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National nursing science priorities: Creating a shared vision

Patricia Eckardt, PhD, RN[a,*], Joan M. Culley, PhD, MPH, RN, CWOCN, FAAN[b], Elizabeth Corwin, PhD, RN, FAAN[c], Therese Richmond, PhD, CRNP, FAAN[d], Cynthia Dougherty, ARNP, PhD, FAHA, FAAN[e], Rita H. Pickler, PhD, RN, FAAN[f], Cheryl A. Krause-Parello, PhD, RN, FAAN[g], Carol F. Roye, EdD, RN, CPNP, FAAN[h], Jessica G. Rainbow, BSN, BA, RN[i], Holli A. DeVon, PhD, RN, FAHA, FAAN[j]

[a] Molloy College Barbara H. Hagan School of Nursing, Rockville Centre, NY
[b] University of South Carolina College of Nursing, Columbia, SC
[c] Emory University Nell Hodgson Woodruff School of Nursing, Atlanta, GA
[d] School of Nursing, University of Pennsylvania, Philadelphia, PA
[e] School of Nursing, University of Washington, Seattle, WA
[f] The Ohio State University College of Nursing, Columbus, OH
[g] College of Nursing University of Colorado Anschutz Medical Campus, Aurora, CO
[h] Pace University College of Health Professions, Pleasantville, NY
[i] School of Nursing, University of Wisconsin-Madison, Madison, WI
[j] University of Illinois at Chicago College of Nursing, Chicago, IL

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ABSTRACT

Background: Nursing science is essential to advance population health through contributions at all phases of scientific inquiry. Multiple scientific initiatives important to nursing science overlap in aims and population focus.

Purpose: This article focused on providing the American Academy of Nursing and nurse scientists in the Unites States with a blueprint of nursing science priorities to inform a shared vision for future collaborations, areas of scientific inquiry, and resource allocation.

Methods: The Science Committee convened four times and using Delphi methods identified priorities with empirical evidence and expert opinion for prioritization, state of the science, expert interest, and potential target stakeholders.

Discussion: Nursing science priorities for 2017 were categorized into four themes including: (a) precision science, (b) big data and data analytics, (c) determinants of health, and (d) global health.

Conclusion: Nurse scientists can generate new knowledge in priority areas that advances the health of the world's populations.

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* *Corresponding author:* Patricia Eckardt, Molloy College Barbara H. Hagan School of Nursing, 1000 Hempstead Avenue, Rockville Centre, NY 11570.
E-mail address: peckardt@molloy.edu (P. Eckardt).

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Introduction

Nursing science is essential to advances in population health through contributions at each phase of scientific inquiry from bench to implementation science (Fawcett & Ellenbecker, 2015). There are numerous priorities important to nursing science and they often overlap in aims and population focus. The American Academy of Nursing (AAN) serves the nursing community and the public by advancing health policy and clinical practice through creation, synthesis, and dissemination of knowledge and research findings. The Academy continually reevaluates the landscape of dynamic scientific programs and inquiry that affect health policy and practice to reassess and define strategic nursing scientific priorities that advance the mission of the Academy. The Council for the Advancement of Nursing Science (CANS), an open membership entity of the Academy, was established in 2000 to foster better health through nursing science (http://www.nursingscience.org/about/council-history). The CANS Science Committee is composed of nine regular members and two student members. The members were appointed from a pool of volunteer members by the CANS Leadership Council. The chair of the Science Committee in the chair-elect of the Council. The Science Committee provides recommendations to the Council, Academy, funding agencies, and other key stakeholders to influence national science policy, identify research priorities and issues relevant to knowledge development in nursing and health care, and provide expert opinion on scientific training and career development needs and issues. In August of 2016, the CANS Science Committee was asked by the Academy to identify national nursing science priorities and answer the following four questions: (a) Why is the item a priority? (b) What is the state of the science? (c) Who are the target stakeholders? and (d) Which Academy Expert Panels might address the priority? The purpose of this article was to provide the Academy and the national community of nurse scientists with a hierarchical blueprint of national nursing science priorities to inform future collaborations, lines of scientific inquiry, and resource allocation that is aligned with the Academy's mission and goals.

Methods

The Science Committee convened four times over an eight-month period (Figure 1) and used Delphi methods to determine nursing science priorities.

