A Cross-sectional Exploration of Lower Urinary Tract Storage Symptoms Among a Sample of Female Undergraduate College Students

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Boston College

William F. Connell School of Nursing

#### A CROSS-SECTIONAL EXPLORATION OF

## LOWER URINARY TRACT STORAGE SYMPTOMS

### AMONG A SAMPLE OF FEMALE UNDERGRADUATE COLLEGE STUDENTS

a dissertation

by

### KIMBERLY J. ANGELINI

submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

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#### ABSTRACT

#### A CROSS-SECTIONAL EXPLORATION OF LOWER URINARY TRACT STORAGE SYMPTOMS AMONG A SAMPLE OF FEMALE UNDERGRADUATE COLLEGE STUDENTS Kimberly J. Angelini

Lower urinary tract (LUTS) storage symptoms, including overactive bladder (OAB) and urinary incontinence (UI), are common conditions among women with significant health and economic consequences. Much of the existing literature on LUTS focuses on older, often postmenopausal women, and there is limited research available about prevalence, incidence and severity of LUTS in young women. For many young women in the United States, the period from the late teens through early twenties coincides with the period of emerging adulthood and college enrollment. The unique factors influencing women at this stage of development may be influential in understanding prevalence and correlates of OAB and UI later in the life-course. The purpose of this cross-sectional descriptive survey-based study was to explore and describe the experience of urinary storage symptoms, specifically OAB and UI, among female undergraduate college students, and to identify associated factors.

Qualtrics online platform was used to create and distribute the survey to a sample of 1,800 female college undergraduate students at a private Catholic university in the northeast. Two instruments previously used to assess LUTS, the ICIQ-FLUTS and LUTS Tool, were combined into the Urinary Symptoms Scale with a one-week recall. Twelve items assessed LUTS storage symptoms of OAB and UI.

The final sample consisted of 456 female undergraduate college students with a mean age of 20.3-years-old. The sample was predominantly White non-Hispanic. Most commonly reported symptoms included urgency (47.6%), frequency (52.6%), urinary incontinence

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(21.3%), stress urinary incontinence (28.8%), and urge urinary incontinence (16.4%). Total severity scores were low and highly skewed towards the lower range (M = 3.31; SD = 3.91). Participants with symptoms, most commonly reported experiencing symptoms *rarely* or *sometimes* during the past week. Perceived bother from urinary symptoms mean scores were low (M = 1.77) but extended the full range on a 0 to 10 scale. In this study, perceived bother from urinary symptoms as well as perceived impact of urinary symptoms on activities of daily life (ADLs) were significantly associated with care-seeking and use of self-management strategies. Interestingly, LUTS storage symptom severity was not significantly associated with care-seeking, but it was related to use of self-management strategies in this population. Perception of overall health, history of constipation/IBS, sexual activity, delayed toileting behaviors, and premature toileting behaviors were significant in multivariate analyses when controlling for other factors. Further research on the relationship of these factors and LUTS storage symptoms is needed.

This study represented a first step in understanding college women's experiences with LUTS storage symptoms and identifying the unique personal, behavioral and environmental factors associated with LUTS. The study found that OAB and UI symptoms are common among female college undergraduates. In addition, a number of personal and behavioral factors were found to be associated with LUTS storage symptoms. Given that many health-related behaviors established during college years may persist later in adulthood, identifying experiences and influences of young women's LUTS storage symptoms is important in informing future research and practice recommendations.

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#### **CHAPTER ONE: INTRODUCTION AND STATEMENT OF THE PROBLEM**

Chapter One describes an overview of the study under the following headings: (1) problem statement; (2) significance; (3) theoretical framework; and (4) purpose of the study.

#### **Problem Statement**

Lower urinary tract symptoms (LUTS), including overactive bladder and urinary incontinence, are common conditions affecting the health-related quality of life of women in the United States. Overactive bladder (OAB) and urinary incontinence (UI) are common among women, but are largely underreported due to embarrassment, social stigma, and a false sense of normalcy (Milsom et al., 2001; Nicolson, Kopp, Dooley, Chapple, & Kelleher, 2005; Peters, Horrocks, Stoddart, & Somerset, 2004; Tremback-Ball, Levine, Dawson, & Perlis 2008). OAB and UI have been associated with significant health and financial consequences (Coyne, Margolis, Kopp, & Kaplan, 2012; Hu et al., 2004). By the time many women discuss symptoms with a healthcare provider, the symptoms are often more severe and bothersome and may require extensive medical or surgical management. First line therapy for OAB and UI management includes lifestyle and behavior modifications. In order to proactively treat patients with OAB and UI, attention must be given earlier in disease progression when first line therapies can be most effective.

Much of the existing literature on LUTS focuses on older, often postmenopausal women, and the subgroup of those who seek care for symptoms. There is also existing research on LUTS, specifically urinary incontinence (UI), during pregnancy and the postpartum period. However, there is limited research available about prevalence, incidence and severity of LUTS in young women. In addition, current research fails to explore the behavioral and sociocultural factors and other correlates associated with LUTS. The McLeroy Social Ecological Model (McLeroy et al., 1998) and the Social Cognitive Theory (Bandura, 1986) (described in detail below) illustrate the influence of personal, behavioral, and social/environmental factors on LUTS storage symptoms, specifically OAB and UI, in young women. If symptoms and associated factors were identified early in disease progression and behavioral modifications were implemented at younger ages, it may be possible to thwart or slow the progression of symptoms later in the life course and reduce the overall public health burden (Gormley et al., 2014). This study represents a first step in understanding LUTS storage symptoms, specifically OAB and UI, and the associated personal, behavioral, and environmental factors in young adult women.

#### Significance

Lower urinary tract symptoms (LUTS) are common conditions and refer to a wide range of urinary symptoms. The International Continence Society (ICS) standardized terminology divides LUTS into three symptom-groups: storage symptoms, voiding symptoms, and post-micturition symptoms (Abrams et al., 2003). Storage symptoms occur with urine accumulation in the bladder and include overactive bladder (OAB) (e.g., urgency, frequency, nocturia) and urinary incontinence (UI). Voiding symptoms occur during the emptying phase and include hesitancy, weak stream, dysuria, and intermittency. Postmicturition symptoms occur after completion of urination and include symptoms of terminal

dribble, and incomplete emptying. Recent studies have found that 82 to 94.9% of female participants ages 18- to 50-years-old report experience of at least one lower urinary tract symptom (Coyne et al., 2013; Kogan et al., 2014; Van Breda et al., 2015), some of which are benign.

Due to anatomical differences, women are more likely than men to experience storage symptoms, specifically OAB and UI (35.5% and 4.4% respectively) (Maclennan et al., 2000). OAB is currently defined by the ICS and the International Urogynecological Association (IUGA) as urinary urgency, frequency, and nocturia, with or without urinary incontinence (UI) (Abrams et al., 2003; Abrams et al., 2009; Haylen et al., 2010). UI is defined by the International Continence Society (ICS) as any involuntary leakage of urine (Haylen et al., 2011). UI can be urgency related (UUI), stress related (SUI), or mixed (MUI) (Abrams et al., 2009; Rogers, 2008). Due to increased rates of storage symptoms in women, only storage symptoms, specifically OAB and UI, were considered in this study.

#### **LUTS Storage Symptoms**

Storage symptoms, specifically OAB and UI, are the most commonly reported LUTS in women (Coyne et al., 2013). More than 50% of women in the United States report experiencing UI (Markland, Richter, Fwu, Eggers, & Kusek, 2011) and the National Association for Continence (NAFC) reports that more than 17% of women 18 years of age and older report signs and symptoms of OAB (NAFC, 2015). Rates of OAB and UI vary throughout the literature and are thought to be greatly underreported (Gormley et al., 2014).

Overactive bladder and urinary incontinence have been associated with several significant health and financial consequences. Women with OAB and UI report negative impacts on quality of life including decreased sleep, work productivity, and physical/sexual

activity as well as increases in depression and anxiety symptoms (Coyne et al., 2012). The economic burden of treatments and symptom management was estimated in 2004 to be \$51.4 billion dollars annually in the U.S. (Hu et al., 2004).

Despite high prevalence and negative consequences associated with OAB and UI, many women do not report symptoms to their health care provider or report waiting many years before eventually seeking treatment (Nicholson et al., 2005). A prevalence study by Milsom and associates (2001) found that only 60% of patients with OAB reported talking to their health care provider about symptoms; of those, only 27% were receiving treatment. Many health care providers have limited training in assessing and managing bladder conditions and may be unlikely to screen patients for symptoms (Nicholson et al., 2005; Peters et al., 2004.) Women may only seek treatment when symptoms are perceived as severe and impact activities of daily life (ADLs). By the time many women seek care, their condition is typically more severe, costly, and difficult to treat (Gormley et al., 2014).

#### LUTS in Young Women

Understanding young women's experiences with OAB and UI, and identifying associated factors, may lead to increased awareness, screening and practice recommendations for prevention and management strategies. Existing research on OAB and UI has focused primarily on postpartum, middle-aged, and older women who have sought care for symptoms. There is limited research on the experience of LUTS among younger women. The limited research on LUTS storage symptoms in young nulliparous women has focused mainly on UI in female athletes (McAfee, Decker, Kelsey, Pihl, & Westbrook, 2015). Other research on young reproductive age women focuses on environmental concerns for military

women (Steele & Yoder, 2013) and symptoms related to pregnancy (Brown, Donath, MacArthur, McDonald, & Krastev, 2010).

**College women**. For many young women in the United States, the period from the late teens through early twenties coincides with the period of emerging adulthood (Arnett, 2014). This is often a transitional time of new independence, self-discovery and opportunities prior to the responsibilities associated with adulthood (Arnett, 2014). Delays in marriage and childbearing and increased rates of college enrollment for young women have contributed to this interim stage of development (Arnett, 2000). College often presents new opportunities for involvement in high-risk behaviors, including highrisk sexual behaviors, alcohol and other substance use (American College Health Association, 2018), that place young women at risk for LUTS symptoms.

In addition, the high rates of physical activity and rigorous high-impact exercise seen in this age group may also be associated with the occurrence of LUTS storage symptoms. Current fitness trends and the passage of Title IX have led to more female college students participating in sports and athletics. The incidence of UI among college and elite female athletes is reported to be high, ranging from 28-80%; the highest rates are reported among high-impact sports participants (Carls et al., 2007; Goldstick & Constantini, 2014; Simeone et al., 2010). Worry about access to and the cleanliness of public toilets has been associated with altered toileting behaviors that have been correlated with LUTS (Wang & Palmer, 2011). Similarly, worry about cleanliness and privacy of dormitory toilets may affect toileting behaviors and LUTS storage symptoms among college women.

Female undergraduate college students represent a unique population of young women with increased exposure to bladder irritants, athletic involvement, health behaviors, and toileting behaviors that may be associated with urinary storage symptoms. Given the dearth of research examining LUTS experiences and associated factors in young women, this study addresses an important gap in our understanding of women's bladder health. Identifying the experience of urinary storage symptoms, OAB and UI, and associated factors in this population can help to inform future interventions to decrease progression of symptoms for women across the lifespan.

#### **Theoretical Framework**

The McLeroy adaptation (McLeroy et al., 1998) of Bronfenbrenner's Social Ecological Model (Bronfenbrenner, 1977) and Social Cognitive Theory (Bandura, 1986, 1989, 1998) provided the theoretical framework for this study.

#### **Social Ecological Model**

The Social Ecological Model (SEM) was developed by Bronfenbrenner (1977) and has been used to illustrate the multiple environmental factors that influence an individual's development and/or behavior. Bronfenbrenner's model (1977) asserts that changes in the social and physical environment will produce change within an individual, and vice versa. The multi-level factors of the ecological perspective include the microsystem, mesosystem, exosystem, and macrosystem. The microsystem includes social face-to-face interactions and relationships; the mesosystem is the collection of settings (e.g., family, school, religion, etc.) that the individual belongs to; the exosystem represents the larger social system forces (e.g., war, unemployment, natural disasters etc.); and the macrosystem encompasses the social and cultural beliefs of the exosystem that trickle down and influence the individual (Bronfenbrenner, 1977, 2005, 2009). In this way there is a reciprocal relationship between the individual and the other system levels in which the individual is embedded; they are in constant interaction. In order to effectively influence health at the individual level, the environment and/or other system levels need to be addressed as well (Bronfenbrenner, 2009). Adaptations and variations of Bronfenbrenner's SEM have been used extensively to study a variety of health-related behaviors. Winett and associates (1985) used the ecological model in studying life-style choices. Kersell and Milsum (1985) proposed it as a framework to evaluate the individual and environmental factors in behavior. The ecological perspective has also served as a framework to investigate child maltreatment (Belsky, 1980) and factors influencing the obesity epidemic (Egger & Swinburn, 1997), and infectious diseases (Baral, Logie, Grosso, Wirtz, & Beyer, 2013; Brooker, Hay, & Bundy, 2002; McLaren & Hawe, 2005).

The McLeroy Model. McLeroy and associates (1988) adapted Bronfenbrenner's ecological model to investigate the multiple factors that influence health promotion. The McLeroy Model (MM) includes five levels of influence: 1) the individual or intrapersonal level which consists of knowledge, beliefs, and behaviors of the individual; 2) the interpersonal level which consists of social support systems including family, friends, and work groups; 3) the organizational/institutional level which consists of systems at an institutional level that include regulations and rules (both formal and informal); 4) the community level which consists of relationships among organizations within a certain region; and 5) the public policy level which consists of local, state, and national laws or policies (Breslow, 1996; Green, Richard, & Potvin, 1996; McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokkols, 1992). This model has been adopted as a health promotion model

acknowledging the importance of targeting multiple levels of influence to maximize health outcomes (Golden & Earp, 2012; Stokols, 1992, 1996; Weiner, Lewis, Clauser, & Stitzenberg, 2012; Winett, 1995). The behaviors of individuals are influenced by the communities and larger societal systems that they belong to (Breslow, 1996); it is important for researchers and providers to consider these factors in assessing and managing the health of individuals.

The McLeroy Model (MM) (McLeroy et al., 1988) has served as a guiding framework for the study of stress reduction and health promotion among nurses (Wallace, 2006), health literacy and patient engagement (McCormack, Thomas, Lewis, & Rudd, 2017), health disparities among low-income workers (Baron et al., 2014), and HIVrelated behaviors (Baral et al., 2013). The American College Health Association (ACHA) also uses the MM in their Healthy Campus 2020 goals as a framework for improving student and staff health (Healthy Campus 2020, 2016). The MM (McLeroy et al., 1988) was used as the framework for this study, along with the Social Cognitive Theory (Bandura, 1989).

The multiple levels described in the MM (McLeroy et al., 1988) are helpful guides in understanding the experience of urinary storage symptoms in female college students. The individual or intrapersonal level factors that are associated with OAB and UI (e.g., demographic characteristics, health status, chronic conditions, medication use, and knowledge about bladder health). Individual factors also include the behaviors of the individual (e.g., exercise/athletic involvement, sexual behaviors, diet/intake of bladder irritants, alcohol, smoking, toileting behaviors, and care-seeking/self-management behaviors). The interpersonal level includes the social environment, relationships, and

norms that shape personal behaviors and attitudes. There is a strong stigma surrounding LUTS globally and the embarrassment from these symptoms often influences experience and behaviors (Gormley et al., 2014). The organizational/institutional level and community level include the different organizations the individual belongs to (e.g., university, work, religious groups, sports teams, outside activities), cleanliness or access to bathrooms in different organizations, and the beliefs and relationships between these organizations that shape individual action. The public policy level includes policies regarding education, screening, and organizational bathroom policies. The policy level also consists of regulations, guidelines, recommendations, as well as costs associated with OAB and UI management.

#### **Social Cognitive Theory**

The Social Cognitive Theory (SCT) was developed by Bandura (1986) to better understand the factors that influence behavior. Similar to the MM, Bandura (1989) categorized influences into three categories—personal, social, and environmental. Personal factors in the SCT include demographic characteristics, health status, and knowledge. One key concept is self-efficacy. Self-efficacy refers to one's belief or confidence in his/her ability to complete an action or perform a behavior; self-efficacy is behavior-specific (Bandura, 1998). Self-efficacy to perform a given behavior has been found to be a significant predictor of the likelihood of one taking action or engaging in a behavior (Bandura, 1998). However, research on self-efficacy in care-seeking women with LUTS (Wu, Sun, Xu, & Palmer, 2014) has shown a negative association between self-efficacy and care-seeking indicating that greater perceived self-efficacy in managing symptoms was associated with less care-seeking from a health care provider. Perceived social impact of LUTS however, was associated with care-seeking (Wu et al., 2014).

Social factors in the SCT include culture and social stigma that create norms for behavior. One important aspect of social context is observational learning. Observational learning refers to the perceived reality obtained from observing peers and is the primary means through which social learning occurs (Bandura, 1999). For example, students who perceive that their peers drink large quantities of alcohol are more likely to drink heavily themselves. Similarly, those who perceive that their peers do not use condoms are less likely to use condoms themselves (Blayney et al., 2014).

In the SCT, the environment is viewed as the location and space that influence the actions of the individual. In his study of teen aggression, Bandura (1978) expanded upon his earlier work by highlighting the dualistic relationship between individual factors and the environment; this later became known as reciprocal determination (Bandura, 1986).

The SCT has been used by Tremback-Ball, Levine, Dawson, and Perlis (2012) to study women's reported self-efficacy related to performing pelvic floor muscle exercises. Social norms and belief about ability to perform pelvic floor muscle exercises were directly associated with performing exercises. The SCT has also been used to examine the environmental influences on elementary school students play (Harmen et al., 2014), physical activity (Young et al., 2014), 'green' consumer shopping behaviors (Lin & Hsu, 2015), condom use (Snead et al., 2015) and a variety of other health behaviors.

#### **Theoretical Foundations for This Study**

The theoretical foundation for this study is provided by the MM (McLeroy et al., 1988) and the SCT (Bandura, 1989). The multiple factors that influence LUTS were

identified from the published literature and include personal factors, individual behavioral factors, social factors, and environmental factors. This study combines the theories (Figure 1) to illustrate the relationships between personal, behavioral, social, and environmental factors on OAB and UI experiences among young college women.

**Personal factors.** Personal factors of interest in this study of OAB and UI in young women include demographic characteristics, health conditions, medications (i.e., oral contraceptive use) (Iliado et al., 2009), and knowledge about LUTS (Parden et al, 2016; Tremback-Ball, 2008).

Individual behavioral factors. Another category of personal factors focuses on individual behaviors. Behavioral factors that contribute to LUTS are not well understood but may be important in guiding research to influence prevention and care of LUTS across the lifespan (Wang & Palmer, 2010). Toileting behaviors including delayed, premature, and strained voids as well as position (e.g. sitting or crouching over the toilet) and place (e.g. home or public) preference for voiding have gained some recent literature attention (Wang & Palmer, 2010). For many students, college represents the first time living away from home. Residence hall toilets are often shared and may present privacy and cleanliness concerns that can influence toileting behaviors. Other behaviors that may influence the development of LUTS include sexual activity, exercise/athletic involvement and dietary intake or other ingestion of substances that are bladder irritants (e.g., alcohol, tobacco, caffeine) (Dallosso et al., 2003; Lee et al., 1993; Nuotio et al., 2001). Current fitness trends have resulted in many young women participating not only in sports, but also in other high impact athletic class es (e.g., CrossFit<sup>TM</sup> and high intensity interval

training) that have been associated with LUTS storage symptoms, specifically OAB and UI.

Care-seeking behaviors and use of self-management strategies (e.g., use of absorbent pads) are also related to the experience of OAB and UI (Gormley et al., 2014). College health centers and access to providers may influence care-seeking in this population. Use of self-management strategies may differ across the life course. Since incontinence pads or briefs and other products are often marketed towards older women, college women may not feel that they are intended or appropriate for them.

**Social factors.** Social factors include the social environment, relationships (e.g., family, friends, peers, colleagues, etc.), and social/cultural norms that shape personal behaviors and attitudes. Stigma surrounding LUTS (e.g., shame and embarrassment) occurs at this level. College marks a time when the social network shifts from parents to peers. Social norms and stigma may have greater influence in the college population.

**Environmental factors.** Environmental factors include the organizational, institutional, community, and policy levels from social ecological perspectives including the McLeroy Model (McLeroy et al., 1988). The organizational/institutional level and community level are combined in this study to illustrate the different organizational affiliations (e.g., university, work, religious, and other organizational affiliations) and relationships within and among those organizations that may influence LUTS. The public policy level includes recommendations, guidelines, and organizational policies that influence LUTS management and health care provider practices. Environmental factors of consideration in this study include cleanliness of toilets, which may be influenced by use of residence hall bathrooms among college women.

Examining multi-system level factors is important to enhance our understanding

of LUTS storage symptoms, specifically OAB and UI, in college women and to identify

potential targets for future interventions and practice/policy recommendations.

#### Figure 1.

Theoretical Framework: Combined MM and SCT theories illustrate the personal, individual-behavioral, social, and environmental factors that act as potential influences of OAB and UI in college women.



#### **Purpose of the Study**

The purpose of this cross-sectional quantitative study was to explore and describe the experience of LUTS storage symptoms, specifically overactive bladder (OAB) and urinary

incontinence (UI), among female undergraduate college students, and to identify associated factors based on the theoretical framework and review of the literature.

#### **Specific Aims**

The specific aims of this study were to:

# 1. Describe female undergraduate college students' experiences with LUTS storage symptoms, specifically overactive bladder (OAB) and urinary incontinence (UI).

<u>Research Question 1</u>: What is the severity of LUTS storage symptoms, specifically OAB and UI, reported in a sample of female undergraduate college students?

2. Examine the associations between selected personal, behavioral, and environmental factors and LUTS storage symptom (OAB and UI) severity in a sample of female undergraduate college students.

<u>Research Question 2</u>: What is the relationship between personal, behavioral, and environmental factors and severity of LUTS storage symptoms (OAB and UI) in a sample of female undergraduate college students?

# 3. Explore the relationships between severity of urinary symptom bother and use of management strategies (care-seeking behavior and self-management behaviors).

<u>Research Question 3a</u>: What is the relationship between the severity of urinary symptom bother and care-seeking behavior?

<u>Research Question 3b</u>: What is the relationship between severity of urinary symptom bother and use of self-management behaviors (e.g., limiting fluid intake, wearing pads and avoiding activities associated with LUTS)?

## Conclusion

Lower urinary tract symptoms (LUTS) symptoms, specifically storage symptoms such as overactive bladder (OAB) and urinary incontinence (UI), are common conditions for women in the U.S. with significant health and financial consequences. There is currently limited research on LUTS in young women. Since college and emerging adulthood represent a transitional time of influence, understanding LUTS storage symptoms (OAB and UI) in college women and identifying associated factors may further our understanding of these conditions, and inform future research and practice.

#### **CHAPTER TWO:**

#### **OPERATIONAL DEFINITIONS AND LITERATURE REVIEW**

A description of operational definitions and an overview of existing literature is presented in Chapter Two. The literature review is organized under the following subheadings: (1) prevalence of lower urinary tract symptoms (LUTS); (2) burden associated with LUTS; (3) emerging adulthood; (4) young women's experiences with LUTS; (5) personal factors; (6) behavioral factors; (7) social factors; (8) environmental factors; and (9) gaps in the literature.

#### **Operational Definitions**

For the purpose of this study, key terms were operationalized and defined as follows.

#### **Terms Related to Lower Urinary Tract Symptoms (LUTS)**

For purposes of this study, terms related to LUTS were taken from the International Urogynecology Association (IUGA) and the International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction (Haylen et al., 2010; Haylen et al., 2012) and the ICS standardization of terminology for LUTS (Abrams et al., 2003). They include storage symptoms, voiding symptoms, and postmicturition symptoms (Abrams et al., 2003).

**Urinary symptoms.** For purposes of this study, the term 'urinary symptoms' is used synonymously with LUTS.

**Storage symptoms.** Storage symptoms occur during the bladder filling and storage phases and include overactive bladder (OAB) and urinary incontinence (UI) symptoms (Abrams et al., 2003; Haylen et al., 2010).

**Urinary incontinence (UI).** Urinary incontinence refers to involuntary leakage of urine (Abrams et al., 2003; Haylen et al., 2012).

**Stress urinary incontinence (SUI)**. SUI refers to involuntary loss of urine on exertion or with sneezing, coughing, laughing or with physical exertion (e.g., lifting) (Haylen et al., 2012).

**Urgency urinary incontinence (UUI)**. UUI refers to involuntary loss of urine associated with urgency (see below definition of Urgency) (Haylen et al., 2012).

**Mixed urinary incontinence (MUI)**. MUI refers to a combination of SUI and UUI and includes urinary incontinence that occurs due to urgency or due to exertion, effort, coughing, or sneezing (Abrams et al., 2003; Haylen et al., 2010).

**Nocturnal enuresis.** Nocturnal enuresis refers to the involuntary urinary loss of urine that occurs during sleep (Abrams et al., 2003).

**Coital incontinence**. Coital incontinence refers to the involuntary loss of urine with sexual activity (Haylen et al., 2012).

**Overactive bladder (OAB)**. OAB refers to symptoms of urgency, frequency, and nocturia with or without incontinence (Haylen et al., 2010).

**Urgency**. Urgency refers to a sudden overwhelming need to void that is difficult to ignore or put off (Haylen et al., 2010).

**Frequency**. Frequency refers to voiding more frequently than previously thought of as normal, or more than 8 daytime voids per day (Haylen et al., 2010; Van Haarst et al., 2004).

**Nocturia**. Nocturia refers to waking up 2 or more times at night to urinate whether able to make it to the bathroom in time or not. Waking up once per night has not been found to be bothersome and therefore is not considered clinically relevant nocturia (Tikkinen et al., 2010; Weiss et al., 2011).

**Voiding symptoms.** Voiding symptoms refer to any alteration in normal function or sensation of urination including hesitancy, weak stream, feeling of incomplete emptying, intermittency, spraying (or splitting) of urinary stream, dysuria, terminal dribble, and post-micturition dribbling (Haylen et al., 2012).

**Straining.** Straining to void describes using muscular effort to begin, continue the urinary stream or to completely empty the bladder (Abrams et al., 2003).

**Hesitancy**. Hesitancy is a perceived difficulty in initiating urination resulting in a delay in beginning the urine stream once the individual has voluntarily decided to pass urine (Abrams et al., 2002).

**Weak stream.** Slow or weak stream is the complaint of a urinary stream perceived as slower than perceived prior (Haylen et al., 2012).

**Feeling of incomplete emptying.** A subjective feeling of a continued need to pass urine immediately following urination, or a complaint that the bladder does not feel empty after urinating (Abrams et al., 2002; Haylen et al., 2012).

**Intermittency.** Intermittency refers to the complaint of urine flow that stops or starts during urination (Haylen et al., 2012).

**Spraying (or splitting) of urinary stream**. Spraying or splitting of the urinary stream is the complaint that urine passage is split or is a spray rather than a single stream (Haylen et al., 2012).

**Dysuria.** Dysuria is the complaint of pain, discomfort, or burning during urination (Haylen et al., 2012).

**Post-micturition symptoms**. Post-micturition symptoms include symptoms that occur immediately following completion of urination (Abrams et al., 2003).

**Terminal dribble**. Terminal dribble is a prolonged final stage of urination when the flow slows to a trickle or dribble (Abrams et al., 2003).

**Post-micturition leakage**. Post-micturition dribbling refers to further involuntary leakage of urine following the completion of micturition (Haylen et al., 2012).

**Symptom bother.** Symptom bother refers to the perceived influence of LUTS on activities of daily life (ADLs) and the extent to which these influences are seen as bothersome, troublesome or irritating.

#### **Terms Related to Personal and Behavioral Factors**

**Bladder health awareness/ knowledge.** This refers to conceptual understanding regarding bladder location, care, symptoms, relation to aging, and understanding of pelvic floor health and pelvic floor muscles.

**Toileting behaviors.** Toileting behaviors refer to events and behaviors that surround toilet use, including those related to voiding place, time, position, and style (Wang & Palmer, 2011).

**Care-seeking behavior.** Seeking help for urinary symptoms by discussing symptoms with a health care provider (e.g., nurse, nurse practitioner, physician) is considered care-seeking behavior.

**Self-management behavior.** For purposes of this study, self-management behavior will include any strategies the individual uses to control urinary symptoms. This may include use of products (e.g., menstrual pads, urinary incontinence pads or briefs, and impressa), preventative voiding strategies (e.g., limiting fluid intake, voiding before leaving the house or before activities), and avoidance behaviors (e.g., avoiding or deterring participation in activities that potentiate urinary symptoms, and avoiding bladder irritants including caffeine and tobacco).

#### **Literature Review**

The literature review summarizes the existing knowledge on the prevalence and burden of LUTS, specifically storage symptoms of OAB and UI, and current understanding of associated factors. The theoretical foundations of the SCT and the MM are used to highlight the different factors and variables influencing LUTS storage symptoms and what is known about them in the existing literature. Current literature on OAB and UI in young women will be synthesized and consideration of associated factors will include potential influence for college women. Gaps in the existing literature will then be discussed.

#### **Prevalence of LUTS**

A multistep process was used to identify articles for LUTS prevalence by first searching the records of online databases (CINAHL, Google Scholar, PubMed, and Scopus) with key words "(LUTS OR OAB OR UI OR urinary symptoms) AND (female

OR women)." Manual searches of references in identified articles as well as listed articles having cited identified articles were also considered.

Lower urinary tract symptoms (LUTS) are common chronic conditions that influence women worldwide. They are divided into three main categories of storage symptoms, voiding symptoms, and post-micturition symptoms (Abrams et al., 2003). Reported rates vary throughout the literature. Irwin and associates (2011) analyzed data from the U.S. Census Bureau International Data Base and found that 45.2% of the worldwide population in 2008 was affected by one or more LUTS. A large populationbased study of the Czech Republic, Russia, and Turkey found that 84% of women experienced at least one urinary symptom (Kogan et al., 2014). A recent study of Chinese nurses found that 67.5% had at least one LUTS (Xu, Chen, Wan, Zhang, Liu, & Wang, 2016). These high rates of occurrence make LUTS a significant public health concern (Irwin et al., 2011).

The most common lower urinary tract symptoms include storage symptoms of urinary incontinence (UI) and overactive bladder (OAB). OAB and UI are more common in women than in men (Irwin, Kopp, Agatep, Milsom, & Abrams, 2011; Kogan, Zachoval, Ozyurt, Schafer, & Christensen, 2014; Norton & Brubaker, 2006; Stewart et al., 2003). UI includes stress urinary incontinence (SUI), urge urinary incontinence (UUI), and mixed urinary incontinence (MUI) (Haylen et al., 2010). Published prevalence rates for UI vary widely and most are based upon samples of middle-aged and older women (Botlero, Urquhart, Davis & Bell, 2008). Reported rates of UI range from 23.7% to 75% (Botlero et al., 2008; Buckley & Lapitan, 2010; Juliato et al., 2016;

Kinchen, Lee, Fireman, Hunkeler, Nehemiah, & Curtice, 2007; Sampselle, Harlow, Skurnick, Brubaker & Bondarenko, 2002).

OAB includes symptoms of urgency, frequency, and nocturia with or without UI (Haylen et al., 2010). As OAB is related to urgency, UUI is most often associated with OAB. Rates similarly vary throughout the literature (Bartoli, Aguzzi, & Tarricone, 2010; Cheung, Khan, Choi, Bluth, & Vincent, 2009; Juliato et al., 2016; Teleman, Lidfeldt, Nerbrand, Samsioe, & Mattiasson, 2004). The National Overactive Bladder Evaluation (NOBLE) Program included 11,740 people in the United States and found that approximately 17% of women greater than 18 years of age were affected by OAB and 9.3% had UI (Stewart et al., 2003). A large population-based study of four European countries and Canada found that 13% of women reported OAB symptoms (Irwin et al., 2006). A similar European study found that 17.4% of women reported OAB symptoms; increased frequency was the most commonly reported symptom (85%), followed by urgency (54%), and UUI (36%) (Milsom et al., 2000). Other authors report rates of UUI alone to be over 12% (Stewart et al., 2003; Thom et al., 2006; Wein & Rovner, 2002). Bartoli and associates (2010) conducted a systematic review from 1980-2002 and found an average prevalence of OAB of 14%, with higher rates associated with population age. The United States OAB on Physical and Occupational Limitations study (OAB-POLL) (Coyne et al., 2013) used census-matched demographic data from 5,023 women and found the overall OAB prevalence was 30%; this rate also increased with age. Rates are thought to vary based on different instruments used in evaluation, as well as presumed differences in population based on environment and other factors (Bartoli et al., 2010).

Based upon data from the U.S. Census Bureau population predictions for 2010 to 2050, the number of women with LUTS is predicted to increase; the prevalence of UI alone is expected to more than double by the year 2050 (Wu, Hundley, Fulton, & Myers, 2009). This projected increase is due to the projected aging of the population as higher rates of OAB and UI are associated with increasing age (Coyne et al., 2013; Norton & Brubaker, 2006; Nygaard et al., 2008). An estimated 2.3 billion people will be affected by at least one LUTS, which constitutes an 18.4% increase in the rate during the last decade (Irwin, Kopp, Agatep, Milsom, & Abrams, 2011). Similarly, rates of OAB and UI have increases highlight the need for public health efforts to prevent and manage these conditions.

