Modelling Nurse Retention: An example from Ontario, Canada

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Health Care Sector

- Labour intensive
- The way technology has evolved in HC has tended to shift the production possibility frontier outward but not resulted in a large degree of capital-labour substitutability. (Baumol Cost disease.)
- As the population ages the type of care demanded will probably be even more labour intensive

HC Labour Force

- Nurses constitute the majority of the HC labour force in most developed countries
- Nursing is itself an aging labour force in most countries
- Feeds concern about shortages and the overall size of the nursing labour force into the future

Shortage

- Demand side: if in future there will be greater demand for labour intensive types of care then traditional supply of labour is liable to be insufficient

- Supply side: Two issues
- 1)Entry into nursing, which will depend on the relative attractiveness of the profession and the number of available spots in training programs
- 2)At the other end—retirement, which goes along with the aging of the workforce— the age distribution of this workforce has not been stable over time.
- In between these is the question of the number of hours of labour supplied

Policy

- Need different policies to deal with each of these aspects
- Suggests that to large extent need to be analyzed separately
- Focus for this lecture will be on the determinants of departures/exits/leaves from the profession itself

Exits/Departures

- Mixture of retirement, either at the usual retirement age or early
- Exits for reasons other than retirement
- Important to consider that this tends to be a heavily female dominated profession and because of child bearing and rearing, departure behaviour of females will tend to be different from that of males

Starting point

- Standard labour theory i.e. Income leisure trade-off
- Nurses have a certain amount of flexibility with respect to this trade-off, in the form of shift work, full-time or part-time employment
- Have also to recognize that different job characteristics will yield different degrees of disutility—so not just constant marginal disutility of leisure given up

Individual's problem

- Utility maximizer
- Utility will depend on the wage (the income part of the trade-off) as well as the different aspects of the job (not just hours of foregone leisure)
- With regard to departures from the profession—really looking at a corner solution in that the hours the individual chooses to supply to that particular market, for whatever reason goes to zero
- Since we are studying departure from the profession and not necessarily the labour force, there is also the consideration of the income-characteristic mix of those alternate employment opportunities

Institutional features

- Two most obvious are:
- 1)Question of whether there is monopsony power on the employer side

- 2)Extent of unionization on the supply side which creates a monopoly
- Means that there could be a competitive model, a monopsony model, a monopsony-monopoly model or monopoly model

Across jurisdictions

- The type of market structure will differ from country to country and potentially from region to region
- While there may be a universal human tendency to regard a certain amount of work as having a certain amount of disutility, to get at that one has to take account of institutional and market structures in different countries
- Problem is often getting the data necessary to analyze these markets as completely as possible

Political minefield

- Attempting to assess earnings of publicly paid health care workers is very politically charged
- Nurses in Canada, for example, earn a significant premium over comparably educated females
- Nurse practitioners can earn as much as some general practitioners
- Public sector pays salaries out of tax dollars but labour supply organizations tend to be resistant to making that data available to the public

Who can practice as a nurse?

- To practice in Ontario, all nurses must register annually with the regulatory body, the College of Nurses of Ontario
- Failure to renew one's license results in suspension of practice privileges
- Maintenance of registration involves completion of a registration form and payment of a nominal fee
- Re-application requires a certain amount of additional paperwork and a nurse who fails to register in three consecutive years must undergo substantial re-training

Nurse types

- Registered Nurses (RNs):More extensive training and since 2000 have been required to have a undergraduate degree in nursing.
  - Training focussed on dealing with acute care patients.
  - Represent about 77% of the nursing labour force

- Licensed Practical Nurses (LPNs): 2 year diploma from college nursing program.
  - Focus on providing care to people with stable but chronic disease.

