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Geographical Imbalances: Migration Patterns of New Graduate Nurses and Factors Related to Working in Non-Metropolitan Hospitals

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Purpose: To examine geographical imbalances by analyzing new graduate nurses' migration patterns among regions where they grew up, attended nursing school, and had their first employment and to identify factors related to working in non-metropolitan areas. **Methods:** The sample consisted of 507 new graduates working in hospitals as full-time registered nurses in South Korea. Migration patterns were categorized into 5 patterns based on sequential transitions of "geographic origin-nursing school-hospital." Multiple logistic regression analysis was conducted to identify factors associated with working in non-metropolitan hospitals. **Results:** Nurses who grew up, graduated, and worked in the same region accounted for the greatest proportion (54%). Sixty-five percent had their first employment in the region where they graduated. Nurses tended to move from poor to rich regions and from non-metropolitan to metropolitan areas. Working in non-metropolitan hospitals was related to older age, the father having completed less than 4 years of college education, non-metropolitan origin, non-capital city school graduation, and a diploma (vs. baccalaureate) degree. **Conclusion:** Admitting students with rural backgrounds, increasing rural nursing school admission capacities, and providing service-requiring scholarships, particularly for students from low-income families, are recommended to address geographical imbalances.

Key words: Geographic; Imbalance; Migration; Mobility; Nurses

INTRODUCTION

Globally, approximately one half of the population lives in rural areas, but only 38% of the total nursing workforce and 24% of the physician workforce serve these areas (World Health Organization [WHO], 2010). Shortages of health professionals in poor and rural areas affect both industrialized and developing countries. These shortages impede delivery of effective health services and improvement of health outcomes (WHO, 2010; Zurn, Dal Poz, Stilwell, & Adams, 2004). One of the main causes of geographical imbalances is health professionals' migration from poor to rich regions and from rural to urban areas (Zurn et al.). Poor and rural areas are known to be highly related to but not always coincide with each other; many rural areas may be poor but all poor regions are not rural areas. Therefore, examination of migration on the two dimensions (poor-rich and rural-urban) is necessary.

Although a greater proportion of nurses may tend to work in rural areas than that of physicians (WHO, 2010), nurses also migrate within countries to seek better opportunities for their personal and professional development. Their migrations have been reported to result in geographical imbalances that leave some areas depleted of nurses (Robinson, Murrells, & Griffiths, 2008). Reducing geographical imbalances in the nurse workforce will contribute to increasing access to

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health care and improving the health outcomes of people living in poor and rural areas.

The WHO (2010) suggested that the choice and formulation of national policies to reduce geographical imbalances should be guided by an analysis of the factors that influence the decisions of health professionals to work in rural areas. Previous studies have examined factors associated with working in rural areas-personal, family, and educational factors (Dussault & Franceschini, 2006; Henderson & Tulloch, 2008; Serneels, Lindelow, Montalvo, & Barr, 2007). Personal and family factors are age, gender, ethnicity, geographic origin (e.g., rural backgrounds), motivation to help the poor, parental income, spouse's employment, schooling for children, and quality of life (e.g., lifestyle). In particular, a systematic review found that rural origin was identified as the single factor most strongly associated with working in rural areas (Grobler et al., 2009). Those who graduated from rural schools or had clinical experiences in rural areas during their studies were more likely to practice in rural settings (Wilson et al., 2009). The nursing literature has also reported that nurses with rural backgrounds, who graduated from rural nursing schools, and who had experience in rural areas during their studies were more likely to practice in rural settings (Bushy & Leipert, 2005; Lea & Cruickshank, 2005; Playford, Wheatland, & Larson, 2010; Wood, 1998). Other factors that are unique to a given nation (e.g., cultural values and educational policies) would influence nurses' decisions on choice of geographical location for working. For example, in countries like Korea that have two or more types of basic nursing education programs (e.g., a 3-year diploma and 4-year baccalaureate), nurses' choice of workplace could be affected by the type of educational programs.

Another gap found in the literature is lack of any thorough examination of nurses' sequential transitions of "geographic origin – nursing school – first employment," that is, migrations from the place where nurses grew up to nursing schools and from nursing schools to the place where they were first employed. These sequential transitions enable us to examine the influence of both having a rural origin and attending rural nursing schools on working in rural areas. A more thorough examination becomes particularly important because at least four stakeholders (i.e., nursing schools, hospitals, and government authorities of education and health) are involved in developing and implementing policy interventions. Examination of nurses' sequential transitions is expected to provide stakeholders with a more complete picture of nurses' migration patterns that could result in geographic imbalances, and to produce evidence necessary to develop and implement integrated policy interventions.