#### **Burden Associated with LUTS**

LUTS have been associated with severe health-related quality of life (QOL) and economic consequences that carry a significant public health burden.

**Health-related burden.** LUTS storage symptoms of OAB and UI have been associated with decline in QOL and psychological well being, unsatisfying social and sexual relationships, limitation in activity and activities of daily life (ADLs), and increases in other co-morbid conditions (Coyne et al., 2004; Coyne et al., 2007; Coyne et al., 2008; Dmochowski & Newman, 2007; Irwin et al., 2006).

OAB and UI have been shown to negatively impact social and professional life as well as sexual health and function (Coyne et al., 2004; Coyne et al., 2007; Coyne et al., 2008; Dmochowski & Newman, 2007; Irwin et al., 2006). A study by Dmochowski and Newman (2007) found that significantly more women with OAB reported unsatisfying relationships than women without OAB symptoms and that about one in eight women felt that they had to make compromises in their work or social lives. OAB and UI have also been associated with impaired sexual function including decreased satisfaction with arousal, orgasm and lubrication, resulting in shame or avoidance of sexual encounters (Alatas, Ozkan, & Ogce, 2013; Roglaski, 2005; Sampselle et al., 2008). SUI has been associated with increased leakage during penetration and UUI has been associated with urinary leakage during orgasm (Barber & Mullen, 2005; Coyne et al., 2006). In a qualitative study of middle-aged women (mean of 53 years old) with LUTS women reported they felt unsatisfied in their sexual relationships due to pain, fear of leaking, or anxiety (Coyne et al., 2006).

Symptoms of OAB and UI have been shown to negatively impact ADLs and QOL (Rogalski, 2005; Stewart et al., 2003). In a study of 898 women (mean age of 50 years old), women with OAB were more likely to perceive interruption in their ADLs and QOL (Dmochowski & Newman, 2007). Many women with UI avoid certain activities and travel due to symptoms (Sampselle et al., 2000).

Women with OAB generally report being less healthy than women without symptoms (Dmochowski & Newman, 2007; Muller, 2013). OAB and UI have been associated with decreased psychological well-being, feelings of shame, mental stress, worry, and increased rates of depression and anxiety in middle-age women (Dmochowski & Newman, 2007; Rogalski, 2005; Nygaard et al., 2003). Women with severe UI symptoms experience an 80% increased risk of depression compared to other women (Nygaard et al., 2003).
Most studies on health burden have been conducted with older women, however studies with younger women also illustrate significant bother and lower perceived overall well-being (O'Halloran et al., 2012; Parden et al., 2016). Despite minimal literature in young women, a study with young women (mean age ~ 20 years) with UI also had much lower reported psychological well-being than women without UI (O'Halloran et al., 2012).

**Economic burden.** LUTS have been associated with a very high economic burden that includes costs of treatment, increased nursing home admissions, and costs of over-the-counter products. In the U.S., the annual costs of UI alone exceed 12 billion dollars annually (Wilson, Brown, Shin, Luk, & Subak, 2001). The actual expenditure is difficult to estimate because the costs of absorbent pads, laundry, and hygiene products are usually out-of-pocket (Davis, 2008; Herbruck, 2008; Subak et al., 2006). It is estimated that after diabetes test strips and stoma care products, the cost of urinary pads or briefs are the next greatest expenditure for health supplies (Morrison & Levy, 2006). With some of these considerations in mind, the annual economic burden of treatments and symptom management is estimated at approximately \$51.4 billion dollars annually (Hu et al., 2004). The total costs of LUTS, specifically storage symptoms, are substantial and are greater than the costs of other serious conditions for women including breast cancer management (Landefeld et al., 2008). This high societal economic burden highlights the importance of prevention and management of this public health issue.

# **Emerging Adulthood**

For most young women in the United States, the period from late adolescence through the mid-twenties represents a transitional time of change and development. With the delays in marriage and childbirth seen during the past few decades, modern psychologists have proposed a transitional stage, occurring between 18- to 25-years-old, called 'emerging adulthood' ; during this phase individuals are free of the dependency of adolescence but have not yet assumed the responsibilities of early adulthood (Arnett, 2000). Emerging adulthood is described as a time of identity exploration in terms of work, school, relationships, and love (Arnett, 2014). It marks an age of instability when many graduate high school and move on to either college or temporary work. There is a newfound independence as the routine structure of family and school is replaced with peer relationships and freedom of opportunities. This time is often described as being caught in between adolescence and adulthood (Arnett, 2014).

A major reason for this in-between time of emerging adulthood is that more high school graduates are attending college than ever before; 71.9% of female high school seniors enroll in institutions of higher education following graduation (U.S. Bureau of Labor Statistics, 2017). The high rate of college enrollment has been associated with a later start to marriage and family planning. The median age of marriage in 1960 was about 20-years-old; in 2017, the median age at marriage was 28-years-old (U.S. Census Bureau, 2017). The average age for first childbirth in the United States was 26.4 years old in 2017 (Centers for Disease Control and Prevention, 2017a). Emerging adulthood is a subjective time; some adolescents transition earlier into young adulthood while other 30-year-olds are still caught up in a time of identity exploration (Arnett, 2014). For this

reason, this study focuses on the unique development of female undergraduate college students (18- to 23-years-old). This stage represents a transition from living under the control of parents and family to new-found independence. Many of the behaviors adopted during this time are carried into young adulthood and beyond.

**Young women in college.** College enrollment is up 20% since 2003 with approximately 21 million students enrolled in institutions of higher education in the United States, 57% of whom are female (National Center for Education Statistics [NCES], 2016). These increasing rates place the specific needs of college students as an emerging importance. College marks the first time that many young people are living away from home and presents opportunities for high-risk behaviors (e.g., sexual encounters, alcohol use, and other drugs). College also presents social pressures related to relationships, sexual pressures, alcohol, and other drugs. There is often a freedom from the structures of high school and family life as class attendance is not always required, which can present stressors in balancing class work, social relationships, and other activities (Centers for Disease Control and Prevention [CDC], 2016c).

Many mental health conditions arise at this time including anxiety and depression. Between 15- and 24-years-old, suicide is the second leading cause of death (CDC, 2015). Other major health concerns for college students include alcoholism, disordered eating, unintended pregnancy, sexually transmitted infections (STIs), and sexual assault (Soleimanpour, Geierstanger, Kaller, McCarter, & Brindis, 2010). Struggling with health concerns has been correlated with poor academic success and may present issues in future professional and personal development (American College Health Association [ACHA], 2013).

College also marks a time of self-discovery and experimentation, both sexually and with substances (e.g., alcohol, tobacco, and other drugs). About half of all newly diagnosed sexually transmitted infections occur between 15- to 24-year-olds (CDC, 2016c). Similarly, alcohol and tobacco use among college students continue to be significant public health issues (CDC, 2015; CDC, 2016b; Rigotti et al., 2010). An estimated 60% of college students report alcohol consumption, 66% of which engage in heavy or binge drinking, defined as the consumption of 4 or more drinks for women at one time (National Institute of Alcohol Abuse and Alcoholism [NIAAA], 2015). Emerging adulthood (young adults between 18- to 34-years-old) reports the highest rates of binge drinking (CDC, 2016a; CDC, 2016b) and those enrolled in college are more likely to engage in binge drinking than those who do not attend college (Grucza et al., 2009). Initiation of smoking habits often begins in college with almost 40% of students enrolled in college reporting their first use of a tobacco product while in college (Rigotti et al., 2010). In general, national and state rates of tobacco use in the United States are declining and these rates are being seen on college campuses as well. In a sample of college students in the northeast (Angelini, Sutherland, & Fantasia, 2017b) fewer than 5% of the women reported tobacco use while almost 90% reported consuming alcohol. Many college students do not identify themselves as "smokers" because they only use tobacco socially on the weekends or with alcohol use (Levinson et al., 2007). The effects of social smoking on health are not completely understood (Levinson et al., 2007; Shiffman et al., 2015).

Aside from concerns regarding substance use and sexuality, healthy eating and exercise routines are common challenges for college populations. Rates of obesity on

college campuses are increasing (Sparling, 2007) and are associated with higher rates of other metabolic conditions including diabetes and hypertension in this population. There is an abundance of food options in college dining facilities and students are often faced with the ability to make decisions on what to eat for the first time in their life. After high school sports and activities end, students are often challenged to join college sport teams or establish their own exercise routine. These health decisions are part of self-discovery in emerging adulthood as students become more independent of the structures provided by their families up until this point.

Female college students are more likely than their male counterparts to utilize university health care services (Turner & Keller, 2015). A recent study on college student health care utilization (Angelini, Sutherland, & Fantasia, 2017a) found that female college students sought care for specific issues including gynecologic and genitourinary care. Urinary symptoms, particularly UTIs, are common complaints in this population (Angelini, Sutherland, & Fantasia, 2017a) and management could include education on urinary health and both symptom identification and prevention in this age group.

College women are exposed to many new opportunities to make their own health, school, social, and sexual life decisions independent of their parents. Many of these decisions and behaviors they carry with them later in to young adulthood. This unique time in the life course, presents certain characteristics that set it apart from adolescence and young adulthood. Women in emerging adulthood are of reproductive age, but most have not been pregnant or begun to start their families. Understanding the unique health concerns of college students can help to identify factors that may be associated with urinary symptoms for these women.

## Young Women's Experiences with LUTS

Research on LUTS in reproductive aged women has focused mainly on pregnancy and the post-partum period (discussed later in this review). There have also been several studies with nursing and medical students. Health science majors have broader knowledge on genitourinary health and may adopt different work and life behaviors than the larger college population. However, even among nursing students, knowledge of UI was low with many unsure of the risk factors for UI and the effects of aging and pregnancy on UI (Hutchings & Sutherland, 2014; Luo, Parry, Huang, Wang, & He, 2016).

Much of the research on LUTS in this age group focuses on UI, particularly SUI in female athletes (McAfee et al., 2015). Among high impact athletes, rates of UI were found to be high; it is commonly reported that as many as one in three athletes experience UI (Carls et al., 2007; Simeone et al., 2010). Almeida and associates (2016) found UI in athletes and non-athletes (52.2% versus 27.1%), and found that both groups reported changing behaviors to avoid leaking urine. Rates of UI are reported to range from 10% to 25% in young women less than 30 years of age regardless of athletic involvement (Bardino, Di Martino, Ricci, & Parazzini, 2015; Carls, 2007; Hagglund, Olsson, & Leppert, 1999; O'Halloran, Bell, Robinson, & Davis, 2012; Parden et al., 2016; Siracusano et al., 2003; Van Breda et al., 2015). Research findings related to mixed UI describe the development of "pseudo-urgency" from changed bladder habits due to experiences with SUI (Bandukwala & Gousse, 2015). As female athletes commonly report having SUI, it is becoming increasingly more important to understand the factors associated with SUI and other urinary symptoms in young women. UI in early life has

been shown to be a strong predictor of UI in later life (Bo & Sundgot-Borgen, 2010). Knowledge on OAB and UI prevalence in young women may be important to establish a baseline of 'normal" for the general population (van Breda, Bosch, & de Kort, 2015). Understanding contributors and experiences of LUTS storage symptoms in younger women may help to decrease the prevalence and associated burden of this public health issue for women of all ages.

Rates of LUTS among young women vary widely throughout the literature. Experience of at least one LUTS was reported in 94.3% of a sample of presumably healthy medical students aged 18- to 30-years-old (van Breda et al., 2015). Sjogren and associates (2017) found that 19.3% of a sample of 173 Swedish women (mean age of 21.6 years) reported nocturia twice or more per night, 50.9% reported a frequency of more than 9 voids per day, and 34.2% reported urgency symptoms. UI was reported in 35.9% of this population. This UI rate was greater than rates reported by authors in other studies. However, fluid intake was not assessed in this study; it is unknown whether excessive fluid intake may have been associated with the greater frequency of UI. Other studies with young women found daytime urinary frequency (> 9 voids) reported by 9.5% of young women and UI reported by 20.1% (van Breda et al., 2015). Another recent study of 1,092 women, 19- to 30-years-old, found that the overall prevalence of UI symptoms was less among nulliparous women than among women who had previously been pregnant (8.8% versus 28.7%). However there were no differences in UUI between these groups (Parden et al., 2016). These differences in rates may be due to measurement, sampling, parity, or other factors that may influence experience and presentation of LUTS.

Other research on reproductive aged women has looked at correlations between weight, hormonal contraceptive use, and LUTS. A systematic review of UI and obesity demonstrated that increased body mass index (BMI) was positively associated with increased UI symptoms and, subsequently, weight loss was a predictor of decreased symptoms (Greer, Richter, Bartolucci, & Burgio, 2008). Emerging adulthood, and specifically the transition to college, has often been linked to increases in overweight status with the notorious 'freshman fifteen' (Gow et al., 2010). Many of the diet and exercise behaviors of adulthood are initiated in college years; overweight college students are more likely to remain overweight as adults (Gow et al., 2010). On the other side, issues with disordered eating (e.g., anorexia and bulimia) often arise during college years. Studies have shown an association between eating disorders and LUTS, specifically UI (Araujo et al., 2008; Bo & Sundgot-Borgen, 2001).

There may also be additional factors during the years of emerging adulthood and transition to college life that place young women at increased risk for experiencing LUTS storage symptoms. Some studies have shown that college education was a risk factor for OAB among middle-aged women (Coyne et al., 2013). O'Halloran and associates (2012) also found the rate of UI among young women was slightly more in students (13.2%) than in nonstudents (10.6%) of similar age.

There is limited literature on factors, beyond demographic factors, that are associated with LUTS in college-aged women. Our understanding of factors associated with LUTS is based largely on middle-aged women and older women aside from influences of athletics, parity, and obesity. The ranges in prevalence and high cost associated with LUTS increases the importance of assessing the many factors that

contribute to the experience of LUTS in women. With the MM and SCT as guiding frameworks, literature on the personal, individual-behavioral, social, and environmental influences of LUTS storage symptoms, specifically OAB and UI, is reviewed.

## **Personal Factors**

Personal factors that influence LUTS include socio-demographic factors, knowledge about LUTS and bladder health, medications, chronic conditions, and pregnancy (Robinson & Cardozo, 2013). There are currently limited data on the lifestyle and other personal factors surrounding LUTS (Bravendam et al., 2016).

**Socio-demographic factors.** The most common predictor of LUTS is increasing age. There are conflicting data as to whether LUTS are influenced by race and/or ethnicity.

*Age.* Several studies have illustrated the increased prevalence of LUTS with increasing age (Irwin et al., 2006; Kim et al., 2012). Norton and Brubker (2006) found a prevalence of LUTS storage symptoms in 20-30% of young adult women, increasing to 30-40% in middle-aged women, and 30-50% in the elderly. Rates for UI in women under 30 years old range from 10-13% while rates for women 31- to 40-years-old increase by 20% (Hagglund et al., 1999; O'Halloran et al., 2012). OAB similarly increase with age. The United States OAB on Physical and Occupational Limitations study (OAB-POLL) (Coyne et al., 2013) used census-matched demographic data of 5,023 women and found the overall prevalence of OAB in women 18- to 24-years-old was 2% versus 19.1% of women 65- to 74-years-old.

*Race/ethnicity*. The literature has varying results regarding the associations of race and ethnicity on LUTS symptoms. The OAB-POLL (Coyne et al., 2013) found

higher rates of OAB in Black and Hispanic women age 18- to 29-years-old (24-26%) versus White women (14.9%), however rates across other LUTS were similar (except for OAB and UUI) which may represent that racial and ethnic groups were serving as a proxy for another unmeasured risk factor. Similar studies have shown an increased prevalence of UUI in Black women (Dooley et al., 2008; Fenner et al., 2008). Another large population based study, the Epidemiology of Lower Urinary Tract Symptoms (EpiLUTS) study, found OAB rates were highest among Black women and that Asian women were less likely to seek treatment for symptoms (Coyne et al., 2012). Other studies have shown no difference in OAB or UUI across groups (Finklestein, Glossner, Sanchez, & Uddin, 2008; Kupelian et al., 2006; Markland, Thompson, Ankerst, Higgins, & Krauss, 2007). Some authors have found that UI, specifically SUI, is more common among White women than in other groups (Thom et al., 2006; Townsend, Curhan, Resnick, & Grodstein, 2010). Tennstedt and associates (2008) found that White non-Hispanic women were more likely (35.4%) than Black (9.4%) and Hispanic (14.5%) women to report SUI. These differences in the influence of race/ethnicity may be due to differences in measurement, sampling, or genetic factors that affect symptoms (Wennberg et al., 2011). Some cultural or societal factors may also contribute to variations in LUTS across groups.

**Knowledge and awareness of bladder health.** Women's lack of knowledge about urinary symptoms may lead to misperceptions and delayed care-seeking and management (Mandimika et al., 2014). Often women do not recognize that UI is a medical problem (Basu & Duckett, 2009; Shaw, 2001). Women who avoid care-seeking are more likely to believe that UI and LUTS are normal and are unaware of available

treatment options (Kinchen et al., 2003). Two recent studies found that women often perceived UI symptoms as normal (Luo et al., 2016; Smith et al., 2011). In one study of 1,365 Chinese nursing students, only 35% knew that UI was not a normal part of aging and only 37.5% knew that UI was not a normal occurrence after childbirth (Luo et al., 2016). One study found that 18.3% of incontinent women reported never having heard of the pelvic floor, and 24.6% reported having heard of it but not knowing what it was (Bardino et al., 2015). There were also misunderstandings about healthy bladder behaviors. One in three women believe that premature voiding, voiding before leaving the house or before certain activities without the urge to do so, will relieve symptoms of LUTS and prevent infection (Xu et al., 2016).

There is a lack of knowledge among women, especially young women, regarding urinary symptoms and normal bladder behaviors (e.g., avoiding straining, voiding without urge) (Howard-Thornton, Craine, Holden, & Pearl, 2011; Mandimika et al., 2014; Sjogren et al., 2016; Pauwels, De Laet, De Wachter, & Wyndaele, 2006). In a study of 168 high-school students, mean age 14.1 years, only 18% knew how urine exited the body and only 37% knew there were three openings in the female pelvic region (Herbert-Beirne et al., 2015). In a qualitative study of young women (mean age of 27 years) many did not report learning about pelvic floor disorders until they experienced childbirth (Howard-Thornton et al., 2011). This lack of understanding is potentiated by common misperceptions regarding LUTS and social stigma surrounding symptoms. Many young women perceive urinary symptoms as embarrassing or as a condition that is normal only in older women (Tremback-Ball et al., 2008). Many incontinence products (e.g., pads and briefs) are marketed towards older women and young women may not feel

that they are intended for them (Peake et al., 2003). Education has been shown to increase care-seeking behavior and improve expectations for treatment outcomes for LUTS (O'Connell, Wellman, Baker, & Day, 2006). Bladder health education that begins at pregnancy and childbirth might not be soon enough (Parden et al., 2016).

**Medications.** LUTS storage symptoms may also occur as common side effects of several medications. Hormones, specifically estrogens, have been reported to influence OAB and UI presentation in several studies. As part of the Nurses' Health Study, Townsend and associates (2009) found that women between 25- to 40-years-old who had ever used oral contraceptives reported greater UI symptoms, especially UUI. However of other studies with similar age cohorts, oral contraceptives were associated with a decreased risk of UI (Iliadou, Milsom, Pedersen, & Altman, 2009; O'Halloran et al., 2012). The Women's Health Initiative Randomized Control Trial found that menopausal women being treated with estrogen containing hormone therapy had an increased risk of UI within one year of beginning therapy (Hendrix et al., 2005). Although findings are inconsistent and vary across studies, there is evidence to support an effect of estrogen on LUTS storage symptoms and the need for further study. In contrast, a separate study with reproductive- aged women found that the progesterone-releasing IUD had no effect on LUTS (Iliadou et al., 2009). As hormonal contraception use is common in reproductive aged women, special consideration is indicated in a college population.

Other medications that have been associated with LUTS storage symptoms have been identified and include diuretics, some antidepressants, and several cardiac medications. Cardiac medications, including calcium channel blockers and angiotensinconverting enzyme (ACE) inhibitors, relax the urinary sphincters and slow bladder

muscle contractions causing increased urinary leakage (Newman & Giovannini, 2012; Rantell, 2014). Diuretics increase urine production, which can cause increased frequency and urgency (Newman & Giovannini, 2012; Rantell, 2014).

Several antipsychotics and antidepressants, including selective serotonin reuptake inhibitors (SSRIs) and atypical antipsychotics (AAPs), have been associated with LUTS storage symptoms (Hall, Maserejian, Link, Steers, & McKinlay, 2012; Rantell, 2014). Mental health concerns, including depression and anxiety, often arise during college years and consideration of the effects of anti-depressants and other medications in this population merits attention.

**Chronic health conditions.** Many chronic conditions including obesity, and chronic constipation have been associated with LUTS and UI due to an increased intraabdominal pressure (Sung & Hampton, 2009). The International Continence Society (ICS) 5<sup>th</sup> International Consultation on Incontinence (Abrams et al., 2012) report that SUI is often caused by injury during childbirth, high body mass index (BMI), chronic constipation, low pelvic muscle tone, and urethral hypermobility, while UUI is often caused by involuntary bladder contractions.

*Obesity.* Obesity has been shown to potentiate LUTS and specifically UI due to increased intra-abdominal pressure (Sung & Hampton, 2009; Tennstedt et al., 2008). In a systematic review of UI and obesity, increased body mass index (BMI) was positively associated with increased UI symptoms (Greer, Richter, Bartolucci, & Burgio, 2008). This increase is associated with increased pressure and strain on the pelvic floor from added weight (Dallosso et al., 2003; Richter et al., 2008; Teleman, Lidfeldt, Nerbrand,

Samsioe, & Mattiasson, 2004; Zhang et al., 2006). Weight loss has been associated with decreased LUTS (Zhang et al., 2006).

*Constipation.* Due to increased pressure on the pelvic floor associated with pressure and straining from chronic constipation, there is a significant association between constipation and LUTS storage symptoms specifically UI and OAB (Abrams et al., 2012; Kinnunen, 1991; Sung & Hampton, 2009). Studies have found constipation to be linked to increased UI and alleviation of constipation has been shown to decrease both OAB and UI symptoms (Carach, 2001; Qassem et al., 2014; Snooks, 1985). About one in four college women in the U.S. report experiencing constipation, diarrhea, and irritable bowel syndrome (Alaqeel, Alowaimer, Alonezan, Almegbel, & Alaujan, 2017; Heidelbaugh et al., 2015).

*Eating disorders.* Studies have shown an association between history of eating disorders and LUTS, specifically UI (Araujo et al., 2008; Bo & Sundgot-Borgen, 2001). The association was attributed, in part, to increased intra-abdominal pressure from persistent vomiting, low states of estrogen in anorexia or female athlete triad, and/or low muscle tone from lack of adequate nutrition (Bo & Sundgot-Borgen, 2001).

*Mental health.* Anxiety and depression have been associated with increased rates of UI and OAB across several studies (Coyne et al., 2013; Robinson & Cardozo, 2003; Tennstedt et al., 2008). Rates of mental health issues, anxiety and depression among college students are reportedly greater than 15% (Eisenberg, Gollust, Golberstein, & Hefner, 2007). As such, studies of LUTS storage symptoms among college women should consider the potential influence of mental health disorders and related medications on LUTS.

**Childhood enuresis.** Childhood toilet training is important to understanding of LUTS in young adulthood because early perceptions and beliefs regarding bladder health and toileting contribute to behaviors in adult life (Palmer et al., 2012). In the United States, 'accidents' during toilet training are often perceived as bad behaviors associated with shame, guilt, and embarrassment (Garcia et al., 2005). Negative reinforcement in response to UI and bedwetting (nocturnal enuresis) in childhood has been associated with increased rates of LUTS in older children and young adults (Bakker & Wyndaele, 2000). Bladder problems in childhood has been associated with increased rates in childhood has been associated with increased rates of UI and OAB later in life (Brown et al., 2010; Kuh, Cardozo, & Hardy, 1999; Siracusano et al., 2003). Several studies have found associations between childhood nocturnal enuresis and LUTS storage symptoms in adulthood (Kuh, Cardozo, & Hardy, 1999; O'Halloran et al., 2012; Siracusano et al., 2003).

**Pregnancy.** Pregnancy has been found to be a major risk factor for SUI and UUI (Brown, Donath, MacArthur, McDonald, & Krastev, 2010; MacLennon, Taylor, Wilson, &, Wilson, 2010). About 1 in 3 women will experience UI both during and after pregnancy (Boyle, 2012). Rates during pregnancy range from 30-60% while postpartum rates range from 6-35% (Burgio et al., 2003). UI rates increase throughout the course of the pregnancy from 10.8% pre-pregnancy to 55.9% during the third trimester (Brown et al., 2010).

Recommended primary prevention strategies include performing pelvic floor muscle exercises (PFM) exercises before and throughout pregnancy to decrease UI postpartum, decrease vaginal trauma during delivery, and assist in expediting recovery

time (Moore, 2013; Wesnes, 2013; Morkved & Bo, 2014; Pelaez, Gonzalez-Cerron, Montejo, & Barakat, 2014). The strongest predictor of UI in pregnancy was occasional leakage (less than once a month) prior to pregnancy (Brown et al., 2010). College often represents a time prior to family planning and pregnancy. Identification of LUTS storage symptoms and subsequent risk prior to pregnancy could help decrease progression of symptoms during pregnancy. Pregnancy is recognized as a transitional time where women are open to behavior change (Olander, Smith, & Darwin, 2018). Preconception education on LUTS storage symptoms and bladder health then should be considered in the nulliparous college female population.

# **Behavioral Factors**

Individual behaviors and lifestyle choices also contribute to LUTS storage symptoms. Dietary intake or consumption of bladder irritants such as caffeine, alcohol, and nicotine may also contribute to LUTS. Personal behaviors including athletic and exercise involvement have been shown to increase storage symptoms. Similarly, beliefs and values about bladder health are adopted at a young age and influence bladder habits and behaviors later in life (Garcia, Crocker, & Wyman, 2005; Palmer, Athanasopoulos, Lee, Takeda, & Wyndaele, 2012). These behaviors can arise in response to symptoms, can lead to symptoms, or both. This section will describe the role of bladder irritant consumption, athletic/exercise behaviors, toileting and bladder behaviors on LUTS, as well as the subsequent care-seeking and self-management behaviors women adopt in response to symptoms. Ingestion of bladder irritants, fluids, and other substances. Certain foods and drinks can exacerbate urinary symptoms and have been associated with increased urinary urgency, frequency, and/or UUI. Known bladder irritants include acidic and spicy foods, sugar and artificial sweeteners, alcohol, caffeine, and tobacco (Dallosso, McGrother, Matthews, & Donaldson, 2003; Riesenhuber, Boehm, Posch, & Aufricht, 2006). However, a systematic review of the effect of coffee, fluid, tobacco and other irritants on LUTS found limited inconclusive or contradictory results (Bradley et al., 2007). College students are among the top consumers of several bladder irritants including caffeine, alcohol, tobacco, and carbonated beverages. Further research is needed to examine associations between these bladder irritants and LUTS storage symptoms in college women.

*Caffeine*. Caffeine is a known diuretic and potentiates frequency symptoms, which can increase urgency and UUI (Creighton & Stanton, 1990; Riesenhuber et al., 2006). Women with increased caffeine intake have been found to have more than double the rate of urinary urgency than those who do not (Hannestad, Rortveit, Daltveit, & Hunskaar, 2003; Maserejian, Wager, Giovannucci, Curto, McVary, & McKinlay, 2013). Caffeinated sodas have similar effects as coffee and other caffeinated beverages.

*Carbonation and sweeteners.* Non-caffeinated carbonation and added artificial sweeteners have also been associated with increased LUTS symptoms. Dallosso and associates (2003) found an association between carbonated beverages and UUI and OAB. Artificial sweeteners, found in many sodas and beverages, were shown to increase detrusor contraction and therefore OAB and UUI symptoms (Dasgupta, Elliott, Doshani, & Tincello, 2006). Although the data on the effects of carbonated beverages and

artificial sweeteners are limited, and at times contradictory, there is some preliminary evidence to suggest that limiting these irritants may reduce LUTS (Miller et al., 2016; Robinson et al., 2017).

*Alcohol.* Although there is limited research, alcohol is a known bladder irritant (Dallosso et al., 2003; Maserejian et al., 2013; Taari, Ruutu, Lehtonen, 1990) and has been anecdotally associated with increases in LUTS symptoms. Systematic reviews of alcohol's effect on LUTS are limited and often contradictory (Bradley et al., 2007). However, there are preliminary data to support the notion that limiting alcohol intake may decrease LUTS severity (Miller et al. 2016; Robinson et al., 2017). An estimated 60% of college students drink alcohol and 66% of those who drink engage in heavy or binge drinking, defined as the consumption of 4 or more drinks for women in a two-hour time frame (NIAAA, 2015). Thus, understanding the associations between alcohol intake and LUTS symptoms in female college students is essential.

*Fluid intake.* Fluid intake and urination are closely linked. Excessive fluid intake has been shown to exacerbate storage symptoms of OAB and UI (Arya & Asfaw, 2009; Beetz et al., 2003; Bradley et al., 2017; Callan et al., 2015; Wood et al., 2018). In contrast, restricting fluid may concentrate the urine and act as a bladder irritant, also aggravating OAB and UI symptoms and potentially increasing comorbid health conditions (e.g., kidney stones and chronic constipation) (Arya & Asfaw, 2009; Wood et al., 2018). Recommended daily intake of water varies based on age and condition, but in general for women is 2.7 liters, approximately 11 cups (Campbell, 2004). More evidence is needed for management and recommendations regarding the role of fluid intake and exacerbation of urinary symptoms (Bradley et al., 2017).

*Tobacco*. Recent studies have found associations between smoking and LUTS storage symptoms (Bump, 1992; Coyne et al., 2013; Hannestad, Rortveit, Daltveit, & Hunskaar, 2003; Koley, 1984). Women who smoke regularly are more than twice as likely to have LUTS (Maserejian et al., 2012). Many college women use other forms of tobacco (e.g., vaping) and/or self-identify as 'social smokers' in that they only smoke on weekends or when they consume alcohol (CDC, 2015).

Athletics/exercise behaviors. Athletic and exercise involvement have been shown to increase LUTS storage symptoms. UI is common among female athletes and is highly under-reported (Goldstick & Constantini, 2014). Rates of UI among college and elite athletes range from 28 to 80% with the highest prevalence found among athletes who engage in high-impact sports (Carls et al., 2007; Caylet et al., 2006; Eliasson et al., 2002; Simeone et al., 2010; Sung & Hampton et al., 2009; Thyssen, Clevin, Oleosen, & Lose, 2002). In a study of young nulliparous women, UI (specifically SUI) was highest in high impact and strengthening activities including volleyball, and gymnastics with gymnasts having the highest rates (Almeida et al., 2016). UI in athletes was higher (52.2%) than in non-athletes (27.1%) with both athletes and non-athletes reporting changing or altering behavior to avoid leakage (Almeida et al., 2016). Although SUI is most common among high impact athletes, UUI is also commonly reported especially in cyclists and soccer players (Simeone et al., 2010).

Many women who participate in other forms of physical activity also experience LUTS. About one in three women report leakage during at least one type of exercise despite being continent otherwise (Nygaard et al., 1990). Among women who report regular exercise, UI rates range from 7-38% depending on the type of exercise (Bo et al.,

2008). High impact physical activity has been associated with higher rates of UI (Caylet et al., 2006) and even long-term low-impact activity has been associated with UI in young nulliparous women (Eliasson et al., 2005). Nygaard and associates (2005) found that participation in strenuous activity during the adolescent years contributed to increased rates of UI in middle age and older women. Other authors have found that participation in high-impact athletics in college or young adulthood alone did not predispose women to UI, however history of leaking during physical activity when younger was found to be associated with increased risk of leaking later in life (Bo & Sundgot-Borgen, 2010). The effect of physical activity on UI is known and presents an opportunity for providers to screen and open communication regarding pelvic floor muscles and bladder health with young active females (Angelini, 2017c).

**Toileting and bladder behaviors.** In a concept analysis of toileting behaviors related to elimination patterns in women (Wang & Palmer, 2010), urination was defined as the set of voluntary actions related to emptying the bladder and includes place, time, position, and style. Understanding the multiple aspects of urination behaviors is essential to assessment of the onset and experience of LUTS in women (Liao et al., 2008). The antecedents to the actual behavior are of importance as there is a dualistic relationship between symptoms and behavior; whether symptoms are the cause of certain behaviors or vice versa.

There is strong evidence to support behavioral training and bladder re-training in the treatment for UI (Burgio et al., 2002; Mattiasson, 2003). Education and awareness of current bladder behaviors are the foundation for behavioral and lifestyle intervention

(Wyman et al., 2009). Typically, the bladder should be emptied every 3 to 4 hours (Wyman, Burgio, & Newman, 2009). Other dysfunctional bladder patterns and behaviors include voiding without the urge (or 'just in case'), voiding upon first desire, and fluid restriction to decrease frequency (Wyman et al., 2009).