***Note about Nurse Practitioners—too few to analyze

The supply side

- Ontario nurses represented by a single licensing body, the College of Nurses of Ontario

- Ontario nurses represented by a single union, the Ontario Nurses Association

Care (employment) sectors (1)

- Hospitals (61% of nurses)
  - All Ontario hospitals are not-for-profit— and technically they are private
  - BUT…
  - Receive virtually all funding from provincial government (global budgets).
  - Government imposes requirements in terms of what services are to be provided and staffing mix (e.g. 70-30 rule etc.)
  - Heavy reliance on RNs

Care (employment) sectors (2)

- Long-term Care (12% of nurses)
  - Includes nursing homes and homes for the aged
  - Mixture of Private for profit , not-for profit and public facilities
  - Majority are private for-profit
  - Vast majority are remunerated by provincial government on per capita (i.e. Per patient) basis
  - High degree of homogeneity of patients-people that require low intensity inpatient care
  - Reliance on LPNs and Personal Support (unregulated) Workers

Care (employment) sectors (3)

- Home and Community Care (12% of nurses)
  - Mix of provider agencies –for-profit and not-for-profit
  - Compete through a request for proposals process for the right to provide care within a health region for a given period of time
  - Typically only one provider agency awarded a contract within a region
  - Successful agencies are reimbursed by the provincial government for services provided
  - Two types of patients: those being kept out of nursing homes and those patients discharged earlier from hospital in order to free up beds
  - Volatile sector for nurses because they may lose their job if the provider agency they work for is not successful in renewing its contract

Care (employment) sectors (4)

- Other
  - Doctor's offices
  - Walk-in clinics
  - Laboratories where people get blood taken
  - Very small portion of the nursing labour force
  - Regular hours

Wage determination process

- Bargaining between nurses' union and representatives of employment sector (i.e. One representative each for LTC, Hospital, Home Care)
- Contract usually for 3-4 years
- Province-wide wage and benefit structure
- Wage determined according to a formula which does not have regional adjustment terms in it – i.e. wage by category is the same all across the province.
- Factors included:
  - years of experience
  - full-time, part-time
  - RN or LPN
  - Shift rates (e.g. nights, rotation)

Data available for Ontario

- 2005 Survey of Work and health of nurses
  - One –shot cross-sectional
  - Extensive questions about work place injuries
  - Job satisfaction
  - Did not ask about wages or individual income
- Canadian Labour Force Survey
  - Repeated cross-section
  - Doesn't distinguish nurse types nor where they work
  - Wages included

Data available for Ontario(2)

- Registration Database
  - Covers period 1993-2006
  - Panel –individual nurses linked across years via a unique identifier
  - Information about the population of nurses in the province

Registration database

- Includes information about:
  - Demographics
    - Year of birth, sex, place of residence
  - Training
    - RN or LPN
    - Years of experience in nursing
    - Additional education beyond initial nursing degree
  - Workplace characteristics
    - Single versus multiple employers
    - Workplace sector (i.e. Hospital, LTC, Community, Other)
    - Where it is
  - Job characteristics
    - Full-time or part-time
    - Shift work (regular/rotation) and day/evening/night shift
    - Dimension of work (direct care, administration, teaching/research)

Registration database (2)

- What's missing?
  - No wage or benefit information
  - No information about marital status or number of dependent children
  - Not uncommon to have a lack of data—reason that most studies based on US data, to a lesser extent UK and some from Norway—each of these also has its limitations.

Options?

- Throw up our hands and walk away in disgust

Or

- think about what useful information might be extracted from the data such as it is.
- We chose the second option in order to try to contribute to informing policy in Ontario

So why are we using a database which does not contain wage data?

- Universe of nurses in Ontario in each year
- Covers multiple employment sectors, not just (e.g.) public hospitals
- Can create a panel data set with much longer panels than (e.g.) workforce surveys usually contain
- Lets us follow a nurse through a large part of her career, with all of the changes in things like education, sector of employment, shift work etc. which characterize a career
- Look at actual exit behaviour, not just intentions, and look at both permanent and temporary exit.