In light of the knowledge gaps in the literature, this study was conducted to (a) explore new graduate nurses' migration patterns among regions where they grew up, graduated, and had their first employment; (b) examine whether or not nurses move from poor to rich regions and from rural to urban areas by calculating a net gain or loss of nurses from migration; and (c) identify factors related to working in rural hospitals.

METHODS

1. Data sources and sample

Data used in this study were obtained from public survey data of the Graduates Occupational Mobility Survey (GOMS). The GOMS is conducted by the Korea Employment Information Service (KEIS) to produce data required to understand the transition of college graduates to the labor market (KEIS, 2009). The GOMS is designed as a longitudinal study that followed college graduates for 3 years after graduation. We used the 2005 GOMS and 2007 GOMS. The 2005 GOMS included 26,544 participants who graduated in August 2004 or February 2005 and surveyed them in 2006, 2007, and 2008. The 2007 GOMS included 18,050 participants who graduated in August 2006 or February 2007 and surveyed them from 2008 to 2010. We utilized the first-year survey data from the 2005 and 2007 GOMS.

After identifying 702 graduates from nursing schools, 507 nurses who had their first employment in hospitals as full-time employees were selected for the study sample. Data were downloaded through the KEIS Website (http://survey.keis.or.kr/survey_keis/) after registration for this study. Data did not include any information that could identify individuals.

2. Measurements

1) Regions of origin, nursing school, and hospital

To examine migration patterns, three regions were considered: where the subjects lived at the time they were 14 years old (geographic origin), where they graduated from nursing school, and where they obtained their first employment (hospital). The GOMS contained two survey questions reflecting geographic origin: the location where graduates lived at the time they were 14 years old, and the location in which their high school was located. In the literature, rural origin has been defined as completing pri-

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mary and/or secondary school education in a rural setting, and attending a rural primary school was reported to be most relevant (Wilkinson et al., 2000; Wilson et al., 2009). Thus the location where the subject was living at age 14 was chosen for this study because it closely matches the time of completing primary school. In addition, some students in rural areas leave their hometown for urban areas when they enter high school, so the location of the high school may not reflect their rural backgrounds.

Given that South Korea consists of 16 administrative areas (i.e., the capital, 6 metropolitan cites, and 9 provinces), geographic origin, nursing schools, and hospitals were categorized into 7 regions: Seoul (capital), Gyeonggi (1 metropolitan city & 1 province), Chungcheong (1 metropolitan city & 2 provinces), Gangwon (1 province), Gyeongsang (3 metropolitan cities & 2 provinces), Jeolla (1 metropolitan city & 2 provinces), and Jeju (1 province). Thus, most regions consist of both metropolitan cities and non-metropolitan areas (i.e., provinces).

2) Migration patterns

Nurses' migrations were categorized into 5 patterns as follows:

(1) AAA (origin=school=hospital): the individual grew up, graduated, and had the first employment in the same region.

(2) AAB (origin=school≠hospital): the individual grew up and graduated in the same region then moved to another region for the first employment.

(3) ABB (origin≠school=hospital): the individual left the region of origin to study nursing and stayed in the new region for the first employment.

(4) ABA (origin≠school, and origin=hospital): the individual left the region of origin to study but returned back to this region for the first employment.

(5) ABC (origin≠school, school≠hospital, and origin≠hospital): all three regions were different.

3) A net gain or loss from migration

For each region, a gain of graduates moving from other regions and a loss of those leaving their school regions were summed to calculate a net gain or loss and its percentage out of the total number of graduates in the corresponding region. For example, if there were 200 graduates from the Seoul region and a gain of 30 graduates coming from other regions and a loss of 10 graduates who left the Seoul region, then the net gain would be +20 (10%=20/200). A net gain or loss was also calculated by capital, metropolitan, and non-metropolitan area.

4) Poor versus rich regions

Instead of dichotomizing the 7 regions into either poor or rich regions, the economic status of the 7 regions was assessed using the rank of the gross regional domestic product (GRDP) per capita. The GRDP per capita ranks of the 7 regions were consistent across the years of 2005, 2006, and 2007 (Statistics Korea, 2012). Distribution of hospital beds by region (as of 2007) was also analyzed as a regional characteristic (Ministry of Health & Welfare, 2012).