Toileting behaviors associated with LUTS include delayed voiding, premature voiding, strained voiding, and crouching or hovering over the toilet (Palmer et al., 2012). Delaying the urge to void, or delayed voiding, is common among women and can lead to over-distension of the bladder (Wang & Palmer, 2010). Xu et al. (2016) found that 53.6% of women reported that they often or always delayed voiding when busy; 42% reported that they suppressed the urge to void at work and waited more than 4 hours to urinate. Premature voiding, voiding without the urge or sensation to void, is equally common and often associated with childhood behaviors and desire to avoid the need to use public restrooms (Wang & Palmer, 2010). One study found that experiencing LUTS was strongly related to reports of premature voiding (Sjogren, Malmberg, & Stenzelius, 2017). Strained voiding is defined as straining or pushing down to hurry the process of voiding either to begin voiding, continue voiding, or speed up voiding (Wang & Palmer, 2010). Although it is unclear the effect straining has on LUTS (Pauwels et al., 2006; Robinson et al., 2012), studies have found a relationship between strained voiding and LUTS (Sjogren et al., 2017; Xu et al., 2016).

Optimal bladder emptying involves assuming a relaxed position and allowing time for the bladder to empty completely without straining (Lukacz et al., 2011). Crouching or hovering over the toilet, often to avoid sitting on public toilets, decreases the ability of the pelvic muscles to relax and adequately empty the bladder (Moore,

Richmond, Sutherst, Imrie, & Hutton, 1991). Xu and associates (2016) found that 32.1% of women reported often or always crouching or covering over the toilet when away from home. Place preference for voiding includes the desire to avoid public restrooms. In young women (mean age of 21 years), the most frequently reported toileting behaviors were place preference and delayed voiding (Sjogren et al., 2017). This irregular and infrequent voiding pattern from trying to avoid school or work toilets is associated with increases in LUTS among women (Botlero et al., 2008; Brown et al., 2010; MacLennan et al., 2000). LUTS that are due in part to dysfunctional toileting behaviors can be decreased with the correction of toileting patterns and education on healthy toileting behaviors (Sjogren et al., 2016).

**Care-seeking behaviors.** Misconceptions, embarrassment, social taboos, and lack of knowledge regarding LUTS are significant barriers to care-seeking (Bradway et al., 2008; Resnick et al., 2006). In a study of college students, 18- to 30-years-old, 71% reported being unable to speak about their UI; 15% reported that they would seek care for their symptoms (Tremback-Ball, Levine, Perlis, & Dawson, 2013). About half of women with UI or OAB report discussing symptoms with their care provider (Benner et al., 2007; Griffiths et al., 2006). Some studies report care-seeking rates that are even lower, in the 15-40% range (Hagglund et al., 2001; Kinchen et al., 2013; Kogan et al., 2014). In a recent study by Dmochowski and Newman (2007), women who did not report symptoms to their provider offered the following reasons: 84% felt the symptoms were not important enough to bother with; 71% reported never being asked about symptoms by their provider; 69% felt symptoms were normal and just something to live with; and 59% did not want medication management for symptoms. Kogan and associates (2014) found

similar reasons reported by women for not seeking care for LUTS symptoms: symptoms were not severe enough (34%); symptoms perceived as a normal part of aging (24%); perceived as too embarrassing (16%); and preferred to self-medicate (15%).

Those with greater symptom bother and effect on QOL were more likely to report seeking care (Dmochowski & Newman, 2007). Most of the literature on LUTS care-seeking behavior has focused on older women or care-seeking specifically for SUI (Kinchen et al., 2003; Koch, 2006). Of those women who did seek help, 74% reported waiting for more than a year to do so; 46% of women reported waiting up to three years before seeking help (Margalith, 2004). Women reported not seeking care until symptoms intensified, or caused worry and/or bother that overrode the embarrassment of disclosing the presence of symptoms (Welch, Taubenberger, & Tennstedt, 2011). Symptom bother was shown to increase with age (Benner et al., 2007) so identifying symptoms early is essential to implementing first line therapies. Provider education and active screening may help open communication surrounding LUTS and lead to earlier case finding and treatment implementation. The International Continence Society (ICS) places promotion of health-seeking behavior through education on healthy bladder habits, and simple language and terminology as a goal for care (Newman et al., 2017).

Self-management behaviors. Despite lack of care-seeking, many women are bothered enough with LUTS that they adopt avoidance behaviors or other lifestyle modifications and self-management strategies to decrease the burden of symptoms. Societal beliefs about LUTS and associated embarrassment lead many women to avoid participation in activities that exacerbate LUTS (e.g., sports or athletics) (Wyman et al., 2009). UI has been perceived as a barrier to exercise; younger women report increased

distress from symptoms and increased restriction of activities related to UI than older women (Nygaard et al., 2005; Shaw, 2001). Avoidance of exercise at a young age is associated with increased risk of developing heart disease, obesity, hypertension, osteoporosis, and diabetes (Nygaard et al., 1990). Furthermore, women report limiting fluid intake in order to prevent leakage (Bardino et al., 2015; Wyman et al., 2009), which can lead to dehydration and potentially exacerbate OAB symptoms due to increased urine concentration.

Bardino and associates found that about one third of women with UI reported restricting fluid to keep dry, 71% reported changing clothing when wet, and 65% reported worry surrounding odors from leakage (2015). More than half of young women with UI report worrying about odors associated with leakage and restricting fluid intake; about one third report wearing absorbent pads to keep dry (O'Halloran et al., 2012). Most commonly women report wearing pads, restricting fluids, avoiding certain activities that cause leakage, or doing nothing at all to manage symptoms (Kogan et al., 2014). As some of the self-management behaviors could actually be exacerbating symptoms, it is important for providers to identify what women are doing to self-manage and provide education on healthy bladder health behaviors and lifestyle choices.

## **Social Factors**

The social stigma and norms surrounding LUTS influence attitudes and behaviors related to symptom management and understanding. The social stigma surrounding LUTS is prevalent in the United States and across other countries. This stigma is associated with shame, humiliation, and embarrassment (Hagglund et al., 2007; Muller, 2013; Nicolson et al., 2008; Nicolson et al., 2005; Siracusano et al., 2003).

Across cultures, UI has been perceived as a social burden related to self-neglect and poor hygiene rather than a medical condition (Wilson, 2004). Societal stigma can result in psychosocial decline and lower self-esteem, loss of independence, social isolation, premature retirement, anxiety, and depression (Elstad et al., 2010; Garcia et al., 2005). The extent of embarrassment and stigma is related to whether the symptoms are perceptible or whether the woman can control visibility of symptoms with management (Elstad et al., 2010). Although UI and use of absorbent products (e.g., incontinence pads and briefs) are becoming more normalized with advertisements in the media, young women still report UI as a socially unacceptable topic (Tremback-Ball et al., 2013). As peers and social expectations are pivotal in college culture, embarrassment and social stigma surrounding LUTS may play a larger role in this population.

### **Environmental Factors**

Environmental factors include the physical environment (including access and cleanliness of toilets) that contribute to LUTS storage symptoms. Many women report worry regarding cleanliness of and access to public toilets. This worry impacts behavior patterns that can influence LUTS (Wang & Palmer, 2010). Fear surrounding cleanliness of public toilets results in many young and older women avoiding school or work toilets. This avoidance of public toilets has been associated with increased prevalence of LUTS (Botlero et al., 2008; Brown et al., 2010; MacLennan et al., 2000). Lack of privacy and dirty toilet conditions may result in delayed voiding and/or decreased fluid intake to defer voids (Bradley et al., 2005). Sjogren and associates (2016) found that 87.2% of women reported worry regarding cleanliness of public toilets and 17.4% reported attempts to avoid public toilets. In attempts to avoid public toilets, women report emptying their

bladders before leaving the house and waiting or delaying voiding until after they return home (Sjogren et al., 2016). Many women also report crouching or hovering over public toilets due to fears related to cleanliness; this behavior has been shown to decrease pelvic floor relaxation and contribute to incomplete bladder emptying (Moore et al., 1991; Wang & Palmer, 2010; Yang et al., 2010).

Access and limited time for toilet breaks have been associated with contributing to LUTS (DuBeau, 2010; Palmer et al., 2012). Nurses and nurses' aides often delay their voiding at work due to limited bathroom breaks, worry regarding cleanliness of public toilets, and lack of toileting facilities (Palmer & Newman, 2015). One study of nurses found that more than half were worried about cleanliness of public restrooms and more than one third tried to avoid using public toilets when possible. Nurses also reported busy work schedules and lack of restroom access as barriers to utilizing the restroom while at work (Zhang et al., 2013). Prevalence of LUTS is greater among nurses despite the assumptions that nurses know more about appropriate bladder health behaviors than the general public (Liao et al., 2009; Zhang et al., 2013). This discrepancy might be due in part to the work environment of nurses. Environmental concerns during deployment for military women have also been associated with LUTS (Steele & Yoder, 2013). Access and cleanliness of toilets can present a challenge to genitourinary health for military women and have been associated with adoption of behaviors and self-management strategies to either decrease or hide symptoms (Steele & Yoder, 2013).

## Gaps in the Literature

Currently there is limited evidence on the role of personal, individual-behavioral, social, and environmental factors in LUTS storage symptom presentation. In the last few

years, the National Institute of Health (NIH)/ National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) has advocated that LUTS research move beyond descriptive studies of occurrence to focus on identifying potentially modifiable factors (including comorbid conditions, personal, behavioral, social, and environment factors) using a multi-level framework (Bravendam et al., 2016; Harlow et al., 2017). To meet these aims, NIDDK started the Prevention of Lower Urinary Tract Symptoms (PLUS) research consortium in September of 2015. The aims are to increase research on factors that contribute to LUTS and explore the experience of LUTS in women across the lifespan (Bravendam et al., 2016). Women of all ages experience LUTS storage symptoms, specifically OAB and UI. The experience of LUTS storage symptoms during the period of young emerging adulthood has been associated with LUTS storage symptoms in older adulthood. Therefore, the experiences of OAB and UI in young women may provide valuable insights for research and practice. College women may present a unique population with exposure to specific factors that contribute to LUTS storage symptoms.

## Conclusion

There is limited evidence on the multi-level factors associated with LUTS storage symptoms, specifically OAB and UI. There is also limited data on LUTS in emerging adulthood, specifically among college-aged women. This study addressed this gap in the literature by using the social ecological perspective (MM) and SCT as guiding frameworks to analyze the personal, individual-behavioral, social, and environmental factors that influence LUTS in a sample of college women.

## **CHAPTER THREE: DESIGN & METHODS**

Chapter Three describes the research design and methods of this study under the following headings: (1) research design; (2) setting; (3) sample; (4) procedures; (5) instruments/measures; and (6) analytic approach.

### **Research Design**

The purpose of this cross-sectional descriptive study was to explore and describe the experience and severity of LUTS storage symptoms, specifically overactive bladder (OAB) and urinary incontinence (UI), among female undergraduate college students, and to identify associated factors. Data were collected using the Qualtrics<sup>™</sup> web-based survey platform (IBM, 2014); surveys were distributed to female undergraduate college students via their university email addresses.

This design was appropriate for an exploratory study to address the research aims: Aim 1: Describe female undergraduate college students' experiences with LUTS storage symptoms, specifically overactive bladder (OAB) and urinary incontinence (UI). Aim 2: Examine the associations between selected personal, behavioral, and environmental factors and LUTS storage symptom (OAB and UI) severity in a sample of female undergraduate college students.

Aim 3: Explore the relationships between severity of urinary symptom bother and use of management strategies (care-seeking behavior and self-management behaviors).

The study design was appropriate given that there is limited research on factors associated with LUTS storage symptoms, specifically OAB and UI, in young women.

#### Setting

This study included a random sample of female undergraduate college students enrolled at a private Catholic university in the northeastern United States. The site has a total enrollment of about 14,250 students, with 54% female undergraduate enrollment. The majority of students are White non-Hispanics. Approximately 11% of students selfidentified as Hispanic, 9% Asian, 4% Black or African American, 3% multi-racial, and 7% other. An additional 5% are of unknown race/ethnicity. The university has many intercollegiate Division I sports teams, club sports teams, intramural sports teams, and a large university fitness center with classes in aquatics, high intensity interval training, cycling, yoga, aerobics, and more.

### Sample

The target population was female undergraduate college students greater than 18 years old. An acknowledged limitation of the study is the homogeneity of the sample. The sample may not be representative of all college women or young women of similar age who are not enrolled in college. Nonetheless, as this was an exploratory design, the target population was appropriate for the proposed study. A random sample of 1,800 university email addresses was requested for participant recruitment from the university office of research. Freshman, or first year, students were excluded from sampling to facilitate inclusion criteria of at least 18 years of age.

## **Inclusion criteria**

The inclusion criteria included: 1) identified by university census data as 'female'; 2) undergraduate student matriculated at the mentioned university in their sophomore, junior, or senior year; 3) able to read and write in English; and 4) 18 years of

age or older. The age specification was to ensure that the participants were old enough to give consent.

## **Sample Size Estimation**

The G\*power 3.1 power analysis system (Faul et al., 2009) was used to estimate the desired recruitment sampling pool of 1,800 students. This sampling pool was determined based on correlation coefficients and effect sizes of predictor variables (age, race, physical activity, sexual activity, caffeine consumption, sport involvement) on the outcome variable (experience of LUTS) from a pilot study done with female undergraduate college students during winter of 2016 (Angelini, 2016). Effects sizes between predictors and LUTS scores were in the small to moderate range, from .12 to .69. The requested sampling pool for recruitment was based on response rates in previous studies with similar college-aged samples with similar methods (30-38.6% response rates) (Sutherland, Amar, & Laughon, 2013; Sutherland et al., 2015; Angelini, 2016).

## Procedures

## Recruitment

Data were collected from female undergraduate college students in their sophomore, junior, or senior years (classes of 2018, 2019, and 2020) at a private university in the northeastern U.S. An email was sent to 1,800 randomly selected university email addresses provided by the university office of research. Using the procedures described by Dillman (2007) to increase response rates, participants received a pre-survey email explaining the study and inviting the student to participate by clicking on a link to the Qualtrics<sup>TM</sup> survey site on Day 1, followed by an invitation to take the survey link on Day 4, and a reminder email on Day 7. Contact emails (Appendix A) were

sent during study days prior to fall semester final exams based on good response rates at this time from pilot testing (Angelini, 2016). Emails were sent from the principal investigator's university provided email address to increase personalization of correspondence and increase response rates (Cook, Health, & Thompson, 2000).

In order to access the online survey, participants had to first check "YES" to indicate that they understood the informed consent (Appendix B) and agreed to participate. In order to complete the survey, participants were required to select an age of 18-years-old or older on the first question, in order to meet the inclusion criteria. At the end of the survey, participants were redirected to a separate link where they could provide an email addresses for an incentive raffle to win one of two \$100 Amazon<sup>™</sup> gift cards, if they chose to do so.

Qualtrics<sup>™</sup> online platform was used to create and distribute the surveys via university email addresses. The Qualtrics<sup>™</sup> system was set to the "anonymize" setting so that the system did not record any identifying information (e.g., IP addresses, location, email addresses). In this way, responses were anonymous and could not be linked to the individual study participants.

#### **IRB/Human Subjects**

Prior to data collection, approval was obtained from the Boston College Institutional Review Board (IRB). Contact emails about the survey (Appendix A), information on the study and consent to participate (Appendix B), the survey questionnaire (Appendix C), and incentive raffle entry site (Appendix D) along with online application materials were approved by the Boston College IRB. The Qualtrics<sup>TM</sup> system was set to the "anonymize" setting so that data were not linked to email addresses

or IP addresses. The PI and all consultants completed CITI training in the ethical conduct of research with human subjects prior to the initiation of the survey.

## **Instruments/ Measures**

The survey was pre-tested with a small group of students to ensure ease of reading, time, and flow. The survey took between 10 to 20 minutes to complete. Although the survey was conceptualized in three sections, items were rearranged to improve survey-flow. The survey is included in Appendix C.

#### **Section I: Personal Factors**

**Demographics.** Section one included socio-demographic questions (e.g., race, ethnicity, age, and mother's highest level of education). Mother's highest level of education was used as a proxy for socioeconomic status (SES) as it is highly correlated with other proxy variables for SES including parental occupation and income (U.S. Department of Health and Human Services, 2001). Demographics were all single-item questions. Response options for age were *less than 18 years old, 18 years old, 19 years old, 20 years old, 21 years old, 22 years old, 23 years old or older*. Participants were able to select all race options that they identified with from *African American or Black, Asian or Pacific Islander, Caucasian or White, Native American or American Indian,* and *Other*. Hispanic/Latino ethnicity was asked with response options of *yes or no*. Mother's highest level of education response options included: *middle school or less, some high school but no diploma, high school diploma, some college or technical school, associate's degree, bachelor's degree, some graduate school but no degree, graduate degree (e.g., MS, MD, JD, PhD), don't know, and N/A -- no mother or mother figure.* 

Health and medication. Section one also included questions about perceived health status, medication use, and chronic health conditions. Response options for perceived health status included *poor, fair, good, very good*, and *excellent*. Questions were asked about the presence of common chronic health conditions in this population (e.g., anxiety/depression, constipation, diabetes, heart disease) and prescription medications (e.g., anti-anxiety and anti-depressive medications, cardiac medications, and hormonal contraceptives). Response options were binary, *yes* or *no*. Bedwetting was assessed with the single item, "Do you remember wetting the bed when you were ten years old or older?" Response options included *yes, no* and *unsure*. Body mass index (BMI) was calculated from two single item open-ended questions asking participants for their height and weight.

**Knowledge about urinary incontinence / bladder health.** Knowledge of urinary incontinence and bladder health was assessed with 7 items. Five items were adapted from the UI subscale of the validated 12-item Prolapse Incontinence Knowledge Questionnaire (PIKQ) (Shah et al., 2008). Response options included *true, false* and *don't know*. One point was given for a correct answer and no points were given for incorrect responses or *don't know*. Two additional questions were added to the 5 PIKQ – UI subscale questions based on responses to the pilot study (Angelini, 2016) and were formatted to mirror the PIKQ- UI subscale items. Participants were asked to respond using *true, false* or *don't know* to the statements, "UI is a normal part of aging" and "It is normal to leak a little urine during exercise."

**Embarrassment.** Embarrassment about urinary incontinence (UI) was assessed with a single item. Participants were asked to respond using *true, false* or *don't know* to the statement "Leaking urine is embarrassing and not something to talk about."

## Section II: Behavioral and Environmental Factors

Section two included questions related to individual behaviors including toileting behaviors, sexual behaviors, childhood enuresis, exercise and athletic involvement, LUTS symptom self-management, and care-seeking behaviors. Many of the single item questions were previously tested in a pilot study with college women (Angelini, 2016). Although there are behavioral factors that contribute to BMI, BMI is listed with personal factors in this study.

**High-risk behaviors.** Sexual activity was measured with an item from the YRBS (CDC, 2017). Dietary intake of substances related to urinary symptoms (e.g., caffeine, tobacco, and alcohol) was included in section two. Questions on alcohol and tobacco use were taken from the Youth Risk Behavior Survey (YRBS) for high school students (Centers for Disease Control and Prevention (CDC, 2017).

**Exercise and athletics.** Athletic involvement was measured with a single item question on sports team participation. Response options included collegiate level, club, intramural team involvement, or none of the above. Exercise frequency was assessed with an item from the YRBS (CDC, 2017) asking participants to report the number of days during the past week that they exercised for more than one hour. A checklist was used to assess participants' involvement in high impact activities that have been associated with LUTS in the literature. Items on the checklist included ballet, gymnastics/cheerleading, weightlifting, CrossFit/high intensity interval training, running, and field sports including soccer, lacrosse,

field Hockey, softball, volley ball, and tennis). Respondents were asked to check applicable items.

**Consumption of bladder irritants.** Participants were asked about their frequency of intake of substances (caffeine, alcohol, tobacco) that have been commonly cited as bladder irritants. One item asked about cups of caffeinated beverages consumed per day; response options included *none, one, two, three, four, five, and six or more cups*. One item asked on how many of the past 30 days the participant had consumed any alcohol; a second item asked on how many of the past 30 days the participant consumed five or more drinks of alcohol in a row. One additional item asked on how many of the past 30 days the participant second five or more drinks of alcohol in a row. One additional item asked on how many of the past 30 days the participant of the past 30 days the participant five, response options included: *0 days, 1 day, 2 days, 3 to 5 days, 6 to 9 days, 10 to 19 days, 20 to 29 days, and all 30 days*.

The intake of other foods and beverages that were potential bladder irritants was assessed using a yes / no checklist. Participants were asked to indicate whether any of the following foods or beverages seemed to worsen their urinary symptoms; response options included *yes* and *no*. The checklist was only offered to those participants who reported a response other than N/A - I *do not have urinary symptoms* to an earlier item on the survey, the communication with health care provider item. Common bladder irritants were included (e.g., coffee, tea, soda, alcohol, spicy foods, acidic fruit juices, tomato products, and artificial sweeteners) based upon the literature and findings from the Shorter-Moldwin Food Sensitivities Questionnaire (Shorter et al., 2014).

**Toileting behaviors**. Toileting behaviors were assessed with 14 items from the Toileting Behaviors: Women's Elimination Behaviors (TB-WEB) tool (Wang & Palmer, 2010). The 14 items were selected based on pilot data (Angelini, 2016) and adapted for this

study. The 14-item version of the TB-WEB contains four subscales: place preference (four items), premature voiding (three items), delayed voiding (three items), and strained voiding (four items). Responses are measured on a 5-point Likert-type scale; response options include *never* (0), *rarely* (1), *sometimes* (2), *often* (3), and *almost always* (4). This tool was recently validated in a pilot study with college women (Cronbach's alpha 0.85; Angelini, 2016). Total possible TB-WEB scale scores range from 0 to 56; possible subscale scores ranged as follows: place preference (0 to 16), premature voiding (0 to 12), delayed voiding (0 to 12), and strained voiding (0 to 16). Four individual items from the TB-WEB place preference subscale address environmental factors (e.g., worry over bathroom cleanliness) that may influence toileting behaviors.

**Position preference for urination.** Based on results from an earlier study, items from the position preference subscale of the TB-WEB were separated from the other 4 TB-WEB subscales and restructured into two items with mutually exclusive responses. Participants were asked what position they generally used for urination at home and away from home. A third was added to assess preferred position for urination in residence hall bathrooms. Response options included: *I sit on the toilet seat to urinate,* and *I crouch/hover/stand over the toilet to urinate.* An additional response, N/A - I *do not live in a residence hall*, was added for the residence hall question. Position preference items were considered separately in analyses.

**Care-seeking** / **Communication with health care provider.** Participants were asked if they had ever talked about urinary symptoms with a health care provider (e.g., nurse, nurse practitioner, or physician). The single item question was worded, "Have you ever talked to your health care provider (HCP) (nurse, nurse practitioner, or physician) about your urinary
symptoms?" Response choices included *yes, no*, and *N/A- I do not have urinary symptoms*. Not applicable responses were re-coded as missing.

Self-management strategies. Participants who selected a response other than "N/A—I do not have urinary symptoms" to the health care provider question were asked about use of different self-management strategies on a checklist where they were able to check as many strategies as applied. Self-management strategies were included based on common strategies reported in the literature and from qualitative responses on the pilot study (Angelini, 2016). Participants had the option to check N/A - I do not have urinary symptoms. Self-management strategies that were included on the checklist were: nothing, menstrual pads, incontinence pads or briefs, Impressa<sup>TM</sup>, medications, avoiding caffeine, avoiding alcohol, avoiding activities that cause LUTS, limiting fluid, voiding 'just in case', voiding before exercise, and voiding before sex. Participants who selected any response other than N/A - I do not have urinary symptoms or nothing were considered to be using self-management strategies. Use of self-management strategies was subsequently recoded as a binary variable with yes (1) and no (0).

#### Section III: Outcome Variables

Section three included the outcome variable, urinary storage symptoms of OAB and UI, as well as items assessing urinary symptom bother and impact of urinary symptoms on daily life.

**Urinary Symptoms Scale (USS).** The 22-item Urinary Symptoms Scale (USS) used in this study to assess lower urinary tract symptoms (LUTS) was developed based upon the items, wording and timeframe from two published instruments, the ICIQ-FLUTS and the LUTS. The validated 12-item International Consultation on Incontinence

Questionnaire-Female Lower Urinary Tract Symptoms (ICIQ-FLUTS) (Avery et al., 2004; Brooks et al., 2004) has been used to assess LUTS frequency or severity using five-point Likert-like responses in studies with young women (18- to 30-years-old) with reported adequate reliability (Sjogren et al., 2016; VanBreda et al., 2015). Higher scores indicate greater extent or severity of urinary symptoms. The 22-item Lower Urinary Tract Symptoms (LUTS) Tool (Coyne et al., 2013) was developed through a qualitative focus group (Coyne et al., 2010) and used nonmedical terminology to assess for urinary symptoms. Internal reliability of the LUTS Tool was acceptable in a pilot study with young college women (Cronbach's alpha = .881; Angelini, 2016). Benefits of the LUTS Tool included detailed items on UI sub-types, and used a one week timeframe to facilitate recall.

The 22-item Urinary Symptoms Scale (USS) adopted the one week recall timeframe and much of the item phrasing from the LUTS tool. Response options for most items ranged from *never (0), rarely (1), sometimes (2), to often (3), and almost always* (4). Responses for questions related to daytime voiding frequency were numerical: *1-3 times per day (0), 4-7 times per day (1), 8-10 times per day (2), 11 to 13 times per day (3), and 14 or more times per day (4)*. Responses for questions related to nighttime voiding frequency were also numerical: *0 times per night (0), 1 time per night (1), 2 times per night (2), 3 times per night (3), and 4 times per night (4)*. Total possible scores for the total USS ranged from 0 to 88. Because lower urinary storage symptoms of OAB and UI were the primary focus of this study, most analyses were limited to the USS—Storage Symptom subscale.

**USS-Storage Symptom subscale.** Twelve of the items on the USS assessed urinary storage symptoms of OAB and UI; these formed the USS-storage symptom subscale. Urinary storage symptom severity was measured by summing responses to the 12 items on the USS-Storage Symptom subscale. Individual items addressed participants' perceived frequency, perceived urgency, different UI sub-types (e.g., UI, UI before getting to the toilet, urge UI, UI with laughing, coughing and sneezing, UI with activity, UI while asleep, UI with sexual activity, other UI), daytime frequency, and nighttime frequency. The two frequency items, daytime and nighttime frequency, were recoded to account for normal frequency (e.g., less than eight times per day *(0)*, *8-10 times per day (1)*, *11 to 13 times per day (2)*, and *14 or more times per day (3)*. The nighttime frequency item was recoded as: *0 to 1 times per night (0)*, *2 times per night (1)*, *3 times per night (2)*, and *4 times per night (3)*. As a result, total possible scores for the USS-storage Symptom subscale ranged from 0 to 46.

**Urinary symptom bother.** Urinary symptom bother was measured using a single item to assess perceived overall bother from urinary symptoms. Participants were asked to rate the amount of bother from 0 to 10. A question on perceived impact of urinary symptoms on daily life was added with a similar scale of *no impact* (0) to *severe impact* (10). Only participants who reported experiencing at least one symptom on the USS were asked about perceived bother and impact of urinary symptoms.

#### **Analytic Approach**

A description of the preliminary analyses and main analyses are included in Chapter Four. Prior to data analyses, a codebook was created. Data without identifiers were imported from the Qualtrics<sup>™</sup> platform to SPSS v.23 (IBM, 2014). All statistical analyses were conducted using SPSS v.23 (IBM, 2014) software. Data were recoded as necessary and multi-item scales were summed.

Preliminary data analyses included computing descriptive statistics, including means and frequencies, for all items. Cronbach's alphas were calculated for all multiitem scales (e.g., PIKQ UI subscale, TB-WEB and subscales, USS and storage symptom subscale). In order to be included in subsequent analyses, multi-item scales were required to demonstrate internal reliability alpha scores of at least 0.7 (DiIorio, 2006; Privitera, 2014). Multi-collinearity among the predictor variables was assessed prior to multivariate analyses. Analyses were conducted to assess for the presence of selectivity bias in the final sample. The demographic characteristics of the sample were compared to the demographic characteristics of the population of female undergraduate students at the university.

Main analyses addressed the specific aims:

Aim 1: Describe female undergraduate college students' experiences with LUTS storage symptoms, specifically overactive bladder (OAB) and urinary incontinence (UI). Aim 2: Examine the associations between selected personal, behavioral, and environmental factors and LUTS storage symptom (OAB and UI) severity in a sample of female undergraduate college students. Aim 3: Explore the relationships between severity of urinary symptom bother and use of management strategies (care-seeking behavior and self-management behaviors).

# Conclusion

The purpose of this study was to explore and describe the experience of urinary storage symptoms, specifically overactive bladder (OAB) and urinary incontinence (UI), among female undergraduate college students, and to identify associated factors. The study design was appropriate given that there is limited research on factors associated with LUTS in young women. The theoretical framework and review of the literature helped to identify factors associated with urinary storage symptoms of OAB and UI. Special consideration was given to the unique factors that may influence experience of OAB and UI among female undergraduate college students. Results of the study are presented in Chapter Four.

# **CHAPTER FOUR: RESULTS**

This cross-sectional descriptive study was designed to explore and describe the experience of urinary storage symptoms, specifically overactive bladder (OAB) and urinary incontinence (UI), among female undergraduate college students, and to identify associated factors. Chapter Four presents the results. The first section summarizes the description of the sample. The second section summarizes preliminary analyses including descriptions of predictor and outcome variables as well as bivariate associations. The final section presents main analyses related to the specific aims.

# **Description of the Sample**

Surveys were distributed via university email addresses, provided by the university research office, to a random sample of 1,800 female undergraduates. Students were given 14 days to respond. Four hundred and eighty-two female undergraduates responded to the survey. Twelve cases had substantial missing data and were excluded. The university research office erroneously included 95 undergraduate students from the night school in the random sample of emails that it provided. Forty-seven of the 95 night school students were in the 18- to 22- year-old age range and 48 were 23 years old or older; some undergraduate students in the night school are in their forties and fifties. Participants who responded that they were 23 years old or older were excluded from the final sample (n = 14). However, students from the night program who were less than 23 years old could not be identified and excluded, as all responses were anonymous. Although these individuals met the age criterion for inclusion in the study, they did not fit the residential undergraduate student profile and may differ from residential students in

unknown ways in terms of lifestyle and behavioral factors.

# Representativeness

After the 12 cases with extensive missing data and the 14 cases that were more than 23-years-old were removed, the final sample included 456 female undergraduate college students. This represents a response rate of 25.33%. This response rate, lower than expected, was slightly greater than earlier surveys with the same population (15.5% to 20%; Sutherland et al., 2016; Sutherland, Fantasia, & Fontenot, 2015). This response rate was consistent with online survey response rates published in the literature and was assessed for response representativeness and non-response error (Cook et al., 2000; MacDonald et al., 2009; Porter & Whitcomb, 2003).

In order to assess for non-response error, independent t-tests and Chi-Squared tests were used to assess differences in demographics (age, race, and ethnicity) between the study participants (N = 456) and the university population of female undergraduates. An independent t-test determined that individuals in the study were slightly younger (M = 20.30, SD = 0.95) than female undergraduate students in their sophomore, junior and senior years (N = 3,694; M = 20.55 years, SD = 0.98, t = 5.16, p < .001), although this difference was statistically significant. Chi-squared tests were used to assess differences in race and ethnicity between the study participants and female undergraduates enrolled at the university (N = 4,417). No statistically significant differences were found in terms of ethnicity ( $X^2 = 2.93$ , p = .09). Regarding race, the sample had significantly more individuals who self-identified as White (76.5%) than the university (68.3%), ( $X^2 = 10.14$ , p < .001).

Independent t-tests and chi-squared tests were also used to assess for differences in age and race between the study participants (n = 456) and the 12 cases that were deleted due to extensive missing data. No statistically significant differences in age (t = -1.03, p = .31) or race ( $X^2 = 2.74$ , p = .95) were found between retained and deleted cases.

### **Preliminary Analyses**

Data without identifiers were imported from the Qualtrics<sup>™</sup> platform to SPSS v.23 (IBM, 2014). Prior to analyses, the data were cleaned and a codebook was created. Data were reviewed and assessed for outliers and missing values. Data were recoded as necessary and multi-item scales were summed. Distributions were assessed for normality.

Descriptive statistics were calculated for all predictor and outcome variables as were measures of internal reliability (Cronbach's  $\alpha$ ) for all multi-item scales. Preliminary analyses also included bivariate associations among predictor variables and between predictor variables and outcome variables.

#### **Descriptive Statistics for Predictor Variables**

**Demographic characteristics.** Participants' mean age was 20.30 years with a standard deviation of 0.95 years. As shown in Table 1, most participants (89.2%) were between the ages of 19 and 21 years old. The majority (76.5%) self-identified as White/Caucasian. Participants also identified with other races such as: Asian/Pacific Islander (12.9%), Black/African-American (2.4%), and Native American or American Indian (0.4%). Most participants (89.9%) self-identified as non-Hispanic. 41% of participants reported their mother's highest level of education as a bachelor's degree; 38.8% reported their mother had earned a graduate degree.