The initial session (Round I) involved reviewing the Science Committee's initial policy statement provided to the AAN Board in February 2016. Using a semi-anonymous format, of electronic querying of committee members for Round II, the Science Committee chairperson collated all committee members responses to the questions set forth by the AAN Board that included identifying emerging science priority areas. At the CANS Annual Scientific Conference in October 2016 (Round III), the Science Committee met and through an iterative voting process, narrowed a list of 18 topics to four thematic areas:

1. *Precision science* (includes omics, physiological, psychological, and environmental factors and also phenotypes, chronic disease, symptoms, self-management, and palliative care).
2. *Big data and data analytics* (includes informatics, technology, and topics such as data elements, data security, and bioethics).

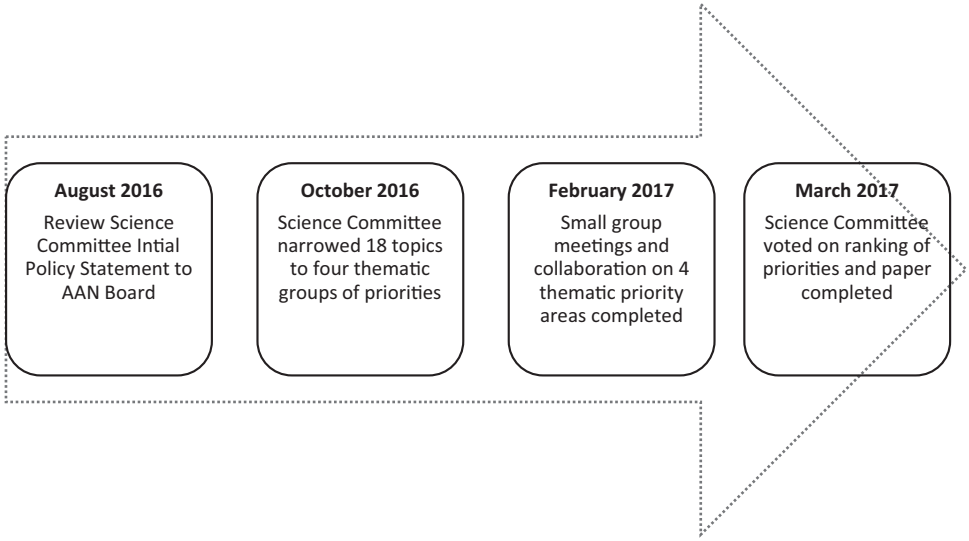

Figure 1 – Steps in determining science priorities for national nursing agenda.

Table 1 – Committee Members' Scientific Priority Votes

Priority	First	Second	Third	Fourth
Big data	3	1	3	
Global health				7
Health determinants	2	2	3	
Precision science	2	5		

Seven of nine members participated in *final* ranking.

3. *Health determinants* (includes health disparities, chronicity, workplace violence, military health, veterans, health promotion, and cognition).
4. *Global health* (includes nursing care in under-resourced countries, emerging infectious diseases, and the threat of epidemics).

For each thematic area, committee members gathered empirical evidence and expert opinion regarding rationale for prioritization, state of the science, expert interest, and potential target stakeholders. The committee members volunteered to work on specific priority areas based on their own expertise and programs of research. After small group meetings and collaboration, the committee reconvened and drafted a full statement regarding the four identified priorities. Last, after vetting the statements of each workgroup and further discussion and information sharing (Round 4), each committee member was invited to ranked the four priorities in order of importance (Table 1).

Findings

The findings are presented by scientific priority addressed and three of the four questions answered: Why is this a priority? What is the state of the science? and Who are the target stakeholders? Each priority area was found to be a shared priority area across the majority of the AAN Expert Panels. However, the charge of this committee was to provide suggestions about which Academy expert panel could address the priorities as presented in this framework (Table 2).

Priority 1: Precision Science

Why Is This a Priority?

Precision science is an innovative scientific approach to disease prevention, identification, and treatment that maximizes effectiveness by taking into account individual variability in personal and environmental characteristics. These characteristics include lifestyle, existing co-morbidities and biomarkers, cognitive and emotional factors, and genetic, epigenetic, and other omic underpinnings (Collins, 2015). It includes the individual's health and family history. Taken together, precision science provides a comprehensive and unique set of information to better explain the complex mechanisms underlying a patient's health, disease, symptoms, or condition in order to better predict symptom susceptibility, disease occurrence and progression, and to develop targeted interventions. It goes beyond the conventional "average response" to

