



Published in final edited form as:

NeuroUrol Urodyn. 2022 September ; 41(7): 1601–1611. doi:10.1002/nau.25007.

Urinary incontinence product use and costs are higher in incontinent women with greater unmet social needs

Leah P. Chisholm, MD¹, Elisabeth M. Sebesta, MD¹, Stephanie Gleicher, MD, MPH¹, Melissa Kaufman, MD, PhD¹, Roger R. Dmochowski, MD, MMHC¹, W. Stuart Reynolds, MD, MPH¹

¹Department of Urologic Surgery, Division of Reconstructive Urology and Pelvic Health, Vanderbilt University Medical Center, Nashville, Tennessee

Abstract

Introduction: Urinary incontinence is a common condition in women, who often use incontinence containment products to self-manage. Few studies have sought to quantify use and costs of incontinence products associated with subtypes of incontinence and severity, therefore this study aimed to quantify incontinence product use and personal costs to women.

Methods: This is a secondary analysis from a sample of adult women recruited electronically via ResearchMatch for a study on urinary symptoms and social determinants of health. Participants completed validated questionnaires on urinary symptoms, and were asked about daily numbers and types of incontinence products used and weekly costs, along with demographic and baseline clinical information, and information about unmet social needs. Descriptive statistics were performed, in addition to Wilcoxon rank sum and Kruskal-Wallis tests to compare incontinence product usage and cost based on type of incontinence, symptom severity, and other demographics, in addition to multivariable linear regression.

Results: 702 women who reported using weekly incontinence products were included in the final analytic sample. Overall, women reported using a mean of 1.8 ± 2.1 incontinence products in 24 hours (median 1, interquartile range [IQR] 1), with a maximum of 32. Mean weekly

Corresponding Author: Elisabeth M. Sebesta, MD, Department of Urology, Vanderbilt University Medical Center, A1302 Medical Center North, Nashville, TN 37232, elisabeth.sebesta@vumc.org. P: 615-343-5602, F: 615-322-8990.

Author contributions

All authors have fulfilled the requisite criteria for authorship, as detailed below:

- 1) Substantial contributions to conception and design (EMS, WSR)
- 2) Drafting and revising the article critically for important intellectual content (LPC, EMS, WSR)
- 3) Final approval of the version to be published (LPC, EMS, SG, MRK, RRD, WSR)

Conflict of Interests/Other disclosures

All authors declare that they have no conflicts of interests or disclosures.

Ethical approval

This study was approved by Institutional Review Board of Vanderbilt University Medical Center (IRB #211445).

Patient consent

This study was deemed Exempt by the VUMC IRB.

Permission to reproduce the material

There is no material in this original article from other sources that requires permissions. In consideration of the Editors of *NeuroUrology and Urodynamics* taking action in reviewing and editing this submission, the authors hereby transfer, assign, or otherwise convey all copyright ownership to *NeuroUrology and Urodynamics*, in the event that this work is published in the journal.

Clinical trial registration

This is an original research study. It does not qualify as a clinical trial.

cost of was $\$5.42 \pm \8.59 (median \$3, IQR \$4), with cost up to \$100. Non-white women trended towards having higher product usage and cost, with significant cost increase seen among non-Hispanic Black women and Hispanic women. Usage and cost were higher in women who had less education, had household income below the poverty line, were on disability, were using Medicaid or were uninsured, had more unmet social needs, and in those with mixed incontinence. Additionally, daily product use and weekly costs increased with incontinence symptom severity, with the biggest increase between those with severe and very severe symptoms.

Conclusions: In this study we were able to quantify the number of incontinence products used daily and the weekly costs in incontinent women across type and severity of incontinence. Costs were even greater, and may be prohibitive, in women with more unmet social needs, Medicaid or no insurance, less than college education, lower income, or on disability.

Keywords

incontinence; leakage; pad usage; cost; social needs; disparities

Introduction:

For many women, “pads” are most associated with period products, even though many use pads to manage urinary incontinence (UI) outside of their menstrual cycles. While numerous studies have demonstrated that the cost of female hygiene products can be high¹, these studies are often focused on period products used during the menstrual cycle and not on products to manage UI. Since UI more commonly affects women beyond their reproductive years, the costs of incontinence pads are likely substantial as well.

Urinary incontinence affects 25–45% of women^{2,3} and poses a significant public health burden that includes the hidden cost of time, psychological welfare, and quality of life⁴. Despite many prior studies documenting quality of life burdens in women with UI through various mechanisms^{5,6}, few have specifically examined the financial impacts of UI and the potential role of this monetary element on quality of life. How these financial burdens of UI are associated, if at all, with unmet social needs remains unknown.

Therefore, the objective of this study was to quantify incontinence-related product use and personal costs accrued by incontinent women, in order to better define the economic impact of UI. Additionally, we aimed to investigate differences in product use and cost among various subtypes and severities of incontinence, and to determine possible social determinants of health contributing to usage and cost differences among women.

Material and Methods:

This is a secondary analysis from an Institutional Review Board–approved (#211445) study of participants recruited electronically through a recruitment referral database available at our institution, ResearchMatch⁷. Between September 2021 and January 2022, approximately 140,000 potential participants were contacted via a single email advertisement with an invitation to complete an anonymous, electronic questionnaire using Research Electronic Data Capture (REDCap)^{8,9} with the primary objective of investigating the relationship

between bladder symptoms and various social determinants of health. Participants were incentivized with the chance to enter to be one of ten participants randomly selected to win \$100. Of all participants contacted, 5,233 (approximately 3.7%) responded to the email and started the survey.