# Table 1.

Demographic Characteristics

Variable	n	%
Age (in years)		
18 years old	4	0.9%
19 years old	101	22.1%
20 years old	152	33.3%
21 years old	154	33.8%
22 years old	45	9.9%
Race		
Asian/Pacific Islander	59	12.9%
Black/ African American	11	2.4%
Caucasian/ White	349	76.5%
Native American or American Indian	2	0.4%
Other	18	3.9%
Asian/Pacific Islander & Caucasian	13	2.9%
Black/ African American & Caucasian	2	0.4%
Asian/Pacific Islander & Native American or American Indian	1	0.2%
Caucasian & Native American or American Indian	1	0.2%
Ethnicity		
Hispanic	46	10.1%
Non-Hispanic	410	89.9%
Mother's Highest Level of Education		
Middle school or less	3	0.7%
Some high school but no diploma	7	1.5%
High school diploma	24	5.3%
Some college or technical school	29	6.4%
Associate's degree	14	3.1%
Bachelor's degree	186	41.0%
Some graduate school but no degree	15	3.3%
Graduate degree (e.g., MS, MD, JD, PhD)	176	38.8%

Note. Ns range from 454 to 456.

**Perception of health.** Table 2 summarizes results related to personal factors

including perception of health, chronic health conditions (e.g., anxiety/depression,

constipation, eating disorder, diabetes, OAB, UI, sexually transmitted infections [STI]) and medication use (e.g., anti-anxiety/anti- depression medications, cardiac medications, combined estrogen and progesterone contraception, and progesterone-only contraception). More than half (57.5%) of the participants reported being in good or excellent health.

## Table 2.

Variable	n	%
Perception of Health		
Poor/Fair	43	9.4
Good	151	33.1
Very good/ Excellent	262	57.5
Chronic Conditions		
Anxiety/Depression	156	34.8
Constipation/IBS	35	7.9
Diabetes	5	1.1
Eating Disorder	34	7.7
Overactive Bladder	3	0.7
Sexually Transmitted Infection	15	3.4
Urinary Incontinence	8	1.8
Medication Use		
Anti-depressant/anti-anxiety medication	74	16.6
Heart Medication	3	0.7
Estrogen containing contraception	196	43.8
Progesterone only contraception	54	12.5
UI is embarrassing and not something to talk about - True	70	16.2

Note. Ns range from 431 to 456 unless otherwise noted.

**Health conditions.** Participants were asked to report their height in feet and inches and enter their weight in pounds. Nine participants did not complete weight values and two values seemed highly improbable (0.21 and 50 pounds) and were removed. BMI was calculated for the 447 cases with complete height and weight data (M = 22.85, SD = 3.34, minimum = 16.17, maximum = 43.63).

More than one-third of participants (34.8%) reported being diagnosed with anxiety and/or depression. Three (0.7%) reported an OAB diagnosis and 1.8% reported a UI diagnosis. Fifty-three (12.6%) reported wetting the bed after the age of 10-years-old.

**Medication use.** Almost half of participants (43.8%) reported using combined (estrogen and progesterone) hormonal contraception and 12.5% reported using progesterone only hormonal contraception (e.g., progesterone only pills, DepoProvera, Nexplanon, and levonogestrel containing intrauterine devices). Although 34.8% of participants reported a diagnosis of anxiety and/or depression, only 16.6% report taking anti-anxiety and/or anti-depression medication.

**Knowledge about urinary incontinence** / **bladder health.** Response options to the five items from the Prolapse Incontinence Knowledge Questionnaire (PIKQ)-UI subscale included *true, false,* and *don't know*. Due to an error in the original set-up of the Qualtrics<sup>TM</sup> data collection, *don't know* responses were not coded. Instead, they were recorded as "system missing." Because of this error, it was impossible to ascertain how many respondents selected *don't know* versus did not answer. As a result, there were extensive amounts of missing data and the internal reliability of the 5-item subscale was quite low (Cronbach's  $\alpha = 0.44$ ). Thus, the PIKQ-UI subscale was not included in subsequent analyses. More than half of the sample (N = 456) selected the correct response to the statements, "There are exercises that can control leakage" (n = 269), "It is important to diagnose the type of UI prior to treating" (n = 279), and "Once people start leaking they can never control their urine again" (n = 275).

The two additional UI knowledge items on UI with aging and UI with physical activity had the same response options as the PIKQ-UI subscale items. Similarly, *don't* 

*know* responses were not coded for these items; thus, only frequencies can be reported. Many participants agreed with (reported "true") the statements, "UI is a normal part of aging" (n = 219) and "It is normal to leak a little during exercise" (n = 123).

**Embarrassment.** A total of 16.2% of participants responded *true* to the statement, "UI is embarrassing and not something to talk about" and 18.7% reported *don't know*.

**Consumption of bladder irritants.** Table 3 summarizes reports of bladder irritant consumption and perceived effects of irritants on urinary symptoms. The majority (88.4%) of participants reportedly drank fewer than two caffeinated beverages per day. Most of the participants reported drinking alcohol three to nine times during the past month. Of those who drank, 30.3% reported binge drinking (four or more drinks at one time) up to twice in the past month. An additional 31.2% of participants reported binge drinking up to nine times in the past month. Although the majority of participants (83%) reported never using tobacco products, 10.8% reported using tobacco products once or twice in the past month.

At the end of the survey, participants were asked to identify bladder irritants that they believed worsened their urinary symptoms. Participants who had responded *N/A—I do not have urinary symptoms* to an earlier question were skipped out of items related to worsening of urinary symptoms. Of the 171 participants who responded, many identified bladder irritants that they believed worsened their urinary symptoms. Nearly 2/3 of participants identified alcohol and coffee as worsening urinary symptoms. Alcohol, coffee, tea, soda, and artificial sweeteners were reported to exacerbate urinary symptoms by 61.3%, 60.2%, 25.5%, 16.6%, and 9% of respondents, respectively.

# Table 3.

Variable	n	%
Caffeine		
None	113	24.8
1-2 cups	290	63.6
3-4 cups	46	10.1
5 or more cups	7	1.5
Alcohol (days/last month)		
0 days	48	10.6
1-2 days	73	16.1
3 - 9 days	259	57.0
Over 10 days	74	16.3
Binge drinking (days/month)		
0 days	161	35.6
1-2 days	137	30.3
3-9 days	141	31.2
Over 10 days	13	2.9
Tobacco/Nicotine (days/month)		
0 days	375	83.0
1-2 days	49	10.8
3-9 days	16	3.5
Over 10 days	12	2.7
Perception of irritants that worsen urinary		
symptoms		
Alcohol ( $n = 160$ )	98	61.3
Acidic fruit juice ( $n = 155$ )	7	4.5
Artificial sweeteners ( $n = 155$ )	14	9.0
Coffee $(n = 161)$	97	60.2
Soda ( <i>n</i> = 157)	26	16.6
Spicy food ( $n = 156$ )	8	5.1
Tea $(n = 157)$	40	25.5
Tomato products $(n = 154)$	2	1.3

Bladder Irritant Consumption (Caffeine, Alcohol, Tobacco) and Perceived Effect of Irritants on Urinary Symptoms

Note. Ns range from 452 to 456 unless otherwise noted.

**Physical activity.** Table 4 summarizes participants' reports of physical activity. Most participants (74.2%) reported not participating on any sports teams; 5.3% reported participating on an inter-collegiate team and 20.5% reported participating on a club or intramural team. When asked how many days were spent exercising for at least one hour during the past week, 19.1% reported zero days, 31.9% reported exercising on one or two days, 39.1% reported exercising on three to five days, and 9.9% reported exercising six to seven days during the past week.

# Table 4.

Physical Activity (sports team involvement and other athletic activity involvement) and	nd
Sexual Activity (sexual intercourse and pregnancy/birth history)	

Variable	n	%
Sports Team Involvement		
No	336	74.2
Yes, Collegiate Team	24	5.3
Yes, Club/Intramural	93	20.5
Physical Activity ( > 60 minutes/day during the past week)		
0 days	87	19.1
1-2 days	145	31.9
3-5 days	178	39.1
6-7 days	45	9.9
Athletic Activity Involvement		
Ballet	23	
Cheer or Gymnastics	8	
Field sport (including Soccer, Lacrosse, Field hockey,	49	
Softball, Volley ball, or Tennis)		
HIIT/Cross-fit	87	
Heavy weight lifting	70	
Long distance running/marathon training	63	
Short distance running/jogging	231	
Sexual Activity		
Ever had sexual intercourse	296	65.6
Ever been pregnant/given birth ( $n = 296$ )	1	0.3%

Note. Ns range from 451 to 456 unless otherwise noted.

Participants were also asked about participation in athletic activities that have been associated with LUTS and UI, in the literature. Participants were asked to select all activities in which they routinely participated. Three hundred and fifteen participants reported participating in at least one athletic activity. The most commonly reported activities were *short distance running* (n = 231), *HIIT/Cross-fit classes* (n = 87), *heavy weight lifting* (n = 70), and *long distance running* (n = 63). Forty-nine reported participation in a *sport* (i.e., soccer, lacrosse, field hockey, softball, volleyball, or tennis). Twenty-three reported *ballet dancing* and eight reported participating in *cheer or gymnastics*. Almost half of all participants (n = 196) reported participation in more than one athletic activity. The number of athletic activities reported ranged from one to five.

**Sexual activity.** Table 4 also summarizes reports of sexual activity and histories of pregnancy and childbirth. Approximately two-thirds of participants (65.6%) reported a history of past or current sexual activity; of those, only one reported a history of pregnancy and childbirth.

**Toileting behaviors.** Table 5 summarizes responses to the 14 items on the TB-WEB. Responses of *sometimes, often,* and *almost always* were considered positive responses for a given behavior. Responses of *never* or *rarely* were considered negative. The vast majority of participants reported worrying over the cleanliness of public toilets (80.3%) and trying to empty their bladder prior to leaving the house (89.7%). Most (81.2%) reported delaying bladder emptying when busy.

The TB-WEB included four subscales: place preference, premature voiding, delayed voiding, and strained voiding. The total TB-WEB scale demonstrated acceptable internal reliability in this sample (Cronbach's  $\alpha = 0.82$ ). Cronbach's alphas for the subscales were as follows: place preference ( $\alpha = 0.75$ ), premature voiding ( $\alpha = 0.72$ ), delayed voiding ( $\alpha = 0.76$ ), and strained voiding ( $\alpha = 0.88$ ).

Subscale	Variable	n	%
Place preference	When I use public toilets, I worry about how clean they are.	350	80.3
	(Sometimes/often/always)		
	I try to avoid using public toilets.	241	55.4
	I try to empty my bladder before leaving my home.	391	89.7
	When I am AWAY from my home, I try to hold my urine	207	47.5
	until I get home		
Premature Void	When I am AT MY HOME, I empty my bladder even when	125	28.7
	I do not feel the need to urinate.		
	When I am AWAY from my home, I empty my bladder	42	9.6
	even when I do not feel the need to urinate.		
	I empty my bladder without feeling a need to urinate, but do	215	49.3
	so "just in case".		
Delayed Void	I will delay emptying my bladder when I am busy.	354	81.2
	I wait to empty my bladder until I feel I cannot hold my	183	42.1
	urine any longer		
	I wait too long (strong need to urinate or actual leakage)	150	34.4
	when I have to empty my bladder at work or school		
Strained void	I push down (strain/tighten my stomach muscles) to begin	99	22.8
	urinating.		
	I push down in order to empty my bladder.	87	20.0
	I push down to make my bladder empty faster.	153	35.2
	I push down to keep urine flowing during the urination	82	18.9
	process.		

 Table 5.

 Toileting Behaviors: Women's Elimination Behaviors (TB-WEB) Scale

Note. Ns range from 433 to 436.

**Position preference for urination.** Responses to the three items on position preference for urination *at home, away from home,* and in *residence hall toilets* are displayed in Table 6. About half (50.3%) of the study participants reported crouching or hovering over the toilet when using public bathrooms. Reported position for urination at home was associated with position used in residence hall toilets (r = .292, p < .001).

**Care-seeking** / **Communication with health care provider.** Participants were asked whether they talk about their urinary symptoms with a health care provider. Some participants (n = 273) responded N/A - I do not have urinary symptoms, and those cases

were recoded as missing. Participants who selected this response skipped over questions

related to effects of irritants on urinary symptoms and use of self-management strategies..

Of the remaining 171 participants, 24.6% (n = 42) reported discussing urinary symptoms

with their health care provider.

#### Table 6.

Toileting	Rehaviors.	Position	Generally	Used	for	Urination
Tonenng	Denuviors.	1 OSILION	Generally	<sup>o</sup> oseu <sub>.</sub>	jur	Ormanon

	п	%
At home $(n = 431)$		
I sit on the toilet seat to urinate.	425	98.6
I crouch/hover/ stand over the toilet to urinate.	6	1.4
Away from home $(n = 433)$		
I sit on the toilet seat to urinate.	215	49.7
I crouch/hover/ stand over the toilet to urinate.	218	50.3
In your residence hall $(n = 357)$		
I sit on the toilet seat to urinate.	330	92.4
I crouch/hover/ stand over the toilet to urinate.	27	7.6

**Self-management strategies.** A checklist was used to assess participants' use of various self-management strategies. Participants were asked to check any and all strategies that they used. A summary of reports is presented in Table 7. Participants who responded  $N/A - I \ do \ not \ have \ urinary \ symptoms$  to an earlier question were skipped out of the checklist of urinary self-management strategies. Of the 171 participants who were eligible to answer, 66 (38.6%) reported using at least one self-management strategy. The total number of self-management strategies reported by individuals ranged from zero to seven. Those who reported  $N/A - I \ do \ not \ have \ urinary \ symptoms, \ nothing, \ or \ did not respond were manually coded as not using any management strategy (<math>n = 105$ ).

Nineteen participants responded to the question by checking N/A - I do not have urinary symptoms; twenty-two participants did not identify any strategies that they used to manage their urinary symptoms. The most commonly reported self-management strategies included voiding "just in case" (n = 54), voiding before physical activity (n = 42), and voiding before sex (n = 33). Other commonly reported self-management strategies included limiting fluid intake (n = 20), avoiding caffeine (n = 13), and avoiding alcohol (n = 7). Ten participants reported using menstrual pads to manage leakage and three reported using incontinence pads or briefs.

# Table 7.

Variable	n	%
Care-Seeking/	42	24.6
Discussed symptoms with health care provider (yes) $(n = 171)$		
Self management Strategies		
N/A – I do not have urinary symptoms	19	
I have not done anything to manage my urinary symptoms	22	
Pads (menstrual/period pads)	10	
Pads (for incontinence/urine leakage)	3	
Impressa	0	
Medication	3	
Avoid caffeine	13	
Avoid alcohol	7	
Limit fluid intake	20	
Go to the bathroom 'just in case' before going out	54	
Go to the bathroom before working out or exercising	42	
Avoid activities that cause leaking	0	
Go to the bathroom before sex	33	

# **Descriptive Statistics for Outcome Variables**

**Urinary Symptoms Scale (USS).** Four-hundred forty-five participants completed most of items on the USS. Demographics of participants with completed cases (n = 445) were compared to those with missing data (n = 11). No significant differences were seen in age (t = .80, p = .93); race ( $X^2 = 1.76, p = .98$ ); ethnicity ( $X^2 = 1.27, p = .63$ ); or mother's highest level of education ( $X^2 = 4.85, p = .68$ ). The Cronbach's alpha for the USS was .84.

Table 8 displays responses to items on the USS. Positive LUTS occurrence was defined as any response greater than *never* to an individual item. Almost all of the participants reported at least one LUTS (91.2%). Several commonly reported symptoms included delay before urination (47.1%), terminal dribble (63.3%), and incomplete emptying (45.5%). Severities for all items on the USS were summed. The mean severity score for all items on the USS was 8.26 (SD = 7.10, minimum = 0, maximum = 47).

**USS-storage subscale.** Crobach's alpha for the 12-item USS-storage-symptom subscale was 0.80. The majority of participants (78.8%) reported at least one storage symptom. About half of the respondents reported urinary frequency; 18.9% reported more than eight daytime voids. Fifty-five participants (12.4%) reported waking two or more times during the night to void and 47.6% reported urgency. Urinary leakage was reported by 21.3% of the respondents, 16.4% reported urge incontinence, 28.8% reported stress incontinence, and 19.1% reported stress incontinence with physical activity. More than five percent of participants (5.6%) reported leaking urine during intercourse and 4.3% reported leaking urine when asleep. The severity of storage symptoms of OAB and UI

was also assessed. The total possible scores for the 12-item USS-Storage subscale ranged

from 0 to 46. Actual scores ranged from 0 to 26 (M = 3.31, SD = 3.91).

# Table 8.

Reports of Experience of LUTS During the Past Week

Variable	n	%
Voids while awaka		
	2(1	015
	501	81.5
8-10 times	56	12.6
11 or more times	26	5.9
Nocturia		
0-1 time	390	87.6
2 times	35	7.9
3 or more times	20	4.5
Frequency	234	52.6
Urgency	212	47.6
Intermittency (stop/start)	156	35.1
Pain/Discomfort	102	22.9
Delay before urination	209	47.1
Strain with urination	74	16.6
Burning with urination	56	12.6
Weak stream	141	31.8
Split/Spray Stream	132	29.7
Terminal Dribble	281	63.3
Incomplete Emptying	202	45.5
UI	95	21.3
UI before making it to the toilet	61	13.7
UUI	73	16.4
Post-micturition dribbling	51	11.5
UI with physical activity	85	19.1
SUI	128	28.8
UI other	37	8.3
UI when asleep	19	4.3
UI with sex	25	5.6

*Note. Ns* range from 443 to 445; *UI* = *urinary incontinence*; *UUI*= *urge urinary incontinence*; *SUI*= *stress urinary incontinence*.

Symptom bother and impact. Only participants who responded to having experienced at least one urinary symptom on the USS were asked about perceived bother from urinary symptoms and impact of symptoms on activities of daily life (ADLs). Overall, reported bother from urinary symptoms was low although reports covered the full range of possible scores (n = 347, M = 1.77, SD = 2.07, minimum = 0, maximum = 10) (Figure 2). Fewer participants responded to the impact question (n = 226), but perceived impact was only slightly higher than perceived bother from urinary symptoms (M = 2.04, SD = 1.87, minimum = 0, maximum = 10) (Figure 3).

#### Figure 2.

Frequency of Perceived Bother from Urinary Symptoms in a Sample of College Women



All together, how much are you bothered by urinary smptoms?

#### Figure 3.

Frequency of Perceived Impact of Urinary Symptoms on Activities of Daily Life in a Sample of College Women



How much do urinary symptoms disrupt or impact your life?

# **Bivariate Analyses**

Bivariate associations among the predictor variables and between predictors and the outcome variable (total USS-Storage subscale score) were assessed. Associations that were significant at the  $p \le .10$  level are displayed in Table 9. Variables that were significant at the  $p \le .10$  level were also identified for inclusion in subsequent multivariate models. Independent variables that were correlated r or rho > .5 were not included together in the subsequent regression models.

Bivariate associations among predictor variables and the total USS severity scores were also assessed and were nearly identical. Total USS scores and scores on the USS- Storage subscale were significantly correlated (r = .819, p < .001).

Thirteen variables were significantly correlated with total scores on the USS-Storage subscale including caffeinated beverages (rho = .086, p = .072), anxiety/depression (rho = .144, p = .003), constipation/irritable bowel syndrome (rho = .168, p < .001), progesterone hormonal contraception (rho = .131, p = .007), sexual activity (rho = .099, p = .038), childhood bedwetting (rho = .116, p = .018), embarrassment (rho = .087, p = .073), use of self-management strategies (rho = .363, p < .001), the total TB-WEB scale score (r = .193, p < .001) and TB-WEB subscales of delayed voiding (r = .192, p < .001), premature voiding (r = .150, p < .001), and strained voiding (r = .215, p < .001). Overall health was inversely correlated with USS-Storage subscale scores such that greater storage symptom severity was associated with lower perception of overall health (rho = -1.290, p < .001).

There were no significant correlations among variables with the exception of the total TB-WEB score with TB-WEB subscales of delayed voiding, premature voiding, and strained voiding. However, the subscales were not highly correlated. Therefore, the total TB-WEB score was not included in multivariate analyses described below.

6
e
10
9
E

Significant bivariate associations among selected predictor variables and LUTS storage symptom severity

13 14	0.087 a .363.	0.058 0.099	0.021 -0.12	0.075 0.034	0.012 0.117	-0.048 0.1	-096* .154*	.133** .159*	.178** -0.053	.129** 0.065	.137** 0.023	.137** -0.033	1 .158*	-
12	.215**	-0.068	0.028	0.086	0.023	0.032	0.078	0.003		.322	.294	-		
п	.150.	-0.002	0.044	0.053	0.039	-0.003	-0.072	.117*		.151.	-			
10	.192.	-0.059	0.029	0.087	.124*	-0.012	0.009	.137**	679	-				
6	.193.	-0.051	0.007	.104*	0.069	-0.043	0.016	.113*	-					
	.116*	-0.006	-0.036	0.021	0.002	-0.029	-0.065	-						
7	•660	0.05	.121	0.059	0.073	.233.	-							
9	.131.	0.006	•101.	0.089	.107*	-								
5	.168.	-095	0.089	.223	-									
4	.144**	182**	0.09	-										
9	0.086 a	-0.056	-											
2	129**	-												
-	-													
	2	2	2	2	2	2	2	2	2	2	2	2	2	
	Storage symptom severity	Overall health	Caffeinated beverages	. Anxiety/ Depression	. Constipation or IBS	Progesterone contraceptive	Sex	Childhood bedwetting	TB-WEB	). Delayed voiding subscale	. Premature voiding subscal	. Strained voiding subscale	. Embarrassing	Self-management strategie

\* p < .05.,\*\* p < .01.

#### **Main Analyses**

Specific Aim 1: Describe female undergraduate college students' experiences with LUTS storage symptoms, specifically overactive bladder (OAB) and urinary incontinence (UI).

LUTS storage symptoms, specifically OAB and UI, were measured with the 12item USS-Storage symptom subscale. The reported severities of urinary storage symptoms are graphically displayed in Figure 4. Participants with symptoms, most commonly reported experiencing symptoms *rarely* or *sometimes* during the past week. The most commonly reported storage symptoms included perceived urgency and frequency. Total symptom severity is displayed in Figure 5. The mean severity score for urinary storage symptoms was 3.31 (*SD* = 3.91, minimum = 0, maximum = 26).

Specific Aim 2: Examine the associations between selected personal, behavioral, and environmental factors and LUTS storage symptom (OAB and UI) severity in a sample of female undergraduate college students.

The distribution of LUTS storage symptom severity scores did not meet the assumption of normality. As is shown in Figure 5, scores were significantly positively skewed and resembled a negative binomial or Poisson-like distribution. Nearly half (43%) of the scores clustered around zero and one. Counts trailed off from 12% at two to less than one percent each from 12 to 26. Reports of zero and one had similar frequency compared to all other scores and represented reports of *never* experiencing storage symptoms or *rarely* experiencing <u>one</u> storage symptom. One symptom occurring rarely

**Figure 4.** Individual Storage Symptom Severity





**Figure 5.** *LUTS Storage Symptom Severity* 



during the past week was not considered significant. Based upon these conceptual differences, LUTS storage symptom severity scores were recoded as either "no or irrelevant symptom severity" or "relevant symptom severity." The two categories were coded as (0) for severity score of zero or one and (1) for severity score of two or greater). Logistic regression was then used to model the occurrence of relevant LUTS storage symptom severity.

Variables that were significantly associated with occurrence of relevant LUTS storage symptom severity in earlier bivariate analyses were entered into the model stepwise as follows: personal factors (e.g., overall health, health conditions [anxiety/depression, constipation/IBS], medication use [progesterone only hormonal

contraception]), behavioral factors (e.g., childhood bed-wetting, consumption of bladder irritants [caffeine], sexual activity, and toileting behaviors [delayed voiding subscale, premature voiding subscale, and strained voiding subscale]), and social/environmental factors (e.g., embarrassment regarding UI symptoms). Insignificant variables (at the p >.10 level) were removed from the model at each step.

Overall health (B = -.335, p = .006), anxiety/depression (B = .592, p = .006), constipation/IBS (B = 1.56, p = .005), and childhood bed-wetting (B = .579, p = .087) significantly contributed to the model. The addition of progesterone only contraception (B = .551, p = .107) and caffeine consumption (B = .105, p = .259) did not significantly impact the model and these variables were removed at each step. If progesterone only contraception was retained in the model at first entry, it became insignificant and was subsequently removed with the addition of sexual activity (B = .430, p = .214). The addition of sexual activity significantly impacted the model (B = .488, p = .028). The delayed voiding behaviors (B = .122, p = .004) and premature voiding behaviors (B = .142, p = .004) significantly impacted the model, however the addition of the strained voiding behaviors did not (B = .040, p = .269).

The final model containing retained predictor variables was statistically significant ( $\chi^2 = 49.53$ , p < .001) indicating that the model was able to distinguish between participants who had *relevant* LUTS storage symptoms (score of two or more) and those who did not. The Chi-square value for the Hosmer and Lemeshow Test indicated support of the model ( $\chi^2 = 8.272$ , p = .407). According to the Cox and Snell R square, the model explained 11.2% of the variance in LUTS storage symptom severity. Table 10 displays regression coefficients (B), significance level (p), odds ratios

(*OR* [Exp(B)]), and 95% confidence intervals for odds ratios of the final model. Perception of overall health, constipations/IBS, sexual activity, delayed toileting behaviors and premature toileting behaviors made significant contributions to the final model predicting LUTS storage symptom severity. History of anxiety/depression approached but did not reach significance (p = .069) and a history of childhood bedwetting was no longer significant in the final model (p = .153).

The strongest predictor of LUTS storage symptom severity was a history of constipation/IBS with an odds ratio of 4.222 (p = .011) indicating that participants with a history of constipation/IBS were more than 4 times more likely to experience relevant LUTS storage symptom severity. Participants who were sexually active were almost twice as likely (OR = 1.73, p = .017) to experience relevant LUTS storage symptoms. Increases in delayed voiding and premature voiding behavior scores were associated with 1.114 and 1.152 increased likelihood of relevant LUTS storage symptoms, respectively.

Table	10.
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Final Loaistic H	Rearession l	Aodel Predictina	Relevant LUTS S	toraae Svmptom	Severity
	-0				

	В	р	OR	95% CI	95% CI
				lower	upper
Overall health	287	.038**	.751	.572	.985
Anxiety/Depression	.436	.069#	1.547	.966	2.477
Constipation/IBS	1.440	.011*	4.222	1.391	12.817
Childhood bed-	.504	.153	1.656	.829	3.306
wetting					
Sexual activity	.548	.017*	1.729	1.104	2.707
Delayed voiding	.108	.013*	1.114	1.023	1.213
behaviors					
Premature voiding	.142	.004**	1.152	1.047	1.268
behaviors					

*Note:* CI = confidence interval. #<math>p < .10, \*p < .05, \*\*p < .01

Specific Aim 3: Explore the relationships between severity of urinary symptom bother and use of management strategies (care-seeking behavior and selfmanagement behaviors).

Bivariate associations among severity of urinary symptom bother, health care provider care-seeking, and use of self-management strategies are displayed in Table 11. Symptom bother was significantly correlated with talking about urinary symptoms with a health care provider (e.g., nurse, nurse practitioner, physician) (rho = .271, p < .001). Symptom bother was also associated with reported use of self-management strategies (rho = .255, p = .002).

Bivariate associations were also assessed between perceived impact of urinary symptoms on activities of daily life (ADLs), USS-storage symptom severity, talking about symptoms with a health care provider, self-management strategies, and perceived bother of urinary symptoms. Severity of storage symptoms was significantly correlated with perceived bother (r = .618, p < .001), perceived impact (r = .530, p < .001), and use of self-management strategies (rho = .363, p < .001). Severity of storage symptoms was not significantly associated with talking about symptoms with a health care provider (rho = .016, p = .835). Perceived impact of urinary symptoms was significantly correlated with bother (r = .810, p < .001), care-seeking (rho = .234, p = .006), and use of self-management strategies (rho = .205, p = .017). Finally, talking about symptoms with a health care provider significantly associated with use of self-management strategies (rho = .205, p = .017). Finally, talking about symptoms with a health care provider significantly associated with use of self-management strategies (rho = .205, p = .017). Finally, talking about symptoms with a health care provider significantly associated with use of self-management strategies (rho = .189, p = .013).

# Table 11.

Bivariate Asociations Among Storage Symptom Severity, Symptom Bother, Impact, Seeking Care from a Health Care Provider and Self-Management

	1	2	3	4	5
1. Storage symptom	1	.618**	.530**	.016	.363**
severity					
2. Bother		1	.810**	.271**	.255*
3. Impact			1	.234**	.205*
4. Health care provider				1	.189*
5. Self-management strategies					1

\* p < .05, \*\* p < .01.

#### **CHAPTER FIVE: DISCUSSION OF RESULTS AND CONCLUSION**

The primary purpose of this study was to explore and describe the experience of lower urinary tract (LUTS) storage symptoms, specifically overactive bladder (OAB) and urinary incontinence (UI), among female undergraduate college students, and explore how symptom severity relates to symptom bother, self-management strategies and careseeking behaviors. The secondary purpose was to identify personal, behavioral and environmental factors associated with OAB and UI symptoms in order to identify potential targets for future intervention and inform practice

Chapter Five presents the discussion of findings, organized by the specific aims. Additionally, Chapter Five presents the study limitations, implications for nursing, and implications for future research.

### **College Women's Experiences with LUTS Storage Symptoms**

The first aim of this study was to describe female undergraduate college students' experiences with lower urinary tract (LUTS) storage symptoms, specifically overactive bladder (OAB) and urinary incontinence (UI). Reports of symptom frequency were used to represent LUTS storage symptom severity, consistent with previous studies employing similar instrumentation (Sjogren et al., 2017; van Breda et al., 2015). The instrument used to assess LUTS symptoms in general and storage symptoms specifically, included items from commonly used measures in the field, the ICIQ-FLUTS and LUTS Tools (Avery et al., 2004; Brooks et al., 2004; Coyne et al., 2013). However, in earlier studies, the time frame for recall varied from one to four weeks.

In the current study, any response greater than *never* was considered adequate to indicate the positive experience of the symptom. Some other studies using the same or similar instruments have defined a positive symptom experience as a response greater than *rarely* or *sometimes* (Coyne et al., 2013; van Breda et al., 2015). In this study with a recall of one week, any report of symptoms was considered clinically relevant. However, in the regression model on LUTS storage symptom severity, a score of one (or one symptom occurring *rarely*) was considered clinically irrelevant and recoded as zero. Scores greater than two were considered clinically relevant LUTS storage symptom severity.

In general, experiences with LUTS storage symptoms in this sample were similar to findings from other studies with young women (Coyne et al., 2013; Kogan et al., 2014; Sjogren et al., 2017; van Breda et al., 2015). Reports of specific symptoms, such as urgency, frequency, nocturia, and UI, were also similar to findings from previous research. Overall, reports of LUTS storage symptom severity (i.e., frequency) were low for all individual symptoms and for LUTS storage symptom total severity scores. Most individual symptoms were reported to occur *never* or *rarely*. The symptoms with the greatest reported severity were urgency and perceived frequency. These findings are similar to reports of urinary symptom severity in other studies with young women (O'Halloran et al., 2012; Parden et al., 2016; Sjogren et al., 2017; van Breda et al. 2015). Similarly, reports of nighttime frequency, or nocturia, were similar to results from a previous study by Sjogren and associates (2017) in a sample of young women (mean age of 21.6 years). Reports of urgency were slightly higher in this sample (47.6%) than previous findings that ranged from 14.5 to 34.2% (Coyne et al., 2013; Sjogren et al., 2017; van

Breda et al., 2015).

Consistent with the findings from a recent study of 22-year-old women (Stockhil et al., 2018), about half of the respondents in the current study reported experiencing urinary frequency. However, only 18.9% of participants reported voiding more than eight times during the daytime, which is considered a problematic voiding pattern. Earlier studies found that 9.5 to 50.9% of young women reported nine or more daytime voids on an average day (Sjogren et al., 2017; van Breda et al., 2015). These differences may be related to dietary fluid intake, which was not assessed in this sample or in prior studies. Differences in actual versus perceived frequency is of note in this study and may be of consideration for future research or practice. Understanding women's perceptions of frequency versus actual daytime voids may influence education or management of toileting schedules.

Rates of urinary leakage (21.3%) were consistent with the range of rates (10 – 35.9%) reported in other studies with young women (Almousa & van Loon, 2018; Hagglund et al., 1999; O'Halloran et al., 2012; Parden et al., 2016; Sjogren et al., 2017; van Breda et al., 2015). Stress urinary incontinence (SUI) was the most common type of incontinence reported in this study; more participants reported leakage with coughing, laughing, or sneezing (28.8%) than with physical activity (19.1%). This was surprising as much of the literature in this age group has focused on SUI related to physical activity in college athletes. Other studies have reported higher rates of SUI than urge urinary incontinence (UUI) in young women (O'Halloran et al., 2012; Parden et al., 2016; Sjogren et al., 2017). Rates of leaking urine during sexual activity and while asleep were surprisingly high in the current sample. Although participants reported that leaking occurred *rarely* or *sometimes*, these findings are still clinically significant. It is unknown

whether urine leakage that occurred during sexual activity may have been related to concurrent alcohol use. Concurrent alcohol use during episodes of UI (e.g., nocturnal enuresis or leakage with intercourse that occurred while intoxicated) was not assessed in this study. However, alcohol use and high-risk alcohol consumption were not significantly correlated with severity of LUTS storage symptoms in the current study.

Similar to findings from the pilot study (Angelini, 2016) participants' reports of urinary symptoms such as delay before urination, terminal dribble, and post-micturition drip were reported with greater frequency than expected. These differences could be due to differences in instrumentation or interpretation of questions by those in this sample.