Context

- A few sector specific binding agreements in the province which cover most nurses within sectors under the same wage and benefit structure
- And those wages are determined by a province-wide negotiated formula—grid

- Implication: lack of wage info may be less of a problem because the registration data includes info on those characteristics which enter the wage formula and therefore determine her wage.

How generalizable is this?

- English NHS, and European countries nurses covered under collective agreements
- Want to know whether licensure data can provide economically meaningful information about nurse exit behaviour in this kind of setting
- Opens up the possibility of doing labour market studies in jurisdictions where applicable data had seemed limited or unavailable

Invocation of theory

- Compensating wage differential
- Jobs have a series of characteristics each of which yields varying degrees of disutility
- Ties into the nature of many labour contracts which assign rates for different characteristics of the job
- Equivalence to a risk premium in a wage (Viscusi)
- From the perspective of the individual nurse, the wage is exogenous but she knows the price attached to each job characteristic and presumably the wages offered in each sector

Employer side

- Individual employer (e.g. Hospital) has a target retention rate
- Relates also to the individual characteristics of the job
- In a province-wide unionized setting:
  - Can't adjust wages (except between contracts)
  - Can't adjust to local market conditions
  - Will tend to adjust the number of nurses as a consequence

Wages and job characteristics (1)

- Economists normally focus on wages as the key determinant of labour supply
- When we have information on job characteristics we would like to include it, and to estimate the compensating wage differential for each individual characteristic.
- When wages are designed to include a significant compensating differential component, omitting characteristics will result in an omitted variable bias problem, as would omitting the wage.

Wages and job characteristics (2)

- If differences in wages across observations reflect differences in job characteristics, the estimate of the pure impact of a wage increase on the probability of a quit will be biased downward.

- Normally, then, we would like to include both wage and characteristics.

Wages and job characteristics (3)

- We have a different problem.
- Since our data set does not include wages, we would have to generate them using contract information.
- Because wages are determined by a province-wide formula based on job characteristics included in our data base, the wage will be a linear combination of those characteristics.
- Thus wages generated this way would be highly collinear with the set of job characteristics.

Wages and job characteristics (4)

- Given the formulas, differences in wages across (e.g.) hospital RNs will reflect differences in their job characteristics, and not local labour market conditions.
- We know that when job characteristics differ across cross-section observations the wage will differ by a pre-determined amount.
- Unlike UK studies, we cannot use a subset of the characteristics to create a job Grades variables. We have to include all of the characteristics individually.
- Rather than include a variable which is generated as a linear combination of other variables, we chose to look at the interpretation of the coefficients on the characteristics.

Empirical Approach - Summary

- Include variables which enter the negotiated wage function as explanatory variables in the retention equation, but do not include a (predicted) wage variable

- This allows us to investigate the effect of individual factors which enter the wage equation on the probability of exiting the profession
- Since the wage is determined by a province-wide negotiated formula, a change in one of the characteristics would automatically lead to a change in the nurse's wage

Interpretation of our coefficients

- An increase in the value of a characteristic which yields disutility to the nurse will also lead to an increase in her wage, according to the pre-determined formula

- Thus, whether a characteristic has a statistically significant coefficient depends on whether the increase in the wage associated with that characteristic adequately compensates for the disutility associated with it.

- When the coefficient is not significant in this kind of wage determination structure, it can be taken as meaning that any disutility associated with having more of that characteristic is just compensated for by the corresponding wage increase.

- When a characteristic which enters the negotiated wage formula has a significant positive coefficient, it can be interpreted as saying that the weight given to that characteristic in the negotiated wage formula yields a wage increase which is not sufficient to compensate for the added disutility.