Those who identified as cisgender women, aged 18 years and older, who were able to read and complete the electronic survey in English were eligible for inclusion in this analysis. We excluded those who did not complete the survey, were currently pregnant, reported a history of a cystectomy, reported using a catheter, or reported a known neurologic condition or neurogenic lower urinary tract dysfunction. Data on non-responders were not available.

To assess urinary symptoms, we used the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI SF), which is a 4-question validated questionnaire that measures frequency, severity, and impact of urinary leakage within a 4-week recall.¹⁰ The ICIQ-UI SF is scored out of 21 points, with higher scores indicating greater severity of symptoms. Participants were then categorized into the following groups according to their ICIQ-UI SF score: “Slight” symptoms (ICIQ-UI SF 1–5), “Moderate” symptoms (ICIQ-UI SF 6–12), “Severe” symptoms (ICIQ-UI SF 13–18), and “Very Severe” symptoms (ICIQ-UI SF 19–21).¹¹

We also assessed type of incontinence using questions from the Symptoms of Lower Urinary Tract Dysfunction Research Network Symptom Index 10 (LURN SI-10).¹² Urge urinary incontinence (UUI) was defined as a positive response (greater than “Never”) to the question “In the past 7 days, how often did you leak urine or wet a pad after feeling a sudden need to urinate?”. Stress urinary incontinence (SUI) was defined as a positive response (greater than “Never”) to the question “In the past 7 days, how often did you leak urine or wet a pad while laughing, sneezing, coughing, or doing physical activities such as exercising or lifting a heavy object?”. Mixed urinary incontinence (MUI) was defined as those who had both UUI and SUI per the above definitions.

In addition, participants were asked if they ever wore disposable incontinence products including liners, pads, or diapers for urinary leakage, with a dichotomous response. To those who answered positively, the number of pads and the number of diapers used in 24 hours was asked separately, in addition to the total cost in dollars spent on incontinence products per week. For analysis, the total number of incontinence products used daily was calculated by adding pads and diapers. Of the 3,037 women available for inclusion in this study, 1,806 women (59.5%) reported any weekly UI. Of these women, 702 (38.9%) reported ever using incontinence products, including pads, liners, or diapers for their UI and became the analytic sample for this study. Figure 1 details inclusion and exclusion criteria for participants included in final analysis.

Participants were also asked to complete a 10-question screener with dichotomous responses to assess unmet social needs. An unmet social need refers to a specific individual-level social determinant of health that is identified by a person as negatively impacting their health.¹³ The screener was created for a study examining social determinants of health in a primary care setting.¹⁴ The questions assessed needs in several different

domains including housing instability and quality, food insecurity, utilities, transportation to medical appointments, healthcare cost, child or elder care, legal issues, and interpersonal relationships and violence. For analysis, participants were categorized into groups reporting none, one, two, or three or more unmet social needs, as only 158 (5.2%) of all participants included in this analysis reported 4 or more unmet social needs.

In addition, participants self-reported age, race/ethnicity, height, weight, highest level of education, employment status, household income, type of insurance, number of members living in the household, and other general health conditions. In order to determine the poverty rate, the total household income was adjusted to the number of persons reported to be living in the household as recommended by the 2021 U.S. Poverty Guidelines.¹⁵

Descriptive statistics were performed, summarizing data as counts and percentages or means and standard deviations. Non-parametric testing using the Wilcoxon rank sum and Kruskal-Wallis tests were used to compare mean incontinence product usage and cost based on type of incontinence, symptom severity, and other demographics. Pairwise comparisons were carried out using a Bonferroni correction. Multivariable linear regression was used to assess for independent associations of potential predictors and incontinence product usage and cost. Each model included multiple predictors including age, race/ethnicity, UI type, number of unmet social needs, education level, employment, insurance type, socioeconomic status using the poverty threshold, and incontinence severity. All analysis was performed in Stata 17.0 (StataCorp, College Station, TX) with a p-value <0.05 considered significant.

Results:

Table 1 shows baseline characteristics of the 702 women included in the analytic sample. The mean age was 57.3 ± 14.5 years. The majority of the respondents identified as white, non-Hispanic (88.3%), with the remaining nearly 12% of participants distributed among the following races: Asian (0.9%), Black, non-Hispanic (5.1%), Hispanic (1.9%), Multiracial (2.0%), Other (1.1%), and Unspecified (0.6%). Most women included in the study were college educated (80.2%), insured (95.2%), with annual household income per resident above the 2021 U.S. poverty line (97.4%). Over half the participants reported MUI (60.3%), followed by UUI only (16.1%), SUI only (14.5%) and other incontinence (9.1%). Overall, women reported using a mean of 1.8 ± 2.1 incontinence products in 24 hours (median 1, interquartile range [IQR] 1), with a maximum of 32 products daily. The mean weekly cost of incontinence products was $\$5.42 \pm \8.59 (median \$3, IQR \$4), with range from \$0 to \$100.

Type of UI

Women with MUI reported usage of significantly more incontinence products per day (2.2 ± 2.6) as compared to women with UUI (1.6 ± 1.1 , $p < 0.01$) or SUI (1.3 ± 0.8 , $p = 0.05$) only (see Table 1). Women with MUI also reported significantly higher mean weekly costs on incontinence products ($\$6.85 \pm 10.22$) as compared to women with UUI ($\$4.54 \pm 5.86$, $p = 0.03$) and SUI ($\$2.72 \pm 3.24$, $p < 0.01$). Women with UUI only and SUI only reported similar daily use of incontinence products, although this difference in weekly cost observed between women with UUI and SUI was not statistically significant ($p = 0.07$).

