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A Social Ecological Model for Military Women's Health

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A B S T R A C T

Background: U.S. military women's health (MWH) is influenced by unique life experiences while serving in combat and combat support roles in the armed forces. Daily accomplishment of the military mission exposes women to occupational, physical, and psychosocial factors that affect their health status. Here, we present the theoretical framework for a social ecological model (SEM) for MWH.
Methods: By synthesizing the common elements of various SEMs for health, we describe the layers in the military social ecological system that are typical of the milieu of servicewomen. With the individual's knowledge, beliefs, behaviors, and physiology at the center of the model, relevant components of the microsystem, mesosystem, exosystem, and macrosystem are identified.
Results: Support for the SEM-MWH can be found in all layers of the social ecological system. Distinguishing factors of the SEM-MWH include characteristics of the military environment, community, health care system, regulations and policies, and the military culture in which women live and work. Servicewomen's life experiences in the microsystem, mesosystem, exosystem, and macrosystem occur in a nested, interactive system that affects their health behaviors and their health status.
Conclusions: The social ecological system of servicewomen is unique and must be fully explored and appreciated to ensure the health of women who serve. Investigation of the effects of policies throughout all layers of the SEM-MWH on the individual servicewoman is warranted.

Women who serve in the U.S. Armed Forces live and work within social, organizational, and cultural spheres that influence their health. Scholarship on the social and organizational context of health demonstrates that individual health is affected by multiple levels of influence (McLeroy, Bibeau, Steckler, & Glanz, 1988). In Bronfenbrenner's (1977) foundational ecological model of human development, levels of influence on individuals were defined as the microsystem, mesosystem, exosystem, and macrosystem. Experts in sociology, psychology, and health sciences have since adapted Bronfenbrenner's model into many versions of social ecological models (SEMs) for health. In the SEM of health, the layers of influence create forces that affect the experience of health, health care, and health behaviors of an individual (McLeroy et al., 1988). This ecological perspective has successfully been applied to health promotion for over 30 years. We believe that a SEM will help to bridge the gaps between theory, research, and practice by facilitating research to identify leverage points for change in servicewomen's lives. Therefore, we propose an SEM framework for military women's health (SEM-MWH).

Background

All military members are entitled to medical and dental health care in accordance with U.S. Code Title 10 (2018). The military health system (MHS), the fourth-largest health care

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system in the United States (Smith, Bono, & Slinger, 2017), is the integrated system of health and readiness that provides care to military members and their families (Defense Health Agency [DHA] Decision Support Division, 2019; Mendez, 2018). Administered by the DHA, the MHS provides care for 9.6 million beneficiaries of military health care in hospitals, clinics, and dental clinics across the globe, including co-locations with military combat operations worldwide (DHA, 2020). The purpose of the MHS is to ensure the readiness of the military, specifically that U.S. forces are medically ready to deploy and that the medical force is ready to deliver supportive health services both at home and in support of the full range of military operations (DHA, 2018). This includes sex- and gender-specific health care, preventive medicine, and environmental controls that would improve the health and safety of military women.

There are currently 230,399 servicewomen on active duty in the U.S. Armed Forces (17.3% of all active duty members; Defense Manpower Data Center, 2020), and as of 2017, there were 158,679 servicewomen in the National Guard and Reserves (19.6% of total National Guard/Reserves members; Office of the Deputy Assistant Secretary of Defense for Military Community and Family Policy, 2018). Of note, 108,987 women were deployed from 2008 to 2013 (Office of the Assistant Secretary of Defense & Health Affairs, 2015). Since 2016, the U.S. Armed Forces have accepted women into all military occupations, including combat and combat support roles (Parrish, 2016). Women now serve in all military occupational specialties, both in the home (garrison) and in deployed (operational) environments. As the burgeoning roles of women afford opportunities to perform in all combat and combat support assignments, it is particularly relevant to acknowledge the effects on women's health of all environmental, occupational, physical, and psychosocial factors inherent in military service. Despite the change in personnel policy that opens all military occupational specialties to women, they have yet to be fully integrated into the military culture (Segal, Smith, Segal, & Canuso, 2016), which may lead to continued and pervasive psychological and physical health effects.

Theoretical Approaches to MWH

Several theories have been proposed to guide the inquiry into and application to practice of military women's health care. The conceptual model of military women's life events and well-being, founded on the major principles of the life course theory, identifies the influence of military women's individual experiences on their well-being throughout their life course (Segal & Lane, 2016; Segal, Lane, & Fisher, 2015). In this model, women's reproductive and gynecological health is identified as one of four dimensions of the military family's life course that interact to affect a woman's well-being (Segal & Lane, 2016). A recognition of the concepts in the life course model by providers, researchers, and policymakers in military women's health care is necessary when considering their current state of health, whether deployed or not. Another model for MWH specifically addresses women's health behaviors in the deployed environment. Based on the social ecological theory, this conceptual framework for MWH integrates the concepts of individual physiology, beliefs, and health behaviors with the physical features of the environment, activities, and roles that military women engage in during deployment (Trego, 2009a; 2009b). An appreciation for life events is an underlying theme in the SEM, because women's personal experiences contribute to their current physiology, beliefs, and health behaviors. While remaining cognizant of the multiple influences on health for women from the time they enter military service through their lifespans as veterans, our SEM focuses specifically on the time during active service, when women are required to maintain a ready state of health.

In accordance with its mission, it is imperative that the MHS contribute both to the medical readiness of servicewomen (i.e., that women are medically ready to deploy) and to the readiness of the MHS to deliver supportive health services "anytime and anywhere" to servicewomen (DHA Decision Support Division, 2019, p. 3). Our purpose is to describe a social ecological approach to the health of military women that accounts for individual, environmental, organizational, and cultural influences in the military setting. An SEM can guide research, practice, and policies designed to facilitate change at various levels in the military social ecological system and promote the health of women.

The SEMs for health are based on Bronfenbrenner's sentinel work, in which he identified multiple layers of environmental influence on behaviors (Bronfenbrenner, 1976). Finding a salient application to health behaviors, multiple theorists have subsequently developed SEMs of layers that influence health promotion (Golden & Earp, 2012). McLeroy et al. (1988) proposed a SEM for health promotion that identified intrapersonal characteristics, interpersonal (group) processes, institutional factors, community factors, and public policy within an individual's environmental layers as factors that influence health. This model highlighted the importance of the social and organizational contexts of individual health-related behaviors, with an underlying supposition that change created in the social environment would support concomitant change in individual health behaviors.

Glanz and Bishop (2010) highlighted the value of SEMs in health promotion interventions, whereas Grzywacz and Fuqua (2000) proposed an SEM of health that further explicates the importance of the individual's behaviors, beliefs, and physiology in relation to their health status. This SEM emphasized the value of providers using an SEM approach to patients' medical conditions by investigating the condition in the context of each layer of the social ecological system. Leveraging this SEM allows providers to identify not only health behaviors that lead to or mediate a medical condition but also social ecological system-wide factors that affect an individual's health. This approach underscores the permeating effect of each layer of the system on the individual. It places the individual at the center of the model, as the recipient of the circumstances of each layer of their own unique social ecological system. Although behavior change may be one mediator of health outcomes, additional leverage points within the system could produce changes that either directly or indirectly improve an individual's health. Ultimately, by identifying the links between health outcomes and the layers of the social ecological system, there is an opportunity to identify leverage points in each layer where efforts at change can be targeted (Grzywacz & Fuqua, 2000; Stokols, 1996).

A multilevel focus for health promotion efforts has been widely adopted by agencies such as the Centers for Disease Control and Prevention (CDC), the World Health Organization, and the Institute of Medicine (Golden & Earp, 2012). The CDC's WISEWOMAN (Well-Integrated Screening and Evaluation for WOMen Across the Nation) program has used the SEM approach successfully for prevention of heart disease and stroke, demonstrating the usefulness of SEMs in health promotion efforts in women throughout the United States (CDC, 2018).

An SEM is particularly applicable to the population of military women, because their health and well-being can be influenced by the unique environmental conditions that are imposed

throughout the layers of a woman's social ecological system by military occupations and the culture of the military. Using an SEM can assist in designing research to evaluate the health conditions of servicewomen from a multilevel perspective, link health outcomes to conditions in each layer of the woman's environment, identify leverage points for change, and guide the development of interventions in multiple layers of influence. The use of an SEM for MWH could lead to changes in the military environment that help prevent or mitigate risks for disease, injury, and illness, as well as facilitate the adoption of healthy behaviors by women. Building on the foundations of the conceptual framework for MWH, we provide the framework for the SEM for MWH and identify theoretical leverage points within each layer of the social ecological system. Figure 1 provides a visual for the proposed SEM-MWH model.