Break

Previous Literature

- Few studies have examined the decision to leave the nursing profession per se
- Some work done at the market level looking at inflows and outflows

- Those at the individual level have considered:
  - Probability that someone decides to work as a nurse
  - Number of hours worked given employment as a nurse
  - Factors that affect quit rates from particular nursing jobs

Important previous contributions to the Literature

- Parker & Rickman (2005)
  - leave the profession (either to non-nursing job or labor market)
  - US CPS 1980-1990, RNs n=674 to 1143
  - Survey did not distinguish employment sectors and could not control for temporary leaves
  - Higher wages, FT reduced probability of leaving for single nurses and add education, age and other income increased probability

- Schumacher (1997)
  - US CPS 1983-1994 as above, included relative wages but either not sig or small effect
  - Hospital based RNs and those employed in public sector less likely to leave

Previous Literature cont'd(3)

- Shields & Ward (2001)
  - Used survey data from UK NHS n=9625
  - Focus on role of job satisfaction in intentions to quit (not actual exit)
  - Did not have wages per se but included nurses professional grade as a proxy (also determined on grid)
  - Higher grade nurse more likely to be satisfied but also more likely to indicate an intention to quit.
  - Nurses below age 30 were more likely to be potential quitters
  - "Primary and community" was associated with a lower intention to quit

- Barron & West (2005)
  - Used BHPS 1991-2001
  - Younger and male nurses more likely to transition to employment outside nursing
  - higher earnings reduced transition rate

Previous Literature (4)

- Frijters, Shields &Wheatley Price(2007)
  - NHS QLS, interviewed up to 5 times over 15 mos
  - N=6971 interviewed sometime btw 1992 and 2001
  - New entrants more likely to leave
  - FT, Hospital based less likely to leave
  - No wages for 3 of 5 waves
  - No direct information about actual nursing grades
  - Survey only divided nurses into managerial, supervisory and non-supervisory responsibility
  - generated predicted wage equations for nursing and non-nursing using age, tenure and job level and predicted alternate wage
  - Find relative wage (differential between the predicted wages above) had small positive effect on retention
- Holmas (2002)
  - Duration analysis for max 5 years (1993-97) N=5284 RNs in public sector
  - Nurses left a hospital to work for local health council or for hospital not part of the database were censored
  - Proportional hazard model similar to ours
  - Wages had a significant effect on exit rate for staff (as compared to management or specialty nurses)
  - Shift work and PT status were associated with greater likelihood of exit
  - Conclude: Failure to account for shift may underestimate impact of the wage

Data used

- Linked databases licensure data for 1993-2005 inclusive on nurses' unique identifiers
- Have data on any nurse that was in the dataset as of 1993 and any that entered thereafter to 2005
- Combined dataset contains information on:
  - 148,830 RNs
  - 49,932 LPNs

Defining the pool of nurses

- Includes those who currently:

1) work as nurses in Ontario ("actives")

2) are registered, are not working but seeking employment

3)are registered but work outside nursing

4)are registered but work outside Ontario

and

5)are not registered and are under 65 years of age.

- 2)-5) are termed "eligibles"
- Nurses aged 65 and over in 1993 are defined as "retired" and not included in the analysis

Our focus

- We focus here on predictors of quitting nursing work (i.e. Moving from “actives”)
- Active nurses who discontinued their registration were considered to have exited nursing in Ontario
- Allowance was made for nurses who exited and re-entered the dataset at some later point
- Didn’t do competing risk analysis at this point because lacked detailed data about characteristics of nurses’ exit destinations—particularly for those who exit the licensure data completely

Geographic considerations

- In addition to demographic, job, and workplace characteristics we also included region of employment to capture local labour market conditions
- Also sub-divide data into whether a nurse was located in a Central Metropolitan Area (CMA) or non-CMA
- Non-CMAs are more likely to be rural or to contain small urban centres
- Certain general economic data are reported annually on a CMA/non-CMA basis (unemployment rate, per capita income, cpi)

Methods

- Employ Anderson-Gill formulation of the Cox proportional hazard model
- Outcome variable: length of time until exit in Ontario workforce
  - The starting point was the first year in which the individual is observed in the database
  - The endpoint was failure to renew the registration, unemployment, indication of working outside nursing, indication of not seeking nursing employment, retirement or end of follow-up period (i.e. 2005)
- Each individual is treated as an observation from a Poisson process
- A right censored observation is considered an event count that is still zero (in this model, a nurse who remains active in the workforce)
- Left censoring is allowed for by including a date of licensure variable.