5) Rural versus urban areas

There are no universally-accepted definitions of rural and urban consistently used by different researchers or across different countries (Wilson et al., 2009; WHO, 2010). In this study, non-metropolitan areas (i.e., the 9 provinces) were considered to represent rural areas. Urban areas were considered to be the metropolitan cities, and the capital was singled out from the other 6 metropolitan cities because of its unique nature as the capital and major city of the nation.

6) Factors associated with working in non-metropolitan hospitals

Personal and family, and educational factors were examined in this study. Personal and family factors included age, gender, marital status, whether their father had 4 or more years of college education or not as a proxy of family socioeconomic status (SES), and geographic origin (i.e., living in a capital, metropolitan, or non-metropolitan area at age 14). Educational factors were nursing school location (capital, metropolitan, or non-metropolitan), and nursing degree (diploma vs. baccalaureate).

3. Data analysis

Distributions of 5 migration patterns of "geographic origin-nursing school-hospital" were analyzed according to nursing school regions. Nurses' migration patterns from nursing schools to hospitals were then analyzed in relation to net gains or losses from migration, GRDP per capita, and hospital beds. Factors associated with working in non-metropolitan hospitals were identified using multiple logistic regression analysis by contrasting nurses working in non-metropolitan versus capital or metropolitan areas. SAS version 9.2 was used to analyze the data.

RESULTS

The mean age of the sample was 24.2 years, and the majority were fe-

male (94.9%), single (93.5%), and 3-year diploma graduates (72.2%). Forty-eight percent grew up in capital or other metropolitan cities. Half of the respondents graduated from nursing schools located in non-metropolitan areas and 37.9% had their first employment in non-metropolitan hospitals.

1. Migration patterns: Geographic origin-nursing school-hospital

Each nurse was categorized into one of 5 migration patterns. Distributions of the 5 migration patterns by nursing school region are presented in Table 1. Overall, the greatest proportion of nurses fell into Pattern AAA (54.0%) followed by Pattern AAB (20.5%). Three quarters graduated from nursing schools in the regions where they grew up (i.e., AAA +AAB). Approximately two thirds had their first employment in the region where they graduated (i.e., AAA+ABB). These migration patterns differed by school region. Pattern AAA accounted for the greatest proportions in 5 regions (Seoul, Gyeonggi, Chungcheong, Gyeongsang, and Jeolla), whereas AAB accounted for the greatest proportion in the Gangwon and Jeju Regions. The Seoul and Gyeongsang regions had the greatest proportion of AAA and ABB (i.e., school =hospital) whereas the Gangwon and Jeju regions had the smallest proportion of graduates working in their school regions.

2. Migration from schools to hospitals

Nurses' movements from school to hospital were analyzed further to examine inter-regional movements and a net gain or loss for each region as the result of the movements (Table 2). The diagonal with shaded cells indicates the proportion of nurses who had their first employment in the same region in which they graduated; the numbers and percentages in the shaded cells correspond to those in the column of AAA + ABB (school = hospital) in Table 1. All school regions had nurses who moved to the Seoul, Gyeonggi, and Chungcheong regions. The majority of graduates from the Gangwon region, which had the smallest proportion of nurses who stayed in their school region, moved to the Seoul (41.2%) and Gyeonggi (29.4%) regions. However, few nurses moved to the Gangwon, Jeolla, and Jeju regions. As a result, the Seoul region, which had the highest GRDP per capita, had a net gain of 89.2%. The Gyeonggi region, which had the second highest proportion of hospital beds, also had a net gain of 46.8%. Other regions had a net loss; the greatest net losses were found in the Gangwon (-79.4%) and Jeju (-62.5%) regions, which had the lowest GRDP per capita and the smallest proportion of hospital beds.

Nurses' movements from school to hospital were also analyzed by capital, metropolitan, or non-metropolitan area (Table 3). Whereas 14% of graduates from the capital areas moved to the other areas, 38.4% in metropolitan schools and 42% in non-metropolitan schools moved to other areas. As a result, metropolitan and non-metropolitan areas had a net loss of 12.6% and 24.7%, respectively. When contrasting non-metropolitan versus capital or metropolitan areas, 42% of graduates from non-metropolitan schools moved to other areas whereas 17.5% (=[9+35]/[93+159]) of graduates from capital or metropolitan schools moved to non-metropolitan hospitals. Although many graduates in non-metropolitan schools moved to other areas, non-metropolitan

Table 1. Migration Patterns among Regions of Origin, of Graduation, and of First Employment by School Region

	n	Migration patterns, n (%)						
		AAA	AAB	ABB	ABA	ABC	AAA + AAB (origin=school)	AAA + ABB (school=hospital)
Overall	507	274 (54.0)	104 (20.5)	55 (10.8)	36 (7.1)	38 (7.5)	378 (74.6)	329 (64.9)
School Region								
Seoul	93	46 (49.5)	2 (2.2)	34 (36.6)	7 (7.5)	4 (4.3)	48 (51.6)	80 (86.0)
Gyeonggi	62	26 (41.9)	5 (8.1)	12 (19.4)	15 (24.2)	4 (6.5)	31 (50.0)	38 (61.3)
Chungcheong	63	31 (49.2)	14 (22.2)	4 (6.3)	2 (3.2)	12 (19.0)	45 (71.4)	35 (55.6)
Gangwon	34	5 (14.7)	11 (32.4)	1 (2.9)	7 (20.6)	10 (29.4)	16 (47.1)	6 (17.6)
Gyeongsang	155	107 (69.0)	39 (25.2)	3 (1.9)	3 (1.9)	3 (1.9)	146 (94.2)	110 (71.0)
Jeolla	92	56 (60.9)	28 (30.4)	1 (1.1)	2 (2.2)	5 (5.4)	84 (91.3)	57 (62.0)
Jeju	8	3 (37.5)	5 (62.5)	0 (0.0)	0 (0.0)	0 (0.0)	8 (100.0)	3 (37.5)

AAA (origin=school=hospital); AAB (origin=school ≠ hospital); ABB (origin ≠ school=hospital); ABA (origin ≠ school, & origin=hospital) and ABC (origin ≠ school, school ≠ hospital, & origin ≠ hospital).

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Table 2. Migration from Schools to Hospitals by School Region

School region	Hospital region, n (%)*							Net gain or loss n (%)†	Rank of GRDP‡ per Capita	Hospital beds % (rank)§
	Seoul (n=176)	Gyeonggi (n=91)	Chungcheong (n=58)	Gangwon (n=7)	Gyeongsang (n=114)	Jeolla (n=58)	Jeju (n=3)			
Seoul (n=93)	80 (86.0)	9 (9.7)	1 (1.1)	1 (1.1)	1 (1.1)	1 (1.1)		+83 (+89.2)	1st	15.3 (3rd)
Gyeonggi (n=62)	23 (37.1)	38 (61.3)	1 (1.6)					+29 (+46.8)	5th	19.9 (2nd)
Chungcheong (n=63)	20 (31.7)	7 (11.1)	35 (55.6)		1 (1.6)			-5 (-7.9)	2nd	10.7 (5th)
Gangwon (n=34)	14 (41.2)	10 (29.4)	3 (8.8)	6 (17.6)	1 (2.9)			-27 (-79.4)	6th	3.5 (6th)
Gyeongsang (n=155)	24 (15.5)	17 (11.0)	4 (2.6)		110 (71.0)			-41 (-26.5)	3rd	34.8 (1st)
Jeolla (n=92)	13 (14.1)	9 (9.8)	12 (13.0)		1 (1.1)	57 (62.0)		-34 (-37.0)	4th	14.9 (4th)
Jeju (n=8)	2 (25.0)	1 (12.5)	2 (25.0)				3 (37.5)	-5 (-62.5)	7th	0.8 (7th)

*Empty cells indicate no case; †A net gain or loss refers to the sum of a gain and a loss of graduates in each region; the percent indicates the net gain or loss divided by the total number of graduates; ‡GRDP refers to gross regional domestic product and the ranks of 7 regions were consistent across years of 2005, 2006, and 2007; §Proportions of hospital beds as of 2007.

Table 3. Migration from Schools to Hospitals by Location

School location	Hospital location, n (%)			Nurses who left their school location, n (%)	Net gain or loss (%)*
	Capital (n=176)	Metropolitan (n=139)	Non-metropolitan (n=192)		
Capital (n=93)	80 (86.0)	4 (4.3)	9 (9.7)	13 (14.0)	+83 (+89.2)
Metropolitan (n=159)	26 (16.4)	98 (61.6)	35 (22.0)	61 (38.4)	-20 (-12.6)
Non-metropolitan (n=255)	70 (27.5)	37 (14.5)	148 (58.0)	107 (42.0)	-63 (-24.7)

*A net gain or loss refers to the sum of a gain and a loss of graduates in each region; the percent indicates the net gain or loss divided by the total number of graduates.

graduates still accounted for the majority (77.1%=148/192) of nurses working in non-metropolitan hospitals.

3. Factors associated with working in non-metropolitan hospitals

Results from the multiple logistic regression analysis on factors related to working in non-metropolitan hospitals are presented in Table 4. Among personal and family factors, older age (p=.013) and the father having less than 4 years of college education (p=.006), and geographic origin (p<.001) were associated with working in non-metropolitan hospitals. Nurses who grew up in a non-metropolitan area (vs. the capital) had a 3.492-fold increase in the odds of working in non-metropolitan hospitals (p=.001). Two nursing education factors were also related to working in non-metropolitan hospitals. Those who graduated from non-metropolitan schools had the greatest odds (OR=9.00; p<.001) of working in non-metropolitan hospitals; graduates from metropolitan schools also had a 2.608-fold increase (p=.035) in the odds of working in non-metropolitan hospitals when compared with graduates from the capital area. Having a diploma (vs. baccalaureate) degree was also associated with an increase in the odds of working in non-metropolitan hospitals (OR=2.83; p<.001).

DISCUSSION

We found tendencies for new graduate nurses to move from poor to rich regions and from non-metropolitan areas to the capital or other metropolitan areas. First, nurses moved from poor to rich regions, with a strong tendency toward moving to the capital (i.e., the richest region) regardless where they graduated from. This movement to the capital resulted in the greatest net gain of new graduates from migration. In contrast, the Gangwon and Jeju regions with the lowest economic status had the greatest loss of new graduates. Second, new graduates moved from non-metropolitan areas to the capital or metropolitan areas. Whereas 17.5% of graduates from capital or metropolitan schools moved to non-metropolitan hospitals, 42% of graduates from non-metropolitan schools moved to the other areas. These findings support our knowledge that nurses tend to move from poor to rich and from rural to urban areas.

Despite the fact that nurses tended to move from poor to rich areas, interestingly, the Gyeonggi region, which was fifth in the rank of the GRDP per capita, had a net gain of 46.8% from migration. This gain may

Table 4. Factors Associated with Working in Non-metropolitan Hospitals

Variables		n (%) or M ± SD	Odds ratio (95% CI)	*p*
Personal and family	Age (year)	24.24 ± 2.19	1.17 (1.03-1.32)	.013
	Female (vs. male)	481 (94.9)	1.13 (0.40-3.21)	.816
	Married (vs. not)	33 (6.5)	0.48 (0.17-1.41)	.184
	Father with less than 4years of college education (vs. not)	402 (79.3)	2.37 (1.29-4.38)	.006
	Geographic origin			< .001
	Capital	80 (15.8)	1	
	Metropolitan	164 (32.3)	0.73 (0.32-1.70)	.470
	Non-metropolitan	263 (51.9)	3.49 (1.69-7.20)	.001
Nursing education	School location			< .001
	Capital	93 (18.3)	1	
	Metropolitan	159 (31.4)	2.61 (1.07-6.34)	.035
	Non-metropolitan	255 (50.3)	9.00 (4.02-20.1)	< .001
	Diploma (vs. baccalaureate)	366 (72.2)	2.83 (1.63-4.92)	< .001

be attributed to not only having the second highest proportion of hospital beds, but also its geographical location, surrounding the capital city. The Gyeonggi region is full of commuter towns of the capital city. Unlike the other areas classified as "non-metropolitan," the Gyeonggi region offers the convenience of accessibility to the capital with living conditions and environment for an urban lifestyle. Therefore, geographic characteristics and other factors (e.g., historical and cultural context) should be considered in the analysis of geographical imbalances. Interactions of these economic, geographic, and cultural characteristics may result in geographical segregation when a specific region has a great loss but little gain of nurses from migration. When geographical segregation exists in certain regions, government and nursing policies are required to ensure that those regions be more self-sufficient to have a sustainable supply of the nurse workforce.

We found that both personal and family, and nursing education factors were related to working in non-metropolitan hospitals. First, as a personal factor, nurses who grew up in non-metropolitan areas were more likely to work in non-metropolitan hospitals, which is consistent with the literature (Grobler et al., 2009; WHO, 2010). This suggests that the nurse shortage in rural areas could be reduced by selecting more students with rural backgrounds. This suggestion is consistent with the recommendations by the WHO of using targeted admission policies to enroll students with rural backgrounds. Similar to a few other Asian countries (WHO), the Korean government has a policy that colleges and universities have special quotas for students from rural areas or low-income families to increase equal opportunities in education (Korean Council for University Education, 2012). Future research is required to track nursing students who are admitted through this policy and to examine whether they are more likely to work in rural areas and thus contribute to reducing geographical imbalances in the nurse workforce.