Elements of the SEM for MWH

The elements of the SEM-MWH include the individual servicewoman who is surrounded by layers of influence that are designated as the microsystem, mesosystem, exosystem, and macrosystem. Each layer has key characteristics that influence the health of the individual at the center of the model. A review of the literature provided examples of the key characteristics in a servicewoman's environment. We examine the theoretical origins of each element of the model and provide supporting evidence from the literature. Table 1 summarizes the elements of the SEM-MWH.

The Individual

The individual is the central component of an SEM, whether the goal is to promote health care behaviors, treat acute or chronic disease, or prevent illness. An individual's behaviors, beliefs, and physiology interact with the layers of their social ecological system to create their state of physical and psychosocial health (Grzywacz & Fuqua, 2000). Also referred to as intrapersonal factors, the attributes of an individual that determine health-related behaviors include their knowledge, attitudes, and self-concept (McLeroy et al., 1988). For women who join the military, their existing personal identity (e.g., as daughter, mother, companion, partner, student, or professional) is reshaped during assimilation into the military. Military training and socialization create a belief system based on core values, including honor, courage, commitment, loyalty, respect, integrity, excellence, and selfless service, which merge into the self-concept to varying degrees (Coll, Weiss, & Yarvis, 2011; Demers, 2011). These values are indoctrinated into military personnel during entry to the service and are reinforced and codified throughout their careers by doctrine and traditions. The attitudes of servicewomen are thus cultivated by the military values system and informed by experience, which can influence health-related behaviors throughout their military careers. For example, military personnel demonstrate high health literacy (Weld Padden, Ricciardi, & Bibb, 2009), but they value what is best for the group over their own well-being. The belief that group needs takes precedence over individual needs may affect servicewomen's decisions when faced with the choice of seeking health care or contributing to the mission of their units. Women have expressed a strong desire to continue with their mission despite experiencing genitourinary (Wilson, et al., 2017; Wilson, Corrigan, & Braun, 2016) or menstrual symptoms (Trego, 2007). A potential leverage point in servicewomen's individual level characteristics is encouragement of behaviors that promote health, such as seeking health care.

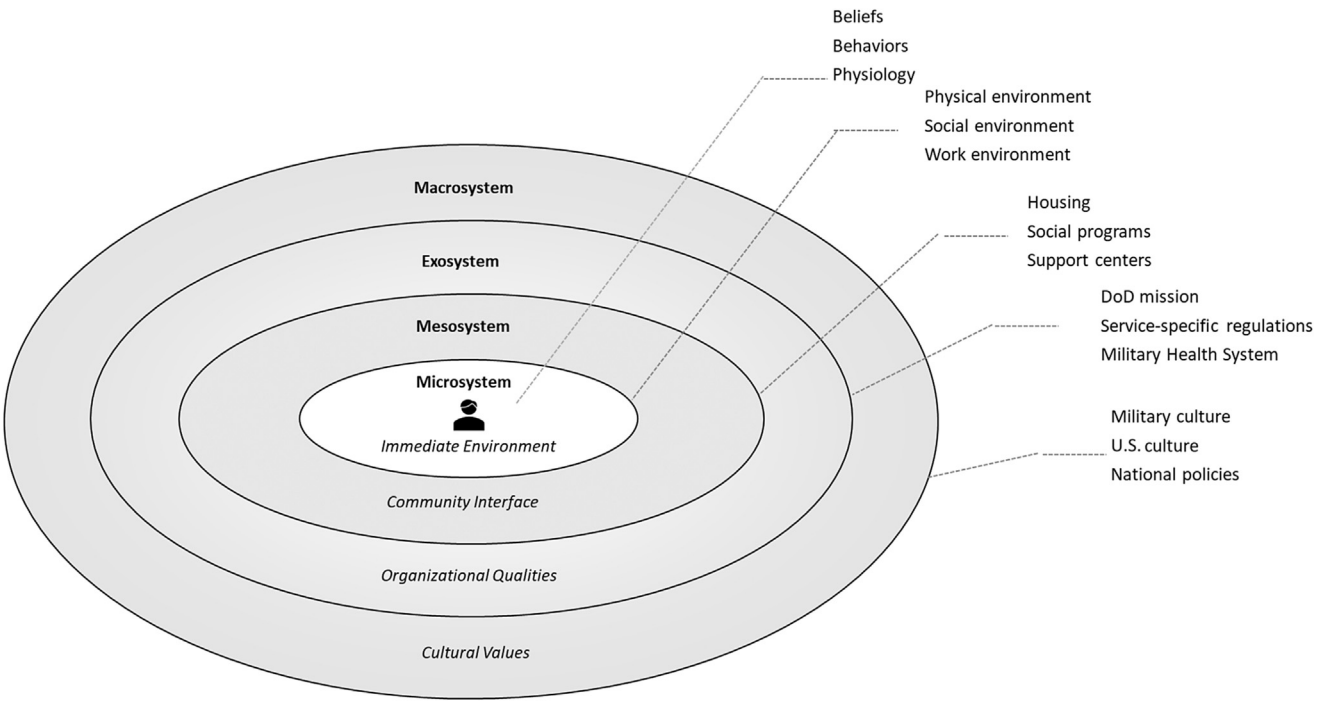

Figure 1. Proposed social ecological model (SEM) for military women's health (MWH).

Table 1
Elements of the Social Ecological Model (SEM) for Military Women's Health (MWH)

SEM Layer	Characteristics that Influence Health	Examples
Individual	Beliefs	Core values
	Behaviors	Health behaviors
	Physiology	Symptoms
Microsystem	Physical environment	Military occupational tasks
		Deployed setting
	Social environment	Family and friends
		Peers
	Work environment	Military occupational setting
		Unit cohesion/coworker social support
Mesosystem	Community interface	Housing, social programs, and support centers on military installations
		Military treatment facilities
Exosystem	Organizational qualities	Department of Defense mission and regulations
		Service-specific (Army, Navy, Air Force, Marines) missions and regulations
		Military Health System readiness mission
Macrosystem	Cultural values	Military culture
		U.S. culture
		National policies

The Microsystem

The microsystem is the immediate environmental layer of influence on the health of an individual. Described by Bronfenbrenner as the relations an individual has with their setting, the microsystem includes the individual's role, activities they perform, and physical features of the environment, time, and place (Bronfenbrenner, 1977). Subsequently, the microsystem has been described in the health promotion literature as consisting of the physical environment, the social environment (interpersonal relationships), and the work environment. Both the physical and psychosocial aspects of employment affect multiple elements of well-being that contribute to health status. However, the distinction between the two is often blurred in the military environment. For military women, the physical environment would be their living and workplace in the garrison (on the military installation), off-installation, during deployment or training, or while afloat. Garrison environments are characterized by the modern amenities of living, such as transportation, shelter, sanitation, electricity, water, and heat. However, deployed and field training environments have fewer amenities or provide the essentials to a limited degree, which negatively affects health behaviors. For example, running water, plumbing, or electricity may be available only at certain times or not at all. Military women have described the deployed environment in ground operations as dirty, unsanitary, and not conducive to basic feminine hygiene (Czerwinski et al., 2001; Hawley-Bowland, 1996; Wilson, et al., 2017). Women aboard ships live in crowded living quarters that lack privacy, work in arduous jobs that pose multiple occupational hazards, and have limited resources, all of which may lead to negative health outcomes (Curry et al., 2016; McLarnon & Wise, 2003; Ryan-Wenger & Lowe, 2000). The lack of privacy is an inherent limitation in the deployed or training environment that affects hygienic practice such as showering and urination (Czerwinski et al., 2001; Hawley-Bowland, 1996; Ryan-Wenger & Lowe, 2000; Steele, 2016).

The austere and physically challenging conditions of field training environments, combat deployments, humanitarian missions, and peacekeeping missions have been adversely associated with women's genitourinary health (Armed Forces Health Surveillance Center, 2014c; Czerwinski et al., 2001; Lowe & Ryan-Wenger, 2003; Steele & Yoder, 2013), gynecologic health (Armed Forces Health Surveillance Center, 2014a; Braun, et al., 2016; Powell-Dunford, Cuda, Moore, Crago, & Deuster, 2009; Powell-Dunford et al., 2011), and health care utilization patterns (Armed Forces Health Surveillance Center, 2014a; 2014b; 2014c). Therefore, the physical environment of military women's workplace influences their health. Conditions in the immediate environment hinder the individual's ability not only to adopt healthy behaviors but also to seek health care (Grzywacz & Fuqua, 2000; Stokols, 1992). For example, gynecologic care in the deployed or shipboard environment can be limited by the location of the woman's unit, logistics, and type of medical personnel available (Braun et al., 2016; Naclerio, Stola, Trego, & Flaherty, 2011; Nielsen et al., 2009; Ryan-Wenger & Lowe, 2000; Steele & Yoder, 2013; Thomson & Nielsen, 2006; Trego, 2007, 2012).

