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Using Omaha System Documentation to Understand Physical Activity Among Rural Women

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USING OMAHA SYSTEM DOCUMENTATION TO UNDERSTAND PHYSICAL ACTIVITY AMONG RURAL WOMEN

By

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ABSTRACT
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Rural women are more inactive and have different barriers to physical activity than those who live in more urban settings, yet few studies have specifically examined physical activity and associated factors in this population. Clinical data documented with standardized terminology by nurses caring for rural women may provide an opportunity to generate evidence that informs and improves nursing care. However, the knowledge to be gained and utility of nurses' clinical documentation in regard to physical activity have not been explored. Accordingly, the purpose of this study was to increase understanding of physical activity and associated factors among rural women by analyzing clinical data documented by local health department (LHD) nurses using the Omaha System standardized terminology. The study was guided by the ecological model for health promotion. A two-phase, retrospective, mixed-methods design was used. Phase One involved quantitative secondary analysis of a de-identified dataset derived from a convenience sample of women who received care from LHD nurses in a rural, Minnesota county (*N*=852). Measures included demographic data, baseline Physical activity Knowledge, Behavior, and Status (KBS) ratings, Physical activity signs/symptoms, and

ecological factors operationalized with the Omaha System Problem Classification Scheme and Problem Rating Scale for Outcomes. Results revealed rural women had more than adequate Knowledge (M=3.41), inconsistent Behavior (M=3.27), and minimal to moderate signs/symptoms (M=3.56) for Physical activity. Hierarchical regressions indicated ecological factors influenced Physical activity Behavior; however, age, BMI, and Physical activity Knowledge had more impact. Phase Two involved a focus group session with a purposive sample of LHD nurses (*N*=12) in the study setting. A semi-structured interview guide was used to elicit their perspectives about the quantitative findings. Three themes emerged with qualitative thematic analysis: (a) *knowledge is good, behavior is the issue*; (b) *clients may be more complex than what is captured;* and (c) *assessment and coding are impacted by professional judgment, time constraints, and priorities.* The outcomes of this study provide support for measuring and analyzing physical activity from an ecological perspective with clinical information documented by nurses using the Omaha System. The results indicate Physical activity Behavior among rural, female, LHD clients in the Midwest is inconsistent and influenced by demographic factors of age, BMI, Physical activity Knowledge, and environmental factors. However, LHD nurses perceive Physical activity Behavior remains an issue, despite more than adequate Physical activity Knowledge. In addition, nurses reported that documented data may not have fully captured client complexity due to nursing time constraints and client priorities. Future studies are needed with attention to these assessment and coding challenges. Providing nurses with ongoing education on KBS rating and information regarding potential research applications of client clinical data may help address these challenges and strengthen future research in this area.

DEDICATION

This dissertation is dedicated to my husband. It is your support, encouragement, and selflessness that made it possible for me to pursue this goal. I am grateful.

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CHAPTER 1.0

Introduction

Physical inactivity is a significant public health challenge (Blair, 2009) and modifiable risk factor for serious chronic conditions such as heart disease, stroke, and cancer (United States Department of Health and Human Services [HHS], 2014a). This issue is of particular concern for rural women given that rural populations have a higher prevalence of chronic disease (Jones, Parker, Ahearn, Mishra, & Variyam, 2009) and rural women are less likely to meet physical activity guidelines (Parks, Housemann, & Brownson, 2003) than women who live in urban areas. Yet, very little physical activity research has specifically examined rural women and the factors associated with this health behavior.

Nurses care for clients with diverse problems and health statuses in a variety of settings with the goals of promoting and improving health. Physical activity is an important component of these efforts, yet comprehensive and quantifiable physical activity assessment data is not consistently documented in nursing practice. The expanding use of electronic health records and standardized terminologies provide an opportunity for improvements in data collection, analysis, and distribution (Olsen & Baisch, 2014). This information can be used to increase understanding of client health problems and behaviors and to generate evidence that informs and improves nursing care. However, little is known about the use and effectiveness of information systems or standardized terminologies in the local health department practice setting (Olsen & Baisch, 2014), and the knowledge to be gained and utility of nurses' clinical documentation in regard to physical activity have yet to be explored. Accordingly, the

purpose of this study was to increase understanding of physical activity and the factors associated with this health behavior among rural women by analyzing clinical data documented by local health department nurses using the Omaha System (Martin, 2005a) standardized nursing terminology. This study adds to what is known about physical activity, generating evidence from women residing in a rural, geographic region that had not previously been studied. It also increases knowledge concerning use of standardized terminology for documentation of physical activity in clinical practice. In addition, it expands what is known about how nurses' clinical documentation can increase knowledge of health phenomena and inform clinical practice at individual and population levels.

Structure to Dissertation

This non-traditional dissertation consists of three manuscripts. The first is a review of literature on factors associated with physical activity among rural women. This article has already been published (Olsen, 2013). The second is a manuscript mapping the Omaha System to the ecological model for health promotion (McLeroy, Steckler, Bibeau, and Glanz, 1988). The third manuscript is a report of findings from a mixed methods study that examined physical activity in rural women using Omaha System clinical data collected by local health department nurses in a rural, Midwestern county. For approximately four years physical activity assessments have been conducted on almost all clients served by this staff, regardless of reason for services, and documented using the Omaha System. Secondary analysis was used to examine Physical activity Knowledge, Behavior, and Status, as well as factors associated with this health behavior, among rural women receiving care from local health department nurses. In addition, a

focus group interview was conducted with the local health department nurses who collected the data to examine their perspectives regarding the findings, the results of which are also reported in the third manuscript to validate and expand upon the quantitative findings.

Chapter One of this non-traditional dissertation is an overview of the study, including the background of the problem, purpose and significance of the study, and definitions of concepts. Chapter Two consists of a review of the literature on factors associated with physical activity among rural women, including the first manuscript. It also includes an explanation of the theoretical framework used to guide the study and the second manuscript: a mapping of the Omaha System to the ecological model for health promotion (McLeroy et al., 1988). Chapter Three is a report of the study methodology. The study findings are reported in Chapter Four with the third manuscript. A synthesis of the study findings and implications for policy, practice, research, and education are presented in Chapter Five.

Background

Physical activity is essential for preventing leading causes of death in the United States (US) including heart disease, stroke, type 2 diabetes, and cancer (HHS, 2014a). Additional health benefits associated with physical activity include improved mental health, lower risk of falls, and weight control (Centers for Disease Control and Prevention [CDC], 2011a). Yet, fewer than 20% of US adults meet current physical activity guidelines (HHS, 2014a). Consequently, increasing levels of physical activity to improve health is both a national health goal and public health challenge (HHS, 2014a).

Women are less likely than men to achieve physical activity guidelines (CDCb, 2011). Additionally, rural women, when compared to women living in urban areas, report more barriers to physical activity (Wilcox, Castro, King, Housemann, & Brownson, 2000), are more likely to be completely inactive during leisure time (Brownson et al., 2000), and are less likely to meet physical activity guidelines (Parks, Housemann, & Brownson, 2003). Yet, only a limited number of research studies have explored factors associated with physical activity among rural women (Olsen, 2013). Although differences in physical activity levels and barriers have been found to vary by geographic region (Wilcox et al., 2000), many areas of the US have not been studied, and inconsistent or absent definitions of the word *rural* weaken the conclusions that can be drawn from existing research (Olsen, 2013). Research that more deeply explores personal, socio-economic, and environmental factors that influence physical activity in unstudied rural contexts is needed.

Nurses are challenged to help clients initiate and increase physical activity to promote better health. In order to maximize effectiveness, interventions should be tailored to the target population (Guide to Community Preventative Services, 2012). This is essential in rural areas where healthcare resources and staff are often limited (Jones, Parker, & Ahern, 2009) and the prevalence of chronic disease is higher than in more urban settings (Jones, Parker, Ahearn, Mishra, & Variyam, 2009). However, it requires that nurses understand the unique factors associated with physical activity for the population of interest.

One barrier to this effort is a lack of information. There is "need for routine and consistent assessment of physical activity in research and clinical settings to improve risk

factor identification, minimize physical inactivity, and further advance our understanding of the health-related impact" (Strath et al., 2013, p. 2259). Nurses are encouraged to make physical activity assessment a part of each client interaction (Exercise is Medicine ® Australia, 2012; Hainsworth, 2006). Diverse methods of physical activity measurement should be used to fit client circumstances and goals (Strath et al., 2013; Warms, 2006). Examples include subjective methods, such as the Global Physical Activity Questionnaire (World Health Organization [WHO], n.d.), and objective measures, such as heart rate monitoring and accelerometers (Strath et al., 2013). The recommendations of these experts, as well as both national and international health goals, support the relevance of this area of research and the need for nursing assessments that consistently capture comprehensive and quantifiable physical activity data in an effort to build evidence for improving care.

Increasingly, efforts to improve the health of the public call for an evidence-based approach (Jacobs, Jones, Gabella, Spring, & Brownson, 2012). The systematic use of data and information systems is among the key elements identified for evidence-based public health (Jacobs et al., 2012). Advances in technology over the past decade with expanding use of electronic health records and standardized terminologies provide an opportunity for increased effectiveness in data collection, analysis, and dissemination (Olsen & Baisch, 2014). Yet, little has been documented about the details surrounding the use and effectiveness of various information systems or standardized terminologies at the local health department level (Olsen & Baisch, 2014). This is concerning since local health departments are a common practice setting for nurses, providing a unique

opportunity to assess and intervene with clients, families, and communities to optimize physical activity.

Effective use of electronic health records and documentation of client assessment data, nursing interventions, and client outcomes using standard terminologies is needed to expand nursing knowledge. Analysis of these data has the potential to increase understanding of factors associated with physical activity, risk factors for inactivity, and its prevalence. Subsequently, this knowledge could be used to inform evidence-based intervention development and care guidelines or standards.

As stated above, nursing knowledge of physical activity, development of evidence-based interventions, and creation of care guidelines may be facilitated by use of standardized terminologies for data collection. A standardized terminology is a common language that provides a means for professional communication (Rutherford, 2008) using a controlled vocabulary of discrete terms that are sometimes arranged in a hierarchy (Hardiker, Hoy, & Casey, 2000). Standardized terminologies support the documentation, sharing, and exchange of client care information among healthcare providers and researchers, as well as increased nursing intervention visibility, evaluation of care outcomes, and adherence to standards of care (Thede & Schwiran, 2011).

The Omaha System. The Omaha System is one of twelve standardized nursing terminologies recognized by the American Nurses Association (Thede & Schwiran, 2011). It differs from the medically-focused International Classification of Disease (ICD) and Current Procedural Terminology (CPT) code systems in that it is multi-axial, broadly describing health status and interventions (Monsen et al., 2010). Consequently, it can more accurately capture nursing problems and nursing care. The Omaha System was

developed in the 1970s by staff of the Visiting Nurse Association of Omaha who recognized the need to describe and quantify healthcare practice (Martin, 2005b). It was expanded and refined between 1975 and 1986 with three research projects funded by the Division of Nursing of the US Department of Health and Human Services (Martin, 2005b). During development, reliability and validity of the system were established (Martin, Norris, & Leak, 1999; Monsen et al., 2010). Recently, the Minnesota e-Health Advisory Board made the recommendation that all healthcare settings create a plan for implementing an American Nurses Association-recognized terminology within their electronic health record systems, and the Omaha System was specifically recommended for information exchange between public health or community-based settings (K. Monsen, personal communication, April 21, 2014). The Omaha System consists of three components that provide a comprehensive picture of the needs, healthcare services rendered, and associated outcomes for individuals, families, and communities (Martin, 2005b). The three components are the Problem Classification Scheme, the Intervention Scheme, and the Problem Rating Scale for Outcomes (Martin, 2005b).

The Problem Classification Scheme consists of 42 problems categorized within environmental, psychosocial, physiological, or health-related behaviors domains (Martin, 2005c). Each problem is modified as (a) an actual, potential, or health promotion issue with (b) an individual, family, or community focus (Martin, 2005c). Additionally, signs and symptoms are documented for actual problems, risk factors for potential problems, and descriptive data for health promotion issues (Martin, 2005c). Physical activity is identified as one of the 42 problems in the Omaha System Problem Classification Scheme.

In the Intervention Scheme of the Omaha System, client care actions implemented by healthcare providers are classified according to three levels (Martin, 2005c). First, one of four intervention categories is specified: Teaching, Guidance, and Counseling; Treatments and Procedures; Case Management; or Surveillance. Second, the target(s) of the intervention is selected. Finally, client-specific information is documented. This involves brief, unstandardized narrative notes that describe the intervention. See Figure 1.

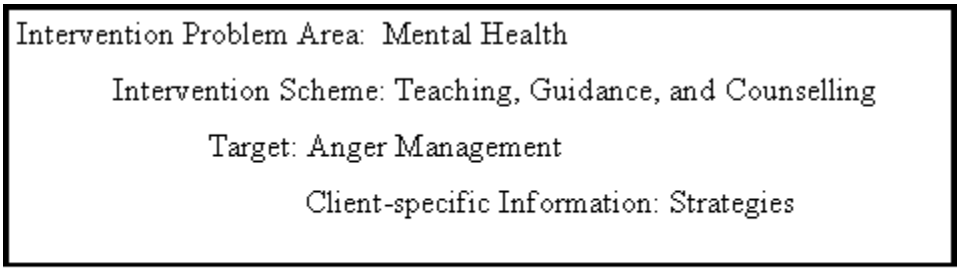

Figure 1. Example Documentation: Omaha System Intervention Scheme

The Problem Rating Scale for Outcomes is a measurement of client status and progress in three areas using a five-point Likert-type scale. The three areas are Knowledge, Behavior, and Status (Martin, 2005c). When integrated into the electronic health record, the Omaha System has the potential to improve communication efficiency and provide "meaningful and measureable data about health outcomes for the population" (Monsen, Honey, & Wilson, 2010, p. 375).

Study Design and Methods

In this retrospective, mixed methods descriptive study, I examined physical activity among rural women by completing a secondary analysis of client data documented using the Omaha System. Additionally, I used focus group methods to examine nurses' perspectives regarding the findings. The sample setting was a local health department in rural Minnesota. The aim of this study was to expand nursing

knowledge about physical activity and the various factors that either increase or decrease this health-related behavior in rural women. A second aim was to examine what can by learned by regularly assessing and documenting physical activity in all clients using an established, standardized nursing language. The study consisted of two phases. Phase One was a quantitative secondary analysis of a dataset extracted from clinical data documented by local health department nurses using the Omaha System. The results of this phase of the study increased understanding of physical activity, including levels of physical activity and factors associated with this health behavior, in a population underrepresented in research: rural women from the upper Midwest. Phase Two was a qualitative thematic analysis of data elicited in a focus group session to examine the local health department nurses' perspectives of the quantitative findings. The use of sequential methodological triangulation (Morse, 1991) through this two-phase, mixed methods approach supported a comprehensive approach to addressing the aims of the study and strengthened the validity of the findings.

Theoretical Framework

This study was guided by the ecological model for health promotion (McLeroy et al., 1988). Ecological models are based upon a systems approach, recognizing that multiple levels within the social environment are unique and important for their influence on health behaviors (McLeroy et al., 1988). Consistent with a reciprocal causation worldview, ecological models are also grounded on the premise that human behaviors both influence and are influenced by their environments (McLeroy et al., 1988). Accordingly, McLeroy et al. (1988) asserted health behavior is determined by intrapersonal factors, interpersonal processes and groups, institutional factors, community

factors, and public policy. An explanation of how the Omaha System was mapped to the ecological model for health promotion (McLeroy et al., 1988) can be found in Chapter Two.

Purpose of the Study

The purposes of this study were to (a) increase understanding of physical activity among rural women; (b) increase understanding of the factors associated with physical activity among rural women; (c) examine the relationship of ecological factors on physical activity behavior; (d) demonstrate the knowledge that can be gained through consistent assessment, documentation, and analysis of physical activity data using standardized nursing terminology; and (e) examine local health department nurses' perspectives regarding the findings.

Significance of the Study

Physical inactivity is one of the most significant public health challenges of the 21st century with low cardiorespiratory fitness levels accounting for approximately 16% of all deaths (Blair, 2009) and $75 billion in medical expenses in the US each year (CDC, 2011c). Lack of physical activity has been associated with multiple negative health consequences, including elevated risk for cardiovascular disease, breast and colon cancer, type 2 diabetes, and ischemic stroke (WHO, 2013). Yet, fewer than 20% of US adults meet current guidelines for aerobic and strengthening physical activity (HHS, 2014a), and rates of physical activity are lowest among rural women (Parks, Housemann, & Brownson, 2003). Along with nutrition and obesity, physical activity is one of the nation's Healthy People 2020 leading health indicators (HHS, 2014b). It is also a priority in the Healthy Minnesota 2020 state plan (Minnesota Department of Health & Healthy

Minnesota Partnership, 2012) and a health focus area in the Healthiest Wisconsin state plan (Wisconsin Department of Health Services, 2010).

Twenty-three percent of US women live in rural areas (HHS, 2011). Although idyllic images of farm life, stay-at-home mothers, and traditional families persist as stereotypical perspectives of the lives of rural women (Smith, 2008), 71% of rural women are employed and 42% work full-time (Smith, 2008). In addition, employment rates of rural mothers with young children exceed those of their urban counterparts (Smith, 2008).

When compared to women living in urban areas, rural women report more barriers to physical activity (Wilcox et al., 2000), are more likely to be completely inactive during leisure time (Brownson et al., 2000), and are less likely to meet physical activity guidelines (Parks, Housemann, & Brownson, 2003). However, researchers have varied in their definitions of both *rural* and *physical activity*. Research that specifically defines and consistently applies these terms is needed to strengthen nursing knowledge in this area (Olsen, 2013).

Inadequate levels of physical activity are of particular concern for rural women, since prevalence of chronic disease is higher in rural areas than in more urban settings (Jones, Parker, Ahearn, Mishra, & Variyam, 2009). Additionally, women residing in rural areas are distinctly vulnerable to numerous health risks due to a variety of unique social, cultural, and economic concerns (Coward et al., 2006). For example, in a study comparing factors associated with physical activity between rural and urban women, Wilcox et al., (2000) reported more caregiver duties ($p<.001$) and more discouragement from others ($p<.01$) among rural women. Additionally, Peterson, Schmer, and Ward-Smith (2013) reported rural women perceived few roles models for physical activity as

well as a societal acceptance of being overweight. Research aimed to understand and promote physical activity is urgently needed to improve health and prevent disease in this population.

Nurses have the potential to expand what is known about physical activity among all populations, including rural women. This includes information on client levels of physical activity, factors associated with physical activity, and the effectiveness of nursing interventions on both physical activity behaviors and health outcomes. One way to accomplish this is through consistent assessment and documentation of physical activity and associated risk factors. However, nursing documentation varies considerably, is often recorded in an unstandardized format, and can be difficult to retrieve from the health record (Keenan, Yakel, Tschannen, & Mandeville, 2008). These issues limit the transportability of this information between providers and systems, as well as the ability to analyze the data to increase understanding of phenomena and inform care at the individual and population levels. Use of standardized terminology and information systems for nursing documentation have the potential to address these challenges. However, research is needed to explore the knowledge that can be gained from nursing documentation, identify how standardized terminologies are working for the nurses who use them, and examine nurses' perspectives regarding the information that is captured.

This study was innovative in data collection and analysis methods. It involved the secondary analysis of assessment and baseline problem outcome data recorded by local health department nurses in an electronic clinical information system using standardized nursing terminology. The data were analyzed quantitatively using common descriptive

and inferential statistical analysis. In addition, qualitative thematic analysis of data elicited in a focus group session was conducted to examine local health department nurses' perspectives regarding the findings.

This study adds to what is known about physical activity, generating evidence from women residing in a rural, geographic region that has not previously been studied. In addition, it increases knowledge concerning use of standardized terminology for documentation in clinical practice. Finally, it expands what is known about how nurses' clinical documentation can increase knowledge of health phenomena and inform clinical practice at individual and population levels.

Definition of Concepts

As previously noted, this study was guided by the ecological model for health promotion, a theory grounded in the perspective that health behaviors such as physical activity influence and are influenced by personal, social, and environmental factors (McLeroy et al., 1988). Specifically, the theory consists of five levels of variables: intrapersonal factors, interpersonal processes and groups, institutional factors, community factors, and public policy (McLeroy et al., 1988). Similarly, the Omaha System also includes multiple levels of influence, identified as problems within the physiological domain, psychosocial domain, and environmental domain. Each of these areas affects and is affected by health-related behaviors. Consistent with the reciprocal worldview, health-related behaviors such as physical activity are influenced by factors within multiple levels or domains and can be studied within each ecological context. This study focused on variables at the intrapersonal, interpersonal, and community (environment) levels of the model to understand their influence on physical activity behavior in the

individual client. For the purpose of this study, the concepts and operational definitions described in the next sections and summarized in Table 1.1 were used. In addition, a conceptual mapping of the Omaha System and the ecological model for health promotion (McLeroy et al., 1988) can be found in Chapter Two.

Physical Activity

Physical activity is a multidisciplinary phenomenon of interest that can be found in the literature of diverse health and non-health related professions. Within the context of health, physical activity is a phenomenon of interest for its ability to affect health outcomes. Therefore, use of the term by health disciplines often implies attributes necessary to achieve these results. Physical activity has been measured both objectively and subjectively in research and clinical practice and has been studied with both quantitative and qualitative methods. This diversity is consistent with the reciprocal worldview (Fawcett, 1993). Even so, this paradigm emphasizes "empirical observations and methodological controls" (Fawcett, 1993, p. 58). From this perspective, the advancement of nursing science on this topic will require clear and consistent definitions and measures of physical activity. Therefore, for this study, physical activity was defined as the "state or quality of body movements during daily living" (Martin, 2005d, p. 331). When an actual Physical activity problem was identified and documented, it was described according to the Omaha System Problem Classification Scheme signs and symptoms: sedentary lifestyle, inadequate/inconsistent exercise routine, inappropriate type/amount of exercise for age/physical condition, and other. Physical activity was operationalized in two ways: according to the Omaha System Problem Rating Scale for Outcomes - Behavior rating for Physical activity and the Omaha System Problem Rating

Scale for Outcomes - Status rating for Physical activity. Both consist of a five-point scale. For Physical activity Behavior, a rating of one indicates inappropriate behavior-not engaging in regular physical activity, and a rating of five is consistently appropriate behavior – engaging in regular, appropriate physical activity and independently completing daily activities. For Physical activity Status, a rating of one indicates extreme signs and symptoms, and a rating of five is no signs and symptoms. Notably, the signs and symptoms of a physical activity problem as described above and referenced in the Physical activity Status rating describe behaviors. Consequently, multicollinearity due to conceptual overlap was possible. This is an expected and accepted issue with the Omaha System: because physical activity is within the health-related *behavior* domain, the Status rating must account for client behavior. For this study, potential statistical problems were avoided by examining the Behavior and Status ratings separately without use of both measures in regression models.

Intrapersonal Factors

Intrapersonal factors are among the most extensively studied variables in physical activity literature with diverse and occasionally contradictory findings. For this study, intrapersonal factors were broadly defined as "characteristics of the individual such as knowledge, attitudes, behavior, self-concept, etc." (McLeroy et al., 1988, p. 355). Intrapersonal factors examined in this study included age, body mass index (BMI), race/ethnicity, physiological health problems, and knowledge of physical activity. When indicated, relevant variables were operationalized using the Omaha System as a guide. For example, physiological health problems were operationalized using the Omaha System Problem Rating Scale for Outcomes - Status rating for all problems in the

physiological domain. They were rated using the Omaha System five-point scale in which a rating of one indicates extreme signs and symptoms and a rating of five is no signs and symptoms (Martin, 2005d). Knowledge of physical activity was operationalized according to the Omaha System Problem Rating Scale for Outcomes - Knowledge rating for Physical activity. This involved use of a five-point scale in which a rating of one indicates no knowledge of need to participate in physical activity and a rating of five is superior knowledge of goals and potential benefits of physical activity participation (Martin, 2005d).

Interpersonal Factors

The significance of interpersonal factors on health behaviors, including physical activity, is well documented in both theoretical and empirical literature. Consistent with the reciprocal worldview, they both influence and are influenced by physical activity within a setting or context. Interpersonal factors have been diversely conceptualized (Willis, Ainette, & Walker, n.d.) and can encompass the support, pressures, persuasion, social norms, modeling, and communications present in the social context as one observes and interacts with family, friends, co-workers, leaders, acquaintances, and the media. Interpersonal factors may be measured both objectively and subjectively and may be perceived as either positive or negative. For this study, interpersonal factors were defined using a modified version of the Omaha System psychosocial domain definition: patterns of communication, behavior, emotions, and relationships with others. Interpersonal factors examined in this study included psychosocial problems operationalized using the Omaha System Problem Rating Scale for Outcomes - Status rating for all psychosocial domain problems. Examples of problems in this domain

include Social contact, Role change, Mental health, Interpersonal relationship, Caretaking/parenting, Abuse, and Neglect. Although some of the problems in this domain could be categorized at the intrapersonal level, the Omaha System considers social implications in the problem definition, supporting alignment at the interpersonal level. For example, the Omaha System definition of Mental health is "development and use of mental/emotional abilities to adjust to life situations, interact with others, and engage in activities" (Martin, 2005d, p. 199). The Omaha System five-point rating scale was used to measure each problem with a rating of one indicating extreme signs and symptoms and a rating of five indicating no signs and symptoms (Martin, 2005d).

Community Factors

Community factors are "relationships among organizations, institutions, and informal networks within defined boundaries" (McLeroy et al., 1988, pg. 355). This includes the aesthetics and options available in the physical environment as well as structures and networks that either support or provide barriers to physical activity. Similar to interpersonal factors, theoretical and empirical literature support the relevance of the concept, and it can be measured both objectively and subjectively. For this study, community factor was defined using a modified version of the Omaha System environmental domain definition: material resources and physical surroundings in one's living area, neighborhood, and broader community. Community factors examined in this study included community, season, and environmental problems. Community was operationalized using zip codes. Season was operationalized by dividing the date of data collection into summer (May 1 to October 31) and winter (November 1 to April 30). Environmental problems were operationalized using the Omaha System Problem Rating

Scale for Outcomes - Status rating for all environmental domain problems. The Omaha System five-point rating scale was used to measure each area with a rating of one indicating extreme signs and symptoms and a rating of five indicating no signs and symptoms (Martin, 2005d).

Standardized Terminology

As previously stated, a standardized terminology is a common language that provides a means for professional communication (Rutherford, 2008) using a controlled vocabulary of discrete terms that are sometimes arranged in a hierarchy (Hardiker, Hoy, & Casey, 2000). Because of its relevance to community health, the Omaha System was the standardized terminology used for this study.

Rural Area

Understanding human behavior is dependent upon context or setting, because it both influences and is influenced by the environment (Coward et al., 2006). In rural areas, healthcare resources and personnel are less abundant than in urban settings (Jones, Parker, & Ahern, 2009) and incidence of chronic disease is higher (Jones, Parker, Ahearn, Mishra, & Variyam, 2009). Additionally, residents of rural areas have lower incomes, less health insurance coverage, more demands to provide care for nearby family members, added transportation difficulties, and limited accessibility to specialty care (Coward et al., 2006). Although both subjective and objective measurements of rurality are appropriate in the reciprocal worldview, a significant limitation of many published studies that have examined physical activity and rural women was inconsistent or absent explanations of how the concept was defined. Research studies that define and apply the concept "rural" clearly and consistently are needed to strengthen knowledge in the area of

rural health. Consequently, this study defined "rural" as counties with a Rural-Urban Continuum Code of six or higher. This encompassed counties with urban populations of less than 2,500 up to 19,999 citizens with or without some adjacency to a metro area (United States Department of Agriculture, 2013). See Table 1.2.

Chapter Summary

Physical activity is essential for preventing leading causes of death in the US, yet most adults do not meet physical activity guidelines and rural women are more likely to be inactive during leisure time than their urban counterparts (Brownson et al., 2000). This is concerning given the higher incidence of chronic disease in rural populations (Jones, Parker, Ahearn, Mishra, & Variyam, 2009). Empirical and theoretical literature support the relevance of intrapersonal, interpersonal, and community factors on physical activity behavior. Yet, rural settings are unique in their socio-cultural and environmental composition when compared to both urban and other rural areas, supporting the need for context-specific research.

Nurses have the potential to increase understanding of physical activity by routinely assessing this health behavior and associated risk factors (Strath et al., 2013). However, research is needed to explore the knowledge that can be gained from nursing documentation, identify how standardized terminologies are working for the nurses who use them, and examine nurses' perspectives regarding the information that is captured.

The purpose of this study was to increase understanding of physical activity and the factors associated with this health-related behavior among rural women. This included the impact of intrapersonal, interpersonal, and community factors on physical activity behavior and local health department nurses' perspectives regarding the findings.

This study addressed current knowledge gaps by generating physical activity evidence from women residing in a rural, geographic region that had not been studied and by exploring the value of using the Omaha System as a tool for routinely assessing and documenting physical activity when caring for clients in a community setting.

Table 1.1. Definitions of Concepts

	Conceptual definition	Operationalized measure(s)	Details
Physical activity	"State or quality of body movements during daily living" (Martin, 2005c, p. 331).	• Omaha System (Martin, 2005d) Problem Rating Scale for Outcomes - Behavior category	• Rating scheme (1-5): ○ 1= inappropriate behavior-not engaging in regular physical activity ○ 5= consistently appropriate behavior – engaging in regular, appropriate physical activity and independently completing daily activities
		• Omaha System (Martin, 2005d) Problem Rating Scale for Outcomes - Status category	• Rating scheme (1-5): ○ 1= extreme signs and symptoms ○ 5= no signs and symptoms
Intrapersonal factors	"Characteristics of the individual such as knowledge, attitudes, behavior, self-concept, etc. This includes the developmental history of the individual" (McLeroy et al., 1988, pg. 355).	• Age	• Numeric value
		• Race/ethnicity	• Dichotomous value (Non-Hispanic Caucasian: yes/no):
		• BMI	• Dichotomous value (overweight or obese/not overweight or obese) if a Nutrition problem with the sign and symptoms of a BMI of 25 or higher was recorded.
		• Physiological health problems with Omaha System (Martin, 2005d) Problem Rating Scale for Outcomes – Status rating	• Dichotomous value (present/not present) if any of the Physiological domain problems have a Status rating of 1, 2, or 3 ○ Rating scheme (1-5) for each problem area: ▪ 1=extreme signs and symptoms

	Conceptual definition	Operationalized measure(s)	Details
			▪ 5=no signs and symptoms
		• Physical activity Knowledge	• Rating scheme (1-5): ○ 1= no knowledge of need to participate in physical activity ○ 5= superior knowledge of goals and potential benefits of physical activity participation
Interpersonal factors	Patterns of communication, behavior, emotions, and relationships with others.	• Psychosocial problems with Omaha System (Martin, 2005d) Problem Rating Scale for Outcomes – Status rating	• Dichotomous value (present/not present) if any of the Psychosocial domain problems have a Status rating of 1, 2, or 3 ○ Rating scheme (1-5) for each problem area: ▪ 1=extreme signs and symptoms ▪ 5=no signs and symptoms
Community factors	Material resources and physical surroundings in one's living area, neighborhood, and broader community.	• Community	• Categorical value (zip code)
		• Season	• Dichotomous value (summer: May 1 to October 31/ winter: November 1 to April 30)
		• Environmental problems with Omaha System (Martin, 2005d) Problem Rating Scale for Outcomes – Status rating	• Dichotomous value (present/not present) if any of the Environmental domain problems have a Status rating of 1, 2, or 3 ○ Rating scheme (1-5) for each problem area: ▪ 1=extreme signs and symptoms

	Conceptual definition	Operationalized measure(s)	Details
			▪ 5=no signs and symptoms
Standardized terminology	A common language that provides a means for professional communication (Rutherford, 2008) using a controlled vocabulary of discrete terms that are sometimes arranged in a hierarchy (Hardiker, Hoy, & Casey, 2000).	Omaha System	
Rural area	A county with an urban populations of up to 19, 999 citizens adjacency to or not adjacent to a metro area (United States Department of Agriculture, 2013).	Rural-Urban Continuum Code of six or higher (United States Department of Agriculture, 2013)	

Table 1.2. Rural-Urban Continuum Codes (United States Department of Agriculture [USDA], 2013)

	USDA code and definition
Defined as rural for this study	Nine: not adjacent to a metro area with a population of less than 2,500 or completely rural
	Eight: adjacent to a metro area with a population of less than 2,500 or completely rural
	Seven: not adjacent to a metro area with a population of 2,500 to 19,999
	Six: adjacent to a metro area with a population of 2,500 to 19,999
Defined as non-rural for this study	Five: not adjacent to a metro with a population of 20,000 or more
	Four: adjacent to a metro area with a population of 20,000 or more
	Three: population of fewer than 250,000 in a metro county
	Two: population of 250,000 to 1,000,000 in a metro county
	One: population of 1,000,000 or more in a metro county

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CHAPTER 2.0 REVIEW OF LITERATURE AND THEORETICAL FRAMEWORK

Chapter Introduction

The purpose of this study was to increase understanding of physical activity and the factors associated with this health behavior among rural women by analyzing clinical data documented by local health department nurses using the Omaha System (Martin, 2005). Additional aims were to examine the relationship of ecological factors and physical activity behavior; demonstrate the knowledge that can be gained through consistent assessment, documentation, and analysis of physical activity data using standardized nursing terminology; and examine local health department nurses' perspectives regarding the findings. This chapter consists of background and theoretical information that support the study presented in four sections. Section 2.1 is a review of the literature on factors associated with physical activity among rural women. Section 2.2 entails an explanation of several theoretical models useful in physical activity research, including the ecological model for health promotion (McLeroy, Steckler, Bibeau, and Glanz, 1988) which is the theoretical framework used to guide this study. Two manuscripts prepared for publication are located at the end of the chapter: a review of literature in Section 2.3 and a conceptual mapping of the Omaha System and the ecological model for health promotion (McLeroy et al., 1988) in Section 2.4.

