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Diaper Need is Associated with Pediatric Care Utilization: An Analysis of a Nationally Representative Sample of Parents of Young Children

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Abstract

Objective: To examine the possible association between diaper need, difficulty affording an adequate amount of diapers, and pediatric care visits for urinary tract infections (UTIs) and diaper dermatitis (DD).

Study design: This cross-sectional analysis using nationally representative survey data collected July-August 2017 using a web-based panel, examined 981 parents of children between 0-3 years old in the United States (response rate, 94%). Survey weighting for differential probabilities of selection and nonresponse was used to estimate the prevalence of diaper need and to perform multivariable logistic regression of the association between parent reported diaper need and visits to the pediatrician for diaper rash or urinary tract infections within the past 12-months.

Results: An estimated 36% of parents endorsed diaper need. Both diaper need (adjusted odds ratio [aOR] 2.37; 95% CI 1.69–3.31) and visiting organizations to receive diapers (aOR 2.14; 95% CI 1.43–3.21) were associated with DD visits. Similar associations were found for diaper need (aOR 2.63; 95% CI 1.54–4.49) and visiting organizations to receive diapers (aOR 4.50; 95% CI 2.63–7.70) for UTI visits.

Conclusions: Diaper need is common and associated with increased pediatric care visits. These findings suggest pediatric provider and policy interventions decreasing diaper need could improve child health and reduce associated health care utilization.

Keywords

Social determinants of health; Poverty; Diaper bank; Policy; Health care utilization; Child Health

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Introduction

One child is estimated to use between 4600 and 4800 disposable diapers during the first three years of life,¹ costing families between \$945 and \$1,500 annually.² Although diapers are a basic need of infants and vital for good health, research estimates that 1 out of 3 families experience diaper need.^{3,4} Diaper need is the gap between the number of diapers required for infants to stay clean and the number of diapers a family can afford without cutting back on other basic needs.⁵ Diapering an infant is a primary parental activity, but for low-income families, diapering imposes a significant financial burden. The U.S. Bureau of Labor Statistics reported the poorest 20% of families spent almost 14% of their 2014 household income on diapers.⁶ Government assistance programs such as Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) or Supplemental Nutrition Assistance Program (SNAP), cannot be used to purchase diapers. In 2013, the first peer-reviewed published study quantifying diaper need among low-income women in an urban area found that 28% of women reported diaper need and of those women, 27% reported putting off changing a child's diapers when their supply was running short, or "stretching" diapers.³ Since this paper was published, additional research has supported the negative impact of diaper need on a family's economic success and maternal mental health,⁷ yet no research has directly linked diaper need with child health outcomes.

Two child health outcomes associated with the frequency of diaper changes and thus diaper need, are urinary tract infections (UTIs) and diaper dermatitis (DD).⁸⁻¹¹ DD is a general term used to describe various inflammatory reactions of the skin within the diaper region and is often related to irritant contact on the skin, such as moisture from urine and feces and friction from diapers themselves, or infection, including candidal dermatitis.¹²⁻¹⁴ DD is a common reason for visits to the pediatrician¹⁵, and cases can vary in severity from mild to severe; however, most cases rarely cause long-term health problems for the infant but cause appreciable distress for both the infant and caregiver with prevalence rate estimates between 8-12% at any given time.^{16,17} The American Academy of Dermatology recommends changing an infant's diaper every 1 to 3 hours during the day, or as soon as the diaper is soiled, and at least once per night to prevent DD.¹⁸

UTI is one of the most common serious bacterial infections with prevalence rate estimates between ~5.0% and 7.0% in infants 2-years old or younger.¹⁹⁻²² However, UTIs are challenging to detect in very young children;²³ therefore, prevalence may be underestimated.²⁴ There is an association between untreated UTI in early childhood and serious short- and long-term health complications, including renal scarring²⁵⁻²⁸ (even in infants with normal urinary tracts),²⁹ hypertension,³⁰ preeclampsia,³¹ and renal failure.³²

Not only do UTIs and DD have multiple predictors of risk (Figure 1 illustrates these risk factors),^{8-11,14,22-23,33-44} but they also share a risk factor that is shaped by conditions of poverty—diaper need. Diaper need impacts the frequency of diaper changing such that families endorsing diaper need may be less likely to change their children as frequently as they desire. A significant association between frequency of diaper change and DD is well documented in the literature,^{8,9} and more recent research has elucidated an inverse relationship between the frequency of diaper changes and risk of UTI in infants.^{10,11}

To further explore the relationship between diaper need and child health outcomes, this study uses nationally representative data to examine whether diaper need was associated with pediatric health care visits for DD and UTI.