The second characteristic of the microsystem is the *social environment* created by interpersonal relationships with family, friends, and coworkers (McLeroy et al., 1988). These social relationships provide the emotional support, information, and access to social roles that are the basis of social support (McLeroy et al., 1988). The social resources that women gain from interpersonal relationships include reliable alliance, a sense of attachment, guidance, social integration, reassurance of worth, and opportunity for nurturance (O'Neal, Mancini, & DeGraff, 2016). Interpersonal relationships can influence health by mediating stress, improving overall well-being, providing support for health care decisions, and reinforcing healthy behaviors (McLeroy et al., 1988). Social support is associated with well-being, specifically in women with military experiences (Conforte et al., 2017; Driscoll et al., 2015; Kline et al., 2013; Lehavot, Der-Martirosian, Simpson, Shipherd, & Washington, 2013; Mankowski, Haskell, Brandt, & Mattocks, 2015; Smith et al., 2013; Tucker & Kelley, 2009; Welsh, Olson, Perkins, Travis, & Ormsby, 2015). For example, social support has been associated with higher levels of physical health (Lehavot et al., 2013) and decreased mental health symptoms (Nayback-Beebe & Yoder, 2011; Park, Wachen, Kaiser, & Mager Stellman, 2015; Smith et al., 2013; Tucker & Kelley, 2009) in servicewomen; also, social support is positively associated with servicewomen seeking mental health care following sexual assault (Zinzow et al., 2015) and for posttraumatic stress disorder (Hourani, Williams, Bray, Wilk, & Hoge, 2016). Furthermore, social support is a recognized indicator of overall well-being, one that has been found to be particularly relevant for servicewomen's health outcomes and health-seeking behaviors (Mankowski et al., 2015; Mattocks et al., 2012).

Although the social environment of servicewomen is composed of social networks and support systems that are similar to those of civilian women, there are distinct differences. Like their civilian counterparts, servicewomen's families (immediate relatives, spouses, and children) are commonly their first line of social support. However, servicewomen often have nontraditional families (e.g., single parent, step parent, never married, or divorced family structures) and therefore have varying family support networks (Segal & Lane, 2016; Southwell & MacDermid Wadsworth, 2016). Additionally, the members of a military woman's family, including spouse, children, and parents, are not always co-located with her to provide support. Friendship networks for servicewomen may include friends from their life prior to service, as well as those during their service; friends, peers, and co-workers may also be one and the same in the military milieu (Mota, Medved, Hiebert-Murphy, Whitney, & Sareen, 2018; Welsh et al., 2015).

Fortunately, social support is also available in the military work environment, where women find social support from other female military members and their commanders (Mankowski, et al., 2015). Social support from spouses, military leadership, and neighbors has been shown to moderate both depressive symptoms and the perception of negative deployment experiences in women (Welsh et al., 2015). Servicewomen rely on social support throughout their careers, but it is critical in times of deployment and reintegration following deployment (Demers, 2011; Mankowski et al., 2015; Maung, Nilsson, Berkel, & Kelly, 2017). At these times, women may not seek support from their family to shelter them from the harms of their own combat experiences (Mankowski et al., 2015; Maung et al., 2017). Military unit support (e.g., camaraderie), in particular, has demonstrated a protective effect against women experiencing sexual harassment and assault during deployment (Walsh et al., 2014).

Other characteristics of the work environment can influence health directly or indirectly. There are three general ways in which work can contribute to health: direct effects on physical and psychological health, the ability to seek and adhere to treatment, and the undermining or reinforcement of health promotion behaviors and intervention (Grzywacz & Fuqua, 2000). The physical demands of many military occupations, both in garrison and in the training or operational environment, create obvious health and safety risks. For military women, examples of work environment-related physical health outcomes include musculoskeletal injuries resulting from physical fitness activities (Knox et al., 2011; Nindl, Jones, Van Arsdale, Kelly, & Kraemer, 2016; Nye, Pawlak, Webber, Tchandja, & Milner, 2016) and low back, ankle, and foot injuries, which are common in deployed settings (Roy, Ritland, & Sharp, 2015). In combat settings, women are also subject to traumatic brain injuries (Brickell et al., 2016) and other blast injuries (including burns, wounds, and polytrauma; Dye, Eskridge, Tepe, Clouser, & Galarneau, 2016). Furthermore, there may be unidentified physiological consequences of serving in operational environments, such as Gulf War illness, a chronic multisymptom illness that was recognized only in the ensuing decade (Coughlin et al., 2017; National Academies of Sciences, Engineering, and Medicine, 2016).

In addition to affecting physiological health, military work-related experiences such as basic training, specialty training, deployments, and exposures to trauma also affect psychological health. The psychological challenges that women encounter in the work environment of the military—including exposure to combat and trauma (Dohrenwend, Yager, Wall, & Adams, 2013; Gibbons, Hickling, & Watts, 2012; Gilmore et al., 2016; Lee, 2012; Mayo, MacGregor, Dougherty, & Galarneau, 2013; Ramchand, Rudavsky, Grant, Tanielian, & Jaycox, 2015; Sippel, Roy, Southwick, & Fichtenholtz, 2016), sexual harassment (Coll et al., 2011; Gibson, Gray, Katon, Simpson, & Lehavot, 2016), stressors related to rank and position (Cohen et al., 2016), and role conflict (Southwell & MacDermid Wadsworth, 2016)—have been found to negatively affect mental health (Boyd, Bradshaw, & Robinson, 2013; Coll et al., 2011; Gibson et al., 2016; Runnals et al., 2014). Conversely, the psychosocial environment of the workplace can generate protective psychological factors, such as social cohesion, prestige, and self-identity (Grzywacz & Fuqua, 2000). However, the psychosocial milieu of the military work environment is affected by a military culture that has been influenced by the gender-based norms of a male-dominated organization. In the 2018 Workplace and Gender Relations Survey of Active Duty Members, women reported being mistreated, ignored, or insulted in the workplace owing to their gender (Breslin et al., 2019). Furthermore, the hierarchical structure of the military perpetuates differential treatment based on class and rank, which are inherent characteristics of a military organization.

To counteract the negative potential of the hierarchical structure, military policies regarding prevention of accidents, discrimination, and harassment are disseminated to unit personnel through mandatory training in the workplace. However, it has been difficult to attenuate the complex effects of military culture on the workplace environment. For example, despite unit-level training on the prevention of harassment and discrimination, servicewomen continue to report higher ratings for workplace hostility and lower ratings for unit climate than servicemen (Breslin et al., 2019).

Military jobs also provide a stable income, health benefits, and opportunities for growth and promotion, all of which are associated with better health status. Furthermore, there is an exceptional interdependence between the workplace and the health care system that involves obligatory health promotion practices for servicemembers (Villagran, Ledford, & Canzona, 2015). For example, military women are required to have periodic physical examinations and preventive care, such as screening for cervical cancer. These routine care visits provide the opportunity for women to interact with providers and support staff and consequently build interpersonal relationships that enhance health. Moreover, military commanders are ultimately responsible for ensuring that their personnel receive that care. However, military members still perceive workplace-related barriers, such as the inability to get time off, that prevent them from obtaining care (Elnitsky et al., 2013; Kim, Britt, Klocko, Riviere, & Adler, 2011).

Potential leverage points in the microsystem for improving the health of military women include building interpersonal relationships that would enhance the social support of military women, particularly during times of increased psychosocial stress. Enhancing the physical workspace with measures to improve safety while carrying out military duties would decrease the likelihood of workplace injuries.

The Mesosystem

Bronfenbrenner described the mesosystem as a "system of microsystems," or the interrelationship between the major components of an individual's microsystem (Bronfenbrenner, 1977). In more recent theory development, the mesosystem

has been described as the interface of the individual with their community, or the primary groups to which they belong (McLeroy et al., 1988), and it represents a higher level of influence on health (Grzywacz & Fuqua, 2000).

The military community is characterized by servicemembers living in contiguity with other military members and families, either on a military installation or in the surrounding community (O'Neal et al., 2016). For example, military installations have housing for military families and single members, general merchandise and grocery stores, convenience stores, fuel stations, multidenominational chapels, schools (K-12), hobby shops, sports programs, golf courses, gymnasium facilities, and social clubs. Accordingly, servicewomen reside, socialize, and carry out daily activities among other military members. This affords them opportunities to interact with other servicemembers and their families who uphold the same core values and have experienced similar life events.

Military communities also have family support centers to assist military members with the demands of the military lifestyle, such as deployments and frequent relocations. Specific social support programs available on installations include family support groups, spouses' clubs, and programs like the Army's BOSS (Better Opportunity for Single Soldiers). An active duty member's military community connection is associated with decreased depressive symptoms/anxiety and increased self-efficacy to influence issues that affect their lives (O'Neal et al., 2016). Perceived military community support has been positively associated with parental psychosocial function (Conforte et al., 2017), an important consideration for military mothers. As a result, the military community can be a strong source of social support, a mitigating factor for negative health outcomes.