What is the aim of the approach?

- Allows for re-current event data (i.e. Multiple entry and exit into the workforce)
- Allows for time dependency of covariates (i.e. Nurses can change sectors, locale, type of work etc. over study period)
- Allows for non-contiguous observations on each subject
- Want a way to recognize that it is the individual's complete history that (including temporary exits) ultimately determines exit from the workforce

A word about unobserved heterogeneity

- Failure to control for unobserved characteristics—such as differences in preferences related to job characteristics—could produce biased estimates of the baseline hazard and estimates of the coefficients
- To control for this we assume there is an unobserved random variable which enters the hazard which is time constant and independent of the model covariates
- This is called a frailty specification
- Assume this variable follows a gamma distribution (computational simplicity)

Results-RNs in CMAs-Demographics

Variable	With Shift 1993-98		Without shift 1993-98		Without Shift 1993-2005	
Age (base40-44)	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
55-64	0.41***	1.51	0.50***	1.64	0.42***	1.52
50-55	0.19**	1.21	0.18**	1.20	0.16***	1.17
45-49	0.11	1.11	0.12	1.13	0.10**	1.11
35-39	-0.01	0.99	0.01	1.00	-0.03	0.97
30-34	-0.05	0.95	-0.06	0.95	-0.09	0.91
25-29	0.02	1.02	-0.01	0.99	-0.06	0.95
20-24	0.28**	1.33	0.23	1.26	0.05	1.05
Male	0.14	1.15	0.15	1.16	0.08	1.09

Results-RNs in CMAs-Job Characteristics

Variable	With shift 1993-98		Without shift 1993-98		Without shift 1993-2005	
	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Part-time	0.01	1.01	0.02	1.02	0.01	1.01
Teach	0.22***	1.24	0.25***	1.29	0.44***	1.56
Admin	0.27***	1.31	0.30***	1.36	0.53***	1.70
Evenings	0.08	1.09				
Nights	0.01	1.01				
Rotation	-0.09	0.91				

Results-RNs in CMAs-Training

	With shift 1993-98		Without shift		With shift 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Additional Education	0.01	1.01	0.01	1.01	-0.01	0.99
Experience in Nursing (base 15-19 years)						
< 2 years	-0.26	0.77	-0.25	0.78	-0.26	0.77
2-5 years	0.25***	1.29	0.22***	1.25	0.27***	1.32
5-10 years	0.01	1.10	0.07	1.08	0.09	1.10
10-15 years	0.09	1.10	0.08	1.08	0.02	1.02
20-25 years	0.05	1.06	0.04	1.04	0.01	1.00
> 25years	0.01	1.00	-0.01	0.99	-0.03	0.97

Results-RNs in CMAs-Workforce

	With shift 1993-98		Without shift 1993-98		Without shift 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Multiple Employer	0.07	1.07	0.09	1.10	0.07	1.07
Sector (base Hospital)						
LTC	0.05	1.05	0.08	1.08	0.11	1.12
Community	0.25***	1.29	0.29***	1.34	0.33***	1.39
Other	0.32***	1.38	0.35***	1.42	0.43***	1.54