As a family factor, father's educational level (i.e., a proxy of family's SES) was associated with working in non-metropolitan hospitals. Serneels and colleagues (2007) also reported that nursing students with lower parental income were more willing to work in rural areas. It is possible that students from families with lower SES could have a greater motivation to help the poor, which has been reported to be related to working in rural areas (Serneels et al.), but was not measured in the study reported here. More information is required to measure family SES accurately in future studies. This relationship may also indicate that service-requiring scholarships might attract students from low-income families and also meet their greater needs for financial assistance than students from high-income families.

Regarding nursing education factors, nurses who graduated from non-capital schools were more likely to work in non-metropolitan hospitals. In particular, graduates from non-metropolitan (vs. capital) schools had the greatest odds (OR=9.001) of working in non-metropolitan hospitals. This suggests the need for increasing admission capacities (e.g., the number of enrolled students each year) in rural nursing schools, as the WHO (2010) recommended locating schools outside of capitals and other major cities. As another educational factor, holding a diploma (vs. baccalaureate) degree was associated positively with working in non-metropolitan hospitals. When countries like Korea are reducing the absolute number or proportion of admission capacities in non-baccalaureate programs, the effects of the reduction

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on geographical imbalances needs to be analyzed.

Although we were not able to identify the reasons why nurses moved from non-metropolitan to metropolitan areas in this study, better work environments and greater opportunities for further education and career development in metropolitan hospitals are expected to contribute to their migrations (Hegney, McCarthy, Rogers-Clark, & Gorman, 2002). In Korea, there has been a nurse shortage in small rural hospitals (Yoo & Choi, 2009). To resolve the nurse shortage in these hospitals, the Korean government has approved new nursing schools and increased admission capacities in existing nursing schools, which has resulted in an increase in admission capacities by 27%, from 11,147 in 2006 to 14,124 in 2010 (Chung, 2009; Korean Nurses Association, 2007). However, even after increasing admission capacities, the media still reports difficulties in recruiting and retaining nurses in small, rural hospitals (Cho, 2011). Merely increasing the overall supply of nurses may not resolve the root causes of geographical imbalances, but rather could cause a surplus of nurses in the capital or metropolitan areas. Therefore, evidence-based interventions targeting specific causes of geographic imbalances should be implemented in the future, as the WHO (2010) has recommended.

Last, this study provides an example of how to analyze nurses' migration patterns that is applicable to other health professionals and other countries. Having a bigger picture of migration patterns can guide different stakeholders to develop evidence-based policy interventions. For example, migration patterns differed by school region and particularly, the proportions of graduates who had their first employment in their school region (i.e., Pattern AAA or Pattern ABB) ranged from 17.6% to 86%. This is similar to a study by Robinson et al. (2008) that reported regional variations in retention of locally trained nurses. These regional variations in migration patterns indicate that when the government decides to allocate or reallocate nursing schools in certain regions, the decision should be based on the migration patterns of graduates in these regions: how many local students are admitted, move to other regions to have their first employment, and return back to work where they had grown up. By analyzing changes in nurses' migration patterns, researchers can examine the impacts of policy interventions on reducing geographical imbalances.

This study has limitations. First, although the GOMS used in this study was nationally representative data, a few regions had a smaller number of new graduates. Therefore, oversampling graduates from those regions with a smaller number of new graduates will be necessary in future studies. Second, factors associated with working in rural areas reported in the literature (e.g., exposure to rural health during studies, motivation to help the poor) were not examined fully due to limited information in the GOMS on individual and educational characteristics. Third, because the study sample consisted of only new graduate nurses, the findings may not reflect movements of experienced nurses who would migrate in different patterns.

CONCLUSION

This study provides empirical evidence that nurses move from poor to rich regions and rural to urban areas. Just as the WHO has recommended the application of mutually reinforcing combinations or bundles of policy interventions (Dayrit, Dolea, & Braichet, 2010; WHO, 2010), we also recommend possible interventions to reduce geographical imbalances. First, we suggest that nursing schools need to be proactive in recruiting students from rural backgrounds and provide service-requiring scholarships, particularly for students from low-income families. Second, the government needs to increase admission capacities in rural nursing schools. Future studies are needed to produce more evidence on nurses' migrations and factors affecting their decision to work in rural areas. Using this scientific evidence, government and nursing policymakers are also required to develop and evaluate evidence-based interventions to reduce geographic imbalances in the nurse workforce.

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