Results of the multivariable linear regression analyses for incontinence product usage and cost can be seen in Table 3, displayed as beta coefficients. The results of multivariable regression supported the findings from our univariable analyses for incontinence type. Mixed incontinence was associated with higher product usage as compared to those with UUI only, however this difference did not remain significant ($p=0.06$), and no UI type was not associated with higher cost on linear regression.

Race/Ethnicity

Overall, women of all races and ethnicities reported similar daily pad usage, however, multiracial and Non-Hispanic, Black women reported highest mean daily usage at 2.7 ± 2.7 and 2.4 ± 2.8 incontinence products, respectively. In general, minority women (Black, non-Hispanic, Hispanic, and Multiracial) reported higher weekly cost spent on incontinence products (mean $\$8.39 \pm 11.47$, $\$7.29 \pm 10.21$ and $\$8.21 \pm 12.48$, respectively) compared to non-Hispanic white (mean $\$5.08 \pm 8.08$) and Asian women (mean $\$5.83 \pm 4.67$). Despite these differences observed, there was no statistically significant differences in daily incontinence product usage or weekly cost by race/ethnicity in our univariate analysis.

When looking at race/ethnicity and incontinence product usage and cost in multivariable linear regression, we did observe some important findings. Only identifying as multiracial was associated with increased daily product usage as compared to White, non-Hispanic ($p=0.04$), with no other differences amongst race/ethnicities. However, identifying as Black, non-Hispanic ($p<0.01$) and Hispanic ($p=0.04$) was associated with significantly higher weekly costs as compared to White, non-Hispanic women.

Social Determinants of Health and Socioeconomic Factors

Significant differences in both daily incontinence product usage and weekly cost were observed among women of various socioeconomic backgrounds. Women with less than a college education reported higher daily product usage (mean 2.7 ± 4.1) and higher weekly cost (mean $\$7.99 \pm 13.50$) compared to women with at least a college education ($p<0.01$). Women on disability also reported higher daily product usage and weekly cost, average 2.4 ± 2.0 and $\$8.10 \pm 9.87$, respectively, which was significantly greater than women who were employed full time, part time, or retired ($p<0.01$). Differences remained when looking at highest level of education in our multivariable analysis, with having an advanced degree being associated with less product usage and cost as compared to those with a high school degree or less, but there were no associations observed with employment status.

Higher daily pad usage was also reported among women who were uninsured or insured through Medicaid as compared to those who used private insurance ($p<0.01$). Having dual insurance with Medicaid/Medicare and private was associated with less incontinence product usage ($p=0.04$), and understandably better insurance coverage (i.e. Medicare [$p<0.01$], private [$p=0.03$], a combination [$p=0.01$], or military [$p=0.03$]) was associated with decreased weekly cost as compared to being uninsured. Additionally, women who reported 3 or more unmet social needs had greater daily pad usage and weekly cost as compared to women with no or 1 unmet social needs ($p<0.01$). In multivariable analysis, the

findings were only significant in those with 3 or more needs for product usage ($p=0.03$), and for 2 unmet needs for product cost ($p<0.01$) as compared to those with no needs

Finally, women with annual household incomes below the poverty line had significantly greater daily incontinence product usage and weekly cost ($p<0.01$), although the association with cost was not statistically significant ($p=0.06$) upon multivariate analysis.

Symptom Severity

Table 2 shows data regarding incontinence severity. Information on incontinence severity using ICIQ-UI SF scores was available for 698 women (99.4%), as four women were excluded from this analysis who, despite reporting UI on ICIQ-UI SF, responded “None” to the specific question “How much urine do you leak?”. The majority of women were categorized as having moderate symptoms ($n=402$, 57.6%) followed by slight symptoms ($n=185$, 26.5%). The remainder had severe symptoms ($n=103$, 14.8%), with only a few women having very severe symptoms in this cohort ($n=8$, 1.2%). Daily incontinence product usage and weekly costs increased with higher ICIQ-UI SF scores, with significant increases between each incontinence severity category ($p<0.01$). Women categorized as having very severe symptoms reported a much higher usage and costs with mean of 9.5 ± 11.3 incontinence products per day and $\$33.88 \pm 29.16$ per week compared to the other categories, however, with very few women in this group, limited conclusions should be drawn (Figure 2). In multivariable analysis, things findings persisted, and as expected, each increase in incontinence severity category by ICIQ-UI SF score was associated with an increase in daily product usage and weekly cost as compared to those with “Slight” symptoms, or the lowest scores.

Discussion:

This study demonstrates the wide range of usage and cost of incontinence products, such as pads and diapers, in women who experience UI. Average daily product use ranged from 0 to 32 products and weekly cost ranged from \$0-\$100, suggesting not only a widespread degree of symptoms but also a widespread degree of financial burden among women. Findings in our study are consistent with prior studies when it comes to average cost and number of incontinence products used daily,^{4,16,17} as well as differences in usage and cost at various levels of symptoms severity.⁴ As expected, increased severity of incontinence positively correlated with higher product use and higher product related expenses. The largest increase in pad usage and cost was seen at the highest severity of leakage (Figure 1). The increase in incontinence product usage and cost among women with very severe symptoms was almost triple that of women with severe symptoms, suggesting such women experience a disproportionate financial burden.

