	0.99 (0.82, 1.19)	1.03 (0.86, 1.24)	1.00 (0.83, 1.20)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.64 (1.37, 1.96) ***	1.52 (1.27, 1.83) ***	1.42 (1.18, 1.71) ***	1.66 (1.38, 1.99) ***	1.42 (1.18, 1.71) ***
Demand	Per SD		1.10 (1.01, 1.19) *			1.02 (0.93, 1.11)
Control	Per SD		0.91 (0.84, 0.99) *			0.94 (0.86, 1.02)
Decision Authority	Per SD		0.95 (0.87, 1.03)			0.98 (0.90, 1.07)
Skill Discretion	Per SD		0.93 (0.86, 1.01)			0.94 (0.86, 1.02)
Social Support	Per SD		0.86 (0.79, 0.93) ***			0.93 (0.85, 1.02)
Social Support form Supervisor	Per SD		0.87 (0.80, 0.94) **			0.92 (0.84, 1.00)
Social Support from coworker	Per SD		0.97 (0.89, 1.05)			0.99 (0.91, 1.08)
Effort	Per SD			1.02 (0.93, 1.12)		1.01 (0.92, 1.12)
Reward	Per SD			0.78 (0.72, 0.85) ***		0.82 (0.74, 0.89) ***
Promotion Reward	Per SD			0.80 (0.73, 0.87) ***		0.81 (0.74, 0.89) ***
Esteem Reward	Per SD			0.90 (0.83, 0.98) *		0.95 (0.86, 1.04)
Security Reward	Per SD			1.01 (0.93, 1.10)		1.00 (0.92, 1.09)
Overcommitment	Per SD			1.13 (1.04, 1.23) **		1.13 (1.04, 1.24) **
Employment opportunity	Difficult				1.00	1.00
	Easy				1.21 (1.01, 1.45) *	1.26 (1.05, 1.52) *
Sigma u		0.24 (0.12, 0.48) ***	0.24 (0.12, 0.48) ***	0.24 (0.12, 0.48) ***	0.24 (0.12, 0.48) ***	0.24 (0.12, 0.49) ***
Rho		0.017	0.017	0.018	0.017	0.018
Log likelihood		-2342.77	-2326.0	-2312.22	-2340.65	-2306.42
AIC		4699.54	4672.06	4644.43	4697.30	4640.85
BIC		4748.44	4741.92	4714.29	4753.19	4738.65

Multilevel logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

5.2. Germany

Socio-demographic characteristics and psychosocial work characteristics at baseline, intention to leave the nursing profession at follow-up

See Table 5 above.

Differences of characteristics at baseline between nurses who participated only baseline survey and who participated both baseline and follow-up surveys

Compared to the 899 nurses who participated only baseline survey, 1246 nurses who participated both baseline and follow-up surveys (58.09% follow-up rate) were quite comparable except they were significantly older (see Table 9).

Prospective associations of socio-demographic characteristics, psychosocial work characteristics at baseline with newly developed ITL at follow-up

Clear dose-response relationships were demonstrated by the findings displayed in Table 10. When analyzing the separate impacts of socio-demographic characteristics, job strain, ERI, and employment opportunity at baseline on newly developed ITL at follow-up, young age, being single, poor self-rated health, and ERI were all significant, with relatively strongest effects exerted by age. However, when mutually adjusting the effects of these predictors on ITL, the odds ratios of young age, being single, and ERI on ITL remained almost unchanged, whereas the odds ratio of poor self-rated health lost its statistical significance. Exploring the full information provided by the continuous measure of the log-transformed ratio of effort/reward exhibited elevated explanatory power if compared with information based on tertiles.

The single psychosocial work dimensions were additionally examined. Similarly, when taking mutual adjustment for all characteristics into account, poor self-rated health was no longer related to ITL, whereas young age, being single, reward (in particular, promotion reward), and overcommitment were found to be consistently predictable to nurses' intention to leaving the profession (Table 11).

Table 9 Comparison of characteristics at baseline between study subjects who participated only baseline survey and both baseline and follow-up surveys in nurses from Germany

	Study subjects who participated only baseline survey		Study subjects who participated both baseline and follow-up surveys		
Continuous variables #	N	Mean ± SD	N	Mean ± SD	*p*
Age (years)	899	36.74 ± 9.64	1246	37.55 ± 9.00	0.0486
Demand	899	10.27 ± 1.92	1246	10.28 ± 1.89	0.9258
Control	899	20.26 ± 4.14	1246	20.54 ± 3.94	0.1149
Social support	899	24.19 ± 5.28	1246	24.54 ± 5.05	0.1131
Effort	899	10.93 ± 1.19	1246	10.84 ± 1.21	0.1009
Reward	899	17.07 ± 2.43	1246	17.17 ± 2.40	0.3815
Overcommitment	899	8.50 ± 1.89	1246	8.53 ± 1.84	0.7253
Categorical variables ##	N	%	N	%	
Marital status					0.2026
Single	227	25.25	285	22.87	
Cohabitated	672	74.75	961	77.13	
Position rank					0.5202
Low	747	83.09	1022	82.02	
High	152	16.91	224	17.98	
Shift work					0.6562
Day shift	345	38.38	490	39.33	
Rotating shift	554	61.62	756	60.67	
Self-rated health					0.9999
Poor	171	19.02	237	19.02	
Good	728	80.98	1009	80.98	
Employment opportunity					0.7641
Difficult	305	33.93	415	33.31	
Easy	594	66.07	831	66.69	
Intention to leave					0.2850
No	745	82.87	1054	84.59	
Yes	154	17.13	192	15.41	

Student’s t-test

Chi-square test

Table 10 Prospective associations of socio-demographic variables, job strain, effort-reward imbalance, employment opportunity at baseline with newly developed ITL at follow-up in nurses from Germany (OR, 95% CI) (N=1054)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.66 (0.52, 0.83) ***	0.64 (0.50, 0.80) ***	0.64 (0.51, 0.82) ***	0.65 (0.52, 0.82) ***	0.63 (0.50, 0.80) ***
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.78 (1.12, 2.83) *	1.71 (1.07, 2.73) *	1.73 (1.08, 2.76) *	1.77 (1.11, 2.82) *	1.72 (1.07, 2.76) *
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	1.33 (0.69, 2.54)	1.25 (0.65, 2.40)	1.46 (0.76, 2.81)	1.31 (0.68, 2.50)	1.40 (0.72, 2.72)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	0.87 (0.55, 1.37)	0.88 (0.56, 1.40)	0.84 (0.53, 1.34)	0.88 (0.56, 1.38)	0.86 (0.54, 1.37)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.72 (1.01, 2.91) *	1.63 (0.95, 2.79)	1.27 (0.73, 2.21)	1.68 (0.99, 2.86)	1.25 (0.71, 2.19)
Job strain						
Log (Demand / Control)	Low		1.00			1.00
	Intermediate		0.87 (0.51, 1.51)			0.67 (0.38, 1.20)
	High		1.34 (0.79, 2.28)			0.92 (0.51, 1.66)
	Per SD		1.04 (0.84, 1.31)			0.86 (0.66, 1.12)
Social Support	Per SD		0.92 (0.74, 1.15)			0.99 (0.79, 1.24)
Effort-reward imbalance						
Log (Effort / Reward)	Low			1.00		1.00
	Intermediate			0.89 (0.49, 1.62)		0.93 (0.50, 1.72)
	High			1.71 (0.97, 3.03)		1.77 (0.94, 3.33)
	Per SD			1.28 (1.01, 1.64) *		1.34 (1.01, 1.76) *
Overcommitment	Per SD			1.33 (1.06, 1.67) *		1.35 (1.06, 1.71) *
Employment opportunity						
Finding another job	Difficult				1.00	1.00
	Easy				0.83 (0.53, 1.28)	0.84 (0.54, 1.32)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

Table 11 Prospective associations of socio-demographic variables, psychosocial work factors at baseline with newly developed ITL at follow-up in nurses from Germany (OR, 95% CI) (N=1054)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.66 (0.52, 0.83) ***	0.65 (0.51, 0.82) ***	0.64 (0.50, 0.81) ***	0.65 (0.52, 0.82) ***	0.64 (0.50, 0.82) ***
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.78 (1.12, 2.83) *	1.75 (1.09, 2.81) *	1.68 (1.05, 2.71) *	1.77 (1.11, 2.82) *	1.75 (1.08, 2.82) *
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	1.33 (0.69, 2.54)	1.24 (0.63, 2.41)	1.37 (0.71, 2.65)	1.31 (0.68, 2.50)	1.34 (0.68, 2.63)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	0.87 (0.55, 1.37)	0.88 (0.56, 1.40)	0.86 (0.54, 1.37)	0.88 (0.56, 1.38)	0.84 (0.52, 1.34)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.72 (1.01, 2.91) *	1.64 (0.96, 2.81)	1.27 (0.73, 2.20)	1.68 (0.99, 2.86)	1.28 (0.73, 2.24)
Demand	Per SD		0.97 (0.77, 1.22)			0.82 (0.62, 1.07)
Control	Per SD		0.92 (0.73, 1.15)			1.01 (0.79, 1.30)
Decision Authority	Per SD		0.98 (0.77, 1.23)			1.08 (0.84, 1.37)
Skill Discretion	Per SD		0.90 (0.73, 1.12)			0.92 (0.74, 1.14)
Social Support	Per SD		0.91 (0.73, 1.13)			1.07 (0.84, 1.37)
Social Support form Supervisor	Per SD		0.96 (0.76, 1.20)			1.07 (0.84, 1.38)
Social Support from coworker	Per SD		0.93 (0.74, 1.17)			1.03 (0.81, 1.32)
Effort	Per SD			0.89 (0.70, 1.14)		0.97 (0.74, 1.26)
Reward	Per SD			0.70 (0.56, 0.87) **		0.65 (0.50, 0.85) **
Promotion Reward	Per SD			0.76 (0.60, 0.96) *		0.74 (0.59, 0.94) *
Esteem Reward	Per SD			0.82 (0.66, 1.03)		0.77 (0.58, 1.01)
Security Reward	Per SD			1.02 (0.81, 1.28)		1.03 (0.82, 1.30)
Overcommitment	Per SD			1.37 (1.09, 1.72) **		1.42 (1.11, 1.80) **
Employment opportunity	Difficult				1.00	1.00
	Easy				0.83 (0.53, 1.28)	0.90 (0.57, 1.41)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

5.3. Italy

Socio-demographic characteristics and psychosocial work characteristics at baseline, intention to leave the nursing profession at follow-up

See Table 5 above.

Differences of characteristics at baseline between nurses who participated only baseline survey and who participated both baseline and follow-up surveys

Compared to the 1413 nurses who participated only baseline survey, 2039 nurses who participated both baseline and follow-up surveys (59.07% follow-up rate) were significantly older, higher position, and more day shift work, with better health; they also had higher control, higher social support, and lower effort (see Table 12).

Prospective associations of socio-demographic characteristics, psychosocial work characteristics at baseline with newly developed ITL at follow-up

Findings were displayed in Table 13. When analyzing the separate impacts of socio-demographic characteristics, job strain, ERI, and employment opportunity at baseline on newly developed ITL at follow-up, high position, poor self-rated health, and low social support were all significant, with relatively strongest effects exerted by health. When mutually adjusting the effects of these predictors on ITL, the odds ratios of high position, poor self-rated health, and low social support on ITL remained almost unchanged.

The single psychosocial work dimensions were additionally examined. Similarly, when taking mutual adjustment for all characteristics into account, reward was no longer related to ITL, whereas high position, poor self-rated health, and low social support (in particular, social support from coworker) were found to be consistently predictable to nurses' intention to leaving the profession (Table 14).