A distinctive feature of military communities is the co-location of medical treatment facilities on most military bases. Service members receive their care in a facility that is dedicated to providing care only to beneficiaries of the military health care system. Similar to the community support sources on base, the medical treatment facility (MTF) on base is a setting in which women interact with other military members and their families. Maternity care is one example of the inter-relationship between military women, members of their communities, and their health care providers in the MTF setting. A health benefit of these microsystem interactions in an MTF is exemplified by multiple studies finding that group prenatal care for military women and military spouses is associated with positive maternal outcomes and satisfaction with care (Kennedy et al., 2011; Tarney et al., 2015; Tubay et al., 2018; Walton, Shaffer, & Heaton, 2015; Weis, Lederman, Walker, & Chan, 2017). However, a limitation of health care in the mesosystem is the disruption in continuity of care that is generated by frequent relocations, either of the women or their providers.

Military women also interface with virtual communities. Military members report high usage of personal technology, including computers, laptops, tablets, and mobile phones for emailing, Internet browsing, social networking, texting, and watching YouTube (Bush & Wheeler, 2015). Facebook and social media are commonly used for health information, health behavior tracking (via applications), and health care advice. Examples of health-related mobile apps used by women in the military are apps for colorectal cancer awareness (Brittain, Pennings Kamp, & Salaysay, 2018), nutrition (Lohse, 2013), and weight loss (James & Harville, 2018). Among women receiving care at an MHS medical center, the app for a national prenatal care social media campaign, Text4Baby, was found to improve attitudes toward prenatal care, drinking alcohol during pregnancy, and prenatal vitamins (Evans et al., 2014).

Potential leverage points in the mesosystem that could have positive effects on health may be found in formal and informal social groups in the military community, which provide the opportunity to reinforce health behaviors and strengthen social support for women. The MTF setting presents a multifaceted opportunity to leverage both interpersonal and community-level proponents for women's health in an environment where multiple microsystems interact.

The Exosystem

The exosystem provides yet another layer of influence for health. Defined as matters outside of the person's situation (Bronfenbrenner, 1977), the exosystem includes events and settings that indirectly influence health (Grzywacz & Fuqua, 2000). When people are members of an organization, institutional factors, particularly the organizational mission, drive policies and programs that either directly or indirectly affect their health. Institutional characteristics can influence health by promoting a healthful environment and encouraging healthy behaviors (Grzywacz & Fuqua, 2000; McLeroy et al., 1988; Stokols, Pelletier, & Fielding, 1996). Living and working within one large institution (i.e., the Department of Defense [DoD])—with its inherent formal and informal rules—is a dominating factor in the exosystem of servicewomen. Specifically, women's lives are rooted within the subordinate organizations of the DoD (e.g., the Department of the Army, the Department of the Air Force, and the Department of the Navy) that indirectly influence the health of military personnel.

The DoD has a mission to maintain force readiness to enact the nation's security policies (Ball et al., 2017). Although the goal of the DoD is to protect the nation, the objective of each service (Army, Navy, Air Force, Marines) is to train and equip people who perform warfighting, peacekeeping, and humanitarian/disaster assistance missions. Each service has a distinct mission that guides training and operations and creates the context for the health of women. How the services safely train women to perform their duties is guided by various service-specific, although not necessarily gender-specific, policies. For example, in the wake of allowing women in combat military occupational specialties, each of the services has determined gender-neutral physical standards that members must meet for their particular ground combat occupations (Hardison, Hosek, & Bird, 2018). Physical fitness testing is another example of a service-specific policy that contributes to the organizational context of servicewomen's health. Physical fitness and training requirements, which obviously affect military members' health, are workplace requirements determined at the organizational level of the social ecological system. Examples of institutional policies that directly affect the health and health practices of many military women are DoD policies related to contraceptive counseling (DHA Medical Affairs/Clinical Support Division, 2019) and maternity leave (Carter, 2016). DoD policy directs the services 1) to conduct sexual assault and sexual harassment prevention training and 2) to provide treatment for victims of sexual assault. This is an example of a policy with both indirect and direct effects on women's health that is mandated on a DoD level and further defined at the service and subordinate command levels (Sexual Assault Prevention and Response Program, 2017).

To maintain the readiness of the services, the DoD provides a type of "universal health care" to military members and their families with free and comprehensive acute, chronic, and preventive health care services through the MHS. The MHS falls under the direction of the Office of the Assistant Secretary of Defense for Health Affairs (DHA, 2019), which assumes statutory obligations to care for active duty military personnel. The MHS delivers health care services, provides public health and medical education, engages with private sector partnerships, and conducts medical research and development (DHA, 2018). MTFs have traditionally been managed and operated under each department (Army, Navy, Air Force), allowing for service-specific organizational and operational provision of health care. The provision of clinical care has, therefore, varied between the MTFs in accordance with the population and the mission of the military personnel receiving care, and the organization of the MHS has indirectly affected servicewomen's health in varying ways. These circumstances changed with the National Defense Authorization Act (2017), in which the DHA was mandated by law to integrate the MHS under a centralized administration. Consequently, in 2018, the DHA assumed responsibility for the administration of all MHS services, with the goals of decreasing variance in care and improving coordination of care across the entire MHS (DHA, 2018). The DHA plans to "create a culture of proactive prevention" that will engage servicemembers and decrease the need for care (DHA Agency, 2018, p.22). This reform of the MHS into a single enterprise is intended to enhance the DoD goal of maintaining a fit and ready force, and it could result in enhanced preventive measures and support for health care among all servicewomen. Through policy development and execution of the health care mission, the DHA and MHS substantially contribute to the exosystem of military women.

However, the hierarchical structure of military organizations also has distinctive deleterious effects on both health and health-seeking behaviors (Trowbridge & Pearson, 2013). For example, a barrier to seeking care is servicewomen's fears about their health needs being shared throughout their chain of command (Braun, Kennedy, Sadler, et al., 2016; Braun, Kennedy, Womack, et al., 2016; Krulewitch, 2016; Manski, Grindlay, Burns, Holt, & Grossman, 2014; Nielsen et al., 2009; Powell-Dunford et al., 2011; Wilson et al., 2017). Some women with concerns about the effects of seeking health care on their military career or reputation—for example, those aboard ships (Braun et al., 2016a) and those who have experienced sexual assault (Burns, Grindlay, Holt, Manski, & Grossman, 2014)—have resorted to obtaining care from providers outside of the MHS. Under a new restricted reporting system in which their command is not notified of the report, women who reported sexual assault in 2017 still experienced retaliation, but more than one-half were able to receive information about behavioral and medical health care and treatment (61% and 56%, respectively), according to the 2018 Workplace and Gender Relations Survey of Active Duty Members (Breslin et al., 2019).

Fully appreciating the organizational context of servicewomen's health within the DoD may be helpful in creating and implementing preventive health or health promotion programs. There most likely are potential leverage points within the exosystem where institutional policy and regulatory modifications may result in 1) clinical practice guidelines for providers throughout the MHS and 2) increased access to standardized care, preventive care, and organizational programs that promote health among women.

The Macrosystem

Bronfenbrenner defined the macrosystem as a "general prototype" for institutional patterns and structures in a given culture or subculture (Bronfenbrenner, 1977). The macrosystem is intangible and consists of implicit ideologies that are manifested through daily customs and provide meaning to the roles, activities, and social networks of an individual. The macrosystem is the highest order of "belief systems, cultural ideology, and social policy" (Grzywacz & Fuqua, 2000). As such, the economic, social, educational, legal, and political systems are elements of the macrosystem that are evinced throughout the microsystem, mesosystem, and exosystem of an individual (Bronfenbrenner, 1977).

Servicewomen live in a subculture that is distinct from mainstream culture (Coll et al., 2011). They live and work in a world that is shaped by military culture, and an understanding of this unique culture is necessary to appreciate the influence that it may have on women's health (Center for Deployment Psychology, 2016; Coll et al., 2011). Military culture is the "sum total of all knowledge, beliefs, morals, customs, habits, and capabilities acquired by service members and their families through membership in military organizations" (Center for Deployment Psychology, 2016, p.21). Military culture provides social norms and promotes discipline and obedience to authority for the good of the group rather than the individual (Demers, 2011). Military culture endorses the "24/7 on-duty" status of servicemembers, mandatory deployments, frequent relocations, and temporary homes, schools, and social networks of servicemembers with the rationale that these are necessary to accomplish the mission. The fundamental principles of military culture drive military members' daily thinking, communication, and actions. This concept of military culture is a key component of the macrosystem and, as such, it permeates all layers of the social ecological system. Embedded in an individual's core values and beliefs, military culture influences daily activities in the microsystem, guides interactions with the military community in the mesosystem, and shapes the components of the exosystem.