This study also confirms prior findings regarding racial differences in product costs, again demonstrating higher cost among non-Hispanic Black women in our multivariate analysis. One study (Subak et al) looked at incontinence related cost by race, also finding an increase of product cost among Black, non-Hispanic women, however this study included costs of all incontinence related supplies (including toilet paper and paper towels) as well as laundering costs⁴, while our study specifically looked at use of pads or diapers. Interestingly, despite

significant differences in cost among minorities, there was no significant differences in number/usage of products, suggesting a financial disparity rather than a symptom disparity. Prior studies have suggested that Black women are willing to pay more for incontinence products,⁴ although availability in community resources, retail desertification and redlining may also play a role in the observed cost disparity as seen with other goods.^{18,19}

In comparison to existing literature, the average weekly cost (\$5.42) and average daily usage of incontinence products (1.8) observed in our study falls within range of prior studies showing average weekly cost \$1–20 and daily usage between 1.5–3 products.^{4,16,17} Our average cost tended to be lower compared to studies that included costs other than pads or diapers in their analysis, such as Subak et al. Additionally, like previous studies, our study demonstrates a similar increase in cost and pad usage with severity of incontinence.^{4,16} Unlike other studies, our study demonstrated a significant difference in usage and cost in women with MUI compared to sole SUI or UUI, where as previous studies have shown increased cost for women with UUI when compared to SUI and MUI alone.⁴ In our study, women with MUI reported higher pad usage which likely contributed to reported higher cost, however upon multivariable analysis neither increase in pad usage or cost remained significant. These results are difficult to understand, and suggest that various social factors and incontinence severity more heavily contribute to differences in incontinence product usage and cost.

This study is the first of its kind to evaluate pad usage and cost among incontinent women in relation to various social determinants of health. Women with lower education levels, lower incomes, and more unmet social needs reported significantly higher pad usage and costs. The same pattern was observed for women with disabilities, on Medicaid, or without insurance. Such findings highlight the additional financial challenge that incontinence may present for women who are already affected by financial hardship. Reasons for differences in pad usage and cost were not assessed in this study, however when looking at disparities that exist in usage and costs of menstrual products, potential reasons for socioeconomic related differences include inadequate access to affordable prices, poor health literacy, insurance limitations, and financial barriers.^{20,21} Studies have already shown the impact of education on health literacy, with increased health literacy improving timely diagnoses and promoting health centered care.^{22,23} The association between lower education levels and increased pad usage observed in this study raises the concern that women of lower socioeconomic status may be experiencing unnecessary or avoidable costs related to incontinence due to lack knowledge of their diagnosis or of the options available for management of UI outside of pads or diapers. Furthermore, women are affected by their insurance coverage which can limit access to the specialist care necessary to provide additional therapies and interventions aimed at decreasing leakage, which in turn may decrease product usage and costs.

Our study has several limitations. It consisted of a rather homogeneous population of white, non-Hispanic women with at least a college education who utilized private insurance, therefore the results are not necessarily generalizable to the United States population. Additionally, by advertising the study for those with “bladder symptoms” the generalizability of our study may be limited by selection bias as participants who are heavily affected by their use and/or spending on incontinence products could be more likely

to complete the survey. Due to the nature of our anonymous, electronic questionnaire, this study is also limited by the inability to provide guidance to participants or confirm or clarify reported responses. Additionally, we relied on patient recall of incontinence symptoms, product usage and monetary expenses, which limits our ability confirm the reported findings. Additionally, our sample only involved a small number of women with the highest severity of UI, limiting conclusions regarding product use and cost for this group. This study did not examine cost differences among various brands, packaging, or quality or absorbency of incontinence products, and therefore we are unable to assess the interplay of retail marketing and financial spending for incontinence women. The study also did not inquire about using items for incontinence other than pads, pantyliners, or diapers, therefore we may not be capturing some women with incontinence who utilize other materials. Lastly, our study does not capture that some findings without statistically significant differences in pad usage and cost, may still be clinically and fiscally significant for women experiencing incontinence.

The strengths of our study include a large sample size, the use of validated assessment tools to measure urinary incontinence severity and type and social determinants of health, and the adjustment for various potential covariates. The increasing linear slope between increased severity of urinary incontinence and product costs demonstrated in this study sheds light on the complex interplay between severity of urinary symptoms and cost of symptomatic management. This study identifies the significant increased financial burden for women with severe urinary leakage as well as the disparities that exist for minority women and women of lower socioeconomic status.

When looking at ways to avoid unnecessary costs related to urinary incontinence, we must also consider the expansion of re-usable products. There has been increased awareness among women regarding the use of reusable menstrual products due to not only cost savings, but also environmental savings²⁴. Studies have shown that reusable incontinence products may be a satisfactory alternative for women^{25,26} and may even be cheaper for women with mild incontinence symptoms²⁷. With the creation of reusable incontinence products, more studies comparing cost and effectiveness between non-reusable and re-usable products among varying severities of UI may produce a shift in product use which may help decrease financial hardship on incontinent women. Additionally, studies investigating the underlying mechanism of economic disparities would be valuable in guiding health policies to improve equity in health care as well as incontinence product access and pricing. Future studies should also investigate the potential monetary prohibitive impact of increased incontinence product pricing.

Conclusions:

In this study, we quantified the mean and range of daily incontinence product usage, in addition to weekly cost. We identified a wide range of product usage and spending among incontinent women. Additionally, we compared these findings across multiple socioeconomic factors and by severity of incontinence. With increasing symptom severity, there is an increase in both number of products used and cost, which imposes a significant financial burden. Women with lower socioeconomic status also encounter higher product

costs despite similar pad usage to women with higher socioeconomic status, suggesting major economic disparities related to insurance status, unmet social needs, education level and poverty. Further investigation is warranted to explore mechanisms contributing to underlying disparities regarding incontinence product access among women to best advocate for public health policy reform.