Table 2 – Science Priorities Specific to AAN Expert Panels

AAN Expert Panels	Precision Science	Big Data and Data Analytics	Health Determinants	Global Health
Acute and critical care	✓		✓	
Aging			✓	
Bioethics	✓	✓	✓	✓
Breast feeding				✓
Building health care system excellence		✓		
Child, adolescent, and family	✓		✓	
Cultural competence and health equity			✓	✓
Emerging infectious diseases	✓	✓		✓
Environmental and public health	✓	✓	✓	✓
Genomic nursing and health	✓	✓	✓	
Global nursing and health	✓		✓	✓
Health behavior			✓	
History of nursing and health policy				
Informatics and technology	✓	✓		
Lesbian, gay, bisexual, transgender, queer, health			✓	
Maternal and infant health	✓		✓	✓
Military and veterans health		✓	✓	
Nursing theory-guided practice				
Palliative and end-of-life care				
Primary care	✓			
Psychiatric, mental health, and substance abuse	✓		✓	✓
Quality health care		✓		
Violence			✓	✓
Women's health	✓		✓	✓

Note. AAN = American Academy of Nursing.

treatment that is predicated on select strategies governed by individual variability. Precision science brings together discovery science and implementation science to tackle health problems of the individual, incorporating basic, translational and clinical science.

The National Institutes of Health (NIH) has embraced precision medicine and is pursuing the All of Us Research Program (initially identified by the NIH as the Precision Medicine Initiative [PMI]) in order to revolutionize medicine and generate the scientific evidence needed to move the concept of precision medicine into every day clinical practice (Collins & Varmus, 2015). However, precision science is broader than the PMI; it is, in fact, an underlying pillar of the nursing profession and as such must be a priority of the Academy. If it is not, and we do not participate in the precision science initiative, our voice will not be heard now or in the future.

Precision science will allow nurses and nursing scientists to better understand the complex mechanisms underlying a patient's health and symptoms. It will help us to more holistically stratify those at highest risk for disorders and symptoms and to tailor interventions most likely to be effective (Antman et al., 2015; Antman & Loscalzo, 2016). Precision science also will allow us to evaluate the actual efficacy of those interventions based on how symptoms, biomarkers, and disease trajectory respond to a *hypothesis-driven* intervention. Precision medicine focuses on cellular, molecular, and genomic aspects of disease: it is important to recognize that precision science is that but much more. It is imperative that the Academy thoughtfully and vocally brings the nursing lens to precision science and incorporate it into our work, our education, our practice, and policy.

Nurses have always cared for patients by individualized assessment and personalized patient and family intervention. Nursing scientists are on the forefront of integrating genetic, omic, biologic, and systems data into the study of symptom management and testing of self-management intervention programs (Baggott, Cooper, Marina, Matthay, & Miaskowski, 2012; Davies et al., 2015; Wuest, Horn, Marti-Jaun, Kuhn, & Hersberger, 2014). Nursing scientists have capacity to bring tailored treatments to patients with chronic illnesses, appreciating the nuances of individualized treatment response (Moore, Jones, & Alemi, 2016). Advanced practice nurses are strong advocates for screening for risks such as diabetes, hypertrophic cardiomyopathy, and hypertension that can bring early treatment to potentially fatal conditions (Williams et al., 2016).

It is essential that nursing leaders bring this *nursing lens* to the national dialogue on precision science in order to address key aspects that promote health, well-being, and health-related quality of life in ways that extend beyond the biomedical paradigm. Precision science incorporates all determinants of health, from the genetic code to the zip code, with a focus on improving precise assessment, diagnosis, and treatment aimed at prevention and cure and improved quality of life, the hallmarks of nursing practice. Embracing precision science needs to be all-inclusive, crossing research, education, practice, and policy. The Academy is uniquely positioned to serve as nursing's informed voice in advocating that the approaches and planned data collection in the PMI incorporate patient problems that are central to nursing science and that nursing science can answer through the PMI and other initiatives. In addition, well-informed and prepared Academy members can drive policy and professional discussions around funding priorities, lead discussions about the critical ethical issues that arise through precision science and its initiatives, and assure that those vulnerable populations at highest risk and with highest need are included in and reap the benefits from knowledge gained from precision science.

What Is the State of the Science in Precision Science?

Significant advances in precision science have occurred over the last several decades. For example, both midwives and obstetricians encourage prenatal and even preconception screening for chromosomal abnormalities such as Downs Syndrome, Tay-Sachs disease, cystic fibrosis, and sickle cell disease (Benn et al., 2015; Nypaver, Arbour, & Niederegger, 2016). Nurse practitioners and physicians may choose to screen members of an entire family early and more frequently for breast, colon, or prostate cancer and for early or predictive signs of cardiovascular (CV) disease. Patients with sickle cell disease may be evaluated for pharmacogenetic characteristics to improve pain relief with targeted medication (Mnika, Pule, Dandara, & Wonkam, 2016). However, clinicians often consider only a limited number of factors when assessing, diagnosing, and treating patients. Even when personal features are obvious, for example, gender, race, or age, a clinician might not weigh that feature in evaluating disease risk or symptom development. For example, although being born premature is a recognized risk factor for Autism Spectrum Disorder (Schieve et al., 2016) and preterm birth is 1.5 times as common in African-Americans than Caucasians (Behrman & Butler, 2007), African-American children are significantly less likely to be comprehensively evaluated for autism compared with white children (Christensen et al., 2016). Likewise, although research suggests women may experience different symptoms during a myocardial infarction compared with men, women are still less likely to be accurately diagnosed using standard cut-off levels for cardiac enzymes than men when presenting to an emergency department (Trambas et al., 2016).

Even when precision science is used effectively to screen or diagnose, it can be sporadic. Travel to an area with high risk for infectious disease is now regularly considered when symptoms consistent with Zika infection are present in a pregnant woman, but a teacher living in New Mexico who presents with muscle aches may not be screened for a vacation to

Minnesota, an area susceptible to Lyme infection, and thus Lyme disease may not be diagnosed at an early stage. Clinicians do not regularly assess for neighborhood toxin exposures, neighborhood violence, or screen patients for serotonin transporter gene polymorphisms that increase the risk of depression (Caspi et al., 2003). This results in missed opportunities to provide anticipatory guidance to engage in stress-reducing practices.

New areas of precision science likely to be important to nursing research in the coming years include analysis of an individual's symptom trajectory in light of his or her metabolomics profile to evaluate risk of flu complications, or heart failure progression, or analysis of a woman's microbiome composition to provide risk estimates for preterm birth (Li, Dunlop, Jones, & Corwin, 2015). Precision science is early in its developmental trajectory in all disciplines but is moving forward rapidly with new knowledge emerging every day. This rapid forward momentum bodes well for improving targeted, personalized, and efficient health care but is also generating ethical issues that must be thoughtfully considered and empirically studied.

Who Are the Target Stakeholders?

The NIH (likely each institute), led by the PMI, and multiple professional organizations such as the American Heart Association and the American Cancer Society are key stakeholders.

Priority 2: Big Data and Data Analytics

Why Is This a Priority?

Nursing science is conducted in an interdisciplinary team science environment that is driven by big data and data analytics. Big data science is the application of mathematical techniques to large data sets to infer probabilities for prediction and find novel patterns to enable data driven decisions. By definition, big data are large in volume and complexity, difficult to understand using traditional means, and require integration of multiple data points over time (Cios & Nguyen, 2016; Magee, Lee, Giuliano, & Munro, 2006). Data analytics overlaps with computer science, statistics, data mining, predictive analytics, and machine learning for the systematic use of big data and includes philosophical and analytical approaches to working with big data (Brennan & Bakken, 2015).

Big data and data analytics are a priority in nursing science as they are integral to scientific advances across disciplines. For example, in biology, genomic research is grounded in big data, and data analytics is the foundation of population health management. Nursing science from cell level bench work to pragmatic trials and care delivery from population health management to palliative care are increasingly informed by big data and data analytics. In addition, big data and data analytics are ubiquitous and increasing in size, dimensionality, and centrality to science and practice. Of particular importance to nursing, health-related big data are creating between-subject as well within-subject data with unparalleled complexity and girth that will drive health care policy and clinical decision making (Henly et al., 2015; Westra et al., 2015).

Nursing science can provide the expertise in population health and big data and data analytics to responsibly inform policy and clinical decision making. In addition, National Institute of Nursing Research (NINR) has promoted the use of common data elements in nursing science research, which will lead to larger, shared datasets that will inform symptom science and self-management in chronic illness. Nursing informatics is a dynamic specialty that integrates nursing science with multiple information management and analytical sciences to identify, define, manage, and communicate data, information, knowledge and wisdom in nursing practice (American Nurses Association, 2014; American Nurses Association, 2015; Saba & McCormick, 2015). Informatics provides the structure that supports, changes, expands, and transforms nursing practice through the design and implementation of information technology (Saba & McCormick, 2015). Nursing informatics provides the vehicle for integrating nursing data into health policy and embedding nursing data into research and practice. To do this, we must (a) engage and equip all nurses with health information and technology skills to explore new and innovative ways to provide patient care, (b) transform documentation that supports evidence-based and personalized care to improve outcomes, (c) develop training modules for faculty to use and teach nursing informatics and big data analytics at the graduate level, and (d) provide workshops, Web-based seminars, or summer institutes to provide faculty and students the opportunity to gain expertise necessary for capturing and analyzing real-time streaming data for future personalized monitoring of health status.

What Is the State of the Science in Big Data and Data Analytics?

The state of the science in Big Data and Data Analytics is ever-changing with new advances within nursing and other disciplines. Large amounts of data have been recorded, stored, combined, transformed, linked, and interrogated over the past 35 years, driven most recently following the 2009 American Reinvestment & Recovery Act Health Information Technology for Economic and Clinical Health Act mandate for meaningful use of data (Beaty & Quirk, 2015). The PMIs in the Unites States, China, and Europe involve the alignment of data from health records, biological samples and sensory devices, genomic sequences, and phenotypic survey and observational study data. The U.S. Big Data to Knowledge initiative is designed to support development of methods to increase use of biomedical big data, disseminate novel methods and software, and improve training in the use of big data (Bourne et al., 2015). Nurse scientists are leaders in research and knowledge advancement in big data science, omics,

data analytics, and informatics. However, the push forward needs to be relentless and well-orchestrated. All scientific disciplines remotely associated with human health are adding to the daily exponential knowledge increases in big data science and analytics, though their expertise and experience with big data, analytics, and population health management pales when compared with nursing. Nurses are the advocates for the individuals and populations that we serve as practitioners and scientists (Lilly et al., 2015). Nurses need to lead and participate in the acquisition, structure, use, analysis, protection, and dissemination of human subject data whether the data are omics, phenotypic, electronic health records, or social media activity (Jenkins et al., 2007). Advocacy for the global populations and their data will be achieved only with nurse scientists at the forefront of big data and analytics research and initiatives.

Who Are the Target Stakeholders?

The target stakeholder for this priority spans most scientific disciplines and extends across populations. Health and the human experience have been transformed and continue to be transformed, by big data, social networks, and the Internet of things. Health promotion models and health care delivery systems are informed and based on evidence largely from big data and analytics. Big data can be from an individual $n = 1$ for targeted optimized therapy or data mined health care records of a group with similar primary diagnoses and comorbid conditions, placing big data and data analytics at the core of health promotion and policy for individual care and population management. The ubiquity of big data and analytics and the investment of governmental and private agencies across the nation and globe in big data and data analytics to guide policy and programmatic changes are unprecedented. To participate in and lead this paradigm shift will require the unwavering attention of nurse scientists to keep nursing science relevant in the scientific community and to keep big data and data analytics relevant to global populations. Scientific organizations as diverse as the American Communication Association, American Educational Association, the Academy of Business Research, the American Medical Informatics Association, and National Academies of Sciences, Engineering, and Medicine have identified big data and data analytics as a current and future priority investing large amounts of public and private sector monies into these prioritized initiatives.

Priority 3: Determinants of Health

Why Is This a Priority?

Determinants of health are complex and multifaceted factors responsible for influencing peoples' health (Phelan, Link, & Tehranifar, 2010). An array of personal, social, economic, and environmental factors affect health status. Although there are varying classifications of health determinants, five broad categories generally included are social and economic environment, physical environment, health care behaviors, genetics, and the health care system (Office of Disease Prevention and Health Promotion, 2016). Social and economic environmental determinants include aspects of discrimination, education and educational opportunity and quality, and income. Employment, working conditions, and social support networks are also included under social and economic environment. Physical environment determinants include elements of the natural and built environment such as air and water quality, lead exposure, and the design of neighborhoods. Individual behavioral determinants include choices about lifestyle or habits, either spontaneously or through response to incentives (e.g., diet, exercise, and substance abuse). An important component of behavioral determinants is culture—the customs, practices, and traditions as well as the beliefs and values of the family and community. Genetic determinants include the genetic composition of individuals or populations that may predispose to or protect against illness. Moreover, epigenetic changes may occur as the result of various social, physical, and environmental exposures. Health care system determinants commonly include access, cost, quantity, and quality of health care services.

What Is the State of the Science in Determinants of Health?

In the past several decades, there has been a growing interest in what defines and shapes health. Several models of health determinants have been proposed to explain the complex relationships among the various categories of determinants, including models proposed by the Centers for Disease Control and Prevention (CDC, 2016) and the World Health Organization (WHO, 2015). Most models illustrate that health is the result of multiple determinants and that multiple dimensions of health are influenced by determinants including mortality, morbidity, functioning, and well-being (Marmot & Allen, 2014). In addition, researchers have posited multiple causal pathways through which determinants influence outcomes as well as other determinants (Health Policy Brief, 2014). These proposed pathways may also differ across time, with some determinants playing a particularly strong role at certain periods in life and less so at other times. In many health determinant models, one aspect is relatively clear—individuals may or may not have direct control of factors that affect their health. For example, children born into poverty, to low-income mothers who experience high levels of social and economic stress, exposure to noxious substances during pregnancy, with physical conditions such as pre-eclampsia or diabetes, will be at much greater risk for poor health and developmental outcomes (Shonkoff, Garner, & on behalf of the Committee on Psychosocial Aspects of Child and Family Health and the Committee on Early Childhood Adoption and Dependent Care; Section on Developmental and Behavioral Pediatrics, 2012).

These children may continue to live in impoverished environments in unsafe neighborhoods and attending poorly resourced schools. Because of maternal exposures during pregnancy, these children may have epigenetic changes that further raise their risk for poor heath and development. For these children, research into the complex relationships among various health determinants is needed in order to identify exposures that raise the highest risk and interact to compound risks. Only through careful research, can the effects of health determinants and the potential areas for intervention be clearly identified.

Another example of the effect of health determinants is in the population of those who have served in the military (American Academy of Colleges of Nursing, 2016; Institute of Medicine, 2012; Johnson et al., 2013). Veterans who have served our country during wartime may have experienced personal, social, economic, and environmental factors that have affected their health. Examples are personal sacrifice of their time and being away from social support networks such as family and friends, the effects of war on psychosocial and neurobiological changes due to prolonged exposure to stressful events, and being exposed to noxious chemicals such as Agent Orange and other herbicides. Many veterans are being diagnosed with posttraumatic stress disorder and traumatic brain injury due to their time in the service, which in turn affects positive reintegration into civilian life and affects society as a whole. Careful inquiry and research-evidence–based interventions that effect this marginalized population can be developed to improve veterans' health.

Although the five categories of determinants are generally accepted as the major contributors to health, recent research findings have suggested that other factors have a strong and unique impact on health and might be considered as possible mechanisms linking direct and indirect determinants or as determinants in their own right. For example, stress is often considered a component of social determinants. However, stress appears to have a direct effect on health outcomes and may influence the way in which a person responds to other determinants (i.e., Lee & Dik, 2016). Certainly, differential exposure to stressful experiences is one of the central ways that social and economic environment, physical environment, health care behaviors, genetics, and the health care system come together to produce health outcomes. It has become clear that there is cumulative damage caused by chronic lifelong stress as well as the harmful and permanent effects of stressful experiences, or adverse childhood experiences, that occur in early life (i.e., McDonnell & Valentino, 2016).

Substantive research on health determinants is needed to examine the relationships among the components of health determinants to patient outcomes. Exploration of these relationships will require innovative research approaches that will likely involve other research priorities including those focused on precision science and big data. It will be particularly important to examine the effects of health determinants over time, in different populations and communities, and particularly intergenerationally to fully explicate those determinants that are most likely to result in adverse health outcomes as well as those that are amenable to modification by individuals or health programs and policies.

Who Are the Target Stakeholders?

A number of agencies and institutions have identified health determinants as a scientific priority because of the known or expected effects of these on health and development. Certainly, the NIH has identified health determinants as an area needing further study; the Center for Health Disparities, the NINR, the National Cancer Institute, and the National Institute for Child Health and Development identify health determinants in their areas of mission. Other organizations for whom health determinants are of research interest include the Patient-Centered Outcomes Research Institute, the Department of Defense, and the Department of Agriculture. A number of nursing organizations have noted health determinants as an area of needed research including the American Nurses' Association and Sigma Theta Tau International. Both the CDC and the WHO have an interest in specific areas of health determinants. Health care systems, health care insurers, and health care payers are also taking an increasing interest in health determinants, particularly as the adverse effects of various determinants become better understood.

Priority 4: Global Health

Why Is This a Priority?

As the world continues to become increasingly connected virtually and physically, we have become more aware of both the health care crises around the globe and the ease of transmissions of epidemics, such as SARS and Ebola. Improvements in health in the last 20 years have included increases in life expectancy, decreases in mortality among mothers and children under 5, and improved control of HIV in some African nations (Shisana et al., 2009). However, these improvements are not universal, and for many in low- and middle-income countries, health outcomes are still poor (Jamison et al., 2013; Kissick, 2012). Global health care is defined as the distribution of a limited set of health resources to underserved populations in resource-poor parts of the world (Kim, Farmer, & Porter, 2013). As more is learned about the state of health around the world, there is a moral imperative to share our expertise and resources with low- and middle-income countries where illness and death from easily preventable conditions are a daily occurrence (Abegunde, Mathers, Adam, Ortegon, & Strong, 2007; The World Health Organization, 2015). This also requires adequate training of future scientists with expertise in global health and provides the opportunity

to benefit from the expertise and experience of our colleagues around the world. Given the ease of air travel, there is a need to prepare for the possibility of potential future epidemics (Colizza, Barrat, Barthélemy, & Vespignani, 2006). Scientists must have systems in place to react quickly when such an event occurs, including funding and infrastructure to conduct cutting edge research (Bogoch et al., 2016). In order to improve health around the world, there needs to be an integrated and strategic approach (Kim et al., 2013) to address these five priority areas: (a) infectious disease, (b) environmental air pollution, (c) lack of access to care, (d) noncommunicable diseases, and (e) health of women and children.

What Is the State of the Science in Global Health?

The first priority area is infectious disease. The proportion of deaths worldwide attributable to infectious diseases, such as HIV/AIDS and malaria, has decreased slightly in recent years, but rates are still unacceptably high (Parpia, Ndeffo-Mbah, Wenzel, & Galvani, 2016). These diseases continue to receive much research attention. For example, a cure and treatments for malaria are a target of the Gates Foundation. Other infectious diseases such as Hepatitis B and C remain unabated. Infectious diseases also have the potential to become global epidemics (Nelson, Easterbrook, & McMahon, 2016).

The second priority is environmental air pollution. Deaths from infectious diseases are dwarfed by the number of deaths attributable to poor air quality. Environmental pollution has received little attention; however, it is the leading risk factor for death in low- and middle-income countries (Landrigan & Fuller, 2014). Four of every five residents of cities with reliable measurements face levels of particulate air pollution that exceed WHO recommendations. Globally, air pollution in urban areas was 8% higher in 2013 than it was in 2008. In the United States, environmental science, air quality, and global warming have become partisan political issues, threatening the health of all Americans and those in the global community.

The third priority area is lack of access to care for the majority of people in resource-poor countries (de Jongh, Gurol-Urganci, Allen, Zhu, & Atun, 2016; Lee et al., 2016). Research on ways to increase the number of providers, increase efficiencies, and improve care is needed. The distribution of providers also presents a barrier to care as most are employed in urban areas resulting in lack of access to care in rural areas. Global health care provider shortages are often more pronounced in low- and middle-income countries (Kuehn, 2007). These provider shortages have led to barriers to implementation of health care programs including cancer care programs (Beddoe, Nair, & Dottino, 2016) and sexual and reproductive health programs (Serour, 2009) among others. Focusing on building health care infrastructure will be crucial to increasing access to care, prevention, and treatment.

The fourth priority is noncommunicable diseases. Both physical and mental illness require greater resources to improve global health (Chisholm et al., 2016). For example, chronic conditions, such as Type 2 diabetes mellitus, which is at epidemic levels in the many resource-rich countries, are partially responsible for the increasing incidence of CV diseases in resource-poor countries (WHO, 2017, *Top ten causes of death*). Research is needed on primary and secondary prevention strategies as well as targeted interventions for specific conditions such as ischemic heart disease, heart failure, and atrial fibrillation. Childhood and adult obesity are at epidemic levels (Ford, Patel, & Narayan, 2016). Mental health problems are also common and undertreated and will require more resources to improve the health and productivity of nations around the globe. Traumatic injuries are another area of concern globally, both unintentional and those caused by violence. Unintentional injuries are the leading cause of death for ages 1 to 44 in the United States (CDC National Center for Injury Prevention and Control, 2014).