Military culture influences women's health status and health behaviors. Unique stressors inherent in the culture—including the frequent moves; the responsibilities associated with the rank, duties, and positions held by a servicemember; and concern for military career progression (or lack of)—can affect a servicemember's physical and mental health (Center for Deployment Psychology, 2016). The social norms and core values of military culture may inhibit military members from seeking either physical or mental health care, a result of the pervasive effects of a masculinist institution and gendered norms of its members (Archer, 2013; Bonnes, 2019; Segal et al., 2016; Weitz, 2015). The reluctance to seek health care is driven in part by the stigma associated with seeking certain types of services, such as mental health care (Elnitsky et al., 2013; Kim et al., 2011; Quartana et al., 2014), gynecological care (Cook & Dickens, 2014; Krulewitch, 2016; Manski et al., 2014; Nielsen et al., 2009; Ryan-Wenger & Lowe, 2000), or care following military sexual assault (Burns et al., 2014; Manski et al., 2014; Mattocks et al., 2012; Zinzow et al., 2015). In military culture, there is also concern that seeking mental health care, in particular, will negatively affect career progression (Burns et al., 2014; Ghahramanlou-Holloway et al., 2018).

Although seeking mental health care can be interpreted as a sign of weakness or unprofessionalism in military culture, it is doubly so for women. Not only do military women perceive a

stigma related to mental illness, but they also perceive a stigma associated with their gender and identity as a soldier when seeking health care (Maung et al., 2017; Zinzow et al., 2015). The characteristics of weakness, showing emotions, feeling fear, and seeking health care are associated with femininity, rather than the masculinity that typifies the culturally accepted identity of a soldier (Bonnes, 2019). The reluctance to seek health care illustrates the effect of a military culture that perpetuates gendered stereotypes.

Although military women are immersed in the military culture, they are not isolated from the influences of the social, political, and economic environments of the American culture. These are higher levels of influence in the macrosystem that affect the entire U.S. population. As with the effects of military culture, these overarching concepts permeate the layers of the SEM, and the social determinants of health (e.g., discrimination, socioeconomic status, economic stability, quality of housing, access to food sources, and educational level) (Office of Disease Prevention and Health Promotion, 2019) of the American culture are superimposed on the military culture macrosystem. With the deployment of more women than ever in foreign conflicts, exposure to dissonant cultural values and the immediate and long-term effects on women's health should also be considered. Thus, merely by virtue of being based in the United States, the macrosystem of military women involves other macrosystemic cultural influences.

Additionally, national policies and politics shape the macrosystem of military women. Public health policies generated by federal agencies such as the CDC provide guidance for the MHS when developing its policies. An example is Healthy People 2020, which promotes healthy living and guides public policies for the health and well-being of the U.S. population (CDC, 2019). Political influences are inherent in the regulation of federal funding mechanisms, in particular those that fund the DoD and the MHS. An example of public policy that is heavily influenced by politics is regulation of abortion; for instance, 10 U.S.C. section 1093 restricts the use of DoD funds and facilities from providing abortion services to beneficiaries.

Because of the complexity of servicewomen's macrosystem—a hybrid of civilian and military cultures—further investigation is required into the social determinants of health and health promotion in this select population. Potential leverage points in the macrosystem that could have positive effects on military women would lie in 1) revisions to or creation of new public policies, 2) political support for federal policies that will decrease gender-based inequities in the DoD, and 3) federal regulations that promote access to quality health care and health promotion resources in both the MHS and the civilian health care system.

Interacting Layers of the SEM-MWH

Congruent with other health promotion SEMs, our model depicts a group of nested, interacting systems (Grzywacz & Fuqua, 2000). The layers of influence are intertwined to produce effects on MWH at the individual level. Intrapersonal processes can be targeted by specific interventions to prevent, detect, or treat disease or to promote a specific area of health. The microsystem, mesosystem, exosystem, and macrosystem that influence intrapersonal processes in military women contain leverage points that decisionmakers can use to improve servicewomen's health.

Policies at the DoD level direct those at the service level, which direct those at the military commander's level, thereby influencing the servicewoman's total environment from macrosystem to microsystem. For example, paid parental leave benefits for federal employees led to military parental leave policies that provide time for both mothers and their active duty partners to care for their infant while not working (Aitken et al., 2015; Andres, Baird, Bingenheimer, & Markus, 2016; Jou, Kozhimannil, Abraham, Blewett, & McGovern, 2018; NDAA, 2019). These evidence-based changes in military parental leave can facilitate healthy behaviors such as physical fitness activity and breastfeeding prior to servicewomen's return to work after childbirth. Other changes support breastfeeding after servicewomen return to their workplaces. Based on the overwhelming national and international evidence for breastfeeding, a federal policy that supports lactating mothers in the workplace led to a DoD policy that applies to all military installations and in all military facilities (Office of the Undersecretary of Defense for Personnel and Readiness, 2016). These policies may result in the normalization of taking leave from the military workplace for childcare as well normalizing support for lactation among military women's superiors and peers. Accordingly, interpersonal processes in the microsystem can be affected by changes in the work environment, as influenced by policies of the commander, attitudes of co-workers, and service-specific policies. Each of these influences filtering down through the systemic levels can affect the individual servicewoman's health.

Implications for Practice and/or Policy

Leverage points for improving servicewomen's health exist throughout the layers of the SEM-MWH and include creating educational resources to encourage adoption of healthy behaviors (individual level), enhancing military workplaces to improve safety and allow for building interpersonal relationships (microsystem), improving programs and facilities on military bases and in medical treatment facilities to ensure servicewomen can easily receive multiple forms of support (mesosystem), increasing access to high-quality health care, including preventive care (exosystem), and adopting federal laws and regulations to decrease gender-based inequities in the military and increase access to comprehensive health care (macrosystem). Guided by an SEM for MWH, a national agenda for research on MWH would provide the opportunity to use research findings both in revising policies that contribute to the health status of military women and in studying the effects of policies on women's health.

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References

Aitken, Z., Garrett, C. C., Hewitt, B., Keogh, L., Hocking, J. S., & Kavanagh, A. M. (2015). The maternal health outcomes of paid maternity leave: A systematic review. *Social Science & Medicine*, 130, 32–41.

Andres, E., Baird, S., Bingenheimer, J. B., & Markus, A. R. (2016). Maternity leave access and health: A systematic narrative review and conceptual framework development. *Maternal and Child Health Journal*, 20(6), 1178–1192.

Archer, E. M. (2013). The power of gendered stereotypes in the US Marine Corps. *Armed Forces & Society*, 39(2), 359–391.

Armed Forces Health Surveillance Center. (2014a). Gynecologic disorders diagnosed during deployment to Southwest/Central Asia, active component