Funding:

UL1 TR000445 from NCATS/NIH

R01DK128293

R01DK129624

Data availability

The full data that support the findings of this study are available from the corresponding author, (EMS), upon reasonable request. The authors confirm that summarized data supporting the findings of this study are available within the article and tables.

References:

1. Howard C, Rose CL, Trouton K, et al. FLOW (finding lasting options for women): multicentre randomized controlled trial comparing tampons with menstrual cups. *Can Fam Physician* 2011;57(6):e208–e215. [PubMed: 21673197]
2. Milsom I, Gyhagen M. The prevalence of urinary incontinence. *Climacteric* 2019;22(3):217–222. [PubMed: 30572737]
3. Melville JL, Katon W, Delaney K, Newton K. Urinary incontinence in US women: a population-based study. *Arch Intern Med* 2005;165(5):537–542. [PubMed: 15767530]
4. Subak LL, Brown JS, Kraus SR, et al. The “costs” of urinary incontinence for women. *Obstet Gynecol* 2006;107(4):908–916. [PubMed: 16582131]
5. Pizzol D, Demurtas J, Celotto S, et al. Urinary incontinence and quality of life: a systematic review and meta-analysis. *Aging Clin Exp Res* 2021;33(1):25–35. [PubMed: 32964401]
6. Mallah F, Montazeri A, Ghanbari Z, Tavoli A, Haghollahi F, Azimineko E. Effect of urinary incontinence on quality of life among Iranian women. *J Family Reprod Health* 2014;8(1):13–19. [PubMed: 24971128]
7. Harris PA, Scott KW, Lebo L, Hassan N, Lightner C, Pulley J. ResearchMatch: a national registry to recruit volunteers for clinical research. *Acad Med* 2012;87(1):66–73. [PubMed: 22104055]
8. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;42(2):377–381. [PubMed: 18929686]
9. Harris PA, Taylor R, Minor BL, et al. The REDCap consortium: Building an international community of software platform partners. *J Biomed Inform* 2019;95:103208. [PubMed: 31078660]
10. Avery K, Donovan J, Peters TJ, Shaw C, Gotoh M, Abrams P. ICIQ: A brief and robust measure for evaluating the symptoms and impact of urinary incontinence. *Neurourology and Urodynamics* 2004;23(4):322–330. doi:10.1002/nau.20041 [PubMed: 15227649]
11. Klovning A, Avery K, Sandvik H, Hunskaar S. Comparison of two questionnaires for assessing the severity of urinary incontinence: The ICIQ-UI SF versus the incontinence severity index. *Neurourol Urodyn* 2009;28(5):411–415. [PubMed: 19214996]
12. Cella D, Smith AR, Griffith JW, et al. A new brief clinical assessment of lower urinary tract symptoms for women and men: LURN SI-10. *J Urol* 2020;203(1):164–170. [PubMed: 31364922]
13. Alderwick H, Gottlieb LM. Meanings and misunderstandings: a social determinants of health lexicon for health care systems. *The Milbank Quarterly* 2019;97(2):407. [PubMed: 31069864]

14. Heller CG, Rehm CD, Parsons AH, Chambers EC, Hollingsworth NH, Fiori KP. The association between social needs and chronic conditions in a large, urban primary care population. *Prev Med* 2021;153:106752. [PubMed: 34348133]
15. US Department of Health and Human Services. The poverty guidelines updated periodically in the Federal Register Washington, DC: US Department of Health and Human Services. 2015;42.
16. McClish DK, Wyman JF, Sale PG, Camp J, Earle B. Use and costs of incontinence pads in female study volunteers. *Journal of WOCN* 1999;26(4):207–213. [PubMed: 10476176]
17. Ward-Smith P. The cost of urinary incontinence. *Urol Nurs* 2009;29(3):188–190, 194. [PubMed: 19579413]
18. Kwate NOA, Loh JM, White K, Saldana N. Retail Redlining in New York City: Racialized Access to Day-to-Day Retail Resources. *J Urban Health* 2013;90(4):632–652. [PubMed: 22777683]
19. Myers CK, Close G, Fox L, Meyer JW, Niemi M. Retail redlining: Are gasoline prices higher in poor and minority neighborhoods? *Econ Inq* 2011;49(3):795–809.
20. Rossouw L, Ross H. Understanding Period Poverty: Socio-Economic Inequalities in Menstrual Hygiene Management in Eight Low- and Middle-Income Countries. *Int J Environ Res Public Health* 2021;18(5). doi:10.3390/ijerph18052571
21. Tull K. Period poverty impact on the economic empowerment of women Published online January 23, 2019. Accessed April 12, 2022. <https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/14348>
22. Bayati T, Dehghan A, Bonyadi F, Bazrafkan L. Investigating the effect of education on health literacy and its relation to health-promoting behaviors in health center. *J Educ Health Promot* 2018;7:127. [PubMed: 30505855]
23. Saranjit S, Lennard L, Others. Health Literacy: Being Able to Make the Most of Health National Consumer Council; 2004.
24. van Eijk AM, Jayasinghe N, Zulaika G, et al. Exploring menstrual products: A systematic review and meta-analysis of reusable menstrual pads for public health internationally. *PLOS ONE* 2021;16(9):e0257610. [PubMed: 34559839]
25. Macaulay M, Clarke-O'Neill S, Fader M, Pettersson L, Cottenden A. A pilot study to evaluate reusable absorbent body-worn products for adults with moderate/heavy urinary incontinence. *J Wound Ostomy Continence Nurs* 2004;31(6):357–366. [PubMed: 15867711]
26. Gallo M, Staskin DR. Patient satisfaction with a reusable undergarment for urinary incontinence. *J Wound Ostomy Continence Nurs* 1997;24(4):226–236. [PubMed: 9274280]
27. Alam PA, Huang JC, Clark BA, Burkett LS, Richter LA. A Cost Analysis of Icon Reusable Underwear Versus Disposable Pads for Mild to Moderate Urinary Incontinence. *Female Pelvic Med Reconstr Surg* 2020;26(9):575–579. [PubMed: 30001254]