Any reports of individual urinary symptoms were considered clinically significant. However, the survey was descriptive and did not address the potential presence of a urinary tract infection (UTI). Frequency, urgency, and UI are common symptoms of UTIs (Coyne et al., 2013; Robinson & Cardozo, 2003), and frequent UTIs have been associated with increased rates of urinary incontinence in young women (Hagglund et al., 1999). UTIs are common among college women and are UTI symptoms are one of the most common reasons for college women to seek care at a college health center (Angelini, Sutherland, & Fantasia, 2017a). Thus, it is important to differentiate between acute urinary symptoms as a result of UTIs versus more chronic LUTS.

#### Summary

Any reports of LUTS storage symptoms (i.e., individual symptom score of one or greater) were considered clinically significant in the current study. Despite low reported frequency of individual symptoms and total LUTS storage symptom severity, presence of

any report of symptoms in this presumably healthy population requires further attention. LUTS storage symptom severity was still found to be associated with perceived bother from urinary symptoms, impact on activities of daily life (ADLs), care-seeking, use of self-management strategies and other selected factors (described in further detail below). These associations suggest a relationship between heath related quality of life and perceived overall health and LUTS storage symptom severity.

# Personal, Behavioral and Environmental Associations with LUTS

The second aim of this study was to examine the associations between selected personal, behavioral, and environmental factors and LUTS storage symptom (OAB and UI) severity in a sample of female undergraduate college students. This study was one of the first to examine influential factors in order to identify potential targets for future interventions.

#### Personal Characteristics Associated with LUTS Storage Symptoms

This sample was fairly homogeneous and comprised mostly of White, non-Hispanic females in the middle or upper socioeconomic status, and many were less than 21-years-old. All but one of the respondents were nulliparous. In general, the sample selfidentified as being in good health and most were within the normal body mass index (BMI) range for healthy individuals (18.5 to 24.9; CDC, 2015). Fewer particpants in this sample reported a BMI greater than the upper limits of normal range (21.9%) compared to a national survey of college students conducted by the American College Health Associations National College Health Assessment national survey (33%) (ACHA, 2013). Perhaps due to the homogeneity of the sample and small sample size, demographic data and BMI were not significantly correlated with LUTS storage symptom severity. For
example, an earlier study by Brucker and associates (2017) found that obese young women were more likely to experience LUTS than other young women. Responses were also self-report rather than measured height and weight and may be influenced by embarrassment to report true values. Further investigation on the relationship between BMI and LUTS storage symptom severity is needed in this population in order to influence management and practice recommendations.

Anxiety and/or depression was reported by more than one third of the participants, while only 16.6% reported use of anti-anxiety or anti-depressant medication. It was interesting that only a history of anxiety/depression and not medication use for these conditions was associated with LUTS symptom severity in bivariate analyses. These reports were based on self-report and no assessment of therapy or counseling use was included as part of this study. This and small sample sizes and limited analytical power, may explain the differences in significance. These findings are similar to findings from a recent study on LUTS in young women that found greater reported depression and anxiety in participants who experienced LUTS (Stockhil et al., 2018). Although history of anxiety and/or depression was associated with LUTS storage symptom severity in bivariate analyses, it was no longer significant when controlling for other variables in multivariate analyses (described in detail below). Further research is needed on the relationship between anxiety/depression and LUTS in this population.

Constipation and irritable bowel syndrome (IBS) were present in less than ten percent of the sample, yet they were significantly correlated with LUTS storage symptom severity in bivariate analyses. These results are similar to other studies with older women that have documented associations between constipation, IBS, and LUTS storage

symptoms (Carach, 2001; Sung & Hampton, 2009; Zingone et al., 2017). Increased straining with bowel movements has been associated with increased pressure on the pelvic floor and subsequently rates of LUTS (Abrams et al., 2012).

Attitudes and beliefs. Many participants reported that UI was normal and/or a normal part of aging. These findings are similar to previous reports in the literature (Hutchings & Sutherland, 2014; Luo et al., 2016; Parden et al., 2016; Smith et al., 2011; Tremback-Ball et al., 2008). Similarly, many reported that it is normal to leak a little urine during exercise; this was also reported in the pilot study (Angelini, 2016). These types of misperceptions represent opportunities for patient education.

A significant number of the participants in this study (16.2%) reported that urinary incontinence was embarrassing and not something to talk about. Previous researchers have found that women, specifically young women, report LUTS and UI embarrassing and difficult to talk about due to social stigma surrounding symptoms (Tremback-Ball, Levine, Dawson, & Perlis, 2008;Tremback-Ball, Levine, Perlis, & Dawson, 2013). Findings from bivariate analyses in this study suggested a significant association between perceived embarrassment of UI and LUTS storage symptom severity. Embarrassment and social stigma surrounding LUTS may also defer careseeking and management (Bradway et al., 2008).

## **Behavioral Characteristics Associated with LUTS Storage Symptoms**

A surprising number of participants (12.6%) reported wetting the bed after the age of 10 years. These reports are greater than those previously reported in a large epidemiological study (Yeung et al., 2006). They found nocturnal enuresis rates of 2% to 3.4% in children 9- to 19-years-old (Yeung et al., 2006). Long-term childhood

bedwetting has been associated with emotional and social distress, as well as increased frequency of LUTS in adulthood (Constantini et al., 2018; Fitzgerald et al., 2006; Heron et al., 2017). Findings from the current study reinforce this association as reports of childhood enuresis were significantly associated with LUTS storage symptom severity. However, participants' recall of childhood bedwetting may have been flawed. In addition, the frequency of episodes was not assessed. Further evaluation of the frequency (e.g., infrequent versus nightly) of childhood enuresis and LUTS storage symptoms in this population is needed.

**Ingestion of substances and bladder irritants**. The period of emerging adulthood presents young people with opportunities to engage in high-risk behaviors including exposure to alcohol, other substances, and sexual encounters (Arnett, 2014). These risk behaviors are particularly prevalent on college campuses (Healthy Campus 2020, 2016). Many participants in this study reported alcohol consumption during the past month and of those, almost two-thirds reported binge drinking (consumption of four or more drinks at one time) (CDC, 2016a; CDC, 2016b). These high rates of binge drinking are similar to data from a national survey, which found that 66% of college students reported high-risk alcohol consumption (NIAAA, 2015). Despite these rates of high-risk alcohol consumption and the fact that alcohol is a known bladder irritant (Dallosso et al., 2003; Maserejian et al., 2013), alcohol consumption was not significantly related to LUTS storage symptom severity in the present study. Failure to disclose urinary symptoms that occured while intoxicated, either due to embarrassment or lack of recall, may have influenced results and required further investigation in this population.

Similarly, tobacco use was not significantly related to LUTS severity despite prior

studies that found increased LUTS storage symptoms in those with higher rates of tobacco use (Maserejian et al., 2012). The finding of no such association in the current study may be due to the fact that most of the participants in this sample did not use tobacco products, and those who did reported infrequent use of once or twice in the past month. These findings are similar to other studies on college campuses as rates of smoking have declined in the past few decades (Angelini, Sutherland, & Fantasia, 2017b; Rigotti et al., 2010). Further, rates of infrequent or "social" smoking are more common among college students (Levinson et al., 2007) than consistent smoking. Further investigation is needed on the effects of infrequent tobacco use and LUTS.

Caffeinated beverage consumption was significantly associated with LUTS storage symptom severity in bivariate analyses. Caffeinated beverages were the only bladder irritants assessed that were significant predictors of symptoms. Although the majority of participants reported consuming less than two cups of coffee per day, increased consumption of caffeine was associated with increased LUTS storage symptom severity. This finding is consistent with the findings of previous findings (Dalloso et al., 2003; Dasgupta et al., 2006). Participants with urinary symptoms most often identified coffee and alcohol as worsening their urinary symptoms as well as tea and carbonated beverages (Dallosso et al., 2003; Dasgupta et al., 2006).

**Sexual health, activity, and hormonal contraceptives**. Approximately twothirds of participants reported a history of past or current sexual activity, which was significantly associated with LUTS storage symptom severity. These findings may be due in part to increased rates of UTIs among sexually active women (Lach et al., 1980) and the inability to screen for acute UTIs in this sample. In previous studies of post-

menopausal women, increased LUTS were associated with decreased sexual activity, which might represent effects of vaginal atrophy related to dyspareunia and LUTS postmenopause and do not translate to a younger population (Moller et al., 2006). However, no inclusion of external measures to assess for UTI symptoms, including recent visit to the college health center, were included in this study. Further study on the relationship between sexual activity and UTI symptoms versus urinary storage symptoms is needed.

Many of the participants reported use of combined (estrogen and progesterone) or progesterone-only hormonal contraception. As this population is of reproductive age, this finding is not surprising. However, as this setting was a Catholic university, results must be taken in consideration. Previous researchers have demonstrated associations between estrogen use and UI (Iliadou et al., 2009; O'Halloran et al., 2012; Townsend et al., 2009) as well as a lack of evidence of relationships between the progesterone-containing intrauterine device (IUD) and LUTS storage symptoms (Iliadou et al., 2009). Findings from this study contradict previous findings in that use of progesterone-only methods was significantly associated with increased LUTS storage symptom severity in bivariate analyses, whereas the relationship between estrogen containing contraception and LUTS severity was not significant. A possible reason for this is because progesterone-only methods (e.g., progesterone-only pill, progesterone-IUD, injection, and implant) are typically longer acting contraception and might be used more frequently in participants with higher sexual activity.

**Physical activity and involvement on sports teams.** Numerous investigators have documented elevated rates of urinary incontinence among college athletes, particularly among elite athletes (Carls et al., 2007; Goldstick & Constantini, 2014;

Simeone et al., 2010). Athletic team membership was not significantly related to LUTS storage symptom severity in the current study. This finding may be due to the fact that most of the participants were not members of any athletic teams. Sports team membership aside, almost half of the sample reported exercising for at least one hour three or more times per week and many reported running, high intensity interval training, cycling, and weight lifting.

LUTS storage symptom severity was also not significantly associated with levels of physical activity and participation in high impact activities. Previous researchers have found high rates of UI in those who participate in high-impact activities (Almeida et al., 2016; Caylet et al., 2006). Nygaard and associates (2005) found increased rates of UI in middle-aged women who had participated in strenuous high impact athletics in college. This finding may be interpreted as indicating a long-term influence on UI across the life course. Therefore, education of college athletes on bladder health and pelvic floor muscles could represent a unique opportunity for intervention and prevention strategies for women who exercise both on a team and independently. Again, small subsample sizes may have limited analytical power and the ability to detect associations between activity and LUTS in the present study.

**Voiding behaviors**. Similar to previous research findings, many participants reported delaying bladder emptying when busy (Sjogren et al., 2017; Xu et al., 2016). This behavior can lead to over-distention of the bladder and has been associated with LUTS (Palmer et al., 2012). Higher scores on the delayed voiding subscale were significantly associated with increased LUTS storage symptom severity in bivariate analyses. The other toileting behavior subscales were also significantly associated with

LUTS storage symptom severity. The place preference subscale assessed environmental factors of worry regarding cleanliness of public toilets and attempts to avoid public toilets. Similar to previous studies, the majority of participants in this sample reported worry over cleanliness of public toilets and attempts to avoid using public toilets (Sjogren et al., 2016; Wang & Palmer, 2010). About half of the study participants reported crouching or hovering over the toilet when using public bathrooms; this is higher than the rates of crouching or hovering reported in other studies (Xu et al., 2016). The majority of participants reported sitting on the toilet seat *at home* and *in residence hall toilets*. This suggests that residence hall toilets may not be viewed as public toilets and worry over the cleanliness of residence hall toilets may not lead to crouching or hovering behaviors when voiding.

### Multivariate Analysis of Selected Influences of LUTS Storage Symptoms

As described in Chapter Four, the distribution of LUTS storage symptom severity was highly skewed resembling more of a negative binomial or Poisson-like distribution. Just under half of the cases (about 43%) were either zero or one, and there was an evident basement effect with the majority of the counts occurring under five and tapering off in the upper range. The actual range of severity was only a little over half of the potential range. For this reason, LUTS storage symptom severity was recoded as a dichotomous variable (*no or irrelevant* symptom severity for counts of zero or one, and *relevant* symptom severity for counts of two or more). Counts of two or more suggest a single symptom occurring *sometimes* or two symptoms occurring *rarely*. This basement effect suggests a need for further evaluation of instrumentation in this population to better assess the scope of symptom severity.

Although several selected personal, behavioral, social, and environmental factors were shown to be significantly associated with LUTS storage symptom severity in bivariate analyses (discussed above), only perception of overall health, history of constipation/IBS, sexual activity, delayed toileting behaviors, and premature toileting behaviors were significant when controlling for other factors.

It is not surprising that constipation/IBS was found to increase likelihood of relevant LUTS storage symptom severity four-fold when controlling for other factors. Constipation and straining with bowel movements can increase pressure exerted on the pelvic floor and weaken pelvic floor muscles (Abrams et al., 2012; Qassem et al., 2014). The wide confidence interval for constipation reflects the small percentage of the sample (less than 10%) that reported constipation. Further research with a larger sample size is needed.

After controlling for toileting behaviors (delayed voiding and premature voiding), history of anxiety and/or depression was no longer significant. This is surprising because reports of anxiety and/or depression have been associated with increased LUTS severity in previous studies (Coyne et al., 2013; Sjogren et al., 2017; Stockhill et al., 2018; Tennstedt et al., 2008). The lack of significant findings in the current study may be due to the homogeneity of the sample, small sample size and a possible lack of analytic power. Although the relationship was not significant in the current study, it may still be important and requires further investigation with larger sample sizes. Additional research on the nature of the relationship (whether history of anxiety/depression is a predictor of LUTS, a result of the experience of LUTS, or a symptom cluster) is needed in order to guide management and practice recommendations.

As expected, progesterone-only contraception did not significantly impact the model when sexual activity was held constant. The potential influence of sexual activity on relevant LUTS storage symptom severity needs to be further assessed in this population as increased sexual activity may result in an increased risk for urinary tract infections (UTI). As described above, this study did not test for the presence of current UTI when evaluating symptoms occurring over the past week. Further evaluation of the role of sexual activity in LUTS storage symptom presentation versus UTI symptoms requires evaluation in this setting.

Lower perceived overall health was significantly associated with relevant LUTS storage symptom severity in the final model. The impact of this in a young, presumably healthy, population requires further attention and evaluation. The relationship whether causative or a result of LUTS requires further evaluation.

Of the toileting behaviors that were significantly associated with LUTS storage symptom severity in bivariate analyses (delayed voiding behaviors, premature voiding behaviors, and strained voiding behaviors), only delayed voiding behaviors and premature voiding behaviors contributed to the final model. The relationship of these behaviors in the development of LUTS storage symptoms and/or as a result of symptoms requires further study. It was interesting that strained voiding behaviors did not significantly contribute to the model, however this confirms findings from previous studies finding an indeterminate relationship between LUTS and strained voiding behaviors (Pauwels et al., 2006; Robinson et al., 2012).

# Summary

In summary, a number of personal, behavioral and environmental factors were found to be significantly associated with LUTS storage symptom severity during bivariate analyses. However, only perception of overall health, history of constipation/IBS, sexual activity, delayed toileting behaviors, and premature toileting behaviors were significant when controlling for other factors. Further investigation is needed to determine the relationship of these factors (causal or causative) and LUTS storage symptom experience.

## LUTS Perceived Bother, Self-Management and Care-Seeking

Specific aim three was to explore the relationships between severity of urinary symptom bother and use of management strategies (care-seeking behavior and self-management behaviors). Overall perceived bother from urinary symptoms was low with an average score of about two out of ten. This is similar to findings from another study of young women aged 18- to 25-years-old with reports of bother ranging from zero to a little over two for each urinary symptom (Sjogren et al., 2017). Reports of the perceived impact of urinary symptoms on activities of daily life (ADLs) were also low; the average was about two out of ten.

More than one-eighth of the young women in this study who experienced LUTS reported doing nothing to manage their urinary symptoms. Previous studies have found mixed results. Kogan and associates (2014) found a lack of self-management strategies being used by women with LUTS. Others find a variety of strategies being used (Bardino et al., 2015; Kogan et al., 2014; O'Halloran et al., 2012). The most frequently reported in this study included fluid intake limitation and going to the bathroom before exercise,

before sex, and before leaving the house "just in case." These are the same types of prevention strategies reported by women in previous studies (Bardino et al., 2015; Kogan et al., 2014; O'Halloran et al., 2012).

Absorbent pad use was less commonly reported in this study compared to other strategies; this finding may be related to the age of the sample and the marketing of products towards this age group. Most participants who reported pad use, used menstrual pads rather than the more effective urinary incontinence pads or briefs. Again, this could be due to how products are marketed and the belief that urinary products are not designed for them. This represents an area for patient education for younger women with LUTS. Of note, no participants reported use of the Impressa product recently gaining popularity to decrease SUI episodes. Furthermore, no one reported avoiding activities that cause urinary symptoms. This finding was somewhat surprising as many investigators have found UI to be a barrier to exercise and other activities that may cause urinary leakage (Bardino et al., 2015; Nygaard et al., 2005; Shaw, 2001). It is possible that symptoms were not severe enough to deter activities or results may be influenced by another external factor. Further investigation on avoidance behaviors in this age group is warranted.

#### **Care-Seeking**

Reports of care-seeking were also low. Fewer than one third of the study participants reported discussing symptoms with a health care provider. Numerous investigators have found low rates of care-seeking and provider communication regarding urinary symptoms (Benner et al., 2007; Hagglund et al., 2001; Kinchen et al., 2013; Kogan et al., 2014).

Perceptions of increased symptom bother were significantly associated with discussing urinary symptoms with a health care provider as well as the use of selfmanagement strategies. Perceived impact of LUTS storage symptoms on ADLs was also significantly associated with discussing urinary symptoms with a health care provider and use self-management strategies. These findings are consistent with those from earlier studies that women with greater perceived symptom bother and impact on quality of life (QOL) are more likely to report care-seeking and report use of self-management strategies (Bardino et al., 2015; Dmochowski & Newman, 2007; Irwin et al., 2008; Kinchen et al., 2003; Koch, 2006; Welch, Taubenberger, & Tennstedt, 2011).

It was surprising that LUTS storage symptom severity was not associated with care-seeking, particularly since symptom severity was associated with increased bother, decreased ratings of overall health, use of self-management strategies and activities of daily living (ADLs). These findings may be due to how the question was worded. Participants were asked to report if they had talked about urinary symptoms with their health care provider. There was no distinction as to whether the participant had broached the subject and told her health care provider about her symptoms or if the provider initiated the conversation by asking/screening for urinary symptoms. However, findings from an unpublished study of 177 advanced practice nurse practitioners (NPs) in the U.S. demonstrated that fewer than half of the NPs reported screening female patients for changes in urination or urinary symptoms (Angelini & Sutherland, unpublished).

Similarly, it was unclear if participants were using self-management strategies based upon recommendations from a health care provider or if they undertook these actions independently. Previous studies have shown that, even if women reported and/or

discussed symptoms with a provider, many failed to report that they had been treated or advised as to how to best manage symptoms (Shaw et al., 2001). Further research is needed to understand management and education provided to women with urinary symptoms by health care providers.

It is clear that there is a missed opportunity in identifying LUTS storage symptoms, bother, and impact from urinary symptoms if providers are not actively screening and talking about urinary symptoms with patients. Previous studies have demonstrated that women report experiencing symptoms for many years prior to eventually seeking care from their provider (Margalith, 2004). This missed opportunity presents an area for future research and practice interventions.

### Summary

In summary, perceived bother from urinary symptoms as well as perceived impact of urinary symptoms on activities of daily life (ADLs) were significantly associated with care-seeking and use of self-management strategies. Interestingly, LUTS storage symptom severity was not significantly associated with care-seeking. However, it was related to use of self-management strategies in this population.

#### **Study Limitations**

The study findings should be viewed in light of several study limitations. First, the sample for this exploratory study consisted of 456 female undergraduate college students at a private university in the northeast with minimal minority representation. Therefore, this sample was not representative of all female undergraduate college students in the United States. Further, young women attending college may differ demographically and in terms of exposure to personal, environmental, and behavioral

factors than women of similar age not enrolled in college. This limits the generalizability of the study to this small sample of college women. The erroneous inclusion of night school students to the sampling pool further limits results participants from the night school are not representative of the residential undergraduate student population. However, as there were very few night school students in this sample, it is unlikely that these cases significantly impacted the study findings.

Second, the response rate for this study was lower than expected and may be due to the timing of recruitment during university study days prior to the winter break. Students at this time may have been occupied with studies or inundated with other surveys. However, this time was found to yield good response rates in the pilot study (Angelini, 2016). Further, the response rate was consistent with those from earlier studies with similar college-based samples (Sutherland et al., 2015; 2016). To encourage representative sampling of female undergraduate college students, incentives were provided and all correspondence was sent from the principal investigator's university provided email address to increase personalization to increase response rates (Cook, Health, & Thompson, 2000).

Although the demographics of the study participants showed that they were representative of undergraduate women at the college, it is possible that those who participated may have been different from non-participants in other ways. For example, respondents might have been more apt to complete the study if they experienced LUTS. Therefore, the extent of LUTS storage symptoms may be over-reported in this sample. Reported rates of LUTS did not differ significantly from those found in a previous study with a similar age group (Sjogren et al., 2017).

Finally, this exploratory study utilized a cross-sectional design; as such, causation cannot be inferred from the findings (Shadish, Cook & Campbell, 2002). Despite these limitations, the study had many strengths, including a theoretical framework and a fairly large sample size. This study provided preliminary insight into selected personal, behavioral, social, and environmental factors associated with LUTS storage symptoms in college women based on two guiding theoretical models. Findings from this initial study provide insight for future researchers.

#### **Implications for Nursing**

Based upon population growth predictions for 2010 to 2050 (Census Bureau, 2015), the number of women with LUTS storage symptoms is expected to increase. The prevalence of UI alone is expected to more than double by the year 2050 (Wu, Hundley, Fulton, & Myers, 2009). This projected increase is due to the projected aging of the population and the higher rates of OAB and UI that are associated with increasing age (Coyne et al., 2013; Norton & Brubaker, 2006; Nygaard et al., 2008). These increases highlight the need for public health efforts to prevent and manage these conditions.

Numerous researchers have documented the prevalence of LUTS in middle-aged and older women. However, the recent emphasis on prevention strategies for LUTS across the lifespan (Harlow et al., 2017) highlights the importance of evaluating symptoms and associated factors earlier in the life course. Beliefs and bladder health habits adopted at a young age have been shown to influence bladder habits and behaviors later in life (Garcia, Crocker, & Wyman, 2005; Palmer, Athanasopoulos, Lee, Takeda, & Wyndaele, 2012). Attention then must be given to prevalence and factors associated with LUTS in young women.

With more female high school graduates enrolled in college than ever before and the postponement of marriage and family planning (U.S. Bureau of Labor Statistics, 2017), the experience of LUTS in young adult and college women is of emerging importance. This study helped to highlight the experiences of LUTS storage symptoms, specifically OAB and UI, among college women. This study also highlights potential factors associated with LUTS storage symptoms and management strategies related to symptom severity, bother, and impact on activities of daily life (ADLs). Findings from this preliminary descriptive study provide valuable insights for practice and future interventions related to LUTS storage symptom identification and management.

# Practice

Screening. The National Institutes of Health report that the prevalence of UI among women is high, and recognition of this problem by health care providers is low (Landefeld et al., 2008). A lack of clinician screening and assessments for LUTS contribute to high prevalence of LUTS (Newman et al., 2009). There are doubts as to whether providers are following clinical practice guidelines for LUTS screening and management (Kirby et al., 2006). Time constraints, pessimism regarding treatment efficacy, and a lack of current knowledge regarding LUTS have been identified as barriers to provider screening and detection of LUTS (Albers-Heitner et al., 2008; Keilman & Dunn, 2010; Nicolson et al., 2005; Peters et al., 2004; Teunissen et al., 2006). A recent study of nurse practioners found less than half reported routinely asking their female patients about experience of urinary symptoms (Angelini & Sutherland, unpublished data).

Fewer than half of incontinent individuals actively seek treatment and report the problem (OAB and UI symptoms) to their care providers; therefore, providers must directly ask about the presence of symptoms (Harris et al., 2007). Studies have shown increased health care utilization among women with OAB, however, less than 12% reported talking about urinary symptoms with their health care provider (Dmochowski & Newman, 2007). Ideally, conversation and detection should be included in annual routine visits and gynecological exams (Lamin et al., 2016). A thematic analysis by Welch, Taubenberger, and Tennstedt (2011) found that women reported discussing urinary symptoms with their provider for the first time during a visit for routine health care or for another problem. Routine questioning and early detection allow for symptoms to be recognized early, information on healthy bladder habits can be provided and first line therapies implemented (Wyman et al., 2009). Encouraging guidelines for screening young women for urinary symptoms may increase awareness and early detection, and decrease progression of symptoms later in the life-course. Attention to barriers to screening and provider communication about LUTS requires further study.

**Management.** National and international organizations agree that the recommended first line therapy for LUTS is behavioral modification and pelvic floor muscle strengthening (Gormley et al., 2015; Landefelde et al., 2008; Wilson et al., 2005; Wyman et al., 2009). A review of two Cochrane reviews (Angelini, 2017b) demonstrated that PFM exercises either alone or in combination with biofeedback were beneficial in decreasing LUTS. However, many providers are not providing adequate verbal instruction on PFM exercises, which may contribute to high rates of ineffective technique (e.g., not contracting the correct muscles) among women (Bump, 1991; Tremback-Ball et

al., 2012). In order to effectively manage urinary storage symptoms, health care providers need to evaluate pelvic muscle tone, provide adequate instructions for PFM exercises, and/or refer for further management.

Education surrounding modifiable lifestyle factors and behavior change include toileting schedules and timed voiding and avoidance of bladder irritants. These visits are often time consuming and offer low returns in terms of reimbursement. In a time of billing and visit constraints, nurse practitioners commonly manage routine primary care visits and screenings and may be able to provide a cost-effective option for identification and treatment of LUTS (Abrams et al., 2012; Lamin et al., 2016).

Second and third line therapy options include medication, oxybutynin, percutaneous tibial nerve stimulation, and surgical management. A study by Shaw and associates (2001) found that even when patients reported discussing LUTS with their providers, many providers failed to offer management options. In large database studies, OAB and UI diagnoses were given to less than 25% of women with clinical symptoms, and of those, less than one-third received medication management (Benner et al., 2007; Goldman et al., 2015; Mandimika et al., 2014; Minassian et al., 2012). Increased age, parity, and higher reported bother scores were associated with an increased likelihood of receiving a diagnosis and treatment plan (Minassian et al., 2015). Many young women with symptoms go undiagnosed and unmanaged. This highlights missed opportunities to screen, detect and effectively treat LUTS (Cheung et al., 2009).

**Provider education.** Multiple sources have identified lack of knowledge as a barrier to appropriate identification and management (Albers-Heitner et al., 2008; Collette, Leclerc, & Tu, 2003; Saxer, De Bie, Dasseb, & Halfens, 2008). There is a need

for more effective communication with providers to overcome misconceptions, understanding, expectations, and outcomes of LUTS (Smith et al., 2011). Bradway and Cacchione (2010) recommend that nursing faculty incorporate incontinence education in both the classroom and clinical settings to increase evidence-based knowledge for identification and management of LUTS. If nurses, nurse practitioners, and other health care providers have a greater understanding and awareness of LUTS storage symptom prevalence, risk factors, and management options, then they will have accurate information to convey. Interventions to promote provider screenings will need to address the multiple factors that act as facilitators and barriers to screening and management.

Women, specifically young women, need to be aware of problematic urinary symptoms and bladder habits and given the tools to mitigate risks. These tools include: information and education, open dialogue with providers, implementation of first line therapies including behavior and lifestyle modification, and appropriate referrals and care plans.

Transition to college often requires health care visits for vaccines and routine check-ups. This visit may represent an optimal time to provide education on several health concerns specific for this population, including sexual health, safe substance consumption, healthy diet and exercise, as well as urinary and bladder health.

#### **Implications for Research**

Given the study findings and limitations, there are a number of implications for research and practice. First, further research is needed to follow-up on the findings from the current exploratory study with larger, more diverse samples of college women from different regions across the U.S. Future studies would also benefit from the inclusion of

young women who are not enrolled in college to ascertain whether the milieu of the college environment creates increased risk for LUTS.

Second, beyond primarily qualitative studies of LUTS to explore qualitative descriptions of symptoms, bother, and impact related to LUTS storage symptoms in college women. As mentioned before, several items from the validated tool seemed inaccurately inflated and may be due to misinterpretation of problematic versus normal voiding patterns. A qualitative design to describe frequency and description of urinary symptoms in this population may differ from previous findings in older women and modification in instrumentation may be indicated.

Furthermore, research with health care providers (nurses, nurse practitioners, and physicians) is needed to understand their knowledge, beliefs and behaviors related to LUTS screening and management of urinary symptoms in young women. Although urinary symptoms are considered to be fairly common during the postpartum and postmenopausal years, the current study indicated that urinary symptoms are often present among younger otherwise healthy women. The finding that most participants did not discuss LUTS storage symptoms with their health care provider represents missed opportunities for early diagnosis and secondary prevention and highlights the need for providers to actively screen young women for LUTS symptoms

Consistent with a life course perspective (Elder, 1998), by screening and intervening with younger, non-pregnant women, health care providers may be able to alter the trajectory of LUTS symptoms later in life. Research on multi-level influences of college health care provider screenings of young women for IPV/SV have identified a number of individual and organizational factors that influence intentions to screen and

actual screening behaviors (Sutherland & Hutchinson, 2018; Sutherland et al., 2016; 2017). Some of the key organizational influences identified included screening as a priority in the college health center, use of electronic health records with screening reminders, and nurse practitioner role in prevention strategies and patient education (Angelini et al., 2017; Sutherland & Hutchinson, 2018; Sutherland et al., 2016; 2017).

## Conclusion

This exploratory study represents an important first step in understanding college women's experiences with LUTS storage symptoms and identifying the unique personal, behavioral and environmental factors associated with LUTS. The study found that LUTS, specifically overactive bladder (OAB) and urinary incontinence (UI), are common among female college undergraduates. In addition, a number of behavioral and social factors were found to be associated with the presence of LUTS storage symptoms. Given that many health-related behaviors established during emerging adulthood may persist into middle- and later-adulthood (Arnett, 2014), identifying influences of young women's LUTS storage symptoms is an important first step in promoting screening and developing effective multi-targeted interventions to reduce symptoms in young women and prevent more severe LUTS symptoms in middle- and later-adulthood.

# References

- Abrams, P., Cardozo, L., Fall, M., Griffiths, D., Rosier, P., Ulmsten, U., ... & Wein, A. (2002). The standardization of terminology of lower urinary tract function: report from the Standardization Sub-committee of the International Continence Society. *American Journal of Obstetrics and Gynecology*, *187*(1), 116-126.
- Abrams, P., Cardozo, L., Fall, M., Griffiths, D., Rosier, P., Ulmsten, U., ... & Wein, A. (2003). The standardization of terminology in lower urinary tract function: report from the standardization sub-committee of the International Continence Society. *Urology*, *61*(1), 37-49.
- Abrams, P., Artibani, W., Cardozo, L., Dmochowski, R., van Kerrebroeck, P., & Sand, P. (2009). Reviewing the ICS 2002 terminology report: the ongoing debate. *Neurourology and Urodynamics*, 28(4), 287-287.
- Abrams, P., Cardozo, L., Khoury S., & Wein, A. (eds). (2012). Incontinence: Proceedings from the 5<sup>th</sup> International Consultation on Incontinence. Retrieved from https://www.ics.org/Publications/ICI\_5/INCONTINENCE.pdf.
- Agur, W. I., Steggles, P., Waterfield, M., & Freeman, R. M. (2008). The long-term effectiveness of antenatal pelvic floor muscle training: eight-year follow up of a randomized controlled trial. *BJOG: An International Journal of Obstetrics & Gynaecology*, 115(8), 985-990.
- Alatas, E., Ozkan, S., & Ogce, F. (2013). The effect of overactive bladder syndrome on the sexual life in asymptomatic continent women. *Australian Journal of Advanced Nursing*, 30(4), 59.

- Alaqeel, M. K., Alowaimer, N. A., Alonezan, A. F., Almegbel, N. Y., & Alaujan, F. Y.
  (2017). Prevalence of Irritable Bowel Syndrome and its Association with Anxiety among Medical Students at King Saud bin Abdulaziz University for Health Sciences in Riyadh. *Pakistan Journal of Medical Sciences*, *33*(1), 33.
- Albers-Heitner, P., Berghmans, B., Nieman, F., Lagro-Janssen, T., & Winkens, R.
  (2008). Adherence to professional guidelines for patients with urinary incontinence by general practitioners: a cross-sectional study. *Journal of Evaluation in Clinical Practice*, 14(5), 807-811.
- Almousa, S., & van Loon, A. B. (2018). The prevalence of urinary incontinence in nulliparous adolescent and middle-aged women and the associated risk factors: A systematic review. *Maturitas*, 107, 78-83.
- American College Health Association. (2013). American College Health Association–
   National College Health Assessment II: Spring 2014 reference group executive
   summary. *Retrieved from www. acha-ncha. org/docs/ACHA-NCHA- II ReferenceGroup ExecutiveSummary Spring2013. pdf.*

Angelini, K.J. (2016). [Cross-sectional survey study]. Unpublished raw data.