females, U.S. Armed Forces, 2008-2013. *Medical Surveillance Monthly Report (MSMR)*, 21(8), 7–12.
Armed Forces Health Surveillance Center. (2014b). Urinary tract infections during deployment, active component, U.S. Armed Forces, 2008-2013. *Medical Surveillance Monthly Report (MSMR)*, 21(3), 2–5.
Armed Forces Health Surveillance Center. (2014c). Vaginal yeast infections while deployed in Southwest/Central Asia, active component females, U.S. Armed Forces, 2008-2013. *Medical Surveillance Monthly Report (MSMR)*, 21(8), 13–15.
Ball, S., Stevenson, L., Ladebue, A., McCreight, M., Lawrence, E., Oestreich, T., & Lambert-Kerzner, A. (2017). Adaptation of Lean Six Sigma methodologies for the evaluation of Veterans Choice Program at 3 urban Veterans Affairs Medical Centers. *Medical Care*, 55(Suppl. 7, Suppl. 1), S76–S83.
Bonnes, S. (2019). Service-women's responses to sexual harassment: The importance of identity work and masculinity in a gendered organization. *Violence Against Women*, 26(12-13), 1656–1680.
Boyd, M. A., Bradshaw, W., & Robinson, M. (2013). Mental health issues of women deployed to Iraq and Afghanistan. *Archives of Psychiatric Nursing*, 27(1), 10–22.
Braun, L. A., Kennedy, H. P., Sadler, L. S., Dixon, J., Womack, J., & Wilson, C. (2016a). US Navy women's experience of an abnormal cervical cancer screening. *Journal of Midwifery & Womens Health*, 61(2), 249–256.
Braun, L. A., Kennedy, H. P., Womack, J. A., & Wilson, C. (2016b). Integrative literature review: U.S. Military women's genitourinary and reproductive health. *Military Medicine*, 181(1), 35–49.
Breslin, R., Davis, L., Hylton, K., Hill, A., Klauberg, W., Petusky, M., & Klahr, A. (2019). *2018 workplace and gender relations of active duty members: Overview report (No. OPA Report No 2019-027). Office of People Analytics*. Available: www.sapr.mil/sites/default/files/Annex_1_2018_WGRA_Overview_Report_0.pdf. Accessed: February 18, 2021.
Brickell, T. A., Lippa, S. M., French, L. M., Kennedy, J. E., Bailie, J. M., & Lange, R. T. (2016). Female service members and symptom reporting after combat and non-combat-related mild traumatic brain injury. *Journal of Neurotrauma*, 34(2), 300–312.
Brittain, K., Pennings Kamp, K. J., & Salaysay, Z. (2018). Colorectal cancer awareness for women via Facebook: A pilot study. *Gastroenterology Nursing*, 41(1), 14–18.
Bronfenbrenner, U. (1976). The experimental ecology of education. *Educational Researcher*, 5(9), 5–15.
Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist*, 32(7), 513–531.
Burns, B., Grindlay, K., Holt, K., Manski, R., & Grossman, D. (2014). Military sexual trauma among US servicewomen during deployment: A qualitative study. *American Journal of Public Health*, 104(2), 345–349.
Bush, N. E., & Wheeler, W. M. (2015). Personal technology use by U.S. military service members and veterans: An update. *Telemedicine and e-Health*, 21(4), 245–258.
Carter, A. M. (2016). *DoD-wide changes to maternity leave. (Directive-type Memorandum [DTM] 16-002)*. Available: http://dmna.ny.gov/hro/agr/army/files/1458071249–Maternity%20Secdef%2005Feb2016.pdf. Accessed: February 18, 2021.
Center for Deployment Psychology. (2016). *Military culture: Core competencies for healthcare professionals. Military Culture for Healthcare Professionals Course (Online Course)*. Available: https://deploymentpsych.org/military-culture. Accessed: February 18, 2021.
Centers for Disease Control and Prevention (CDC). (2018). *WISEWOMAN*. Available: www.cdc.gov/wisewoman/index.htm. Accessed: February 18, 2021.
Centers for Disease Control and Prevention (CDC). (2019). *Healthy People 2020*. Available: www.healthypeople.gov. Accessed: February 18, 2021.
Cohen, G. H., Sampson, L. A., Fink, D. S., Wang, J., Russell, D., Gifford, R., … Galea, S. (2016). Gender, position of authority, and the risk of depression and posttraumatic stress disorder among a national sample of U.S. Reserve component personnel. *Women's Health Issues*, 26(3), 268–277.
Coll, J. E., Weiss, E. L., & Yarvis, J. S. (2011). No one leaves unchanged: Insights for civilian mental health care professionals into the military experience and culture. *Social Work in Health Care*, 50(7), 487–500.
Conforte, A. M., Bakalar, J. L., Shank, L. M., Quinlan, J., Stephens, M. B., Sbrocco, T., & Tanofsky-Kraff, M. (2017). Assessing military community support: Relations among perceived military community support, child psychosocial adjustment, and parent psychosocial adjustment. *Military Medicine*, 182(9), e1871–e1878.
Cook, R. J., & Dickens, B. M. (2014). Reducing stigma in reproductive health. *International Journal of Gynecology and Obstetrics*, 125(1), 89–92.
Coughlin, S. S., Krengel, M., Sullivan, K., Pierce, P. F., Heboyan, V., & Wilson, C. (2017). A review of epidemiologic studies of the health of Gulf War women veterans. *Journal of Environment and Health Sciences*, 3(2).
Curry, J. A., Maguire, J. D., Fraser, J., Tribble, D. R., Deiss, R. G., Bryan, C., Tisdale, M. D., Crawford, K., Ellis, M., & Lalani, T. (2016). Prevalence of Staphylococcus aureus colonization and risk factors for infection among military personnel in a shipboard setting. *Military medicine*, 181(6), 524–529.
Czerwinski, B. S., Wardell, D. W., Yoder, L. H., Connelly, L. M., Ternus, M., Pitts, K., & Kouzekanani, K. (2001). Variations in feminine hygiene practices of military women in deployed and noncombat environments. *Military Medicine*, 166(2), 152–158.
Defense Health Agency (DHA). (2018). *The Defense Health Agency 2017 Stakeholder Report*. Available: https://health.mil/About-MHS/OASDHA/Defense-Health-Agency. Accessed: May 7, 2019.
Defense Health Agency (DHA). (2019). *Elements of the MHS*. Available: www.health.mil/About-MHS. Accessed: May 7, 2019.
Defense Health Agency (DHA) Decision Support Division. (2019). *Evaluation of the TRICARE Program: Fiscal year 2019 report to Congress. Access, cost, and quality data through fiscal year 2018*. Available: www.health.mil/Military-Health-Topics/Access-Cost-Quality-and-Safety/Health-Care-Program-Evaluation/Annual-Evaluation-of-the-TRICARE-Program. Accessed: February 18, 2021.
Defense Health Agency (DHA) Medical Affairs/Clinical Support Division. (2019). *Procedural instruction number 6200.02*. Available: https://health.mil/Reference-Center/Policies/2019/05/13/Comprehensive-Contraceptive-Counseling. Accessed: February 18, 2021.
Defense Health Agency. (2020). The Defense Health agency 2019 Stakeholder Report. Available: https://health.mil/About-MHS/OASDHA/Defense-Health-Agency.
Defense Manpower Data Center. (2021). *Table of active duty females by rank/grade and service, data as of: December 2020*. Available: www.dmdc.osd.mil/appj/dwp/dwp_reports.jsp. Accessed: February 18, 2021.
Demers, A. (2011). When veterans return: The role of community in reintegration. *Journal of Loss and Trauma*, 16(2), 160–179.
Dohrenwend, B. P., Yager, T. J., Wall, M. M., & Adams, B. G. (2013). The roles of combat exposure, personal vulnerability, and involvement in harm to civilians or prisoners in Vietnam-War-related posttraumatic stress disorder. *Clinical Psychological Science*, 1(3), 223–238.
Driscoll, M. A., Higgins, D. M., Seng, E. K., Buta, E., Goulet, J. L., Heapy, A. A., … Haskell, S. G. (2015). Trauma, social support, family conflict, and chronic pain in recent service veterans: Does gender matter? *Pain Medicine*, 16(6), 1101–1111.
Dye, J. L., Eskridge, S. L., Tepe, V., Clouser, M. C., & Galarneau, M. (2016). Characterization and comparison of combat-related injuries in women during OIF and OEF. *Military Medicine*, 181(Suppl. 1), 92–98.
Elnitsky, C. A., Chapman, P. L., Thurman, R. M., Pitts, B. L., Figley, C., & Unwin, B. (2013). Gender differences in combat medic mental health services utilization, barriers, and stigma. *Military Medicine*, 178(7), 775–784.
Evans, D. W., Wallace Bihm, J., Szekely, D., Nielsen, P., Murray, E., Abroms, L., & Snider, J. (2014). Initial outcomes from a 4-week follow-up study of the Text4baby program in the military women's population: Randomized controlled trial. *Journal of Medical Internet Research*, 16(5), e131.
Ghahramanlou-Holloway, M., Koss, K., Rowan, A., LaCroix, J. M., Perera, K., Carreno, J., & Grammer, J. (2019). Retrospective and prospective examination of outpatient mental health utilization and military career impacts. *Stigma and Health*, 4(2), 143–151.
Gibbons, S. W., Hickling, E. J., & Watts, D. D. (2012). Combat stressors and posttraumatic stress in deployed military healthcare professionals: An integrative review. *Journal of Advanced Nursing*, 68(1), 3–21.
Gibson, C. J., Gray, K. E., Katon, J. G., Simpson, T. L., & Lehavot, K. (2016). Sexual assault, sexual harassment, and physical victimization during military service across age cohorts of women veterans. *Women's Health Issues*, 26(2), 225–231.
Gilmore, A. K., Brignone, E., Painter, J. M., Lehavot, K., Fargo, J., Suo, Y., … Gundlapalli, A. V. (2016). Military sexual trauma and co-occurring posttraumatic stress disorder, depressive disorders, and substance use disorders among returning Afghanistan and Iraq veterans. *Women's Health Issues*, 26(5), 546–554.
Glanz, K., & Bishop, D. B. (2010). The role of behavioral science theory in development and implementation of public health interventions. *Annual Review of Public Health*, 31, 399–418.
Golden, S. D., & Earp, J. A. L. (2012). Social ecological approaches to individuals and their contexts: Twenty years of health education & behavior health promotion interventions. *Health Education & Behavior*, 39(3), 364–372.
Grzywacz, J. G., & Fuqua, J. (2000). The social ecology of health: Leverage points and linkages. *Behavoiral Medicine*, 26(3), 101–115.
Hardison, C. M., Hosek, S. D., & Bird, C. E. (2018). *Gender-neutral physical standards for ground combat occupations. Volume 1. A review of best-practice methods. Rand Corporation*. Available: https://www.rand.org/pubs/research_reports/RR1340z1.html. Accessed: February 18, 2021.
Hawley-Bowland, C. (1996). Epidemiologic overview of common gynecologic disorders and first-trimester complications among active-duty women. *Womens Health Issues*, 6(6), 353–355.
Hourani, L., Williams, J., Bray, R. M., Wilk, J. E., & Hoge, C. W. (2016). Gender differences in posttraumatic stress disorder and help seeking in the U.S. Army. *Journal of Women's Health (Larchmt)*, 25(1), 22–31.
James, D. C. S., & Harville, C. (2018). Smartphone usage, social media engagement, and willingness to participate in mHealth weight management research among African American women. *Health Education & Behavior*, 45(3), 315–322.
Jou, J., Kozhimannil, K. B., Abraham, J. M., Blewett, L. A., & McGovern, P. M. (2018). February). Paid maternity leave in the United States: Associations with