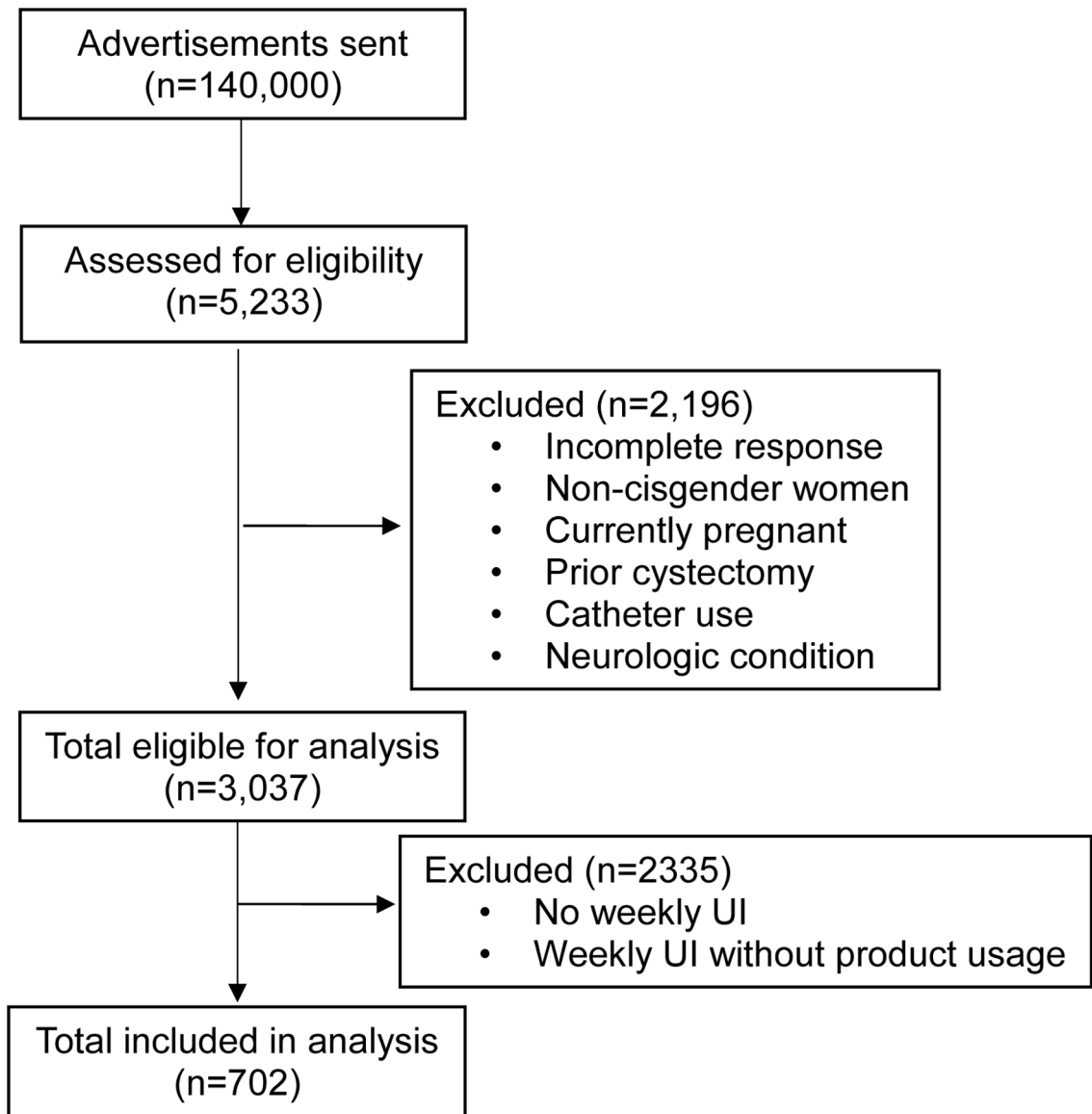


Figure 1.
Study inclusion flow chart

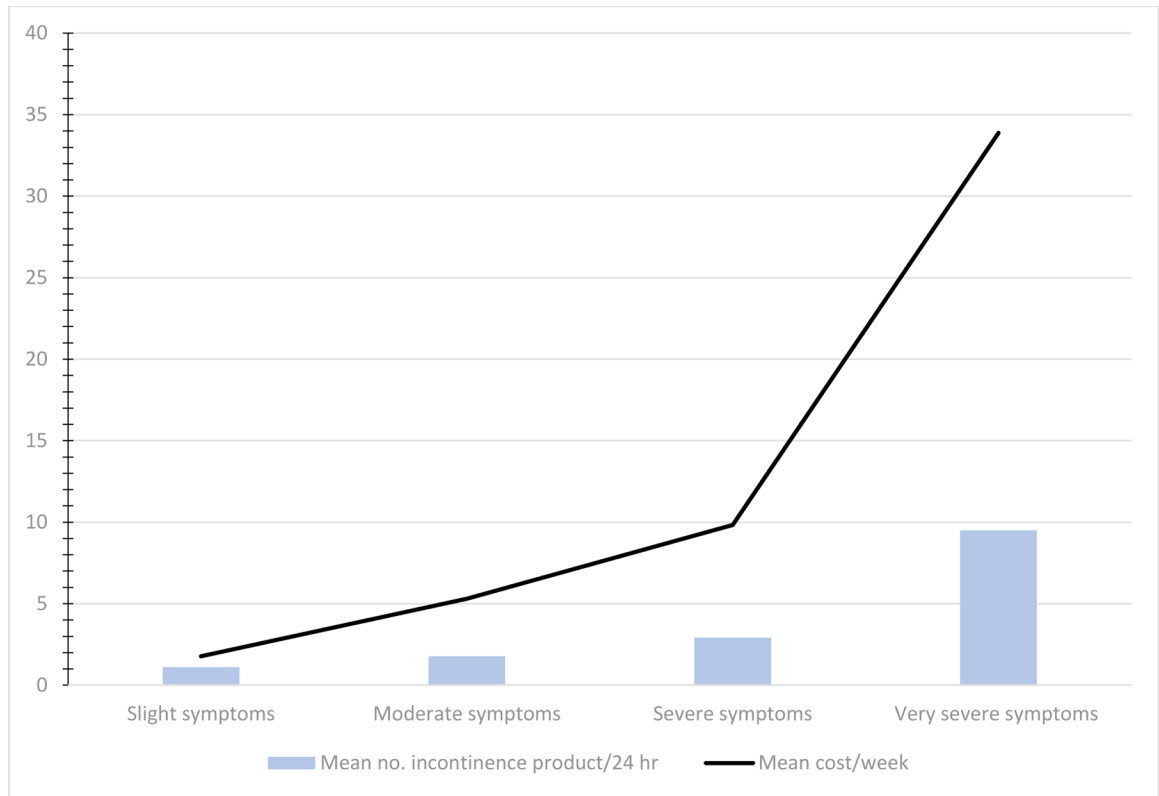


Figure 2.
Correlation of incontinence product usage and cost increase by symptom severity

Table 1.

Comparison of average incontinence product usage and cost by patient demographics

	N (%)	Mean incontinence product/24 hrs (SD)	p Value	Mean cost/week (SD)	p Value
N	702	1.9 (2.1)		\$5.42 (8.59)	
Race/ethnicity			0.7		0.5
White, non-Hispanic	618 (88.3)	1.8 (2.1)		\$5.08 (8.08)	
Black, non-Hispanic	36 (5.1)	2.7 (2.7)		\$8.39 (11.47)	
All Hispanic	14 (2.0)	1.4 (0.9)		\$7.29 (10.21)	
Asian	6 (0.9)	2.0 (1.6)		\$5.83 (4.67)	
Multiracial	14 (2.0)	2.7 (2.7)		\$8.21 (12.48)	
Other	8 (1.1)	1.8 (0.9)		\$4.88 (5.28)	
Unspecified	4 (0.6)	1.3 (0.5)		\$15.25 (26.54)	
Living community			0.3		0.06
Rural area	92 (13.1)	2.3 (2.8)		\$6.91 (8.86)	
Small town/city	205 (29.2)	1.8 (1.9)		\$5.70 (11.03)	
Suburban	273 (38.9)	1.7 (1.4)		\$4.75 (6.27)	
Urban/large city	132 (18.8)	2.1 (3.0)		\$5.36 (8.19)	
Education level			0.007		<0.001
High school graduate	139 (19.8)	2.7 (4.1)		\$7.99 (13.50)	
Associate's or Bachelor's degree	308 (43.9)	1.7 (1.2)		\$5.66 (7.95)	
Graduate or professional degree	255 (36.3)	1.6 (1.1)		\$3.74 (4.72)	
Employment status			<0.001		0.03
Working full time	239 (34.1)	1.6 (1.3)		\$4.75 (6.75)	