Section 2.1: Review of Literature on Physical Activity among Rural Women

An integrative review of literature using Whittemore and Knafl's (2005) methodology was conducted with the goal of identifying factors associated with physical activity among rural women in the United States (US). Academic Search Premier, Academic Search Complete, CINAHL, PsycINFO, MEDLINE, and Health Source –

Nursing/Academic Edition were systematically searched with key terms for relevant, for non-experimental studies. The key search terms were (a) physical activity, rural women; (b) physical activity, rural women, determinants; (c) physical activity, barriers, rural women; (d) walking, rural women; (e) physical activity, rural, women; and (f) exercise, rural women. The initial search yielded 307 articles which were reduced to a final sample of twenty-one studies. Inclusion criteria were reports of research results on diversely designed studies of factors associated with physical activity among rural, adult women. Exclusion criteria included articles of intervention research, studies of populations outside the US, and research in which the results were not specific to rural women. The details of the search, selection, data extraction, and data analysis methods, as well as the findings, are documented in a published article (Olsen, 2013). See Section 2.3.

Because the final search for the article referenced above was conducted in August 2012, the search was replicated in October 2013 to identify any new, relevant publications. Excluding my article (Olsen, 2013), three new publications met the original inclusion and exclusion criteria and will be integrated in the findings below (Marshall, Bland, & Melton, 2013; Melton, Marshall, Bland, Schmidt, & Guion, 2013; Peterson, Schmer, & Ward-Smith, 2013). The search was replicated again in January 2015 and one additional article was found (Haardörfer, Alcantara, Patil, Hotz, & Kegler, 2014).

Methods and Findings

Twenty-one studies representing multiple disciplines were included in the original, published review of literature (Olsen, 2013). Four additional, relevant articles were published between August 2012 and January 2015. Among the 25 total

publications, thirteen used quantitative methods, eight used qualitative methods, three studies incorporated both methodologies, and one was an explanatory case study. The Matrix Method was used for data analysis and synthesis (Garrard, 2007). Three main categories of physical activity correlates were identified: physical environment factors, socio-economic factors, and personal factors (Olsen, 2013). A brief synopsis of the findings will be presented accordingly in the following section.

Physical environment factors. Three themes of physical environment factors were evident in the reviewed literature: lack of access, safety, and structures (Olsen, 2013). First, rural women identified lack of access to facilities as a barrier to physical activity (Wilcox, Castro, King, Housemann, & Brownson, 2000; Eyler & Vest, 2002; Sanderson, Littleton, & Pulley, 2002; Wilcox, Oberrecht, Bopp, Kammermann, & McElmurray, 2005; Peterson, Schmer, & Ward-Smith, 2013). For example, Wilcox et al. (2000) reported rural women were significantly more likely than urban women to lack a safe place to exercise ($p<.01$). Sanderson, Littleton, and Pulley (2002) reported lack of access to facilities as a barrier to physical activity in their qualitative study of rural, African American women. Similar findings were reported by Eyler & Vest (2002) in their qualitative study of rural, Caucasian women. Wilcox et al.'s (2005) qualitative study of both Caucasian and African American women revealed lack of facilities and transportation difficulties as barriers. Finally, Peterson, Schmer, and Ward-Smith (2013) reported that women perceived having limited choices for physical activity due to their rural location.

Safety was another environmental theme. Women in several studies reported safety concerns as a general barrier (Wilcox et al., 2000; Eyler & Vest, 2002; Sanderson,

Littleton, & Pulley, 2002; Wilcox, Bopp, Oberrecht, Kammermann, & McElmurray, 2003; Peterson, Schmer, & Ward-Smith, 2013). Specific concerns included heat (Sanderson, Littleton, & Pulley, 2002), busy roads (Atkinson, Billing, Desmond, Gold, & Tournas-Hardt, 2007; Wilcox et al., 2003; Peterson, Schmer, & Ward-Smith, 2013), wild animals (Atkinson et al., 2007; Gangeness, 2010), and dogs (Wilcox et al., 2000; Wilcox et al., 2003). As previously noted, Wilcox et al. (2000) reported rural women were significantly more likely than urban women to lack a safe place to exercise ($p<.01$). In addition, Wilcox et al. (2003) reported higher levels of physical activity were associated with perceived neighborhood safety ($p<.05$).

The third physical environment theme, structures, had mixed results. Several studies reported lack of sidewalks and streetlights as barriers to physical activity (Bove & Olson, 2006; Wilcox et al., 2000, Eyler & Vest, 2002; Peterson, Schmer, & Ward-Smith, 2013). However, Wilcox et al. (2003) reported a negative correlation between sidewalks and physical activity levels ($p<.05$). The authors did not explain this further.

Socio-economic factors. Two themes, social and economic, were identified in this category (Olsen, 2013). Within the social theme, family and childcare demands were predominate (Eyler & Vest, 2002; Gangeness, 2010; Wilcox et al., 2003; Wilcox et al., 2005; Marshall, Bland, & Melton, 2013). These largely qualitative findings included the reported barriers of family responsibilities (Eyler & Vest, 2002; Wilcox et al., 2005), childrearing needs (Gangeness, 2010), and family, household, and childrearing responsibilities (Wilcox et al., 2003; Marshall, Bland, & Melton, 2013). Additionally, in a study comparing factors associated with physical activity between rural and urban women, Wilcox et al., (2000) reported more caregiver duties ($p<.001$) and more

discouragement from others ($p<.01$) among rural women; however, no additional information about the duties or the discouragement was reported. Related to the latter finding, social support was an additional social factor.

The presence of social support (Wilcox et al., 2003; Peterson, Schmer, & Ward-Smith, 2013) and group membership or socialization during physical activity (Eyler, 2003; Eyler & Vest, 2002; Osuji, Lovegreen, Elliott, & Brownson, 2006; Dye & Wilcox, 2006) were reported facilitators of physical activity. For example, Dye and Wilcox (2006) identified social support and role models as factors promoting physical activity in their qualitative study of rural women over age 65. Eyler and Vest (2002) had similar findings in their qualitative study of rural, Caucasian women between the ages of 20 and 50. Likewise, Peterson, Schmer, and Ward-Smith's (2013) reported that having supportive friends to walk with facilitated physical activity among rural women between ages 20 and 65. Further, women in this qualitative study perceived few role models for physical activity in the rural setting as well as a societal acceptance of being overweight. From the quantitative perspective, Wilcox et al. (2003) reported a correlation between social support and higher levels of physical activity ($p<.01$). Similarly, Eyler (2003) reported belonging to a community group increased the odds of meeting physical activity recommendations (OR=2.20, 95% CI: 1.23-3.93). Seeing people in the neighborhood exercising also increased the odds of meeting physical activity recommendations (OR=2.02, 95% CI: 1.08-3.77) (Sanderson et al., 2003). In contrast, a lack of support from family members was a common barrier to physical activity in several studies (Wilcox et al., 2005; Bopp, Wilcox, Oberrecht, Kammermann, & McElmurray, 2004; Peterson, Schmer, & Ward-Smith, 2013).

A final social factor was religion with some studies reporting a positive relationship between church support or attendance and physical activity (Eyler, 2003; Wilcox et al., 2005; Sanderson et al., 2003). For example, Eyler (2003) reported that attending religious services increased the odds of meeting physical activity recommendations among rural, Caucasian women (OR=1.63, 95% CI: 1.01-2.63). Similarly, Sanderson et al. (2003) reported rural, African American women who attended religious services were more likely to meet physical activity recommendations (OR=2.10, 95% CI: 1.21-3.65).

Several economic factors influenced physical activity in rural women. First, a positive relationship between physical activity levels and income was reported (Hinton & Olson, 2001; Sanderson et al., 2003). In addition, income level affected several other important variables. For example, low income women reported more transportation barriers (Atkinson et al., 2007; Bove & Olson, 2001) and less social support (Osuji et al., 2006; Adachi-Mejia et al., 2010), while higher income women cited time as a barrier (Adachi-Mejia et al., 2010; Osuji et al., 2006). Second, higher education was associated with increased levels of physical activity (Hinton & Olson, 2001; Wilcox et al. 2000; Wilcox et al., 2003). Finally, employment and work demands were associated with physical activity levels. Adachi-Mejia et al. (2010) studied mothers (n=1691) from rural Vermont and New Hampshire that worked outside the home and reported lack of interest ($p<.05$), time ($p<.001$), and self-discipline ($p<.001$) as barriers to physical activity. Eyler (2003) reported that among Caucasian women from rural Illinois and Missouri (n=1000), being employed increased the odds of meeting physical activity recommendations (OR=1.58, 95% CI: 1.17-2.15). Similarly, Haardörfer et al. (2014) reported significantly

less sedentary behavior among employed rural women from Georgia when compared to those who were unemployed. However, in a qualitative study of non-exercising women from rural Illinois and Missouri (n=33), Eyler and Vest (2002) reported work hours as a barrier to physical activity. Sanderson, Littleton, and Pulley (2002) studied African American women from rural Alabama (n=61) and reported work hours, as well as being tired due to work and family responsibilities, as barriers to physical activity. Additionally, Marshall, Bland and Melton (2013) reported time and employment demands as one of seven categories of barriers to physical activity listed by rural, pregnant women. Notably, neither number of work hours nor type of work was examined as a variable in any of these studies. Finally, Kelsey et al. (2006) specifically studied rural female workers. Among blue-collar Caucasian and African American women from rural North Carolina (n=1093), a positive correlation was reported between positive coping and recreational exercise (p<.001). Positive coping (p<.05) and positive affect (p<.001) predicted increased physical activity while eating as a coping mechanism for coping had a negative relationship (p<.05).

Personal factors. Two themes, physical characteristics and cognitions and affect, were identified in this category (Olsen, 2013). Physical characteristics included health, with poor health or injury associated with lower levels of physical activity and better health associated with some or higher amounts (Eyler, 2003; Osuji et al., 2006; Sanderson et al., 2003; Eyler, 2003; Sanderson, Littleton, & Pulley, 2002; Dye & Wilcox, 2006; Wilcox et al., 2003; Wilcox et al., 2005; Peterson, Schmer, & Ward-Smith, 2013). A second physical characteristic, energy level or tiredness, was inversely related to physical activity levels (Sanderson, Littleton, & Pulley, 2002; Dye & Wilcox,

2006; Osuji et al., 2006; Adachi-Mejia et al., 2010; Bopp et al., 2004; Wilcox et al., 2005). In four qualitative studies, rural women reported being too tired (Sanderson, Littleton, & Pulley, 2002; Bopp et al., 2004) or having a lack of energy (Dye & Wilcox, 2006; Wilcox et al., 2005) as barriers to physical activity. Similar findings were reported in two quantitative studies. For example, in a cross-sectional study of rural, Midwestern women (N=1877), Osuji et al. (2006) reported lack of energy (OR= 1.8, 95% CI 1.5, 2.2) and being too tired (OR = 1.8, 95% CI: 1.4, 2.2) increased the odds of not meeting physical activity guidelines. Similarly, in a study of rural, Northeastern mothers (N=1691), Adachi-Mejia et al. (2010) reported lack of energy as a common barrier among participants (70.4%) and a significant barrier among those with annual incomes of less than $35,000 ($p<.05$). Given that fatigue and lack of energy are common symptoms of depression and that research suggests rural residents (Probst et al., 2006), particularly impoverished rural women (Hauenstein & Peddada, 2007), have higher rates of this disorder, it is noteworthy that depression was mentioned in only four studies (Bopp et al., 2004; Dye & Wilcox, 2006; Wilcox et al., 2003; Peterson, Schmer, & Ward-Smith, 2013). Depression surfaced as a theme in two qualitative studies. Dye and Wilcox (2006) reported older, low-income rural women perceived less depression as a benefit of physical activity. Peterson, Schmer, and Ward-Smith (2013) reported that participants perceived depression as related to level of motivation. Both Bopp et al. (2004) and Wilcox et al. (2003) measured depression in older rural African American and Caucasian women in their quantitative studies. While Bopp et al. (2004) did not find a significant correlation between depression and participation in strength training, Wilcox et al. (2003) reported significant negative correlations between depression and both physical activity

($p<.05$) and self-efficacy ($p<.01$). Weight was an additional factor with women of normal weight more likely to meet physical activity guidelines ($x^2=8.29$; $p=.016$) (Boeckner, Pullen, Walker, & Hageman, 2006). Additionally, excess weight was reported as a barrier (Sanderson, Littleton, & Pulley, 2002), and body mass index was positively correlated with sedentary behavior (Haardörfer et al., 2014).

The category of cognitions and affect included two primary themes: self-efficacy and motivation (Olsen, 2013). First, rural women with higher levels of self-efficacy reported more physical activity (Wilcox et al., 2003, Dye & Wilcox, 2006; Sanderson et al., 2003; Walker, Pullen, Hertzog, Boeckner, & Hageman, 2006). For example, Eyler (2003) reported self-efficacy increased the odds of participating in any physical activity among rural, Caucasian women from the Midwest (OR=2.75, 95% CI: 1.25-6.06). Similarly, Sanderson et al. (2003) reported high self-efficacy increased rural, African American women's odds of meeting physical activity recommendations (OR=5.26, 95% CI: 1.54-18.01). In a study of rural pregnant women, Hinton and Olson (2001) reported a positive association between increased physical activity levels in pregnancy and self-efficacy ($p<.05$). A similar association was reported by Wilcox et al. (2003) in a sample of rural, Caucasian and African American women 50 years of age and older ($p<.05$). Low self-efficacy was also reported as a barrier to physical activity in a qualitative study in the same demographic group (Wilcox et al., 2005).

Motivation was a second common theme, particularly among qualitative studies. For example, Miller, Marolen, and Beech (2010) conducted a qualitative study of physical activity among rural African American women with type two diabetes and reported decreased motivation among women who had decreased readiness for physical

activity. Sanderson, Littleton, and Pulley (2002) also studied rural African America women using qualitative methods, reporting lack of motivation as a barrier to physical activity. In a study of Caucasian and African American women, Wilcox et al. (2005) reported low motivation as a barrier. Correspondingly, Dye and Wilcox (2006) reported that higher levels of motivation promoted physical activity in a qualitative study of rural, low-income women over 65 years of age. Marshall, Bland, and Melton (2013) used both qualitative and quantitative methods in their study of rural pregnant women, reporting lack of personal motivation as one of seven categories of barriers to physical activity. Notably, Peterson, Schmer, and Ward-Smith (2013) also reported lack of motivation as a barrier to physical activity in their qualitative study. Participants perceived depression as related to level of motivation. Finally, Osuji et al. (2006) conducted a quantitative study of rural women from the Midwest states of Missouri, Tennessee, and Arkansas. They reported lack of motivation significantly increased odds of not meeting physical activity guidelines (OR= 1.9; 95% CI: 1.5-2.3).

Synthesis of Findings and Recommendations for Future Research

This review revealed a slightly increasing trend toward the study of physical activity among pregnant rural women (Marshall, Bland, & Melton, 2013; Melton et al., 2013). It also indicated a variety of personal, socio-economic, and physical environment factors influence rural women's physical activity behavior. In the category of physical environment, rural women reported both a lack of facilities and difficulty accessing those that exist. In addition, safety concerns such as busy roads, weather extremes, dogs, and wild animals were reported. However, findings related to physical environment structures were inconsistent.

The reviewed literature supported the significance of both social and economic factors in regard to physical activity among rural women. Social responsibilities and lack of social support were common barriers to physical activity due to effects on time and energy. In contrast, social support, being part of a physical activity group, and having physical activity role models were reported to positively affect physical activity. Wilcox et al.'s (2000) foundational study comparing determinants of physical activity among rural and urban women reported that rural women have more caregiving responsibilities and experience more discouragement for physical activity than their urban counterparts. Participation in a church was a final social factor reported to support physical activity among both Caucasian and African American women.

Economic themes in the reviewed literature included income, education, and employment. A positive relationship was reported between physical activity levels and both income and educational level. In addition, several authors reported income levels either moderated or mediated the effects of other factors. This is significant considering that poverty is prevalent in rural areas (Housing Assistance Council, 2011). For example, the poverty rate in non-metropolitan areas exceeds the national rate and is 10% higher in non-metropolitan female-headed households than those in metropolitan areas (Housing Assistance Council, 2011). Finally, the reviewed literature indicated employment affected physical activity levels in varying ways. Exploration of the effect of work hours, shift, commute, type of work, or worksite promotions was absent.

The final category identified in the literature was personal factors, including both physical characteristics and cognitions and affect. Physical characteristics themes were health, energy level or tiredness, and weight. Several studies reported good health to be

associated with more physical activity. In contrast, both a lack of energy and being too tired were common barriers reported in qualitative and quantitative studies. Weight was an additional physical characteristic in the reviewed literature. Excess weight was reported as a barrier and showed a negative relationship to physical activity.

The cognitions and affect theme within the personal category included self-efficacy and motivation. Multiple studies supported the benefit of self-efficacy. Motivation was also supported by several studies (*n*=7), the majority of which were conducted with qualitative methods and provided minimal information regarding the strength of the association between motivation and physical activity or how the relationship may be mediated or moderated by other significant personal, social, or environmental factors.

Notably, inconsistent or unspecified definitions of what was considered to be a rural area were used in many of the reviewed studies. For example, the authors of eight studies did not specify a definition or census information on the area from which the study sample was drawn. In addition, among the studies in which this information was provided, the conceptualization of the term *rural* ranged from communities of less than 1,000 residents to those designated as non-metropolitan or with fewer than 50,000 residents. These gaps and inconsistencies weaken the conclusions that can be drawn from the findings (Olsen, 2013). Similar discrepancies were evident regarding how authors conceptualized and operationalized physical activity. For example, some authors used participants' perceptions, others calculated metabolic equivalent of task units (METs), and several categorized physical activity according to low, medium, and high

levels. Further, self-reported physical activity data were used in essentially all the reviewed studies.

The results of this review indicated that some factors associated with physical activity among rural women are similar to those documented among other population groups. Examples include self-efficacy (Kaewthummanukul & Brown, 2006; United States Department of Health and Human Services [HHS], 2013; Short, Vandelanotte, Rebar& Duncan, 2013) and motivation (HHS, 2013), as well as education, income, age, and BMI (Jeffrey Kao, Jarosz, Goldin, Patel, & Smuck, 2014; HHS, 2013). In addition, both social support and access to facilities have also been positively correlated with physical activity levels in the general population (HHS, 2013; Wendel-Vos, Droomers, Kremers, Brug, & van Lenthe, 2007). However, several gaps in the literature that should be addressed with future studies were revealed. First, there is a general lack of research examining factors associated with physical activity among rural women, and even fewer researchers have specifically studied rural women who are employed or included employment as a variable (n=6). These studies were diverse, had inconsistent findings, and generally failed to examine number of work hours, shift, type of employment, or the impact of employment or the work environment on physical activity or other major factors associated with physical activity in this population, such as family and childcare demands and fatigue. Second, inconsistent or unspecified definitions of rural were used in many studies of rural women of physical activity. This weakens the strength and generalizability of these findings. Third, most involved collection of self-reported physical activity data from participants. Although convenient and feasible, self-reported data relies on memory and assumes honesty; consequently, it is less reliable than actual

measures. Fourth, despite the results of a foundational study by Wilcox et al. (2000) which reported that rural women expressed more caregiver demands and experienced more discouragement for physical activity than urban women, subsequent researchers have failed to further explore and describe additional details about this difference. Fifth, the examination or control of depression for its relationship to physical activity was sparse in the literature, despite the prevalence of depression in rural populations. Sixth, although motivation was identified as a factor associated with physical activity in several studies, minimal information was provided regarding the strength of the association between motivation and physical activity, the quality of the motivation, or how the relationship between motivation and physical activity may be mediated or moderated by other significant personal, social, or environmental factors.

In summary, significant gaps persist in what is known about factors associated with physical activity among rural women. These gaps will need to be addressed to advance the science of nursing and inform nursing practice in the area of health behavior change. In addition, outside of a small number of articles targeting primary care and advanced practice nurses, literature exploring or suggesting how nurses could collect and utilize clinical physical activity data to increase knowledge of this health behavior or inform patient care is absent. This is concerning given the recommendation to regularly and consistently assess physical activity as part of the provision of patient care (Strath et al., 2013; Exercise is Medicine ® Australia, 2012; Hainsworth, 2006). Research that examines physical activity using clinical data is needed to learn more about physical activity in specific populations and to increase nursing knowledge regarding optimal methods of measuring, documenting, and utilizing this information. Because nursing

practice is increasingly documentation intensive, this gap should be addressed with attention to information systems and standardized terminologies used in clinical settings.

Section 2.2: Theoretical Framework

Multiple theories of health behavior change exist and could be used to guide research designed to fill the gaps in knowledge about physical activity among rural women identified in the previous section. Examples of theories commonly found in the physical activity literature across health disciplines include social ecological models, social cognitive theory, transtheoretical model of health behavior change, theory of planned behavior, health promotion model, and self-determination theory. Each has been empirically tested and found to have value in explaining physical activity behavior.

Notably, less than half of the reviewed studies of physical activity among rural women identified a theoretical framework (*n*=9). Among those that did, theories used to either frame the studies or categorize findings were social ecological model (*n*=5), social cognitive theory (*n*=2), health promotion model (*n*=1), and theory of planned behavior (*n*=1). In the following section, a brief overview of several theoretical models will be provided along with a critical analysis of each theory's utility for physical activity research (See Table 2.1).

Theoretical Models

Social cognitive theory. Bandura's (1989) social cognitive theory was developed from a reciprocal causation worldview grounded in the premise that humans both influence and are influenced by their environments. In addition, humans' capacity for reflective thought and self-regulation provide the opportunity to transcend past experiences and environmental influences in regard to motivation and action (Bandura,

1989). According to this model, three primary concepts affect physical activity behavior: self-efficacy, goal representations, and outcome expectations.

Bandura (1989) defines the first of these concepts, self-efficacy, as "people's beliefs about their capabilities to exercise control over events that affect their lives" (p. 1175). This concept impacts behavior through the following types of processes: cognitive, motivational, affective, and selection (of situations and social environments). Second, goal representations are conceptualized as cognitively generated goals which influence self-motivation through forethought and self-regulation. In addition, goal representations are influenced by affective self-evaluation, perceived self-efficacy for achieving goals, and continual readjustment of internal standards. The third concept, anticipated outcomes, is a person's cognitive predictions regarding the consequences of the behavior. Anticipated outcomes influence motivation and action through a person's desire to achieve positive outcomes or to avoid negative consequences.

Social cognitive theory is one of the most commonly used theories for health behavior change (National Cancer Institute, 2005) and numerous studies, including those reviewed in the previous section, have indicated support for the significance of its theoretical constructs, especially self-efficacy. However, the theory may be inadequate for addressing some of the more specific unanswered questions regarding physical activity, such as those identified for rural women. Examples include research questions seeking a more precise understanding of the nature and significance of motivation, social support, biological, and environmental factors.

Transtheoretical model of health behavior change. Prochaska and DiClemente (1982) theorize that people move through stages when changing health behaviors. The

stages include pre-contemplation, contemplation, determinism, action, maintenance, and relapse (Prochaska & DiClemente, 1982; Prochaska & DiClemente, 1986). Developmental and environmental processes are thought to facilitate the progression from pre-contemplation to contemplation (Prochaska & DiClemente, 1982; Prochaska & DiClemente, 1986). In addition, Prochaska and DiClemente (1986) propose that people engage in activities or experiences that modify thoughts, emotions, behaviors, or relationships as they progress through subsequent stages. These activities are called processes of change and include consciousness-raising, self-liberation, social liberation, counterconditioning, stimulus control, self-reevaluation, environmental reevaluation, contingency management, dramatic relief, and helping relationships (Prochaska & DiClemente, 1986). Certain processes of change are more commonly emphasized in some stages of change over others (Prochaska & DiClemente, 1986). Finally, self-efficacy, decisional balance, and temptation are important theoretical concepts and are postulated to differ in significance depending upon one's stage of change (Prochaska & DiClemente, 1986).

Although the transtheoretical model of change was not used in any of the reviewed studies of physical activity in rural women, it evolved from studies of the health behavior change process (National Cancer Institute, 2005) and is often used to guide research and interventions. However, the theory is largely intrapersonal in focus and does not transparently incorporate relevant concepts such as physical and mental health, motivation, socio-economic factors, environmental factors, and cultural factors. Further, it may have more value for intervention studies targeting health behavior change than descriptive research.

Theory of planned behavior. Ajzen (1985) proposed the theory of planned behavior as an expansion to the theory of reasoned action (Ajzen & Fishbein, 1980) in order to account for situations in which people do not have volitional control over intended behavior. This includes both actual and perceived control. The theory of planned behavior is comprised of several concepts. Attitude toward the intended behavior, subjective norm, and perceived behavioral control are postulated to determine behavioral intention, which is the immediate antecedent to the behavior (Ajzen, 2006).

Ajzen (1985) asserts that a person's beliefs about the positive or negative outcomes of a behavior, as well as the likelihood those consequences would actually occur, influence attitude toward behavior. Subjective norm, or a person's socially-influenced perception of a behavior, is thought to be affected by normative beliefs about the social pressures to engage in the behavior and the person's level of motivation to conform (Ajzen, 1985). Control beliefs, defined as beliefs about one's control over internal and external factors that may support or impede behavior, affect one's perceived behavioral control. Ajzen (1985) correlates this with Bandura's (1989) concept of self-efficacy. Finally, intention is the action one plans to take and indicates the amount of motivation and effort a person is willing to put toward a behavior (Ajzen, 1991).

Similar to the transtheoretical model of change, the theory of planned behavior has an intrapersonal focus. Although one's perceptions of social and contextual factors are considered relevant, concepts such as physical and mental health, social support, and environmental influences are not transparently addressed, limiting the theory's usefulness for addressing complex gaps in physical activity research.

Health promotion model. The health promotion model is grounded in the Reciprocal Interaction Worldview in which people are viewed holistically while recognizing that various parts can be examined within the whole (Pender, 2011). Pender (2011) identifies empirical indicators that are both influenced by and reciprocally affect behavior-specific cognitions and affect, hypothesizing that change in thought will precede a change in behavior. These concepts are categorized into three components: individual characteristics and experiences, behavior-specific cognitions and affect, and behavioral outcome (Pender, Murdaugh, & Parsons, 2011).

The first component, individual characteristics and experiences, is based upon the perception that health behavior change is impacted by two variables: personal factors and prior related behaviors (Pender, Murdaugh, & Parsons, 2011). The second component, behavior-specific cognitions and affect, encompasses eight variables that directly influence health-promoting behavior (Pender, Murdaugh, & Parsons, 2011). The behavior-specific cognitions and affect variables are considered to have motivational significance. They include perceived benefits of action, perceived barriers to action, perceived self-efficacy, activity-related affect, interpersonal influences, situational influences, commitment to a plan of action, and immediate competing demands and preferences. The final component of the health promotion model, behavioral outcome, encompasses the variable of health-promoting behavior (Pender, Murdaugh, & Parsons, 2011).

One strength of the health promotion model is the incorporation of multiple concepts, implying acknowledgment of the complexity of humans and the behavior change process. In addition, several levels found in social ecological models are

exemplified in the health promotion model. However, similar to social cognitive theory, the transtheoretical model of change, and the theory of planned behavior, all relevant concepts are not transparently identified within the framework. Additionally, due to the large number of concepts that are part of the health promotion model, it may be challenging to incorporate the complete model in a research study.

Self-determination theory. Deci and Ryan's (1985) self-determination theory is a broad theory of motivation comprised of five mini-theories of different aspects of motivation or personality (Self-determination theory, n. d.). The quality and quantity of motivation, as well as how the concept is influenced by social and cultural factors, are viewed as important in self-determination theory. Ryan and Deci (2000) conceptualize motivation as being moved or energized to take action. The qualitative domain of motivation is hypothesized to be on a continuum starting with amotivation, or the absence of motivation, and increasing to various levels of extrinsic motivation, followed by intrinsic motivation. These types of motivation are considered to be different approaches and are dependent upon what is motivating a person at the given time (Ryan & Deci, 2000).

According to Ryan and Deci (2000), intrinsic motivation involves a drive to action grounded in the inherent satisfaction or enjoyment it will bring. Extrinsic motivation, however, is driven by external pressure, control, or instrumental value (Ryan & Deci, 2000). As previously stated, Ryan and Deci (2000) identify four different types of external motivation: external, introjected, identified, and integrated. External regulation is the most externally focused, driven by rewards or the desire to avoid punishment (Ryan & Deci, 2000). Introjected regulation also involves an external focus

but does include the personal perception of some internal causality (Ryan & Deci, 2000). An example would be motivation to gain the approval of others. The next level of external motivation is identified regulation which involves a "somewhat internal" locus of causality (Ryan & Deci, 2000, p. 61). At this level, a person values a goal and action becomes personally important. In the final level of external motivation, integrated regulation, motivation is very internally focused, emanating from a sense of self; however, it is still directed toward the attainment of an external goal (Ryan & Deci, 2000). The various levels of motivation are considered to be innate, yet context-dependent and influenced by social and environmental factors. Although they are structured on a continuum, they are not perceived to be a developmental progression; rather, one may experience different types of motivation in response to different behaviors or diverse situations (Ryan & Deci, 2000).

Three conditions are theorized to support motivation and are important concepts in self-determination theory: autonomy, competence, and relatedness (Ryan & Deci, 2000). Autonomy involves having the ability to take action and perceiving that one's actions are self-determined. Competence is viewed as synonymous with self-efficacy (Ryan & Deci, 2000). In addition, it must be accompanied by autonomy in order for people to perceive they have control over outcomes. Relatedness is a sense of belonging, being connected, and feeling cared for or supported. These concepts are impacted by the social context and influence type of motivation.

Although self-determination theory was not used in any of the reviewed studies of rural women, it may hold promise for guiding research that aims to fill gaps in the research, specifically those regarding the concept of motivation. Strengths include a

focus on motivation, a well-developed conceptualization of the concept, and the inclusion of other concepts and systems levels that are recognized as significant across multiple behavior change theories. That said, it may hold less value for answering research questions specifically concerned with other relevant concepts, such as physical and mental health, social support, and environmental factors.

Ecological model for health promotion. McLeroy, Steckler, Bibeau, and Glanz (1988) propose an ecological model for health promotion focused on health behavior and founded upon Brofenbrenner's (1977) social ecological framework. The model is based upon a systems approach that recognizes multiple levels within the social environment as unique and important for their influence of and by health behaviors (McLeroy et al., 1988). According to McLeroy et al. (1988), health behavior is determined by intrapersonal factors, interpersonal processes, institutional factors, community factors, and public policy. Intrapersonal factors include individual characteristics, such as developmental level, knowledge, attitude, and self-concept (McLeroy et al., 1988). Interpersonal processes address the role of social groups and social support for health behaviors, including family, friends, and work groups (McLeroy et al., 1988). Institutional factors refer to formal and informal rules or policies that exist within social organizations, such as schools or worksites (McLeroy et al., 1988). Next, at the community factor level, networks and relationships between organizations are considered (McLeroy et al., 1988). Finally, public policy factors are laws and policies at local, state, and national levels (McLeroy et al., 1988).