maternal and infant health. *Maternal and Child Health Journal*, 22(2), 216–225.
Kennedy, H. P., Farrell, T., Paden, R., Hill, S., Jolivet, R. R., Cooper, B. A., & Rising, S. S. (2011). A randomized clinical trial of group prenatal care in two military settings. *Military Medicine*, 176(10), 1169–1177.
Kim, P. Y., Britt, T. W., Klocko, R. P., Riviere, L. A., & Adler, A. B. (2011). Stigma, negative attitudes about treatment, and utilization of mental health care among soldiers. *Military Psychology*, 23(1), 65–81.
Kline, A., Ciccone, D. S., Weiner, M., Interian, A., St Hill, L., Falca-Dodson, M., … Losonczy, M. (2013). Gender differences in the risk and protective factors associated with PTSD: A prospective study of National Guard troops deployed to Iraq. *Psychiatry*, 76(3), 256–272.
Knox, J., Orchowski, J., Scher, D. L., Owens, B. D., Burks, R., & Belmont, P. J. (2011). The incidence of low back pain in active duty United States military service members. *Spine*, 36(18), 1492–1500.
Krulewitch, C. J. (2016). Reproductive health of active duty women in medically austere environments. *Military Medicine*, 181(9), 1166.
Lee, E. A. D. (2012). Complex contribution of combat-related post-traumatic stress disorder to veteran suicide: Facing an increasing challenge. *Perspectives in Psychiatric Care*, 48(2), 108–115.
Lehavot, K., Der-Martirosian, C., Simpson, T. L., Shipherd, J. C., & Washington, D. L. (2013). The role of military social support in understanding the relationship between PTSD, physical health, and healthcare utilization in women veterans. *Journal of Traumatic Stress*, 26(6), 772–775.
Lohse, B. (2013). Facebook is an effective strategy to recruit low-income women to online nutrition education. *Journal of Nutrition Education & Behavior*, 45(1), 69–76.
Lowe, N. K., & Ryan-Wenger, N. A. (2003). Military women's risk factors for and symptoms of genitourinary infections during deployment. *Military Medicine*, 168(7), 569–574.
Mankowski, M., Haskell, S. G., Brandt, C., & Mattocks, K. M. (2015). Social support throughout the deployment cycle for women veterans returning from Iraq and Afghanistan. *Social Work in Health Care*, 54(4), 287–306.
Manski, R., Grindlay, K., Burns, B., Holt, K., & Grossman, D. (2014). Reproductive health access among deployed U.S. servicewomen: A qualitative study. *Military Medicine*, 179(6), 645–652.
Mattocks, K. M., Haskell, S. G., Krebs, E. E., Justice, A. C., Yano, E. M., & Brandt, C. (2012). Women at war: Understanding how women veterans cope with combat and military sexual trauma. *Social Science & Medicine*, 74(4), 537–545.
Maung, J., Nilsson, J. E., Berkel, L. A., & Kelly, P. (2017). Women in the National Guard: Coping and barriers to care. *Journal of Counseling & Development*, 95(1), 67–76.
Mayo, J. A., MacGregor, A. J., Dougherty, A. L., & Galarneau, M. R. (2013). Role of occupation on new-onset post-traumatic stress disorder and depression among deployed military personnel. *Military Medicine*, 178(9), 945–950.
McLarnon, C. O., & Wise, J. H. (2003). Blue water nursing: The role of Navy nurses on board US Navy combatant ships. *Critical Care Nursing Clinics of North America*, 15(2), 233–243.
McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly*, 15(4), 351–377.
Mendez, B. H. P. (2018). *Defense primer: Military Health System*. Available: https://fas.org/sgp/crs/natsec/IF10530.pdf. Accessed: February 18, 2021.
Mota, N. P., Medved, M., Hiebert-Murphy, D., Whitney, D., & Sareen, J. (2018). Negotiating home base: Narratives of psychological well-being among female military members. *Health Place*, 50, 105–111.
Naclerio, A., Stola, J., Trego, L., & Flaherty, E. (2011). *The concerns of women currently serving in the Afghanistan theater of operations white paper*. Available: http://www.globalsecurity.org/military/library/report/2011/womens-concerns-afghanistan.pdf. Accessed: February 18, 2021.
National Academies of Sciences Engineering and Medicine. (2016). *Gulf War and Health Volume 10: Update of Health Effects of Serving in the Gulf War, 2016*. Washington, DC: The National Academies Press.
National Defense Authorization Act for Fiscal Year 2017, Pub L. No. 114-328. (2016). Available: www.govinfo.gov/content/pkg/PLAW-114publ328/html/PLAW-114publ328.htm. Accessed: February 18. 2021.
National Defense Authorization Act for Fiscal Year 2019, Pub L. No. 116-92. (2020). Available: www.congress.gov/public-laws/116th-congress. Accessed: February 18. 2021.
Nayback-Beebe, A. M., & Yoder, L. H. (2011). Social conflict versus social support: What is more influential in mental health symptom severity for female service members? *Archives of Psychiatric Nursing*, 25(6), 469–478.
Nielsen, P. E., Murphy, C. S., Schulz, J., Deering, S. H., Truong, V., McCartin, T., & Clemons, J. L. (2009). Female soldiers' gynecologic healthcare in Operation Iraqi Freedom: A survey of camps with echelon three facilities. *Military Medicine*, 174(11), 1172–1176.
Nindl, B. C., Jones, B. H., Van Arsdale, S. J., Kelly, K., & Kraemer, W. J. (2016). Operational physical performance and fitness in military women: Physiological, musculoskeletal injury, and optimized physical training considerations for successfully integrating women into combat-centric military occupations. *Military Medicine*, 181(Suppl. 1), 50–62.
Nye, N. S., Pawlak, M. T., Webber, B. J., Tchandja, J. N., & Milner, M. R. (2016). Description and rate of musculoskeletal injuries in Air Force basic military trainees, 2012-2014. *Journal of Athletic Training*, 51(11), 858–865.
O'Neal, C. W., Mancini, J. A., & DeGraff, A. (2016). Contextualizing the psychosocial well-being of military members and their partners: The importance of community and relationship provisions. *American Journal of Community Psychology*, 58(3-4), 477–487.
Office of the Assistant Secretary of Defense, & Health Affairs (2015). *House Report 113-446, Page 164: Deployment Health for Women*. Available: www.health.mil/Reference-Center/Reports/2015/07/22/Deployment-Health-for-Women. Accessed: February 18, 2021.
Office of the Deputy Assistant Secretary of Defense for Military Community and Family Policy. (2018). *2017 Demographics: Profile of the military community*. Available: http://download.militaryonesource.mil/12038/MOS/Reports/2017-demographics-report.pdf. Accessed: February 18, 2021.
Office of Disease Prevention and Health Promotion (2019). *Social determinants of health*. Available: www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health. Accessed: February 18, 2021.
Office of the Undersecretary of Defense for Personnel and Readiness (2016). *Department wide policy for nursing and lactation rooms*. Available: www.wbdg.org/FFC/DOD/DOD_NursingMothersMemo_110116.pdf. Accessed: February 18, 2021.
Park, C. L., Wachen, J. S., Kaiser, A. P., & Mager Stellman, J. (2015). Cumulative trauma and midlife well-being in American women who served in Vietnam: Effects of combat exposure and postdeployment social support. *Anxiety Stress Coping*, 28(2), 144–161.
Parrish, K. (2016). *DoD gives final go-ahead to open all military jobs to women [Press release]*. Available: www.dcmilitary.com/journal/commanders_column/dod-gives-final-go-ahead-to-open-all-military-jobs/article_621886db-e3f6-5a6b-b1c9-f80b54ca210b.html. Accessed: February 18, 2021.
Powell-Dunford, N., Cuda, A. S., Moore, J. L., Crago, M. S., & Deuster, P. A. (2009). Menstrual suppression using oral contraceptives: Survey of deployed female aviation personnel. *Aviation, Space, and Environmental Medicine*, 80(11), 971–975.
Powell-Dunford, N. C., Cuda, A. S., Moore, J. L., Crago, M. S., Kelly, A. M., & Deuster, P. A. (2011). Menstrual suppression for combat operations: Advantages of oral contraceptive pills. *Womens Health Issues*, 21(1), 86–91.
Quartana, P. J., Wilk, J. E., Thomas, J. L., Bray, R. M., Rae Olmsted, K. L., Brown, J. M., … Hoge, C. W. (2014). Trends in mental health services utilization and stigma in US soldiers from 2002 to 2011. *American Journal of Public Health*, 104(9), 1671–1679.
Ramchand, R., Rudavsky, R., Grant, S., Tanielian, T., & Jaycox, L. (2015). Prevalence of, risk factors for, and consequences of posttraumatic stress disorder and other mental health problems in military populations deployed to Iraq and Afghanistan. *Current Psychiatry Reports*, 17(5), 1–11.
Roy, T. C., Ritland, B. M., & Sharp, M. A. (2015). A description of injuries in men and women while serving in Afghanistan. *Military Medicine*, 180(2), 126–131.
Runnals, J. J., Garovoy, N., McCutcheon, S. J., Robbins, A. T., Mann-Wrobel, M. C., Elliott, A., … Strauss, J. L. (2014). Systematic review of women veterans' mental health. *Womens Health Issues*, 24(5), 485–502.
Ryan-Wenger, N. A., & Lowe, N. K. (2000). Military women's perspectives on health care during deployment. *Womens Health Issues*, 10(6), 333–343.
Segal, M. W., & Lane, M. D. (2016). Conceptual model of military women's life events and well-being. *Military Medicine*, 181(Suppl. 1), 12–19.
Segal, M. W., Lane, M. D., & Fisher, A. G. (2015). Conceptual model of military career and family life course events, intersections, and effects on well-being. *Military Behavioral Health*, 3(2), 95–107.
Segal, M. W., Smith, D. G., Segal, D. R., & Canuso, A. A. (2016). The role of leadership and peer behaviors in the performance and well-being of women in combat: Historical perspectives, unit integration, and family issues. *Military Medicine*, 181(Suppl. 1), 28–39.
Sexual Assault Prevention and Response Office (SAPRO). (2019). *Fact sheet: Policy and Strategy*. Available: https://sapr.mil/. Accessed: February 18, 2021.
Sippel, L. M., Roy, A. M., Southwick, S. M., & Fichtenholtz, H. M. (2016). An examination of the roles of trauma exposure and posttraumatic stress disorder on emotion regulation strategies of Operation Iraqi Freedom, Operation Enduring Freedom, and Operation New Dawn veterans. *Cognitive Behaviour Therapy*, 45(5), 339–350.
Smith, B. N., Vaughn, R. A., Vogt, D., King, D. W., King, L. A., & Shipherd, J. C. (2013). Main and interactive effects of social support in predicting mental health symptoms in men and women following military stressor exposure. *Anxiety Stress Coping*, 26(1), 52–69.
Smith, D. J., Bono, R. C., & Slinger, B. J. (2017). Transforming the military health system. *Journal of the American Medical Association*, 318(24), 2427–2428.
Southwell, K. H., & MacDermid Wadsworth, S. M. (2016). The many faces of military families: Unique features of the lives of female service members. *Military Medicine*, 181, 70–79.
Steele, N., & Yoder, L. (2013). Military women's urinary patterns, practices, and complications in deployment settings. *Journal of Urologic Nursing*, 33(2), 61–71.
Steele, N. M. (2016). *A female urinary diversion device for military women in the deployed environment*. Available: https://apps.dtic.mil/sti/citations/AD1022563. Accessed: February 18, 2021.