Working part time	81 (11.5)	1.8 (2.6)		\$4.83 (8.02)	
Unemployed	35 (5.0)	1.9 (1.6)		\$5.76 (6.37)	
Retired	230 (32.8)	1.8 (1.9)		\$4.85 (8.80)	
Disability	81 (11.5)	2.4 (2.0)		\$8.10 (9.87)	
Other	36 (5.1)	2.7 (5.2)		\$8.58 (14.85)	
Health insurance			<0.001		0.02
Uninsured	34 (4.8)	2.5 (2.5)		\$8.00 (8.81)	
Medicaid	57 (8.1)	3.2 (5.1)		\$9.74 (15.47)	
Medicare	127 (18.1)	1.8 (1.4)		\$4.77 (5.39)	
Private	292 (41.6)	1.5 (1.1)		\$4.53 (6.16)	
Medicaid/Medicare + Private	103 (14.7)	1.5 (0.9)		\$3.83 (4.53)	
Military	15 (2.1)	2.2 (1.7)		\$4.80 (4.11)	
Other	74 (10.5)	2.3 (2.9)		\$7.90 (15.10)	
Number of unmet social needs			<0.001		<0.001
0	435 (62.0)	1.6 (1.4)		\$4.26 (6.92)	
1	124 (17.7)	1.8 (1.7)		\$5.77 (7.92)	
2	56 (8.0)	2.3 (3.3)		\$7.88 (13.31)	

	N (%)	Mean incontinence product/24 hrs (SD)	p Value	Mean cost/week (SD)	p Value
3+	87 (12.4)	2.9 (3.8)		\$9.25 (11.56)	
Poverty			<0.001		0.008
Below Poverty Line	25 (2.6)	5.6 (7.7)		\$14.36 (17.17)	
Above Poverty Line	677 (96.4)	1.7 (1.5)		\$5.09 (\$7.94)	
Type of incontinence			<0.001		<0.001
UUI only	113 (16.1)	1.6 (1.1)		\$4.54 (5.86)	
SUI only	102 (14.5)	1.3 (0.8)		\$2.72 (3.24)	
MUI	423 (60.3)	2.2 (2.6)		\$6.85 (10.22)	
Undefined	64 (9.1)	1.1 (0.8)		\$1.92 (2.64)	

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 2.

