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## Health Trajectory Research: A Call to Action for Nursing Science

**Susan J. Henly, PhD, RN [Professor],**

University of Minnesota School of Nursing

**Jean F. Wyman, PhD, RN, FAAN, and**

Professor and Cora Meidl Siehl Endowed Chair in Nursing Research, University of Minnesota School of Nursing

**Joseph E. Gaugler, PhD**

Associate Professor, McKnight Presidential Fellow, University of Minnesota School of Nursing

### Abstract

The focus of health trajectory research is study of health over time for individual persons, families, or communities. The person-focused, time-based perspective reflects health as it is experienced over the life course and maps directly onto processes of care, contributing to ease in translation of results to practice. The agenda focuses on theoretical and empirical components needed to (a) build health trajectory science; (b) develop the scientific workforce to conduct health trajectory research; (c) integrate health trajectory research with other critical, emerging areas of nursing science (genomics and genetics, informatics, dynamic systems and communication); and (d) apply health trajectory research across the life span and continuum of care. Agenda items point the way toward a reorientation of nursing research that incorporates and emphasizes understanding of individual health trajectories.

### Keywords

health trajectory; applied longitudinal data analysis; nursing research agenda

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Health trajectory research arises from the scholarly discipline of nursing, where the central focus is the study of health. Health trajectory research extends the accepted nursing metaparadigm to incorporate time as a fundamental concept and aligns nursing research models for longitudinal data with methodological standards in related disciplines. The basic approaches illustrated in this *Supplement* refocus nursing science on the person because intra-individual change over time in the personal health experience is the core concern (Henly, 2007). Scientific questions about change in health, the design of time-based health trajectory research projects, and statistical models for health trajectories map onto the processes of professional nursing (from assessment, goal setting, and interventions to

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Corresponding Author: Susan J. Henly, PhD, RN, University of Minnesota, School of Nursing, 5-140 WDH, 308 Harvard St SE, Minneapolis, MN 55455, henly003@umn.edu.

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outcome evaluation), thus leveraging the potential impact of nursing research findings to improve patient care. The time-based health trajectory perspective informs nursing science across the life span and across the continuum of care, including health promotion and disease prevention, acute care, and palliative and end-of-life care. In chronic disease, health trajectories provide the groundwork for understanding clinical course and the impact of interventions on disease progression.

The adoption of the health trajectory research perspective will require an increasingly well-prepared scientific workforce in nursing (Henly, 2011). Similar to recent educational changes in biological sciences (National Research Council, 2003), training for a life in nursing science may well need to begin deliberately in the undergraduate years and include mathematics through calculus. Continued discussion of the content of PhD programs in nursing science is required to determine the most efficient ways to develop student knowledge, advance theory (Wohlwill, van Geert, & Mos, 1991; Ram & Gerstorf, 2009) and use the advanced longitudinal approaches needed to capture temporal dynamics in health and illness-related phenomena. Quantitative course selection and sequencing, integration of the health trajectory content of nursing science with statistical models for longitudinal data, and specialized workshops for developing current nurse scientists' skills may all have their place.

A health trajectory research agenda for person-centered nursing science appears in the Table. The agenda items identify four areas for action: (a) theoretical and empirical components needed to build health trajectory science, (b) paths to development of the community of scientists in nursing, (c) intersections with innovative and emerging areas of nursing research, and (d) translation of health trajectory findings across the life span and continuum of care. Action items associated with each area are identified and explained in Table 1.

## Conclusion/Call to Action

Health trajectory research is person-centered and reconciles nursing science with the patient-focused perspectives and values in theory and practice. The person-centered health trajectory research agenda paves pathways to this future science. Health trajectory research is an exciting and welcome challenge at the frontiers of nursing science, with promise for improving health across the life span when findings are translated to practice.