Stokols, D. (1992). Establishing and maintaining healthy environments—toward a social ecology of health promotion. *American Psychologist*, 47(1), 6–22.
Stokols, D. (1996). Translating social ecological theory into guidelines for community health promotion. *American Journal of Health Promotion*, 10(4), 282–298.
Stokols, D., Pelletier, K. R., & Fielding, J. E. (1996). The ecology of work and health: Research and policy directions for the promotion of employee health. *Health Education Quarterly*, 23(2), 137–158.
Tarney, C. M., Berry-Caban, C., Jain, R. B., Kelly, M., Sewell, M. F., & Wilson, K. L. (2015). Association of spouse deployment on pregnancy outcomes in a U.S. Military population. *Obstetrics and Gynecology*, 126(3), 569–574.
Thomson, B. A., & Nielsen, P. E. (2006). Women's health care in Operation Iraqi Freedom: A survey of camps with echelon I or II facilities. *Military Medicine*, 171(3), 216.
Trego, L. L. (2007). Military women's menstrual experiences and interest in menstrual suppression during deployment. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 36(4), 342–347.
Trego, L. L. (2009a). Development of the Military Women's Attitudes Toward Menstrual Suppression Scale: From construct definition to pilot testing. *Journal of Nursing Measurement*, 17(1), 45–72.
Trego, L. L. (2009b). Theoretical substruction: Establishing links between theory and measurement of military women's attitudes towards menstrual suppression during military operations. *Journal of Advanced Nursing*, 65(7), 1548–1559.
Trego, L. L. (2012). Prevention is the key to maintaining gynecologic health during deployment. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 41(2), 283–291, quiz 291-282.
Trowbridge, R. E., & Pearson, R. (2013). Impact of military physician rank and appearance on patient perceptions of clinical competency in a primary care setting. *Military Medicine*, 178(9), 994–1001.
Tubay, A. T., Mansalis, K. A., Simpson, M. J., Armitage, N. H., Briscoe, G., & Potts, V. (2019). The effects of group prenatal care on infant birthweight and maternal well-being: A randomized controlled trial. *Military Medicine*, 184(5-6), e440–e446.
Tucker, M. M., & Kelley, M. L. (2009). Social support and life stress as related to the psychological distress of single enlisted Navy mothers. *Military Psychology*, 21(Suppl. 2), S82–S97. Available: https://www.govinfo.gov/content/pkg/USCODE-2018-title10/pdf/USCODE-2018-title10.pdf. Accessed: February 18, 2021.
United States Code, 2018 Edition. (2018). *Title 10 - Armed Forces, 10 § 1071 et seq.* Available: https://www.govinfo.gov/content/pkg/USCODE-2018-title10/pdf/USCODE-2018-title10.pdf. Accessed: February 18, 2021.
Villagran, M., Ledford, C. J. W., & Canzona, M. R. (2015). Women's health identities in the transition from military member to service veteran. *Journal of Health Communication*, 20(10), 1125–1132.
Walsh, K., Galea, S., Cerda, M., Richards, C., Liberzon, I., Tamburrino, M. B., … Koenen, K. C. (2014). Unit support protects against sexual harassment and assault among national guard soldiers. *Womens Health Issues*, 24(6), 600–604.
Walton, R. B., Shaffer, S., & Heaton, J. (2015). Group prenatal care outcomes in a military population: A retrospective cohort study. *Military Medicine*, 180(7), 825–829.
Weis, K. L., Lederman, R. P., Walker, K. C., & Chan, W. (2017). Mentors offering maternal support reduces prenatal, pregnancy-specific anxiety in a sample of military women. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 46(5), 669–685.
Weitz, R. (2015). Vulnerable warriors: military women, military culture, and fear of rape. *Gender Issues*, 32(3), 164–183.
Weld, K. K., Padden, D., Ricciardi, R., & Bibb, S. C. (2009). Health literacy rates in a sample of active duty military personnel. *Military Medicine*, 174(11), 1137–1143.
Welsh, J. A., Olson, J., Perkins, D. F., Travis, W. J., & Ormsby, L. (2015). The role of natural support systems in the post-deployment adjustment of active duty military personnel. *American Journal of Community Psychology*, 56(1-2), 69–78.
Wilson, C., Corrigan, R., & Braun, L. (2017). Deployed women's illness behaviors while managing genitourinary symptoms: An exploratory theoretical synthesis of two qualitative studies. *Nursing Outlook*, 65(5 Suppl), S17–S25.
Wilson, C., Corrigan, R., Reese, S., Almonte, A., Simpson, D., & Wilson, A. (2016). Military medics' insight into providing women's health care in deployed settings. *Military Medicine*, 181(11), e1608–e1614.
Zinzow, H. M., Britt, T. W., Pury, C. L., Jennings, K., Cheung, J. H., & Raymond, M. A. (2015). Barriers and facilitators of mental health treatment-Seeking in U.S. Active Duty Soldiers with sexual assault histories. *Journal of Traumatic Stress*, 28(4), 289–297.

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