A unique aspect of social ecological models among behavior change theories is the distinct recognition of multiple systems beyond the individual as significant for

influencing health behavior. The reviewed literature in the previous section indicated factors associated with physical activity among rural women can be organized into three categories: personal, socioeconomic, and environmental. This corresponds well with the ecological model for health promotion, lending support for its use in physical activity research. One limitation of the model, however, is that fact that it is broad in scope and imprecise in identifying specific concepts and relationships at each level. For example, the concept of motivation would fit well within the intrapersonal level of the social ecological model, yet it is not specifically identified as a concept within the framework by McLeroy et al. (1988). Despite this drawback, the ecological model for health promotion has been supported by the findings of recent research on several health promotion topics, including nutrition (Fowles & Fowles, 2008; Bandoni, Sarno, & Jaime, 2011), weight management (Ali, Baynouna, & Bernsen, 2010), and physical activity (Walcott-McQuigg, Zerwic, Dan, & Kelley, 2001). Additionally, it was selected as the guiding framework for the American College Health Association's (n.d.) Healthy Campus 2020 initiative. The ecological model for health promotion is a robust, holistic theory of health behavior that conceptually aligns with both the current evidence regarding factors associated with physical activity among rural women and the Omaha System. It is particularly suitable for research involving these two topics in the context of community nursing practice and was selected as the guiding theoretical framework for this study. The previously mentioned limitation was addressed by mapping the Omaha System to the ecological model for health promotion (See Section 2.4) and providing specific operational definitions for each study variable (See Chapter One; Table 1.1).

Two manuscripts prepared for publication will be presented in the next two sections of this chapter. The first is a review of the literature about factors associated with physical activity among rural women in the US. This manuscript was accepted for publication in the journal *Public Health Nursing*. It became available online ahead-of-print in January 2013 with official publication in July 2013. The focus of this journal is population health across the lifespan with emphasis on vulnerable populations and public health issues of concern to nurses. The manuscript in Section 2.3 is identical to the final revised manuscript that was submitted to *Public Health Nursing* prior to publication.

The second manuscript is a conceptual mapping of the Omaha System and the ecological model of health promotion (McLeroy et al., 1988). Manuscript Two, as included in Section 2.4, also was prepared for submission to *Public Health Nursing*. This journal was selected because *Public Health Nursing* publishes articles relating to theory development and methodological innovations. In addition, the manuscript aligns with the journal's focus on issues of concern to public health nurses.

Table 2.1. Theoretical Frameworks useful in Research of Physical Activity

Theorist(s)	Theory	Philosophical perspective	Concepts	Critique
Bandura (1989)	Social Cognitive Theory	Reciprocal causation	Self-efficacy; Goal representations; Anticipated outcomes	Comprehensive in recognition of personal, social, and environmental factors. Motivation is imbedded in each of the main theoretical concepts and said to be reflected in level of effort and duration of perseverance but is not a discrete concept in the model. Lack of attention to biological factors. May not account for the complexity of social support.
Prochaska & DiClemente (1982; 1986)	Transtheoretical Model of Change	Not specified	Stages of change: pre-contemplation, contemplation, determinism, action, maintenance, relapse Processes of change: consciousness-raising, self-liberation, social liberation, counterconditioning, stimulus control, self-reevaluation, environmental reevaluation, contingency management, dramatic relief, and helping relationships;	Explains the health behavior change process. Intrapersonal in focus and assumes a logical and orderly process toward change without accounting for biological or emotional factors. Motivation recognized as necessary for change but not included as a distinct concept in the model.

Theorist(s)	Theory	Philosophical perspective	Concepts	Critique
			Other: self-efficacy, decisional balance, temptation	
Ajzen (1985; 1991; 2006)	Theory of Planned Behavior	Not specified	Attitude toward behavior; Subjective norm; Perceived behavioral control; Actual behavioral control; Intention	Motivation conceptualized as synonymous with intention. Self-efficacy considered relevant as an aspect of behavioral control. Focused on intrapersonal cognitive processes with lack of attention to biological, some social, or environmental factors.
McLeroy, Steckler, & Bibeau (1988)	Social Ecological Model	Not specified	System levels: intrapersonal, interpersonal, institutional, community, public policy Concepts at each level suggested but not discretely specified	Comprehensive. Accounts for the impact of multiple systems on health behavior. Very broad with little detail suggested regarding discrete concepts at each level.
Pender, Murdaugh, & Parsons (2011)	Health Promotion Model	Reciprocal interaction	Individual characteristics and experiences variables: Personal factors; Prior related behaviors; Behavior-specific cognitions and affect variables: Perceived benefits to action; Perceived barriers to action; Self-efficacy; Activity-related affect; Interpersonal influences;	Comprehensive in consideration of personal, social, and environmental factors. Complex with many concepts: factors both directly and indirectly influence each other and behavior.

Theorist(s)	Theory	Philosophical perspective	Concepts	Critique
			Situational influences; Commitment to plan of action; Immediate competing demands and preferences	Motivation imbedded in the behavior-specific cognitions and affect variables but not distinctly identified as a theoretical concept
Deci & Ryan (1985); Ryan & Deci (2000)	Self-Determination Theory	Organismic	Autonomy; Competence; Relatedness Types of motivation: intrinsic, extrinsic (integration, identification, introjection, external), amotivation	Motivation is the fundamental concept in the model. Social and environmental factors considered. Complexity of individuals recognized. Though parsimonious, the model does not address antecedents to autonomy, competence, and relatedness.

Section 2.3: Manuscript One "An Integrative Review of Literature on the Determinants of Physical Activity among Rural Women"

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Abstract

Objective(s): The purpose of this integrative review was to analyze current, non-experimental literature to identify factors that influence physical activity levels in rural women with a goal of informing nurses and improving the effectiveness of future physical activity interventions in this population.

Design and sample: Whittemore and Knafl's (2005) integrative review methodology was used. The sample included eleven quantitative articles, seven qualitative studies, two studies that incorporated both methodologies, and one explanatory case study.

Measurements: Each article was evaluated for quality using the American Association of Critical-Care Nurses (AACN) revised evidence leveling system. Data were analyzed and then synthesized using the Matrix Method.

Results: The terms "rural" and "physical activity" were diversely defined in the reviewed articles. The results revealed three categories of determinants: personal factors, socio-economic factors, and physical environment factors.

Conclusions: Effective nursing interventions to promote physical activity should address barriers and motivating factors in all three categories of determinants for maximum efficacy. Additional research that clearly defines and consistently applies the terms "rural" and "physical activity" is needed to strengthen knowledge in this area.

Key words: Rural women, physical activity determinants

An Integrative Review of Literature on the Determinants of Physical Activity among Rural Women

Introduction

Improving health through daily physical activity (PA) is a national health goal and public health challenge (United States Department of Health and Human Services [HHS], Healthy People 2020, 2012). Studies have indicated that rural women may be at greatest risk for inactivity (Brownson et al., 2000; Wilcox, Castro, King, Housemann, & Brownson, 2000). Interventions to address this issue are needed; however, a clear understanding of the unique PA barriers and facilitators rural women experience and perceive is first necessary in order to ensure the effectiveness of these programs. This integrative review explores current, relevant literature to identify the determinants of PA levels in this population.

Background

Regular PA has many health benefits including weight control, improved mental health, and reduced risk for chronic diseases such as heart disease, diabetes, and some cancers (CDC, 2011a). The CDC (2011b) recommends that adults between the ages of 18 and 64 get a minimum of 150 minutes of moderate-intensity aerobic activity, 75 minutes of vigorous-intensity aerobic activity, or an equivalent mix of both each week. In addition, muscle-strengthening activities should be done two or more days each week. PA levels in excess of the minimum recommendations can provide increased health benefits (CDC, 2011b). For example, Mora et al. (2007) reported an inverse relationship between PA and cardiovascular disease risk in healthy women with the lowest risk among the most physically active participants. Similarly, Hu et al. (1999) reported greater levels of PA to be associated with reduced risk for type 2 diabetes among women. This

dose-response association between increased levels of PA and reduced disease risk has also been observed in both colon and breast cancers (Thune & Furberg, 2001). In summary, it is important that women participate in adequate levels of PA for optimal health.

Despite the documented benefits of exercise, the CDC (2011c) estimates that 25.4% of United States (US) adults do not participate in any leisure time physical activity (LTPA). Further, the prevalence of leisure time physical inactivity is higher among rural residents (43%) than those living in urban areas (35%) (CDC, 2011d). Even so, there has been little study of PA determinants among rural populations (Brownson et al., 2000). In addition, determinants of PA differ by gender (Phongsavan, McLean, & Bauman, 2007), and women are less likely than men to achieve recommended levels (CDC, 2011e). Notably, 26.2% of women report no leisure-time PA as compared to 21.7% of men (CDC, 2010). Finally, determinants of LTPA have also been found to differ between rural and urban women (Wilcox et al., 2000), and, when compared to women living in urban areas, rural women are more likely to be completely inactive during leisure time (Brownson et al., 2000). These disparities are of particular concern to nurses who, through a variety of roles and settings, work with clients to promote health and reduce disease risk. Often this includes the provision of interventions to facilitate health behavior changes including increased levels of PA. Many rural areas have fewer healthcare resources and personnel than more urban settings (Jones, Parker, & Ahern, 2009); consequently, it is vital that interventions be both efficient and effective. This requires understanding the unique determinants of PA within the population of interest.

A comprehensive review synthesizing the state of the science on this topic and identifying gaps in research is currently lacking.

Research question

The purpose of this integrative review was to analyze current, non-experimental literature to identify factors that influence physical activity (PA) levels in rural women with a goal of informing nurses and improving the effectiveness of future interventions in this population. The research question is: what are the determinants of PA levels among rural women in the United States?

Methods

Design and sample

This integrative review followed the methodology suggested by Whittemore and Knafl (2005). Their five stage process includes articulation of the problem to be studied, completion of a well-defined literature search, evaluation of the quality of data found in relevant literature, analysis of the data, and presentation of conclusions. Research studies incorporating diverse designs are included in the review to present various perspectives and expand the knowledge base of nursing (Whittemore & Knafl, 2005).

A systematic search of existing English, peer-reviewed literature on determinants of PA among rural women was conducted through the following computerized databases: CINAHL, Academic Search Premier, Academic Search Complete, PsycINFO, MEDLINE, and Health Source – Nursing/Academic Edition. Key words used in the search included (a) physical activity, rural women; (b) physical activity, rural women, determinants; (c) physical activity, barriers, rural women; (d) walking, rural women; (e) physical activity, rural, women; and (f) exercise, rural women. The purpose of the

present study was to identify factors associated with PA among rural women; therefore, experimental studies of PA interventions were excluded with the goal of improved understanding of PA determinants in the absence of variable manipulation. Further, due to international variation in health and social policies that may impact motivation and time available for PA, only studies of rural women residing in the US were included. The initial search resulted in a sample of 307 articles following the exclusion of duplicates. The articles were reviewed according to inclusion and exclusion by the author. After removing those articles that studied populations outside the US (n = 182), did not specifically examine rural women or factors influencing physical activity in this population (n = 88), or reported on intervention research (n = 16), the final sample for this integrative review was comprised of 21 studies. They included eleven quantitative articles, seven qualitative studies, two studies that incorporated both methodologies, and one explanatory case study.

Measures

Each article was evaluated for quality by the writer using the American Association of Critical-Care Nurses (AACN) revised evidence leveling system (Armola et al., 2009). The new AACN structure consists of six rating levels. Level A includes meta-analysis and meta-synthesis studies, and Level B signifies both randomized and non-randomized well-designed and controlled studies. Level C broadly encompasses qualitative studies, descriptive and correlational research, integrative and systematic reviews, and randomized controlled trials with inconsistent results. Level D indicates resource supported peer-reviewed standards, Level E signifies theory based evidence from case reports and expert opinion, and Level M identifies manufacturer recommendations.

Because the purpose of this review was to identify determinants of PA in rural women and excluded experimental research, all included studies were descriptive in nature with most receiving a Level C rating.

Analytic strategy

Data were analyzed and then synthesized by the author using the Matrix Method (Garrard, 2007) according to purpose, methods, findings, and critique (see Table I). Descriptions of barriers and motivators of PA also were extracted and summarized. For each article, definitions used by the researchers to categorize their population as rural and to measure PA were delineated. Findings were then synthesized through comparison, interpretation, and categorization of themes.

Results

Definitions

The terms "rural" and "physical activity" were diversely defined and interpreted in the literature. Because this review sought to identify factors that influence PA in the specific population of rural women, precise definitions were necessary to enhance the explanatory power of the findings. Therefore, each of the included studies was analyzed to determine how the authors interpreted and defined these terms. Considerable variation was found (see Table II).

Rural. Several studies described the sample population as rural but failed to provide a specific definition (Atkinson, Billing, Desmond, Gold, & Tournas-Hardt, 2007; Hinton & Olson, 2001; Dye & Wilcox, 2006; Kelsey et al., 2006; Miller, Marolen, & Beech, 2010; Sanderson et al., 2003a). Conversely, Gangeness (2010) provided the most stringent and precise definition of rural, restricting her sample to communities with

populations of less than 1,000 and with no towns of more than 2,500 residents within a 15-mile radius. Similarly, Wilcox, et al. (2000) studied communities of less than 2, 500 residents. Perry, Rosenfeld, and Kendall (2008) simply stipulated that rural communities in their sample were located at least 10 miles from any cities with populations of 30,000 or more. Others used the US Department of Agriculture non-metropolitan county classification (Bopp, Wilcox, Oberrecht, Kammermann, & McElmurray, 2004; Sanderson et al., 2003b; Wilcox, Bopp, Oberrecht, Kammermann, & McElmurray, 2003; Wilcox, Oberrecht, Bopp, Kammermann, & McElmurray, 2005). Multiple studies limited their samples to communities with maximum populations ranging from less than 10,000 residents to as high as 21,000 people (Adachi-Mejia et al., 2010; Boeckner, Pullen, Walker, & Hageman, 2006; Bove & Olson, 2006; Osuji, Lovegreen, Elliott, & Brownson, 2006; Sanderson, Littleton, & Pulley, 2002). Further, the most liberal definitions of rural included towns as large as 49,999 residents (Walker, Pullen, Hertzog, Boeckner, & Hageman, 2006) or those that met the US Bureau of Census classification of being outside an urban center or cluster (Eyler, 2003; Eyler & Vest, 2002). In summary, considerable variation was found regarding how rural was defined, potentially limiting the ability to infer conclusions that will be applicable in various rural settings.

Physical activity. Standardized instruments or definitions from well-reputed organizations were used in several studies to measure PA levels. For example, some used the Modified 7-day Activity Recall instrument (Boeckner et al., 2006; Walker et al., 2006), while others used questions from the Behavior Risk Factor Surveillance System (BRFSS) or Youth Risk Factor Surveillance System (YRFSS) surveys (Adachi-Mejia et al., 2010; Bopp et al., 2004; Eyler, 2003; Osuji et al., 2006; Wilcox et al., 2000; Wilcox

et al., 2005; Sanderson et al., 2003a). In addition, the Physical Activity Scale for the Elderly (PASE) was used (Bopp et al., 2004; Wilcox et al., 2003). Days per week of "moderate" or "vigorous" activity was another measure (Atkinson et al., 2007; Eyler & Vest, 2002; Perry, Rosenfeld, & Kendall, 2008). Bove and Olson (2006) and Dye and Wilcox (2006) did not specify a definition, while Miller, Marolen, and Beech (2010) accepted participants' definitions in their qualitative study. Further, some authors noted acceptance of a variety of activities as PA (Gangeness, 2010; Kelsey et al., 2006). Similar to the variation noted among definitions of "rural", the discrepancies in measurement of PA found in the current literature is notable and weakens the degree of certainty that may be inferred from these findings.

Determinants of Physical Activity

Analysis of findings related to determinants of PA in rural women revealed three categories: personal factors, socio-economic factors, and physical environment factors (see Table III). These categories reflect the barriers and motivators that influence PA behaviors in the studied population. Additionally, rural women were found to have significantly more barriers to PA than urban women (Wilcox et al., 2000). Further, a dose-response relationship was identified that indicated the more barriers to PA a rural woman experienced, the less likely she was to meet PA guidelines (Osuji et al., 2006) or participate in strength training (Bopp et al, 2004). Finally, in a study testing Pender's Health Promotion Model, Walker et al. (2006) found perceived barriers to be part of canonical determinate variate, meaning a new variable composed of multiple predictor variables, to be significantly related to a physical activity marker variate.

Personal factors. The category of personal factors encompasses two themes that reflect the unique attributes and perspectives of individuals: physical characteristics and cognitions and affect. The theme of physical characteristics includes both modifiable and non-modifiable factors that were found to influence PA levels. First, health status was a common finding (n = 7). For example, not being in good health was found to increase one's likelihood of not meeting PA guidelines (Eyler, 2003; Osuji et al., 2006) or participating in strength training (Bopp et al, 2003). Optimal health was also found to be significant when comparing those who were active (Sanderson et al., 2003a; Sanderson et al., 2003b) or got any level of PA (Eyler, 2003) with those that were inactive. Further, poor health, illness, and injury were cited as barriers in several studies (Perry, Rosenfeld, & Kendall, 2008; Sanderson et al., 2002; Sanderson et al., 2003a; Dye & Wilcox, 2006; Wilcox et al., 2003; Wilcox et al., 2005). In addition, fear of injury was noted as a barrier (Osuji et al., 2006; Wilcox, Castro, King, Housemann, & Brownson, 2000; Bopp et al., 2004; Wilcox et al., 2003). Finally, pregnancy was found to impact PA levels, resulting in either a maintenance or decrease in PA levels among those who had been active prior to pregnancy and a maintenance or increase in levels among those who had been inactive prior to pregnancy (Hinton & Olson, 2001). Second, age was found to determine PA levels in rural women. Women between the ages of 20 and 29 were more likely to both participate in any level of PA as well as to meet the guidelines (Eyler, 2003). Sanderson et al. (2003b), however, found that African American women between the ages of 30 and 39 were more likely to meet PA guidelines. Younger age was also associated with higher PA levels among women age 50 and over (Wilcox et al., 2003). Wilcox et al. (2005) reported that some African American women felt they were too old for PA. Conversely,

Hinton and Olson (2001) found that pre-pregnancy PA levels showed a positive correlation to age. These findings indicate a need for more exploration of this factor among population subsets of rural women.

Energy levels were a third physical characteristic influencing PA. This was described as a lack of energy or tiredness (Adachi-Mejia et al., 2010; Sanderson et al., 2002; Dye & Wilcox, 2006; Bopp et al., 2004; Wilcox, 2005), though Osuji et al. (2006) differentiated the two, finding them both to be significant predictors of who would not meet PA guidelines. Interestingly, Perry, Rosenfeld, and Kendall (2008) reported that women perceived the energizing effects of walking to be a motivator of PA.

The final physical characteristic found to be a determinant was weight. Women of normal weight were more likely to meet target PA levels (Boeckner et al., 2006), and being overweight was found to be a barrier to PA (Sanderson et al., 2002). Further, a negative relationship was found between PA level and eating for coping (Kelsey et al., 2006). Along these lines, Hinton and Olson (2001) found pre-pregnancy PA frequency to be negatively associated with body mass index (BMI); however, a positive correlation was found during pregnancy.

The theme of cognitions and affect includes multiple factors that reflect the ways in which individuals think and feel about PA and life situations. This theme is particularly relevant given the fact that these factors are usually considered to be modifiable, are often constructs in health behavior change theories, and are a frequent focus of health behavior change interventions. Five variables were identified: self-efficacy, self-discipline, motivation, coping style, and positive affect.

Self-efficacy has consistently been found to be a predictor of health behavior change and can be defined as the belief that one is competent and skilled enough to accomplish a behavior necessary to achieve a desired goal (Bandura, 1977). Eyler (2003) found that low self-efficacy levels were associated with increased likelihood of inactivity among rural women. In addition, low self-efficacy was reported as a barrier to strength training in rural, white women (Bopp et al., 2004). Wilcox et al. (2003) and Dye and Wilcox (2006) reported self-efficacy promoted PA among older rural women. Similarly, Sanderson et al. (2003b) found an association between higher self-efficacy and meeting PA guidelines among African American women between the ages of 20 and 50. Hinton and Olson (2001) found a positive correlation between exercise and PA change during pregnancy. Further, perceived self-efficacy was part of the canonical determinate variate that Walker et al. (2006) found to be significantly related to a PA marker variate.

Lack of motivation was found to be a barrier to PA and to be associated with a decreased likelihood of not meeting PA guidelines (Osuji et al., 2006; Sanderson et al., 2002; Wilcox, 2005). Additionally, Miller (2004) found a relationship between decreased motivation and decreased readiness for PA. Closely related to this, Adachi-Mejia et al. (2010) found lack of interest to be a significant barrier to PA among rural mothers of school-aged children. Similarly, Sanderson et al. (2003a) found that active African American women were less likely to report lack of interest as a barrier to PA.

The remaining three variables encompassed by the cognitions and affect theme were self-discipline, coping style, and positive affect. Although only one study cited self-discipline as significant barrier to PA (Adachi-Mejia et al., 2010), it is worth noting for several reasons. First, it is one of the most recent studies found in the literature search.

Second, random selection methodologies were used to collect a very large number of study participants. Finally, self-discipline was found to be the second most commonly cited barrier to PA as well as one of three significant determinants in the final regression model ($p < .001$). A unique perspective and different determinants were found by Kelsey et al. (2006) who examined the relationship of emotions and PA. The researchers found that both positive affect and positive coping (i.e., getting extra sleep, talking with friends and family, hobbies) were significant predictors of PA.

Socio-economic factors. Both social and economic forces were found to be themes of influence within the socio-economic category. Findings comprised factors such as family demands, social support, religious influence, occupational matters, income, and educational level. Although some of these factors are presumably common to women residing in both rural and urban areas, others were identified as unique to the rural context.

Social forces included family and childcare demands and social support. First, multiple studies cited family and childcare demands as a barrier to PA ($n = 7$). Demands on time, the need to adapt due to childcare responsibilities, and lack of time and energy due to family needs were common findings (Eyler & Vest, 2002; Gangeness, 2010; Perry et al., 2008; Bopp et al., 2004; Wilcox et al., 2003; Wilcox et al., 2005). Further, Wilcox et al. (2000) found that rural women had significantly more caregiver duties than urban women. These duties were not specified. Eyler (2003) found that the number of children a rural woman had impacted the odds that she would be inactive. Those with only one child were more likely to participate in some PA than those that had two or more children

at home. Sanderson et al. (2003a) reported being married as a factor associated with being active among both African American and white women.

The second social force identified in the literature was social support. Rural women were more likely to participate in PA if they were a part of a group or were able to meet their social needs when exercising (Eyler, 2003; Eyler & Vest, 2002; Osuji et al., 2006; Perry et al., 2008; Dye & Wilcox, 2006). Similarly, seeing others exercising in the neighborhood was also positively associated with levels of PA (Eyler, 2003, Sanderson et al., 2003b). Wilcox et al. (2003) reported social support was a motivator for PA while lack of social support from family was a barrier to participation (Bopp et al., 2004; Wilcox et al., 2005). Further, Walker et al. (2006) found social support to be part of the canonical determinate variate significantly related to a PA marker variate. Finally, Wilcox et al. (2000) found that rural women experienced significantly more discouragement from others regarding PA than urban women. Exactly how this occurs was not specified.

Several studies noted religious influences on PA. Sanderson et al. (2003b) reported African American women that attended religious services were more likely to both participate in any level of PA as well as to meet PA guidelines. Similarly, Eyler (2003) reported white women that attended religious services were more likely to participate in PA. The need for church support was also reported as a barrier to PA among African American women (Wilcox et al., 2005).

Economic forces within the socio-economic category included occupational demands, income, and education. First, several studies noted work as a determinant of PA (n=6). Work hours and demands were identified as a barrier to PA (Eyler & Vest,

2002; Sanderson et al., 2002; Bopp et al., 2004; Wilcox et al., 2005), creating a need for adaptation (Gangeness, 2010). Adachi-Mejia et al. (2010) found that working outside the home was correlated with decreased time and self-discipline for PA. To the contrary, however, Eyler (2003) found that working outside the home was associated with an increased likelihood of meeting PA guidelines.

The second economic force identified was income. Although two studies noted a correlation between increased income and increased levels of PA (Hinton & Olson, 2001; Sanderson et al., 2003b), this determinant is most notable for its influence on other determinants. For example, rural women with lower income levels were found to lack knowledge regarding PA guidelines (Atkinson, Billing, Desmond, Gold, & Tournas-Hardt, 2007). Transportation problems were also identified as a barrier (Atkinson et al., 2007; Bove & Olson, 2006), as was an inability to afford fitness membership fees (Atkinson et al., 2007). Additionally, several barriers were identified as significantly different in lower income women when compared to those that were more affluent, such as decreased social support and childcare issues (Adachi-Mejia et al., 2010; Osuji et al., 2006). Conversely, women with higher incomes were more likely to cite time as a barrier (Adachi-Mejia et al., 2010; Osuji et al., 2006).

Education was identified as the third and final economic force impacting PA. Higher education levels were found to be associated with increased levels of pre-pregnancy PA (Hinton & Olson, 2001) and among women age 50 and over (Wilcox et al., 2003). Additionally, Wilcox et al. (2000) reported that rural women participated in significantly less PA than urban women if they had less than a high school education.

It should be noted that lack of time was identified in several studies as a determinant of PA (Adachi-Mejia et al., 2010; Atkinson et al., 2007; Osuji et al., 2006; Sanderson et al., 2002). The time variable was typically aligned with one or more of the socio-economic factors, such as family and childcare demands, occupational demands, and income. For example, Adachi-Mejia et al. (2010) noted that a lack of time was the most commonly cited barrier to PA, and this was found to have additional significance among women who worked outside the home as well as those with incomes greater than or equal to $75,000 per year. Similarly, Atkinson et al. (2007) found that a lack of time was related to childcare responsibilities. Notably, the majority of articles that cited time as a barrier had studied women with children or those between the ages of 20 and 50 (*n* = 3).

Physical environmental factors. The physical environment in rural areas differs from that found in more urban settings and can impact PA levels. Three themes were identified within this category: access, safety, and structures.

Wilcox et al. (2000) reported that rural women had less access to facilities for PA than urban women. Lack of access was also noted as a barrier in other studies (Eyler & Vest, 2002; Sanderson et al., 2002; Bopp et al., 2004; Wilcox et al., 2005). Further and as previously mentioned, lower income rural women experienced lack of access to facilities due to both an inability to afford membership fees (Atkinson et al., 2007) and transportation difficulties (Atkinson et al., 2007; Bove & Olson, 2006; Wilcox et al., 2005).

The second theme found to impact PA within the physical environment category was safety. Several studies noted that rural women either lack a safe place for PA or

have safety concerns that serve as barriers (Eyler & Vest, 2002; Sanderson et al., 2002; Wilcox et al., 2000; Wilcox et al., 2003). Additional barriers were found to include busy roads (Atkinson et al., 2007; Wilcox et al., 2003), heat (Sanderson et al., 2002), dogs (Wilcox et al., 2000; Wilcox et al., 2005), and wild animals (Atkinson et al., 2007; Gangeness, 2010).

Structures were found to be the final theme identified within the physical environment category. First, most studies reported that rural women found a lack of sidewalks to be a barrier to PA (Bove & Olson, 2006; Eyler & Vest, 2002; Wilcox et al., 2000; Wilcox et al., 2005); however, one study reported a negative correlation (Wilcox et al., 2003). A second structural barriers was a lack of streetlights (Bove & Olson, 2006; Eyler, 2003; Eyler & Vest, 2002; Gangeness, 2010; Wilcox et al., 2000).

Discussion

As previously stated, the purpose of this integrative review of descriptive research was to identify those factors that influence PA levels in rural women with a goal of informing nurses and improving the effectiveness of future interventions in this population. The results revealed three categories of determinants: personal factors, socio-economic factors, and physical environment factors. Themes within each category were found to either support or impede PA in the lives of rural women. Affirming determinants included personal factors such as the presence of positive cognitions and affect (self-efficacy, self-discipline, motivation, coping style, and affect) and socio-economic forces such as social support and higher education. Determinants considered as barriers included the physical characteristics of poor health, fear of injury and lack of energy; the social force of family and childcare demands; and physical environment

factors such as lack of access, safety concerns, and structural inadequacies. In addition, contradictory findings were noted specific to several determinants. For example, though increased age and weight were usually found to bear a negative relationship to PA levels, the opposite was true in a study of pregnant rural women. Further, work hours and demands were typically found to be a barrier; however, working outside the home was also reported as a positive determinant. Finally, factors associated with PA among rural women were found to vary by income level. Although a positive association between income and PA has been generalized to all populations (HHS, Healthy People 2020, 2012), this is of particular concern for women residing in rural areas where poverty rates are higher (DeNavas-Walt, Proctor, & Smith, 2008) and incidence of chronic disease is greater (Jones, Parker, Ahearn, Mishra, & Variyam, 2009) than in urban settings. Findings suggest that barriers to PA among low-income rural women include transportation problems, childcare issues, lack of knowledge of PA guidelines, inability to afford membership fees, and lack of social support.

Because PA is vital for optimal health and disease prevention, nurses are challenged to help patients initiate and increase this important health behavior. Findings in this integrative review indicated the multi-dimensional nature of determinants of PA in rural women. Therefore, effective nursing interventions to promote PA must holistically address barriers and motivating factors in all dimensions for maximum efficacy. Additionally, practice approaches will need to be modified to address determinants specific to subsets of women in rural populations, including pregnancy, occupational status, and various income levels. In addition to these practice implications, findings indicated a need for policy changes that address safety concerns and barriers to PA

access, such as issues of transportation and affordability, among rural women. Although further study is needed to determine whether other variables may be confounding the relationship between environmental factors and PA, funding for the creation and maintenance of sidewalks as well as streetlights should be considered. In addition, policies to enhance access may be beneficial. This may include the creation of more facilities or increasing the availability and affordability of those who already exist. It may also include enhancing transportation options available for accessing these resources. Finally, occupational policies that may promote PA should be considered. Examples may include the ability to walk during break time, paid time to exercise, or incentives to promote PA in working rural women.

Of the twenty-one studies reviewed, all but one relied upon self-report of PA levels when assessing determinants. Therefore, future studies should examine these determinants as they relate to actual or observed levels of PA to validate and strengthen these findings. Although eight of the quantitative or mixed studies used a method of random sampling, only one of the qualitative studies specifically noted using purposive sampling. Future qualitative studies should ensure this sampling methodology is employed to strengthen findings.

Notably, minimal information was found in current literature regarding variation in PA determinants based on culture or ethnicity other than Caucasians and African Americans, indicating a need for further exploration in this area. Additionally, only one study examined the difference between determinants among rural women who live in village centers and those who live a distance away from them. This gap in the literature should be addressed. Most of the reviewed studies were conducted in four geographic

regions: New England states (*n*=5), several Midwest states (*n*=5), Alabama (*n*=3), and South Carolina (*n*=3). Future research should target additional geographic areas. Barriers to PA may be different for women living in rural towns than those living in the "country"; if so, interventions to promote PA would need to be customized. Another aspect of the findings that warrants further exploration is the determinants of PA during pregnancy described by Hinton and Olson (2001). Contrary to the typically observed negative correlation between weight and PA level, a positive relationship between these variables was found during pregnancy. Further, Hinton and Olson (2001) found that PA levels were maintained or increased during pregnancy among those women who exercised less frequently prior to pregnancy. These findings indicate that pregnancy may be an optimal time for nurses to initiate PA interventions with inactive rural women. Additionally, research is needed to further specify and explore the unique caregiver duties of rural women that are associated with PA levels as well and how others discourage them from participating in PA as reported by Wilcox et al. (2000). Finally, but quite possibly most significantly, is the need for additional research that clearly and defines and consistently applies the terms "rural" and "physical activity" to strengthen the knowledge base in this area.

Limitations

As noted, the terms "rural" and "physical activity" were inconsistently defined in the reviewed studies, limiting the level of certainty one can infer from these findings as well as their applicability in designed effective interventions across all rural contexts. Completion of data evaluation, analysis, and synthesis by one reviewer presents an

additional limitation. Finally, it is possible that the exclusion of articles studying women residing outside the US may have resulted in the omission of relevant information.