Finally, the fifth priority is the health of women and children. The WHO estimates that 800 women die each day from complications of pregnancy and childbirth (Alkema et al., 2016; Arora et al., 2016; WHO, n.d.b, *Top ten causes of death*). These deaths are largely preventable with basic prenatal, perinatal, and postpartum care. The health of women and children are key to sustainable development in the world (Langer et al., 2015). In 2010, an estimated 14.9 million babies were born preterm, 11.1% of all live births worldwide, ranging from about 5% in several European countries to 18% in some African countries (Beck et al., 2010). More than 60% of preterm babies were born in south Asia and sub-Saharan Africa, where 52% of the global live births occur. Preterm birth also affects rich countries, for example, the United States has high rates and is one of the 10 countries with the highest numbers of preterm births. Of the 65 countries with estimated time trends, only three, Croatia, Ecuador, and Estonia, had reduced preterm birth rates from 1990 to 2010 (Blencowe et al., 2012).

Who Are the Target Stakeholders?

A number of agencies and institutions have identified global health as a scientific priority. The NIH has identified global health as an area needing further study (National Institutes of Health, 2015); the National Institute of Nursing Research (2011) and the National Institute for Child Health and Development also note global health in their areas of mission (Grady, 2017). Other organizations for whom global health is of research interest include the U.S. Association for International Development (Liu et al., 2016), Patient-Centered Outcomes Research Institute (Arora et al., 2016), and the Department of Defense (Burke, 2016). A number of nursing organizations have noted global health research as being an area of focus including the American Nurses' Association and Sigma Theta Tau

International. Both the Centers for Disease Control and the World Health Organization also have an interest in specific areas of global health. Numerous nongovernmental organizations such as the Gates Foundation and the Clinton Foundation support global health initiatives (Cohen, 2016). Nurse scientists, nurse educators, and academic institutions are also taking an increasing interest in health determinants, particularly as the effects of adverse determinants become better understood. Global health priorities deserve research attention by nurse scientists who may not have engaged in global health research previously. For example, the increasing burden of chronic conditions such as CV diseases and diabetes have etiologies that include health behaviors. Prevention researchers can turn their attention and expertise to study this issue in an under-resourced country. Collaboration with researchers who study cultural competence would enhance the research.

Discussion and Recommendations

The purpose of this article was to provide a blueprint of nursing science priorities to inform a shared vision for future collaborations, areas of scientific inquiry, and resource allocation in these emerging and influential areas of science. The specific goal was to evaluate and address nursing science priorities in a framework that is relevant to nurse scientists and to nurses who transform and translate our science to meet the health care needs of individuals and populations. The framework provides information as to why these are priorities, the state of the science for each priority, and potential stakeholder groups that are well positioned to collaborate with scientists in each priority area. Precision science and big data were the topics at the March 2017 NINR-sponsored National Nursing Research Roundtable, underscoring the importance of these two top scored priorities by the CANS Science Committee. These are the science priorities that we have identified in 2017. The priorities are dynamic and may change depending on a number of factors such as political influences, global stability, disease prevalence and incidence, financial resources, and scientific discovery. The mission of the Academy is to serve the public and the nursing profession by advancing health policy, practice, and science through organizational excellence and effective nursing leadership. Nurse scientists can help move the agenda of the Academy forward by discovery of new knowledge in these diverse science priority areas. For example, new knowledge that a dysbiotic microbiome may be a risk factor for the development of metabolic syndrome has implications for precision health strategies. The Academy may then focus on promoting policies to support implementation of new dietary recommendations or advocate for new funding mechanisms. Expert panels such as Child, Adolescent, & Family or Genomic Nursing & Health may create new guidelines or recommendations for practice based on new findings.

Conclusions

The constantly shifting sociopolitical climate, the competing and changing needs of multiple stakeholders, and the often capricious nature of health and disease in populations require interdisciplinary collaboration to advance national and global health initiatives. Nursing science is leading advances in population health, and CANS is positioned to take a leadership role, with our interdisciplinary stakeholders, to set priorities for future directions in nursing science. CANS, an initiative of the AAN, serves as a resource for nurses involved in science, policy, care, and education. CANS is a partnership organization with representatives of the four nursing research societies, Sigma Theta Tau International, the American Nurses Foundation, and NINR having a seat on the Leadership Council. This open membership organization provides a rich and varied panorama of viewpoints to inform nursing scientific priorities and together can advance nursing science in improving the health of society.

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