Results-RNs in non-CMAs-Demographics

	With Shift 1993-98		Without shift 1993-98		Without Shift 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Age (base40-44)						
55-64	1.16***	3.20	1.18***	3.25	1.27***	3.58
50-55	0.56***	1.74	0.57***	1.77	0.77***	2.15
45-49	0.14***	1.15	0.14***	1.15	0.31***	1.37
35-39	0.05	1.05	0.03	1.03	-0.02	0.98
30-34	0.08	1.09	0.08	1.09	0.04	1.04
25-29	0.17***	1.18	0.16***	1.17	0.09	1.09
20-24	0.07	1.07	0.06	1.06	-0.01	0.99
Male	0.16***	1.17	0.13**	1.13	0.19***	1.20

Results-RNs in non-CMAs-Job Characteristics

Variable	Shift 1993-98		Without Shift 1993-98		Without Shift 1993-2005	
	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Part-time	0.12***	1.12	0.14***	1.15	0.20***	1.22
Teach	-0.03	0.97	0.01	1.01	0.07	1.07
Admin	0.19***	1.21	0.25***	1.28	0.29***	1.33
Evenings	0.23***	1.26				
Nights	0.31***	1.36				
Rotation	-0.21***	0.81				

Results-RNs in non-CMAs-Training

	With Shift 1993-98		Without Shift 1993-98		Without Shift 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Additional Education	0.18***	1.20	0.18***	1.20	0.14***	1.15
Experience in Nursing (base 15-19 years)						
< 2 years	0.66***	1.93	0.63***	1.88	0.91***	2.48
2-5 years	0.36***	1.44	0.33***	1.39	0.62***	1.86
5-10 years	0.20***	1.22	0.17***	1.18	0.24***	1.27
10-15 years	0.08	1.09	0.07	1.07	0.05	1.05
20-25 years	-0.18***	0.83	-0.19***	0.83	-0.19***	0.83
> 25years	-0.02	0.98	-0.03	0.97	-0.05	0.95

Results-RNs in non-CMAs-Workforce

	With Shift 1993-98		Without Shift 1993-98		Without Shift 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Multiple Employer	-0.19***	0.83	-0.21***	0.81	-0.17***	0.85
Sector (base Hospital)						
LTC	-0.04	0.96	0.03	1.03	0.12***	1.13
Community	0.06**	1.07	0.16***	1.17	0.21***	1.24
Other	0.33***	1.39	0.39***	1.48	0.51***	1.66

Results-LPNs in CMAs-Demographics

	With Shift 1993-98		Without shift 1993-98		Without Shift 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Age (base40-44)						
55-64	0.19	1.20	0.12	1.12	-0.08	0.93
50-55	0.17	1.19	0.21	1.23	0.22	1.24
45-49	-0.08	0.92	0.03	1.03	0.07	1.08
35-39	0.02	1.02	0.06	1.06	-0.02	0.98
30-34	-0.07	0.93	-0.06	0.94	-0.02	0.98
25-29	-0.04	0.96	-0.03	0.97	-0.01	0.99
20-24	-0.21	0.81	-0.19	0.83	-0.11	0.89
Male	0.04	1.04	0.09	1.09	-0.07	0.93

Results-LPNs in CMAs-Job Characteristics

	With Shift 1993-98		Without Shift 1993-98		Without Shift 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Part-time	0.08	1.09	0.08	1.08	0.08	1.08
Teach	0.25	1.28	0.22	1.24	0.40**	1.50
Admin	0.32	1.38	0.26	1.30	0.69***	2.00
Evenings	-0.02	0.98				
Nights	-0.09	0.91				
Rotation	-0.02	0.98				

Results-LPNs in -CMAs-Training

	With shift 1993-98		Without shift 1993-98		Without shift 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Additional Education	-10.12	0	-10.10	0	-0.96	0.38
Experience in Nursing (base 15-19 years)						
< 2 years	0.28	1.33	0.26	1.29	0.21	1.24
2-5 years	0.17	1.19	0.13	1.14	0.10	1.10
5-10 years	0.21	1.23	0.20	1.22	0.20**	1.22
10-15 years	0.15	1.16	0.12	1.13	0.07	1.07
20-25 years	0	1.00	-0.04	0.96	-0.05	0.95
> 25years	0.06	1.06	-0.02	0.98	-0.08	0.92