Conclusion

Physical activity is important for health promotion and disease prevention. Nurses play a significant role in facilitating health behavior change. Rural women have been found to be less active and experience more barriers to PA than urban women. This integrative review found that PA determinants among rural women can be categorized according to personal, socio-economic, and physical environment factors. Therefore, nursing interventions to promote PA in rural women should address each of these dimensions for optimal effectiveness.

Table I. Determinants of Physical Activity in Rural Women

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
Adachi-Mejia et al. (2010)	• Quantitative descriptive study of perceived intrinsic barriers to PA among rural mothers • Random selection of schools in rural VT and NH (*N*=24) with child/parent dyads enrolled in study (*n*=1691) • Telephone survey using YRBSS questions to assess PA and the Twin Cities Walking Survey to assess barriers	Most commonly cited barriers: • Lack of time (83.1%) • Lack of self-discipline (73.9%) • Lack of energy (70.4%) Income differences: • <$35,000: significant barriers (p<.05): lack of energy, lack of enjoyment, lack of company, being self-conscious • >$75,000: more likely to report lack of time as a barrier (p<.05) Working outside the home barriers: • Lack of time and self-discipline Barriers in the fully adjusted model : • Lack of interest (p<.05) • Lack of time (p<.001) • Lack of self-discipline (p<.001)	C Strengths: • Detailed demographics Limitations: • Participant self-reported levels of PA are high compared to other studies • No reliability and validity measures presented for Twin Cities Walking Survey questions
Atkinson et al. (2007)	• Quantitative cross-sectional and qualitative study to understand the nutrition, physical activity, and technology needs of low-income, rural mothers • Quantitative: Telephone surveys with 130 question instrument and random sample of female food stamp recipients with school-aged children in rural MD counties (*N*=146)	Findings specific to PA: Quantitative: • 39% reported moderate PA 7 days/week • 22% reported vigorous PA 3 or more days/week • 38.3% reported regular PA for > 6 months. Qualitative: • Unaware of PA guidelines • Considered chores and childcare to be adequate means of PA Barriers to PA: • Transportation difficulties	C Strengths: • Random sampling (quantitative) • Focus group questions provided; developed from expert advice • Analysis conducted by multiple researchers • Detailed demographics Limitations:

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
	• Qualitative: Recruited focus groups (*N*=56)	• Membership fees • Safety concerns (busy roads, lack of sidewalks, and wild animals) • Children decreased time but increased opportunities for PA	• Only descriptive statistics provided from quantitative data • Unclear if recruited sample was purposive or convenience • Source of survey instrument not specified
Boeckner et al. (2006)	• Quantitative cross-sectional study to examine the health characteristics, behaviors, and biometrics of obese, rural Hispanic women • Convenience sample of US-born obese Hispanic women in rural NE; Age range: 19-69 (*n*=70). • Modified 7-day Activity Recall Instrument; biometrics and food survey	PA findings: • More normal-weight women (61.9%) met target PA levels compared to overweight (42.9%) and obese (21.4%) women. (x^2=8.29; *p*=.016) • Minutes spent in moderate PA were not significantly different across weight categories (*p*=.109)	C Strengths: • Reliability and validity of PA instrument addressed • PA clearly defined Limitations: • Small, convenience sample
Bopp et al. (2004)	• Quantitative and qualitative study to examine correlates of strength training among older, rural African American and Caucasian women, to examine difference according to race, to understand perceptions toward strength training, and to identify barriers.	Qualitative findings: • African American women: perceived benefits were physical and mental health; perceived risks were pulled muscles and health complications such as heart attack or stroke; barriers included poor health, being tired, lack of social support, and family or work obligations • Caucasian women: perceived benefits were physical and mental health;	C Strengths: • Rural defined • Demographic characteristics provided • Three researchers identified emergent themes

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
	• Quantitative: Surveys with a convenience sample (*N*=102) of African American (*n*=42) and Caucasian (*n*=60) women over the age of 50 from Fairfield County, SC. Instruments included PASE, EBBS, GDS, pros and cons of PA scale (Marcus et al., 1992), and social support for PA scale (Sallis et al.,1987) • Qualitative: Focus groups with a convenience sample (*N*=39) of sedentary or underactive African American (*n*=16) and Caucasian (*n*=23) women over the age of 50 from Fairfield County, SC; BRFSS used to screen participants	perceived risks were pulled muscles; barriers included poor health, low self-efficacy, lack of time, lack of knowledge, and lack of facilities Quantitative findings: 49% (43% African American, 53% Caucasian) reported no strength training in the past week. Significant variables positively associated with participation in strength training were more education (*p*=.03), decisional balance (*p*=.004), and social support (*p*=.03). Number of barriers was negatively associated (*p*=.004). The logistic regression model explained 29.9% of the variance in strength training participation with positive independent correlates of social support from family (*p*=.01) and decisional balance for exercise (*p*=.02); caring for a child was a negative independent correlate (*p*=.045)	• Instrument reliability and validity data provided Limitations: • Convenience sample
Bove & Olson (2006)	• Qualitative study of low-income, rural women's perceptions of weight and factors contributing to obesity • Purposive recruitment to reflect the diversity of rural low-income mothers in Upstate NY (*n*=28)	Findings specific to PA determinants: • Frequent transportation difficulties due to weather • Lack of public transportation • Inability to afford the purchase, operation, or maintenance of a vehicle (noted by 43% and more common among the overweight)	C Strengths: • Purposive sampling • A research team identified emergent themes • Detailed demographics

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
	• Three, in-depth, personal interviews were collected a year apart	• Remote area residents were had less PA than those in village centers, citing highways, lack of sidewalks, icy conditions, and lack of street lighting as barriers • Walking for pleasure was more common among those residing in village centers	• Specified method of analysis Limitations: • PA was just one aspect of this study • No participant quotes in the PA results section
Dye & Wilcox (2006)	• Qualitative study to examine PA perceptions among rural, low-income women over 65 years of age • Convenience sample of women over 55 recruited through three senior centers in rural areas of a southern state (*n*=28) • Focus groups	Themes organized according to social cognitive theory. Personal factors promoting PA: • Preferred activities • Past experience • Perceived benefits to physical and mental health • Self-efficacy • Motivation Personal factors impeding PA: • Lack of energy • Health problems Social and Environmental factors promoting PA: • Social support • Role models • Space and music for group exercises	C Strengths: • Moderators trained. • Instrument pre-tested and revised Limitations: • Convenience sample • Rural not defined • Lack of detail regarding number of researchers involved in data analysis
Eyler (2003)	• Quantitative cross-sectional study to identify personal, environmental, and social correlates of PA in Midwestern rural white women	Significant correlates comparing those meeting PA recommendations with those not meeting: Personal: • Age 20-29 (OR=1.63, 95% CI: 1.12-2.37)	C Strengths: • Random sampling • Instrument reliability data provided

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
	• Random selection of rural White women living MO and IL; Age range: 20-50 (*n*=1000) • Telephone survey using the Women and Physical Activity instrument	• Annual income ≥$35,000 (OR=2.76, 95% CI: 1.08-4.01) • Being employed (OR=1.58, 95% CI: 1.17-2.15) • Good health (OR=.65, 95% CI: 0.44-.79); Social Environmental: • Social role strain (OR=1.04, 95% CI: 1.01-1.08) Physical Environmental: • Street lighting (OR=.68, 95% CI: 0.50-0.93) Significant correlates comparing those who with any PA with those who are inactive: Personal factors: • Age 20-29 (OR=2.76, 95% CI: 1.08-7.05) • No more than one child at home (OR=2.34, 95% CI: 1.22-4.48) • Very good or excellent health (OR=4.04, 95% CI: 2.20-6.41) • Good health (OR=1.90, 95% CI: 1.10-3.48) • self-efficacy (OR=2.75, 95% CI: 1.25-6.06) Social Environmental factors: • Belong to a community group (OR=2.20, 95% CI: 1.23-3.93) • Attend religious services (OR=1.63, 95% CI: 1.01-2.63) Physical Environmental: none	• PA levels clearly described Limitations: • Alpha level for significance not found
Eyler & Vest (2002)	• Qualitative study to determine environmental and policy	Social environment themes: • Social support	C Strengths:

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
	correlates to PA in rural women • Recruitment of non-exercising White women from three rural communities in MO and IL; Age range of 20-50 (*n*=33). • Focus groups; questions and source not specified	• Family responsibility • Guilt Physical environment themes: • Lack of access • Lack of sidewalks and streetlights • Safety concerns. Policy factors: • Work hours	• "Rural" is defined • Sample demographics provided. Limitations: • Unclear if sample is purposive or convenience • Lack of detail regarding data analysis method and number of researchers involved
Gangeness (2010)	• Multiple, descriptive, explanatory case study to describe rural women's perceptions of the rural built environments for PA • Two communities with pop. of <1,000 and fewer than 2500 people within a 15-mile radius. • Focus groups of women (*n*=26) and city councils (*n*=8); Interviews of city staff (*n*=2), women to verify individual interviews (*n*=2), and women with perceived power (*n*=7); analysis of community documents.	Theme of "adaptation": Rural women adapted to built environment conditions: • Seasonal concerns (darkness, climate) • Wild animals • Traffic control • Other people (safety) • Personal needs (child rearing, occupational, social needs). • Walking was a predominant activity. • Few differences noted between the two communities.	E Strengths: • Theories guided study (Ecological model and Critical Feminist Theory) • Data analysis method specified Limitations: • Unclear sample selection process • Results analyzed by only one researcher
Hinton & Olson (2001)	• Observational cohort study to examine relationships between socio-demographic	• Pre-pregnancy PA in 64% of sample with significant correlation at $p<.05$ to each of	C Strengths:

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
	characteristics and PA levels of rural women prior to and during pregnancy • Sample recruited from pool of women registered for prenatal care in a rural Upstate NY healthcare system (*n*=622). • Self-administered, modified Godin Questionnaire and biometrics	the following: marital status, education level, age, and income • Pregnancy change in PA associated with pre-pregnancy frequency of PA (p <.001): PA levels were maintained or decreased among those who exercised frequently prior to pregnancy and were maintained or increased among those who did not; • Significant positive predictors of change in PA at p<.05 were exercise self-efficacy and BMI	• Instrument reliability and validity data provided Limitations: • Rural is not defined. • Convenience sample
Kelsey et al. (2006)	• Quantitative cross-sectional study to explore the relationship of positive affect to health behaviors and self-reported health among rural female blue-collar workers in NC • Convenience sample of women from 12 worksites. Age range of 19-75 (*n*=1093) • 75-question survey; questions included Cohen's perceived stress scale and Watson's positive and negative affect scales	Findings specific to PA: • Positive correlation of positive coping and recreational exercise (p<.001) Predictor variables for PA: • Positive affect (p<.001) • Positive coping (p<.05) • Eating for coping, negative relationship (p<.05)	C Strengths: • Survey instrument was pilot tested • Reliability and validity testing for some sections of the survey Limitations: • Convenience sample • Only Caucasian and African American women included • Rural not defined
Miller et al. (2010)	• Qualitative study to explore perceptions of PA and Motivational Interviewing among rural African American women with type 2 diabetes	Findings specific to PA: • PA/exercise perceived as a way to lose weight and induced thoughts about barriers	C Strengths: • Focus group questions provided

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
	for >6 months who were recruited from a community clinic. Age range of 21-50 (*n*=31) • Four focus group sessions; five discussion questions	• Low PA readiness associated with lack of motivation and competing priorities • High PA readiness associated with confidence	• Sample demographic data provided • Data analyzed independently by two reviewers • Data analysis method described Limitations: • Unclear if sample was purposive or convenience • Rural not defined.
Osuji et al. (2006)	• Quantitative cross-sectional study to examine the relationship of environmental, social, and personal barriers to physical activity among rural Midwestern women from MO, AR, TN • Random sampling. Mean age =48 (*n* = 1877) • Telephonic surveys using questions from BRFSS and questions developed in previous studies	Dose-response relationship found: more barriers = less likely to meet guidelines; 65% did not meet PA guidelines Odds of not meeting guidelines adjusted for age and income (95% CI): • Too tired (OR = 1.8; 1.4, 2.2)** • Lack of time (OR= 1.4; 1.1, 1.7)** • No one to exercise with (OR = 1.3; 1.08, 1.7)** • Community not safe from crime (OR= 1.3; 1.01, 1.7)** • No motivation (OR= 1.9; 1.5, 2.3)**** • Don't like to exercise (OR = 1.7; 1.4, 2.1)**** • Afraid of injury (OR= 1.5; 1.2, 1.9)**** • Not in good health (OR= 1.8; 1.5, 2.3)**** • No energy (OR= 1.8;1.5, 2.2)****	C Strengths: • Random sampling • Detailed demographics • References for reliability and validity measures provided • Statistical significance reported Limitations: • Race and ethnicity not included as variables

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
		Odds of not meeting guidelines that differed by income (95% CI): Income >$25,000: • Lack of time (OR= 1.7; 1.3, 2.3)**** • Motivation (OR= 2.5; 1.9-3.2)**** • Traffic safety concerns (OR= 1.3; 1.01-1.7)** Income <$25,000: • Inverse relationship to having no childcare (OR= 0.6; 0.4-0.95)** • Lack of social support (OR=1.4; 1.01-2.0)**	
Perry, Rosenfeld, & Kendall (2008)	• Qualitative study to describe barriers and motivators to walking program participation among rural women in OR (*n*=17). Age range of 21-65 • Focus groups; source of questions not specified	Barrier themes: • Balancing family and self • Chronic illness gets in the way of routine • Illness or injury breaks routine Motivator themes: • Being a part of a group • Group camaraderie • Learning • Pacesetter • Seeing progress • Energizing • I am a walker	C Strengths: • "Rural" is defined • Data analyzed by four independent reviewers • Detailed demographic data • Data analysis method described Limitations: • Participants had been part of an intervention, possibly affecting results
Sanderson et al. (2002)	• Qualitative study to explore rural African American women's perceptions regarding PA	Barrier themes: Personal: • Too tired due to work and family • Overweight	C Strengths: • Ample specific qualitative

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
	• Convenience sampling of women from rural AL. Age range of 20-50 (*n*=61) • Focus groups; source of questions not specified	• Poor health • Lack of motivation • Lack of time Social: • Inactive neighbors • Childcare (also an enabler). Environmental: • Lack of sidewalks • Hot weather • Lack access to facilities Policy: • Work hours • Safety concerns • Cultural: • Lack of role models • Lack of resources • Less concern about body image	information through quotes Limitations: • Number of researchers and process of data analysis unclear
Sanderson et al. (2003a)	• Quantitative descriptive study to examine leisure and non-leisure PA patterns among African American and white women, identify factors associated with those achieving ≥150 min./wk of PA, compare characteristics of those meeting this target with those that do not, and identify implications for interventions to increase PA	68% were categorized as active, engaging in ≥150 min./wk of combined LTPA and non-leisure PA at moderate intensity only 35% of whom achieved this target without the inclusion of non-leisure PA time; 36% reported no PA of at least moderate intensity for greater than 10 minutes 67% of African American women (*n*=457) were characterized as active. This group was more likely to be married (*p*=.005), perceive better health (*p*<.0001), and less likely to give health reasons for not being more active (*p*<.0001).	C Strengths: • Random selection • Statistical significance reported Limitations: • Rural not defined • Difference in white and African American sample sizes

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
	• Random selection of women from two rural communities in Alabama aged 40 and over (*n*=585) • Face to face survey using BRFSS LTPA questions and additional questions developed to assess non-leisure PA	74% of white women (*n*=128) were characterized as active. They, too, were more likely to be married (*p*=.039), perceive better health (*p*=.004), and less likely to give health reasons for not being more active (*p*=.020). AORs for active African American women: • Increasing age (AOR 0.97) • Reporting arthritis (AOR 0.58) • Being married (AOR 1.75) • Less likely to state health as a barrier (AOR 0.30) • Less likely to give lack of interest as a barrier (AOR 0.39) AORs for active white women: • Less likely to report negative health perception (AOR 0.51)	
Sanderson et al. (2003b)	• Quantitative study to describe PA among African American women between the ages of 20 and 50 in rural Alabama, compare factors between more and less active groups, and discuss implications for interventions. • Random digit dialing to select and screen households in the non-metropolitan counties of Greene, Lowndes, and Wilcox in Alabama. Sample consisted of 567 African American	39% met PA guidelines, 46% were insufficiently active, and 15% were inactive. Correlates comparing those meeting PA recommendations with those not meeting: Personal: • Age 30-39 (OR=1.74, 95% CI: 1.18-2.56) • Annual income $15,000- < $35,000 (OR=1.50, 95% CI: 1.01-2.22) • High self-efficacy (OR=5.26, 95% CI: 1.54-18.01) • Very good or excellent health (OR=3.06, 95% CI: 1.92-4.87); Social Environmental:	C Strengths: • Random selection • Instrument reliability and validity reported Limitations: • Statistical significance of results is unclear

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
	women between 20 and 50 years old • Telephone surveys with created instrument	• See people exercise in neighborhood (OR=2.02, 95% CI: 1.08-3.77) • Attend religious services (OR=2.10, 95% CI: 1.21-3.65) Physical Environmental: none Correlates comparing those participating in some level of PA with those that were inactive: Personal: • Some college (OR=3.26, 95% CI: 1.47-7.22) • Annual income ≥$35,000 (OR=2.19; 95% CI: 1.03-4.63) or $15,000- < $35,000 (OR=1.95, 95% CI: 1.17-3.23) • Employed (OR=2.04, 95% CI: 1.29-3.25) • Very good /excellent health (OR=2.15, 95% CI: 1.17-3.93) Social Environmental: • Know someone who exercises (OR=1.82, 95% CI: 1.06-3.14) • Higher social issues score (OR=1.29, 95% CI: 1.11-1.49) • Attend religious services (OR=3.82, 95% CI: 2.16-6.75) Physical Environmental: none	
Walker et al. (2006)	• Quantitative descriptive correlational study to determine the influence of perceived self-efficacy, benefits, barriers, and family	PA findings: Canonical determinant variate (linear combination of perceived self-efficacy, benefits, barriers, family support, and peer support) was significantly correlated with PA marker variate (linear combination of	C Strengths: • Random sampling • Study based upon theoretical framework: Pender's

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
	and peer support on PA and healthy eating behaviors. • Random selection of rural Midwestern women between the ages of 50-69 (*n*=179) • PA-specific instruments: Modified 7-day Activity Recall, Rockport Walking Test, Sit and Reach test, Chair-stand test, biometrics, EBBS, SEEHS, FSEHS, and Friend Support for Exercise Habits Scale	daily calories expended per kilogram of body weight, VO2max, and weekly minutes of stretching and of muscle strengthening): 21.7% of variance; (Wilks's lambda = .666, $p < .001$)	Health Promotions Model; • Reliability and validity addressed for all instruments Limitations: • Caution must be used in the interpretation of results due to non-normal distributions of some variables. • Small sample for statistical significance
Wilcox et al. (2000)	• Quantitative descriptive study to examine urban-rural differences among women regarding LTPA • Random selection of phone numbers from randomly selected zip code areas to meet ethnic diversity parameters. Women over 40 years old. Rural (*n*=1242); Urban (*n*=1096) • Telephone survey based on questions from the BRFSS, NHIS, and other surveys	• Rural women more likely than urban women to be sedentary ($p<.001$), especially if in the South ($p<.001$) or with less than a HS education ($p<.001$) • Rural women in the West were more likely to be active than urban counterparts ($p<.01$) • Rural women had more barriers to LTPA than urban women ($p<.001$); • Barriers that were significantly different for rural women at the $p<.001$ level: caregiver duties and unattended dogs • Barriers that were significantly different for rural women at the $p<.01$ level: lack of a safe place. fear of injury, and discouragement from others • Significant differences for urban women at the $p<.001$ level: more likely to have	C Strengths: • Random sampling of women from all regions of the US • Several minority populations represented in study • Statistical significance reported Limitations: • Reliability and validity of instrument minimally addressed

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
		sidewalks, streetlights, high crime, access to facilities, and to see others exercising	
Wilcox et al. (2003)	• Quantitative study guided by social cognitive theory to increase understanding of factors influencing PA in older African American and white women • Surveys administered to a convenience sample (*N*=102) of African American (41%) and white women (59%) aged 50 and over in Fairfield County, SC • Instruments included PASE, self-efficacy for PA (Sallis et al, 1988), GDS, pros and cons of PA scale (Marcus et al., 1992), and social support for PA scale (Sallis et al.,1987), questions developed to measure stress and perceived physical environment, and open-ended questions about PA barriers, motivators and risks	• Higher PA levels were associated with younger age***, higher education***, self-efficacy**, fewer depressive symptoms**, greater perceived stress**, decisional balance***, social support***, perceived neighborhood safety**, absence of sidewalks**, and less perceived neighborhood traffic** • The hierarchical model explained 47.4% of the variance in PA with the socio-demographic set (age, race, education, and marital status) = 22.8% of the variance; psychological set (depressive symptoms, decisional balance, self-efficacy, and perceived stress) = 8.8% of the variance; social set (PA social support, health care provider discussion of PA) = 6.3% of the variance; and physical environment set (sidewalks, safety, and traffic) = 9.4% of the variance • Barriers to PA (*n*=74): health problems (*n*=19), no barriers (*n*=15), lack of self-motivation (*n*=11), lack of time (*n*=9), family and household responsibilities (*n*=9) • Motivators to PA (*n*=63): health-related factors (*n*=18), social support (*n*=17) • Perceived risks to PA (*n*=56): no risks (*n*=13), falls (*n*=10), injuries (*n*=9)	C Strengths: • Verbal administration of surveys offered to those with low literacy or visual impairments • Instrument reliability and validity data provided • Noted that data did not violate assumptions for statistical analysis • Open-ended questions were coded by two researchers Limitations: • Convenience sample

Year/ Authors	Purpose and Method	Findings	Level of Evidence* Strengths/ weaknesses
Wilcox et al. (2005)	• Qualitative study to examine perceptions of PA and exercise as well as current PA recommendations, factors that promote and hinder PA, and risks and benefits of PA • Focus groups with a convenience sample (*N*=39) of African American (*n*=16) and white (*n*=23) sedentary or underactive women aged 50 or over from Fairfield County, SC; BRFSS used to screen participants for PA level	• PA was conceptualized more broadly than exercise, the necessary amount of exercise was perceived as dependent on age and health status, and some felt current PA recommendations were unrealistic • Perceived benefits: physical health, mental health, and weight/appearance • Perceived risks: injury and "overdoing it" • Perceived barriers: health problems, lack of energy, low motivation, feeling too old, low confidence and self-efficacy, family and work demands on time, lack of social support from family, cultural need for church support of PA (African American), lack of facilities, transportation difficulties, lack of sidewalks, stray dogs	C Strengths: • Three researchers were part of the coding process • Statistically significant demographic differences between African American and white participants was presented Limitations: • Convenience sample

Abbreviations: PA indicates physical activity; YRBSS, Youth Risk Behavior Surveillance System; PASE, Physical Activity Scale for the Elderly; EBBS, Exercise Benefits/ Barriers Scales; GDS, Geriatric Depression Scale; BRFSS, Behavior Risk Factor Surveillance System; Pop., population; BMI, body mass index; LTPA, leisure time physical activity; AOR, adjusted odds ratio; SEEHS, Self-Efficacy for Exercise Habits Scale; FSEHS, Family Support for Exercise Habits Scale; NHIS, National Health Interview Survey; HS, high school; all states abbreviated according to the US Postal Service approved list.

*AACN's revised Evidence Leveling System (Armola et al., 2009)

** $p < 0.05$

*** $p \leq 0.01$

**** $p \leq 0.001$

Table II. Definitions

Author/Year	Rural	Physical Activity Measures
Adachi-Mejia et al. (2010)	Communities with <10,000 residents	YRBSS
Atkinson et al. (2007)	Not specified	Days per week of moderate exercise; days per week of vigorous exercise
Boeckner et al. (2006)	Community of 21,000 residents	Modified 7-day Activity Recall Instrument; minutes per week of moderate-intensity PA
Bopp et al. (2004)	Non-metropolitan county with population of 23,454 residents	PASE, BRFSS
Bove & Olson (2006)	Counties with no cities larger than 19,000 residents	Not specified
Dye & Wilcox (2006)	Not specified	Not specified
Eyler (2003)	US Bureau of Census classification: being outside of an urban area or urban cluster	Three categories influenced by the CDC and ACSM
Eyler & Vest (2002)	US Bureau of Census classification: being outside of an urban area or urban cluster	Moderate exercise for at least 20 minutes at a time 3 days per week
Gangeness (2010)	Communities with less than 1,000 residents and no communities larger than 2,500 residents within a 15-mile radius	A variety of indoor and outdoor activities
Hinton & Olson (2001)	Not specified	Rating of the frequency of regular exercise during free time that resulted in sweating or breathing hard: often (daily), sometimes, rarely, or never
Kelsey et al. (2006)	Not specified	Frequency (times per week or month) and duration (minutes per time) of the following: active playing, walking/hiking, jogging/swimming/biking, aerobic exercise classes, and dancing
Miller et al. (2010)	Not specified	Defined by participants

Author/Year	Rural	Physical Activity Measures
Osuji et al. (2006)	Communities with ≤ 12,993 residents	BRFSS
Perry, Rosenfeld, & Kendall (2008)	Community at least 10 miles from a town with a population of 30,000	Exercise more than 3 days a week at moderate intensity in the last month
Sanderson et al. (2002)	County population of 13,500	Regular exercise: three times a week for at least 20 minutes per time
Sanderson et al. (2003a)	Not specified	BRFSS and questions created to assess non-leisure PA
Sanderson et al. (2003b)	US Department of Agriculture (1993) Non-metropolitan classification	Three categories determined from questions created to assess PA
Walker et al. (2006)	Towns with up to 49,999 residents	Modified 7-day Activity Recall and time spent in strengthening and stretching exercises
Wilcox et al. (2000)	CDC classification (1996); Communities with < 2, 500 residents	Three categories influenced by the BRFSS and NHIS
Wilcox et al. (2003)	US Department of Agriculture (1993) Non-metropolitan classification	PASE
Wilcox et al. (2005)	US Department of Agriculture (1993) Non-metropolitan classification	BRFSS

Abbreviations: YRBSS indicates Youth Risk Behavior Surveillance System; PA, physical activity; PASE, Physical Activity Scale for the Elderly; CDC, Centers for Disease Control and Prevention; ACSM, American College of Sports Medicine; BRFSS, Behavior Risk Factor Surveillance System; NHIS, National Health Interview Survey

Table III. Synthesis of Results

Category	Theme	Findings
Personal factors	Cognitions and affect	+Self-efficacy
		+Self-discipline
		+Motivation
		+Positive coping style
		+Positive affect
	Physical characteristics	(-)Poor health; fear of injury
		+Lower age; exception: younger age correlated decreased pre-pregnancy PA
		(-)Lack of energy; exception: energizing effect of walking was a motivator
		(-)Increased weight; exception: positive relationship between PA and BMI during pregnancy
Socio-economic factors	Social forces	(-)Family and childcare demands
		+Social support
		+Seeing others exercise
		+Religion
	Economic forces	(-)Work hours and demands; exception: one study found work outside the home to be a positive determinant
		Income: barriers and positive determinants vary by income levels
		+Higher education
Physical environment factors	Access	(-)Transportation difficulties, lack of resources and options, lack of affordability
	Safety	(-)Weather (ice and heat), people, dogs, wild animals
	Structures	(-)Lack of streetlights and sidewalks; exception: one study found a negative association between PA and presence of sidewalks

Abbreviations: PA indicates physical activity, BMI is body mass index

+ indicates positive determinant; (-) indicates barrier to physical activity

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Section 2.4: Manuscript Two "The Omaha System: An Ecological Approach to Physical Activity Research and Care"

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Abstract

Lack of physical activity is a global health problem. Public health nurses have the potential to influence population health outcomes in this area. However, methods are needed to support research that addresses physical activity and increases understanding of the impact public health nurses may have toward measuring, explaining, and changing this health-related behavior. The purpose of this article was to operationalize an overarching ecological perspective with the Omaha System standardized terminology in order to provide a method for using nurses' clinical documentation to advance physical activity research and to guide the selection of theory-based physical activity nursing interventions. A three-phase process informed by the literature was designed and used to conceptually map the ecological model for health promotion and the Omaha System. The results of the mapping process revealed the ecological nature of the Omaha System and provided support for measuring and analyzing health-related behavior problems from an ecological perspective with Omaha System data. This process could be replicated with other health-related problems and standardized terminologies to guide theoretically-based nursing care and research.

Key words: Omaha System, Ecological theory, Physical activity

The Omaha System: An Ecological Approach to Physical Activity Nursing Care and Research

Introduction

Physical activity is a modifiable risk factor for serious chronic conditions such as heart disease, stroke, and cancer (United States Department of Health and Human Services [HHS], 2014). However, most people do not meet physical activity guidelines (HHS, 2014). Consequently, inadequate physical activity, now considered the fourth leading cause of death (Kohl et al., 2012), is a significant public health challenge (Blair, 2009). Increasing levels of physical activity among individuals, groups, and populations is an important component of public health nursing.

Extensive documentation of assessments, interventions, and outcomes are fundamental responsibilities in nursing practice. Increasingly, public health nurses use electronic health records to capture this information, many of which record the data with standardized terminologies such as the Omaha System (Martin, 2005a). A standardized terminology is a common language that provides a means for professional communication (Rutherford, 2008) using a controlled vocabulary of discrete terms that are usually arranged in a hierarchy (Hardiker, Hoy, & Casey, 2000). The use of electronic health records and standardized terminologies provides an opportunity for improvements in public health data collection, analysis, and distribution (Olsen & Baisch, 2014). Not only do these tools support the storage and retrieval of individual client information, data recorded in electronic health records using standardized terminologies can be efficiently compiled, de-identified, and analyzed to increase understanding of

population health problems, such as physical activity, and to generate evidence that informs and improves nursing care.

The science of nursing is advanced by theory guided research and practice. Frequently, health behavior change interventions, including those that target physical activity, are informed by theories that emphasize individual responsibility (McLeroy, Steckler, Bibeau, & Glanz, 1988). Yet, "societal problems, like physical inactivity, require comprehensive multi-factorial solutions" (Haggis, Sims-Gould, Winters, Gutteridge, & McKay, 2013, p. 3). Ecological models consider the interactions of individuals with the social, built, and political environments and "have been recommended as an effective means for addressing individual, interpersonal, and environmental factors to increase physical activity" (Warren, Maley, Sugarwala, Wells, & Devine, 2010, p. 230).

Despite the recognized value of using theory to guide nursing care and research, as well as the increasing use of standardized terminologies in nursing practice, the links between theories and standardized terminologies have received little attention in professional literature. This is an area that needs to be addressed to validate the delivery of theoretically-based nursing care and support for the use of nursing documentation for theoretically-guided research. Accordingly, the purpose of this article was to operationalize an overarching ecological perspective with the Omaha System standardized terminology in order to advance research and guide theory-based nursing care. The public health problem of physical activity will be used as the exemplar; however, the process may be replicated with other health-related behavior problems.

Background

Physical Activity

Physical activity is essential for preventing leading causes of death in the United States (US) including heart disease, stroke, type 2 diabetes, and cancer (HHS, 2014). Additional health benefits associated with physical activity include improved mental health, lower risk of falls, and weight control (Centers for Disease Control and Prevention [CDC], 2011). Yet, fewer than 20% of US adults meet current physical activity guidelines (HHS, 2014). Consequently, addressing this problem in order to improve health is both a national health goal and public health challenge (HHS, 2014).

Public health nurses are well-positioned to address this problem and expand what is known about physical activity. This includes information on client physical activity levels, factors associated with physical activity, and the effectiveness of nursing interventions on both physical activity behaviors and health outcomes. One way to accomplish this is through consistent assessment and documentation of physical activity, associated risk factors, interventions, and outcomes. However, nursing documentation varies considerably, is often recorded in an unstandardized format, and can be difficult to retrieve from the health record (Keenan, Yakel, Tschannen, & Mandeville, 2008). These issues limit the transportability of this information between providers and systems, as well as the ability to analyze the data to increase understanding and inform care at the individual and population levels. Effective use of electronic health records and documentation of client data using standardized terminologies has the potential to expand nursing knowledge and improve nursing care aimed at increasing levels of physical activity.

Omaha System

A standardized terminology is a common language that provides a means for professional communication (Rutherford, 2008) using a controlled vocabulary of discrete terms that are often arranged in a hierarchy (Hardiker, Hoy, & Casey, 2000). In addition to supporting the documentation, sharing, and exchange of client care information among healthcare providers, standardized terminologies increase the visibility of nursing interventions, evaluation of care outcomes, and adherence to standards of care (Thede & Schwiran, 2011). The Omaha System is one of twelve standardized terminologies recognized by the American Nurses Association (Thede & Schwiran, 2011) and commonly used in public health and community practice settings. It differs from the medically-focused International Classification of Disease (ICD) and Current Procedural Terminology (CPT) code systems in that it is multi-axial, broadly describing health status and interventions (Monsen et al., 2010). Consequently, it can more accurately capture nursing problems and nursing care. The Omaha System was developed in the 1970s by staff of the Visiting Nurse Association of Omaha who recognized the need to describe and quantify healthcare practice (Martin, 2005b). It was expanded and refined between 1975 and 1986 with three research projects funded by the Division of Nursing of the US Department of Health and Human Services (Martin, 2005b). During development, reliability and validity of the system were established (Martin, Norris, & Leak, 1999; Monsen et al., 2010). Recently, the Minnesota e-Health Advisory Board made the recommendation that all healthcare settings create a plan for implementing an American Nurses Association-recognized terminology within their electronic health record systems, and the Omaha System was specifically recommended for information exchange between

public health or community-based settings (K. Monsen, personal communication, April 21, 2014).

The Omaha System consists of three components that provide a comprehensive picture of the needs, healthcare services rendered, and associated outcomes for individuals, families, and communities (Martin, 2005b). The three components are the Problem Classification Scheme, the Intervention Scheme, and the Problem Rating Scale for Outcomes (Martin, 2005b).

The Problem Classification Scheme consists of 42 problems categorized as falling within the environmental, psychosocial, physiological, or health-related behavior domains (Martin, 2005c). Each problem is modified as (a) an actual, potential, or health promotion issue with (b) an individual, family, or community focus (Martin, 2005c). Additionally, signs and symptoms are documented for actual problems, risk factors for potential problems, and descriptive data for health promotion issues (Martin, 2005c). Physical activity is identified as one of the 42 problems in the Omaha System Problem Classification Scheme.

In the Intervention Scheme of the Omaha System, client care actions implemented by healthcare providers are classified according to three levels (Martin, 2005c). First, one of four Intervention Scheme categories is specified: Teaching, Guidance, and Counseling; Treatments and Procedures; Case Management; or Surveillance. Second, the target(s) of the intervention is selected. Finally, client-specific intervention care information is documented. See Figure 1.

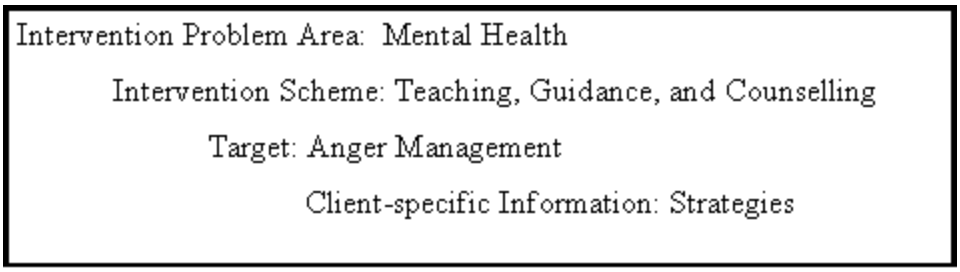

Figure 1. Example Documentation: Omaha System Intervention Scheme

The Problem Rating Scale for Outcomes is a measurement of client status and progress in three areas using a five-point Likert-type scale. The three areas are Knowledge, Behavior, and Status (Martin, 2005c). When integrated into the electronic health record, the Omaha System has the potential to improve communication efficiency and provide "meaningful and measureable data about health outcomes for the population" (Monsen, Honey, & Wilson, 2010, p. 375).

The Omaha System has been described as a middle range theory that supports the Donabedian (1966) model and compliments other theories (Martin, 2005b). Thus, nurses' efforts to increase physical activity levels among clients will benefit from application of the Omaha System in conjunction with theories specific to health promotion (Michie, Johnston, Francis, Hardeman, & Eccles, 2008).

Ecological Model for Health Promotion

McLeroy et al. (1988) propose an ecological model for health promotion focused on health behavior and founded upon Brofenbrenner's (1977) social ecological framework. The model is based upon a systems approach that recognizes multiple levels within the social environment as unique and important for their influence on and by health behaviors (McLeroy et al., 1988). According to McLeroy et al. (1988), health behavior is determined by intrapersonal factors, interpersonal processes, institutional

factors, community factors, and public policy. Intrapersonal factors include individual characteristics, such as developmental level, knowledge, attitude, and self-concept (McLeroy et al., 1988). Interpersonal processes address the role of social groups and social support for health behaviors, including family, friends, and work groups (McLeroy et al., 1988). Institutional factors refer to formal and informal rules or policies that exist within social organizations, such as schools or worksites (McLeroy et al., 1988). Community factors include neighborhoods, networks, and relationships between organizations (McLeroy et al., 1988). Finally, public policy factors are laws and policies at local, state, and national levels (McLeroy et al., 1988).

The theoretical value of the ecological model for health promotion has been supported by the findings of recent research on several health promotion topics, including nutrition (Fowles & Fowles, 2008; Bandoni, Sarno, & Jaime, 2011), weight management (Ali, Baynouna, & Bernsen, 2010), and physical activity (Walcott-McQuigg, Zerwic, Dan, & Kelley, 2001). It was also selected as the guiding framework for the American College Health Association's (n.d.) Healthy Campus 2020 initiative.

Methods

Despite the common use of ecological theory in contemporary health promotion research and practice (CDC, 2013), one limitation of the ecological model for health promotion is that it is broad in scope and imprecise in identifying specific concepts and relationships at each level. Use of a standardized terminology for documentation may help to address this limitation, because it supports "the identification of specific nursing care elements and the relationship of those nursing care elements to patient outcomes" (Saba & Taylor, 20, p. 326). Therefore, a standardized terminology such as the Omaha

System may be useful for guiding theory-based interventions and research. However, this first requires a mapping of the concepts in the standardized terminology with those in the theory, as well as an examination of whether or not the standardized terminology adequately captures relevant theoretical concepts.

A three-phase process informed by the literature (Goossen, 2006; Hyun & Park, 2002; Pohl et al., 2009) was designed and used for the conceptual mapping process. During Phase One, the first author extracted all Omaha System problems in the Problem Classification Scheme and all interventions in the Intervention Scheme for Physical activity using the *User's Guide to The Omaha System* (Martin, 2005d). The meaning of each item was determined using definitions from the *User's Guide to The Omaha System* (Martin, 2005d). This was repeated for the five levels of the ecological model for health promotion, using definitions documented by McLeroy et al. (1988). In Phase Two, the first author used a table format to map interventions described by McLeroy et al. (1988) at each level of the model to relevant Omaha System problems and the Intervention Scheme. A table format was also used to map the Omaha System Problem Classification Scheme to ecologically-based correlates of physical activity derived from an integrative review of literature (Olsen, 2013). A third table was used to map physical activity interventions from published research studies at each level of the ecological model for health promotion (McLeroy et al., 1988) to the Omaha System Intervention Scheme for Physical activity. In phase three of the process, two subject matter experts validated the results, engaging in rich dialogue until consensus was achieved.

Results

The outcome of interest in the ecological model for health promotion **(**McLeroy et al., 1988) is patterned behavior. Similarly, the health-related behavior domain of the Omaha System includes eight areas of patterned behavior. According to McLeroy et al. (1988), behavior is determined by multiple levels of influence, including intrapersonal factors, interpersonal processes and primary groups, institutional factors, community factors, and public policy. The Omaha System also includes multiple levels of influence, identified as problems within the physiological domain, psychosocial domain, and environmental domain. Each of these areas affects and is affected by health-related behaviors. This is consistent with ecological theory in which "behavior is viewed as being affected by, and effecting, multiple levels of influence" (McLeroy et al., 1988, p. 354). Further, the patterned behavior of both individuals and aggregates are of interest (McLeroy et al., 1988). This includes the causes of the behavior and mechanisms or strategies for behavioral change (McLeroy et al., 1988). Likewise, the Omaha System is designed to address problems, including health-related behaviors at the individual, family, and community levels. This is accomplished within the context of the practitioner-client relationship using a cyclic and dynamic problem solving approach that includes the following steps: collecting and assessing data, stating the problem, identifying admission problem ratings, planning and intervening, identifying interim or dismissal problem ratings, and evaluating problem outcomes (Martin, 2005b).

The ecological structure of the Omaha System and its consistency with the ecological model for health promotion (McLeroy et al., 1988) are depicted in Figure 2. Multiple dimensions of connections are represented. First, the figure illustrates the general alignment the theory (left circle) and the Omaha System (right circle). Beginning

with the inner left circle, intrapersonal or individual factors can be broadly defined as "characteristics of the individual such as knowledge, attitudes, behavior, self-concept, etc." (McLeroy et al., 1988, p. 355). This theoretical concept can be operationalized with problems in the Omaha System Physiological domain. Examples include Respiration, Circulation, Pain, and Neuro-musculo-skeletal problems. As indicated in the figure, physiological problems influence health-related behaviors. The bi-directional arrow depicts the reciprocal nature of this relationship, since health-related behaviors also influence physiological problems. For example, physical activity reduces one's risk for an Omaha System Circulation problem such as heart disease (HHS, 2014). Additionally, the presence of heart disease can limit one's ability to engage in physical activity.

Interpersonal factors encompass the support, pressures, persuasion, social norms, modeling, and communications present in the social context as one observes and interacts with others. This theoretical concept is represented by the family level of the left circle and can be operationalized with the Omaha System Psychosocial domain, defined as "patterns of behavior, emotion, communication, relationships, and development" (Omaha System, 2015, para. 4). Examples include Social contact, Interpersonal relationship, Mental health, Abuse, and Neglect. Although some of the problems in this domain could be categorized at the intrapersonal level, the Omaha System considers social implications in problem definitions, supporting general alignment of this domain at the interpersonal level. For example, the Omaha System definition of Mental health is "development and use of mental/emotional abilities to adjust to life situations, interact with others, and engage in activities" (Martin, 2005d, p. 199). As depicted with the bi-directional arrow in Figure 2, psychosocial problems both influence and are influenced by health-related

behaviors. For example, having no one with whom to exercise (Omaha System problem of Social contact) is one barrier to physical activity (Osuji, Lovegreen, Elliott, & Brownson, 2006). Yet, engaging in physical activity classes or groups can increase one's social contact.

The final three levels of McLeroy et al.'s (1988) theory have been combined in the outer layer of the left circle in Figure 2. Community factors are "relationships among organizations, institutions, and informal networks within defined boundaries" (McLeroy et al., 1988, pg. 355). They can be operationalized with problems in the Omaha System Environmental domain, examples of which are Income and Neighborhood/workplace safety. Consistent with the levels described above, the bi-directional arrow represents the reciprocal relationship between problems at this level and health-related behaviors. For example, traffic and wild animals (Omaha System problem of Neighborhood/workplace safety) are barriers to physical activity (Gangeness, 2010). Yet, physical activity can improve Neighborhood/workplace safety, since the presence of more people exercising can prompt drivers to slow down and keep wild animals at bay.

Another dimension conveyed in the figure is that the health-related behaviors of individuals and aggregates are of interest in both the ecological model for health promotion (McLeroy et al., 1988) and the Omaha system. This is represented by the left circle's connection to the health-related behavior arrow. The Omaha System is designed to address problems within each domain at individual, family, and community levels. This may, in turn, affect health-related behaviors at individual, family, and community levels, represented by the health-related behavior arrow leaving the right circle, connecting to the left circle, and spanning all levels of both circles.

All lines within the model are dashed to account for the dynamic and reciprocal relationship between levels of influence, target levels of care, and health-related behaviors. As an example, a physiological domain problem, such as Pain, may affect a psychosocial problem, such as Interpersonal relationship. Likewise, a psychosocial problem, such as Abuse, may impact the physiological problem of Neuro-musculo-skeletal. These issues may, in turn, affect health-related behaviors, just as health-related behaviors can affect them. The same holds true for levels of influence. When problems from any of the domains occur in an individual, they have an impact on problems in the community. Also, when problems from any of the domains occur in a community, they affect the problems and health-related behaviors of individuals and groups. Finally, the model in Figure 2 illustrates that all of this occurs within the context of the nurse-client relationship, and nurses have the opportunity assess, plan, intervene, and evaluate in each area.

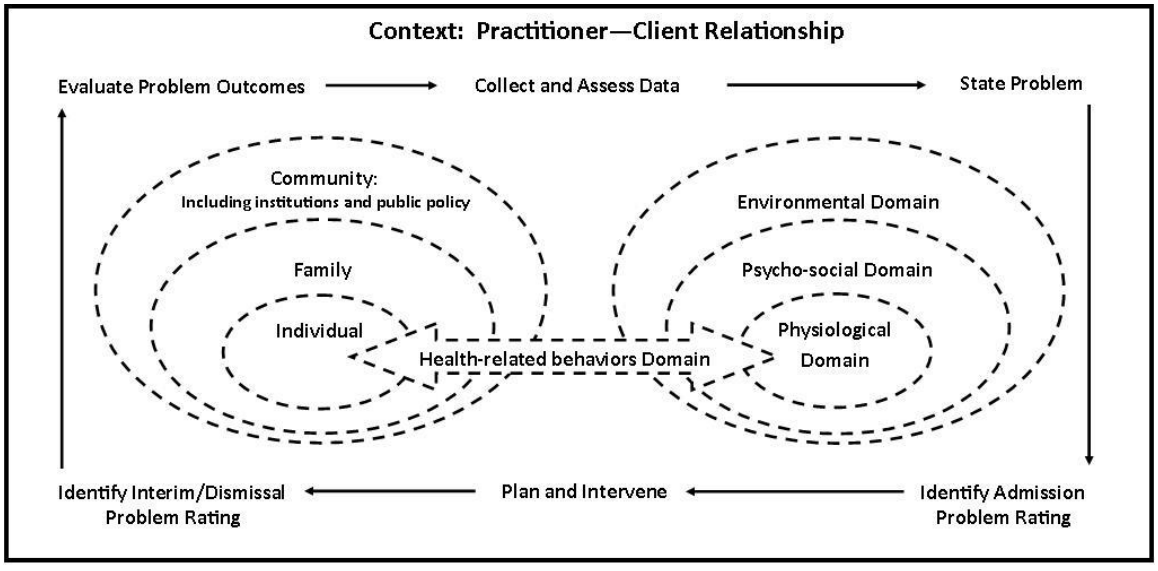

Figure 2. The ecological structure of the Omaha System in alignment with the ecological model for health promotion (McLeroy et al., 1988).

The practical relevance of the ecological structure of the Omaha System and its alignment with the ecological model for health promotion (McLeroy et al., 1988) is documented in Table 1. When McLeroy et al. (1988) introduced their model, the authors provided examples of health behavior change interventions at each theoretical level. Each health problem and interventional strategy can be described using the Omaha System standardized terminology. Accordingly, ecological theory-based nursing care and research can be both guided by and documented with the Omaha System.

One of the eight patterned behavior problems in the health-related behavior domain of the Omaha System is Physical activity. As previously noted, ecological theories address both the causes of a health behavior and strategies for behavioral change (McLeroy et al., 1988). In Table 2, ecologically-based correlates of physical activity derived from an integrative review of literature (Olsen, 2013) are used to illustrate how the Omaha System Problem Classification Scheme can capture and/or inform causes of physical inactivity. In alignment with the ecological model for health promotion (McLeroy et al., 1988), this information can be studied and used with both individuals and aggregates (families or communities). In Table 3, example physical activity interventions from published research studies are used to demonstrate how the Omaha System Intervention Scheme for Physical activity aligns with the ecological model for health promotion (McLeroy et al., 1988) and can be used to inform and document strategies for behavior change. Finally, Figure 3 connects theory to practice, providing a hypothetical example of how local health department nurses could utilize the Omaha System to operationalize ecological theory for clinical research and to guide nursing care.

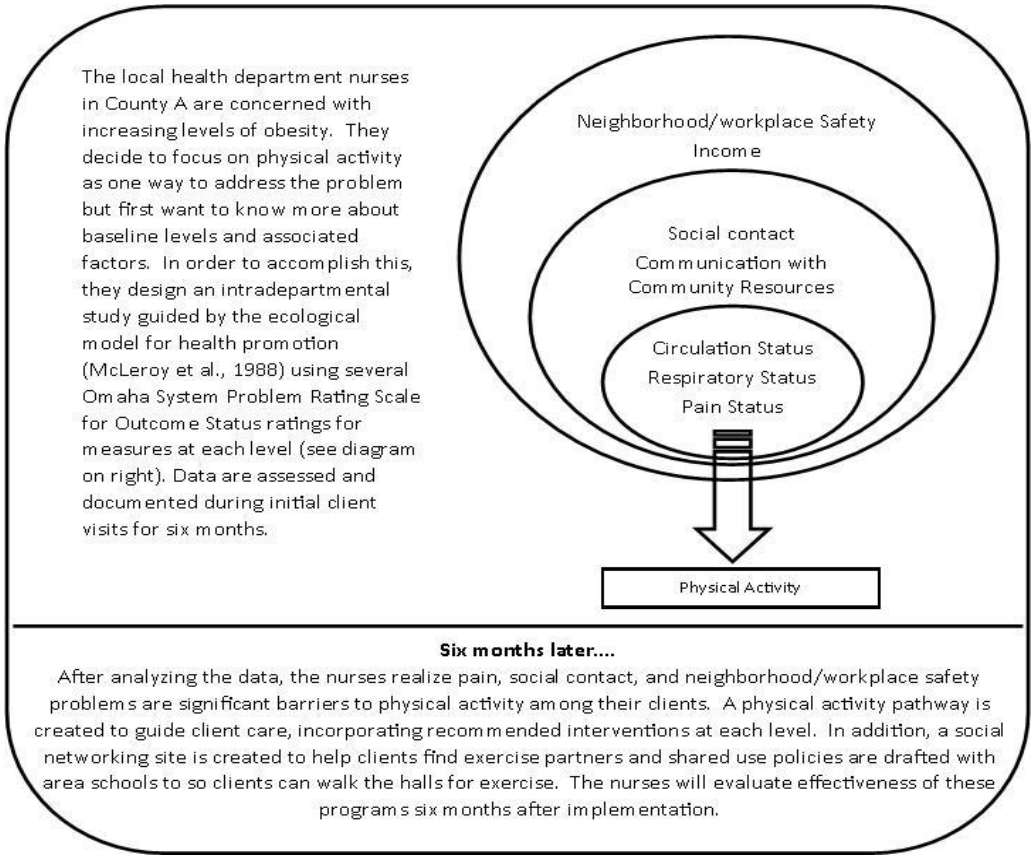

Figure 3. Application of Results to Clinical Research and Practice

Discussion

The purpose of this article was to operationalize an overarching ecological perspective with the Omaha System standardized terminology in order to advance research and guide theory-based nursing care. The results of the conceptual mapping process indicated numerous connections between the Omaha System and the ecological model for health promotion **(**McLeroy et al., 1988), including similar outcomes of interest, recognition of multiple levels of influence on health-related behaviors, and concern for both individuals and aggregates. Tables 1 through 3 illustrate these links and demonstrate the ecological structure of the Omaha System. Consequently, use of the Omaha System supports an ecological approach to nursing care. In addition, it provides a

means by which researchers can examine client information documented using the Omaha System from a theoretical perspective to learn more about factors associated with physical activity and effective interventions.

Efforts to increase physical activity and promote health are needed at individual, family, and community levels. This requires "that we progress beyond traditional health intervention models that isolate individuals from social, environmental, and political systems of influence" (Haggis et al., 2013, p. 2). A central tenet of ecological models is that multiple levels of influence affect and interact with health behaviors (Ding et al., 2012). Ecological theory is particularly appropriate and even recommended for physical activity research, based on strong evidence regarding the impact of environmental factors (Ding et al., 2012; Warren et al., 2010). The alignment of the ecological model for health promotion (McLeroy et al., 1988) and the Omaha System advances support for the use of the Omaha System in nursing practice as a theoretically-based standardized terminology that can be used to guide and document care. When used as part of electronic health record systems, it supports the ability to efficiently use theory-based, de-identified public health nurse client documentation for research. This has tremendous potential for expanding nursing and public health knowledge and improving health outcomes in all areas, including physical activity.

Although the conceptual mapping indicated that many evidence-based factors associated with physical activity are captured by the Omaha System, a few are not represented outside of potential documentation as demographic data or as an "other" entry. For example, enjoyment of exercise has been positively correlated with physical activity (HHS, 2014). In addition, belief in one's ability to exercise, or self-efficacy, has

been extensively supported by research as a positive correlate of physical activity (HHS, 2014; Short et al., 2013; Jefferis et al., 2014; Wilcox et al., 2003). Another gap is the fact that several factors relevant to physical activity are only documented in the Intervention Scheme. Consequently, their use as interventions and subsequent changes in physical activity can be captured, but baseline and follow-up levels of the factors being addressed are not documented. One example of this is motivation. Exploring motivation is captured as a nursing intervention in the Omaha System Intervention Scheme; however, this may not involve documentation of a client's motivation level at baseline and following the intervention. This limits the ability to utilize client clinical information to determine to what degree motivation actually impacts client physical activity and how much change in motivation occurs following intervention.

Despite these limitations, the Omaha System standardized terminology and the ecological model for health promotion **(**McLeroy et al., 1988) are well aligned for many relevant concepts. Future studies are needed to test the effectiveness of using Omaha System Physical activity documentation in research. Studies are also needed to examine the interaction between factors at different levels of the ecological model for their impact on physical activity levels (Ding et al., 2012).

Conclusion

Physical activity is a significant public health challenge (Blair, 2009) warranting attention in nursing research and client care. The expanding use of standardized terminologies by nurses to document client information in electronic health records provides an opportunity to efficiently utilize clinical data to increase understanding of physical activity and to generate evidence that informs and improves nursing care.

However, nursing care and research should be theoretically-based, and the links between standardized terminologies and theories have received little attention in professional nursing literature. In this article, a conceptual mapping of the Omaha System standardized terminology to the ecological model for health promotion **(**McLeroy et al., 1988) is proposed, indicating good alignment and revealing the ecological nature of the Omaha System. The results provide a means by which researchers can examine client information documented using the Omaha System from a theoretical perspective to learn more about factors associated with physical activity and effective interventions, as well as a process that can be replicated with other health problems to guide theoretically-based nursing care and research.

Table 1. Map of interventions described by McLeroy et al. (1988) at each level of the ecological model for health promotion to relevant Omaha System problems and the Intervention Scheme

Ecological Model for Health Promotion Levels	Definition and Goal of the Level from McLeroy et al. (1988)	Example Interventions from McLeroy et al. (1988)	Application of the Omaha System: Problem	Application of the Omaha System: Intervention Category	Application of the Omaha System: Intervention Target	Application of the Omaha System: Client-specific Intervention Care Description
Intrapersonal Factors	"Characteristics of the individual such as knowledge, attitudes, self-concept, skills…. developmental history" (p. 355). Goal: change individuals.	"Adolescent smoking prevention programs (which) incorporate peer resistance training (or social inoculation)" (p. 356).	Substance use	Teaching, Guidance, and Counseling	Coping skills	Strategies to deal with behavior triggers
Interpersonal Processes and Primary Groups	"Formal and informal social network and social support systems, including family, work group, and friendship networks" (p. 355). Goals: change individuals through social influences and change social norms.	Teen pregnancy prevention "support groups, skills training, and the development of norms for contraceptive use in male adolescent networks" (p. 359).	Family planning	Case management	Support group	Age/culture/ condition – specific groups for pregnancy prevention, infertility, etc.

Ecological Model for Health Promotion Levels	Definition and Goal of the Level from McLeroy et al. (1988)	Example Interventions from McLeroy et al. (1988)	Application of the Omaha System: Problem	Application of the Omaha System: Intervention Category	Application of the Omaha System: Intervention Target	Application of the Omaha System: Client-specific Intervention Care Description
Institutional Factors	"Social institutions with organizational characteristics, and formal (and informal) rules and regulations for operation" (p. 355). Goals: create healthier organizational environments and members.	"Labeling food offerings in cafeterias" (p. 360).	Nutrition	Case management	Dietary management	Group meal sites
Community Factors	"Relationships among organizations, institutions, and informal networks within defined boundaries" (p. 355). Goals: change community groups and structures to support individual change, increase community	"Pesticide forum to coordinate community concerns and health agency involvement with environmental pollutants" (p. 364).	Neighbor-hood/ workplace safety	Case management	Safety	Community safety organization

Ecological Model for Health Promotion Levels	Definition and Goal of the Level from McLeroy et al. (1988)	Example Interventions from McLeroy et al. (1988)	Application of the Omaha System: Problem	Application of the Omaha System: Intervention Category	Application of the Omaha System: Intervention Target	Application of the Omaha System: Client-specific Intervention Care Description
	awareness, influence resource expenditures, and increase power of disadvantaged populations.					
Public Policy	"Local, state, and national laws and policies" (p. 355). Goal: protect the health of the population through regulatory changes.	"Prohibitions on smoking in public buildings and restrictions on alcohol sales and consumption" (p. 365).	Substance use	Case management	Legal system	Courts

Table 2. Map of the Omaha System Problem Classification Scheme to Example Correlates of Physical Activity among Rural Women in Published Literature

Omaha System Domain	Omaha System Problem	Omaha System Problem Signs/symptoms	Barriers to Physical Activity among Rural Women
Physiological Domain	Pregnancy	Difficulty coping with body changes	Symptoms of pregnancy (Marshall, Bland, & Melton, 2013).
	Neuro-musculo-skeletal	Limited range of motion	Arthritis (Peterson, Schmer, & Ward-Smith, 2013).
	Other Physiological Domain Problems	As indicated	Poor health, illness and chronic illness (Perry, Rosenfeld, & Kendall, 2008; Sanderson, Littleton, & Pulley, 2002; Osuji, Lovegreen, Elliott, & Brownson, 2006).
Psychosocial Domain	Mental health	Sadness, hopelessness, decreased self-esteem	Depression (Peterson et al., 2013).
	Social contact	Limited social contact	Lack of role models (Sanderson et al., 2002) and having no one with whom to exercise (Osuji et al., 2006).
	Interpersonal relationship	Incongruent values, goals, expectations, schedules	Discouragement from significant others (Wilcox et al., 2000; Peterson et al., 2013) and lack of social support (Osuji et al., 2006; Eyler & Vest, 2002).
	Caretaking/parenting	Dissatisfaction, difficulty with responsibilities	Social role strain (Eyler, 2003), balancing family and self (Perry et al., 2008), caregiver, family, and childrearing duties (Wilcox et al., 2000; Eyler & Vest, 2002; Gangeness, 2010; Marshall et al., 2013), and lack of childcare (Osuji et al., 2006).
	Communication with community resources	Limited access to care/services/goods	Can't afford transportation to places for physical activity (Bove & Olson, 2006).
Environmental Domain	Income	Low/no income	Low income (Eyler, 2003), lack of resources (Sanderson et al., 2002), and inability to afford memberships (Atkinson et al., 2007).
	Neighborhood/ workplace safety	High crime rate;	Crime (Osuji et al., 2006).
		Vehicle, traffic hazards;	Traffic (Osuji et al., 2006; Gangeness, 2010; Peterson et al., 2013).
		Uncontrolled/dangerous/	Unattended dogs (Wilcox et al., 2000) and wild animals

Omaha System Domain	Omaha System Problem	Omaha System Problem Signs/symptoms	Barriers to Physical Activity among Rural Women
		infected animals; Inadequate/unsafe play/exercise areas	(Gangeness, 2010). Absence of a safe place to exercise (Wilcox et al., 2000) and safety and/or weather concerns (Eyler & Vest, 2002; Atkinson et al., 2007; Peterson et al., 2013).
Health-related Behavior Domain	Nutrition	Overweight: adult BMI 25.0 or more	Overweight and obesity (Boeckner, Pullen, Walker, & Hageman, 2006; Sanderson et al., 2002).

Table 3. Map of the Omaha System Intervention Scheme for Physical Activity to the Ecological Model for Health Promotion (McLeroy et al., 1988) Using Examples from Physical Activity Research Studies Guided by Ecological Theory

Ecological Model for Health Promotion Levels	Physical Activity Intervention Description	Omaha System Intervention Category	Omaha System Intervention Target	Omaha System Client-specific Intervention Care Description
Intrapersonal Factors	Individualized goal setting (Warren et al., 2010);	Teaching, Guidance, and Counseling	Behavior modification	Increase appropriate physical activity
	Skill-building meeting and email coaching (Rovniak et al., 2013)	Teaching, Guidance, and Counseling	Exercises	Establish appropriate types/schedule
Interpersonal Processes and Primary Groups	Online social networking site for physical activity (Rovniak et al., 2013);	Case management	Support group	Reliable internet sites
	Worksite walking teams or groups (Warren et al., 2010)	Case management	Support system	Work associates
Institutional Factors	Onsite fitness facility at work (Lucove, Huston, & Evenson, 2007);	Case management	Durable exercise equipment	Exercise equipment
	Management support for physical activity programming (Warren et al., 2010)	Case management	Support system	Work associates
Community Factors	Stakeholder symposium to address goals for community physical activity programs and	Case management	Other community resources	Other (built environment)

Ecological Model for Health Promotion Levels	Physical Activity Intervention Description	Omaha System Intervention Category	Omaha System Intervention Target	Omaha System Client-specific Intervention Care Description
	services (Haggis et al., 2013)			
Public Policy	Policies for shared use of existing school sport and recreational facilities outside of school hours for district residents of all ages (Spengler, 2012)	Case management	Durable exercise equipment	Exercise equipment

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Chapter Summary

Published research of factors associated with physical activity among rural women is sparse (*N*=25). A review of the existing literature indicated a variety of personal, socio-economic, and physical environment factors influence rural women's physical activity behavior. However, within this body of evidence, several gaps in the research were identified, and definitions of essential concepts such as rural and physical activity were variable or absent, thus limiting the conclusions that can be drawn from the results. Consequently, future research should specify how the term rural was applied to the study population. In addition, studies should address the concept of motivation and its relationship to physical activity, rural women's caregiver responsibilities and the discouragement they experience toward participating in physical activity, and the impact of depression. Actual physical activity measures should be used in future studies to strengthen the body of knowledge in this area, and more research is needed to clarify the impact of environmental structures such as sidewalks. Finally, physical activity research that uses clinical data collected by nurses is needed to learn more about physical activity in specific populations and to increase nursing knowledge regarding optimal methods of measuring, documenting, and utilizing this information. Accordingly, the purpose of this study is to increase understanding of physical activity and the factors associated with this health behavior among rural women by analyzing clinical data documented by local health department nurses using the Omaha System, as well as to examine their perspectives regarding the findings. This will address the final research gap mentioned above and will strengthen evidence regarding factors associated with physical activity

among rural women by using of a precise definition of how the term rural was applied to the study population.

Several conceptual/theoretical frameworks exist and could be used to guide studies of physical activity. Examples include the ecological model for health promotion, social cognitive theory, transtheoretical model of health behavior change, theory of planned behavior, health promotion model, and self-determination theory. Each has been empirically tested and found to have value in explaining physical activity behavior. Theory selection should be based upon research questions with attention to the impact of multiple systems on this health behavior. Therefore, the ecological model for health promotion (McLeroy et al., 1988), a robust, holistic theory of health behavior that conceptually aligns with both the current evidence regarding factors associated with physical activity among rural women and the Problem Classification Scheme of the Omaha System, was selected as the theoretical framework for this study.

The general lack of research and persistent knowledge gaps regarding factors associated with physical activity among rural women support the continued exploration of this phenomenon. The results of this inquiry may be used to design tailored physical activity nursing interventions to help facilitate patient health behavior change and improve the measurement, documentation, and utilization of physical activity data in nursing practice.