Comparison of average incontinence product usage and cost by symptoms severity

	Slight symptoms (ICIQ UI SF 1–5)	Moderate symptoms (ICIQ UI SF 6–12)	Severe symptoms (ICIQ UI SF 13–18)	Very severe symptoms (ICIQ UI SF 19–21)	P value
	N=185	N=402	N=103	N=8	
Mean no. incontinence product/24 hr (SD)	1.1 (0.6)	1.8 (1.7)	2.9 (1.9)	9.5 (11.3)	<0.001
Mean cost/week (SD)	\$1.77 (2.19)	\$5.31 (7.53)	\$9.83 (9.99)	\$33.88 (29.16)	<0.001

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 3:

Predictors of incontinence product usage and cost on multivariable linear regression. Correlations displayed as beta coefficients with 95% confidence intervals.

Predictor	Daily incontinence product usage			Weekly incontinence product cost		
	Beta coeff.	95% CI	p-Value	Beta coeff.	95% CI	p-Value
Age (per 1-year increase)	0.02	0.002 – 0.03	0.02	0.09	0.03 – 0.14	<0.01
Race/ethnicity						
White, non-Hispanic	Ref			Ref		
Black, non-Hispanic	0.39	-0.23 – 1.01	0.2	3.51	0.95 – 6.07	<0.01
All Hispanic	0.03	-0.94 – 0.99	0.9	4.06	0.07 – 8.05	0.04
Asian	-0.25	-1.71 – 1.20	0.7	-1.22	-7.24 – 4.80	0.7
Multiracial	1.00	0.04 – 1.96	0.04	3.04	-0.93 – 7.01	0.1
Other	-0.54	-1.79 – 0.71	0.4	-2.13	-7.31 – 3.06	0.4
Unspecified	-0.48	-2.24 – 1.28	0.6	10.27	2.99 – 17.55	<0.01
Living community						
Rural area	Ref			Ref		
Small town/city	-0.35	-0.80 – 0.09	0.1	-0.85	-2.69 – 0.99	0.4
Suburban	-0.32	-0.75 – 0.11	0.1	-1.43	-3.20 – 0.34	0.1
Urban/large city	-0.35	-0.83 – 0.13	0.2	-2.43	-4.42 – -0.44	0.02
Education level						
High school graduate	Ref			Ref		
Associate's or Bachelor's degree	-0.67	-1.04 – -0.30	<0.01	-1.10	-2.63 – 0.42	0.2
Graduate or professional degree	-0.49	-0.87 – -0.10	0.02	-1.86	-3.47 – -0.26	0.02
Employment status						
Working full time	Ref			Ref		
Working part time	-0.05	-0.52 – 0.41	0.8	-0.40	-2.33 – 1.53	0.7
Unemployed	-0.57	-1.25 – 0.11	0.1	-1.85	-4.67 – 0.97	0.2
Retired	-0.04	-0.51 – 0.43	0.9	-0.64	-2.58 – 1.30	0.5
Disability	-0.21	-0.74 – 0.32	0.4	-0.14	-2.34 – 2.06	0.9
Other	0.47	-0.19 – 1.14	0.2	2.27	-0.47 – 5.00	0.1
Health insurance						
Uninsured	Ref			Ref		
Medicaid	-0.05	-0.83 – 0.73	0.9	-0.75	-3.98 – 2.48	0.7
Medicare	-0.77	-1.53 – -0.002	0.05	-4.40	-7.56 – -1.23	<0.01
Private	-0.66	-1.32 – -0.01	0.05	-3.06	-5.81 – -0.31	0.03
Medicaid/Medicare + Private	-0.83	-1.62 – -0.04	0.04	-4.32	-7.59 – -1.05	0.01
Military	-0.42	-1.52 – 0.68	0.5	-5.17	-9.73 – -0.61	0.03
Other	-0.56	-1.35 – 0.24	0.2	-2.76	-6.04 – 0.52	0.1
Unmet social needs						
0	Ref			Ref		
1	0.25	-0.11 – 0.62	0.2	1.44	-0.06 – 2.94	0.06
2	0.42	-0.09 – 0.93	0.1	2.08	0.95 – 5.21	<0.01

		<i>Daily incontinence product usage</i>			<i>Weekly incontinence product cost</i>		
	3+	0.54	0.05 – 1.03	0.03	1.92	–0.09–3.94	0.06
Below poverty line		2.69	1.89 – 3.50	<0.01	3.23	–0.10 – 6.55	0.06
Type of incontinence							
	UI only	Ref			Ref		
	SUI only	0.23	–0.26 – 0.73	0.4	–0.23	–2.26 – 1.81	0.8
	MUI	0.37	–0.01 – 0.75	0.06	0.67	–0.90 – 2.24	0.4
	Undefined	0.02	–0.55 – 0.60	0.9	–0.51	–2.89 – 1.87	0.7
Incontinence severity by ICIQ UI SF							
	Slight	Ref			Ref		
	Moderate	0.40	0.05 – 0.75	0.03	2.73	1.29 – 4.17	<0.01
	Severe	1.26	0.77 – 1.74	<0.01	6.71	4.71 – 8.71	<0.01
	Very severe	7.86	6.57 – 9.15	<0.01	30.83	25.50 – 36.15	<0.01

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript