

7. SUSTAINABLE NURSING HUMAN RESOURCES SYSTEMS

Allison Squires, PhD, RN; Christine Kovner, PhD, RN, FAAN; and Ann E. Kurth, PhD, CNM, FAAN

“A system is an interconnected set of elements that is coherently organized in a way that achieves something” (Meadows 2008). Systems thinking, as applied to nursing human resources, offers researchers and policymakers a way to explore the dynamics of producing and maintaining the nursing workforce in a manner that can meet population health demands. In this paper, we provide a conceptual model and proposed strategy for thinking about ways to create sustainable systems for nursing human resources within the broader context of health systems strengthening. We provide high-, middle-, and low-income country case examples from the United States, Mexico, and Tanzania to illustrate our thinking on the subject. The paper concludes with strategic recommendations for research, policymaking, and funding studies and programs that will create sustainable systems for nursing human resources in a variety of contexts.

DEFINING THE ISSUES

Most countries face some form of episodic or persistent shortage of nursing human resources (NHR), the largest health cadre globally (Oulton 2006). The common parameters for determining when there is a shortage of nurses is that there are more jobs available than there are nurses willing to take them at the prevailing wage. There are multiple reasons for the global nursing shortage; some are country-specific and some due to the nature of the profession itself. We posit that there is a uniform way to examine NHR development issues across countries, including the reasons for shortages, by studying the problem using systems thinking.

Meadows (2008) succinctly defined a system as “an interconnected set of elements that is coherently organized in a way that achieves something” (3). An evolutionary process creates a system that reinforces itself, but also one is capable of evolving within shifting contextual circumstances. In the case of systems thinking, this is known as changes in the feedback loops of the system.

Abbott (1988) first introduced the concept of a system as associated with professions and how they operate as a group. His work stressed professional behavioral elements—membership in professional organizations, regulation, jurisdiction over specific types of client services, continuing education offerings, and so forth—as key components of a professional system because the organization of professions dictates that members of the professional body adhere to a certain set of standards for practice, behavior, and social contribution. Other elements of a professional system include social and institutional power dynamics, market dominance, and gender issues (Bourgeault, Benoit, and Hirschhorn 2009; Bolton and Muzio 2008; Freidson 1970; George 2007; Johnson 1972; Larson 1977; Timmermans 2008). Squires (2007) also explored systems-based concepts specifically in relation to the nursing profession and identified eight dimensions in that system: economic, political, sociocultural, unions, the workplace, intraprofessional development dynamics, historical,

and international influences. The descriptive study drew heavily from traditional sociological theories around professions and theorized that those eight dimensions influenced the dynamics of nursing human resources and the profession itself, regardless of country.

In the case of an NHR system, the simplest description of its purpose and elements includes producing NHR through the country's educational system and keeping them in the workforce long enough to sustainably address population health needs. An effective and sustainable NHR system addresses the needs of the individual, professional group, and in the case of nurses, individual patient and population health outcomes. Its "achievement" is its ability to produce nurses to meet population health needs and keep them engaged in practice and the profession so the resulting effects on health outcomes are sustainable. How well the NHR system functions and the quality of its products relate to the overall quality of the professional institution of nursing and related infrastructure in the country. For example, the strength of the educational and health systems will directly impact the NHR system since they are all intertwined (Frenk et al. 2010). A weak educational system will not prepare potential nurses well in basic skills such as reading, writing, and mathematics. That means that nursing schools must then make up for that knowledge deficit. A weak health care system cannot hire nurses or retain them in the workplace because working environments are poor or financial resources for adequate salaries do not create adequate retention incentives.

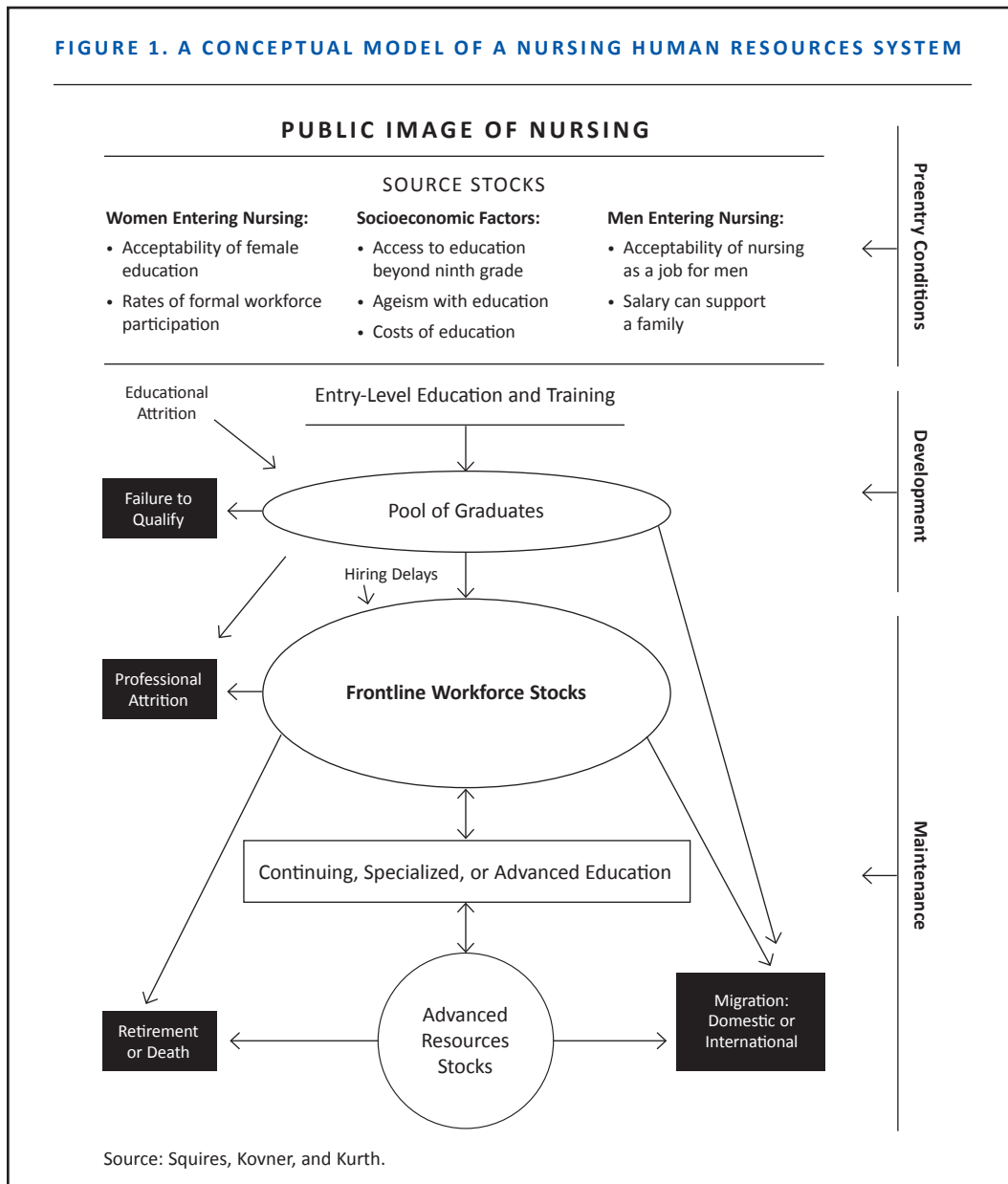
Therefore, the purpose of this paper is to apply systems thinking to NHR to set a twenty-first-century agenda for informing research, policy, and funding. It is a synthesis of the major evidence from the field. We provide a conceptual model of how we envision an NHR system, including key inflow and outflow points, where the system is vulnerable to stock depletions, and where feedback loops occur. Three case studies of NHR apply the conceptual model and discuss how research and policy strategies by key actors in the country addressed systemic problems that have contributed to the nursing shortage in the country.

A CONCEPTUAL MODEL OF A NURSING HUMAN RESOURCES SYSTEM

Figure 1 provides our conceptualization of an NHR system. The key starting input point is the public image of the nursing profession in the country. How the public views nursing is based on the value of its service to society, interactions with patients in the health care system, entry level of education, perceptions of job security, salaries, opportunities for advancement, and other individual goals (intellectual, altruistic, etc.) (Fletcher 2007). Unions and professional organizations may contribute to the public perception of the profession. The public image subsequently attracts or deters individuals to or from choosing nursing as a career. If nursing has a positive public image, then recruitment into the production system is not a problem. In

another scenario, nursing could have a positive public image and have enough entrants, but jobs remain scarce. Candidates may take the risk of obtaining the education simply to have a degree. When the public image of nursing is poor, sustaining stocks of NHR becomes problematic and standards for entry drop in order to attract more candidates to schools. Like having too few nurses, that situation often translates into poorer quality personnel working in the field and, subsequently, worse patient outcomes.

FIGURE 1. A CONCEPTUAL MODEL OF A NURSING HUMAN RESOURCES SYSTEM



A professionalization project is the process by which an occupational group develops the characteristics of a profession (Abbott 1991). Therefore, historical factors will also influence the identity of who becomes a nurse and the profession's present state of development. For example, if nurses have historically come from a particular socioeconomic class or religious group in a country, then part of the public's perception of nurses comes from those associations (Birn and Solorzano 1999). Former colonial or regional political powers will also influence the state of the occupation's professionalization project (Birn 2006).

The next part of the model relates to "source stocks" that serve as key sources of input into the entry-level education part of the NHR system. For women, their access to education, participation in the formal workforce, and other gender-sensitive factors will influence their options and ultimately their choice of nursing as a career. For men, the overall job market, the acceptability of nursing as a male career, and its ability to support a family will be key factors for entry. Both sexes will be affected by access to education (at all levels) based on their socioeconomic status. Ageism in education may also affect the potential pool of candidates if older applicants are not allowed entry into the profession. In some countries, age restrictions around admission into public universities, where many nursing education programs are found, may deter older candidates (Cohn and Addison 1998). Faculty availability and other necessary components of entry-level educational programs will greatly influence the availability of student slots and how many qualified applicants are turned away.

Once accepted into an educational program, entrants either progress through the curriculum and complete programs or leave the program prior to completion (attrition). Family issues, financial reasons, and nursing not being the candidate's first career choice are the three primary reasons for educational attrition (Müggenburg 2004; Squires 2007). Familial issues are often tied to gender and economic circumstances, with some families prioritizing short-term economic stability over education, thereby causing candidates to leave programs. Financial reasons may be tied to familial or individual circumstances and either deter entry into or impede progression through a nursing education program. Career choice is the last issue and more prevalent in countries where university entry exam scores determine the choice of study. In some universities in Mexico, for example, students with low entry scores are placed automatically into nursing programs even if the student has no interest in studying for the career (Squires 2007). Academic progression issues may also arise if the candidate does not have the skills and abilities to pass nursing courses. As a result of the conditions noted, nursing programs may experience high attrition rates—a major delay point in the NHR system that affects the annual pool of graduates that will enter the market for jobs.

Graduation rates create a pool of candidates who, in many countries, must pass a licensing, certification, or registration exam. These exams or equivalent credentialing processes are designed to protect the public from unsafe practitioners—candidates who may not possess

the knowledge, skills, and abilities to safely deliver nursing services to vulnerable clients. While necessary for public safety, the licensure or credentialing process is a key delay point in the system. Failure to qualify for professional credentials or licensure decreases the graduate workforce stocks. At the same time, a lack of a credentialing system may contribute negatively to the public image of nursing since consumers may feel they have little recourse to alert governing authorities to poor quality of care provided by nurses.

Once a nurse obtains his or her license, in some countries a lack of nursing jobs and/or hiring delays may mean waiting a year or longer for employment. This is the case in Mexico, where labor wastage among bachelor's-prepared nurses is high (Nigenda et al. 2006). In another scenario, there may be many jobs, but those are in undesirable locations, have poor work circumstances, or are unfunded positions. At this point and depending on the country, the risk for migration for employment (domestic or international) increases, as does the risk for professional attrition. Nurses may opt not to move for work, thereby delaying entry into the workforce or contributing to professional attrition due to a lack of local employment opportunities in nursing. Recent work by Kovner and colleagues (2011) in the United States suggests that nurses tend to take jobs within 100 miles (60 kilometers) of where they finished twelfth grade (or equivalent).

We propose that after credentialing or licensure, there are two phases of a nursing career that are defined by the location of employment and create two sets of NHR stocks in the system: frontline workers and advanced resources. A frontline clinical position involves providing direct patient care services in an entry-level (e.g., hospital staff nurse) or in an advanced practice role (e.g., nurse practitioner in primary care). Frontline positions might occur in a hospital, nursing home, primary care clinic, nongovernmental organization (NGO), community-based organization, or public health organization. With the exception of nurse practitioner (or equivalent) roles, career advancement opportunities for most frontline nurses present themselves as the opportunity to move away from frontline clinical positions into administrative, educational, research, and other roles within the profession—roles forming the part of the system comprising “advanced resources stocks.” These roles are also important for system sustainability because they facilitate health system operations, contribute to producing additional workforce stocks, and create the evidence that supports clinical practice and informs human resources for health policymaking. Advanced resources stocks are also heavily intertwined with the functioning of the educational and health care systems of a country.

With the sources of the stocks established, the employing organization becomes a key factor in sustaining the NHR system (and subsequently the health care system) or encouraging losses. As hundreds of studies from around the world repeatedly demonstrate, wages and the practice environment, nurse-to-patient ratios or workloads, administrative systems, availability of child care services, and opportunities for internal or external advancement keep nurses working in these positions (Aiken et al. 2003; Aiken et al. 2008; Blegen et al. 2011; Burnes Bolton et al. 2007;

Etchegaray et al. 2010; Friese et al. 2008; McHugh et al. 2011; Schenkel 2011; Spetz 2008; Squires and Juárez 2012; Van den Heede et al. 2009). This is true of hospital and primary care settings and public and private organizations; none are immune to these issues. Organizational-level problems can also contribute to a negative public image for nursing personnel since patients experience their interactions with nurses within a health care organization.

A discussion of health care organizations, if we consider the scope of where nurses work around the globe, would be lacking without a discussion of NGOs. For some countries, NGOs also play important roles in creating employment opportunities for NHR. Their involvement in this process varies widely between countries so the discussion in this paper is limited to generalities.

In some cases, NGOs may draw nursing staff away from “traditional” workplaces in hospitals or primary care settings (public or private) for frontline or advanced resources positions. They can offer career advancement opportunities and, sometimes, higher salaries than nurses would receive in traditional settings. For the individual worker, an NGO can provide added security in countries where social or political instability hinders health system operations and increases a worker’s sense of vulnerability.

At the same time, NGOs do recruit qualified workers away from the public and private systems where they are often desperately needed, especially the public one. Pay differentials offered by NGOs can create system imbalances, especially within the public sector, affecting frontline resource stocks. The singularity of their missions may also mean that NGOs are a wealth of resources that could contribute to strengthening the nursing system, but do not extend their scope beyond the programmatic mission. For local health workers, this dynamic can create a sense of “NGO fatigue” or frustration when training initiatives are imposed on them without a proper needs or sustainability assessment. NGOs may also contribute to overburdening nurses in the local health system through “task shifting gone wrong”—where a nurse already challenged by high patient-to-nurse ratios now assumes pharmacy and lab technician roles, among many others.

An NGO’s main challenge is to not exacerbate stock imbalances within the system and, ideally, contribute to system strengthening. Carefully developed recruitment plans are the best way to avoid contributing to system imbalances. For example, an NGO that recruits experienced nurses (five or more years of experience) creates an opportunity for career advancement for experienced nurses in the frontline workforce stock, thereby creating room for new graduate nurses to enter the system. NGOs that are fully cognizant of the ethics behind their hiring practices and that see themselves as part of the nursing human resources system contribute the least to system instability.

A highly functional and sustainable NHR system adapts to changing socioeconomic conditions, produces enough nurses to replace those lost to attrition factors (e.g., changing careers, disability, retirement, death), and adjusts for population growth. Ideally, organizational factors are minimal sources of stock losses. We now illustrate how the model applies in three

different case studies. Tanzania and Mexico serve respectively as the cases for low- and middle-income countries. The United States provides an example for high-income countries.

Case Study 1: Tanzania—A Nursing System Crisis

Like twenty-nine other countries in sub-Saharan Africa (SSA), Tanzania is in the midst of a severe nursing human resources crisis with only about 29,000 nurses for a country of 45 million (TNMC 2012). Tanzania would need to reach 100,000 nurses to meet the WHO minimum requirements of 2.3 health care workers per 100,000 population (WHO 2006). It is, unfortunately, an example of a system with major stock losses from multiple points of vulnerability. These vulnerability points come from a combination of both domestic and international policies that affect health system operations.

To begin, twenty-first-century nursing in Tanzania has a challenging public image. The great need for nurses guarantees a public perception of job security, and a strong educational history affords it a positive association with the middle class. Yet, extremely high patient-to-nurse ratios in almost every clinical setting, even the private sector, contribute to burnout among nursing staff and negatively affect their interactions with the public (Squires et al. 2012). The relationship dynamic contributes to the public's perception of nurses, thereby deterring entrants. While gender is not a deterrent to studying nursing in the country, socioeconomic conditions do prevent many individuals from pursuing nursing degrees. The high cost of nursing education and pressure from families to get training in something "quick" so the potential nurse can provide financial support to the family means many choose other fields. The 2008 Ministry of Health (MOH) policy change that reduced nursing education programs to two- and three-year options (from previous three- and four-year mandates) has increased enrollments in and graduates from nursing programs (TNMC 2012). It is too early in the policy implementation stage to determine educational outcome differences. Faculty shortages and limited classroom space in both public and private nursing programs, however, hinder the country's production capacity.

How did Tanzania arrive at this point? As numerous studies demonstrated, the roots of the problem go back to the late 1980s and early 1990s, when structural adjustment policies were imposed on Tanzania by international financial organizations such as the World Bank and International Monetary Fund (IMF). Meant to shift economies from state-driven entities to market-based ones, for health systems throughout Africa, these policies significantly contributed to severe weakening of health systems and negatively affected population health by eliminating gains made in earlier decades (Lugalla 1995; Songstad et al. 2011). Supplies disappeared, the quality of instruments and facilities deteriorated, and cost-saving initiatives targeted health workers and cut them from the system because human resources were and remain the single largest expense of any health care system (Loewenson 1993; Songstad et al. 2011). Salaries

would not get paid for months at a time because of delays in state payments due to the spending restrictions required by the international financial policies and, often, corruption (TNMC, personal communication, July 2012). Hiring was frozen, resulting in a feedback loop that undermined production. Coupled with the HIV epidemic, the effects were devastating to health system functioning.

In response, health workers of all cadres sought alternative employment solutions. Many migrated internally from rural to urban areas. When jobs disappeared or working conditions proved dissatisfactory, they migrated outside of the country. Many stayed within sub-Saharan Africa, migrating to Botswana or South Africa (Liese and Dussault 2004). Others hunted for employment in the common receiving countries involved in international nurse migration: the United Kingdom, Canada, and the United States. Within a decade of the early 1980s structural adjustment policy implementation, Tanzania's health system and its capacity to produce health care workers was in crisis (Lugalla 1995). Despite recent advances made through substantial international investment, the legacy of these policies remains today and still affects health workers (Songstad et al. 2011).

In the present, the nursing community and MOH officials are working to shore up the foundation of the profession. One benefit of the crisis is that it has created a culture of collaboration that makes government, professional, and private sector entities willing to work together. For example, the Tanzanian Nursing and Midwifery Council (TNMC), the independent national nursing regulatory body that maintains all nursing licenses in the country, spent the early part of the twenty-first century reviewing all the nursing registrations in order to determine how many nurses were actually still alive and working in the country. They have received support from the MOH for their operations, but do not rely on them primarily for financial support and are the organizational entity that serves as the main regulatory body in the country. License fees help support operations and other professional development initiatives. Meanwhile, the MOH's nursing division is able to check its own records against those of the TNMC as a data quality check, enhancing transparency and accountability for both organizations. Schools of nursing also increasingly rely on the TNMC to track their graduates, laying the foundation for studying career paths of nurses in the country.

To more strategically address the NHR crisis in the country and strengthen the system, key actors need more nursing-specific workforce research. While the National Institute for Medical Research (NIMR)—Tanzania's equivalent to the US National Institutes of Health and funded from both private and public monies—has a human resources for health unit that studies health workforce dynamics in the country, its research has focused largely on physicians and physician assistants. Studies about health workers in Tanzania published in international, peer-reviewed journals rarely differentiate between health worker cadres and report findings as though the issues they face are similar and singular, from the community health worker to the physician

(Squires et al. 2012). An NHR-specific research program would provide the MOH and other key actors the necessary information they need to develop the profession. It would also provide strategies for organizational strengthening initiatives that could improve retention and reduce burnout. Illustrating links between the deficit of nursing personnel and patient outcomes around HIV/AIDS, malaria, and other MOH-priority diseases will add a further sense of urgency to the problem and direct funding sources toward nursing-specific workforce studies.

Case Study 2: Mexico—Linking Long-Term Stability and Professional Infrastructure to Decrease Systemic Blockages

The health care human resources dynamic in Latin American countries is very different from the SSA region. Most of Latin America produces more physicians than it needs, resulting in an oversupply in all the middle-income countries and some of the low-income ones (Nigenda et al. 2011). Social class dynamics ensure that medical school enrollments are always at their peak as students seek the status and title associated with a medical school education. In most countries new graduates enter saturated markets where the only jobs available are in remote rural areas. Like most regions around the world, Latin America has not figured out how to ensure their physicians stay working in remote regions, so physician supply issues center on distribution problems.

NHR are altogether another story. Like nursing in SSA, most nurses in Latin America come from families of low socioeconomic status and are often the first in their families to complete high school or any level of university education (Malvárez and Castrillón Agudelo 2006). Men typically do not become nurses and are faced with multiple stereotypes when they enter the profession. Nursing education has multiple levels of entry and has not yet reached a standard for entry-level education, even though a bachelor's degree is the target. Nurses commonly give vaccinations and appear to have a simple role as a physician helper, which shapes the public perception of the profession throughout the region.

In the specific case of Mexico, the country has slightly over 200,000 formally educated nurses for a population of 110 million, with increasing numbers of personnel educated at the post-high school and baccalaureate levels (SSA 2012). The nursing system faces multiple roadblocks to successful functioning. Researchers have captured the issues around work environments of nurses and hiring barriers in studies (Nigenda et al. 2006; Squires and Juárez 2012) with multiple opportunities for organizational and institutional strengthening needed to address systemic issues. Migration to English-speaking countries is not common in Mexico because of the language barrier. Not even a free trade agreement like the North American Free Trade Agreement (NAFTA) could overcome that obstacle to migration for nurses (Squires 2011). There is some immigration to Spain for nursing positions, but the 2008 economic crisis has stemmed that outflow. Domestic

migration issues reflect broader internal trends across the board with workers seeking employment predominantly in urban areas. Nurses with minimum basic training staff rural clinics, with recent medical school graduates being required, by law, to work there for a year (Vázquez Martínez 2010). Those nurses tend to stay in those communities for the duration of their careers (Squires 2007).

Meanwhile, with more than six hundred public and private nursing schools, Mexico does not face a production problem related to a lack of institutions. The explosive growth in private education in the country since the mid-1990s has ensured that enough educational institutions operate in the country to produce nurses. Most, however, do not have official accreditation so the quality of graduates varies widely. Enough master's level graduate programs exist to produce faculty, but a nurse's ability to pay for higher education is a deterrent to many who want to enter those programs and advance their careers. Entry-level production issues center mostly on admission policies, high attrition rates, and a lack of educational program regulation. Familial pressures often contribute to high attrition rates as female students experience greater pressure to leave school to support their families when tough economic circumstances arise.

After completing a nursing program, Mexican nurses need to complete a year of social service in the public sector, a time and experience equivalent to nursing externship programs in the United States. To obtain their nursing credentials, they must receive a passing evaluation during that year. The variability in graduate quality, with up to 30 percent of new graduate nurses failing to qualify at the professional level after their year of social service (Vázquez Martínez 2010), points to problems with educational quality and standards. The nursing profession does not have the resources to invest in national accreditation programs that can adequately respond to demand. Neither the Secretary of Health and Social Assistance nor the Ministry of Education has ever allocated supporting funds for this kind of institution. There is an optional licensure program in the country, which could serve as an additional educational outcomes check, but it is not mandatory. In a country with a shifting epidemiological profile that consists of increasingly complex patients with multiple chronic diseases, the nursing workforce may be underprepared to manage these kinds of patients. The health system may face increased costs and poor patient outcomes as a result. Continuing professional education, a potential short-term solution, is available to nurses in Mexico if they can afford the costs and obtain the time off from their jobs. Salaries and organizational policies determine both of these.

Our NHR system model, as applied to Mexican nursing, provides targets for strategic strengthening, suggesting that the NHR system in Mexico should focus on reducing systemic blockages to placing frontline workers in full-time positions and creating ways to increase the number of advanced resources stocks. Stronger regulatory mechanisms in the education sector and a professional licensure system would provide the health care system and consumers with a higher-quality nursing graduate who is more capable of handling the complexity of patients with noncommunicable diseases.

Case Study 3: The United States—A Case of Temporary or Permanent NHR System Stability?

In general, high-income countries tend to have better nursing workforce data available for analysis and policymaking. That kind of data quality is reflected in this section as we analyze the case of nursing in the United States. With 3.1 million nurses and one of the highest nurse-to-population ratios in the world at 9.8 per 1,000 (ANA 2012), the United States has had cyclical nursing shortages (defined as more jobs than nurses willing to take those jobs at the prevailing wage). Although the worldwide recession has abated the latest domestic nursing shortage, researchers posit that as the economy improves, nurses will reduce hours and older nurses will retire (Auerbach, Beurhaus, and Staiger 2011). Using our conceptual model about NHR (shown in figure 1) allows us to identify decision points at which US policymakers and donors could intervene in the system's production and sustainability processes, thereby moderating future supply-and-demand changes.

Beginning with the public image element of the model, the US public highly regards nurses, with national polls consistently showing nurses among the top ten most admired and trusted professionals (Jones 2010). Nursing positions, historically, tend to be secure, with nurses rarely getting laid off due to service reductions. Slow hiring is the main issue during economic downturns and that will vary by region of the country.

The entrants into nursing have a variety of postsecondary educational program options that range from two-year associate to several-year master's degree programs. There is also now a target date by which the entry degree for advanced practice nursing credentials is to be at the practice doctorate level, known as the doctor of nursing practice (DNP). Public education is free through secondary school. Each state has its own system of higher education that is highly subsidized, but private higher education remains a choice for many people. However, many qualified students are refused admission due to lack of slots in academic programs (Kovner and Djukic 2009). Furthermore, not all of those students who enroll graduate. One estimate of the graduation rates from nursing bachelor's programs is about 89 percent and 71 percent for associate degree programs (Kovner and Djukic 2009), but these numbers are not validated.

Following graduation, potential nurses must take the National Council Licensure Examination, the passing of which all states and territories accept as the qualification for licensure. About 88 percent of US-educated nurses passed this examination on their first try in 2011 (NCSBN 2012), compared to about 34 percent for internationally educated nurses.

While the proportion of male students continues to increase, the more than three million US nurses are primarily white, female, and middle-aged (HRSA 2012). About 85 percent are employed (more than two-thirds full-time), most often in hospitals (62.2 percent). US nurses are well paid compared with other predominately female occupations in the United States, with an average salary of US\$66,973 in 2008.

Most new US nurses work in hospitals and form the majority of frontline workforce stocks (Kovner et al. 2007), where they often have flexible work options including three to four twelve-hour shifts per week. Some may also have more than one nursing job, but those data are difficult to track. Their work environments vary by the specific setting and ownership. Over their early career these registered nurses (RNs) gradually leave their first RN job (18.8 percent by the end of their first year); some move out of hospital work, but most go to other hospitals (Kovner et al. 2007). By 4.5 years after starting their first job, almost half have left that first job (Kovner, Brewer, and Greene 2009). They begin to leave hospital work and instead work in the many occupational settings that employ nurses, such as ambulatory care or nursing homes. A small percentage leave frontline nursing roles; some return to school to obtain a bachelor's or graduate degree, which offers them the opportunity for a wider selection of frontline positions or roles included in advanced resources stocks. For example, many become nurse practitioners. Alternatively, some leave nursing to become stay-at-home parents or to work in another career.

US nurses can readily move from state to state. Although each state and territory has its own licensing or qualifying board, the boards recognize each other's license, and nurses can obtain a license by supplying documentation and a fee. Additionally, a group of states called "compact states" automatically recognize licensure from states within the group as a way to facilitate interstate practice.

Many nurses work in frontline clinical positions for their entire career. Others' careers develop into advanced resources roles through three main areas of progression. Through education and experience, nurses become advanced clinical nurses with positions such as nurse practitioner (NP) or clinical nurse specialist, both of which now require master's degrees in nursing. Because of the master's degree requirement, these nurses can also work in entry-level educational settings, which places the NP role in both the frontline and advanced resources stocks in the US NHR system. To further solidify an NP's ability to contribute from the advanced resources position, the American Association of Colleges of Nursing, the accrediting body for bachelor- and higher-degree nursing programs, will require a doctorate of nursing practice for graduates of nurse practitioner programs by 2015 (AACN 2004). Otherwise, at least a master's degree is required to teach in a nursing educational program, and positions in most baccalaureate programs require a doctorate in nursing or a related field. Nursing and hospital management offers another career progression opportunity; however, most nurse managers do not have graduate degrees and in fact many only have an associate degree (HRSA 2012). Similarly, nurses can advance by working in nursing education, either in nursing programs or within an educational program in a care delivery setting. Nursing informatics, legal consultation, and health care consulting are other options for career progression for entry-level nurses.

The Patient Protection and Affordable Care Act (ACA) and the impending retirement of a large percentage of the working nursing population in the next ten years are two factors that will

contribute significantly to frontline and advanced resources stock levels. Auerbach, Beurhaus, and Staiger's recent analysis of entrants into nursing suggests that the United States has reached replacement levels due to enrollments of nursing students in their twenties (2011). That means there are enough people studying nursing to replace those who retire. The exception is the nurse faculty shortage, which will have a significant effect on the system's ability to keep frontline and advanced resources stocks at the levels needed for optimal system functioning. The ACA is a bit of an unknown variable in terms of how it will affect the nursing system. It could increase demand or keep levels where they are; much will depend on how administrators view cost control initiatives: Do they staff an organization to prevent the costs of complications or take the risk for lower staffing to save shorter-term costs? Only time will tell.

In conclusion, applying the conceptual model to US nurses helps us identify the various points at which nurses leave and enter the workforce and potential barriers to practice. It also offers new directions for research in the areas of career progression studies and workforce forecasting. Ongoing studies are examining career progression issues in the country, but this is a relatively new area of study for the United States.

FUTURE DIRECTIONS: RESEARCH, POLICY, AND FUNDING

With this NHR system model applied to three very different countries, the case studies illustrate its applicability across different income categories, settings, histories, and variations in professional and health systems infrastructure strength. It also provides a standardized language to discuss and frame nursing human resources issues. The cases also suggest that the model may be useful for developing a nursing workforce research agenda and making policy recommendations that are country-specific. Funders can also work with key actors for determining where the most strategic investments can be made that will have the greatest impact in developing NHR, the oft-cited "backbone" of every health system.

From the three case studies, it is also clear that researchers, policymakers, and funders need better and more consistent data about the nursing workforce and its places of employment. Without accurate data, positive policy change is impossible. Around the world, many countries or regions are working to improve their health care human resources datasets. World Health Organization country profiles show that countries report "nurses" in a single category that includes anyone with a formal nursing education, whether an associate degree holder or a doctorally prepared nurse. The auxiliary nursing role is sometimes categorized separately, but many of those personnel may fall into the "nurses" category (Nigenda et al. 2011). Some countries do track midwives separately. Overall, however, these data are insufficient for creating sustainable NHR systems and analyzing their performance.

At the national and regional levels, countries need to know not just how many nurses there are, but also the different categories of nurses, including nurse's aides, practical or enrolled nurses, registered nurses, nurse-midwives, advanced practice nurses (where recognized and available), educators, administrators, and those prepared to conduct research. Where entry-level education varies, educational preparation data must also be tracked (Frenk et al. 2011). Standardized credentialing language would also go a long way in determining educational and role equivalency across regions and between countries. Educational institutions also need to report attrition and graduation rates. Patient care organizations need standards for reporting about nurse-to-patient ratios at the bedside in different clinical settings. Standardized reporting of patient outcome data would also allow researchers to examine relationships to NHR. Incentives for accurate and complete reporting, along with regular audits, are needed to reduce corruption.

Each role—researcher, policymaker, and funder—is key in the data development process, and the model can serve as a directional guide. Funders, collaborating with policymakers, can use it to determine where to best direct their resources. Researchers need funds to build the systems to track workforce data and study them, along with gathering data about work environments. Health system leaders will then have a stronger evidence base from which they can make decisions and take steps to improve retention rates and reduce those costs to the system. Many of these collaborations can have a huge impact on NHR in low- and middle-income countries simply because they have never been done before.

Overall, however, the greatest impact these studies would have is on health system financing because they will illustrate the systemic costs of personnel shortages, educational preparation, and their subsequent relationships to patient outcomes. For example, if a US-based study demonstrated that the addition of about 150,000 nurses to the US health care system would reduce costs just related to medical errors by US\$6 billion (Dall et al. 2009), imagine what similar analyses could do for low- and middle-income countries.

Any conceptual model cannot include all factors that may influence a system, and the complexity of the twenty-first-century world means the themes highlighted by the model need additional, country-specific detail. For example, professional associations will play a role in the system in countries that have them. At present, however, not all countries do, so they do not factor into the model at this time.

In conclusion, sustainable nursing human resources systems are key to strong health care systems. Systems can improve if collaboration occurs among the nursing profession, researchers, policymakers, and funders and have the potential for making a significant impact on patient outcomes in a country. The NHR systems model provides a place for all key stakeholders involved to conduct an assessment, develop a plan, monitor implementation, and evaluate results.

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ABOUT THE AUTHORS

Allison Squires is an assistant professor of nursing in the Global Division at NYU College of Nursing. She received her PhD from Yale University and BSN from the University of Pennsylvania. Her research concentrates on health care human resources development in low- and middle-income countries. She has participated in studies involving thirty countries, with current projects based in Mexico, Ghana, Tanzania, and the Republic of Georgia. She also works as a consultant with the Migration Policy Institute, maintains a research scientist appointment at NYU School of Medicine, and is affiliated faculty with the NYU Center for Latin American Studies and the Center for Drug Use and HIV Research.

Christine Kovner is a professor at NYU College of Nursing, a senior faculty associate at the Hartford Institute for Geriatric Nursing at NYU, and a nurse attending at the NYU Langone Medical Center. She also serves on the executive committee of NYU's Clinical Translational Science Institute. Kovner's research focuses on quality improvement, RN working conditions, and the cost of nursing care. She is the principal investigator of a grant from the Robert Wood Johnson Foundation that studies the career trajectories of newly licensed registered nurses. She received her PhD from NYU. She is a fellow of the American Academy of Nursing and is a licensed registered nurse.

Ann E. Kurth is a professor at NYU College of Nursing and executive director of the Global Division, which promotes translational science to address global health disparities. She also serves as an associate dean at the NYU Global Institute for Public Health. As a nurse epidemiologist, Kurth focuses her work on HIV/sexually transmitted infections/reproductive health prevention, screening, and care, as well as on global health workforce issues. Her research has been funded by the NIH, the Bill & Melinda Gates Foundation, UNAIDS, the CDC, HRSA, and others. Kurth is a fellow of the American Academy of Nursing and of the New York Academy of Medicine. She received her PhD in epidemiology from the University of Washington and is a certified nurse-midwife.

Address correspondence to Allison Squires at aps6@nyu.edu

AUTHOR CONTRIBUTIONS

Allison Squires led the writing and developed the concept for the paper and the model behind it. She also wrote the Tanzania and Mexico case studies.

Christine Kovner wrote the US case study, contributed to refining the conceptual model, and helped edit the final version of the manuscript.

Ann E. Kurth contributed to the Tanzanian case study, added content about NGOs, and helped refine the conceptual model. She also reviewed the final manuscript.

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