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**Table 1**

**Health Trajectory Research Agenda for Person-centered Nursing Science**

<b>1. Build Health Trajectory Science for Nursing Research</b>	
●	<b>Measurement</b> Select measurement approaches with known sensitivity to change and responsivity to effective treatments (Stewart & Archibald, 1992, 1993). The Patient Reported Outcomes Measurement Information System (PROMIS, n.d.) should be considered.
●	<b>Human Health Development</b> Incorporate basic science findings about physical and functional development (personality and social actions; behavior in nonhuman animals; perception, movement and language in infants and young children; psychopathology and emotional disorders; cognitive processes; Cairns, Costello, & Elder, 1996, p. 223) into knowledge about human health development (Halfon & Hochstein, 2002).
●	<b>Natural History, Clinical Course, Disease and Disability Progression</b> Create descriptive knowledge about the nature of health trajectories as the essential foundation for knowing how, when, and where to intervene (e.g., National Institute of Mental Health, 2010) and to better understand the impact of health trajectories on function and quality of life.
●	<b>Transitions (in health status including life transitions; across care settings)</b> Model trajectories across health and illness and care settings and life transitions to identify patterns of transition outcomes and factors associated with successful transitions at the individual, family, and systems levels (Meleis, Sawyer, Im, Hilfinger Messias, & Schumacher, 2000; National Institute of Nursing Research, 2006; Naylor, Kutzman, & Pauly, 2009).
●	<b>Trajectories as Outcomes</b> Incorporate trajectories as outcomes in randomized trials of nursing interventions.
●	<b>Trajectories as Mediators in Interventions and Outcomes Research</b> Explore use of joint models (Tsiatis & Davidian, 2004) to simultaneously study the effects of nursing interventions on health trajectories and the impact of health trajectories on time to critical life and health events.
●	<b>Individualized/Tailored (Personalized) Interventions and Dynamic Treatment Regimens</b> Extend basic health trajectory research to incorporate patterns of health over time in the determination of tailored nursing intervention components related to timing, duration, and frequency (Beck et al., 2010) and to design and assess the effects of dynamic, within-individual treatment regimens (Shortreed et al., 2010).
●	<b>Health Disparities and the Context for Change</b> Model contextual effects in longitudinal studies (Little, Bovaird, & Card, 2007) to understand the relationships between gender, race, ethnicity, geography, and socio-economic status on health outcomes over time (National Institute of Nursing Research, 2006).
●	<b>Influence Agendas of Specialty Areas in Nursing Science</b> Incorporate health trajectories into the research agendas of nursing specialties across the life span.
<b>2. Develop the Community of Scientists in Nursing</b>	
●	<b>Undergraduate Nursing Science Curriculum</b> Upgrade the undergraduate curriculum for future nurse scientists by (a) incorporating mathematics through calculus and a solid grounding in statistics to ensure quantitative literacy (Steen, 2004) and (b) requiring completion of biology courses designed for future biological scientists (National Research Council, 2003) to ensure incorporation of life sciences research into nursing research.
●	<b>PhD Curriculum in Nursing Science</b> Strengthen PhD curriculum in advanced research design and statistical methods (AACN Taskforce on Research-Focused Doctorate, 2010); incorporate coursework that provides experiences with longitudinal and intra-individual analyses.
●	<b>Post-doctoral Fellowships in Nursing Science</b> Incorporate health trajectory research training in post-doctoral fellowship programs across the areas of nursing science.
●	<b>Composition of Nursing Faculties and Research Teams</b> Include PhD-prepared measurement specialists and statisticians with expertise in modeling change and working with longitudinal data as members of regular nursing faculty and as principal/co-investigators to ensure ready collaboration and synergy in the development of scientific content and method.
●	<b>Advanced Training for Nurse Scientists</b> Conduct specialized workshops and webinars in longitudinal methods and research design to afford nurse scientists the opportunity to gain expertise in health trajectory research methods.
<b>3. Leverage Innovation and Emerging Areas of Nursing Research</b>	
●	<b>Genetics and Genomics</b> Use time and the trajectory perspective to understanding the impact of genetic and genomic variation on outcomes of nursing care and design of gene-based treatments (Lea, Skirton, Read, & Williams, 2011; National Institute for Nursing Research, 2006; Jenkins, Grady, & Collins, 2005).
●	<b>Informatics</b>

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	Use knowledge discovery processes with clinical databases to support complex data visualization, analysis, and predictive modeling (Bakken, Stone, & Larson, 2008) to understand health trajectories in real world settings, to determine treatment outcomes with health trajectories as an outcome, and for comparative effectiveness studies.
●	Dynamic Systems and Communication Use dynamic systems modeling with intensive longitudinal data obtained by emerging technology-based data collection methods (Walls & Schafer, 2006) to advance research related to communication in real time, especially between nurses and patients and their families, among nurses, and between nurses and other health professionals.
<b>4. Translate Health Trajectory Research Findings across the Life Span and Continuum of Care</b>	
●	Health Promotion and Disease Prevention (Healthy People 2020) Model type and patterns of behaviors and symptoms over time, examining the impact of environmental factors (e.g., McLeod & Shanahan, 1996), health system components, and nursing interventions (National Institute of Nursing Research, 2006).
●	Chronicity, including Transition from Acute to Chronic Illness Model types and patterns of symptoms and symptom clusters over time, including the transition from acute to chronic illness; examine the impact of self-management and other interventions on chronic illness trajectories; model type and patterns of health trajectories in caregivers including the impact of interventions (National Institute of Nursing Research, 2006).
●	Palliative and End of Life Care Model types and patterns of trajectories of symptoms and well-being among individuals in need of palliative and end of life care as well as the psychological and physical burden of their caregivers, including impact of interventions.
●	Comparative Effectiveness Incorporate health trajectories as outcomes when designing clinical trials comparing two or more interventions (Patient Protection and Affordable Care Act, 2010).

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