Table 12 Comparison of characteristics at baseline between study subjects who participated only baseline survey and both baseline and follow-up surveys in nurses from Italy

	Study subjects who participated only baseline survey		Study subjects who participated both baseline and follow-up surveys		
Continuous variables #	N	Mean ± SD	N	Mean ± SD	*p*
Age (years)	1413	36.66 ± 7.81	2039	37.54 ± 7.26	0.0009
Demand	1413	9.95 ± 2.22	2039	9.91 ± 2.16	0.5939
Control	1413	18.58 ± 4.78	2039	18.97 ± 4.77	0.0172
Social support	1413	21.82 ± 5.84	2039	22.38 ± 5.71	0.0048
Effort	1413	10.56 ± 1.36	2039	10.33 ± 1.40	<0.0001
Reward	1413	17.46 ± 2.64	2039	17.60 ± 2.50	0.1236
Overcommitment	1413	8.79 ± 1.74	2039	8.74 ± 1.77	0.4159
Categorical variables ##	N	%	N	%	
Marital status					0.4686
Single	190	13.45	257	12.60	
Cohabitated	1223	86.55	1782	87.40	
Position rank					<0.0001
Low	1329	94.06	1789	87.74	
High	84	5.94	250	12.26	
Shift work					0.0016
Day shift	510	36.09	845	41.11	
Rotating shift	903	63.91	1194	58.56	
Self-rated health					0.0424
Poor	369	26.11	471	23.10	
Good	1044	73.89	1568	76.90	
Employment opportunity					0.8607
Difficult	260	18.40	380	18.64	
Easy	1153	81.60	1659	81.36	
Intention to leave					0.6109
No	1135	80.33	1652	81.02	
Yes	278	19.67	387	18.98	

Student’s t-test

Chi-square test

Tables 13 Prospective associations of socio-demographic variables, job strain, effort-reward imbalance, employment opportunity at baseline with newly developed ITL at follow-up in nurses from Italy (OR, 95% CI) (N=1652)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	1,06 (0.89, 1.28)	1.07 (0.89, 1.28)	1.07 (0.89, 1.28)	1.05 (0.88, 1.26)	1.06 (0.88, 1.28)
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.25 (0.76, 2.05)	1.24 (0.75, 2.05)	1.25 (0.76, 2.06)	1.22 (0.74, 2.01)	1.23 (0.75, 2.04)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	0.45 (0.26, 0.77) **	0.44 (0.25, 0.75) **	0.47 (0.27, 0.81) **	0.46 (0.27, 0.79) **	0.47 (0.27, 0.83) **
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	1.34 (0.89, 2.03)	1.36 (0.90, 2.06)	1.32 (0.87, 2.00)	1.38 (0.91, 2.09)	1.40 (0.92, 2.13)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	2.08 (1.42, 3.05) ***	2.05 (1.39, 3.02) ***	1.99 (1.35, 2.94) ***	2.11 (1.44, 3.10) ***	2.02 (1.36, 2.99) ***
Job strain						
Log (Demand / Control)	Low		1.00			1.00
	Intermediate		1.08 (0.67, 1.76)			1.09 (0.65, 1.81)
	High		1.52 (0.98, 2.36)			1.50 (0.96, 2.36)
	Per SD		1.07 (0.88, 1.28)			1.08 (0.88, 1.32)
Social Support	Per SD		0.79 (0.66, 0.95) *			0.79 (0.65, 0.95) *
Effort-reward imbalance						
Log (Effort / Reward)	Low			1.00		1.00
	Intermediate			1.14 (0.73, 1.78)		0.92 (0.56, 1.53)
	High			1.15 (0.72, 1.84)		1.04 (0.66, 1.64)
	Per SD			1.06 (0.87, 1.28)		0.95 (0.77, 1.18)
Overcommitment	Per SD			1.07 (0.89, 1.30)		1.10 (0.91, 1.32)
Employment opportunity						
Finding another job	Difficult				1.00	1.00
	Easy				1.64 (0.96, 2.78)	1.64 (0.96, 2.79)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

Table 14 Prospective associations of socio-demographic variables, psychosocial work factors at baseline with newly developed ITL at follow-up in nurses from Italy (OR, 95% CI) (N=1652)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	1,06 (0.89, 1.28)	1.05 (0.88, 1.27)	1.08 (0.90, 1.30)	1.05 (0.88, 1.26)	1.05 (0.87, 1.27)
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.25 (0.76, 2.05)	1.23 (0.75, 2.03)	1.24 (0.76, 2.04)	1.22 (0.74, 2.01)	1.22 (0.74, 2.02)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	0.45 (0.26, 0.77) **	0.36 (0.20, 0.64) ***	0.43 (0.25, 0.75) **	0.46 (0.27, 0.79) **	0.38 (0.21, 0.69) **
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	1.34 (0.89, 2.03)	1.36 (0.90, 2.07)	1.47 (0.96, 2.27)	1.38 (0.91, 2.09)	1.48 (0.96, 2.29)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	2.08 (1.42, 3.05) ***	2.01 (1.37, 2.96) ***	1.95 (1.32, 2.89) ***	2.11 (1.44, 3.10) ***	1.95 (1.32, 2.89) ***
Demand	Per SD		0.93 (0.78, 1.12)			0.94 (0.77, 1.16)
Control	Per SD		0.86 (0.70, 1.050			0.87 (0.71, 1.07)
Decision Authority	Per SD		0.84 (0.68, 1.04)			0.84 (0.68, 1.04)
Skill Discretion	Per SD		1.02 (0.84, 1.24)			1.05 (0.86, 1.28)
Social Support	Per SD		0.81 (0.68, 0.98) *			0.84 (0.69, 1.02)
Social Support form Supervisor	Per SD		0.94 (0.78, 1.14)			0.97 (0.80, 1.18)
Social Support from coworker	Per SD		0.80 (0.67, 0.96) *			0.81 (0.68, 0.98) *
Effort	Per SD			0.86 (0.70, 1.05)		0.90 (0.72, 1.11)
Reward	Per SD			0.82 (0.69, 0.98) *		0.92 (0.75, 1.13)
Promotion Reward	Per SD			0.96 (0.80, 1.16)		0.97 (0.80, 1.17)
Esteem Reward	Per SD			0.82 (0.68, 0.99) *		0.93 (0.75, 1.15)
Security Reward	Per SD			1.00 (0.84, 1.20)		1.00 (0.83, 1.20)
Overcommitment	Per SD			1.10 (0.91, 1.33)		1.11 (0.92, 1.35)
Employment opportunity	Difficult				1.00	1.00
	Easy				1.64 (0.96, 2.78)	1.67 (0.98, 2.86)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

5.4. France

Socio-demographic characteristics and psychosocial work characteristics at baseline, intention to leave the nursing profession at follow-up

See Table 5 above.

Differences of characteristics at baseline between nurses who participated only baseline survey and who participated both baseline and follow-up surveys

Compared to the 2765 nurses who participated only baseline survey, 892 nurses who participated both baseline and follow-up surveys (24.39% follow-up rate) were comparable except they were significantly younger, with better health. (see Table 15).

Prospective associations of socio-demographic characteristics, psychosocial work characteristics at baseline with newly developed ITL at follow-up

Clear dose-response relationships were demonstrated by the findings displayed in Table 16. When analyzing the separate impacts of socio-demographic characteristics, job strain, ERI, and employment opportunity at baseline on newly developed ITL at follow-up, poor self-rated health, job strain, and ERI were all significant, with relatively strongest effects exerted by ERI. However, when mutually adjusting the effects of these predictors on ITL, the odds ratio of ERI on ITL remained almost unchanged, whereas the odds ratios of poor self-rated health and job strain lost its statistical significance. Exploring the full information provided by the continuous measures of the log-transformed ratios of demand/control and of effort/reward exhibited elevated explanatory power if compared with information based on tertiles.

The single psychosocial work dimensions were additionally examined. Similarly, when taking mutual adjustment for all characteristics into account, poor self-rated health and demand were no longer related to ITL, whereas reward (in particular, promotion reward and esteem reward) was found to be consistently predictable to nurses' intention to leaving the profession (Table 17).

Table 15 Comparison of characteristics at baseline between study subjects who participated only baseline survey and both baseline and follow-up surveys in nurses from France

	Study subjects who participated only baseline survey		Study subjects who participated both baseline and follow-up surveys		
Continuous variables #	N	Mean ± SD	N	Mean ± SD	*p*
Age (years)	2765	39.06 ± 9.48	892	38.00 ± 8.93	0.0024
Demand	2765	9.84 ± 2.12	892	9.96 ± 2.13	0.1471
Control	2765	20.77 ± 4.00	892	20.73 ± 4.12	0.8014
Social support	2765	23.16 ± 5.32	892	23.47 ± 5.21	0.1307
Effort	2765	10.31 ± 1.46	892	10.35 ± 1.40	0.5000
Reward	2765	18.40 ± 2.50	892	18.49 ± 2.38	0.3213
Overcommitment	2765	8.59 ± 1.90	892	8.60 ± 1.86	0.8944
Categorical variables ##	N	%	N	%	
Marital status					0.8392
Single	420	15.19	138	15.47	
Cohabitated	2345	84.81	754	84.53	
Position rank					0.1752
Low	2624	94.90	836	93.72	
High	141	5.10	56	6.28	
Shift work					0.6664
Day shift	1832	66.26	584	65.47	
Rotating shift	933	33.74	308	34.53	
Self-rated health					0.0376
Poor	890	32.19	254	28.48	
Good	1875	67.81	638	71.52	
Employment opportunity					0.3653
Difficult	702	25.39	213	23.88	
Easy	2063	74.61	679	76.12	
Intention to leave					0.3200
No	2359	85.32	773	86.66	
Yes	406	14.68	119	13.34	

Student’s t-test

Chi-square test

Table 16 Prospective associations of socio-demographic variables, job strain, effort-reward imbalance, employment opportunity at baseline with newly developed ITL at follow-up in nurses from France (OR, 95% CI) (N=773)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.96 (0.77, 1.21)	0.98 (0.78, 1.24)	0.98 (0.78, 1.24)	0.98 (0.78, 1.24)	1.02 (0.80, 1.29)
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	0.86 (0.45, 1.66)	0.88 (0.46, 1.70)	0.86 (0.44, 1.67)	0.87 (0.45, 1.67)	0.89 (0.46, 1.72)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	2.10 (0.63, 7.02)	1.78 (0.52, 6.05)	2.15 (0.63, 7.38)	2.22 (0.66, 7.43)	2.12 (0.60, 7.40)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	1.06 (0.67, 1.69)	1.09 (0.68, 1.75)	1.06 (0.66, 1.71)	1.06 (0.67, 1.69)	1.07 (0.66, 1.73)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.62 (1.02, 2.59) *	1.44 (0.90, 2.32)	1.39 (0.86, 2.25)	1.67 (1.04, 2.70) *	1.40 (0.86, 2.28)
Job strain						
Log (Demand / Control)	Low		1.00			1.00
	Intermediate		2.18 (1.17, 4.07) **			1.59 (0.79, 3.20)
	High		2.39 (1.27, 4.50) **			1.64 (0.85, 3.18)
	Per SD		1.46 (1.14, 1.86) **			1.15 (0.86, 1.53)
Social Support	Per SD		0.81 (0.64, 1.01)			0.91 (0.71, 1.16)
Effort-reward imbalance						
Log (Effort / Reward)	Low			1.00		1.00
	Intermediate			1.22 (0.62, 2.42)		1.11 (0.55, 2.23)
	High			3.34 (1.80, 6.17) ***		2.74 (1.40, 5.33) ***
	Per SD			1.93 (1.48, 2.51) ***		1.81 (1.34, 2.44) ***
Overcommitment	Per SD			1.08 (0.86, 1.38)		1.03 (0.81, 1.32)
Employment opportunity						
Finding another job	Difficult				1.00	1.00
	Easy				1.32 (0.77, 2.27)	1.42 (0.81, 2.48)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

Table 17 Prospective associations of socio-demographic variables, psychosocial work factors at baseline with newly developed ITL at follow-up in nurses from France (OR, 95% CI) (N=773)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.96 (0.77, 1.21)	1.00 (0.80, 1.26)	0.97 (0.76, 1.23)	0.98 (0.78, 1.24)	1.00 (0.78, 1.28)
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	0.86 (0.45, 1.66)	0.91 (0.47, 1.76)	0.85 (0.44, 1.66)	0.87 (0.45, 1.67)	0.89 (0.46, 1.74)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	2.10 (0.63, 7.02)	1.88 (0.55, 6.45)	1.97 (0.57, 6.76)	2.22 (0.66, 7.43)	2.03 (0.58, 7.12)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	1.06 (0.67, 1.69)	1.10 (0.69, 1.77)	1.02 (0.63, 1.64)	1.06 (0.67, 1.69)	1.05 (0.64, 1.70)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.62 (1.02, 2.59) *	1.46 (0.91, 2.36)	1.21 (0.74, 1.98)	1.67 (1.04, 2.70) *	1.26 (0.77, 2.08)
Demand	Per SD		1.40 (1.10, 1.77) **			1.22 (0.91, 1.65)
Control	Per SD		0.83 (0.66, 1.06)			0.93 (0.73, 1.20)
Decision Authority	Per SD		0.90 (0.71, 1.15)			1.03 (0.79, 1.33)
Skill Discretion	Per SD		0.87 (0.69, 1.09)			0.88 (0.69, 1.12)
Social Support	Per SD		0.83 (0.66, 1.05)			1.07 (0.82, 1.39)
Social Support form Supervisor	Per SD		0.89 (0.70, 1.12)			1.07 (0.82, 1.39)
Social Support from coworker	Per SD		0.91 (0.73, 1.14)			0.98 (0.78, 1.25)
Effort	Per SD			1.19 (0.91, 1.56)		1.08 (0.80, 1.46)
Reward	Per SD			0.54 (0.43, 0.68) ***		0.54 (0.41, 0.70) ***
Promotion Reward	Per SD			0.64 (0.50, 0.82) ***		0.65 (0.50, 0.84) ***
Esteem Reward	Per SD			0.76 (0.60, 0.96) *		0.76 (0.58, 0.99) *
Security Reward	Per SD			0.90 (0.73, 1.12)		0.89 (0.72, 1.11)
Overcommitment	Per SD			1.05 (0.82, 1.34)		1.00 (0.78, 1.30)
Employment opportunity	Difficult				1.00	1.00
	Easy				1.32 (0.77, 2.27)	1.44 (0.82, 2.54)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

5.5. The Netherlands

Socio-demographic characteristics and psychosocial work characteristics at baseline, intention to leave the nursing profession at follow-up

See Table 5 above.

Differences of characteristics at baseline between nurses who participated only baseline survey and who participated both baseline and follow-up surveys

Compared to the 1490 nurses who participated only baseline survey, 696 nurses who participated both baseline and follow-up surveys (31.84% follow-up rate) had higher position, and more rotating shift work, with better health; they had also lower intention to leave (see Table 18).

Prospective associations of socio-demographic characteristics, psychosocial work characteristics at baseline with newly developed ITL at follow-up

Findings were displayed in Table 19. When analyzing the separate impacts of socio-demographic characteristics, job strain, ERI, and employment opportunity at baseline on newly developed ITL at follow-up, only day shift work was significant. However, when mutually adjusting the effects of these predictors on ITL, the odds ratio of shift work on ITL remained almost unchanged.

The single psychosocial work dimensions were additionally examined. Similarly, when taking mutual adjustment for all characteristics into account, day shift work and demand were found to be consistently predictable to nurses' intention to leaving the profession (Table 20).

Table 18 Comparison of characteristics at baseline between study subjects who participated only baseline survey and both baseline and follow-up surveys in nurses from the Netherlands

	Study subjects who participated only baseline survey		Study subjects who participated both baseline and follow-up surveys		
Continuous variables #	N	Mean ± SD	N	Mean ± SD	*p*
Age (years)	1490	36.75 ± 9.49	696	37.46 ± 9.44	0.1012
Demand	1490	9.15 ± 1.68	696	9.23 ± 1.70	0.2650
Control	1490	20.00 ± 3.30	696	20.15 ± 3.26	0.3338
Social support	1490	23.50 ± 3.80	696	23.79 ± 3.87	0.1027
Effort	1490	9.54 ± 1.33	696	9.57 ± 1.30	0.6309
Reward	1490	19.29 ± 2.07	696	19.42 ± 1.95	0.1554
Overcommitment	1490	7.04 ± 1.32	696	7.03 ± 1.32	0.8071
Categorical variables ##	N	%	N	%	
Marital status					0.7697
Single	219	14.70	99	14.22	
Cohabitated	1271	85.30	597	85.78	
Position rank					<0.0001
Low	1490	100.00	682	97.99	
High	0	0.00	14	2.01	
Shift work					0.0234
Day shift	431	28.93	169	24.28	
Rotating shift	1059	71.07	527	75.72	
Self-rated health					0.0008
Poor	177	11.88	50	7.18	
Good	1313	88.12	646	92.82	
Employment opportunity					0.1656
Difficult	210	14.09	83	11.93	
Easy	1280	85.91	613	88.07	
Intention to leave					0.0262
No	1339	89.87	646	92.82	
Yes	151	10.13	50	7.18	

Student’s t-test

Chi-square test

Table 19 Prospective associations of socio-demographic variables, job strain, effort-reward imbalance, employment opportunity at baseline with newly developed ITL at follow-up in nurses from the Netherlands (OR, 95% CI) (N=646)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.75 (0.51, 1.09)	0.77 (0.52, 1.13)	0.74 (0.50, 1.08)	0.76 (0.52, 1.12)	0.77 (0.52, 1.14)
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.35 (0.54, 3.37)	1.38 (0.55, 3.47)	1.36 (0.54, 3.40)	1.35 (0.54, 3.37)	1.39 (0.55, 3.50)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	0.79 (0.10, 6.31)	0.84 (0.10, 6.93)	0.80 (0.10, 6.58)	0.82 (0.10, 6.66)	0.88 (0.10, 7.44)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	0.38 (0.18, 0.83) *	0.37 (0.17, 0.81) *	0.35 (0.16, 0.78) **	0.37 (0.17, 0.81) *	0.34 (0.15, 0.75) **
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.00 (0.23, 4.40)	0.97 (0.22, 4.28)	1.02 (0.23, 4.47)	1.04 (0.24, 4.60)	1.01 (0.23, 4.50)
Job strain						
Log (Demand / Control)	Low		1.00			1.00
	Intermediate		1.60 (0.67, 3.86)			1.57 (0.64, 3.85)
	High		1.81 (0.73, 4.51)			1.93 (0.73, 5.13)
	Per SD		1.36 (0.95, 1.93)			1.37 (0.92, 2.05)
Social Support	Per SD		1.22 (0.86, 1.73)			1.18 (0.83, 1.68)
Effort-reward imbalance						
Log (Effort / Reward)	Low			1.00		1.00
	Intermediate			1.21 (0.48, 3.03)		1.04 (0.39, 2.78)
	High			1.76 (0.76, 4.10)		1.60 (0.67, 3.78)
	Per SD			1.15 (0.82, 1.62)		1.06 (0.71, 1.57)
Overcommitment	Per SD			0.89 (0.61, 1.30)		0.87 (0.59, 1.29)
Employment opportunity						
Finding another job	Difficult				1.00	1.00
	Easy				2.12 (0.49, 9.17)	1.96 (0.45, 8.54)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

Table 20 Prospective associations of socio-demographic variables, psychosocial work factors at baseline with newly developed ITL at follow-up in nurses from the Netherlands (OR, 95% CI) (N=646)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.75 (0.51, 1.09)	0.75 (0.51, 1.11)	0.74 (0.51, 1.09)	0.76 (0.52, 1.12)	0.76 (0.51, 1.14)
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.35 (0.54, 3.37)	1.38 (0.55, 3.47)	1.38 (0.55, 3.45)	1.35 (0.54, 3.37)	1.39 (0.55, 3.51)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	0.79 (0.10, 6.31)	0.86 (0.10, 7.07)	0.79 (0.10, 6.44)	0.82 (0.10, 6.66)	0.87 (0.10, 7.28)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	0.38 (0.18, 0.83) *	0.33 (0.15, 0.74) **	0.34 (0.15, 0.76) **	0.37 (0.17, 0.81) *	0.32 (0.14, 0.72) **
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.00 (0.23, 4.40)	1.08 (0.24, 4.78)	1.05 (0.24, 4.63)	1.04 (0.24, 4.60)	1.14 (0.25, 5.15)
Demand	Per SD		1.47 (1.04, 2.08) *			1.59 (1.02, 2.47) *
Control	Per SD		1.05 (0.74, 1.49)			1.03 (0.73, 1.47)
Decision Authority	Per SD		1.28 (0.89, 1.84)			1.25 (0.86, 1.81)
Skill Discretion	Per SD		0.76 (0.53, 1.07)			0.74 (0.52, 1.07)
Social Support	Per SD		1.20 (0.85, 1.71)			1.18 (0.81, 1.71)
Social Support form Supervisor	Per SD		1.09 (0.78, 1.54)			1.06 (0.73, 1.53)
Social Support from coworker	Per SD		1.28 (0.88, 1.87)			1.26 (0.85, 1.85)
Effort	Per SD			1.23 (0.87, 1.75)		0.95 (0.61, 1.46)
Reward	Per SD			1.05 (0.74, 1.49)		1.01 (0.69, 1.48)
Promotion Reward	Per SD			0.97 (0.68, 1.40)		1.02 (0.70, 1.51)
Esteem Reward	Per SD			1.17 (0.79, 1.72)		1.09 (0.71, 1.69)
Security Reward	Per SD			0.90 (0.64, 1.27)		0.89 (0.56, 1.27)
Overcommitment	Per SD			0.86 (0.59, 1.25)		0.82 (0.55, 1.22)
Employment opportunity	Difficult				1.00	1.00
	Easy				2.12 (0.49, 9.17)	1.86 (0.42, 8.16)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

5.6. Belgium

Socio-demographic characteristics and psychosocial work characteristics at baseline, intention to leave the nursing profession at follow-up

See Table 5 above.

Differences of characteristics at baseline between nurses who participated only baseline survey and who participated both baseline and follow-up surveys

Compared to the 1363 nurses who participated only baseline survey, 591 nurses who participated both baseline and follow-up surveys (30.25% follow-up rate) had higher position, with better health; they also had lower demand, higher control, higher social support, and higher reward (see Table 21).

Prospective associations of socio-demographic characteristics, psychosocial work characteristics at baseline with newly developed ITL at follow-up

Findings were displayed in Table 22. When analyzing the separate impacts of socio-demographic characteristics, job strain, ERI, and employment opportunity at baseline on newly developed ITL at follow-up, no any factors were significant. However, when mutually adjusting the effects of these predictors on ITL, the odds ratios remained almost unchanged.

The single psychosocial work dimensions were additionally examined. Similarly, when taking mutual adjustment for all characteristics into account, no any variables were found to be predictable to nurses' intention to leaving the profession (Table 23).

Table 21 Comparison of characteristics at baseline between study subjects who participated only baseline survey and both baseline and follow-up surveys in nurses from Belgium

	Study subjects who participated only baseline survey		Study subjects who participated both baseline and follow-up surveys		
Continuous variables #	N	Mean ± SD	N	Mean ± SD	*p*
Age (years)	1363	37.24 ± 9.29	591	38.05 ± 9.01	0.0739
Demand	1363	10.26 ± 1.76	591	10.02 ± 2.04	0.0113
Control	1363	19.54 ± 3.71	591	19.95 ± 3.61	0.0248
Social support	1363	24.54 ± 5.16	591	25.29 ± 4.97	0.0031
Effort	1363	10.45 ± 1.42	591	10.33 ± 1.48	0.1007
Reward	1363	17.93 ± 2.46	591	18.36 ± 2.38	0.0003
Overcommitment	1363	8.45 ± 1.83	591	8.40 ± 1.83	0.5449
Categorical variables ##	N	%	N	%	
Marital status					0.0925
Single	213	15.63	75	12.69	
Cohabitated	1150	84.37	516	87.31	
Position rank					0.0213
Low	1235	90.61	515	87.14	
High	128	9.39	76	12.86	
Shift work					0.5215
Day shift	599	43.95	236	45.52	
Rotating shift	764	56.05	322	54.48	
Self-rated health					0.0055
Poor	296	21.72	96	16.24	
Good	1067	78.28	495	83.76	
Employment opportunity					0.2975
Difficult	343	25.17	162	27.41	
Easy	1020	74.83	429	72.59	
Intention to leave					0.4467
No	1199	87.97	527	89.17	
Yes	164	12.03	64	10.83	

Student’s t-test

Chi-square test

Table 22 Prospective associations of socio-demographic variables, job strain, effort-reward imbalance, employment opportunity at baseline with newly developed ITL at follow-up in nurses from Belgium (OR, 95% CI) (N=527)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.80 (0.52, 1.22)	0.77 (0.50, 1.19)	0.78 (0.50, 1.20)	0.80 (0.51, 1.24)	0.76 (0.49, 1.19)
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.77 (0.63, 4.95)	1.77 (0.62, 5.01)	1.70 (0.60, 4.85)	1.77 (0.63, 4.96)	1.77 (0.62, 5.09)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	0.39 (0.14, 1.08)	0.40 (0.14, 1.16)	0.38 (0.13, 1.08)	0.39 (0.14, 1.10)	0.40 (0.13, 1.22)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	1.07 (0.45, 2.54)	1.06 (0.45, 2.54)	1.09 (0.44, 2.67)	1.07 (0.45, 2.55)	1.10 (0.45, 2.72)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	2.49 (0.97, 6.41)	2.34 (0.90, 6.09)	2.16 (0.82, 5.66)	2.49 (0.96, 6.46)	2.14 (0.80, 5.76)
Job strain						
Log (Demand / Control)	Low		1.00			1.00
	Intermediate		1.43 (0.48, 4.22)			1.16 (0.34, 3.95)
	High		1.69 (0.59, 4.84)			1.72 (0.57, 5.21)
	Per SD		1.11 (0.72, 1.70)			1.00 (0.61, 1.64)
Social Support	Per SD		0.76 (0.50, 1.15)			0.79 (0.52, 1.20)
Effort-reward imbalance						
Log (Effort / Reward)	Low			1.00		1.00
	Intermediate			0.79 (0.45, 1.92)		0.75 (0.43, 1.81)
	High			1.33 (0.66, 3.26)		1.14 (0.57, 2.90)
	Per SD			1.07 (0.67, 1.70)		1.00 (0.60, 1.66)
Overcommitment	Per SD			1.30 (0.84, 2.01)		1.32 (0.84, 2.06)
Employment opportunity						
Finding another job	Difficult				1.00	1.00
	Easy				0.99 (0.38, 2.58)	1.06 (0.40, 2.78)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

Table 23 Prospective associations of socio-demographic variables, psychosocial work factors at baseline with newly developed ITL at follow-up in nurses from Belgium (OR, 95% CI) (N=527)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.80 (0.52, 1.22)	0.78 (0.51, 1.21)	0.78 (0.51, 1.21)	0.80 (0.51, 1.24)	0.77 (0.49, 1.21)
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.77 (0.63, 4.95)	1.74 (0.62, 4.92)	1.74 (0.61, 4.92)	1.77 (0.63, 4.96)	1.74 (0.61, 4.97)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	0.39 (0.14, 1.08)	0.40 (0.13, 1.24)	0.39 (0.13, 1.14)	0.39 (0.14, 1.10)	0.41 (0.13, 1.33)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	1.07 (0.45, 2.54)	1.08 (0.45, 2.59)	1.08 (0.44, 2.63)	1.07 (0.45, 2.55)	1.05 (0.42, 2.60)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	2.49 (0.97, 6.41)	2.26 (0.86, 5.95)	2.16 (0.82, 5.66)	2.49 (0.96, 6.46)	2.02 (0.75, 5.44)
Demand	Per SD		1.09 (0.71, 1.68)			0.96 (0.56, 1.62)
Control	Per SD		0.99 (0.63, 1.56)			1.00 (0.63, 1.60)
Decision Authority	Per SD		0.89 (0.55, 1.44)			0.89 (0.54, 1.46)
Skill Discretion	Per SD		1.17 (0.72, 1.90)			1.13 (0.69, 1.84)
Social Support	Per SD		0.77 (0.51, 1.16)			0.78 (0.50, 1.22)
Social Support form Supervisor	Per SD		0.83 (0.54, 1.26)			0.84 (0.53, 1.32)
Social Support from coworker	Per SD		0.85 (0.56, 1.30)			0.80 (0.51, 1.26)
Effort	Per SD			0.94 (0.59, 1.52)		1.00 (0.59, 1.69)
Reward	Per SD			0.88 (0.59, 1.34)		0.98 (0.62, 1.54)
Promotion Reward	Per SD			0.64 (0.39, 1.05)		0.66 (0.39, 1.10)
Esteem Reward	Per SD			1.21 (0.75, 1.95)		1.38 (0.82, 2.33)
Security Reward	Per SD			1.02 (0.66, 1.57)		1.00 (0.65, 1.56)
Overcommitment	Per SD			1.31 (0.84, 2.03)		1.33 (0.84, 2.11)
Employment opportunity	Difficult				1.00	1.00
	Easy				0.99 (0.38, 2.58)	0.99 (0.37, 2.65)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

5.7. Poland

Socio-demographic characteristics and psychosocial work characteristics at baseline, intention to leave the nursing profession at follow-up

See Table 5 above.

Differences of characteristics at baseline between nurses who participated only baseline survey and who participated both baseline and follow-up surveys

Compared to the 1758 nurses who participated only baseline survey, 1413 nurses who participated both baseline and follow-up surveys (44.56% follow-up rate) were comparable except they had higher control, and less employment opportunity (see Table 24).

Prospective associations of socio-demographic characteristics, psychosocial work characteristics at baseline with newly developed ITL at follow-up

Clear dose-response relationships were demonstrated by the findings displayed in Table 25. When analyzing the separate impacts of socio-demographic characteristics, job strain, ERI, and employment opportunity at baseline on newly developed ITL at follow-up, ERI and employment opportunity were all significant, with relatively strongest effects exerted by employment opportunity. However, when mutually adjusting the effects of these predictors on ITL, the odds ratios of ERI and employment opportunity remained almost unchanged.

The single psychosocial work dimensions were additionally examined. Similarly, when taking mutual adjustment for all characteristics into account, employment opportunity was found to be consistently predictable to nurses' intention to leaving the profession (Table 26).

Table 24 Comparison of characteristics at baseline between study subjects who participated only baseline survey and both baseline and follow-up surveys in nurses from Poland

	Study subjects who participated only baseline survey		Study subjects who participated both baseline and follow-up surveys		
Continuous variables #	N	Mean ± SD	N	Mean ± SD	*p*
Age (years)	1758	37.48 ± 7.36	1413	37.82 ± 7.04	0.1975
Demand	1758	10.37 ± 2.08	1413	10.45 ± 2.04	0.2568
Control	1758	18.69 ± 4.34	1413	19.00 ± 4.29	0.0411
Social support	1758	23.00 ± 5.92	1413	23.36 ± 5.88	0.0887
Effort	1758	10.15 ± 1.24	1413	10.21 ± 1.22	0.1758
Reward	1758	16.84 ± 2.48	1413	16.96 ± 2.37	0.1489
Overcommitment	1758	8.51 ± 1.80	1413	8.53 ± 1.83	0.7864
Categorical variables ##	N	%	N	%	
Marital status					0.5616
Single	90	5.12	66	4.67	
Cohabitated	1668	94.88	1347	95.33	
Position rank					0.0925
Low	1583	90.05	1246	88.18	
High	175	9.95	167	11.82	
Shift work					0.4475
Day shift	332	18.89	282	19.96	
Rotating shift	1426	81.11	1131	80.04	
Self-rated health					0.1310
Poor	463	26.34	339	23.99	
Good	1295	73.66	1074	76.01	
Employment opportunity					0.0072
Difficult	1495	85.04	1248	88.32	
Easy	263	14.96	165	11.68	
Intention to leave					0.5269
No	1582	89.99	1281	90.66	
Yes	176	10.01	132	9.34	

Student’s t-test

Chi-square test

Table 25 Prospective associations of socio-demographic variables, job strain, effort-reward imbalance, employment opportunity at baseline with newly developed ITL at follow-up in nurses from Poland (OR, 95% CI) (N=1281)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	1.05 (0.84, 1.30)	1.05 (0.84, 1.30)	1.04 (0.84, 1.30)	1.02 (0.82, 1.27)	1.01 (0.81, 1.26)
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.18 (0.46, 3.03)	1.18 (0.46, 3.03)	1.18 (0.46, 3.07)	1.17 (0.45, 3.03)	1.18 (0.45, 3.10)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	1.63 (0.68, 3.86)	1.59 (0.67, 3.78)	1.59 (0.66, 3.80)	1.80 (0.75, 4.32)	1.90 (0.78, 4.60)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	0.90 (0.47, 1.70)	0.94 (0.50, 1.79)	0.87 (0.46, 1.65)	0.92 (0.48, 1.74)	0.93 (0.49, 1.78)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.30 (0.82, 2.06)	1.24 (0.78, 1.99)	1.10 (0.68, 1.77)	1.33 (0.84, 2.12)	1.12 (0.69, 1.81)
Job strain						
Log (Demand / Control)	Low		1.00			1.00
	Intermediate		0.82 (0.49, 1.37)			0.68 (0.39, 1.19)
	High		0.88 (0.52, 1.48)			0.71 (0.42, 1.20)
	Per SD		1.18 (0.94, 1.47)			1.13 (0.89, 1.42)
Social Support	Per SD		0.82 (0.66, 1.01)			0.92 (0.73, 1.15)
Effort-reward imbalance						
Log (Effort / Reward)	Low			1.00		1.00
	Intermediate			1.09 (0.62, 1.91)		1.12 (0.63, 1.98)
	High			1.91 (1.12, 3.27) **		2.02 (1.11, 3.66) **
	Per SD			1.19 (0.95, 1.49)		1.11 (0.86, 1.42)
Overcommitment	Per SD			1.16 (0.94, 1.44)		1.18 (0.95, 1.47)
Employment opportunity						
Finding another job	Difficult				1.00	1.00
	Easy				1.94 (1.11, 3.39) *	2.01 (1.14, 3.53) *

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

Table 26 Prospective associations of socio-demographic variables, psychosocial work factors at baseline with newly developed ITL at follow-up in nurses from Poland (OR, 95% CI) (N=1281)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	1.05 (0.84, 1.30)	1.07 (0.86, 1.33)	1.03 (0.83, 1.29)	1.02 (0.82, 1.27)	1.02 (0.82, 1.27)
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.18 (0.46, 3.03)	1.17 (0.45, 3.01)	1.20 (0.46,3.10)	1.17 (0.45, 3.03)	1.19 (0.46, 3.10)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	1.63 (0.68, 3.86)	1.50 (0.62, 3.60)	1.64 (0.68, 3.93)	1.80 (0.75, 4.32)	1.74 (0.71, 4.26)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	0.90 (0.47, 1.70)	0.87 (0.46, 1.65)	0.88 (0.46, 1.67)	0.92 (0.48, 1.74)	0.88 (0.46, 1.68)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.30 (0.82, 2.06)	1.19 (0.74, 1.90)	1.12 (0.69, 1.80)	1.33 (0.84, 2.12)	1.11 (0.69, 1.80)
Demand	Per SD		1.13 (0.92, 1.41)			1.07 (0.85, 1.35)
Control	Per SD		0.92 (0.74, 1.14)			0.93 (0.74, 1.16)
Decision Authority	Per SD		0.89 (0.71, 1.11)			0.91 (0.72, 1.14)
Skill Discretion	Per SD		1.03 (0.83, 1.27)			1.00 (0.81, 1.24)
Social Support	Per SD		0.86 (0.70, 1.06)			0.89 (0.71, 1.12)
Social Support form Supervisor	Per SD		0.84 (0.67, 1.04)			0.85 (0.66, 1.08)
Social Support from coworker	Per SD		1.01 (0.81, 1.25)			1.03 (0.82, 1.28)
Effort	Per SD			1.13 (0.90, 1.44)		1.10 (0.86, 1.40)
Reward	Per SD			0.91 (0.73, 1.14)		0.97 (0.76, 1.24)
Promotion Reward	Per SD			0.83 (0.66, 1.05)		0.84 (0.67, 1.06)
Esteem Reward	Per SD			0.96 (0.77, 1.20)		1.06 (0.82, 1.37)
Security Reward	Per SD			1.11 (0.89, 1.38)		1.06 (0.84, 1.32)
Overcommitment	Per SD			1.19 (0.96, 1.48)		1.18 (0.95, 1.48)
Employment opportunity	Difficult				1.00	1.00
	Easy				1.94 (1.11, 3.39) *	1.98 (1.13, 3.49) *

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

5.8. Slovakia

Socio-demographic characteristics and psychosocial work characteristics at baseline, intention to leave the nursing profession at follow-up

See Table 5 above.

Differences of characteristics at baseline between nurses who participated only baseline survey and who participated both baseline and follow-up surveys

Compared to the 2142 nurses who participated only baseline survey, 583 nurses who participated both baseline and follow-up surveys (21.39% follow-up rate) were comparable except they had higher position and higher control (see Table 27).

Prospective associations of socio-demographic characteristics, psychosocial work characteristics at baseline with newly developed ITL at follow-up

Findings were displayed in Table 28. When analyzing the separate impacts of socio-demographic characteristics, job strain, ERI, and employment opportunity at baseline on newly developed ITL at follow-up, young age and low job strain were all significant, with relatively strongest effects exerted by age. However, when mutually adjusting the effects of these predictors on ITL, the odds ratios of young age and job strain on ITL remained almost unchanged.

The single psychosocial work dimensions were additionally examined. Similarly, when taking mutual adjustment for all characteristics into account, young age, low demand, and social support (in particular, social support from supervisor) were found to be consistently predictable to nurses' intention to leaving the profession (Table 29).

Table 27 Comparison of characteristics at baseline between study subjects who participated only baseline survey and both baseline and follow-up surveys in nurses from Slovakia

	Study subjects who participated only baseline survey		Study subjects who participated both baseline and follow-up surveys		
Continuous variables #	N	Mean ± SD	N	Mean ± SD	*p*
Age (years)	2142	38.28 ± 8.79	583	38.86 ± 8.11	0.1577
Demand	2142	9.99 ± 1.81	583	9.99 ± 1.67	0.9982
Control	2142	19.32 ± 4.31	583	19.74 ± 4.23	0.0379
Social support	2142	24.28 ± 5.47	583	24.15 ± 5.43	0.6014
Effort	2142	10.12 ± 1.33	583	10.08 ± 1.29	0.4661
Reward	2142	16.87 ± 2.89	583	17.03 ± 2.77	0.2350
Overcommitment	2142	8.96 ± 1.77	583	9.08 ± 1.74	0.1634
Categorical variables ##	N	%	N	%	
Marital status					0.6522
Single	132	6.16	33	5.66	
Cohabitated	2010	93.84	550	94.34	
Position rank					0.0020
Low	1939	90.52	502	86.11	
High	203	9.48	81	13.89	
Shift work					0.7114
Day shift	734	34.27	195	33.45	
Rotating shift	1408	65.73	388	66.55	
Self-rated health					0.2567
Poor	767	35.81	194	33.28	
Good	1375	64.19	389	66.72	
Employment opportunity					0.4820
Difficult	1632	76.19	436	74.79	
Easy	510	23.81	147	25.21	
Intention to leave					0.1188
No	1923	89.78	536	91.94	
Yes	219	10.22	47	8.06	

Student’s t-test

Chi-square test

Table 28 Prospective associations of socio-demographic variables, job strain, effort-reward imbalance, employment opportunity at baseline with newly developed ITL at follow-up in nurses from Slovakia (OR, 95% CI) (N=536)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.51 (0.35, 0.73) ***	0.47 (0.32, 0.68) ***	0.50 (0.34, 0.72) ***	0.50 (0.35, 0.72) ***	0.46 (0.31, 0.67) ***
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.20 (0.32, 4.48)	1.15 (0.30, 4.45)	1.16 (0.30, 4.44)	1.15 (0.30, 4.32)	1.04 (0.26, 4.23)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	1.92 (0.40, 9.16)	1.92 (0.39, 9.40)	1.97 (0.40, 9.61)	1.98 (0.41, 9.50)	2.07 (0.41, 10.49)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	1.50 (0.65, 3.46)	1.56 (0.66, 3.68)	1.39 (0.60, 3.24)	1.52 (0.66, 3.50)	1.45 (0.61, 3.47)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.91 (0.94, 3.87)	1.77 (0.86, 3.65)	1.74 (0.84, 3.61)	1.94 (0.96, 3.93)	1.68 (0.79, 3.55)
Job strain						
Log (Demand / Control)	Low		1.00			1.00
	Intermediate		0.98 (0.42, 2.24)			0.96 (0.42, 2.22)
	High		0.49 (0.19, 1.22)			0.43 (0.16, 1.12)
	Per SD		0.71 (0.50, 1.01)			0.68 (0.47, 0.99) *
Social Support	Per SD		0.54 (0.37, 0.77) ***			0.56 (0.39, 0.80) **
Effort-reward imbalance						
Log (Effort / Reward)	Low			1.00		1.00
	Intermediate			0.87 (0.35, 2.16)		0.90 (0.35, 2.29)
	High			1.34 (0.57, 3.19)		1.27 (0.50, 3.26)
	Per SD			1.08 (0.76, 1.54)		1.00 (0.68, 1.47)
Overcommitment	Per SD			1.12 (0.77, 1.62)		1.13 (0.77, 1.66)
Employment opportunity						
Finding another job	Difficult				1.00	1.00
	Easy				1.42 (0.65, 3.09)	1.44 (0.65, 3.20)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

Tables 29 Prospective associations of socio-demographic variables, psychosocial work factors at baseline with newly developed ITL at follow-up in nurses from Slovakia (OR, 95% CI) (N=536)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.51 (0.35, 0.73) ***	0.48 (0.33, 0.69) ***	0.50 (0.35, 0.73) ***	0.50 (0.35, 0.72) ***	0.46 (0.32, 0.68) ***
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	1.20 (0.32, 4.48)	1.07 (0.28, 4.13)	1.17 (0.30, 4.48)	1.15 (0.30, 4.32)	0.97 (0.24, 3.86)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	1.92 (0.40, 9.16)	1.81 (0.37, 9.00)	1.82 (0.37, 9.09)	1.98 (0.41, 9.50)	2.11 (0.40, 11.12)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	1.50 (0.65, 3.46)	1.79 (0.75, 4.30)	1.49 (0.63, 3.54)	1.52 (0.66, 3.50)	1.72 (0.70, 4.26)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.91 (0.94, 3.87)	1.86 (0.90, 3.85)	1.82 (0.88, 3.78)	1.94 (0.96, 3.93)	1.72 (0.81, 3.68)
Demand	Per SD		0.67 (0.47, 0.97) *			0.62 (0.42, 0.92) *
Control	Per SD		1.04 (0.72, 1.52)			1.04 (0.71, 1.52)
Decision Authority	Per SD		1.00 (0.67, 1.48)			1.01 (0.67, 1.51)
Skill Discretion	Per SD		1.06 (0.74, 1.53)			1.05 (0.73, 1.51)
Social Support	Per SD		0.52 (0.36, 0.76) ***			0.53 (0.36, 0.78) **
Social Support form Supervisor	Per SD		0.58 (0.40, 0.83) **			0.59 (0.41, 0.86) **
Social Support from coworker	Per SD		0.82 (0.56, 1.22)			0.79 (0.53, 1.19)
Effort	Per SD			0.93 (0.65, 1.34)		1.03 (0.70, 1.53)
Reward	Per SD			0.86 (0.60, 1.24)		1.00 (0.67, 1.51)
Promotion Reward	Per SD			0.86 (0.57, 1.28)		0.87 (0.57, 1.34)
Esteem Reward	Per SD			0.92 (0.63, 1.34)		1.12 (0.73, 1.72)
Security Reward	Per SD			1.09 (0.75, 1.59)		1.00 (0.67, 1.49)
Overcommitment	Per SD			1.13 (0.78, 1.64)		1.20 (0.82, 1.78)
Employment opportunity	Difficult				1.00	1.00
	Easy				1.42 (0.65, 3.09)	1.58 (0.70, 3.54)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

5.9. China

Socio-demographic characteristics and psychosocial work characteristics at baseline, intention to leave the nursing profession at follow-up

See Table 5 above.

Differences of characteristics at baseline between nurses who participated only baseline survey and who participated both baseline and follow-up surveys

Compared to the 1297 nurses who participated only baseline survey, 1791 nurses who participated both baseline and follow-up surveys (58.00% follow-up rate) were comparable except they were significantly younger, had more employment opportunity; they also had lower intention to leave (see Table 30).

Prospective associations of socio-demographic characteristics, psychosocial work characteristics at baseline with newly developed ITL at follow-up

Clear dose-response relationships were demonstrated by the findings displayed in Table 31. When analyzing the separate impacts of socio-demographic characteristics, job strain, ERI, and employment opportunity at baseline on newly developed ITL at follow-up, young age, job strain, and ERI were all significant, with relatively strongest effects exerted by ERI. However, when mutually adjusting the effects of these predictors on ITL, the odds ratios of young age, job strain, and ERI on ITL remained almost unchanged. Exploring the full information provided by the continuous measures of the log-transformed ratios of demand/control and of effort/reward exhibited elevated explanatory power if compared with information based on tertiles.

The single psychosocial work dimensions were additionally examined. Similarly, when taking mutual adjustment for all characteristics into account, demand and social support were no longer related to ITL, whereas young age, control (in particular, skill discretion), and reward (in particular, promotion reward) were found to be consistently predictable to nurses' intention to leaving the profession (Table 32).

Table 30 Comparison of characteristics at baseline between study subjects who participated only baseline survey and both baseline and follow-up surveys in nurses from China

	Study subjects who participated only baseline survey		Study subjects who participated both baseline and follow-up surveys		
Continuous variables #	N	Mean ± SD	N	Mean ± SD	*p*
Age (years)	1297	31.47 ± 8.75	1791	30.55 ± 7.92	0.0028
Demand	1297	9.96 ± 1.92	1791	9.88 ± 1.82	0.2799
Control	1297	16.99 ± 3.79	1791	16.88 ± 3.68	0.4345
Social support	1297	25.66 ± 5.07	1791	25.84 ± 4.94	0.3316
Effort	1297	10.97 ± 1.41	1791	10.99 ± 1.36	0.7843
Reward	1297	18.04 ± 2.34	1791	18.09 ± 2.30	0.5476
Overcommitment	1297	10.04 ± 1.64	1791	10.01 ± 1.69	0.6900
Categorical variables ##	N	%	N	%	
Marital status					0.3659
Single	489	37.70	704	39.31	
Cohabitated	808	62.30	1087	60.69	
Position rank					0.6762
Low	1032	79.57	1414	78.95	
High	265	20.43	377	21.05	
Shift work					0.1614
Day shift	417	32.15	619	34.56	
Rotating shift	880	67.85	1172	65.44	
Self-rated health					0.3564
Poor	265	20.43	342	19.10	
Good	1032	79.57	1449	80.90	
Employment opportunity					0.0338
Difficult	543	41.87	682	38.08	
Easy	754	58.13	1109	61.92	
Intention to leave					0.0366
No	1065	82.11	1521	84.92	
Yes	232	17.89	270	15.08	

Student’s t-test

Chi-square test

Tables 31 Prospective associations of socio-demographic variables, job strain, effort-reward imbalance, employment opportunity at baseline with newly developed ITL at follow-up in nurses from China (OR, 95% CI) (N=1521)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.71 (0.54, 0.92) **	0.68 (0.52, 0.89) **	0.67 (0.51, 0.88) **	0.70 (0.54, 0.91) **	0.66 (0.50, 0.86) **
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	0.91 (0.60, 1.39)	0.88 (0.57, 1.36)	0.93 (0.60, 1.43)	0.91 (0.60, 1.39)	0.91 (0.59, 1.41)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	1.06 (0.67, 1.69)	1.00 (0.63, 1.60)	1.10 (0.69, 1.77)	1.07 (0.67, 1.70)	1.07 (0.67, 1.72)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	1.24 (0.84, 1.84)	1.17 (0.79, 1.73)	1.12 (0.76, 1.68)	1.24 (0.84, 1.83)	1.09 (0.73, 1.62)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.34 (0.90, 2.01)	1.24 (0.82, 1.87)	1.09 (0.71, 1.65)	1.34 (0.89, 2.00)	1.07 (0.70, 1.63)
Job strain						
Log (Demand / Control)	Low		1.00			1.00
	Intermediate		1.07 (0.69, 1.66)			1.00 (0.64, 1.56)
	High		1.74 (1.16, 2.61) **			1.50 (0.99, 2.28)
	Per SD		1.32 (1.12, 1.56) **			1.24 (1.04, 1.47) *
Social Support	Per SD		0.90 (0.76, 1.06)			0.96 (0.80, 1.14)
Effort-reward imbalance						
Log (Effort / Reward)	Low			1.00		1.00
	Intermediate			1.72 (1.08, 2.73) *		1.62 (1.01, 2.58) *
	High			2.38 (1.49, 3.78) **		2.06 (1.26, 3.36) **
	Per SD			1.45 (1.19, 1.76) ***		1.34 (1.09, 1.66) **
Overcommitment	Per SD			1.05 (0.87, 1.25)		1.05 (0.88, 1.26)
Employment opportunity						
Finding another job	Difficult				1.00	1.00
	Easy				1.11 (0.80, 1.56)	1.19 (0.85, 1.68)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

Table 32 Prospective associations of socio-demographic variables, psychosocial work factors at baseline with newly developed ITL at follow-up in nurses from China (OR, 95% CI) (N=1521)

		Model I	Model II	Model III	Model IV	Model V
Age	Per SD	0.71 (0.54, 0.92) **	0.68 (0.52, 0.89) **	0.67 (0.51, 0.88) **	0.70 (0.54, 0.91) **	0.66 (0.50, 0.87) **
Marital status	Cohabitated	1.00	1.00	1.00	1.00	1.00
	Single	0.91 (0.60, 1.39)	0.88 (0.57, 1.36)	0.94 (0.61, 1.45)	0.91 (0.60, 1.39)	0.93 (0.60, 1.44)
Position rank	High	1.00	1.00	1.00	1.00	1.00
	Low	1.06 (0.67, 1.69)	1.02 (0.64, 1.64)	1.09 (0.68, 1.75)	1.07 (0.67, 1.70)	1.05 (0.65, 1.70)
Shift work	Day shift	1.00	1.00	1.00	1.00	1.00
	Rotating shift	1.24 (0.84, 1.84)	1.16 (0.78, 1.72)	1.10 (0.74, 1.64)	1.24 (0.84, 1.83)	1.06 (0.71, 1.59)
Self-rated health	Good	1.00	1.00	1.00	1.00	1.00
	Poor	1.34 (0.90, 2.01)	1.20 (0.79, 1.82)	1.06 (0.70, 1.62)	1.34 (0.89, 2.00)	1.05 (0.69, 1.60)
Demand	Per SD		1.25 (1.06, 1.48) **			1.15 (0.96, 1.38)
Control	Per SD		0.82 (0.69, 0.98) *			0.84 (0.70, 1.00)
Decision Authority	Per SD		0.96 (0.80, 1.14)			0.98 (0.81, 1.17)
Skill Discretion	Per SD		0.80 (0.67, 0.95) *			0.82 (0.68, 0.97) *
Social Support	Per SD		0.91 (0.77, 1.08)			1.00 (0.83, 1.20)
Social Support form Supervisor	Per SD		0.79 (0.66, 0.96) *			0.86 (0.70, 1.05)
Social Support from coworker	Per SD		1.19 (0.98, 1.11)			1.19 (0.98, 1.44)
Effort	Per SD			1.23 (0.99, 1.52)		1.19 (0.95, 1.48)
Reward	Per SD			0.78 (0.66, 0.92) **		0.81 (0.68, 0.98) *
Promotion Reward	Per SD			0.74 (0.61, 0.89) **		0.76 (0.63, 0.93) **
Esteem Reward	Per SD			0.92 (0.77, 1.10)		0.97 (0.80, 1.17)
Security Reward	Per SD			1.11 (0.92, 1.33)		1.09 (0.91, 1.31)
Overcommitment	Per SD			1.05 (0.87, 1.26)		1.05 (0.87, 1.26)
Employment opportunity	Difficult				1.00	1.00
	Easy				1.11 (0.80, 1.56)	1.18 (0.84, 1.66)

Multivariate logistic regression, * p <0.05, ** p < 0.01, *** p < 0.001

6. Discussion

6.1. Principal findings

The objective of this study was to examine the impact of two established models of psychosocial stress at work (i.e. Job Strain model and Effort-Reward Imbalance model), together with job alternatives in labor market (employment opportunity) and individual resources (including age and health), on the newly developed intention to leave the nursing profession, using a one-year prospective design of an international comparative study covering samples of nurses from eight countries.

Generally, in the Netherlands and Belgium (the social-democratic European regime), nurses had lowest work stress, highest employment opportunity, best health condition, and lowest ITL; in Poland and Slovakia (the post-communist European regime), nurses reported highest work stress, lowest employment opportunity, worst health condition, and relative low ITL; while nurses from Germany, France, and Italy (the conservative-corporatist European regime) and China had relative high work stress, relative high employment opportunity, relative good health condition, and highest ITL. After controlling the differences between countries, it was found that young age, being single, poor health, effort-reward imbalance, and employment opportunity all significantly predicted an elevated risk of ITL. In country-specific analyses, the obvious divergence was observed. In the post-communist European regime, nurses had to stay at their current profession due to lack of employment opportunity in the market (so-called ‘locked-in’ situation); nurses from the social-democratic European regime, in contrast, reported good quality of psychosocial working conditions with easily available employment opportunity, thus weakening a link between stressful work and ITL; while in the conservative-corporatist European regime and China, both work stress and poor health contributed to nurses’ ITL. Notably, effort-reward imbalance played an important role in explaining the premature departure in nurses.

6.2. Divergence and concordance across countries

6.2.1. Divergence and concordance of psychosocial work environment, health, and intention to leave the profession in nurses across countries

Due to the significant cultural, historical, demographic, and political differences across countries worldwide, international comparative research of public health has paid much attention to the contribution of welfare regime types to explain the

differences in health and health-related behaviors between and within countries (Abdul Karim, et al, 2010; Bambra, 2007; Chung, et al, 2007; Clarke, et al, 2007; Navarro, et al, 2003; Navarro, et al, 2006). When looking at the working life of modern societies, there is no doubt that national and international policies of economics, labor market, and healthcare system build the fundamental frame of working conditions through the macro-level pathways, for instance, occupational safety and health legislation and social welfare protection (Bambra, et al, 2009; Fenwick, et al, 1994). It is of interest to know whether the different types of welfare regimes could provide clues, to some extent, to explain the variations of psychosocial work environment, health, and turnover behaviors in international nursing research (Suhonen, et al, 2009).

It was Esping-Andersen's epoch-making work (1990) to differentiate three types of common welfare regimes. The liberal regime is characterized by comparably low levels of welfare provision and a minor role of the government in welfare redistribution, therefore a majority of citizens can obtain adequate welfare from the market which is not regulated with the idea of stimulating employment growth. The typical example is UK. The conservative-corporatist regime is characterized by moderate levels of welfare provision where the strong relation between social protection and the occupational status is predominant. Typically, this regime is also shaped by the church. The typical countries such as Germany, Italy and France have been dominated by Christian traditions with their traditional family values. The social-democratic regime is an idealized type, characterized by comparably high levels of welfare provision, with emphasis on universal social and labor market policies to achieve equality regarding income, employment, and healthcare. The Nordic countries and the Netherlands are in this regime usually. However, during the past two decades, Esping-Andersen's original classification has been expanded by adding some new types (Arts, et al, 2002; Bambra, 2007). The post-communist welfare regime is seen as in the 'transition dilemma', with a set of welfare policies which are inherited from the old system, their quality is low and encompasses many inequalities. This regime refers to the Central and Eastern European countries, which are characterized by low-levels of benefits and supremacy of the social insurance system with high coverage (Fenger, 2007). Another interesting case is China, the biggest developing country, with rapid social and economic changes. In Mao's era, China carried out state-controlled capital accumulation in which people' labor was heavily regulated by the state, rather than market, so that people's wage and welfare was still heavily controlled and unequally distributed according to the development plan set by the state. This unequal welfare distribution is reinforced by the

introduction of ‘socialist market economy with Chinese characteristics’ after mid-1980s when past public provision of welfare quickly faded and a new market-centric welfare system has not been built up. This sets the background of rapid development of Chinese welfare reform around the turn of the century. So far, Chinese welfare regime is considered as a ‘conservative’ one in the sense that market operation is still heavily governed and welfare provision is unequally distributed and segregated through state policy in pursuit of capital accumulation (Li, et al, 2008; Walker, et al, 2009).

Applying the notions of welfare regimes described above, our results reveal such differences do exist in Europe based on three types of conservative-corporatist regime (relative high work stress, relative high employment opportunity, relative good health condition, and highest ITL), social-democratic regime (lowest work stress, highest employment opportunity, best health condition, and lowest ITL), and post-communist regime (highest work stress, lowest employment opportunity, worst health condition, and relative low ITL); while China is close to the conservative-corporatist European regime. The findings from our study are strongly supported by a recent cross-national comparative study, indicating that between-country variations in psychosocial work environment is largely explained by macro welfare regimes, and the impacts of psychosocial work environment on health outcomes are relatively weaker by active labor policies and reliable social protection strategies (Dragano, et al, 2011).

6.2.2. Divergence and concordance of risk factors of intention to leave the profession in nurses across countries

Our findings were in line with other studies. Six cross-sectional studies from USA (Nogueras, 2006; Stone, et al, 2006), Finland (Kuokkanen, et al, 2003), and China (Macao, Taiwan, and mainland) (Chan, et al, 2009; Tsai, et al, 2010; Yang, et al, 2006) showed young nurses had higher risk of intention to leave the profession; a 10-year interval panel study from UK (Barron, et al, 2005) and a 1-year longitudinal study from Israel (Krausz, et al, 199) confirmed young age as a significant predictor of ITL. The same risk factor was also identified by our overall prospective results and results from German, Slovakian, and Chinese nurses. A US cross-sectional study (Andrews, et al, 2009) and a Canadian cross-sectional study (Jourdain, et al, 2010) found low level of health status was related to nurses’ intention to leave. Our overall results indicated that poor self-rated health at baseline predicted the newly developed ITL, the effect was strongest in Italian nurses. The further analysis showed in Italy, the impact of psychosocial work stress on health was very heavy (data not shown),

indicating the mediating effect of health between work environment and nurses' ITL (Bennett, 2000; MacKinnon, et al, 2007).

Interestingly, we did not find any study which showed significant relations between marital status and ITL in nurses, only a cross-sectional study from China (Taiwan) (Tzeng, 2002) indicated that having young child(ren) was associated with ITL. Our overall findings demonstrated that single nurses intended to leave their profession, particularly in German nurses. The pooled data from our nurses sample did not find position rank and shift work were associated with ITL. However, in Italy, the nurses with high ranking position (i.e. charge nurses) had elevated risk of considering leaving the profession. When comparing the psychosocial work characteristics between Italian charge nurses and ordinary nurses, we found charge nurse had much more employment opportunity (data not shown). Such situation pushed the high ranking nurses to quit the nursing profession, suggested by a UK longitudinal study (Barron, et al, 2005). In the Netherlands, nurses with day shift work expressed higher intention to leave, contrasting the normal assumption which nurses with night shift were more likely to quit the profession (Brooks, et al, 2002; Lum, et al, 1998). Perhaps the quite low follow-up rate (31.84%) in the Dutch sample might be helpful to explain the reverse association, to some extent. We found in the Netherlands, nurses who were followed up for one year period took less day shift, and they were also healthier, indicating the selection bias. In addition, the explanation might be attributed to psychosocial factors beyond workplace, such as work-family conflict. Previous findings from the NEXT study showed that, among all European nurses, the Dutch nurses had lowest work-family conflict whereas the Italian nurses suffered most heavily from a work-family conflict, which was profoundly associated with ITL (Simon, et al, 2004).

With respect to the two models of work stress, job strain and effort-reward imbalance, they have been widely used to examine adverse effects on health, such as cardiovascular diseases (Backé, et al, 2011; Kivimäki, et al, 2006), mental illness (Siegrist, 2008; Stansfeld, et al, 2006), or musculoskeletal disorders (Deeney, et al, 2009), among others. The models were also used to explain behavioral decisions, such as absenteeism (Head, et al, 2007) or intended early retirement from paid work (Siegrist, et al, 2009). However, to our knowledge, no prospective investigation so far explored the contribution of these two work stress models towards explaining nurses' intentions of leaving their profession. Chiu from China (Taiwan) (2009) applied the job strain model in a cross-sectional study, the association with ITL was found. Lavoie-Tremblay's cross-sectional study (2008) implied that both work stress models,

job strain and effort-reward imbalance, were associated with ITL at early stages of nurses' careers in Canada. However, due to design restriction and limited statistical modelling, it is difficult to compare these results with the findings of our investigation. Using multilevel logistic regression modeling and mutual adjustment technique, based on a large international sample, our findings demonstrate that most of the variance of ITL is attributed to individual-level as compared to country-level factors. Moreover, reward frustration by the imbalanced effort within the nursing profession seems to be an overriding determinant of newly developed intention to leave the profession. Job strain is less important in this regard. This latter finding to some extent contradicts results of earlier longitudinal study (Hasselhorn, et al, 2008).

In an attempt to explain these conflicting findings it should be stressed that the job strain model was developed during the 1970s and initially addressed work stress in the production sector, and specifically among blue-collar industrial workers. It has been suggested (Marmot, et al, 1999) that the ERI model is better suited to explain work-related stress in the service occupations and professions, in particular those dealing with person-based interaction (such as health professionals). In addition, in recent years, topics related to job promotion, job security and fair pay have become more important internationally, and the fact that our findings stressing the role of work-related rewards are based on a synthesis of data from 8 different countries is in line with this observation. At the methodological level, it should be noted that at least one component of the job strain model, 'demand', has limited reliability given its low Cronbach's α coefficient of 0.52 in this study.

Our prospective findings regarding the roles of job strain and effort-reward imbalance and their components, are supported by results from a series of cross-sectional and longitudinal prospective studies, even if they lacked the theoretical background of these two models. For instance, four cross-sectional studies from USA (Hart, 2005), Canada (Jourdain, et al, 2010), Belgium (Milisen, et al, 2006), and China (mainland) (Wu, et al, 2000) provided evidence of high workload and ITL; four cross-sectional studies from USA (Hart, 2005), Canada (Jourdain, et al, 2010), UK (Brooks, et al, 2002), and Sweden (Fochsen, et al, 2005) provided evidence of low autonomy and ITL, in addition to three cross-sectional studies from USA (Stone, et al, 2006), Japan (Takase, et al, 2008), and China (Taiwan) (Yeh, et al, 2009) on low possibilities for development (skill discretion); and eight cross-sectional studies from USA (Borkowski, et al, 2007; DiMattio, et al, 2010), Canada (Jourdain, et al, 2010; Zeytinoglu, et al, 2006), Belgium (Milisen, et al, 2006), and China (Taiwan and mainland) (Chiu, et al, 2009; Yang, et al, 2006; Yeh, et al, 2009) demonstrated the

association between low social support including poor quality of management and nurses' ITL. A number of cross-sectional studies suggested reward components in nursing setting relating to intention to leave, thirteen cross-sectional studies from USA (Borkowski, et al, 2007; DiMattio, et al, 2010; Lynn, et al, 2005), Canada (Jourdain, et al, 2010; Leiter, et al, 2009; Lum, et al, 1998; Zeytinoglu, et al, 2006), UK (Collins, et al, 2000), Sweden (Fochsen, et al, 2005), and China (Macao, Taiwan, and mainland) (Chan, et al, 2009; Tzeng, 2002; Wu, et al, 2000; Yang, et al, 2006) on low pay; seven cross-sectional studies from USA (Lynn, et al, 2005), Canada (Leiter, et al, 2009), UK (Brooks, et al, 2002; Collins, et al, 2000; Shields, et al, 2001), Sweden (Fochsen, et al, 2005), and China (Taiwan) (Tzeng, 2002) on poor promotion prospects, and four cross-sectional studies from USA (Borkowski, et al, 2007; Lynn, et al, 2005), Japan (Takase, et al, 2006), and China (mainlan) (Wu, et al, 2000) on lack of recognition. With better research design of longitudinal studies, in a study of 444 nurses in UK followed over a 6 month period, dissatisfaction with pay, high paperwork, and lack of continuing education opportunities contributed significantly to newly developed ITL (Robinson, et al, 2005). Barron's 10-year interval panel study (2005) indicated low pay and lack of opportunities to use initiative were highly associated with UK nurses' ITL. In an Australian 8-month longitudinal study, dissatisfaction with salary and autonomy in 1034 nurses was a risk factor of ITL (Cowin, 2002). In a report based on 6-month longitudinal data from Japanese young nurses, low job control and low coworker support were related to increased intention to leave the profession (Tei-Tominaga, et al, 2010). Moreover, a 3-year follow-up Swedish study found that being socially isolated or excluded by superiors and/or workmates at work increased the risk of nurses' job turnover (Josephson, et al, 2008), and an intervention study with 18-month period in Australia, targeting at nurses' intention to leave the profession, suggested improved reward and recognition can help retention of nursing staff in Australia (Collette, 2004). When comparing the single scales of the ERI model in our study, indicators of low professional reward produced relatively strongest effects on risk of ITL (poor salary and restricted promotion prospects). In line with the theoretical notion, it is the discrepancy between high efforts spent and low rewards received in turn (as measured by the respective ratio) that matters most. In addition, nurses experiencing a high level of overcommitment are likely to exaggerate their efforts beyond the expected level, thus raising their susceptibility to reward frustration at work (Siegrist, et al, 2004).

Whereas a majority of findings support the notion that an adverse psychosocial work environment undermines the nurses' long-term commitment to their profession, several weak even null associations observed in the current study, deserve a closer

look, for example, the nurse samples in the Netherlands, in Belgium, in Poland and in Slovakia. It seems that there are different reasons contributing to the divergence. In the Netherlands, working conditions were reported to be generally of good quality, and work stress was rather low in this sample. Alternative jobs were easily available, thus weakening a link between stressful work and intention to leave the profession. In addition, ITL was lower in the Dutch follow-up sample than the baseline sample low follow-up rate (7.18% vs. 10.13), thus pointing to a selection bias in the follow-up sample that contributed to the attenuation of association. We did not observe any association in the Belgian sample. The nurses in Belgium had generally favourable psychosocial work conditions and very low rate of ITL like the nurses in the Netherlands, but the follow-up rate in Belgian sample was rather low (30.25%) indicating selection bias. When looking at the differences of this sample between the nurses who participated only the baseline survey and those who participated both baseline and follow-up surveys, it is found that the work stress level was higher while health level was lower in the former nurses, resulting in healthy worker effect. More importantly, the Belgian sample is a combination of two culturally different population, i.e. nurses working in Dutch-speaking areas and French-speaking areas, which made the results mixed.

The cases of Polish nurses and Slovakian nurses were quite different. The broad labor market in Poland Slovakia was both perceived as very restricted. 88.60% Polish nurses and 75.56% Slovakian nurses felt it difficult to find another job. Under these conditions, the intention to leave was not high even they exposed to high levels of work stress due to lack of alternative job opportunity, in terms of professional ‘locked-in’ (Aronsson, et al, 1999; Muhonen, 2010), supported by our result of elevated 2 time higher risk of ITL in the Polish nurses who had no difficulty finding another job. One exceptional association in the Slovakian nurses was observed, i.e. low job demand at baseline predicted significantly the ITL at follow-up. The extremely low follow-up rate (21.39%), which would cause heavy selection bias, might be helpful to explain the association in the Slovakian sample, to some extent. Again, we should not ignore the macro factor, lack of employment opportunity in the labor market. We suspected that nurses in Slovakia had to work very hard to keep current job, no alternative in the market pushed them to increase their job demand for employment, representing a typical ‘locked-in’ situation (Aronsson, et al, 1999; Muhonen, 2010).

The current findings highlight the contribution of alternative employment opportunities towards explaining intentions to leave the profession. Similar

observations were made earlier (Flinkman, et al, 2010; Hayes, et al, 2006). From one cross-sectional study in USA (DiMattio, et al, 2010) and our cross-sectional analyses of baseline data of the NEXT Study (Widerszal-Bazyl, et al, 2008), we observed that nurses with employment opportunities would have higher risk of ITL. Country-specific analyses support the notion that high unemployment rates and few opportunities of alternative jobs, as is the case e.g. in Poland, reduced the occurrence of ITL despite high levels of psychosocial stress at work (a 'locked-in' condition). In contrast, nurses from the Netherlands reported good quality of psychosocial working conditions with easily available alternative jobs, thus weakening a consistent link between stressful work and ITL. In Germany and China, our study found strong associations of work stress (particularly ERI) with ITL. The contrasting cases of international nurses from different countries demonstrate the importance of conducting international comparisons, and they highlight the moderating influence of macro-structural, labor market-related conditions on associations of stressful work with behavioral and health-related outcomes (Dragano, et al, 2011). Countries have traditionally reported fewer problems retaining nurses in times of economic recession as there are fewer alternative options in the labor market. The economic downturn in the early 1990s in the US and UK, for instance, has been regarded as a factor reducing job mobility, keeping nurses in jobs and postponing career breaks (Buchan, 1994). Based on a large sample from 435 hospitals in the US, it was claimed that the probability of turnover was related to the availability of alternative employment opportunities (Bloom, et al, 1992). This latter finding is confirmed by the Swedish 3-year follow-up study mentioned above which also found that options of getting a new job increased the risk of nurses' turnover (Josephson, et al, 2008). Beyond the nursing setting, such occupational 'locked-in' phenomena were studied in relation to health (Aronsson, et al, 1999; Muhonen, 2010), and it was suggested that ERI mediates the association between being 'locked-in' and an elevated risk of long-term sick leave (Fahlén, et al, 2009). A recent review showed that ill health and stressful work are important factors affecting early retirement (van den Berg, et al, 2010), an association that is relevant among nurses as well.