Methods

Participants and Study Design

This study is a secondary data analysis of a nationally representative cross-sectional survey of parents commissioned by Kimberly-Clark. Survey Sampling International, a top global digital data collection company, was contracted to recruit a representative random sample of the general parent population by age, gender, and income (n=1000) from their large web-based respondent panels; the margin of error for this sample was $\pm 3\%$ at the 95% confidence level. A study invitation was issued to randomly selected members of the web-based panel. Participants were included if they were 18 years old or older, had children between 0-3 years old, were the primary or shared caregiver in the household, and were involved in changing the diaper of children between 0-3 years old. Edelman Intelligence, a full-service consumer research firm, conducted cross-sectional online surveys (approximately 15 minutes to complete) from July to August 2017. The response rate was 94% (1064 initial, 64 drop out, 1000 complete surveys). Nineteen participants were excluded because they were not parents of a child, leaving a final analytic sample of 981. All research procedures were conducted in accordance with MRA Marketing Research Standards and the CASRO Code of Standards and Ethics. Secondary data analytic procedures were approved by the Yale University Institutional Review Board.

Measures

Covariates

Sociodemographics: Demographic characteristics including sex, race (self-identified by participants), relationship status, caregiving responsibility, socioeconomic status indices, geographic location, participation in SNAP, Temporary Assistance for Needy Families (TANF), and WIC were collected.

Diaper Need: Participants were considered to have diaper need if they responded positively to one of the following statements: (1) I currently do not have enough diapers to keep the child(ren) in my household clean, dry and healthy; (2) I find it difficult to afford buying diapers for the child(ren) in my household; and (3) I frequently find myself running out of diapers for the child(ren) in my household.

Diaper receipt: Participants were asked if they visited a variety of locations to obtain diapers. Locations included food banks, churches, synagogues and other places of worship, early childhood education programs (e.g., Head Start), hospitals or health clinics, homeless shelters, or other community based organizations and non-profit organizations. Those who visited at least one of these locations were classified as “visited organization to get diapers.”

Outcome Variables

Diaper Dermatitis and Urinary Tract Infections: The two outcome measures were pediatric care visits for diaper dermatitis and urinary tract infections (UTIs). Parents reported the number of times in the past year they took their child to see a health care professional for diaper rash from zero to more than five times. Participants could also answer not applicable. The same question was asked for urinary tract infections. Responses were dichotomized to zero and one or more times for analysis.

Statistical Analysis

All analyses were weighted for differential probabilities of selection and nonresponse to produce nationally representative estimates. To test for the association between sociodemographic and diaper variables and diaper rash or UTI, chi-square and t tests were used. Multivariate logistic regression models including significant covariates from bivariate analyses ($P < .05$) were used to examine the association between variables and use of pediatric care for diaper rash and UTI. To ensure that we did not exclude relevant covariates in our multivariate logistic regression models, we did exploratory analysis with a more liberal P value ($P < .1$) in bivariate analyses. Collinearity statistics were acceptable (variance inflation factor < 10). Analyses were performed by using R 3.4.4 and Stata 13.0 (Stata Corp, College Station, Texas). All tests were set to P value $< .05$.

Results

Demographic and clinical characteristics

Overall, 55.9% of parents self-designated as female. The majority of participants were Caucasian (72.9% [n = 754]), but African Americans (11.3% [n = 87]), Asian (5.8% [n = 57]), and Native American (2.1% [n = 18]) populations were represented. Nationally, 35.9% (n = 362) of respondents reported diaper need, 32.1% (n = 292) of parents brought their child to a healthcare provider for diaper rash and 11.7% (n = 109) of parents brought their child to a healthcare provider for a UTI. Demographics are summarized in Table 1.

Associations with diaper need and utilization for child diaper rash and UTIs

Bivariate associations demonstrated that parents who endorsed diaper need or visited an organization to receive diapers had higher proportions of care visits for both DD and UTI (all $P < .001$). Partnered parents (married or in a civil union/domestic partnership) had higher rates of bringing their child to care for DD compared to non-partnered parents ($P = .007$). Fathers ($P < .001$) and employed parents ($P = .001$) had higher rates of UTI care visits compared to women and unemployed, respectively. Parents who were TANF, SNAP, or WIC recipients had more care visits for both DD and UTI (both $P < .001$). Geographic location differed such that people living in urban areas had the highest rates of care visits ($P = .02$, $P = .003$, respectively). Similarly, DD and UTI groups differed based on the type of diapers participants used (disposable only, cloth only, mix of disposable and cloth, other). Parents using only cloth diapers had higher rates of visits for diaper dermatitis ($P = .006$), while those using only cloth diapers or a mix of disposable and cloth diapers had more visits for UTI ($P = .001$).

Multivariate logistic regression results are presented in Table 2 and Table 3. Both diaper need (Odds ratio [OR], 2.37, 95% CI, 1.69-3.31, $P < .001$) and visiting organizations to get diapers (OR, 2.14; 95% CI, 1.43-3.21, $P < .001$) were strongly associated with higher odds of DD visits. Participants who completed some college/associate's/technical school and bachelor's degree were less likely to bring their child in for DD (OR, 0.31; 95% CI, 0.12-0.78, $P = .01$ and OR, 0.36; 95% CI, 0.14-0.92, $P = .03$, respectively). Parents' caregiving responsibility and diaper type were not associated with DD visits.