- Angelini, K. J. (2017a). An integrative review of current research on the role of the female urinary microbiota in overactive bladder symptoms. *Urologic Nursing*, 37(2), 94-101.
- Angelini, K. (2017b). Pelvic floor muscle training to manage overactive bladder and urinary incontinence. *Nursing for Women's Health, 21* (1), 51-57.
- Angelini, K. (2017c) Effect of physical activity on urinary incontinence in women: implications for providers. *Women's Healthcare* [IN PRESS].

- Angelini, K., Sutherland, M. A., & Fantasia, H. C. (2017a). College Health Center Utilization Among a Sample of Senior College Women. *The Journal for Nurse Practitioners*, 13(10), e477-e480.
- Angelini, K., Sutherland, M. A., & Fantasia, H. C. (2017b). Reported alcohol and tobacco use and screening among college women. *Journal of Obstetric, Gynecologic & Neonatal Nursing*, 46(3), e75-e82.
- Araujo, M. P. D., Oliveira, E. D., Zucchi, E. V. M., Trevisani, V. F. M., Girão, M. J. B.
  C., & Sartori, M. G. F. (2008). The relationship between urinary incontinence and eating disorders in female long-distance runners. *Revista da Associação Médica Brasileira*, 54(2), 146-149.
- Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American psychologist*, *55*(5), 469.
- Arnett, J. J. (2014). Adolescence and emerging adulthood. Boston, MA: Pearson.
- Arya, L. A., & Asfaw, T. (2009). The importance of monitoring fluid intake during treatment of overactive bladder. *Current Bladder Dysfunction Reports*, 4(2), 98-105.
- Ashworth, P. D., & Hagan, M. T. (1993). The meaning of incontinence: a qualitative study of non-geriatric urinary incontinence sufferers. *Journal of Advanced Nursing*, 18(9), 1415-1423.
- Attila, S., & Çakir, B. (2011). Energy-drink consumption in college students and associated factors. *Nutrition*, 27(3), 316-322.
- Bandukwala, N. Q., & Gousse, A. E. (2015). Mixed urinary incontinence: what first?. Current Urology Reports, 16(3), 9-9.

- Bakker, E., & Wyndaele, J. J. (2000). Changes in the toilet training of children during the last 60 years: the cause of an increase in lower urinary tract dysfunction?. *BJU International*, *86*(3), 248-252.
- Bandura, A. (1978). Social learning theory of aggression. *Journal of Communication*, 28(3), 12-29.
- Bandura, A. (1986). The explanatory and predictive scope of self-efficacy theory. *Journal of social and clinical psychology*, *4*(3), 359-373.
- Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist*, *44*(9), 1175.
- Bandura, A. (1999). Social cognitive theory of personality. *Handbook of Personality: Theory and Research*, 154-196.
- Baral, S., Logie, C. H., Grosso, A., Wirtz, A. L., & Beyrer, C. (2013). Modified social ecological model: a tool to guide the assessment of the risks and risk contexts of HIV epidemics. *BMC Public Health*, 13(1), 482.
- Bardino, M., Di Martino, M., Ricci, E., & Parazzini, F. (2015). Frequency and determinants of urinary incontinence in adolescent and young nulliparous women. *Journal of Pediatric and Adolescent Gynecology*, 28(6), 462-470.
- Barber, M. D., & Mullen, K. J. (2005). The impact of stress urinary incontinence on sexual activity in women. *Cleveland Clinic Journal of Medicine*, 72(3), 225.
- Baron, S. L., Beard, S., Davis, L. K., Delp, L., Forst, L., Kidd-Taylor, A., ... & Welch, L.
  S. (2014). Promoting integrated approaches to reducing health inequities among low-income workers: Applying a social ecological framework. *American Journal of Industrial Medicine*, 57(5), 539-556.

- Bartoli, S., Aguzzi, G., & Tarricone, R. (2010). Impact on quality of life of urinary incontinence and overactive bladder: a systematic literature review. *Urology*, 75(3), 491-500.
- Basu, M., & Duckett, J. R. A. (2009). Barriers to seeking treatment for women with persistent or recurrent symptoms in urogynaecology. *BJOG: An International Journal of Obstetrics & Gynaecology*, 116(5), 726-730.
- Beetz, R. (2003). Mild dehydration: a risk factor of urinary tract infection?. European Journal of Clinical Nutrition, 57, S52-S58.
- Belsky, J. (1980). Child maltreatment: an ecological integration. *American Psychologist*, *35*(4), 320.
- Benner, J. S., Becker, R., Fanning, K., Jumadilova, Z., Bavendam, T., Brubaker, L., & OAB Medication Use Study Steering Committee. (2009). Bother related to bladder control and health care seeking behavior in adults in the United States. *The Journal of Urology*, 181(6), 2591-2598.
- Bø, K. (2004). Pelvic floor muscle training is effective in treatment of female stress urinary incontinence, but how does it work?. *International Urogynecology Journal*, 15(2), 76-84.
- Bø, K., & Sundgot-Borgen, J. (2010). Are former female elite athletes more likely to experience urinary incontinence later in life than non-athletes?. *Scandinavian Journal of Medicine & Science in Sports*, 20(1), 100-104.
- Bø, K., & Sundgot-Borgen, J. (2001). Prevalence of stress and urge urinary incontinence in elite athletes and controls. *Medicine and Science in Sports and Exercise*, 33(11), 1797-1802.

- Botlero, R., Urquhart, D. M., Davis, S. R., & Bell, R. J. (2008). Prevalence and incidence of urinary incontinence in women: review of the literature and investigation of methodological issues. *International Journal of Urology*, 15(3), 230-234.
- Boyle, R., Hay-Smith, E. J., Cody, J. D., & Mørkved, S. (2012). Pelvic floor muscle training for prevention and treatment of urinary and faecal incontinence in antenatal and postnatal women. *Cochrane Database Systematic Review*, 10, CD.
- Bradley, C. S., Rovner, E. S., Morgan, M. A., Berlin, M., Novi, J. M., Shea, J. A., & Arya, L. A. (2005). A new questionnaire for urinary incontinence diagnosis in women: development and testing. *American Journal of Obstetrics and Gynecology*, 192(1), 66-73.
- Bradley, C. S., Erickson, B. A., Messersmith, E. E., Pelletier-Cameron, A., Lai, H. H.,
  Kreder, K. J., ... & Kirkali, Z. (2017). Evidence of the Impact of Diet, Fluid
  Intake, Caffeine, Alcohol and Tobacco on Lower Urinary Tract Symptoms: A
  Systematic Review. *The Journal of urology*, *198*(5), 1010-1020.
- Bradway, C., & Cacchione, P. (2010). Teaching strategies for assessing and managing urinary incontinence in older adults. *Journal of Gerontological Nursing*, 36(7), 18-26. doi;10. 3928/00989134-20100602-03
- Bradway, C., Coyne, K. S., Irwin, D., & Kopp, Z. (2008). Lower urinary tract symptoms in women—a common but neglected problem. *Journal of the American Association of Nurse Practitioners*, 20(6), 311-318.
- Bravendam, T. G., Norton, J. M., Kirkali, Z., Mullins, C., Kusek, J. W., Star, R. A., & Rodgers, G. P. (2016). Advancing a comprehensive approach to the study of lower urinary tract symptoms. *The Journal of Urology*, *196*(5), 1342-1349.

Breslow, L. (1996). Social ecological strategies for promoting healthy lifestyles. *American Journal of Health Promotion*, *10*(4), 253-257.

- Brooker, S., Hay, S. I., & Bundy, D. A. (2002). Tools from ecology: useful for evaluating infection risk models?. *Trends in Parasitology*, 18(2), 70-74.
- Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American psychologist*, *32*(7), 513.
- Bronfenbrenner, U. (2005). Making human beings human: Bioecological perspectives on human development. Sage.

Bronfenbrenner, U. (2009). The ecology of human development. Harvard university press.

- Brown, S. J., Donath, S., MacArthur, C., McDonald, E. A., & Krastev, A. H. (2010).
  Urinary incontinence in nulliparous women before and during pregnancy:
  prevalence, incidence, and associated risk factors. *International Urogynecology Journal*, 21(2), 193-202.
- Brown, J. S., McGhan, W. F., & Chokroverty, S. (2000). Comorbidities associated with overactive bladder. *American Journal of Managing Care*, *6*(11 Suppl), S574-9.
- Brucker, J., Wagner, I., Rudofsky, G., Rauch, G., Sohn, C., & Brocker, K. A. (2017). In obesity even young women suffer from urogynecological symptoms. *Archives of* gynecology and obstetrics, 296(5), 947-956.
- Buckley, B. S., & Lapitan, M. C. M. (2010). Prevalence of urinary incontinence in men, women, and children—current evidence: findings of the Fourth International Consultation on Incontinence. *Urology*, 76(2), 265-270.

- Bump, R. C., Hurt, W. G., Fantl, J. A., & Wyman, J. F. (1991). Assessment of Kegel pelvic muscle exercise performance after brief verbal instruction. *American Journal of Obstetrics and Gynecology*, 165(2), 322-329.
- Bump, R. C., & McClish, D. K. (1992). Cigarette smoking and urinary incontinence in women. American Journal of Obstetrics and Gynecology, 167(5), 1213-1218.
- Burgio, K. L., Goode, P. S., Locher, J. L., Umlauf, M. G., Roth, D. L., Richter, H. E., ...
  & Lloyd, L. K. (2002). Behavioral training with and without biofeedback in the treatment of urge incontinence in older women: a randomized controlled trial. *Jama*, 288(18), 2293-2299.
- Burgio, K. L., Zyczynski, H., Locher, J. L., Richter, H. E., Redden, D. T., & Wright, K.
  C. (2003). Urinary incontinence in the 12-month postpartum period. *Obstetrics & Gynecology*, *102*(6), 1291-1298.
- Callan, L., Thompson, D. L., & Netsch, D. (2015). Does increasing or decreasing the daily intake of water/fluid by adults affect overactive bladder symptoms?. *Journal* of Wound Ostomy & Continence Nursing, 42(6), 614-620.
- Campbell, S. (2004). Dietary Reference Intakes: Water, Potassium, Sodium, Chloride, and Sulfate. *Clinical Nutrition Insight*, *30*(6), 1-hyhen.
- Carls, C. (2007). The prevalence of stress urinary incontinence in high school and college-age female athletes in the midwest: implications for education and prevention. *Urologic Nursing*, *27*(1), 21.
- Caylet, N., Fabbro-Peray, P., Marès, P., Dauzat, M., Prat-Pradal, D., & Corcos, J. (2006).
   Prevalence and occurrence of stress urinary incontinence in elite women athletes.
   *The Canadian Journal of Urology*, *13*(4), 3174-3179.

- Centers for Disease Control and Prevention. (2017a). Births and natality. Retrieved from https://www.cdc.gov/nchs/fastats/births.htm.
- Centers for Disease Control and Prevention. (2017b). Ten leading causes of death and injury. Retrieved from https://www.cdc.gov/injury/wisqars/LeadingCauses.html.
- Centers for Disease Control and Prevention (CDC). (2016a). CDC's screening and brief intervention initiative. Retrieved from

http://www.cdc.gov/ncbddd/fasd/alcohol-screening.html.

- Centers for Disease Control and Prevention (CDC). (2016b). Fact Sheets Excessive Alcohol Use and Risks to Women's Health. Retrieved from http://www.cdc.gov/alcohol/fact-sheets/womens-health.htm.
- Centers for Disease Control and Prevention. (2016c).College health and safety. Retrieved from https://www.cdc.gov/family/college/.
- Centers for Disease Control and Prevention (CDC). (2015). Current Cigarette Smoking Among Adults—United States, 2005–2014. *Morbidity and Mortality Weekly Report, 64*(44),1233–1240.
- Charach, G., Greenstein, A., Rabinovich, P., Groskopf, I., & Weintraub, M. (2001).Alleviating constipation in the elderly improves lower urinary tract symptoms.*Gerontology*, 47(2), 72-76.
- Cheung, W. W., Khan, N. H., Choi, K. K., Bluth, M. H., & Vincent, M. T. (2009).Prevalence, evaluation and management of overactive bladder in primary care.*BMC Family Practice*, *10*(1), 8.

- Collette, C., Leclerc, G., & Tu, L. (2003). Effectiveness of a geriatric urinary incontinence educational program for nursing staff. *Nursing Leadership*, *16*(4), 99-109. doi:10.12927/cjnl.2003.16264
- Commonwealth of Australia (2013). The national public toilet map. Retrieved from https://toiletmap.gov.au.
- Costantini, E., Illiano, E., Giannitsas, K., Prestipino, M., Pastore, A. L., Carbone, A., ... & Bini, V. (2018). Urological dysfunction in young women: an inheritance of childhood?. *BJU international*, *121*(3), 453-457.
- Coyne, K. S., Payne, C., Bhattacharyya, S. K., Revicki, D. A., Thompson, C., Corey, R., & Hunt, T. L. (2004). The impact of urinary urgency and frequency on health-related quality of life in overactive bladder: results from a national community survey. *Value in Health*, 7(4), 455-463.
- Coyne, K. S., Sexton, C. C., Rogers, R., Jumadilova, Z., & Bavendam, T. (2006). The impact of overactive bladder on sexual quality of life for men and women: A qualitative study. *Journal of Women's Health*, 15, 466.
- Coyne, K. S., Margolis, M. K., Jumadilova, Z., Bavendam, T., Mueller, E., & Rogers, R.
  (2007). Overactive Bladder and Women's Sexual Health: What is the Impact?. *The Journal of Sexual Medicine*, 4(3), 656-666.

Coyne, K. S., Sexton, C. C., Irwin, D. E., Kopp, Z. S., Kelleher, C. J., & Milsom, I.
(2008). The impact of overactive bladder, incontinence and other lower urinary tract symptoms on quality of life, work productivity, sexuality and emotional well-being in men and women: results from the EPIC study. *BJU International*, *101*(11), 1388-1395.

- Coyne, K. S., Sexton, C. C., Thompson, C. L., Milsom, I., Irwin, D., Kopp, Z. S., ... & Wein, A. J. (2009). The prevalence of lower urinary tract symptoms (LUTS) in the USA, the UK and Sweden: results from the Epidemiology of LUTS (EpiLUTS) study. *BJU International*, *104*(3), 352-360.
- Coyne, K. S., Sexton, C. C., Kopp, Z., Chapple, C. R., Kaplan, S. A., Aiyer, L. P., & Symonds, T. (2010). Assessing patients' descriptions of lower urinary tract symptoms (LUTS) and perspectives on treatment outcomes: results of qualitative research. *International Journal of Clinical Practice*, 64(9), 1260-1278.
- Coyne, K. S., Sexton, C. C., Kopp, Z. S., Ebel-Bitoun, C., Milsom, I., & Chapple, C.
  (2011). The impact of overactive bladder on mental health, work productivity and health-related quality of life in the UK and Sweden: results from EpiLUTS. *BJU International*, *108*(9), 1459-1471.
- Coyne, K. S., Margolis, M. K., Kopp, Z. S., & Kaplan, S. A. (2012). Racial differences in the prevalence of overactive bladder in the United States from the epidemiology of LUTS (EpiLUTS) study. *Urology*, 79(1), 95-101.
- Coyne, K. S., Sexton, C. C., Bell, J. A., Thompson, C. L., Dmochowski, R., Bavendam, T., ... & Quentin Clemens, J. (2013). The prevalence of lower urinary tract symptoms (LUTS) and overactive bladder (OAB) by racial/ethnic group and age: Results from OAB-POLL. *Neurourology and Urodynamics*, *32*(3), 230-237.
- Creighton, S. M., & Stanton, S. L. (1990). Caffeine: does it affect your bladder?. *BJU International*, 66(6), 613-614.
- Creswell, J. (2012). Research design: Qualitative and quantitative approaches. *Thousand Oaks*.

- Dallosso, H. M., McGrother, C. W., Matthews, R. J., & Donaldson, M. M. K. (2003). The association of diet and other lifestyle factors with overactive bladder and stress incontinence: a longitudinal study in women. *BJU International*, *92*(1), 69-77.
- Dasgupta, J., Elliott, R. A., Doshani, A., & Tincello, D. G. (2006). Enhancement of rat bladder contraction by artificial sweeteners via increased extracellular Ca 2+ influx. *Toxicology and Applied Pharmacology*, 217(2), 216-224.

Davis, C. (2008). The cost of containment. Nursing Older People, 20(3), 24-26.

- Dilorio, C. K. (2006). Measurement in Health Behavior: Methods for Research and Evaluation (Vol. 1). John Wiley & Sons.
- Dmochowski, R. R., & Newman, D. K. (2007). Impact of overactive bladder on women in the United States: results of a national survey. *Current Medical Research and Opinion*, 23(1), 65-76.
- Dooley, Y., Kenton, K., Cao, G., Luke, A., Durazo-Arvizu, R., Kramer, H., & Brubaker, L. (2008). Urinary incontinence prevalence: results from the National Health and Nutrition Examination Survey. *The Journal of Urology*, *179*(2), 656-661.
- DuBeau, C. E., Kuchel, G. A., Johnson, I. I., Palmer, M. H., & Wagg, A. (2010).
   Incontinence in the frail elderly: report from the 4th International Consultation on Incontinence. *Neurourology and Urodynamics*, 29(1), 165-178.
- Dumoulin, C., Hunter, K. F., Moore, K., Bradley, C. S., Burgio, K. L., Hagen, S., ... & Chambers, T. (2016). Conservative management for female urinary incontinence and pelvic organ prolapse review 2013: Summary of the 5th International Consultation on Incontinence. *Neurourology and Urodynamics*, 35(1), 15-20.

- Egger, G., & Swinburn, B. (1997). An" ecological" approach to the obesity pandemic. *BMJ: British Medical Journal*, *315*(7106), 477.
- Eisenberg, D., Gollust, S. E., Golberstein, E., & Hefner, J. L. (2007). Prevalence and correlates of depression, anxiety, and suicidality among university students. *American Journal of Orthopsychiatry*, 77(4), 534-542.
- Elder, G. H. (1998). The life course as developmental theory. *Child development*, 69(1), 1-12.
- Eliasson, K., Larsson, T., & Mattsson, E. (2002). Prevalence of stress incontinence in nulliparous elite trampolinists. *Scandinavian Journal of Medicine & Science in Sports*, 12(2), 106-110.
- Eliasson, K., Nordlander, I., Larson, B., Hammarström, M., & Mattsson, E. (2005).
   Influence of physical activity on urinary leakage in primiparous women.
   Scandinavian Journal of Medicine & Science in Sports, 15(2), 87-94.
- Elstad, E. A., Taubenberger, S. P., Botelho, E. M., & Tennstedt, S. L. (2010). Beyond incontinence: the stigma of other urinary symptoms. *Journal of Advanced Nursing*, 66(11), 2460-2470.
- Erikson, E. (1950). Childhood and society, 167-168.
- Erikson, E. (1963). Children and society. New York: Narton.
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.G. (2009). Statistical power analyses using G\*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41, 1149-1160.
- Fenner, D. E., Trowbridge, E. R., Patel, D. L., Fultz, N. H., Miller, J. M., Howard, D., & DeLancey, J. O. (2008). Establishing the prevalence of incontinence study: racial

differences in women's patterns of urinary incontinence. *The Journal of Urology*, *179*(4), 1455-1460.

- Finkelstein, K., Glosner, S., Sanchez, R. J., & Uddin, N. (2008). Prevalence of probable overactive bladder in a private obstetrics and gynecology group practice. *Current Medical Research and Opinion*, 24(4), 1083-1090.
- Fitzgerald, M. P., Thom, D. H., Wassel-Fyr, C., Subak, L., Brubaker, L., Van Den Eeden, S. K., & Brown, J. S. (2006). Childhood urinary symptoms predict adult overactive bladder symptoms. *The Journal of urology*, 175(3), 989-993.
- Fowke, J. H., Munro, H., Signorello, L. B., Blot, W. J., & Penson, D. F. (2011). Association between socioeconomic status (SES) and lower urinary tract symptom (LUTS) severity among black and white men. *Journal of General Internal Medicine*, *26*(11), 1305-1310.
- Garcia, J. A., Crocker, J., & Wyman, J. F. (2005). Breaking the cycle of stigmatization: managing the stigma of incontinence in social interactions. *Journal of Wound Ostomy & Continence Nursing*, 32(1), 38-52.
- Glazener, C. M., Herbison, G. P., MacArthur, C., Grant, A., & Wilson, P. D. (2005).
  Randomised controlled trial of conservative management of postnatal urinary and faecal incontinence: six year follow up. *BMJ*, *330*(7487), 337.
- Godec, C. J. (1984). "Timed voiding"—A useful tool in the treatment of urinary incontinence. *Urology*, *23*(1), 97-100.
- Goldman, H. B., Anger, J. T., Esinduy, C. B., Zou, K. H., Russell, D., Luo, X., ... & Clemens, J. Q. (2016). Real-world patterns of care for the overactive bladder syndrome in the United States. *Urology*, 87, 64-69.

- Goldstick, O., & Constantini, N. (2014). Urinary incontinence in physically active women and female athletes. *Brittish Journal of Sports Medicine*, *48*(4), 296-298.
- Gormley, E.A., Lightner, J., Burgio, K.L, Chai, T.C., Clemens, J.Q., Culkin,D.J, Das,
  A.K., Foster, H.E., Scarpero, H.M, Tessier, C.D, & Vasavada, S.P. (2014) *Diagnosis and treatment of overactive bladder (non-neurogenic) in adults: AUA/SUFU guideline*. American Urological Association Education and Research,
  Inc.
- Gormley, E. A., Lightner, D. J., Faraday, M., & Vasavada, S. P. (2015). Diagnosis and treatment of overactive bladder (non-neurogenic) in adults: AUA/SUFU guideline amendment. *The Journal of Urology*, 193(5), 1572-1580.
- Green, L. W., Richard, L., & Potvin, L. (1996). Ecological foundations of health promotion. *American Journal of Health Promotion*, *10*(4), 270-281.
- Greer, W. J., Richter, H. E., Bartolucci, A. A., & Burgio, K. L. (2008). Obesity and pelvic floor disorders: a review of the literature. *Obstetrics and Gynecology*, *112*(2 Pt 1), 341.
- Griffiths, A. N., Makam, A., & Edwards, G. J. (2006). Should we actively screen for urinary and anal incontinence in the general gynaecology outpatients setting?–A prospective observational study. *Journal of Obstetrics and Gynaecology*, 26(5), 442-444.
- Grucza, R. A., Norberg, K. E., & Bierut, L. J. (2009). Binge drinking among youths and young adults in the United States: 1979–2006. *Journal of the American Academy of Child & Adolescent Psychiatry*, 48(7), 692-702. doi: 10.1097/CHI.0b013e3181a2b32f
- Hagglund, D., Walker-Engstrom, M. L., Larsson, G., & Leppert, J. (2001). Quality of life and seeking help in women with urinary incontinence. *Acta Obstetricia et Gynecologica Scandinavica*, 80(11), 1051-1055.
- Hagglund, D., Olsson, H., & Leppert, J. (1999). Urinary incontinence: an unexpected large problem among young females. Results from a population-based study. *Family Practice*, 16(5), 506-509.
- Hagglund, D., & Wadensten, B. (2007). Fear of humiliation inhibits women's careseeking behaviour for long-term urinary incontinence. *Scandinavian Journal of Caring Sciences*, 21(3), 305-312.
- Hall, S. A., Maserejian, N. N., Link, C. L., Steers, W. D., & McKinlay, J. B. (2012). Are commonly used psychoactive medications associated with lower urinary tract symptoms?. *European Journal of Clinical Pharmacology*, 68(5), 783-791.
- Hannestad, Y. S., Rortveit, G., Daltveit, A. K., & Hunskaar, S. (2003). Are smoking and other lifestyle factors associated with female urinary incontinence? The Norwegian EPINCONT Study. *BJOG: An International Journal of Obstetrics & Gynaecology*, 110(3), 247-254.
- Harmon, B. E., Nigg, C. R., Long, C., Amato, K., Kutchman, E., Anthamatten, P., ... & Hill, J. O. (2014). What matters when children play: influence of social cognitive theory and perceived environment on levels of physical activity among elementary-aged youth. *Psychology of Sport and Exercise*, *15*(3), 272-279.
- Harris, S. S., Link, C. L., Tennstedt, S. L., Kusek, J. W., & McKinlay, J. B. (2007). Care seeking and treatment for urinary incontinence in a diverse population. *The Journal of Urology*, 177(2), 680-684.

- Haylen, B. T., de Ridder, D., Freeman, R. M., Swift, S. E., Berghmans, B., Lee, J., ... & Schaer, G. N. (2010). International urogynecological association; international continence society. An international urogynecological association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *Neurourology and Urodynamics*, 29(1), 4-20.
- Haylen, B. T., Freeman, R. M., Swift, S. E., Cosson, M., Davila, G. W., Deprest, J., ... & Maher, C. (2011). An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint terminology and classification of the complications related directly to the insertion of prostheses (meshes, implants, tapes) and grafts in female pelvic floor surgery. *Neurourology and Urodynamics*, *30*(1), 2-12.
- Haylen, B. T., de Ridder, D., Freeman, R. M., Swift, S. E., Berghmans, B., Lee, J., ... & Schaer, G. N. (2012). An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *Journal of the Association of Chartered Physiotherapists in Womens Health*, *110*, 33.
- Healthy Campus 2020. (2016) Ecological approach. Retrieved from https://www.acha.org/HealthyCampus/Implement/Ecological\_Model/HealthyCam pus/Ecological\_Model.aspx?hkey=f5defc87-662e-4373-8402-baf78d569c78.
- Heidelbaugh, J. J., Stelwagon, M., Miller, S. A., Shea, E. P., & Chey, W. D. (2015). The spectrum of constipation-predominant irritable bowel syndrome and chronic idiopathic constipation: US survey assessing symptoms, care seeking, and disease burden. *The American Journal of Gastroenterology*, *110*(4), 580.

- Hendrix, S. L., Cochrane, B. B., Nygaard, I. E., Handa, V. L., Barnabei, V. M., Iglesia,
  C., ... & McNeeley, S. G. (2005). Effects of estrogen with and without progestin on urinary incontinence. *Jama*, 293(8), 935-948.
- Herbruck, L.F. (2008). Stress urinary incontinence: Prevention, management, and provider education. *Urologic Nursing*, 28(3), 200-207.
- Herbert-Beirne, J.M., O'Conor, R., Ihm, J.D. Parlier, M. K., Lavender, M. D., &
  Brubaker, L. (2015). A pelvic health curriculum in school settings: the effect on adolescent female's knowledge. *Journal of Pediatric Adolescent Gynecology, 30* (2), 188-192.
- Heron, J., Grzeda, M. T., von Gontard, A., Wright, A., & Joinson, C. (2017). Trajectories of urinary incontinence in childhood and bladder and bowel symptoms in adolescence: prospective cohort study. *BMJ open*, 7(3), e014238.
- Howard-Thornton, L., Craine, S., Holden C. &, Pearl, G. (2011). Pelvic floor health: information for teenagers. *Nursing Times*, *107* (17), 14-17.
- Hu, T.W., Wagner, T.H., Bentkover, J.D., Leblanc, K., Zhou, S.Z., & Hunt, T. (2004).
  Costs of urinary incontinence and overactive bladder in the U.S.: a comparative study. *Urology*, *63* (3), 461-465.
- Hutchings, J., & Sutherland, L. (2014). Student nurse understanding of the psychosocial impact of urinary incontinence. *Urologic Nursing*, 34(6), 318-326.
- Hutchinson, M. K., & Holtman, M. C. (2005). Analysis of count data using poisson regression. *Research in Nursing & Health*, 28(5), 408-418.
- IBM. (2014). IBM SPSS Statistics for Macintosh, Version 23.0. Armonk, NY: IBM Corp.

- Iliadou, A., Milsom, I., Pedersen, N. L., & Altman, D. (2009). Risk of urinary incontinence symptoms in oral contraceptive users: a national cohort study from the Swedish Twin Register. *Fertility and Sterility*, 92(2), 428-433.
- Irwin, D. E., Kopp, Z. S., Agatep, B., Milsom, I., & Abrams, P. (2011). Worldwide prevalence estimates of lower urinary tract symptoms, overactive bladder, urinary incontinence and bladder outlet obstruction. *BJU International*, *108*(7), 1132-1138.
- Irwin, D. E., Milsom, I., Kopp, Z., & Abrams, P. (2008). Symptom bother and health care–seeking behavior among individuals with overactive bladder. *European urology*, 53(5), 1029-1039.
- Irwin, D. E., Milsom, I., Hunskaar, S., Reilly, K., Kopp, Z., Herschorn, S., ... & Abrams,
  P. (2006). Population-based survey of urinary incontinence, overactive bladder,
  and other lower urinary tract symptoms in five countries: results of the EPIC
  study. *European Urology*, 50(6), 1306-1315.
- Irwin, D. E., Milsom, I., Kopp, Z., Abrams, P., & Cardozo, L. (2006). Impact of overactive bladder symptoms on employment, social interactions and emotional well-being in six European countries. *BJU International*, 97(1), 96-100.
- Joanna Briggs Institute. (2011). The Joanna Briggs Institute best practice information sheet: the effectiveness of pelvic floor muscle exercises on urinary incontinence in women following childbirth. *Nursing & Health Sciences*, *3*(13), 378-381.
- Juliato, C. R. T., Baccaro, L. F., Pedro, A. O., Costa-Paiva, L., Lui-Filho, J., & Pinto-Neto, A. M. (2016). Subjective urinary urgency in middle age women: a population-based study. *Maturitas*, 85, 82-87.

- Kegel, A.H. (1948). Progressive resistance exercise in the functional restoration of the pelvic muscles. *American Journal of Obstetric Gynecology*, *56* (2), 238-248.
- Keilman, L. J., & Dunn, K. S. (2010). Knowledge, attitudes, and perceptions of advanced practice nurses regarding urinary incontinence in older adult women. *Research* and Theory for Nursing Practice, 24(4), 260-279.
- Kersell, M. W., & Milsum, J. H. (1985). A systems model of health behavior change. Systems Research and Behavioral Science, 30(3), 119-126.
- Kim, J. H., Shim, S. R., Lee, W. J., Kim, H. J., Kwon, S. S., & Bae, J. H. (2012).
   Sociodemographic and lifestyle factors affecting the self-perception period of lower urinary tract symptoms of international prostate symptom score items. *International Journal of Clinical Practice*, 66(12), 1216-1223.
- Kinchen, K. S., Burgio, K., Diokno, A. C., Fultz, N. H., Bump, R., & Obenchain, R. (2003). Factors associated with women's decisions to seek treatment for urinary incontinence. *Journal of Women's Health*, 12(7), 687-698.
- Kinchen, K. S., Lee, J., Fireman, B., Hunkeler, E., Nehemiah, J. L., & Curtice, T. G.
  (2007). The prevalence, burden, and treatment of urinary incontinence among women in a managed care plan. *Journal of Women's Health*, *16*(3), 415-422.
- Kinnunen, O. (1991). Study of constipation in a geriatric hospital, day hospital, dold people's home and at home. *Aging Clinical and Experimental Research*, 3(2), 161-170.
- Kirby, M., Artibani, W., Cardozo, L., Chapple, C., Diaz, D. C., De Ridder, D., ... & Van Kerrebroeck, P. (2006). Overactive bladder: the importance of new guidance. *International Journal of Clinical Practice*, 60(10), 1263-1271.

- Koch, L. H. (2006). Help-seeking behaviors of women with urinary incontinence: An integrative literature review. *Journal of Midwifery & Women's Health*, *51*(6).
- Kogan, M. I., Zachoval, R., Ozyurt, C., Schafer, T., & Christensen, N. (2014).
  Epidemiology and impact of urinary incontinence, overactive bladder, and other lower urinary tract symptoms: results of the EPIC survey in Russia, Czech Republic, and Turkey. *Current Medical Research and Opinion*, *30*(10), 2119-2130.
- Koley, B., Koley, J., & Saha, J. K. (1984). The effects of nicotine on spontaneous contractions of cat urinary bladder in situ. *British Journal of Pharmacology*, *83*(2), 347-355.
- Kubik, K., Blackwell, L., & Heit, M. (2004). Does socioeconomic status explain racial differences in urinary incontinence knowledge?. *American Journal of Obstetrics* and Gynecology, 191(1), 188-193.
- Kuh, D., Cardozo, L., & Hardy, R. (1999). Urinary incontinence in middle aged women:
   childhood enuresis and other lifetime risk factors in a British prospective cohort.
   *Journal of Epidemiology & Community Health*, 53(8), 453-458.
- Kupelian, V., Wei, J. T., O'Leary, M. P., Kusek, J. W., Litman, H. J., Link, C. L., & McKinlay, J. B. (2006). Prevalence of lower urinary tract symptoms and effect on quality of life in a racially and ethnically diverse random sample: the Boston Area Community Health (BACH) Survey. *Archives of Internal Medicine*, *166*(21), 2381-2387.
- Lach, P. A., Elster, A. B., & Roghmann, K. J. (1980). Sexual behavior and urinary tract infection. *The Nurse Practitioner*, *5*(1), 27-8.