Results-LPNs in CMAs-Workforce

	With shift 1993-98		Without shift 1993-98		Without shift 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Multiple Employer	-0.16	0.85	-0.09	0.91	-0.09	0.91
Sector (base Hospital)						
LTC	0.07	1.07	0.06	1.07	0.08	1.08
Community	-0.12	0.89	-0.15	0.86	0.11	1.11
Other	0.44**	1.55	0.55***	1.73	0.61***	1.83

Results-LPNs in non-CMAs-Demographics

	With shift 1993-98		Without shift 1993-98		Without shift 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Age (base40-44)						
55-64	1.09***	2.98	1.11***	3.04	1.14***	3.11
50-55	0.41***	1.50	0.43***	1.54	0.57***	1.76
45-49	0.06	1.06	0.08	1.09	0.21***	1.24
35-39	0	1.00	-0.01	0.99	-0.02	0.99
30-34	0.08	1.08	0.09	1.09	0.09**	1.10
25-29	0.15**	1.17	0.16***	1.18	0.20***	1.22
20-24	0.09	1.10	0.09	1.09	0.06	1.07
Male	0	1.00	0.01	1.01	0.12***	1.12

Results-LPNs in non-CMAs-Job Characteristics

	With shift 1993-98		Without shift 1993-98		Without shift 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Part-time	0.20***	1.22	0.20***	0.22	0.29***	1.34
Teach	0.18**	1.19	0.19**	1.21	0.24***	1.27
Admin	0.24**	1.27	0.23**	1.25	0.30***	1.35
Evenings	0.06	1.06				
Nights	0.18***	1.19				
Rotation	-0.20***	0.82				

Results-LPNs in non-CMAs-Training

	With shift 1993-98		Without shift 1993-98		Without shift 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Additional Education	0.33***	1.39	0.35***	1.42	0.26***	1.30
Experience in Nursing (base 15-19 years)						
< 2 years	0.42***	1.52	0.39***	1.47	0.58***	1.78
2-5 years	0.14**	1.15	0.11	1.12	0.29***	1.33
5-10 years	0.14**	1.15	0.11	1.12	0.05	1.05
10-15 years	0.07	1.07	0.06	1.06	-0.02	0.98
20-25 years	0	1.00	-0.02	0.98	-0.02	0.98
> 25years	0.05	1.06	0.04	1.04	0.08	1.08

Results-LPNs in non-CMAs-Workforce

	With shift 1993-98		Without shift 1993-98		Without 1993-2005	
Variable	Parameter	Hazard	Parameter	Hazard	Parameter	Hazard
Multiple Employer	-0.24***	0.79	-0.26***	0.77	-0.19***	0.83
Sector (base Hospital)						
LTC	0.01	1.01	0.07	1.07	0.13***	1.14
Community	0.36***	1.43	0.43***	1.54	0.38***	1.47
Other	0.50***	1.66	0.60***	1.82	0.69***	2.00

Key Findings-Sector

- The nursing labour market is composed of sub-markets as evidenced by the higher exit rates associated with the Community and Other sectors
- This result was consistent for RNs across CMAs and non-CMAs and for LPNs in non-CMAs
- Exit rates for RNs were similar across LTC and hospitals (i.e. Low) —probably because RNs in this sector are in supervisory roles
- The Community sector appears to be able to keep its LPNs in the CMAs but not so in the non-CMA regions

Key findings-Age and experience

- As expected older nurses (RNs and LPNs in non-CMAs) have high exit rates—suggest that opting for leisure over a greater number of retirement years as opposed to the extra wages they might have earned (also many may have maximized their pension depending on when they entered the profession)

- RNs with less than 5 years experience and LPNs with less than 2 years experience in non-CMAs had higher rates of exit—no effect observed in CMAs