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CHAPTER 3.0 METHODOLOGY

Chapter Introduction

The purposes of this study were to (a) increase understanding of physical activity among rural women; (b) increase understanding of the factors associated with physical activity among rural women; (c) examine the relationship of ecological factors on physical activity behavior; (d) demonstrate the knowledge that can be gained through consistent assessment, documentation, and analysis of physical activity data using standardized nursing terminology; and (e) examine local health department nurses' perspectives regarding the findings. A retrospective, mixed methods design was employed in two phases. Phase One involved quantitative methods. Secondary analysis was conducted on a de-identified data set of client health information recorded in a clinical information system by local health department nurses using the Omaha System (Martin, 2005). The second phase of the study involved qualitative methods. A focus group session was conducted with the local health department nurses in the sample setting to elicit perspectives regarding the quantitative findings. The focus group data were analyzed using thematic analysis. The sequential methodological triangulation (Morse, 1991) of this two-phase, mixed methods approach supports a more comprehensive understanding of physical activity in this population and strengthens the validity of the findings.

Section 3.1: Phase I Methodology

The first phase of this retrospective, mixed methods study used a quantitative cross-sectional, correlational descriptive approach to address the research questions and hypotheses listed below.

Research Questions and Hypotheses

Among rural, Midwestern women receiving care from local health department nurses:

Question 1: What are the physical activity behaviors, knowledge, and status among rural, Midwestern women receiving care from local health department nurses?

Question 2: Among women documented as having an actual physical activity problem, what are the most common signs and symptoms?

Question 3: Among women with insufficient physical activity levels, what are the most common health problems?

Question 4: Controlling for age, BMI, physiological health problems, and psychosocial problems, how well does physical activity knowledge account for physical activity behavior?

Question 5: Controlling for age, BMI, physiological health problems, and psychosocial problems, how well do season and environmental problems account for physical activity behavior?

Hypotheses

1. Controlling for age, BMI, physiological health problems, and psychosocial problems, higher physical activity knowledge will predict higher levels of physical activity.
2. Controlling for age and BMI, physiological health problems, and psychosocial problems, the ecological factors of summer season and absence of environmental problems will predict higher levels of physical activity.

Protection of Human Subjects

Both phases of this study were granted exempt status following review by the University of Wisconsin–Milwaukee Institutional Review Board (IRB). See Appendix A.

Setting and Sample

The setting of this study was a local health department located in a rural county of west-central Minnesota. According to the 2010 census, the county has a population of 57,303 and a rural-urban continuum code rating of six, meaning it is adjacent to a metro area and urban areas within the county have a population of 2,500 to 19,999 (United States Department of Agriculture, 2013). The median household income between 2008 and 2012 was $47,579 with 12.2% of the population living below the poverty line (United States Department of Commerce, 2014). Half (49.7%) of the residents are women, 96.6% are White, 21.1% of the population is under 18 years of age, and 21.8% is age 65 or older (United States Department of Commerce, 2014).

The population for the quantitative phase of the study was women who received care from the county local health department nurses. The sample was the computerized client records data set from this population between October 2010 and October 2014. This convenience sample was selected because the local health department nurses in this county began consistently assessing physical activity, documenting the client information using the Omaha System, on all clients at that time. This is one of few - if not the only - data sets of its kind (K. Monsen, personal communication, April 11, 2014), thus providing the unique opportunity to examine physical activity in a vulnerable population that had not previously been studied using client data documented with a standardized terminology by nurses in a clinical setting.

Inclusion and Exclusion Criteria

The following inclusion criteria were used in this study: county resident, female, age 18 or older, and received local health department nursing services with a baseline physical activity assessment documented using the Omaha System between October 2010 and October 2014 (N=852). Adult, female clients who did not have a baseline physical activity assessment documented using the Omaha System between October 2010 and October 2014 were excluded from the study (N=105). See Table 3.1 for study sample characteristics and comparisons by age group.

Measurement Instrument

The county's computerized electronic health record information system, utilizing the Omaha System standardized terminology, was the data collection tool for the quantitative phase of the study. The specific measures used included demographic data, Omaha System Problem Classification Scheme, and Omaha System Problem Rating Scale for Outcomes. Because the purpose of this study was to describe physical activity and factors associated with this health behavior in the target population using a descriptive, cross-sectional approach, only data from the baseline physical activity assessment were analyzed.

Reliability and validity of the Omaha System were established as it was developed (Monsen et al., 2010). Nurses working in diverse settings evaluated the system for utility and comprehensiveness (Martin, Norris, & Leak, 1999). Additionally, inter-rater reliability of the Problem Rating Scale for Outcomes was tested in two phases. During Phase One, Finn's *r* correlation scores were analyzed for the Knowledge (*r*=0.73), Behavior (*r*=0.74), and Status (*r*=0.79) subscales (Martin, Norris, & Leak, 1999). In Phase Two, coefficient gamma inter-rater reliability scores for the Knowledge, Behavior,

and Status subscales were reported as 0.53, 0.60, and 0.87, respectively, with the association of ratings significant at $p<0.01$ (Martin, Norris, & Leak, 1999). Content validity was established with a panel of experts, resulting in composite content validity index scores of 0.79 for the Knowledge subscale, 0.73 for Behavior, and 0.76 for Status (Martin, Norris, & Leak, 1999).

The Omaha System data used for this study was coded by local health department registered nurses. All have attended the Omaha Systems Basics workshop by Karen Martin, the Omaha System developer (D. Thorson, personal communication, May 15, 2014).

Procedures

Upon receiving approval for this study from the University of Wisconsin-Milwaukee (UWM) Institutional Review Board (IRB), the director of the local health department in the study setting provided me with a de-identified data set extracted from the computerized electronic health records of the study sample. As the principal investigator, I did not have any contact with the participants and all participant identifying information was kept apart from me and the data. The file was transmitted via my PantherFile secure dropbox and then converted to SPSS (Version 22) for analysis. The data file was cleaned and the frequency distributions of all variables was checked before proceeding with the analysis.

Data Analysis

The data were analyzed quantitatively with SPSS (Version 22) using common descriptive and inferential statistical analyses. Initially, the distributions of each variable were examined. Continuous and interval level variables such as age, Physical activity

Knowledge, Physical activity Behavior, and Physical activity Status were analyzed using the mean and standard deviation. Variables that were skewed were reviewed with the University of Wisconsin – Milwaukee biostatistician before proceeding with the analysis. The only variable for which this was considered an issue was age; however, the decision was made to retain the variable as recorded without transformation to avoid loss of interpretive ability. Instead, participants were grouped into two age categories for some analysis and age was controlled in others.

Categorical variables such as community, physical activity signs and symptoms, race/ethnicity, and Physical activity problem were examined using frequencies, frequency distributions, and percentages. Although BMI was initially expected to be measured as a continuous variable, only 22% (n=186) of subjects had a BMI measure recorded, at least 24 of which were illogical values. However, 99.4% of subjects (n=847) had Nutrition Knowledge, Behavior, and Status (KBS) ratings documented with the Omaha System Problem Rating Scale for Outcomes. Additionally, 34.9% of subjects (n=297) had the Nutrition problem sign and symptom of BMI of 25 or higher recorded. This data was transformed to a dichotomous variable for the BMI measure used for this study. Inclusion of the demographic variable of marital status was anticipated in the initial study plan; however, it was excluded from the analysis because the local health department no longer collects the information, citing frequent change in marital status of clients as the reason.

Statistical analyses were completed on the total sample population. In addition, several statistical analyses were completed separately by age category: under 40 years of age; and age 40 or over. Although separate statistical analyses based on the local health

department programs in which the participants were enrolled was initially planned, the data set included information from more programs than had been expected and 23.5% of subjects (n=200) did not have any program recorded. In addition, when International Classification of Disease (ICD) code information was available, most participants under 40 had a pregnancy or postpartum diagnosis. Consequently, grouping by age category proved to be more meaningful. See Table 3.2 for a list of research questions and hypotheses with variables used and statistical analyses conducted.

Limitations

This phase of the study used a correlational design. Therefore, one limitation is the inability to make causal claims from the results. In addition, the study used a convenience sample. This sampling method was chosen for feasibility reasons and because of the uniqueness of this data set; however, it presents the potential for a systematic selection bias that threatens the internal and external validity of the study. This risk was minimized by including 100% of the accessible population meeting the inclusion criteria over a four year time period (Hulley, Cummings, Browner, Grady, & Newman, 2007). In addition, potentially confounding variables, such as age and BMI, were statistically controlled or grouped and examined separately. Demographic data for the total sample and each of the two age groups were reported. Because significant differences between the two age groups were expected, results for the total sample and for each group were also reported separately. Contextual information regarding the study setting was described in detail. Even so, the statistical results must be interpreted conservatively and with caution since a convenience sample is less likely to be representative of the target population (Polit & Beck, 2012). Risk of measurement error

is another limitation of the proposed study. It is possible that not all Omaha System problems existing for some participants were addressed and coded by the local health department nurses. Further, although the local health department nurses were trained in Omaha System documentation, the system has not been tested for reliability and validity in the sample population. The second phase of the study with methodological triangulation using a focus group interview of the nurses who collected the data was conducted to address this limitation. In addition, periodic consultation with the University of Wisconsin – Milwaukee biostatistician and dissertation committee members was conducted throughout the analysis phase.

Section 3.2: Phase 2 Methodology

The second phase of this retrospective, mixed methods study involved a qualitative focus group interview session to address the research questions listed below. The focus group format was selected because of its effectiveness in obtaining information and a variety of opinions or perspectives from a group (Mack, Woodsong, Macqueen, Guest, & Namey, 2005). A significant strength of focus group interviews is their efficiency: researchers can gather abundant data from multiple perspectives in a short amount of time (Polit & Beck, 2012). Group discussion is stimulated and can lead to sharing of deeper perspectives and opinions (Plummer-D'Amato, 2008a). Further, focus groups help democratize the research process, allowing participants to feel ownership of the interview context (Kamberelis & Dimitriadis, 2008). The synergy created through the process can reveal both individual and collective perspectives not deemed significant enough to mention during individual interviews (Kamberelis & Dimitriadis, 2008). Therefore, this method was particularly well suited for Phase Two of this study which

aimed to explore the rural local health department nurses' perspectives regarding the quantitative findings.

Research Questions

Question 1: What are local health department nurses' perspectives regarding how well the quantitative findings capture and explain the factors that either promote or limit physical activity among adult, female clients?

Question 2: What are local health department nurses' perspectives regarding the process of assessing and documenting physical activity?

Question 3: What are local health department nurses' perspectives regarding the utility of the quantitative findings for their nursing care of individual clients and/or the community?

Setting and Sample

Consistent with the first phase of this study, the setting for Phase Two was a local health department located in a rural, Midwest county of west-central Minnesota. The sample consisted of local health department registered nurses. Inclusion criteria was registered nurses who provided and documented care for clients between October 2010 and October 2014. There were no exclusion criteria. Participants were recruited using non-probability purposive sampling following receipt of exempt status from the University of Wisconsin – Milwaukee IRB (see Appendix A) and Phase One of the study. Non-probability purposive sampling was chosen because it supports recruitment of focus group participants based on the purpose of the study and targets potential participants that have interest and experience in the topic of inquiry (Krueger & Casey, 2000). Recruitment was completed in three phases. First, support for the focus group was

obtained from the director of the local health department. Second, the director was contacted again once the quantitative data had been analyzed to select a convenient date and time for the focus group. Nurses who met the inclusion criteria were identified by the director (*N*=18). Third, those nurses were sent an email invitation to participate, including detailed study information (see Appendix B). The final focus group sample consisted of 12 public health nurses. See Table 3.3 for a summary of participant characteristics.

Data Collection Methods

Data for this study were collected using two methods: a demographic survey and focus group interviews (audio-recorded and transcribed along with field note observations). Each of these methods will be described below.

After consenting to participate in the study (see Appendix C), subjects were asked to complete a demographic survey when they arrived for their scheduled focus group session (see Appendix D). The researcher collected the forms, reviewed them for completion, and clarified any questions. Collection of this data was essential for describing key characteristics and providing rich descriptions of the sample so readers of the study findings will be able to assess for transferability of results (Polit & Beck, 2012).

Focus group interview was the primary method of data collection for this phase of the study. As previously noted, participants were purposively selected. Due to the small size of the department and director scheduling preference, only one session was held. This supported sharing of rich, personal information while preserving diversity of ideas and perspectives. Rodriguez et al. (2011) recommend that the focus group environment be compatible to participants' identities and ways of communicating. Therefore, the

session was held at the local health department office. Consistent with rural cultural norms for gatherings and the department's food policy, healthy snacks were served.

Data were collected by two people: the researcher served as the moderator and the assistant served as primary note-taker. A circle seating arrangement was used with the researcher and assistant sitting opposite each other to avoid creating a power block (Plummer-D'Amato, 2008a). The session was audio-recorded and transcribed. Observations were documented in field notes. It was the research assistant's responsibility to ensure detailed notes regarding the order of speakers and significant non-verbal behaviors of participants are recorded. This is important because it can be difficult to determine who was speaking when relying solely on the audio-recording (Polit & Beck, 2012). The researcher and assistant followed the guidelines suggested by Mack et al. (2005) for focus group facilitation and note-taking.

The session started with introductions and a review of the quantitative study findings led by the moderator. Hurworth's (1996) triangular structure for focus group questioning was followed, beginning with a broad opening question answered by each participant in turn. Subsequently, a series of questions was asked and answered spontaneously (see question guide in Appendix E). The session lasted 60 minutes. Participants were invited to contact the researcher after the session or by phone or email if they had any other information or insights they wanted to share but did not feel comfortable mentioning in the group setting.

Data Analysis and Synthesis

Data for this study were managed electronically. Focus group interview audio recordings were transcribed by the principal investigator. Demographic data were

organized in electronic spreadsheet tables. Field notes were also converted to electronic format. All were stored in a password protected file.

Thematic analysis was used to analyze the focus group data. Controversy exists regarding whether focus group interviews should be analyzed as individual or group data (Polit & Beck, 2012). Therefore, thematic analysis is ideal, because it easily allows for both. The verbatim focus group transcript was analyzed by individual participant for themes and patterns. Emerging themes were organized and managed in a spreadsheet matrix with corresponding quotes from the dataset. Findings were then compared across participants. In addition, the group's data were analyzed as a whole for themes and patterns. A spreadsheet matrix also was used to organize group themes. The audio recording were replayed repeatedly and the transcripts were read multiple times to ensure familiarity with the data. Self-reflective memos were documented. Themes were refined with each successive review of the data as new insights were revealed.

In order to strengthen coherence in this study, steps were taken to demonstrate connectivity and consistency between the themes and interpretations, addressing gaps and linking data such that the analysis was meaningful and theoretically sound (Riessman, 2008). In addition, analytic explanations of both convergent and divergent points were considered (Riessman, 2008). Efforts to support persuasiveness centered upon providing adequate verbatim quotes with contextual descriptions to demonstrate data authenticity and analytic plausibility (Riessman, 2008).

Credibility was established by encouraging honest and uncensored responses, the focus group session was held in a location in which all participants would feel comfortable (worksite conference room) and information about privacy protection

measures was emphasized. To further enhance credibility, potential researcher biases were disclosed and more experienced researchers were consulted to challenge assumptions and enhance accuracy of interpretations (Bloomberg and Volpe, 2008). Dependability was enhanced with an audit trail to clearly describe how data were collected and analyzed (Bloomberg and Volpe, 2008). In addition, more experienced researchers were asked to analyze some sections of data to verify consistency of interpretations (Bloomberg and Volpe, 2008). Because focus group data are firmly contextualized, transferability can be limited (Plummer-D'Amato, 2008b). Therefore, rich descriptions and detailed information were provided in an effort to convey an accurate representation of the study participants, setting, and context for readers so they may evaluate transferability for their specific needs and circumstances (Bloomberg and Volpe, 2008).

Limitations

Despite careful planning, the study was not free of limitations. First, the focus group method of data collection could have affected the type and amount of information revealed. Some participants may not have been comfortable disclosing information in a group setting. The worksite context of the study also may have inhibited disclosure. In addition, focus groups are susceptible to "group think" or conformity of responses (Plummer-D'Amato 2008b). These limitations were addressed by taking steps to strengthen confidentiality among participants and by informing participants of the intended use of the information. Second, focus group data analysis can be challenged by difficulties matching recorded comments to specific participants. This was addressed by having a research assistant present to document the flow of conversation among

participants as well as participants' non-verbal behaviors. Third, a single researcher analyzed the data. This limitation was addressed by consulting with my major professor, an experienced researcher in the area of community health, during the planning, data collection, and analysis phases of the study. In addition, more experienced researchers were asked to analyze some sections of data to verify consistency of interpretations.

Chapter Summary

The purpose of this chapter was to present a description of the research design and methods used for this study, a retrospective, mixed methods descriptive design, guided by the ecological model for health promotion (McLeroy et al., 1988). The study was conducted in two phases. Phase One entailed secondary analysis of a de-identified data set of client health information documented by local health department nurses using the Omaha System. In Phase Two, a focus group session was conducted with the local health department nurses who collected and recorded the data to elicit perspectives regarding the quantitative findings. This methodological triangulation was selected to support more comprehensive and valid study findings.

Table 3.1. Phase I Study Participant Characteristics: Total and Comparison by Age Group

	Total Sample (*N*=852)		Age 18-39 Group (*N*=480)		Age 40+ Group (*N*= 372)			
Variable	*n*	*%*	*n*	%	*n*	%	X^2(df)	*p*
BMI 25 or higher	294	34.5	102	21.3	192	51.6	85.493(1)	<.001
Omaha System PA Problem with S/Sx	408	47.9	134	27.9	274	73.7	175.304(1)	<.001
Race/Ethnicity Non-Hispanic Caucasian	758	89.0	425	88.5	333	89.5	.203(1)	.653
Season of PA Assessment							.017(1)	.896
Summer (May 1–October 31)	433	50.8	243	50.6	190	51.1		
Winter (November 1-April 30)	419	49.2	237	49.4	182	48.9		
Community (population)							---	---
Community A (13,471)	361	42.2	183	38.1	178	47.9		
Community B (2374)	80	9.4	44	9.2	36	9.7		
Community C (2259)	85	10.0	47	9.8	38	10.2		
Others (50 – 1158)	321	37.7	204	42.5	117	31.5		
Missing	5	0.6	<5	<1	<5	<1		
Omaha System Income Problem*							---	---
Missing	605	71.0	236	49.2	369	99.2		
Minimal or No S/Sx	156	18.3	155	32.2	1	<1		
Moderate to Extreme S/Sx	91	10.7	89	18.5	2	<1		

Variable	Total Sample (*N*=852)		Age 18-39 Group (*N*=480)		Age 40+ Group (*N*= 372)		X^2(df)	*p*
	n	*%*	*n*	%	*n*	%		
Medical Diagnosis/Condition**							---	---
Postpartum care	332	39.0	328	68.3	4	1.1		
Pregnancy related	93	10.9	93	19.4	0	0		
Missing	282	33.1	28	5.3	254	68.3		
Miscellaneous	84	9.9	28	5.3	56	15.1		
Unspecified reason for observation/consultation	61	7.2	3	<1	58	15.6		
LHD Program**							---	---
Caring Connections	291	34.2	288	60.0	3	<1		
Nurse Family Partnership	87	10.2	87	18.1	0	0		
Missing	200	23.5	53	11.0	149	40.1		
Miscellaneous (<15 per code)	74	8.7	27	5.6	45	12.1		
PAS/LTCC/Waivers	200	23.5	25	5.2	175	47.0		

BMI is Body Mass Index; PA is physical activity; S/Sx is signs/symptoms; LHD is local health department; PAS is Preadmission Screening; LTCC is Long-Term Care Consultation

*Based on Income Status rating; most common sign/symptom of an Income problem was low/no income

**Based on first International Classification of Disease (ICD) code or Local Health Department program recorded

Table 3.2. Data Analysis Methods for Phase I Research Questions

Research Question or Hypothesis	Variable	Measurement tool	Level of Measurement	Statistical Test
What are the physical activity behaviors, knowledge, and status among rural, Midwestern women receiving care from local health department nurses?	PA Behavior PA Knowledge PA Status	Omaha System Problem Rating Scale for Outcomes rating (1-5) for all three variables	Interval Interval Interval	Descriptive statistics for each variable in the total population (mean with standard deviation; median; mode; range) Descriptive statistics for each variable for total sample and by age group.
Among women documented as having an actual physical activity problem, what are the most common signs and symptoms?	PA signs and symptoms	Omaha System Problem Classification scheme	Nominal: sedentary lifestyle; inadequate, inconsistent exercise routine; inappropriate type/amount of exercise for age/condition; other	Frequencies Analyze for total sample and by age group.
Among women with insufficient physical activity levels, what are the most common health problems? (Insufficient PA defined as a PA Problem Rating Scale for Outcomes behavior rating of <4)	Health problem	Omaha System Problem Rating Scale for Outcomes status rating for Omaha System problem(s) (problem = problem rating scale for outcomes rating of <4)	Interval	Frequency (of most common only) Analyze for total sample and by age group.

Research Question or Hypothesis	Variable	Measurement tool	Level of Measurement	Statistical Test
Controlling for age, BMI, physiological health problems, and psychosocial problems, how well does physical activity knowledge account for physical activity behavior? Hypothesis: Controlling for age, BMI, physiological health problems, and psychosocial problems, higher physical activity knowledge will predict higher levels of physical activity.	PA Behavior	Omaha System Problem Rating Scale for Outcomes rating of PA behavior	Interval	Hierarchical regression Analyze for total sample and by age group.
	PA Knowledge	Omaha System Problem Rating Scale for Outcomes rating of PA knowledge	Interval	
	Covariates:			
	Age	Demographic data	Continuous	
	BMI	Omaha System Problem Classification Scheme for Nutrition	Dichotomous: yes/no; Yes if Nutrition problem with sign and symptoms of a BMI of 25 or higher recorded	
	Physiological health problems	Omaha System Problem Rating Scale for Outcomes status rating for Omaha System problems	Dichotomous: yes/no; Yes if any of the Physiological domain problems are rated $\geq$4)	
	Psychosocial problems	Omaha System Problem Rating Scale for Outcomes status rating for Omaha System problems	Dichotomous: yes/no; Yes if any of the Psychosocial domain problems are rated $\geq$4)	
Controlling for age, BMI, physiological health problems, and psychosocial problems, how well do	PA Behavior	Omaha System Problem Rating Scale for Outcomes rating of PA behavior	Interval	Hierarchical regression

Research Question or Hypothesis	Variable	Measurement tool	Level of Measurement	Statistical Test
season and environmental problems account for physical activity behavior? Hypothesis: Controlling for age, BMI, physiological health problems, and psychosocial problems, the ecological factors of summer season and absence of environmental problems will predict higher levels of physical activity.	Season	Date of assessment	Dichotomous: summer/winter	Analyze for total sample and by age group.
	Environmental problems	Omaha System Problem Rating Scale for Outcomes status rating for Omaha System problems	Dichotomous: yes/no; Yes if any of the Environmental domain problems are rated ≥4)	
	Covariates:			
	Age	Demographic data		
	BMI	Omaha System Problem Classification Scheme for Nutrition	Continuous Dichotomous: yes/no; Yes if Nutrition problem with sign and symptoms of a BMI of 25 or higher recorded	
	Physiological health problems	Omaha System Problem Rating Scale for Outcomes status rating for Omaha System problems	Dichotomous: yes/no; Yes if any of the Physiological domain problems are rated ≥4)	
	Psychosocial problems	Omaha System Problem Rating Scale for Outcomes status rating for Omaha System problems	Dichotomous: yes/no; Yes if any of the Psychosocial domain problems are rated ≥4)	

PA is physical activity; BMI is body mass index

Table 3.3. Characteristics of Phase II Study Participants (N=12)

Variable	*n*	%
Gender		
Male	1	8.3
Female	11	91.7
Age		
20-35	1	8.3
36-50	6	50.0
51+	5	41.7
Highest degree		
Bachelors	10	83.3
Masters	2	16.7
Years of RN experience		
5-10	4	33.3
11-20	5	41.7
More than 20	3	25.0
Years of Public Health Nurse experience		
Less than 2	1	8.3
2-5	2	16.7
6-10	5	41.7
11-20	3	25.0
More than 20	1	8.3
Years of Omaha System experience		
Less than 2	3	25.0
2-5	8	66.7
6-10	1	8.3

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CHAPTER 4.0 RESULTS

Chapter Introduction

The purposes of this study were to (a) increase understanding of physical activity among rural women; (b) increase understanding of the factors associated with physical activity among rural women; (c) examine the relationship of ecological factors on physical activity behavior; (d) demonstrate the knowledge that can be gained through consistent assessment, documentation, and analysis of physical activity data using standardized nursing terminology; and (e) examine local health department nurses' perspectives regarding the findings. One manuscript was prepared to report the study results. The manuscript, as included in Section 4.1, was prepared for submission in *Public Health Nursing,* a journal that focuses on population-based issues of concern to public health nurses. All research questions and hypotheses for both phases of this retrospective, mixed methods study were addressed in the manuscript.

Section 4.1: Manuscript Three "Using Omaha System Documentation to Understand Physical Activity among Rural Women"

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Abstract

Objective(s): To increase understanding of physical activity (PA) and associated factors among rural women; demonstrate knowledge gained through consistent PA assessment and documentation using standardized terminology; and examine local health department (LHD) nurses' perspectives of findings.

Design: Mixed methods guided by ecological theory: quantitative secondary analysis of de-identified client information; thematic analysis of qualitative focus group data.

Sample: A convenience sample of rural women who received LHD nursing services (*N*=852); purposively selected LHD nurses (*N*=12).

Measurements: Demographic data, baseline PA Knowledge, Behavior, and Status (KBS) ratings, PA signs and symptoms, and ecological factors operationalized with the Omaha System.

Results: Rural women had above adequate Knowledge (M=3.41), inconsistent Behavior (M=3.27), and minimal-moderate signs/symptoms (M=3.56) for PA. Hierarchical regressions indicated ecological factors influenced PA Behavior; however, age, BMI, and PA Knowledge had more impact. Qualitative themes from LHD nurses included (a) *knowledge is good, behavior is the issue*; (b) *clients may be more complex than what is captured;* and (c) *assessment and coding are impacted by professional judgment, time constraints, and priorities.*

Conclusions: PA is an important problem for rural women that is influenced by demographic and ecological factors. Omaha System documentation supports measuring and analyzing the problem from an ecological perspective.

Key words: Omaha System, Physical activity, Rural women, Public health nursing

Using Omaha System Documentation to Understand Physical Activity among Rural Women

Introduction

Background

Increasing physical activity among all populations is a public health priority (United States Department of Health and Human Services [HHS], 2014). This goal is particularly relevant for rural women who report more barriers to physical activity (Wilcox, Castro, King, Housemann, & Brownson, 2000), are more likely to be completely inactive during leisure time (Brownson et al., 2000), and are less likely to meet physical activity guidelines than women who live in urban areas (Parks, Housemann, & Brownson, 2003). The higher prevalence of chronic disease and poorer overall health of rural populations (Bennett, Lopes, Spencer, & van Hecke, 2013) generate an urgent need for nursing interventions that address this problem. However, healthcare resources are often limited in rural areas (Jones, Parker, & Ahern, 2009). Therefore, nurses must understand the unique factors associated with physical activity among rural women prior to developing more effective physical activity interventions.

Although few studies have examined factors associated with physical activity specific to rural women, a review of literature conducted by the first author indicated they may be grouped into categories that align with ecological theory (Olsen, 2013). One example is the ecological theory for health promotion (McLeroy, Steckler, Bibeau, & Glanz, 1988). This perspective is based upon a systems approach, recognizing that multiple levels within the social environment are unique and important for their influence on health behaviors (McLeroy et al., 1988). The levels include individual characteristics

such as physical health, age, knowledge, and self-concept; interpersonal processes of social support and social roles within family and friends; and factors at community levels, such as rules, networks, policies, and laws within social organizations and institutions (McLeroy et al., 1988). Previous studies indicated some factors associated with physical activity among rural women at each of these levels are similar to those documented in other populations. Examples include education, income, body mass index (BMI), and age (Jeffrey Kao, Jarosz, Goldin, Patel, & Smuck, 2014; HHS, 2014), self-efficacy (HHS, 2014; Short, Vandelanotte, Rebar& Duncan, 2013), and both social support and access to facilities (HHS, 2014; Wendel-Vos, Droomers, Kremers, Brug, & van Lenthe, 2007). However, other factors vary due to unique social, cultural, and economic concerns in rural areas (Coward et al., 2006). For example, in a study comparing factors associated with physical activity between rural and urban women, Wilcox et al., (2000) reported more caregiver duties ($p<.001$) and more discouragement from others ($p<.01$) among rural women. Additionally, Peterson, Schmer, and Ward-Smith (2013) reported rural women perceived few roles models for physical activity as well as a societal acceptance of being overweight.

Despite these findings, gaps persist in what is known about physical activity in rural women (Olsen, 2013). For example, inconsistent or unspecified definitions of what was considered to be a rural area were used in many published studies. Similar discrepancies were evident regarding how authors conceptualized and operationalized physical activity. Most studies involved collection of self-reported physical activity data from participants. Many rural regions and population sub-groups have not been studied. Additionally, outside of a small number of articles targeting primary care and advanced

practice nurses, few reports suggested strategies for collection and utilization of clinical physical activity data to increase knowledge of this health behavior and/or inform client care. This is concerning given the recommendation to include regular and consistent assessment of physical activity in client care (Strath et al., 2013; Exercise is Medicine ® Australia, 2012; Hainsworth, 2006). Research that examines physical activity using clinical data is needed to learn more about physical activity in specific populations and to increase nursing knowledge regarding optimal methods of measuring, documenting, and utilizing this information. This gap could be addressed with greater attention to information systems and standardized terminologies used in clinical settings.

A standardized terminology is a method of professional communication consisting of a common language (Rutherford, 2008). It is typically constructed using specific terms in a hierarchical arrangement (Hardiker, Hoy, & Casey, 2000). One example is the Omaha System (Martin 2005a) which is one of several nursing terminologies recognized by the American Nurses Association (Thede & Schwiran, 2011). The Omaha System consists of three components: the Problem Classification Scheme, the Intervention Scheme, and the Problem Rating Scheme for Outcomes (Martin, 2005b). Together, they support comprehensive documentation of a client's problems, the interventions provided by health professionals, and the client's status or progress (Martin, 2005b). The Problem Classification Scheme is comprised of 42 problems that may be experienced by a client, all of which fall under one of four domains: environmental, psychosocial, physiological, or health-related behaviors (Martin, 2005c). When a problem is identified in a client, it is further described as an actual, potential, or health promotion concern (Martin, 2005c). Additionally, all actual

problems include signs and symptoms, potential problems include risk factors, and health promotion problems include descriptive information (Martin, 2005c). The second component is the Omaha System Intervention Scheme which supports documentation of care or services provided by health professionals and is organized in three levels in order to specify the intervention, its target, and client-specific information (Martin, 2005c). The third Omaha System component is the Problem Rating Scale for Outcomes which uses a five-point Likert-type scale to measure the client's condition or progress in three areas: Knowledge, Behavior, and Status (Martin, 2005c).

The Omaha System's comprehensive, domain-based structure aligns well with the ecological model of health promotion (McLeroy et al., 1988). See Figure 1. The health-related behavior of physical activity is one of the problems in the Problem Classification Scheme. Additionally, the Problem Rating Scale for Outcomes provides a mechanism for consistent physical activity measurement by nurses, as well as the measurement of physiological, psychosocial, and environmental domain problems. Therefore, examination of clinical data documented by local health department (LHD) nurses using the Omaha System is a promising way to address research gaps and increase nursing knowledge regarding ecological factors associated with physical activity in rural women.