- Lamin, E., Parrillo, L. M., Newman, D. K., & Smith, A. L. (2016). Pelvic floor muscle training: underutilization in the USA. *Current urology reports*, 17(2), 10.
- Landefeld, C. S., Bowers, B. J., Feld, A. D., Hartmann, K. E., Hoffman, E., Ingber, M. J.,
  ... & Pignone, M. (2008). National Institutes of Health state-of-the-science
  conference statement: prevention of fecal and urinary incontinence in adults. *Annals of Internal Medicine*, *148*(6), 449-458.
- Lewis, M. A., Litt, D. M., Cronce, J. M., Blayney, J. A., & Gilmore, A. K. (2014).
   Underestimating protection and overestimating risk: Examining descriptive normative perceptions and their association with drinking and sexual behaviors. *Journal of Sex Research*, *51*(1), 86-96.
- Levinson, A.H., Campo, S., Gascoigne, J., Jolly, O., Zakharyan, A., & Tran, Z.V. (2007). Smoking, but not smokers: identity among college students who smoke cigarettes. *Nicotine & Tobacco Research*, 9(8), 845-852. doi: 10.1080/14622200701484987
- Liao, Y. M., Dougherty, M. C., Biemer, P. P., Liao, C. T., Palmer, M. H., Boyington, A. R., & Connolly, A. (2008). Factors related to lower urinary tract symptoms among a sample of employed women in Taipei. *Neurourology and Urodynamics*, 27(1), 52-59.
- Liao, Yuan-Mei, et al. "Prevalence and impact on quality of life of lower urinary tract symptoms among a sample of employed women in Taipei: a questionnaire survey." *International Journal of Nursing Studies* 46.5 (2009): 633-644.
- Lin, H. Y., & Hsu, M. H. (2015). Using social cognitive theory to investigate green consumer behavior. *Business Strategy and the Environment*, *24*(5), 326-343.

- Litman, H. J., Steers, W. D., Wei, J. T., Kupelian, V., Link, C. L., McKinlay, J. B., &
  Boston Area Community Health Survey Investigators. (2007). Relationship of
  lifestyle and clinical factors to lower urinary tract symptoms: results from Boston
  Area Community Health survey. *Urology*, 70(5), 916-921.
- Lukacz, E. S., Sampselle, C., Gray, M., Macdiarmid, S., Rosenberg, M., Ellsworth, P., & Palmer, M. H. (2011). A healthy bladder: a consensus statement. *International Journal of Clinical Practice*, 65(10), 1026-1036.
- Luo, Y., Parry, M., Huang, Y. J., Wang, X. H., & He, G. P. (2016). Nursing students' knowledge and attitudes toward urinary incontinence: A cross-sectional survey. *Nurse Education Today*, 40, 134-139.
- MacLennan, A. H., Taylor, A. W., Wilson, D. H., & Wilson, D. (2000). The prevalence of pelvic floor disorders and their relationship to gender, age, parity and mode of delivery. *BJOG: An International Journal of Obstetrics & Gynaecology*, 107(12), 1460-1470.
- Mandimika, C. L., Murk, W., McPencow, A. M., Lake, A., Wedderburn, T., Collier, C.
  H., ... & Guess, M. K. (2014). Knowledge of pelvic floor disorders in a population of community-dwelling women. *American Journal of Obstetrics and Gynecology*, 210(2), 165-e1.
- Markland, A. D., Thompson, I. M., Ankerst, D. P., Higgins, B., & Kraus, S. R. (2007).
  Lack of disparity in lower urinary tract symptom severity between communitydwelling non-Hispanic white, Mexican-American, and African-American men. *Urology*, 69(4), 697-702.

- Markland, A. D., Richter, H. E., Fwu, C. W., Eggers, P., & Kusek, J. W. (2011).
  Prevalence and trends of urinary incontinence in adults in the United States, 2001 to 2008. *The Journal of Urology*, *186*(2), 589-593.
- McAfee, A., Decker, C., Kelsey, A., Pihl, M., & Westbrook, E. (2015). Prevalence of urinary incontinence in high school and middle school-aged female athletes.
- McLaren, L., & Hawe, P. (2005). Ecological perspectives in health research. *Journal of Epidemiology & Community Health*, 59(1), 6-14.
- Margalith, I., Gillon, G., & Gordon, D. (2004). Urinary incontinence in women under 65: quality of life, stress related to incontinence and patterns of seeking health care. *Quality of Life Research*, 13(8), 1381-1390.
- Maserejian, N. N., Kupelian, V., Miyasato, G., McVary, K. T., & McKinlay, J. B. (2012). Are physical activity, smoking and alcohol consumption associated with lower urinary tract symptoms in men or women? Results from a population based observational study. *The Journal of Urology*, *188*(2), 490-495.
- Maserejian, N. N., Wager, C. G., Giovannucci, E. L., Curto, T. M., McVary, K. T., & McKinlay, J. B. (2013). Intake of caffeinated, carbonated, or citrus beverage types and development of lower urinary tract symptoms in men and women. *American Journal of Epidemiology*, 177(12), 1399-1410.
- Mason, L., Glenn, S., Walton, I., & Hughes, C. (2001). Women's reluctance to seek help for stress incontinence during pregnancy and following childbirth. *Midwifery*, *17*(3), 212-221.

- Mattiasson, A., Blaakaer, J., Høye, K., & Wein, A. J. (2003). Simplified bladder training augments the effectiveness of tolterodine in patients with an overactive bladder. *BJU International*, 91(1), 54-60.
- McIlvain, G. E., Noland, M. P., & Bickel, R. (2011). Caffeine consumption patterns and beliefs of college freshmen. *American Journal of Health Education*, 42(4), 235-244.
- McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly*, *15*(4), 351-377.
- Miller, J. M., Ashton-Miller, J. A., & DeLancey, J. O. (1998). A pelvic muscle precontraction can reduce cough-related urine loss in selected women with mild SUI. *Journal of the American Geriatrics Society*, 46(7), 870-874.
- Miller, J. M., Garcia, C. E., Hortsch, S. B., Guo, Y., & Schimpf, M. O. (2016). Does instruction to eliminate coffee, tea, alcohol, carbonated, and artificially sweetened beverages improve lower urinary tract symptoms: A Prospective Trial. *Journal of Wound, Ostomy, and Continence Nursing*, 43(1), 69.
- Miller, J. M., Sampselle, C., Ashton-Miller, J., Hong, G. R. S., & DeLancey, J. O. (2008).
   Clarification and confirmation of the Knack maneuver: the effect of volitional pelvic floor muscle contraction to preempt expected stress incontinence.
   *International Urogynecology Journal*, *19*(6), 773-782.

Milsom, I., Abrams, P., Cardozo, L., Roberts, R. G., Thüroff, J., & Wein, A. J. (2001).
How widespread are the symptoms of an overactive bladder and how are they managed? A population-based prevalence study. *BJU International*, 87(9), 760-766.

- Minassian, V. A., Yan, X., Lichtenfeld, M. J., Sun, H., & Stewart, W. F. (2012).
  Predictors of care seeking in women with urinary incontinence. *Neurourology and Urodynamics*, 31(4), 470-474.
- Moore, K. H., Richmond, D. H., Sutherst, J. R., Imrie, A. H., & Hutton, J. L. (1991).
  Crouching over the toilet seat: prevalence among British gynaecological outpatients and its effect upon micturition. *BJOG: An International Journal of Obstetrics & Gynaecology*, *98*(6), 569-572.
- Monz, B., Pons, M. E., Hampel, C., Hunskaar, S., Quail, D., Samsioe, G., ... &
  Papanicolaou, S. (2005). Patient-reported impact of urinary incontinence—results
  from treatment seeking women in 14 European countries. *Maturitas*, 52, 24-34.
- Morrison, A., & Levy, R. (2006). Fraction of nursing home admissions attributable to urinary incontinence. *Value in Health*, *9*(4), 272-274.
- Morkved, S., & Bø, K. (2014). Effect of pelvic floor muscle training during pregnancy and after childbirth on prevention and treatment of urinary incontinence: a systematic review. *British Journal of Sports Medicine*, *48*(4), 299-310.
- Muller, N. (2013). Continence coach: anxiety and fears in women with overactive bladder. *Ostomy/Wound Management*, *59*(1), 16.
- National Association for Continence. (2015) Overactive bladder. Available at http://www.nafc.org/overactive-bladder.
- National Institute of Alcohol Abuse and Alcoholism (NIAAA). (2015). *College drinking*. Available at

http://pubs.niaaa.nih.gov/publications/CollegeFactSheet/CollegeFactSheet.pdf.

- National Institute for Healthcare Excellence (NICE). (2013). Urinary incontinence: the management of urinary incontinence in women. Clinical guideline 171. Retrieved from https://www.nice.org.uk/Guidance/CG171.
- Newman, D. K. (2004). Stating the case for overactive bladder: a nurse practicioner's perspective. *Journal of the American Academy of Nurse Practitioners*, 16(10 Suppl), 1-3.
- Newman, D. K., & Giovannini, D. (2002). The overactive bladder: a nursing perspective. *AJN The American Journal of Nursing*, *102*(6), 36-46.
- Newman, D. K., Denis, L., Gruenwald, I., Ee, C. H., Millard, R., Roberts, R., ... & Williams, K. (2017). Promotion, education and organization for continence care.
  In *Incontinence 6th International Consultation on Incontinence*. Health Publication Ltd.
- Nicolson, P., Kopp, Z., Chapple, C. R., & Kelleher, C. (2008). It's just the worry about not being able to control it! A qualitative study of living with overactive bladder. *British Journal of Health Psychology*, 13(2), 343-359.
- Nicolson, P., Kopp, Z., Dooley, J. A., Chapple, C., & Kelleher, C. (2005). Patients' perceptions and experiences of seeking medical care for overactive bladder (OAB) and the impact on quality of life. *International Urogynecology Journal*, *16*, S127-S128.
- Norton, P., & Brubaker, L. (2006). Urinary incontinence in women. *The Lancet*, *367*(9504), 57-67.

- Nygaard, I., Barber, M. D., Burgio, K. L., Kenton, K., Meikle, S., Schaffer, J., ... & Pelvic Floor Disorders Network. (2008). Prevalence of symptomatic pelvic floor disorders in US women. *Jama*, 300(11), 1311-1316.
- Nygaard, I., DeLancey, J. O., Arnsdorf, L., & Murphy, E. (1990). Exercise and incontinence. *Obstetrics & Gynecology*, 75(5), 848-851.
- Nygaard, I., Girts, T., Fultz, N. H., Kinchen, K., Pohl, G., & Sternfeld, B. (2005). Is urinary incontinence a barrier to exercise in women?. *Obstetrics & Gynecology*, *106*(2), 307-314.
- Nygaard, I. E., Thompson, F. L., Svengalis, S. L., & Albright, J. P. (1994). Urinary incontinence in elite nulliparous athletes. *Obstetrics & Gynecology*, 84(2), 183-187.
- Nygaard, I., Turvey, C., Burns, T. L., Crischilles, E., & Wallace, R. (2003). Urinary incontinence and depression in middle-aged United States women. *Obstetrics & Gynecology*, 101(1), 149-156.
- O'connell, B., Wellman, D., Baker, L., & Day, K. (2006). Does a Continence Educational Brochure Promote Health-Seeking Behavior?. *Journal of Wound Ostomy & Continence Nursing*, 33(4), 389-395.
- O'Halloran, T., Bell, R. J., Robinson, P. J., & Davis, S. R. (2012). Urinary incontinence in young nulligravid women: a cross-sectional analysis. *Annals of Internal Medicine*, 157(2), 87-93.
- Palmer, M. H., Athanasopoulos, A., Lee, K. S., Takeda, M., & Wyndaele, J. J. (2012).
   Sociocultural and environmental influences on bladder health. *International Journal of Clinical Practice*, 66(12), 1132-1138.

- Palmer, M. H., & Newman, D. K. (2015). Women's toileting behaviours: an online survey of female advanced practice providers. *International Journal of Clinical Practice*, 69(4), 429-435.
- Parden, A. M., Griffin, R. L., Hoover, K., Ellington, D. R., Gleason, J. L., Burgio, K. L.,
  & Richter, H. E. (2016). Prevalence, Awareness, and Understanding of Pelvic
  Floor Disorders in Adolescent and Young Women. *Female Pelvic Medicine & Reconstructive Surgery*, 22(5), 346-354.
- Patrician, P. A. (2002). Multiple imputation for missing data. *Research in Nursing & Health*, 25(1), 76-84.
- Pauwels, E., De Laet, K., De Wachter, S., & Wyndaele, J. J. (2006). Healthy, middleaged, history-free, continent women—do they strain to void?. *The Journal of Urology*, 175(4), 1403-1407.
- Peake, S., & Manderson, L. (2003). The constraints of a normal life: The management of urinary incontinence by middle aged women. *Women & health*, 37(3), 37-51.
- Pelaez, M., Gonzalez-Cerron, S., Montejo, R., & Barakat, R. (2014). Pelvic floor muscle training included in a pregnancy exercise program is effective in primary prevention of urinary incontinence: a randomized controlled trial. *Neurourology* and Urodynamics, 33(1), 67-71.

Peschers, U. M., Vodusek, D. B., Fanger, G., Schaer, G. N., DeLancey, J. O., & Schuessler, B. (2001). Pelvic muscle activity in nulliparous volunteers. *Neurourology and urodynamics*, 20(3), 269-275.Wang, K., & Palmer, M. H. (2010). Women's toileting behaviour related to urinary elimination: concept analysis. *Journal of Advanced Nursing*, 66(8), 1874-1884.

Peters, T. J., Horrocks, S., Stoddart, H., & Somerset, M. (2004). Factors associated with variations in older people's use of community-based continence services. *Health & Social Care in the Community*, 12(1), 53-62.

Privitera, G. (2014). Statistics for the behavioral sciences (2<sup>nd</sup> edition). Sage Publications.

- Qaseem, A., Forciea, M. A., Starkey, M., Denberg, T. D., & Shekelle, P. (2014).
  Nonsurgical Management of Urinary Incontinence in Women: A Clinical Practice
  Guideline From the American College of PhysiciansNonsurgical Management of
  Urinary Incontinence in Women. *Annals of Internal Medicine*, *161*(6), 429-440.
- Rantell, A. (2014). Pharmacological management of overactive bladder in women. *Nurse Prescribing*, *12*(5), 232-236.
- Renders, C. M., Valk, G. D., Griffin, S. J., Wagner, E. H., & Assendelft, W. J. (2001). Interventions to improve the management of diabetes in primary care, outpatient, and community settings. *Diabetes Care*, *24*(10), 1821-1833.
- Richter, H. E., Creasman, J. M., Myers, D. L., Wheeler, T. L., Burgio, K. L., & Subak, L. L. (2008). Urodynamic characterization of obese women with urinary incontinence undergoing a weight loss program: the Program to Reduce Incontinence by Diet and Exercise (PRIDE) trial. *International Urogynecology Journal*, *19*(12), 1653-1658.
- Riesenhuber, A., Boehm, M., Posch, M., & Aufricht, C. (2006). Diuretic potential of energy drinks. *Amino Acids*, 31(1), 81-83.
- Rigotti, N.A., Lee, J.E., & Wechsler, H. (2000). US college students' use of tobacco products: results of a national survey. *Journal of the American Medical Association, 284*(6), 699-705. doi:10.1001/jama.284.6.699

- Robinson, D., & Cardozo, L. (2003). Risk factors for urinary incontinence in women. British Menopause Society Journal, 9(2), 75-79.
- Robinson, D., Hanna-Mitchell, A., Rantell, A., Thiagamoorthy, G., & Cardozo, L.
  (2017). Are we justified in suggesting change to caffeine, alcohol, and carbonated drink intake in lower urinary tract disease? Report from the ICI-RS 2015. *Neurourology and Urodynamics*, 36(4), 876-881.
- Robinson, D., Staskin, D., Laterza, R. M., & Koelbl, H. (2012). Defining female voiding dysfunction: ICI-RS 2011. *Neurourology and Urodynamics*, 31(3), 313-316.
- Rogalski, N.M. (2005). A graduate nursing curriculum for the evaluation and management of urinary incontinence. *Educational Gerontology*, *31*, 139-159. doi:10.1080/036012705908 91531
- Rogers, R. G. (2008). Urinary stress incontinence in women. New England Journal of Medicine, 358(10), 1029-1036.
- Rosenberg, M. T., & Dmochowski, R. R. (2005). Overactive bladder: evaluation and management in primary care. *Cleveland Clinic Journal of Medicine*, 72(2), 149-156.
- Sampselle, C. M. (2003). Behavioral intervention: the first-line treatment for women with urinary incontinence. *Current Urology Reports*, *4*(5), 356-361.

Sampselle, C. M., Harlow, S. D., Skurnick, J., Brubaker, L., & Bondarenko, I. (2002). Urinary incontinence predictors and life impact in ethnically diverse perimenopausal women. *Obstetrics & Gynecology*, *100*(6), 1230-1238.

- Sampselle, C. M., Wyman, J. F., Thomas, K. K., Newman, D. K., Gray, M., Dougherty, M., & Burns, P. A. (2000). Continence for women: A test of AWHONN's evidence-based protocol in clinical practice. *Journal of WOCN*, *27*(2), 109-117.
- Saxer, S., De Bie, R.A., Dasseb, T., & Halfens, R.J. (2008). Nurses' knowledge and practice about urinary incontinence in nursing home care. *Nurse Education Today*, 28, 926-934. doi:10.1016/j.nedt.2008.05.009
- Selanders, L. C. (1998). The power of environmental adaptation Florence Nightingale's original theory for nursing practice. *Journal of Holistic Nursing*, *16*(2), 247-263.
- Shamliyan, T., Wyman, J., & Kane, R. L. (2012). Nonsurgical treatments for urinary incontinence in adult women: Diagnosis and comparative effectiveness.
   *Comparative Effectiveness Review No. 36.* Retrieved from www.effectivehealthcare.ahrq.gov/reports/final.cfm.
- Shah, A. D., Shott, S., Kohli, N., Wu, J. M., Catlin, S., & Hoyte, L. (2008). Do racial differences in knowledge about urogynecologic issues exist?. *International Urogynecology Journal*, 19(10), 1371-1378.
- Shaw, C. (2001). A review of the psychosocial predictors of help-seeking behaviour and impact on quality of life in people with urinary incontinence. *Journal of Clinical Nursing*, 10(1), 15-24.
- Shaw, C., Gupta, R. D., Williams, K. S., Assassa, R. P., & Mcgrother, C. (2006). A survey of help-seeking and treatment provision in women with stress urinary incontinence. *BJU International*, 97(4), 752-757.
- Shaw, C., Tansey, R., Jackson, C., Hyde, C., & Allan, R. (2001). Barriers to help seeking in people with urinary symptoms. *Family Practice*, 18(1), 48-52.

- Shiffman, S., Li, X., Dunbar, M. S., Ferguson, S. G., Tindle, H. A., & Scholl, S. M. (2015). Social smoking among intermittent smokers. *Drug & Alcohol Dependence*, 154, 184-191.
- Shorter, B., Ackerman, M., Varvara, M., & Moldwin, R. M. (2014). Statistical validation of the shorter-moldwin food sensitivity questionnaire for patients with interstitial cystitis/bladder pain syndrome. *The Journal of Urology*, 191(6), 1793-1801.
- Simeone, C., Moroni, A., Pettenò, A., Antonelli, A., Zani, D., Orizio, C., & Cunico, S. C. (2010). Occurrence rates and predictors of lower urinary tract symptoms and incontinence in female athletes. *Urologia*, 77(2).
- Siracusano, S., Pregazzi, R., d'Aloia, G., Sartore, A., Di Benedetto, P., Pecorari, V., ... & Belgrano, E. (2003). Prevalence of urinary incontinence in young and middleaged women in an Italian urban area. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 107(2), 201-204.
- Sjogren, J., Malmberg, L., & Stenzelius, K. (2017). Toileting behavior and urinary tract symptoms among younger women. *International Urogynecology Journal*, 1-8.
- Smith, A. L., Nissim, H. A., Le, T. X., Khan, A., Maliski, S. L., Litwin, M. S., ... & Anger, J. T. (2011). Misconceptions and miscommunication among aging women with overactive bladder symptoms. *Urology*, 77(1), 55-59.
- Snead, M. C., O'Leary, A. M., Mandel, M. G., Kourtis, A. P., Wiener, J., Jamieson, D. J., ... & Rietmeijer, C. A. (2014). Relationship between social cognitive theory constructs and self-reported condom use: assessment of behaviour in a subgroup of the Safe in the City trial. *BMJ Open*, 4(12), e006093.

- Snooks, S. J., Barnes, P. R. H., Swash, M., & Henry, M. M. (1985). Damage to the innervation of the pelvic floor musculature in chronic constipation. *Gastroenterology*, 89(5), 977-981.
- Soleimanpour, S., Geierstanger, S.P., Kaller, S., McCarter, V., & Brindis, C.D. (2010).
   The role of school health centers in health care access and client outcomes.
   *American Journal of Public Health*, 100(9), 1597-1603.

Sparling, P. B. (2007). Obesity on campus. Preventing chronic disease, 4(3).

- Stewart, W., Van Rooyen, J., Cundiff, G., Abrams, P., Herzog, A., Corey, R., ... & Wein,
  A. (2003). Prevalence and burden of overactive bladder in the United States. *World Journal of Urology*, 20(6), 327-336.
- Stockil, L., Thompson, J., Briffa, K., Smith, A., Beales, D., Straker, L., ... & Jacques, A. (2018). Urogenital symptoms: prevalence, bother, associations and impact in 22 year-old women of the Raine Study. *International urogynecology journal*, 1-9.
- Stokols, D. (1992). Establishing and maintaining healthy environments: Toward a social ecology of health promotion. *American Psychologist*, *47*(1), 6.
- Stokols, D. (1996). Translating social ecological theory into guidelines for community health promotion. *American Journal of Health Promotion*, *10*(4), 282-298.
- Subak, L. L., Brown, J. S., Kraus, S. R., Brubaker, L., Lin, F., Richter, H. E., ... & Diagnostic Aspects of Incontinence Study (DAISy) Group. (2006). The "costs" of urinary incontinence for women. *Obstetrics and Gynecology*, 107(4), 908.
- Sung, V. W., & Hampton, B. S. (2009). Epidemiology of pelvic floor dysfunction. Obstetrics and Gynecology Clinics of North America, 36(3), 421-443.

- Sutherland, M. A., Amar, A. F., & Laughon, K. (2013). Who sends the email? Using electronic surveys in violence research. Western journal of emergency medicine, 14(4), 363.
- Sutherland, M. A., & Hutchinson, M. K. (2018). Intimate partner and sexual violence screening practices of college health care providers. *Applied Nursing Research*, 39, 217-219.
- Sutherland, M. A., Fantasia, H. C., & Fontenot, H. (2015). Reproductive coercion and partner violence among college women. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 44(2), 218-227.
- Sutherland, M. A., Fantasia, H. C., & Hutchinson, M. K. (2015). Screening for intimate partner and sexual violence in college women: missed opportunities. *Women's health issues*.
- Taari, K., Ruutu, M., & Lehtonen, T. (1990). Effect of alcohol on bladder function: A uroflowmetric and cystometric study. *Neurourology and Urodynamics*, 9(6), 591-594.
- Teleman, P. M., Lidfeldt, J., Nerbrand, C., Samsioe, G., & Mattiasson, A. (2004).
  Overactive bladder: prevalence, risk factors and relation to stress incontinence in middle-aged women. *BJOG: An International Journal of Obstetrics & Gynaecology*, *111*(6), 600-604.
- Tennstedt, S. L., Link, C. L., Steers, W. D., & McKinlay, J. B. (2008). Prevalence of and risk factors for urine leakage in a racially and ethnically diverse population of adults: the Boston Area Community Health (BACH) Survey. *American Journal of Epidemiology*, 167(4), 390-399.

- Teunissen, D., van den Bosch, W., van Weel, C., & Lagro-Janssen, T. (2006). Urinary incontinence in the elderly: attitudes and experiences of general practitioners: a focus group study. *Scandinavian Journal of Primary Health Care*, 24(1), 56-61.
- Thom, D. H., Van Den Eeden, S. K., Ragins, A. I., Wassel-Fyr, C., Vittinghof, E., Subak, L. L., & Brown, J. S. (2006). Differences in prevalence of urinary incontinence by race/ethnicity. *The Journal of Urology*, 175(1), 259-264.
- Thyssen, H. H., Clevin, L., Olesen, S., & Lose, G. (2002). Urinary incontinence in elite female athletes and dancers. *International Urogynecology Journal*, *13*(1), 15-17.
- Tikkinen, K. A., Johnson, T. M., Tammela, T. L., Sintonen, H., Haukka, J., Huhtala, H.,
  & Auvinen, A. (2010). Nocturia frequency, bother, and quality of life: how often is too often? A population-based study in Finland. *European Urology*, *57*(3), 488-498.
- Townsend, M. K., Curhan, G. C., Resnick, N. M., & Grodstein, F. (2009). Oral contraceptive use and incident urinary incontinence in premenopausal women. *The Journal of Urology*, 181(5), 2170-2175.
- Townsend, M. K., Curhan, G. C., Resnick, N. M., & Grodstein, F. (2010). The incidence of urinary incontinence across Asian, black, and white women in the United States. *American Journal of Obstetrics and Gynecology*, 202(4), 378-e1.
- Tremback-Ball, A., Levine, A. M., Perlis, S. M., & Dawson, G. (2013). Young Women's Urinary Incontinence Perceived Educational Needs. *Journal of Women's Health Physical Therapy*, 37(1), 29-34.

- Tremback-Ball, A., Levine, A. M., Dawson, G., & Perlis, S. M. (2012). Young Women's Self-efficacy in Performing Pelvic Muscle Exercises. *Journal of Women's Health Physical Therapy*, 36(3), 158-163.
- Tremback-Ball, A. J., Levine, A. M., Dawson, G., & Perlis, S. M. (2008). Urinary Incontinence Knowledge Among Women 18-30 Years of Age. *Journal of Women's Health Physical Therapy*, 32(2), 17-22.
- Turner, J. C., & Keller, A. (2015). College health surveillance network: Epidemiology and health care utilization of college students at US 4-year universities. *Journal of American College Health*, 63(8), 530-538.
- U.S. Beaureau of Labor Statistics. (2017). College enrollment and work activity of 2016 high school graduates. Retrieved from https://www.bls.gov/news.release/hsgec.nr0.htm.
- U.S. Census Bureau (2017). Median age at first marriage: 1890 to present. Retrieved from https://www.census.gov/content/dam/Census/library/visualizations/time-series/demo/families-and-households/ms-2.pdf .
- U.S. Department of Education, National Center for Education Statistics (NCES). (2016). Digest of Education Statistics, 2014. Retrieved from http://nces.ed.gov/programs/digest/d14/ch\_3.asp.
- van Breda, H. M., Bosch, J. R., & de Kort, L. M. (2015). Hidden prevalence of lower urinary tract symptoms in healthy nulligravid young women. *International Urogynecology Journal*, 26(11), 1637-1643.
- Wang, K., & Palmer, M. H. (2010). Women's toileting behaviour related to urinary elimination: concept analysis. *Journal of Advanced Nursing*, 66(8), 1874-1884.

- Wang, K., & Palmer, M. H. (2011). Development and validation of an instrument to assess women's toileting behavior related to urinary elimination: preliminary results. *Nursing Research*, 60(3), 158-164.
- Wallace, E. (2006). Helping nurses manage their stress by integrating health promotion: an ecological approach. *Californian Journal Of Health Promotion*, *4*(4), 9-12.
- Weiss, J. P., Wein, A. J., van Kerrebroeck, P., Dmochowski, R., Fitzgerald, M., Tikkinen,K. A., & Abrams, P. (2011). Nocturia: new directions. *Neurourology and Urodynamics*, 30(5), 700-703.
- Wein, A. J., & Rovner, E. S. (2002). Definition and epidemiology of overactive bladder. Urology, 60(5), 7-12.
- Welch, L. C., Botelho, E. M., & Tennstedt, S. L. (2011a). Race and ethnic differences in health beliefs about lower urinary tract symptoms. *Nursing Research*, 60(3), 165.
- Welch, L. C., Taubenberger, S., & Tennstedt, S. L. (2011b). Patients' experiences of seeking health care for lower urinary tract symptoms. *Research in Nursing & Health*, 34(6), 496-507.
- Wennberg, A. L., Altman, D., Lundholm, C., Klint, Å., Iliadou, A., Peeker, R., ... & Milsom, I. (2011). Genetic influences are important for most but not all lower urinary tract symptoms: a population-based survey in a cohort of adult Swedish twins. *European Urology*, 59(6), 1032-1038.
- Wesnes, S. L., & Lose, G. (2013). Preventing urinary incontinence during pregnancy and postpartum: a review. *International urogynecology journal*, 24(6), 889.
- Wilson, M. G. (2004). Urinary incontinence: a treatise on gender, sexuality, and culture. *Clinics in Geriatric Medicine*, 20(3), 565-570.

- Wilson, P. D., Berghmans, B., Hagen, S., Hay-Smith, J., Moore, K., Nygaard, I., ... & Dorey, G. (2005). Adult conservative management. *Incontinence*, *2*, 855-964.
- Wilson, L., Brown, J. S., Shin, G. P., Luc, K. O., & Subak, L. L. (2001). Annual direct cost of urinary incontinence. *Obstetrics & Gynecology*, 98(3), 398-406.
- Winett, R. A. (1985). Ecobehavioral assessment in health life-styles: concepts and methods. *Measurement strategies in health psychology*, 147-181.
- Winett, R. A. (1995). A framework for health promotion and disease prevention programs. *American Psychologist*, *50*(5), 341.
- Wood, L. N., Markowitz, M. A., Parameshwar, P. S., Hannemann, A. J., Ogawa, S. L., Anger, J. T., & Eilber, K. S. (2018). Is It Safe to Reduce Water Intake in the Overactive Bladder Population? A Systematic Review. *The Journal of urology*.
- World Health Organization (2017). Health promotion. Retrieved from http://www.who.int/topics/health\_promotion/en/.
- Wu, C., Wang, K., Sun, T., Xu, D., & Palmer, M. H. (2015). Predicting help-seeking intention of women with urinary incontinence in Jinan, China: a theory of planned behaviour model. *Journal Of Clinical Nursing*, 24(3/4), 457-464.
  doi:10.1111/jocn.12623
- Wu, J. M., Hundley, A. F., Fulton, R. G., & Myers, E. R. (2009). Forecasting the prevalence of pelvic floor disorders in US Women: 2010 to 2050. *Obstetrics & Gynecology*, 114(6), 1278-1283.
- Wyman, J. F., Burgio, K. L., & Newman, D. K. (2009). Practical aspects of lifestyle modifications and behavioural interventions in the treatment of overactive bladder

and urgency urinary incontinence. *International Journal of Clinical Practice*, *63*(8), 1177-1191.

- Xu, D., Chen, L., Wan, X., Zhang, Y., Liu, N., & Wang, K. (2016). Toileting behaviour and related health beliefs among Chinese female nurses. *International Journal of Clinical Practice*, 70(5), 416-423.
- Yang, K. N., Chen, S. C., Chen, S. Y., Chang, C. H., Wu, H. C., & Chou, E. C. L. (2010). Female voiding postures and their effects on micturition. *International Urogynecology Journal*, 21(11), 1371-1376.
- Yeung, C. K., Sreedhar, B. I. J. I., Sihoe, J. D., Sit, F. K., & Lau, J. (2006). Differences in characteristics of nocturnal enuresis between children and adolescents: a critical appraisal from a large epidemiological study. *BJU international*, 97(5), 1069-1073.
- Young, M. D., Plotnikoff, R. C., Collins, C. E., Callister, R., & Morgan, P. J. (2014). Social cognitive theory and physical activity: a systematic review and metaanalysis. *Obesity Reviews*, 15(12), 983-995.
- Zhang, C., Hai, T., Yu, L., Liu, S., Li, Q., Zhang, X., ... & Wang, X. (2013). Association between occupational stress and risk of overactive bladder and other lower urinary tract symptoms: A cross-sectional study of female nurses in China. *Neurourology and Urodynamics*, 32(3), 254-260.
- Zhang, W., Song, Y., He, X., Huang, H., Xu, B., & Song, J. (2006). Prevalence and risk factors of overactive bladder syndrome in Fuzhou Chinese women. *Neurourology* and Urodynamics, 25(7), 717-721.

Zingone, F., Iovino, P., Santonicola, A., Gallotta, S., & Ciacci, C. (2017). High risk of lower urinary tract symptoms in patients with irritable bowel syndrome. *Techniques in coloproctology*, 21(6), 433-438.

#### APPENDIX A

### STUDENT CONTACT EMAILS / INVITATIONS TO PARTICIPATE

# **Text for First Email Contact**

Dear Boston College student,

#### The "College Women's Health Survey" is coming .....

Soon you will receive an email request to participate and a link to fill out an online survey. You are receiving this email because you are one of 1,800 randomly selected female undergraduate student emails provided to participate in the survey. Kim Angelini from the BC Connell School of Nursing is conducting this study. The study concerns an issue in women's health that affects many women of all ages. Urinary urgency, frequency, leakage during activities, and waking up multiple times at night to go to the bathroom are all urinary symptoms that affect women's health. It usually takes about 10-15 minutes to complete the survey. Participation is completely voluntary. Information will be collected without names, email addresses or any other individual identifiers, and therefore your responses cannot be linked to you. Students must be 18 years of age or older to participate.