In view of an important role of an adverse psychosocial work environment in explaining ITL, the two models tested in this analysis, as well as additional conceptualisations, such as employment opportunity (Muhonen, 2010), deserve further exploration in studies of organisational well being and turnover behaviors (Siegrist, 2008).

6.3. Methodological considerations

6.3.1. Longitudinal design in epidemiological research

Longitudinal study is a type of observational epidemiological study, which involves repeated observations of the same subjects over long periods of time (Last, 2001). Unlike another type of observational epidemiological study (cross-sectional study), longitudinal study tracks the same people. Therefore, longitudinal studies are often used in medicine to uncover predictors of certain diseases, in psychology to study developmental trends across the life span, and in sociology to study life events throughout lifetimes or generations (Shimazu, et al, 2009; Taris, 2000; Zapf, et al, 1996).

Longitudinal studies have a number of advantages compared to cross-sectional studies. First, longitudinal studies allow an investigator to separate time effects (i.e. changes over time within individuals), from cohort effects (i.e. differences between subjects at baseline). Second, longitudinal data can provide information about individual change. Finally and importantly, it is assumed that longitudinal research designs permit stronger conclusions concerning the causal relations among the study concepts than cross-sectional designs do. As the temporal order of the variables can be determined unambiguously, longitudinal designs are presumed to offer good opportunities to add further to our understanding of the causal processes generating the phenomena of interest (Rothman, et al, 2008).

6.3.2. Multilevel modeling

International comparison is getting popular in public health research, psychological research, and nursing research (Bobak, et al, 2007; Deveugele, et al, 2002; Diez-Roux, 2000; Grigoryan, et al; 2008; Leyland, et al, 2003; Suhonen; et al, 2009; Tsui, et al, 2007). However, many studies ignore the impact of country on the individuals, by using traditional “standard” statistical methods which assume individuals are independent each other. In such international comparative research, however, the individuals in the same country can be described as a kind of hierarchy, i.e. individuals are clustered within countries. The general idea of multilevel modeling is to take the dependency of the individuals into account, moreover, to compare findings at the individual and cultural levels (Twisk, 2006). In this study, we explored variations of intention to leave the profession across countries, and examined the

variations that exist at country and at individual level, by applying statistical modeling of multilevel analysis, which allows for an accurate adjustment for country affiliation, thus considering the dependence of the residuals within a country. Moreover, variations of ITL can be examined separately at the individual and at the country level. Our results indicated that significant, although small between-country variations were observed, i.e. about 1.8% of the total variance in ITL can be attributed to differences between the countries. We therefore strongly recommend research to apply the multilevel modelling for the future international comparative research.

6.3.3. The measurement of outcome: ITL vs. actual turnover.

Concerning the outcome of intention to leave the nursing profession, in our study, the prevalence of ITL at baseline was 16.5% (9.9-36.6%). It varied largely from 2.60% in Belgium (Milisen, et al, 2006) to 51.18% in UK (Shields, et al, 2001), for example, in the USA it was 22.7% and in Canada it was 16.6% (Aiken, et al, 2001). The one-year incidence rate of developing ITL in our NEXT study was 8.8% (4.7-11.9%). Similarly, we found the range of ITL incidence rate was quite broad according to literature review: from 1.15% in UK (Robinson, et al, 2005) to 38.00% in Finland (Kivimäki, et al, 2007). Another outcome from the European NEXT Study was actual turnover, with an estimated one-year rate of 8.0% (5.3-14.0% across eight countries) (Hasselhorn, et al, 2005). According to a report from China (Yang, et al, 2006), the nurses' actual turnover rate in Shanghai during 2001 to 2005 was 12.8%. All the substantial numbers suggest the critical situation of retaining existing nursing workforce internationally.

In general, ITL is regarded as the immediate precursor of actual turnover (Alfonso, et al, 2004), in that it is closely linked to the subsequent steps in the decision process leading to turnover in nursing. In the European NEXT Study, where 53.2% of all those who later left the profession to work in another profession had "frequently considered'' leaving nursing vs. 13.7% of those who remained in their institution during the following 12 months. In addition, the final decision to leave the profession is usually made within six months prior to departure among 83% of all actual leavers, while 80% of all leavers had started seriously considering leaving the profession within the 12 months prior to departure (Hasselhorn, et al, 2005). Moreover, the use of ITL instead of actual turnover in our study could reveal a target population for early intervention before the turnover process becomes too advanced and perhaps irreversible (Alfonso, et al, 2004).

6.3.4. Measuring psychosocial work environment

Both work stress models, job strain and effort-reward imbalance, are the prevailing tools to measure psychosocial work environment (Karasek, 1990; Siegrist, 1996). Some recent research suggested considering some new psychosocial risk factors in workplace (Burr, et al, 2010; Polanyi, et al, 2004). In particular, client-specific work characteristics (such as emotional demand) are regarded as very important psychosocial stressors, especially in the area of human service work, for example, healthcare/nursing work (Rugulies, et al, 2004). In some Dutch and Chinese studies (de Jonge, et al, 1999; Li, et al, 2010; van Vegchel, et al, 2001), it showed that emotional demand was useful to detect nurses' stressor in association with their well-being. Moreover, based on a large Finnish prospective study of 6441 hospital staff, team climate - as indicated by clear and shared goals, continued participation, task orientation and support in favour of innovation - predicted intention to leave the job and actual turnover during the 2 - 4 year follow-up most strongly (Kivimäki, et al, 2007).

In view of research design and analysis, global changes in the economies during the past decades have heavily impacted the healthcare organizations, and accordingly, the working conditions of healthcare workers have changed enormously (Ostry, et al, 2004). More recently, it has been pointed out that the accurate assessment of change in psychosocial work characteristics is crucial when investigating the causal relations between work stress and outcomes with longitudinal design (Hasselhorn, et al, 2008; Li, et al, 2010; Smith, et al, 2008). However, the measurement of change between two time points using repeated measures is often more complicated than is usually realized. The common methods are absolute change, relative change, and absolute change correcting for baseline value; while other techniques are also available, such as analysis of residual change and analysis of covariance (Twisk, 2003). However, it is often found that the conclusions from the same dataset about change measured by different analyses are inconsistent. This situation is referred to as Lord's paradox, which occurs where baseline differences cannot be attributed to chance alone (Lord, 1967; Smith, et al, 2008). For the dimensions of work stress with minimal score and maximal score, the ‘‘ceiling effect’’ and the ‘‘floor effect’’ should be considered seriously. Thus, we recommend the method introduced by Twisk to measure changes of psychosocial work characteristics while taking into account ‘‘ceiling/floor’’ (Twisk, 2003). Compared with other methods of measuring changes, such a technique demonstrated plausible predictive improvement by our recent work (Li, et al, 2010). Further debates on this issue are worth developing.

6.4. Limitations of the study

Several limitations in our study have to be addressed. First, as the sample loss at follow-up was substantial (one-year follow-up rate 41.34%), we cannot exclude a systematic bias due to a disproportionate loss of heavily stressed nurses at baseline (i.e. healthy worker effect, particularly in the Dutch sample, Belgian sample, and Slovakian sample) (Checkoway, et al, 2004). This bias may result in an underestimation of the effects under study (Li, et al, 1999). Second, due to the fact that both types of variables, independent and dependent variables, were based on self-report data, common method variance might weaken the validity of reported results although the longitudinal design reduces this threat to some extent (Podsakoff, et al, 2003; Spector, 2006). Third, the measurement of stressful aspects of the nurses' work experience was restricted to the baseline survey. Therefore, we were not able to test the effects of changes of psychosocial work environment on incident ITL. Clearly, in future studies, multiple measures of exposure are highly desirable (Hasselhorn, et al, 2008; Li, et al, 2010; Smith, et al, 2008).

6.5. Strengths of the study

These limitations are balanced by specific strengths of this investigation. First, this is a large international comparative study with longitudinal design, whereas many studies on nurses' intention to leave the profession were cross-sectional with relatively small samples (Flinkman, et al, 2010; Hayes, et al, 2006). Given the nature of research design, it is possible to draw conclusions on causality of the observed associations (Rothman, et al, 2008; Zapf, et al, 1996). Second, by comparing hospital nurses from countries with different health care systems and different level of economic and socio-political context, we were able to estimate the country-level versus individual-level determinants of ITL, using multilevel modeling (Suhonen, et al, 2009; Twisk, 2006). Third, the well-established work stress models, job strain and effort-reward imbalance, were used to measured psychosocial work characteristics in nursing settings of eight countries (Karasek, 1979; Karasek, 1990; Siegrist, 1996; Siegrist, 2002), and the cross-national validation of the relevant questionnaires has been approved (Choi, et al, 2009; Karasek, et al, 1998; Kristensen, et al, 2005; Siegrist, et al, 2004; Tsutsumi, et al, 2009).

7. Conclusions and Implications

In this study, we explored the reasons why nurses wanted to leave their profession. The longitudinal research design with sophisticated statistical approach further strengthened the findings. Given a large sample size and the inclusion of a variety of countries the results of this study may allow for some generalizations.

If supported by further research, the reported results may form the basis of several evidence-based policy recommendations. At the national level, investments in an extended professional labor market, particularly in post-communist regime of Eastern European countries, contributes to a reduction of the nurses' levels of chronic stress due to feelings of being 'locked-in' in an unrewarding job condition. Recent evidence from an international comparative study demonstrates a moderating role of distinct active labour market policies on associations of stressful work with personal well-being (Dragano, et al, 2011). At the organizational level, measures of increasing reward at work seem to be of primary interest. Such measures should focus on improved career prospects based on nurses' training and achievement, more appropriate remuneration, and ways of providing non-material rewards from organizations. These latter measures may include more formal and informal ways of recognition and esteem of nurses' contributions to the organizations' main goals as well as access to special services or privileges offered by the organization (e.g. recreation facilities, access to kindergarten for own children, flexible work time arrangements) (Siegrist, et al, 2006). Concerning adverse effects of increasing workload, improved policies of personnel development are needed, ideally in combination with programs that strengthen the nurses' resources of coping with external demands (Ruotsalainen, et al, 2008). Some of these measures have already demonstrated their efficacy in reducing the amount of turnover of nurses in hospitals, e.g. in Canada, Australia and Norway (Ahlburg, et al, 1996; Collette, 2004; Holmås, 2002). Furthermore, a literature review from UK suggests that a 10% reduction in the real wage of registered nurses would lower participation in the nurse workforce by around 3%, implying a significant impact of wage change on noticeable nursing participation (Antonazzo, et al, 2003). Additionally, strengthening job control and social support at work, as conceptualised by the job strain model, may contribute to retaining nurses in the hospitals. An intervention study in Canadian hospitals based on both theoretical models, job strain and effort-reward imbalance, was able to produce beneficial long-term effects on nurses' and doctors' levels of emotional well-being, in particular of reducing professional burnout (Bourbonnais, et al, 2011). Such effects

may have wider implications, e.g. on patient safety and quality of care (Stone, et al, 2007; Virtanen, et al, 2009), or via increased nursing staff (Dall, et al, 2009; Kane, et al, 2007; Twigg, et al, 2010), and on successful policies of retaining hospital personnel, including nurses. At the individual level, emphasis should be focused on maintaining nurses' health status to prevent sick leave and prolong the working active life (Kirsten, 2010; Letvak, et al, 2011). However, raising awareness of psychosocial work environment with attention to organizational well-being and productivity among both nurses and nursing managers should not be ignored, which is an essential step to solve the problem. It has been suggested that a comprehensive approach combining both organizational-directed and individual interventions would be a promising way to promote healthy workplace and job performance (Noblet, et al, 2006).

In conclusion, the results of this study covering hospital registered nurses from eight different countries find that the divergence and concordance of psychosocial work characteristics, health status, and professional withdrawal behavior are detected across countries, indicating the social-democratic European regime might be regarded as a good example to retain nurses. Interventions, particularly those aiming at improving the psychosocial work environment and health status, may be effective in maintaining nurses, thus, in tackling the aggravating problem of international nursing shortage.

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