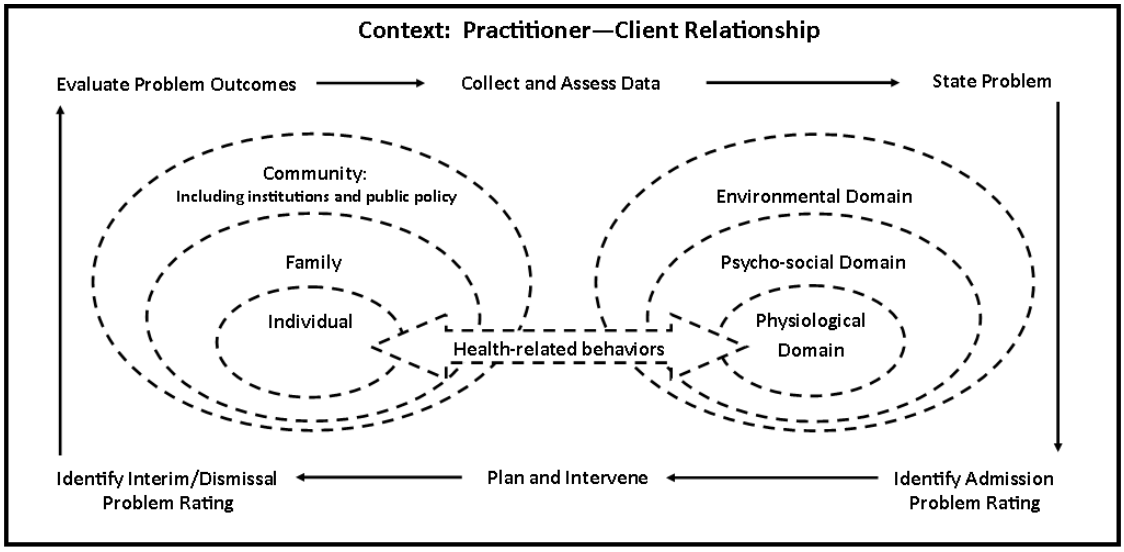

Figure 1. Ecological model for health promotion (McLeroy et al., 1988) aligned with the Omaha System (Martin, 2005a)

Research Questions

The purposes of this two-phase, mixed methods study were to increase understanding of physical activity and associated factors among rural women; demonstrate the knowledge that may be gained through consistent assessment, documentation, and analysis of physical activity data using standardized terminology; and examine LHD nurses' perspectives regarding the findings. Specific aims of the first phase of the study were to describe physical activity among rural Midwestern women receiving care from LHD nurses inclusive of Behavior, Knowledge, Status, signs/symptoms, and the most common health problems among those with insufficient physical activity. Two hypotheses were tested:

1. Controlling for age, BMI, physiological health problems, and psychosocial problems, higher physical activity knowledge will predict higher levels of physical activity.

2. Controlling for age and BMI, physiological health problems, and psychosocial problems, the ecological factors of summer season and absence of environmental problems will predict higher levels of physical activity.

The aim of the second phase of the study was to examine nurses' perspectives regarding the comprehensiveness and usefulness of the quantitative findings.

Methods

Design and Sample

This retrospective, mixed methods study was conducted in two phases. First, quantitative secondary analysis of de-identified client health information recorded by LHD nurses using the Omaha System was conducted. Second, a focus group session was conducted with the LHD nurses in the sample setting to elicit perspectives regarding the quantitative findings. These qualitative data were analyzed using thematic analysis. The sequential methodological triangulation (Morse, 1991) of this approach was used to support a more comprehensive understanding of physical activity in this population and strengthen the credibility of the findings. Both phases of the study were granted exempt status following review by the University of Wisconsin – Milwaukee Institutional Review Board (IRB).

The study setting was a rural, county in Minnesota with a population of 57,303 and a USDA (2013) rural-urban continuum code rating of six (non-metropolitan but adjacent to a metro area and urban areas within the county have a population of 2,500 to 19,999). A convenience sample of women who met the following criteria were included in the quantitative phase of the study: county resident, age 18 or older, and received LHD nursing services with a baseline physical activity assessment documented in the

computerized health record between October 2010 and October 2014 (*N*=852). Those who did not have baseline physical activity assessments documented were excluded from the study (*N*=105). The mean age of participants was 46.74 (SD = 26.31). Most were non-Hispanic Caucasian (89.0%), as compared to 96.6% in the county (US Department of Commerce, 2014). See Table 1 for study sample characteristics and comparisons by age group.

A purposive sample of LHD nurses in the study setting was recruited for the qualitative phase of the study. The department director helped identify nurses who provided and documented care for clients between October 2010 and 2014 (*N*=18), all of whom were emailed an invitation to participate. The final sample included 12 (66.7%) LHD nurses with a mix of bachelor's (*n*=10) and master's (*n*=2) degrees. All but one were female. Most had more than five years public health experience (*n*=9) and two or more years Omaha System coding experience (*n*=9).

Measures

This study was guided by the ecological model for health promotion (McLeroy et al., 1988). The Omaha System was used to operationalize the theory (Olsen, Baisch, & Monsen, 2015). See Figure 1. Quantitative measures were extracted from the LHD's electronic health record system in the form of a de-identified dataset. This included demographic data and client health information recorded using the Omaha System Problem Classification Scheme and Problem Rating Scale for Outcomes.

Physical activity was measured with the Omaha System Problem Rating Scale for Outcomes in which Knowledge, Behavior, and Status are rated on five point Likert-type scales. See Figure 2. In this study, insufficient physical activity was defined as a

Physical activity Behavior rating less than four. In addition, Physical activity signs/symptoms were measured as the four signs and symptoms of an actual problem in the Omaha System Problem Classification Scheme: "sedentary lifestyle, inadequate/inconsistent exercise routine, inappropriate type/amount of exercise for age/physical condition, and other" (Martin, 2005d, p. 331).

	Physical Activity		
	Knowledge	Behavior	Status
5	Superior Knowledge	Consistently Appropriate Behavior	No Signs/Symptoms
4	Adequate Knowledge	Usually Appropriate Behavior	Minimal Signs/Symptoms
3	Basic Knowledge	Inconsistently Appropriate Behavior	Moderate Signs/ Symptoms
2	Minimal Knowledge	Rarely Appropriate Behavior	Severe Signs/Symptoms
1	No Knowledge	Not Appropriate Behavior	Extreme Signs/ Symptoms

Figure 2. Omaha System (Martin, 2005a) Physical Activity Knowledge, Behavior, and Status Rating Scales

The variables of *physiological health problems, psychosocial problems,* and *environmental problems* were each measured dichotomously (yes = Status rating <4 for any problems within the domain). *Health problems* were measured as a Status rating of <4 for any individual Omaha System problem. *Age* was measured in years by subtracting date of baseline physical activity assessment from date of birth. *Season* was measured dichotomously based on date of baseline physical activity assessment: summer (May 1 to October 31) and winter (November 1 to April 30). *BMI* was measured as a dichotomous value using the Omaha System Nutrition problem sign/symptom of BMI of 25 or higher.

Reliability and validity of the Omaha System were established as it was developed (Monsen et al., 2010). Martin, Norris and Leak (1999) conducted a two phase analysis of inter-rater reliability of the Problem Rating Scale for Outcomes resulting in Finn's *r* correlation scores for the Knowledge (r=0.73), Behavior (r=0.74), and Status (r=0.79) subscales and coefficient gamma inter-rater reliability scores for the Knowledge, Behavior, and Status subscales as 0.53, 0.60, and 0.87, respectively, (association of ratings significant at p<0.01). Their assessment of content validity resulted in index scores of 0.79 for the Knowledge subscale, 0.73 for Behavior, and 0.76 for Status (Martin, Norris, & Leak, 1999). All LHD registered nurses in this study attended the Omaha Systems Basics workshop.

For the qualitative phase of the study, a demographic survey and semi-structured focus group interview guide were used to elicit LHD nurses' perspectives about the quantitative results. Participants were asked how the results compared with their experiences with clients, how the results captured and explained factors that promote or limit client physical activity, and about their experiences assessing and documenting physical activity. The first author and an assistant conducted the 60 minute audio-recorded group interview in a conference room at the LHD. Participants were encouraged to contact the first author after the session if they wished to share additional information.

Analytic Strategy

Quantitative data were analyzed with SPSS (Version 22). Data were described using frequencies, means, and standard deviations. Age was positively skewed but not transformed to avoid loss of interpretive value. Two age categories (under 40 years of

age; and age 40 or over) were used for some analyses and age was controlled in other models. Hierarchical regression analyses were used to address the hypotheses. Relationships were all linear and multicollinearity was not evident. To test the first hypothesis, age and BMI were entered in step one as control variables. Physiological health problems and psychosocial problems were added in step two. Physical activity Knowledge was added in step three to test its specific contribution to the model. For the second hypotheses, two factors were tested for their unique contribution to the model. Therefore, age, BMI, physiological health problems, and psychosocial problems were entered in step one as control variables. Season was entered in step two, followed by environmental problems.

To examine the LHD nurses' perspectives of findings, focus group data were transcribed and analyzed for themes and patterns. Emerging themes were organized and managed in a spreadsheet matrix with corresponding quotes from the dataset. Self-reflective memos were documented. Findings were reviewed by the second and third authors to verify consistency of interpretations (Bloomberg and Volpe, 2008).

Results

Mean Physical activity Knowledge, Behavior, and Status ratings for the total sample were 3.41 (SD=.70), 3.27 (SD=1.09), and 3.56 (SD=1.31), respectively. As seen in Table 2, Physical activity Behavior and Status were higher for those under age 40 ($p < .001$).

An actual Physical activity problem was documented in 47.9% (n=408) of the sample. Almost half of these women (n=186) had more than one sign/symptom. Inadequate/inconsistent exercise routine was most common (n=243), followed by

sedentary lifestyle (*n*=194), other (*n*=109), and inappropriate type/amount of exercise for age/physical condition (*n*=93). Descriptive details for signs/symptoms documented as *other* were not available, but LHD nurses indicated it may be selected when clients have medically-advised physical activity restrictions. Signs/symptoms differed by age. Among women under age 40, 27.9% had at least one sign/symptom, as compared to 73.7% of women 40 and over. Chi-square analysis indicated significant differences by age group ($p<.01$) for sedentary lifestyle and inadequate/inconsistent exercise routine. See Table 3.

Insufficient physical activity, defined as a Physical activity Behavior rating of less than four, was documented for 53.2% (*n*=453) of the sample. Among women with insufficient physical activity, the most common health problems were Nutrition (*n*=209), Substance use (*n*=79), and Income (*n*=58). See Table 4 for the differences by age category. An assumption of this study was that all Omaha System problems with moderate, severe, or extreme signs/symptoms (Status rating <4) were assessed and documented. Notable when considering the population for this study, however, was the low number of women age 40 and over with an Income or Mental health problem. This highlighted the possibility that some problems existed but were not captured. Consequently, this question was also analyzed from a second perspective to determine what health problems had a high percentage of women with insufficient physical activity. Among the physiological health problems, 100% with Cognition (*n*=3) and 94% with Pregnancy (*n*=16) problems had insufficient physical activity. In the area of psychosocial health problems, insufficient physical activity was documented for 100% with Abuse (*n*=3), 83% with Caretaking/parenting (*n*=5), 81% with Mental health (*n*=17), and 72%

with Interpersonal relationship (*n*=8) problems. For environmental problems, 80% with Neighborhood/workplace safety (*n*=8) and 64% with Income (*n*=58) problems were insufficiently active. Finally, health-related behavior problems with a high percentage of women with insufficient physical activity included 89% with Substance use (*n*=79), 87.5% with Health care supervision (*n*=42), 85% with Nutrition (*n*=209), and 79% with Family planning (*n*=23).

The first hypothesis was supported by the study findings. Hierarchical regression indicated that age, BMI, physiological health problems, psychosocial problems, and Physical activity Knowledge significantly predicted Physical activity Behavior ($p<.001$). Thirty-three percent of the variance in Physical activity Behavior was accounted for by these five variables. Additionally, after controlling for age, BMI, physiological health, and psychosocial health, Physical activity Knowledge uniquely accounted for 17.2% of the variance in Physical activity Behavior. See Table 5.

The second hypothesis was partially supported by the study findings. Hierarchical regression indicated that age, BMI, physiological health problems, psychosocial problems, season, and environmental problems significantly predicted Physical activity Behavior ($p<.001$). Seventeen percent of the variance in Physical activity Behavior was accounted for by these six variables. After controlling for age, BMI, physiological health, psychosocial health, and season, environmental problems accounted for only 1% of the variance in Physical activity Behavior ($p=.002$). Season was not a significant predictor ($p=.372$). See Table 6.

Qualitative results captured LHD nurses' perspectives regarding the quantitative findings. Three major themes emerged from the data: knowledge is good, behavior is

the issue; clients may be more complex than what is captured; and assessment and coding are impacted by professional judgment, time constraints, and priorities.

Knowledge is good, behavior is the issue. LHD nurses validated the quantitative results of the first phase of the study. In reference to physical activity, one stated "It's definitely a problem." In addition, the nurses reported that women's knowledge of physical activity was usually good, but behavior was a challenge. One participant said, "Their knowledge is fairly high. They understand, so their scoring on the KBS of knowledge is always pretty good, but it's that behavior that runs lower which I think is accurate." In discussing this further, one said "They know! They just don't change that behavior."

Clients may be more complex than what is captured. When reflecting upon the quantitative results, one of the LHD nurses stated, "I think a lot of people we see have the mental health or the physical things going on that sometimes prevents them from doing those physical activities." This was then related to the quantitative results and the relatively small number of women with a documented physiological health problem, psychosocial problem, or environmental problem. The nurses agreed that clients are complex, and the clinical data documented may not capture all problems they are experiencing. One nurse said, "Who we're seeing in the community has multiple issues so what we kind of put in to satisfy the system might not accurately reflect the complexity of what you're asking the KBS scoring of for nutrition, physical activity, and substance abuse."

Other issues of complexity when assessing and documenting client information were inconsistency of behavior and the impact of treatment plans. For example, one

nurse stated, “I find clients very variable, though. I mean they may exercise five times one week but then they skip a few weeks. It’s really hard to get a good average.” Another said, “often when we’re doing assessments it’s somebody that’s either in a care setting like a nursing home or a hospital or they’ve just come home from that and they are getting physical therapy like three to five times per week….but they weren’t doing that before they went into the hospital and they may not do it again once their Medicare benefit runs out.”

Assessment and coding are impacted by professional judgment, time constraints, and priorities. LHD nurses perceived that the limited amount of time they have with clients may affect assessment and coding. For example, one nurse said “In a three hour assessment you try to gather all of this stuff, so some of what gets data entered in is your best professional judgment of scoring.” Another said, “You know, in as limited of time, you try to get what you can as quickly as you can.” These time constraints are further impacted by priorities of care and client goals. One nurse stated, “And, really, we’re focusing on breastfeeding and how are they doing and a lot of other priorities, not that nutrition isn’t a priority. Very much it is. But we just have that window of opportunity in that small amount of time.” Another added, “Different population but same thing. They really want to get help so they can remain in their home, and so physical activity and nutrition might not be the top thing that they want to focus on that day.”

Discussion

The primary aims of this study were to increase understanding of physical activity and associated factors among rural women; demonstrate the knowledge that can be

gained through consistent assessment, documentation, and analysis of physical activity data using standardized terminology; and examine LHD nurses' perspectives regarding the findings. The results provided baseline physical activity data for a sub-population of women within a rural, geographic area that had not been previously studied. Definitions of rural and physical activity were specified and details about the study setting were provided, thus strengthening the evidence available about physical activity among rural women. In addition, the study demonstrated that clinical information documented by nurses using Omaha System standardized terminology provides an effective means of measuring health-related behavior problems and analyzing them from an ecological perspective. Finally, LHD nurses' perspectives regarding the quantitative findings offer insights for practice, policy, and staff education that may improve accuracy and comprehensiveness of data collection and coding.

Consistent with previous studies, the results of this research indicated that rural women do not engage in recommended levels of physical activity (Brownson et al., 2000; Parks, Housemann, & Brownson, 2003; Atkinson, Billing, Desmond, Gold, & Tournas-Hardt, 2007; Osuji, Lovegreen, Elliott, & Brownson, 2006). Also consistent with previous research findings, multiple demographic and ecological factors were associated with physical activity in this population. For example, results of the current study indicated the presence of a negative relationship between physical activity and the demographic factors of age and BMI. This is similar to previous studies in which younger rural women engaged in more physical activity (Wilcox, Bopp, Oberrecht, Kammermann, & McElmurray, 2003; Sanderson et al., 2003) and women of normal weight were more likely to meet target levels of physical activity (Boeckner, Pullen,

Walker, & Hageman, 2006), while being overweight was a barrier (Sanderson, Littleton, & Pulley, 2002).

Negative associations between physical activity and the ecological factors of physiological health problems, psychosocial problems and environmental problems were indicated in the findings of this study. However, after controlling for other variables, only the environmental problems variable was significant when examined alone. Previous researchers have indicated a relationship between ecological factors and physical activity. This included a negative association with poor health (Bopp, Wilcox, Oberrecht, Kammermann, & McElmurray, 2004; Eyler, 2003; Dye & Wilcox, 2006), depressive symptoms (Wilcox et al., 2003), and environmental safety concerns (Atkinson et al., 2007; Osuji et al., 2006), as well as a positive association between physical activity and both social support (Bopp et al., 2004; Wilcox et al., 2003) and income (Atkinson et al., 2007; Adachi-Mejia et al., 2010). The smaller association between ecological factors and physical activity reported in the present study may be attributed to a couple of reasons. First, this study was unique in the way ecological factors were operationalized, resulting in a broader view of the relationship between theoretical concepts and health behavior. Second, as was indicated in the qualitative findings, the complexity of clients' ecological problems may not have been fully captured in the data due to the effect of time constraints and priorities on assessment and coding. Future studies are needed with attention to these issues to ensure all significant problems are documented. As an example of this, closer examination of women for whom specific physiological health problems, psychosocial problems or environmental problems were documented indicated a high percentage had insufficient physical activity. This included the physiological

health problems of Cognition and Pregnancy, the psychosocial health problems of Abuse, Caretaking/parenting, Mental health, and Interpersonal relationship, and the environmental problems of Neighborhood/workplace safety and Income. Although actual numbers of women with most of these problems were too low to be statistically significant, the information revealed indicates undocumented problems may have affected the results, supports an ecological approach to the problem, and provides direction for specific problems within each level to examine in future studies.

Previous researchers have reported positive associations between physical activity and factors such as perceived benefits (Dye & Wilcox, 2006) and decisional balance (Wilcox et al., 2003; Bopp et al., 2004). However, none specifically examined physical activity knowledge. Since nursing interventions often focus on increasing client knowledge, this is an important factor to consider. This study examined the relationship between Physical activity Knowledge and Physical activity Behavior. Quantitative analysis indicated a positive association between the two variables. However, although Physical activity Knowledge did not differ between age groups, women age 40 and over had significantly lower Physical activity Behavior and Status ratings than those under 40. In addition, LHD nurses' perceptions from the qualitative phase indicated behavior is hard to change, despite good knowledge. Research is needed to examine the effect of nursing interventions designed to increase physical activity knowledge on both the physical activity knowledge level and the physical activity behavior of rural women. Potential differences according to age should be considered.

In this study, Physical activity Behavior did not vary significantly between summer and winter seasons. This differs from previous studies which reported seasonal

barriers to physical activity, such as icy conditions in the north (Bove & Olson, 2006) and hot weather in southern states (Sanderson, Littleton, & Pulley, 2002). One of the LHD nurses in this study stated during winter months "With the elderly people, they're so afraid of falling so they just stay put." This was the first study to examine the relationship between season and a physical activity behavior measurement in rural, Midwestern women. Future research is needed to clarify this relationship.

The knowledge that may be gained when nurses consistently assess and document physical activity information using a standardized terminology was demonstrated with this study. In addition, the study was unique regarding the way in which physical activity was measured. First, the physical activity measures were assessed and recorded by nurses. Second, the Omaha System Knowledge, Behavior, and Status rating scales were used to record the data, providing information on three different aspects of physical activity in a standardized format with precise definitions for each rating score. Third, Physical activity signs/symptoms were measured using the Omaha System Problem Classification Scheme. The combination of these data provided comprehensive physical activity information in a population that had not been previously studied. From a practice standpoint, this knowledge increased nurses' understanding of the clients they serve. In addition, the findings support the need for nursing efforts and interventions to address this problem. In terms of research, new knowledge was acquired regarding physical activity and associated factors specific to a previously unstudied population. The focus group data validated the findings and identified some valuable insights for researchers and practitioners regarding the challenges of capturing client complexity, as well as the potential impact of time constraints and priorities on assessment and coding.

Several implications for policy and staff education can be drawn from these insights. First, the quantitative findings have value for both research and practice because data were consistently collected on all clients. The value was enhanced through use of the Omaha System standardized terminology, since it provided a systematic, reliable, and valid method for assessing and recording client data. In addition, the Omaha System is well-aligned with ecological theory, supporting theory-guided research and theory-based nursing care. Nurses interested in realizing these benefits for both research and practice should consider the implementation of a standardized terminology system and departmental documentation policies. Second, the qualitative findings revealed potential data coding issues driven by time constraints or other priorities. Consequently, some existing health problems may not have been captured in nurses' documentation, and nurses may occasionally rely on professional judgment when assessing and documenting client Knowledge, Behavior and Status ratings. These issues may be offset by informing nurses of the ways in which their documentation may be used for research and the results of any analyses conducted on their client data. Finally, the comprehensiveness and accuracy of data and findings may be supported by ongoing staff education on Omaha System coding.

In summary, inadequate and inconsistent physical activity is an important problem for rural women. The results of this study indicated less than half of rural, Midwestern women receiving services from LHD nurses engaged in sufficient physical activity. In addition, almost 50% had signs/symptoms of a Physical activity problem, the most common of which were sedentary lifestyle and inadequate/inconsistent exercise routine. Although Physical activity Knowledge was positively associated with Physical

activity Behavior, LHD nurses perceive difficulty changing behavior despite adequate knowledge. Therefore, future research should examine the impact of nursing interventions designed to increase physical activity knowledge for their effect on both the physical activity knowledge and behavior of rural women. The results of this study indicated ecological factors were associated with physical activity, but the statistical relationship was small for environmental problems and was not significant for psychosocial or physiological health problems. Due, in part to the effect of priorities and time constraints on physical activity assessments and Omaha System coding, the nurses may not have captured the complexity of their clients' problems. The comprehensiveness and accuracy of the results may be improved by informing nurses of the various ways in which their documentation may be utilized and ongoing education on assessment and coding. This study should be replicated after implementing these strategies. Finally, research is needed that examines physical activity interventions documented by nurses using the Omaha System for frequency and impact on Physical activity Behavior.

Limitations

The quantitative phase of the study used a correlational design, limiting causal claims from the results. A convenience sampling method was chosen for feasibility reasons and because of the uniqueness of this data set; however, it presents the potential for a systematic selection bias that threatens the internal and external validity of the study. This risk was minimized by including 100% of the accessible population meeting the inclusion criteria over a four year time period. In addition, potentially confounding variables, such as age and BMI, were statistically controlled or grouped and examined separately; demographic data for the total sample and each of the two age groups were

reported; and contextual information regarding the study setting was described. Even so, the statistical results must be interpreted conservatively and with caution. Risk of measurement error is another limitation of the study. It is possible that some Omaha System problems were not assessed and coded by the LHD nurses. Further, although the LHD nurses were trained in Omaha System documentation, the system was not tested for reliability and validity in the sample population. Methodological triangulation with a focus group interview of the nurses who collected the data was used to address this limitation. In addition, periodic consultation with a biostatistician was conducted throughout the analysis.

Qualitative data were collected in a focus group setting. This could have affected the type and amount of information revealed. Some participants may have been swayed by the responses of others or a desire for conformity. Others may not have been comfortable disclosing information in a group setting. The worksite context of the study also may have inhibited disclosure. These limitations were addressed by taking steps to strengthen confidentiality among participants and by informing participants of the intended use of the information. Another limitation is that focus group data analysis can be challenged by difficulties matching recorded comments to specific participants. This was addressed by having a research assistant present to document the flow of conversation among participants as well as participants' non-verbal behaviors. The qualitative data were analyzed by a single researcher. This limitation was addressed by consulting with experienced researchers in the area of community health, during the planning, data collection, and analysis phases of the study.

Conclusion

Physical activity is an important problem for rural women. The results of this study indicated that rural, Midwestern women receiving care from LHD nurses had more than adequate Physical activity Knowledge but inconsistent Physical activity Behavior. Additionally, ecological factors such as environmental problems influence Physical activity Behavior; however, age, BMI, and Physical activity Knowledge have a larger impact. This study also demonstrated that clinical information documented with the Omaha System can provide a means of measuring health-related behavior problems and analyzing them from an ecological perspective. Client complexity, priorities, and time constraints may affect client assessment and the clinical data that is captured through health record documentation. Nurses who document client health data with standard terminologies benefit from information regarding potential applications for research and practice, as well as ongoing education to promote reliable coding.

Table 1. Phase I Study Participant Characteristics: Total and Comparison by Age Group

	Total Sample (*N*=852)		Age 18-39 Group (*N*=480)		Age 40+ Group (*N*= 372)			
Variable	*n*	*%*	*n*	%	*n*	%	X^2(df)	*p*
BMI 25 or higher	294	34.5	102	21.3	192	51.6	85.493(1)	<.001
Race/Ethnicity Non-Hispanic Caucasian	758	89.0	425	88.5	333	89.5	.203(1)	.653
Omaha System PA Problem with S/Sx	408	47.9	134	27.9	274	73.7	175.304(1)	<.001
Season of PA Assessment							.017(1)	.896
Summer (May 1–October 31)	433	50.8	243	50.6	190	51.1		
Winter (November 1-April 30)	419	49.2	237	49.4	182	48.9		
Community (population)							---	---
Community A (13,471)	361	42.2	183	38.1	178	47.9		
Community B (2374)	80	9.4	44	9.2	36	9.7		
Community C (2259)	85	10.0	47	9.8	38	10.2		
Others (50 – 1158)	321	37.7	204	42.5	117	31.5		
Missing	5	0.6	<5	<1	<5	<1		
Omaha System Income Problem*							---	---
Missing	605	71.0	236	49.2	369	99.2		
Minimal or No S/Sx	156	18.3	155	32.2	1	<1		
Moderate to Extreme S/Sx	91	10.7	89	18.5	2	<1		

Variable	Total Sample (*N*=852)		Age 18-39 Group (*N*=480)		Age 40+ Group (*N*= 372)		X^2(df)	*p*
	n	*%*	*n*	%	*n*	%		
Medical Diagnosis/Condition**							---	---
Postpartum care	332	39.0	328	68.3	4	1.1		
Pregnancy related	93	10.9	93	19.4	0	0		
Missing	282	33.1	28	5.3	254	68.3		
Miscellaneous	84	9.9	28	5.3	56	15.1		
Unspecified reason for observation/consultation	61	7.2	3	<1	58	15.6		
LHD Program**							---	---
Caring Connections	291	34.2	288	60.0	3	<1		
Nurse Family Partnership	87	10.2	87	18.1	0	0		
Missing	200	23.5	53	11.0	149	40.1		
Miscellaneous (<15 per code)	74	8.7	27	5.6	45	12.1		
PAS/LTCC/Waivers	200	23.5	25	5.2	175	47.0		

BMI is Body Mass Index; PA is physical activity; S/Sx is signs/symptoms; LHD is local health department; PAS is Preadmission Screening; LTCC is Long-Term Care Consultation

*Based on Income Status rating; most common sign/symptom of an Income problem was low/no income

**Based on first International Classification of Disease (ICD) code or Local Health Department program recorded

Table 2. Difference in Physical Activity Measures by Age Group

	Under Age 40 (*N*=480)		Age 40+ (*N*=372)				
Measure	*M*	*SD*	*M*	*SD*	*df*	*t*	*p*
PA Knowledge	3.44	.70	3.38	.71	850	1.31	.192
PA Behavior	3.59	.95	2.85	1.11	850	10.18	<.001
PA Status	4.08	1.17	2.89	1.17	850	14.72	<.001

PA is Physical Activity

Table 3. Comparison of Type of Signs and Symptoms of an Actual Physical Activity Problem by Age

	Under Age 40 (N=134)		Age 40+ (N= 274)			
Type of Signs and Symptoms*	*n*	%	*n*	%	$X^2(1)$	*p**
Inadequate/inconsistent exercise routine	92	68.7	151	55.1	6.857	.009
Sedentary lifestyle	47	35.1	147	53.6	12.450	<.001
Inappropriate type/amount of exercise for age/physical condition	37	27.6	56	20.4	2.632	.105
Other	25	17.9	84	30.7	6.619	.010

**p*<.01

Table 4. Most Common Omaha System Problems among Participants with Insufficient Levels of Physical Activity

	Under Age 40 (N=179)	Age 40+ (N= 274)		
Health Problem*	*n*	*n*	$X^2(1)$	*p***
Nutrition	68	141	7.91	.005
Substance use	31	48	.003	.956
Health care supervision	14	28	.740	.390
Income	57	1	--	--
Family planning	23	0	--	--
Mental health	17	0	--	--
Pregnancy	16	0	--	--

*Health problem defined as an Omaha System Problem Rating Scale for Outcomes Status rating less than four
**$p<.01$

Table 5. Summary of Hierarchical Regression Analysis Predicting Physical Activity Behavior with Ecological Factors and Physical Activity Knowledge

Step and Predictor Variable	R^2	ΔR^2	β	*t*	*p*
Step 1					
Age			-.199*	-6.761	<.001
BMI	.145	.145*	-.216*	-7.325	<.001
Step 2					
Physiological Health Problems			-.020	-.651	.515
Psychosocial Problems	.159	.014*	-.045	-1.439	.151
Step 3					
Physical Activity Knowledge	.331	.172*	.426*	14.745	<.001
F(5,846) = 83.76, p <.001					

*p<.01

Table 6. Summary of Hierarchical Regression Analysis Predicting Physical Activity Behavior with Ecological Factors

Step and Predictor Variable	R^2	ΔR^2	β	*t*	*p*
Step 1					
Age			-.227*	-6.673	<.001
BMI			-.287*	-8.856	<.001
Physiological Health Problems			-.027	-.781	.435
Psychosocial Problems	.159	.159*	-.067	-1.871	.062
Step 2					
Season	.160	.001	.028	.894	.372
Step 3					
Environmental Problems	.169	.009*	-.110*	-3.087	.002
F(6,845) = 28.73, p <.001					

*p<.01

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Chapter Summary

The results to the research questions and hypotheses of both phases of this retrospective, mixed methods study were presented in this chapter. All question-specific findings were reported in one manuscript (Section 4.1) prepared for publication.

CHAPTER 5.0 Synthesis of Study

The promotion of health is an essential component of nursing research and practice (Rice & Wicks, 2007). Health promotion efforts focused on physical activity may improve health and reduce risk for chronic diseases such as stroke, cancer, and heart disease (United States Department of Health and Human Services [HHS], 2014). Yet, most adults do not meet physical activity guidelines (HHS, 2014), and rural women in the Midwest are more likely to be inactive during leisure time than those who live in more urban settings (Meit et al., 2014). Because rural populations have poorer overall health and higher rates of chronic disease (Bennett, Lopes, Spencer, & van Hecke, 2013), nursing interventions to increase physical activity among rural women are urgently needed. However, the implementation of efficient and effective interventions requires that nurses first understand the unique factors associated with physical activity in the populations they serve. Therefore, the focus of this dissertation was to increase understanding of physical activity and the factors associated with this health behavior among rural women residing in a rural, geographic region that had not previously been studied.

There is an abundance of literature on physical activity, but few studies have specifically examined rural women. This is significant given that rural areas, which are home to 17% of the population (Meit et al., 2014), have unique social, cultural, and economic concerns (Coward et al., 2006) that may impact participation in physical activity. Because "societal problems, like physical inactivity, require comprehensive multi-factorial solutions" (Haggis, Sims-Gould, Winters, Gutteridge, & McKay, 2013, p. 3), attention to these unique ecological factors is critical to increasing understanding of

the problem and implementing effective interventions. Public health nurses' clinical documentation offers a potential and relatively unexplored source of information about these factors, particularly when documented using electronic health records and standardized terminology. The purpose of this study was to better understand physical activity and associated factors among rural women while exploring the knowledge that may be gained through consistent assessment, documentation, and analysis of physical activity data using standardized nursing terminology. In this final chapter, a summary of the three manuscripts written for this dissertation will be provided along with a discussion of implications for nursing practice, education, policy, and research.

Summary of Manuscripts

In Manuscript One, *An Integrative Review of Literature on the Determinants of Physical Activity among Rural Women*, the state of the science on factors associated with physical activity in this population was reported. A lack of physical activity research specific to rural women, as well as diverse definitions of *rural* and *physical activity* in existing articles, was identified. Three categories of determinants reflecting the barriers and motivators that influence physical activity behaviors in this population were revealed: personal factors, socio-economic factors, and physical environment factors. The results support an ecological approach that addresses all three categories of determinants when designing nursing interventions to promote physical activity among rural women. These findings were disseminated to nurses when this article was published in *Public Health Nursing* in July 2013.