Key findings-FT/PT, shift

- Part-time status was associated with greater likelihood of exit for RNs and LPNs in non-CMAs only

- Evenings and nights associated with greater likelihood of exit for RNs in non-CMAs (not for LPNs in either region type—probably because tend to work primarily days)
- Rotation of shifts reduced exit in non-CMAs for both RNs and LPNs

Key finding-role

- Teaching/research was associated with higher exit for RNs in CMAs –perhaps where more of these opportunities exist

- Administration also associated with higher exit rate for RNs in CMAs and non-CMAs

Policy implications

- Non-CMA/ CMA distinction seems to matter more than distinction even between type of nurse
- For example, the wage premium for shift work may be OK in CMAs but not adequate in non-CMAs
- Lower retention in Community sector of concern if intend to shift care to that sector in the future
- Mal-distribution of providers across less and more developed regions likely to continue if nurses in non-CMAs are more likely to exit the profession
- Results suggest that there needs to be greater flexibility in the labour contract across regions and probably higher wages in the community sector

Some related results from other papers using these data

- Looked at hospital downsizing which occurred in the late 1990s, in which nurses were 'laid-off' and found that they were more likely to exit the profession that to obtain employment in the expanding community sector
- Considered effect of government's 70-30 rule which stipulated that the nursing workforce in hospitals had to be comprised of at least 70% FT RNs and found that hospitals responded by reducing the size of the overall labour force

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References

Alameddine M, Laporte A, Baumann A, et al. 2005. "Stickiness" and "inflow" as proxy measures of the relative attractiveness of various sub-sectors of nursing employment. *Soc. Sci. Med.* 2005; **63**(9): 2310–2319.

Alameddine M, Laporte A, Baumann A, et al. 2006. Where are nurses working? Employment patterns by sub-sector in Ontario, Canada. *Healthcare Policy* 2006; **1**(3): 65–86.

Andersen PK, Gill RD. 1982. Cox's regression model for counting processes: A large sample study. *Annals of Statistics* 1982; **10**(4): 1100–1120.

Antonazzo E, Scott A, Skatun D, Elliot RF. 2003. The labour market for nursing: A review of the labour supply literature. *Health Econ.* 2003; **12**(6): 465–478.

Askildsen JE, Baltagi BH, Holmas TH. 2003. Wage policy in the health care sector: A panel data analysis of nurses' labour supply. *Health Econ.* 2003; **12**(9): 705–719.

Barron D, West E. 2005. Leaving nursing: An event-history analysis of nurses' careers. *J. Health Serv. Res. Policy* 2005; **10**(3): 150–157.

Frijters P, Shields M A, Wheatley Price S. 2007. Investigating the quitting decision of nurses: Panel data evidence from the British national health service. *Health Econ.* 2007; **16**(1): 57–73.

Holmas TH. 2002. Keeping nurses at work: a duration analysis. *Health Econ.* 2002; **11**: 493–503.

Laporte A, Onate K, Levinton C, Baumann A, Deber R (2009) Modeling exit by nurses: An application of licensure data, working paper (available on request from audrey.laporte636@gmail.com)

Parker C, Rickman B. 1995. Economic Determinants of the Labor Force Withdrawal of Registered Nurses. *Journal of Economics and Finance* 1995; **19**(1): 17–26.

Schumacher E J. 1997. Relative Wages and Exit Behavior among Registered Nurses. *Journal of Labour Research* 1997; **18**(4): 581–592.

Shields MA. 2004. Addressing Nurse Shortages: What can Policy Makers Learn from the Econometric Evidence on Nurse Labour Supply? *Econ. J.* 2004; **114:** F464–F498.

Shields MA, Ward M. 2001. Improving nurse retention in the National Health Service in England: The impact of job satisfaction on intentions to quit. *J. Health Econ.* 2001; **20**: 677–701.