We are writing to you in advance to let you know the survey is coming. We hope that you will participate. It is not necessary that you have experienced urinary symptoms to participate. The findings will be used to inform care to assist college women.

As a small "Thank You" for your time, at the end of the survey you can click on a separate link to **enter a drawing to win one of 2 \$100 Amazon gift cards**. You will need to enter your first name and email address to register for the drawing. This site is completely separate from the survey website. The researchers will have email addresses for those who sign up for the gift card drawing, but they will not be able to link email addresses to survey responses. The gift card drawing will be held within 2 weeks of survey completion and winners will be notified by email.

Although the researchers will have first names and email addresses in a separate database for those who enter the gift card drawing, they will not be able to link first names or email addresses to survey responses.

We hope that you will consider participating in this survey. It's only with your help that our research can be successful. Thank you.

Very best wishes, Kim Angelini, WHNP, PhD-c Doctoral Candidate Boston College William F. Connell School of Nursing

## < FOLLOW THIS LINK TO THE SURVEY> <Follow the link to opt out of future emails> <u>Text for Second Email Contact</u>

Dear Boston College student,

# The "College Women's Health Survey" is just a click away ... < FOLLOW THIS LINK TO THE SURVEY>

#### Your opinions and experiences are very important to us.

By participating, you can provide information that will help us design interventions and guide health care related to women's health promotion.

Again . . . participation is voluntary. Information will be collected without names, email addresses or any other individual identifiers, and therefore your responses cannot be linked to you. Students must be 18 years of age or older to participate. It takes about 10-15 minutes to complete the survey.

As a small "Thank You" for your time, at the end of the survey you can click on a separate link to **enter a drawing to win one of 2 \$100 Amazon gift cards**. You will need to enter your first name and email address to register for the drawing. This site is completely separate from the survey website. The researchers will have email addresses for those who sign up for the gift card drawing, but they will not be able to link email addresses to survey responses. The gift card drawing will be held within 2 weeks of survey completion and winners will be notified by email.

The study is being conducted by Kim Angelini at the Boston College Connell School of Nursing. To participate, or for more information, please click on the link below.

#### < FOLLOW THIS LINK TO THE SURVEY> <Follow the link to opt out of future emails>

Thank you for your time and consideration. It's only with your help that our research can be successful.

Very best wishes,

Kim Angelini, WHNP, PhD-c Doctoral Candidate Boston College William F. Connell School of Nursing

# **Text for Third Email Contact**

Dear Boston College Student,

Last week we invited you to participate in the "College Women's Health Survey".

## < FOLLOW THIS LINK TO THE SURVEY>

It is not too late to participate but the deadline is approaching. **The survey link will close on 12/20/2017.** 

Your opinions and experiences are very important to us.

Participation is voluntary. Information will be collected without names, email addresses or any other individual identifiers, and therefore your responses cannot be linked to you. You may skip any questions that you prefer not to answer. Students must be 18 years of age or older to participate.

As a small "Thank You" for your time, at the end of the survey you can click on a separate link to **enter a drawing to win one of 2 \$100 Amazon gift cards**. You will need to enter your first name and email address to register for the drawing. This site is completely separate from the survey website. The researchers will have email addresses for those who sign up for the gift card drawing, but they will not be able to link email addresses to survey responses. The gift card drawing will be held within 2 weeks of survey completion and winners will be notified by email.

The study is being conducted by Kim Angelini at the Boston College Connell School of Nursing. To participate, or for more information, please click on the link below.

#### < FOLLOW THIS LINK TO THE SURVEY> <Follow the link to opt out of future emails>

Thank you for your time and consideration.

Very best wishes,

Kim Angelini, WHNP, PhD-c Doctoral Candidate Boston College William F. Connell School of Nursing

#### **APPENDIX B: INFORMATION AND CONSENT**

The College Women's Health Survey

Dear BC Student,

You are being invited to participate in the study "College Women's Health Survey" because you are a female college student over 18 years of age. You are one of 1,800 female undergraduate students **randomly selected** to receive an invitation to participate in the survey. The purpose of the research is to gather information that will help researchers at Boston College understand and develop educational strategies on urinary symptoms and pelvic floor health in college women. The survey contains questions on demographics (e.g. age, race, ethnicity), health status (e.g. height, weight, health conditions, medication use, physical activity, alcohol and tobacco consumption, and sexual activity), experience of urinary symptoms, several questions on behaviors that have been associated with urinary symptoms, and several questions on your knowledge of urinary and bladder health. This survey is being conducted by Kim Angelini, a doctoral student at the Boston College Connell School of Nursing

The Qualtrics survey system we use for the survey will be set to "anonymous" and your email address will not be linked to your survey; **your survey responses cannot be linked to you.** Your name and other identifiers are not included in the survey and cannot be identified in the analyses or in any reports or publications. Survey results will only be reported in group form.

You and your peers are the experts. Your input, opinions, and insights are very important to the success of this research project. The information gained will be used to better understand young women's experiences with urinary symptoms and influence healthcare for young women like you.

Please read the components of informed consent below and select the YES button if you agree to participate. You will be automatically linked to the online survey. At the end of the survey, you may click on the link to enter the drawing for one of two \$100 Amazon gift cards.

As a reminder – you must be 18 years of age or older to participate in the survey.

Thank you for your consideration and time.

Kim Angelini, WHNP, PhD-c Doctoral Candidate Boston College William F. Connell School of Nursing

#### **Consent to Participate**

You are being contacted via your college email address and invited to participate in a research study, "The College Women's Health Survey". The purpose of the research is to gather information that will help researchers to better understand young women's experiences with urinary symptoms and influence care for young women. The survey contains general questions about your background, health habits, physical activity and athletic involvement, and experiences and behaviors associated with urinary symptoms. If you agree to participate, you will be asked to complete an on-line survey that takes approximately 10-15 minutes to complete.

Participation is completely voluntary. If you choose not to participate, it will not affect your current or future relations with Boston College. You may withdraw your participation at any time for any reason. If you are not comfortable answering a question, you may skip the question or stop the survey at any time (by clicking the "end survey button"). There is no penalty for not answering a question. Participants who skip questions are still eligible to enter the gift card drawing at the end of the survey. There are no known study risks at this time, beyond those of everyday life. Some of the questions in the survey could cause some participants to experience distress. There are no direct benefits or costs to you for participating in this study.

At the end of the survey, you will be given the option to go to a separate link to enter a drawing for one of two \$100 Amazon gift cards. On this separate site you will be asked for your first name and email address. Winners will be notified and gift cards will be sent via that email address. Email addresses that are provided for the gift card drawing cannot be linked to survey responses. Your survey responses cannot be linked to you. The Qualtrics survey system we use is set to anonymously record survey answers without any identifiers. The researchers will know the email addresses of those who sign-up for the gift card drawing, but will not be able to link the email address to survey responses. In any research reports that we write for publication or conference presentations, information from all participants will be combined.

The survey will be open for the next 2 weeks. You will receive up to 2 reminder emails about this survey. The reminder emails will be sent to all students who were selected to participate. Feel free to disregard the reminders if you are not interested in participating or if you already completed the survey. You can also click the opt-out link below.

Please be sure that you understand all of the information above before deciding to participate. If you have questions now, you can contact the investigator listed below. You can also contact her at any time after the survey. After you have read this page and understood it, you may participate in the survey by typing "yes" in the box at the bottom of this page and hitting the 'submit' button. You will then be directly connected to the online survey.

## Please print a copy of this consent form. <PRINT CONSENT>

If you have any questions about the study, please contact the investigator: Kim Angelini, WHNP-BC, PhD Doctoral Student Boston College 140 Commonwealth Ave., Chestnut Hill, MA 02467 Pomerlek@bc.edu

If you have any questions regarding your rights as a research subject, please call: Boston College Office for Research Protections (617) 552-4778 irb@bc.edu The Boston College IRB has approved this protocol from December 4, 2017-December 3, 2018.

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I have read this consent about the study and am ready to participate. I understand the possible risks and benefits of this study. I am at least 18 years of age and eligible to participate.

To access the on-line survey, Please select "yes" in the box below and then hit the 'submit' button.

You will be directly linked to the survey.

< Yes-- Yes -- I consent and want to complete the survey >

< OPT OUT-- No -- I do not consent and do not want to complete the survey >

<Force response to move on>
<Skip to end of survey if select OPT OUT>

# **APPENDIX C**

# SURVEY INSTRUMENT: COLLEGE WOMEN'S HEALTH SURVEY

#### **College Women's Health Survey**

Start of Block: study info

#### College Women's Health Survey

Dear BC Student, You are being invited to participate in the study "College Women's Health Survey" because you are a female college student over 18 years of age. You are one of 1,800 female undergraduate students randomly selected to receive an invitation to participate in the survey. The purpose of the research is to gather information that will help researchers at Boston College understand and develop educational strategies on urinary symptoms and pelvic floor health in college women. The survey contains questions on demographics (e.g. age, race, ethnicity), health status (e.g. height, weight, health conditions, medication use, physical activity, alcohol and tobacco consumption, and sexual activity), experience of urinary symptoms, several questions on behaviors that have been associated with urinary symptoms, and several questions on your knowledge of urinary and bladder health. This survey is being conducted by Kim Angelini, a doctoral student at the Boston College Connell School of Nursing. The Oualtrics survey system we use for the survey will be set to "anonymous" and your email address will not be linked to your survey; your survey responses cannot be linked to you. Your name and other identifiers are not included in the survey and cannot be identified in the analyses or in any reports or publications. Survey results will only be reported in group form.

You and your peers are the experts. Your input, opinions, and insights are very important to the success of this research project. The information gained will be used to better understand young women's experiences with urinary symptoms and influence healthcare for young women like you.

Please read the components of informed consent below and select the YES button if you agree to participate. You will be automatically linked to the online survey. At the end of the survey, you may click on the link to enter the drawing for one of two \$100 Amazon gift cards.

As a reminder – you must be 18 years of age or older to participate in the survey. Thank you for your consideration and time. Kim Angelini, WHNP, PhD-c Doctoral Candidate Boston College William F. Connell School of Nursing

End of Block: study info

**Start of Block: Informed Consent** 

<u>Consent to Participate</u> You are being contacted via your college email address and invited to participate in a research study, "The College Women's Health Survey". The purpose of the research is to gather information that will help researchers to better understand young women's experiences with urinary symptoms and influence care for young women. The survey contains general questions about your background, health habits, physical activity and athletic involvement, and experiences and behaviors associated with urinary symptoms. If you agree to participate, you will be asked to complete an on-line survey that takes approximately 10-15 minutes to complete.

Participation is completely voluntary. If you choose not to participate, it will not affect your current or future relations with Boston College. You may withdraw your participation at any time for any reason. If you are not comfortable answering a question, you may skip the question or stop the survey at any time (by clicking the "end survey button"). There is no penalty for not answering a question. Participants who skip questions are still eligible to enter the gift card drawing at the end of the survey. There are no known study risks at this time, beyond those of everyday life. Some of the questions in the survey could cause some participants to experience distress. There are no direct benefits or costs to you for participating in this study. At the end of the survey, you will be given the option to go to a separate link to enter a drawing for one of two \$100 Amazon gift cards. On this separate site you will be asked for your first name and email address. Winners will be notified and gift cards will be sent via that email address. Email addresses that are provided for the gift card drawing cannot be linked to survey responses. Your survey responses cannot be linked to you. The Qualtrics survey system we use is set to anonymously record survey answers without any identifiers. The researchers will know the email addresses of those who sign-up for the gift card drawing, but will not be able to link the email address to survey responses. In any research reports that we write for publication or conference presentations, information from all participants will be combined. The survey will be open for the next 2 weeks. You will receive up to 2 reminder emails about this survey. The reminder emails will be sent to all students who were selected to participate. Feel free to disregard the reminders if you are not interested in participating or if you already completed the survey. You can also click the opt-out link below.

Please be sure that you understand all of the information above before deciding to participate. If you have questions now, you can contact the investigator listed below. You can also contact her at any time after the survey. After you have read this page and understood it, you may participate in the survey by typing "yes" in the box at the bottom of this page and hitting the 'submit' button. You will then be directly connected to the online survey.

Please print a copy of this consent form.

If you have any questions about the study, please contact the investigator: Kim Angelini, WHNP-BC, PhD Doctoral Student Boston College 140 Commonwealth Ave., Chestnut Hill, MA 02467 Pomerlek@bc.edu

If you have any questions regarding your rights as a research subject, please call: Boston College Office for Research Protections (617) 552-4778 irb@bc.edu **The Boston College IRB has approved this protocol from December 4, 2017-December 3, 2018.** 

I have read this consent about the study and am ready to participate. I understand the possible risks and benefits of this study. I am at least 18 years of age and eligible to participate. To access the on-line survey, Please select "yes" in the box below and then hit the 'submit' button. You will be directly linked to the survey.

 $\bigcirc$  Yes -- I consent and want to complete the survey (1)

 $\bigcirc$  No -- I do not consent and do not want to complete the survey (2)

Skip To: End of Survey If Consent to Participate You are being contacted via your college email address and invited to... = No -- I do not consent and do not want to complete the survey

**End of Block: Informed Consent** 

**Start of Block: Demographics** 

The questions in the first section ask for general information about you. Please answer as honestly as possible. There are no right or wrong answers. Your answers cannot be linked to you.

How old are you?

 $\bigcirc$  less than 18 years old

 $\bigcirc$  18 years old

- $\bigcirc$  19 years old
- $\bigcirc$  20 years old
- $\bigcirc$  21 years old
- $\bigcirc$  22 years old

 $\bigcirc$  23 years old or older

Skip To: Q180 If How old are you? != less than 18 years old

# Thank you for your interest in the "College Women's Health" Survey.

#### We are sorry but you are not eligible to participate.

Participants must be at least 18 years of age in order to consent and participate in the survey.

Please contact Kim Angelini (pomerlek@bc.edu) if you have any questions.

Skip To: End of Survey If Thank you for your interest in the "College Women's Health" Survey. We are sorry but you are not...() Is Displayed

How do you describe your race ? Please check all that apply:

	African American or Black
	Asian or Pacific Islander
	Caucasian or White
	Native American or American Indian
	Other

Do you identify as Hispanic or Latino?

🔿 No

 $\bigcirc$  Yes
What is the highest level of education that your **mother or primary mother figure** completed?

- O Middle school or less
- Some high school but no diploma
- O High school diploma
- Some college or technical school
- Associate's degree
- O Bachelor's degree
- Some graduate school but no degree
- Graduate degree (e.g., MS, MD, JD, PhD)
- O Don't know
- $\bigcirc$  N/A -- no mother or mother figure

**End of Block: Demographics** 

Start of Block: General health, wellness & activity

The questions in this section ask about your general health, wellness and activity. Please answer as honestly as possible. There are no right or wrong answers. Your answers cannot be linked to you.

How would you rate your overall health?

○ Poor
○ Fair
○ Good
○ Very good
○ Excellent

Please enter your height in feet and inches. If you are using a mobile device and this does not display correctly, then please type in your height in the next question.

	Feet					Inches																					
	4 ft.	f	5 t.	6 ft.		1		2		3		4		5		6		7		8		9		10		11	
What is your height?		(	(		(		(		(		(		(		(		(		(		(		(		(		(

\_\_\_\_\_

Please enter your current weight in pounds.

How many cups (8oz) of coffee, tea, or other caffeinated beverages (including energy drinks) do you drink per day?

○ None	
O 1	
O 2	
O 3	
O 4	
O 5	
○ 6 or more	

During the past 7 days, on how many days were you physically active for a total of **at least 60 minutes per day**? (Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time.)

0 days
1 day
2 days
3 days
4 days
5 days
6 days
7 days

\_\_\_\_\_

Do you routinely participate in any of the following activities? (select all that apply)

	Ballet
	Cheerleading or Gymnastics
ball, or Te	Field sport (including Soccer, Lacrosse, Field Hockey, Softball, Volley ennis)
	HIIT/Cross-fit
	Heavy weight lifting
	Long distance running/marathon training
	Short distance running/jogging
	Spinning/Cycle

Do you participate as a member of any sports team?

 $\bigcirc$  No

○ Yes, Collegiate Athletic Team

○ Yes, Club Team

○ Yes, Intramural Team

	No	Yes
Anxiety/ Depression	0	0
Constipation or Irritable Bowel Syndrome or Irritable Bowel Disease	$\bigcirc$	$\bigcirc$
Diabetes	$\bigcirc$	$\bigcirc$
Eating Disorder	$\bigcirc$	$\bigcirc$
Overactive Bladder	$\bigcirc$	$\bigcirc$
Sexually Transmitted Infection	$\bigcirc$	$\bigcirc$
Urinary Incontinence	$\bigcirc$	$\bigcirc$

\_\_\_\_\_

# Have you been diagnosed with any of the following health conditions?

Are you currently taking any of the following medications?
--

	No	Yes
Antidepressant/ anti-anxiety medication	0	$\bigcirc$
Heart medication	$\bigcirc$	$\bigcirc$
Combined hormone contraceptive pill/patch/ring (estrogen & progesterone)	$\bigcirc$	$\bigcirc$
Progesterone contraceptive (e.g. Progesterone Only Pill, DepoProvera, Hormone IUD (Mirena, Skyla, Liletta, Kyleena), or Nexplanon)	$\bigcirc$	$\bigcirc$

During the past 30 days, on how many days did you have at least one drink of alcohol?

$\bigcirc$ 0 days
◯ 1 day
O 2 days
$\bigcirc$ 3 to 5 days
🔿 6 - 9 days
🔿 10 - 19 days
○ 20 to 29 days
O All 30 days

**During the past 30 days,** <u>on how many days</u> did you have **4 or more** drinks of alcohol in a row, that is, within a couple of hours?

0 days
1 day
2 days
3 to 5 days
6 to 9 days
10 to 19 days
20 to 29 days
All 30 days

**During the past 30 days, <u>on how many days</u>** did you use tobacco/nicotine products (cigarettes, cigars, chewing tobacco, electronic vapor products, ect.)

0 days
1 or 2 days
3 to 5 days
6 to 9 days
10 to 19 days
20 to 29 days

○ All 30 days

End of Block: General health, wellness & activity

Start of Block: Personal Factors\_Sexual Health

The next few questions ask about sexual health. Please answer as honestly as possible. There are no right or wrong answers. Your answers cannot be linked to you.

Have you ever had sexual intercourse?

 $\bigcirc$  No

○ Yes

*Skip To: End of Block If Have you ever had sexual intercourse? = No* 

Have you ever been pregnant and given birth?

○ No

 $\bigcirc$  Yes

End of Block: Personal Factors\_Sexual Health

**Start of Block: USS** 

This section contains more detailed questions about specific urinary symptoms that many people experience. Each symptom question asks how frequently you have experienced a specific symptom <u>during the past week</u>. A question then asks how much that specific symptom bothers you. There are no right or wrong answers. Please answer as honestly as possible.

\_\_\_\_\_

**During the past week**, on average, how many times did you urinate during the day while you were awake? (not including at night when you were asleep )

1-3 times
4-7 times
8-10 times
11-13 times
14 or more times

**During the past week**, on average, how many times did you have to get up to urinate during the night?

○ none	
$\bigcirc$ 1 time	
○ 2 times	
$\bigcirc$ 3 times	
$\bigcirc$ 4 or more times	

# During the past week,

<u>During the pu</u>	Never	Rarely	Sometimes	Often	Almost Always
How often did you feel like you were urinating too frequently?	0	0	0	0	0
How often did you have a sudden need to rush to the toilet to urinate?	0	$\bigcirc$	0	$\bigcirc$	$\bigcirc$
How often did your urine flow stop and start while you were urinating?	0	$\bigcirc$	0	$\bigcirc$	$\bigcirc$
How often did you have pain or discomfort in your bladder area?	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
How often was there a delay before you could start to urinate?	0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
How often did you have to strain to urinate or strain while you were urinating?	0	0	0	$\bigcirc$	$\bigcirc$
How often did you have	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
0	0	0	0	$\bigcirc$
0	0	0	0	$\bigcirc$
0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

# During the past week,

<u> </u>	Never	Rarely	Sometimes	Often	Almost Always
How often did you leak urine?	0	0	0	0	$\bigcirc$
How often did urine leak before you could get to the toilet?	0	0	$\bigcirc$	0	$\bigcirc$
How often have you leaked urine in connection with a sudden need to rush to urinate?	0	$\bigcirc$	$\bigcirc$	0	$\bigcirc$
How often have you leaked urine just after you have finished urinating?	0	0	$\bigcirc$	0	$\bigcirc$
How often have you leaked urine when you were physically active and/or exerted yourself (e.g. lifting a heavy object)?	0	0	$\bigcirc$	0	$\bigcirc$
How often did urine leak when you laughed,	0	$\bigcirc$	$\bigcirc$	0	$\bigcirc$

If During t Or During All together, h at all; 10 = bo	<i>the past week, [</i> <i>the past week,</i> ow much are you thers me very m	Never] (Count) [ Never] (Count) u bothered by un uch) Please slic	< 11 t) < 9 rinary symptom te bar or tap sco	s? (0 = does no	ot bother me
Display This Q	Question:				
How often did you leak urine during sexual activity?	$\bigcirc$	$\bigcirc$	0	$\bigcirc$	$\bigcirc$
How often did you leak urine when you were asleep?	0	0	0	0	$\bigcirc$
coughed, and/or sneezed? How often did you leak urine for no obvious reason and without feeling that you had to go?	0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$



Display This Question: If During the past week, [Never] (Count) < 11 Or During the past week, [Never] (Count) < 9

How much do urinary symptoms disrupt or impact your life? (0 = does not disrupt or impact my life at all; 10 = disrupts or impacts my life very much). Please slide bar or tap score where you want the bar to go.

0 1 2 3 4 5 6 7 8

9 10

Amount of Impact (1)	

**End of Block: USS** 

Start of Block: HCP

Have you ever talked to your health care provider (HCP) (nurse, nurse practitioner, physician) about your urinary symptoms?

 $\bigcirc$  N/A --I do not have any urinary symptoms

○ No

○ Yes

Have you told anyone else (family, friends, significant other ect.) about your urinary symptoms?

○ N/A --I do not have any urinary symptoms

🔿 No

 $\bigcirc$  Yes

*Skip To: Q232 If Have you ever talked to your health care provider (HCP) (nurse, nurse practitioner, physician)* ab... = Yes

Skip To: Q177 If Have you ever talked to your health care provider (HCP) (nurse, nurse practitioner, physician) ab... = N/A --I do not have any urinary symptoms

If you have not told your HCP or anyone else about your urinary symptoms, why not?

Many women find certain foods or drinks make their urinary symptoms worse. <u>In your experience</u>, do you find that any of the following foods or drinks make your urinary symptoms (e.g. urgency, frequency, leaking, waking at night to go to the bathroom) worse?

	Yes	No
Alcohol	$\bigcirc$	0
Acidic fruit juice	$\bigcirc$	$\bigcirc$
Artificial Sweeteners	$\bigcirc$	$\bigcirc$
Coffee	$\bigcirc$	$\bigcirc$
Soda	$\bigcirc$	$\bigcirc$
Spicy Food	$\bigcirc$	$\bigcirc$
Tea	$\bigcirc$	$\bigcirc$
Tomato Products	$\bigcirc$	$\bigcirc$
Other	$\bigcirc$	$\bigcirc$

Are there any other foods or drinks that you find make your urinary symptoms worse?

-----

Many women use some of the following strategies to help manage or decrease urinary symptoms.

Have you used any of the following strategies to manage your urinary symptoms? (select all that apply)

	N/AI do not have any urinary symptoms
	I have not done anything to manage my urinary symptoms
	Pads (menstrual/period pads)
	Pads (for incontinence/urine leakage)
	Impressa
	Medication
	Avoid caffeine
	Avoid alcohol
	Limit fluid intake
	Go to the bathroom 'just in case' before going out
	Go to the bathroom before working out or exercising
$\bigcirc$	Avoid activities that cause urine leaking
$\Box$	Go to the bathroom before sex
$\bigcirc$	Other

----

Many children wet the bed at night. Do you remember wetting the bed **when you were 10 years old or older?** 

 $\bigcirc$  No

○ Yes

O Unsure

**End of Block: Intro to urinary symptoms** 

Start of Block: TB WEB

The following statements describe things that many women do related to toileting. Please select the response that best matches how often you do these things.

-----

	Never	Rarely	Sometimes	Often	Almost Always
When I use public toilets, I worry about how clean they are.	0	0	0	0	0
I try to avoid using public toilets.	$\bigcirc$	0	$\bigcirc$	0	$\bigcirc$
I try to empty my bladder before leaving my home.	0	0	$\bigcirc$	0	$\bigcirc$
When I am away from my home, I try to hold my urine until I get home	$\bigcirc$	0	$\bigcirc$	0	$\bigcirc$
When I am at my home, I empty my bladder even when I do not feel the need to urinate.	0	0	$\bigcirc$	0	$\bigcirc$
When I am away from my home, I empty my bladder even when I do not feel the need to urinate.	$\bigcirc$	0	$\bigcirc$	$\bigcirc$	$\bigcirc$
I empty my bladder without feeling a need to urinate, but	0	$\bigcirc$	0	$\bigcirc$	$\bigcirc$

	I				
do so "just in case".					
I will delay emptying my bladder when I am busy.	0	0	0	0	0
I wait to empty my bladder until I feel I cannot hold my urine any longer.	0	0	0	0	0
I wait too long (strong need to urinate or actual leakage) when I have to empty my bladder at work.	0	$\bigcirc$	$\bigcirc$	0	0
I push down (strain/tighten my abdominal muscles) to begin urinating.	0	$\bigcirc$	0	0	0
I push down (strain/ tighten my abdominal muscles) to keep the urine flowing during the urinating process.	0	$\bigcirc$	0	0	0
I push down (strain/ tighten my	0	0	$\bigcirc$	$\bigcirc$	$\bigcirc$

abdominal muscles) in order to empty my bladder.					
I push down (strain/tighten my abdominal muscles) to make the bladder empty faster.	$\bigcirc$	$\bigcirc$	$\bigcirc$	0	$\bigcirc$

At HOME, which position do you generally use to URINATE?

 $\bigcirc$  I sit on the toilet seat to urinate.

○ I crouch/hover/ stand over the toilet to urinate.

AWAY FROM HOME, which position do you generally use to URINATE?

 $\bigcirc$  I sit on the toilet seat to urinate.

 $\bigcirc$  I crouch/hover/ stand over the toilet to urinate.

IN YOUR RESIDENCE HALL BATHROOM, which position do you generally use to URINATE?

 $\bigcirc$  I sit on the toilet seat to urinate.

○ I crouch/hover/ stand over the toilet to urinate.

○ N/A--Do not live in a residence hall

End of Block: TB WEB

### Start of Block: PIKQ-UI

Below are statements regarding urinary incontinence (or leaking urine). Please indicate whether you believe the statement is TRUE or FALSE. Please avoid guessing. If you are unsure please select "Don't Know." Other than pads and absorbent briefs, not much can be done to treat leakage of urine.

○ True
○ False
○ Don't know
Certain exercises can be done to help control urine leakage.
○ True
○ False
○ Don't know
Most people who leak urine can be cured with some kind of treatment.
Most people who leak urine can be cured with some kind of treatment.
Most people who leak urine can be cured with some kind of treatment. O True O False
Most people who leak urine can be cured with some kind of treatment. O True O False O Don't know
Most people who leak urine can be cured with some kind of treatment.   True  False Don't know It is important to diagnose the type of urine leakage before treating it.
Most people who leak urine can be cured with some kind of treatment. <ul> <li>True</li> <li>False</li> <li>Don't know</li> </ul> <li>It is important to diagnose the type of urine leakage before treating it. <ul> <li>True</li> </ul> </li>

○ Don't know

Once people start to leak urine they are never able to control their urine again.

○ True
○ False
○ Don't know
Leaking urine is a normal part of aging.
○ True
○ False
○ Don't know
It is normal for women to leak a little urine during exercise.
○ True
○ False
○ Don't know
Leaking urine is embarrassing and not something to talk about.
○ True

O False

O Don't know

End of Block: PIKQ-UI

Start of Block: Thank you/Raffle Link/Bc resources

Thank you for completing this survey!!!! We appreciate your time and effort. To be entered to win one of the \$100 Amazon gift cards, please click on the link below. You will be directed to a new site where you can enter your email address for the gift card.

LINK TO RAFFLE ENTRY

If you need them, the following resources are available to you at BC: Counseling Services (Gasson Hall 001) 617-552-3310 (weekdays); 617-552-3227 (eves weekends); www.bc.edu/offices/counseling University Health & Services (2150 Commonwealth Ave.) 617-552-3225; www.bc.edu/offices/uhs Office of the Dean of Students (4th floor, Maloney Richard DeCapua, Associate Dean (617) 552–3470 Title IX Coordinator Hall) for Students (4th floor, Maloney Hall) Melinda Stoops, Associate Vice President for Student Affairs: 617-552-3482 **SANet Care Team (441 Maloney Hall)** 617-552-2211 SANet@bc.edu

**Boston College Police** (1st floor, Maloney Hall) (617) 552–4444 (emergency); (617) 552–4440 (non-emergency)

End of Block: Thank you/Raffle Link/Bc resources

### **APPENDIX D**

### **INSTITUTIONAL REVIEW BOARD REVIEW AND APPROVAL**



BOSTON COLLEGE Institutional Review Board Office for Research Protections Waul House, 3<sup>rd</sup> Floor Phone: (617) 552-4778, fax: (617) 552-0498

#### IRB Protocol Number: 18.131.01

- DATE: December 4, 2017
- TO: Kimberly Pomerleau
- CC: Mary Katherine Hutchinson
- FROM: Institutional Review Board Office for Research Protections
- RE: THE EXPERIENCE OF LOWER URINARY TRACT SYMPTOMS IN A SAMPLE OF COLLEGE WOMEN

#### Notice of IRB Review and Approval Expedited Review as per Title 45 CFR Part 46.110, FR 60366, FR, # 7 Waiver of Documentation of Informed Consent [Title 45 CFR 46.117 (c)]

The project identified above has been reviewed by the Boston College Institutional Review Board (IRB) for the Protection of Human Subjects in Research using an expedited review procedure. This is a minimal risk study. This approval is based on the assumption that the materials, including changes/clarifications that you submitted to the IRB contain a complete and accurate description of all the ways in which human subjects are involved in your research.

This approval is given with the following standard conditions:

- You are approved to conduct this research only during the period of approval cited below;
- You will conduct the research according to the plans and protocol submitted (approved copy enclosed);
- You will immediately inform the Office for Research Protections (ORP) of any injuries or adverse research events involving subjects;
- You will immediately request approval from the IRB of any proposed changes in your research, and you will not initiate any changes until they have been reviewed and approved by the IRB;
- The IRB has waived the requirement for the documentation of informed consent as allowed under 45CFR 46.117 (c) (2). The research presents no more than minimal

risk of harm to subjects, and involves no procedures for which written consent is normally required outside of the research context.

- You will only use the informed consent documents that have the IRB approval dates stamped on them (approved copies enclosed).
- 7. You will give each research subject a copy of the informed consent document;
- 8. You may enroll up to 1800 participants. You may not enroll more than this number of participants without seeking IRB approval. To do so will be a violation of the conditions of IRB approval and, if federal funding is involved in your project, a matter of non-compliance that we must report to the federal government. This could significantly and negatively impact your research.
- If your research is anticipated to continue beyond the IRB approval dates, you must submit a Continuing Review Request to the IRB approximately 30 days prior to the IRB approval expiration date. Without continuing approval the Protocol will automatically expire on December 3, 2018.

Additional Conditions: Any research personnel that have not completed an acceptable education/training program should be removed from the project until they have completed the training. When they have completed the training, you must submit a Protocol Revision and Amendment Form to add their names to the protocol, along with a copy of their education/ training certificate.

Approval Period: December 4, 2017-December 3, 2018.

If you are conducting research using an online survey (e.g. Survey Monkey, Qualtrics), the IRB requires that the approval dates appear on the online consent page of your survey. Please copy and paste the statement below onto your survey:

The Boston College IRB has approved this protocol from December 4, 2017-December 3, 2018.

Boston College and the Office for Research Protections appreciate your efforts to conduct research in compliance with Boston College Policy and the federal regulations that have been established to ensure the protection of human subjects in research. Thank you for your cooperation and patience with the IRB process.

Sincerely,



Executive Director of research Administration

Enclosures

jfc

## **APPENDIX E**

# **INCENTIVE RAFFLE WINNER SELECTION**

# "College Women's Health Survey"

Four hundred and thirty five female undergraduate college students provided email addresses for the chance to win one of two \$100 Amazon gift-cards. Winners were selected at random via the described process below and the winners were notified and provided e-gift cards through the provided emails.

PROCESS: Random Number Generator

USED. http://statuek.com/statistics/random-humber-generator.as
--

- Enter a value in each of the first three tout haves	1			
• Enter a value in each of the first three text boxes.				
• Indicate whether duplicate entries are allowed in the table.	1			
• Click the <b>Calculate</b> button to create a table of random numbers.				
<b>Note</b> : The seed value is optional. Leave it blank to generate a new set of numbers. Use it to repeat a previously-generated set of numbers.				
How many random numbers? 2				
Minimum value 1				
Maximum value 435				
Allow duplicate entries False -				
Seed (optional)	Calculate			
RESULTS:				
2 Random Numbers				

## 184 118

**Specs:** This table of 2 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 435. Duplicate numbers were not allowed. This table was generated on 12/22/2017.