Nursing practice and research should be guided by theory. However, despite increasing use of standardized terminologies, the potential for using standardized

terminologies to operationalize theoretical concepts has received little attention in the literature. In Manuscript Two, *The Omaha System: An Ecological Approach to Physical Activity Nursing Care and Research*, the ecological model for health promotion (McLeroy, Steckler, Bibeau, & Glanz, 1988) was operationalized with the Omaha System (Martin, 2005) standardized terminology. This revealed the ecological nature of the Omaha System and provided support for measuring and analyzing health-related behavior problems with Omaha System data. In addition, a process for conceptually mapping theories and standardized terminologies was suggested. This approach could be replicated with other health-related problems to guide theoretically-based nursing care and research.

One of the problems identified in Chapter 1.0 was the lack of understanding of physical activity and associated factors among rural women. A second problem was the need for routine collection of comprehensive and quantifiable physical activity assessment data in nursing practice. With the expanding use of electronic health records and standardized terminologies, this information could be efficiently used to increase understanding of client health problems and behaviors and to generate evidence that informs and improves nursing care. However, the knowledge to be gained and usefulness of nurses' clinical documentation in regard to physical activity had yet to be explored. The purpose of this dissertation was to address these gaps using a retrospective, mixed methods design. In Manuscript Three, *Using Omaha System Documentation to Understand Physical Activity among Rural Women*, the results of the study were reported. Additionally, they will be disseminated as part of the poster presentation at the

2015 Omaha System International Conference in April. A summary of the answers to all study research questions and hypotheses will be provided in the next section.

Study Conclusions

The design of this study was retrospective, mixed methods. It included five quantitative research questions and two hypotheses. In addition, three qualitative research questions were addressed.

Quantitative Questions and Hypotheses

The first quantitative question was *What are the physical activity behaviors, knowledge, and status among rural, Midwestern women receiving care from local health department nurses?* Findings indicated rural women had more than adequate Knowledge (M=3.41; SD=.70), inconsistent Behavior (M=3.27; SD=1.09), and minimal to moderate signs/symptoms for Status (M=3.56; SD=1.31). When comparing women under 40 years of age with those 40 and older, there were significant differences in Physical activity Behavior and Status ratings ($p < .001$). Those under 40 years of age had higher average Physical activity Behavior and Status ratings than those who were 40 and older.

The second quantitative research question was *Among women documented as having an actual physical activity problem, what were the most common signs and symptoms?* Almost half of the women (47.9%; *n*=408) had signs/symptoms of a Physical activity problem documented, many having more than one (*n*=186). *Inadequate/inconsistent exercise routine* was most common (*n*=243), followed by *sedentary lifestyle* (*n*=194), *other* (*n*=109), and *inappropriate type/amount of exercise for age/physical* condition (*n*=93). Women age 40 and older were more likely to have at least one sign/symptom (73.7%) than those under 40 (27.9%). Chi-square analysis

indicated significant differences by age group (p<.01) for two signs/symptoms: *sedentary lifestyle* and *inadequate/inconsistent exercise routine*.

The third quantitative research question was, *Among women with insufficient physical activity levels, what are the most common health problems?* Insufficient physical activity was defined as a Physical activity Behavior rating of less than four. Accordingly, 53.2% (n=453) of the sample had insufficient physical activity levels. Among them, the most common health problems were Nutrition (n=209), Substance Use (n=79), and Income (n=58). An assumption of this study was that all Omaha System problems with moderate, severe, or extreme signs/symptoms (Status rating <4) were assessed and documented. However, a low number of women age 40 and over had physiological, Mental health, or Income problems documented. This highlighted the possibility that some problems existed but were not captured. Consequently, this question was also analyzed from a second perspective to determine what health problems had a high percentage of women with insufficient physical activity. Although the total number of women with a Status rating <4 was low for most health problems (range of n=3 to n=58), 64% to 100% of women with the following problems were insufficiently activity: the physiological health problems of Cognition and Pregnancy; the psychosocial problems of Abuse, Caretaking/parenting, Mental health, and Interpersonal relationship; and the environmental problems of Neighborhood/workplace safety.

The fourth quantitative research question was, *Controlling for age, body mass index (BMI), physiological health problems, and psychosocial problems, how well does physical activity knowledge account for physical activity behavior?* Hierarchical regression indicated these five variables significantly predicted Physical activity

Behavior (p<.001), accounting for 33% of the variance. After controlling for age, BMI, physiological health, and psychosocial health, Physical activity Knowledge accounted for 17.2% of the variance in Physical activity Behavior.

The first study hypothesis related to the fourth research question: *Controlling for age, BMI, physiological health problems, and psychosocial problems, higher physical activity knowledge will predict higher levels of physical activity.* This was supported by the study findings. The standardized beta coefficient for physical activity Knowledge was .426, indicating that physical activity Behavior increased by .426 standard deviations for each standard deviation increase in Physical activity Knowledge when the other variables in the model were held constant. In summary, the results indicated that when age, BMI, physiological health, and psychosocial health were controlled, as Physical activity Knowledge increased, Physical activity Behavior also increased.

The final quantitative research question was, *Controlling for age, BMI, physiological health problems, and psychosocial problems, how well do season and environmental problems account for physical activity behavior?* A second hierarchical regression model indicated that these six variables significantly predicted Physical activity Behavior (p<.001), accounting for 16.9% of the variance. After controlling for age, BMI, physiological health, psychosocial health, and season, environmental problems – which included any of the Omaha System environmental domain problems, such as Neighborhood/workplace safety and Income - accounted for only 1% of the variance in Physical activity Behavior (p=.002). Season, measured dichotomously as winter or summer, was not a significant predictor (p=.372).

The second study hypothesis related to the previous research question: *Controlling for age and BMI, physiological health problems, and psychosocial problems, the ecological factors of summer season and absence of environmental problems will predict higher levels of physical activity.* The second hypothesis was partially supported by the study findings. After controlling for the other variables in the model, summer season did not significantly predict higher Physical activity Behavior (p=.350). In contrast, the absence of environmental problems did significantly predict higher Physical activity Behavior (p=.002); however, it accounted for only 1% of the variance. The standardized beta coefficient for environmental problems was -.110, meaning that Physical activity Behavior decreased by .110 standard deviation if an environmental problem was present when the other variables in the model were held constant. In summary, the results indicated summer season did not affect Physical activity Behavior. However, when age, BMI, physiological health problems, psychosocial problems, and season were controlled, the presence of environmental problems resulted in a small but statistically significant decrease in Physical activity Behavior.

Qualitative Questions

The first qualitative research question was, *What are local health department (LHD) nurses' perspectives regarding how well the quantitative findings capture and explain the factors that either promote or limit physical activity among adult, female clients?* The findings indicated that the quantitative results aligned with the LHD nurses' thoughts and experiences regarding the physical activity of female clients; however, there was a shared perception that they may not capture the complexity of the clients. The first of these perspectives was labeled *Knowledge is Good, Behavior is the Issue*. This reflects

the nurses' agreement that physical activity is an important problem in this population. Consistent with the quantitative findings, the nurses perceived that clients are quite knowledgeable about physical activity; however, behavior is difficult to change. For example, one stated, "Knowledge is always pretty good, but it's that behavior that runs lower." Another said, "They know! They just don't change that behavior." The second perspective was labeled *Clients May Be More Complex Than What is Captured*. This theme encompassed two key points. First, nurses thought a barrier to physical activity for many clients was mental and/or physical health problems. However, a physiological health problem, psychosocial problem, or environmental problem was documented in a relatively small number of women. Consequently, the nurses expressed the view that, once the system requirements are satisfied, data entry may cease. Thus, the clinical data documented may not capture all problems experienced by clients. The second key point represented in this theme was client complexity as related to inconsistency of behavior and the impact of treatment plans. Nurses stated that a challenge when assessing and documenting physical activity is clients' variability in their exercise habits. For example, one nurse stated, "I find clients very variable, though. I mean they may exercise five times one week but then they skip a few weeks. It's really hard to get a good average." In addition, treatment factors such as participation in physical therapy at the time of admission to nursing services may result in a higher baseline assessment, though clients may not continue the same level of physical activity once services have ended.

The second qualitative research question was, *What are local health department nurses' perspectives regarding the process of assessing and documenting physical activity?* The findings indicated that, in addition to client complexity as described above,

several issues may affect this process. This theme, inclusive of the issues identified, was labeled *Assessment and Coding are Impacted by Professional Judgment, Time Constraints, and Priorities.* LHD nurses reporting having limited time to gather extensive assessment data. The need to gather a lot of information as quickly as possible occasionally resulted in reliance on professional judgment. Time constraints were further impacted by priorities of care and client goals. Given the small window of time in which nurses have to focus on the most significant health problems, topics such as physical activity and nutrition may be lower in priority than the reason for the visit and may not be thoroughly addressed.

The third qualitative research question was, *What are local health department nurses' perspectives regarding the utility of the quantitative findings for their nursing care of individual clients and/or the community?* Nurses' views regarding this question were best captured in the theme labeled *Knowledge is Good, Behavior is the Issue.* This reflects the nurses' opinions that physical activity is an important problem for this population and changing behavior is an ongoing challenge that needs to be addressed. Also, indirectly informing this question were the themes labeled *Clients May Be More Complex Than What is Captured* and *Assessment and Coding are Impacted by Professional Judgment, Time Constraints, and Priorities.* Practice changes that will increase the utility of these findings in the future may be inferred. First, potential data coding issues driven by time constraints or other priorities may be offset by informing nurses of the ways in which documentation may be used for research as well as the results of data analyses. For example, one nurse stated, "I would take this (presentation of the quantitative study results) and feel a little more cognizant of the accuracy of what

I'm giving you." Second, the comprehensiveness and accuracy of data and findings may be supported by ongoing staff education on Omaha System coding. One nurse said, "In a three hour assessment you try to gather all of this stuff, so some of what gets data entered in is your best professional judgment of scoring." Another said that in practice one may not grab the Omaha System book, so there may be a benefit from "education on KBSing and scoring."

Summary of Results

The results of the quantitative phase of the study indicated physical activity among rural, Midwestern women receiving care from LHD nurses was inadequate and inconsistent. Almost half had signs/symptoms of a Physical activity problem, the most common of which were sedentary lifestyle and inadequate/inconsistent exercise routine. Results differed significantly by age group. Ecological factors influenced Physical activity Behavior; however, only the presence of environmental problems was significant once other variables were controlled. In addition, age, BMI, and Physical activity Knowledge had a larger impact. Notably, season was not significantly associated with Physical activity Behavior, despite harsh winter conditions in the study setting.

Three themes emerged in the qualitative phase of the study. LHD nurses' perspectives related to the quantitative results included: (a) *knowledge is good, behavior is the issue*; (b) *clients may be more complex than what is captured;* and (c) *assessment and coding are impacted by professional judgment, time constraints, and priorities.* Consistent with the quantitative findings, nurses perceived that Physical activity Knowledge was adequate, but Behavior was lower and difficult to change. Yet, in contrast to the quantitative findings, nurses thought physical and mental health problems

had a more significant impact on Physical activity Behavior than was revealed. They perceived that factors such as time constraints and client priorities may affect assessment and documentation, potentially limiting the ability to thoroughly capture all client problems and necessitating use of professional judgment. In addition, variability in client physical activity levels can present assessment and documentation challenges. Finally, nurses perceived that physical activity is an important and ongoing problem for this population that needs to be addressed.

Implications Resulting from this Body of Work

The purposes of this study were to (a) increase understanding of physical activity among rural women; (b) increase understanding of the factors associated with physical activity among rural women; (c) examine the relationship of ecological factors on physical activity behavior; (d) demonstrate the knowledge that can be gained through consistent assessment, documentation, and analysis of physical activity data using standardized nursing terminology; and (e) examine local health department nurses' perspectives regarding the findings. Implications resulting from this body of work have relevance to nursing practice, education, policy and research. Each will be discussed in the next section.

Nursing Practice

The findings of this body of work expand what is known about physical activity among rural women. The integrative review of literature (Manuscript One) provided information on the state of the science of factors associated with physical activity in this population. This information may be used by nurses when designing physical activity interventions and programming. Three categories of determinants were revealed in the

findings: personal factors, socio-economic factors, and physical environment factors. Therefore, nurses who are trying to increase physical activity with their rural, female clients must acknowledge the need for an ecological approach that targets each category or domain.

Several factors associated with physical activity were either unique or have additional significance for rural women. For example, rates of obesity and depression are higher among rural women (Meit et al., 2014; Hauenstein & Peddada, 2007). From a socio-economic perspective, rural women reported fewer role models for physical activity and societal acceptance of being overweight (Peterson, Schmer, & Ward-Smith, 2013). They also reported more caregiver demands and discouragement for physical activity (Wilcox, Castro, King, Housemann, & Brownson, 2000). Unique environmental factors included lack of access to facilities (Wilcox et al., 2000) and safety concerns such as dogs(Wilcox, Oberrecht, Bopp, Kammermann, & McElmurray, 2005) and wild animals (Atkinson, Billing, Desmond, Gold, & Tournas-Hardt, 2007; Gangeness, 2010). Attention to these issues in nursing practice may increase intervention effectiveness and improve physical activity outcomes.

The second manuscript built upon the knowledge gained from the review of literature. A model that aligned ecological theory with the Omaha System was developed. This framework could be used in practice to guide the delivery of theory-based nursing care. For example, when selecting interventions to increase physical activity, nurses could refer to the framework to ensure they are assessing and addressing issues at each level of the model.

The findings reported in the third manuscript expanded what is known about physical activity in a specific population that had not been previously studied: rural, Midwestern women receiving care from LHD nurses. More than half of the sample population had insufficient physical activity, defined as a Physical activity Behavior rating less than four. Within the coded data, signs and symptoms of a Physical activity problem were most commonly *sedentary lifestyle* or *inadequate/inconsistent exercise routine*. Several demographic and ecological factors were associated with physical activity behavior in this population of rural women. Most significant were age, BMI, Physical activity Knowledge, and environmental problems. This knowledge may increase rural nurses' understanding of the clients they serve and guide the development of both individual and population level interventions.

Nursing Education

The findings from this body of work illuminate some personal, socio-economic, and environmental differences between rural and urban female populations in regard to Physical activity Behavior. Consequently, nursing education should address both urban and rural concerns and emphasize population-level differences in health risks, determinants, and outcomes. Examples include cultural norms, health care and fiscal resources, the built environment, mental health, and chronic disease prevalence.

These findings also have educational implications for practicing nurses. The results of the focus group with LHD nurses indicated coding of assessment data may be impacted by time constraints and client care priorities, necessitating the use of professional judgment in prioritizing what is documented. Staff using a standardized terminology, such as the Omaha System, may benefit from ongoing coding education to

support the comprehensiveness and accuracy of documented data. In addition, they may benefit from education regarding potential uses of the aggregated data as well as periodic reports of findings.

Policy

The knowledge that may be gained when nurses consistently assess and document physical activity on all clients using a standardized terminology was demonstrated in this study. Accomplishing this, however, necessitates the initiation of intra-departmental policies that require these practices. Because physical activity is an important public health challenge impacting the physical and mental health of rural women, nurses are encouraged to make physical activity assessment a part of each client interaction (Exercise is Medicine ® Australia, 2012; Hainsworth, 2006). Consequently, LHD directors may want to institute policies that support expanded use of data systems to learn more about physical activity levels, barriers, and motivators in the populations they serve with goals of increasing intervention effectiveness and measuring changes in this health behavior.

As previously noted, findings from this body of work indicated that a variety of personal, socio-economic, and environmental characteristics impact physical activity levels in rural women. Implications for policy change are particularly relevant for barriers related to environmental characteristics, including lack of access to facilities for physical activity and safety concerns. In order to address these concerns, legislators should consider regulatory policy at the county level to add a five foot paved and marked shoulder or sidewalk on at least one side of all roads during renovation of existing streets and new developments. In addition, state-level policy for shared use of existing school

sport and recreational facilities outside of school hours for community residents should be considered to address these barriers.

Research

Multiple implications for research may be drawn from this body of work. First, Manuscript One highlighted the need for clear definitions of *rural* and *physical activity* when conducting research in this area. Inconsistent or unspecified definitions of both concepts weakened the strength and generalizability of the knowledge gleaned from previous studies. Future researchers should clearly define both terms when designing studies and reporting results.

Second, in Manuscript Two, ecological theory was operationalized with the Omaha System for use in research, providing support for measuring and analyzing physical activity from an ecological perspective with Omaha System data. This could be used in future studies of physical activity. In addition, the three-phase process documented in the manuscript for conceptually mapping a theory to a standardized terminology could be replicated with other Omaha System health-related behavior problems and with other standard terminologies, e.g. International Classification of Disease and Current Procedural Codes.

Third, the results of the mixed-methods study, as described in Manuscript Three, contributed to physical activity research by providing knowledge specific to a previously unstudied population. The study was unique in that client health information documented by nurses using the Omaha System was used to measure the quantitative study variables. This included use of the Omaha System Knowledge, Behavior, and Status rating scales, along with Physical activity signs/symptoms per the Problem Classification Scheme.

Thus, precise, pre-existing definitions were used for each variable and rating, and comprehensive physical activity information was recorded and analyzed. The findings indicated that less than half of the sample population engaged in sufficient physical activity, supporting the need for continued research and efforts in this area. In addition, a small but significant relationship between ecological factors and Physical activity Behavior was revealed. These results may have been affected by issues revealed in the focus group with LHD nurses, such as the impact of client care priorities and time constraints on assessments and coding. Consequently, a fourth outcome of this work was support for using client clinical information documented with the Omaha System to measure and analyze health-related behavior problems, along with guidance for increasing comprehensiveness and accuracy of assessments and coding. Specifically, nurses may benefit from information regarding how the data they collect and document may be used for research. This study has implication for electronic capture of data and supports the need for ongoing education about coding schemes, such as assessment of Knowledge, Behavior, and Status ratings in the Omaha System. In summary, use of client clinical data documented using a standardized terminology such as the Omaha System holds promise as a method for physical activity research, ecological theory can be used to guide research in this area, and future studies are needed with attention to potential assessment and coding challenges.

Future research. Several areas in need of future research were identified through this work. For example, future studies may examine the effect of nursing interventions designed to increase Physical activity Knowledge on both the Physical activity Knowledge and Physical activity Behavior of rural women. The relationship

between ecological factors and Physical activity Behavior revealed in this study was small and may have been affected by assessment and coding challenges, such as client care priorities and time constraints. This study could be replicated in the same county with the application of an intervention that promotes comprehensive coding. Research that examines the association of Physical activity Behavior with specific problems within each Omaha System domain also is needed. In addition, studies are needed that examine physical activity interventions documented by nurses using the Omaha System for frequency and impact on Physical activity Behavior. Finally, this study operationalized ecological theory with the Omaha System to increase understanding of physical activity. Future research should replicate this with other health-related behaviors.

Chapter Summary

The purpose of this body of work was to increase understanding of physical activity among rural women. One outcome of this effort was an integrative review of literature that summarized current literature on the determinants of physical activity in this population and identified gaps in research. A second outcome was a conceptual mapping of the Omaha System to the ecological theory of health promotion (McLeroy et al., 1988). This revealed the ecological nature of the Omaha System and provided support for measuring and analyzing health-related behavior problems from an ecological perspective with Omaha System data. A process for conceptually mapping a theory to a standardized terminology was described for potential replication. A third outcome of the study was expanded knowledge about physical activity and associated factors in a population that had not been studied previously: rural, Midwestern women receiving care from LHD nurses. A fourth outcome of this body of work was support and guidance

for using client clinical information documented with the Omaha System to measure and analyze health-related behavior problems. Finally, implications for future research, and recommendations for education, practice, and policy were identified.

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Appendix A

Institutional Review Board (IRB)

Phase I and II Approval and Amendment

UNIVERSITY of WISCONSIN
UWMILWAUKEE
Department of University Safety & Assurances

Jessica Rice
IRB Administrator
Institutional Review Board
Engelmann 270
P. O. Box 413
Milwaukee, WI 53201-0413
(414) 229-3182 *phone*
(414) 229-6729 *fax*

http://www.irb.uwm.edu
ricej@uwm.edu

New Study - Notice of IRB Exempt Status

Date: August 5, 2014

To: Mary Jo Baisch, PhD
Dept: College of Nursing

Cc: Jeanette Olsen

IRB#: 15.017
Title: Using Omaha System Documentation to Understand Physical Activity among Rural Women

After review of your research protocol by the University of Wisconsin – Milwaukee Institutional Review Board, your protocol has been granted Exempt Status under Categories 2 & 4 as governed by 45 CFR 46.101(b).

On August 5, 2014, this protocol was approved as exempt for a period of three years. IRB approval will expire on August 4, 2017. If you plan to continue any research related activities (e.g., enrollment of subjects, study interventions, data analysis, etc.) past the expiration date, please respond to the IRB's status request that will be sent by email approximately two weeks before the expiration date. If the study is closed or completed before the IRB expiration date, you may notify the IRB by sending an email to irbinfo@uwm.edu with the study number and the status so we can keep our study records accurate.

Any proposed changes to the protocol must be reviewed by the IRB before implementation, unless the change is specifically necessary to eliminate apparent immediate hazards to the subjects. The principal investigator is responsible for adhering to the policies and guidelines set forth by the UWM IRB, maintaining proper documentation of study records and promptly reporting to the IRB any adverse events which require reporting. The principal investigator is also responsible for ensuring that all study staff receive appropriate training in the ethical guidelines of conducting human subjects research.

As Principal Investigator, it is your responsibility to adhere to UWM and UW System Policies, and any applicable state and federal laws governing activities which are independent of IRB review/approval (e.g., FERPA, Radiation Safety, UWM Data Security, UW System policy on Prizes, Awards and Gifts, state gambling laws, etc.). When conducting research at institutions outside of UWM, be sure to obtain permission and/or approval as required by their policies.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project

Respectfully,

Jessica P. Rice
IRB Administrator

UNIVERSITY of WISCONSIN
UWMILWAUKEE

Department of University Safety & Assurances

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Modification/Amendment Notice of IRB Exempt Status

Date: January 15, 2015

To: Mary Jo Baisch, PhD
Dept: College of Nursing

Cc: Jeanette Olsen

IRB#: 15.017
Title: Using Omaha System Documentation to Understand Physical Activity among Rural Women

After review of your proposed changes to the research protocol by the University of Wisconsin – Milwaukee Institutional Review Board, your protocol still meets the criteria for Exempt Status under Categories 2 & 4 as governed by 45 CFR 46.101 subpart b, and your protocol has received modification/amendment approval for:

- Increase total number of participants to 870 which includes increase the number of focus group participants to 18
- Revisions to consent form to reflect this change

Unless specifically where the change is necessary to eliminate apparent immediate hazards to the subjects, any proposed changes to the protocol must be reviewed by the Institutional Review Board before implementation.

Please note that it is the principal investigator's responsibility to adhere to the policies and guidelines set forth by the University of Wisconsin – Milwaukee and its Institutional Review Board. It is the principal investigator's responsibility to maintain proper documentation of its records and promptly report to the Institutional Review Board any adverse events which require reporting.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project.

Respectfully,

Jessica Rice
IRB Administrator

Appendix B

Phase II Email Invitation to Participate in the Study

Dear (Study Setting County) Public Health Nurse:

You are invited to participate in a focus group discussion about physical activity among rural women and your experience assessing and documenting this information on your clients using the Omaha System.

This focus group is part of a dissertation study being done through the University of Wisconsin-Milwaukee aimed at learning more about physical activity and the various factors that either increase or decrease physical activity in rural women. A second aim of the study is to examine what can by learned by regularly assessing and documenting physical activity in all patients using a standard nursing language such as the Omaha System.

The focus group session will provide the opportunity for you and your colleagues to hear and discuss the results of the analysis of physical activity among the female, (Study Setting County) public health clients as recorded in their electronic health records. Your input and insights will be very valuable in helping interpret the results and increasing understanding of the assessment and documentation of physical activity using the Omaha System. Please know that anything you say in the focus group session will be kept confidential.

The focus group will be held on Tuesday, January 20, 2015, at 11:00 AM in the Dead Lake Room. Refreshments will be provided. All (Study Setting County) public health nurses are invited to attend.

I hope you will be able to attend this important discussion. Should you have any questions, please contact me at 1-715-419-0774 or olsen3@uwm.edu.

Kind regards,
Jeanette Olsen PhD candidate, MSN, RN
University of Wisconsin - Milwaukee

Appendix C

Phase II Participant Consent Form

IRB Protocol Number: 15.017

IRB Approval date: August 5, 2014

University of Wisconsin – Milwaukee
Consent to Participate in Research

Study Title: Using Omaha System Documentation to Understand Physical Activity among Rural Women

Person Responsible for Research: Jeanette Olsen, MSN, RN, at 1-715-419-0774, College of Nursing at the University of Wisconsin-Milwaukee.

Study Description: The purpose of this focus group is to provide a setting for discussion of the results of Jeanette Olsen's analysis of physical activity and the factors associated with this health behavior among rural women derived from clinical data documented using the Omaha System. Approximately 18 subjects will participate in this part of the study. If you agree to participate, you will be asked to attend one focus group interview to discuss your professional practice and opinions in regard to the results and documentation of physical activity using the Omaha System. This will take approximately 90 minutes of your time.

Risks / Benefits: Risks that you may experience from participating are considered minimal. There are no costs for participating. Benefits of participating include increased knowledge of physical activity and factors associated with it among your female clients.

Confidentiality: No identifying information will be collected as part of this study, and all study results will be reported without identifying information so that no one viewing the results will ever be able to match you with your responses. Your responses will be treated as confidential and all reasonable efforts will be made so that no individual participant will be identified with his/her answers. Only your first name will be used during the focus group session, and it will not be placed on any notes used for recording information from the focus groups. Data from this study will be saved in a secure, password protected database. The investigators listed above will be the only individuals with access to the data and signed consent forms, and they will listen to the audio recording of the session in complete privacy to protect confidentiality. However, the Institutional Review Board at UW-Milwaukee or appropriate federal agencies like the Office for Human Research Protections may review this study's records.

Voluntary Participation: Your participation in this study is voluntary. You may choose not to take part in this study, or if you decide to take part, you can change your mind later and withdraw from the study. You are free to not answer any questions or withdraw at any time. Your decision will not change any present or future relationships with the University of Wisconsin Milwaukee.

Who do I contact for questions about the study: For more information about the study or study procedures, contact Jeanette Olsen, MSN, RN, at 1-715-419-0774, or contact Dr. Mary Jo Baisch, PhD, RN at 414-229-5545. Both are at the College of Nursing at the University of Wisconsin-Milwaukee.

Who do I contact for questions about my rights or complaints towards my treatment as a research subject? Contact the UWM IRB at 414-229-3173 or irbinfo@uwm.edu.

Research Subject's Consent to Participate in Research:
To voluntarily agree to take part in this study, you must be 18 years of age or older. By signing the consent form, you are giving your consent to voluntarily participate in this research project.

_____
Printed Name of Subject/Legally Authorized Representative

_____ _____
Signature of Subject/Legally Authorized Representative Date

Appendix D

Phase II Participant Demographic Survey

Case Number _____

Focus Group Demographic Survey

Please answer the following questions.

1. What is your gender?
   - Male
   - Female

2. What is your age?
   - 20 – 35
   - 36-50
   - 51 or older

3. How many years' experience do you have as a registered nurse?
   - Less than 5
   - 5 – 10
   - 11 – 20
   - More than 20

4. What is your highest degree?
   - Bachelors
   - Masters
   - Doctorate

5. How many years' experience do you have in public health nursing?
   - Less than 2
   - 2 - 5
   - 6 – 10
   - 11-20
   - More than 20

6. How many years' experience do you have using the Omaha System?
   - Less than 2
   - 2 - 5
   - 6 – 10
   - 11-20
   - More than 20

Appendix E

Phase II Focus Group Interview Guide

Focus Group Interview Guide

1. What is your initial response to these findings?
2. How would you compare these findings with your experiences with clients?
3. When you think about these findings, what thoughts or concerns do you have?
4. The information presented indicated a variety of factors influence the physical activity of clients (insert examples from quantitative results). What are your thoughts regarding how well those results capture and explain the factors that either promote or limit physical activity in your clients (total population and each group)? What, if anything is missing (e.g., barriers, facilitators)?
5. How do you anticipate using this information in your nursing care of individual clients and/or the community?
6. Now I would like to shift a little bit and talk about the process of collecting and documenting physical activity information. Please describe the way you assess physical activity when you provide care for clients.
7. Please describe your experience of assessing and documenting physical activity. How did it impact your work flow? How did it impact the way you thought about your

   care? How did it influence the way you thought about your clients?
8. Is there anything else you would like to share about your documentation

   or use of the Omaha System to document physical activity for your clients?
9. Have I missed anything or is there any other issue about the data collection and results that we haven't discussed?
10. As we reach the end of our time together, please share any final thoughts you may have.

CURRICULUM VITAE

Jeanette Olsen

Place of birth: Cumberland, WI

Education

M.S.N., Viterbo University, La Crosse, WI, December 2009
Major: Nursing

B.S.N., Viterbo University, La Crosse, WI, May 1998
Major: Nursing

A.D.N., Wisconsin Indianhead Technical College, Rice Lake, WI, May 1995
Major: Nursing

A.D., University of Wisconsin Center – Barron County, Rice Lake, WI, May 1992
Major: Arts and Sciences

Dissertation Title: Using Omaha System Documentation to Understand Physical Activity among Rural Women

Awards

Omaha System Partnership PhD Student Informatics Methodologist Award 2015
Wisconsin Indianhead Technical College – Rice Lake Distinguished Alumni 2012
Wisconsin Women's Health Foundation Champion in Women's Health Award 2010
3M Environmental Health and Safety Chairman's Leadership Award 2004

Teaching Experience

Wisconsin Indianhead Technical College, Rice Lake, WI
Instructor – Associate Degree Nursing Program 2009-Present
- Management and Professional Concepts
- Mental Health and Community Concepts
- Advanced Clinical Practice
- Transition to Clinical Practice
- Pharmacology
- Clinical Care across the Lifespan
- Introduction to Clinical Care Management
- Health Alterations
- Health Promotion

Adjunct Instructor – Intermediate Clinical Practice 2008-2009

Related Experience

Rice Lake Area Free Clinic, Rice Lake, WI
Volunteer triage nurse 2011-Present

Cumberland Memorial Hospital, Cumberland, WI
Staff nurse – Medical Surgical and Obstetrics 1995-2011
Occupational Health Supervisor 2002-2004
Contracted to 3M Company to provide occupational health services.
OB Inpatient Supervisor 2000-2002
Home Care Nurse 1999-2000

Healthier Cumberland, Cumberland, WI
Project Director 2006 – 2009

3M Company, Cumberland, WI
Environmental Health and Safety Team Leader 2005 – 2006
Occupational Health Nurse 2004 – 2005

Lakeview Medical Center, Rice Lake, WI
Staff Nurse – Obstetrics 1997-1999

Publications and Presentations

"Using Omaha System Documentation to Understand Physical Activity Among Rural Women."
Co-authored poster presentation at the Omaha System International Conference, Eagan, MN. 2015

"An integrative review of information systems and terminologies used in local health departments."
Co-authored publication in the Journal of the American Medical Informatics Association, February 2014. 2014

"Health coaching: A concept analysis"
Publication in Nursing Forum, January-March 2014. 2014

"An integrative review of literature on the determinants of physical activity among rural women"
Publication in Public Health Nursing, July 2013. 2013

"The Status of Local Health Department Information Systems: A Critical Need for Coordination to Inform Meaningful Health Improvement Initiatives"
Co-presenter at Keeneland Public Health Services and Systems Research Conference, Lexington, KY 2013

Publications and Presentations (continued)

"Health Coaching to Improve Healthy Lifestyle Behaviors: An Integrative Review"
Co-authored publication in the American Journal of Health Promotion September-October 2010, online issue. 2010

"Taking Steps to a Healthier Community"
Presenter at Wheatridge National Symposium on Health and Hope, Milwaukee, WI 2008

"Taking Steps to Healthier Schools through Community Partnerships"
Presenter at the Wisconsin Department of Public Instruction's Building the Heart of a Successful School conference, Wisconsin Dells, WI 2007

Memberships

American Nurses Association
Midwest Nursing Research Society
National League for Nursing
Wisconsin Partnership for Activity and Nutrition
Healthier Cumberland Coalition
Be Well Barron County
Cumberland Education Foundation Board of Directors