Fathers were more likely to bring their child to care for a UTI (OR, 0.31; 95% CI, 0.12-0.80, $P = .002$). Similar to diaper need care visit results, diaper need (OR, 2.63; 95% CI, 1.54-4.49, $P < .001$) and visiting an organization to get diapers (OR, 4.50; 95% CI, 2.63-7.70, $P < .001$), were the most important factors associated with UTI care visits. Parents using only cloth diapers were more likely to make UTI care visits (OR, 2.57; 95% CI, 1.07-6.20, $P = .04$). Parents sharing caregiving responsibility were less likely to bring their child in for UTI (OR, 0.52; 95% CI, 0.30-0.91, $P = .02$). Employment status and geographical location were not associated UTI visits.

Exploratory analysis

Using a P value $< .1$ in bivariate analysis, fathers and younger parents were more likely to bring their child to the pediatrician for DD, while no additional covariates were significant for UTI visits compared to P value $< .05$. However, when the multivariate model with age and gender was compared to the more parsimonious model (i.e., not including age or gender) using the Akaike information criterion (AIC), we found the parsimonious model was more appropriate (lower AIC). Therefore, we elected to keep the original model using P value $< .05$ for DD.

Discussion

To our knowledge this is the first nationally representative study of diaper need and its association with pediatric care utilization for DD and UTIs. Although DD and UTIs are among the most common reasons parents seek pediatric care, few studies have examined the role of social factors in their etiology. In this paper, we found that lack of access to diapers, reflected by diaper need and receiving diapers from community organizations, was associated with more visits to a health care provider for both DD and UTIs. A prior non-peer reviewed report of recipients of diapers from diaper banks in Connecticut⁴⁵ found a lower parent reported incidence of DD, UTI, and associated medical visits. This study adds to the literature by demonstrating similar findings in a nationally representative sample. Further, the current study found this association held when considering potential contributing and confounding factors.

We found that nearly 36% of parents nationwide cannot afford to properly diaper their children. These findings align with two prior studies based in the United States and Canada where a third of mothers reported diaper need.^{3, 4} Given the high number of patient presentations for DD and UTI, pediatric health care providers should screen for diaper need in addition to providing treatment and education. Screening for social determinants of health has been recommended as part of the Bright Futures Guidelines for pediatric

well care visits⁴⁶ and should include specific questions on diaper need as part of pediatric social determinants of health. However, we acknowledge that screening without access to resources or referrals can cause unintentional harm,⁴⁷ and the value of screening depends largely on accompanied access to free or very low-cost diapers for families with need. Clinical interventions can support an individual family in meeting this basic need and should accompany larger public health strategies to address diaper need as a social determinant of health.⁴⁸

Our findings suggest improving access to diapers is one way to decrease the health care utilization for these ailments. Without diapers or emollients, caregivers may be unable to carry out recommended treatment regimens. Unfortunately, many parents are unaware of diaper banks and community organizations which provide free diapers and child hygiene products⁴ and these organizations remain underfunded. Asking parents if they visit organizations to obtain diapers may help increase clinician knowledge of community resources. These efforts align with the American Academy of Pediatrics recent recommendation to connect families with community resources to help with basic needs.⁴⁹

Diapers are a basic need of infants and young children, yet government assistance programs for low-income families, namely SNAP and WIC, do not allow for the purchasing of diapers. Given the negative impact of diaper need on child health, we recommend that these programs expand their rosters of allowable expense items to include diapers and legislation similar to the 2015 “Hygiene Assistance for Families of Infants and Toddlers Act” be revisited.⁵⁰ Despite the Bill not passing the Subcommittee on Human Resources, some states are making incremental progress toward reducing diaper need by providing diapers to families, removing sales tax, and requiring Early Head Start programs to provide diapers to children.⁵¹ A recent study found that only a small proportion of low-income families access diapers through community diaper banks and highlights the need for policies at a municipal, state and federal level to address diaper need in low-income families.⁵² Additionally, the impact of these policies on child outcomes should be further evaluated.

Although not explored in this study, the effects of diaper need on psychological and economic outcomes of families is worth additional study. Diaper need has been associated with maternal depressive symptoms³ and DD is associated with parental anxiety.⁴⁸ Missing work to bring children to appointments, enforced absence from childcare because of lack of a sufficient supply of diapers, and healthcare expenses, are all possible ways DD and UTIs negatively affect the economic security of families. Economic insecurity in turn, is associated with poor parental mental health.^{53, 54} While the use of cloth diapers may defray costs for families who have access to free laundry, a previous study found that exclusive use increases the risk of diaper rash.⁵⁵ We did not find an association between diaper type and diaper rash, but exclusive use of cloth diapers was associated with visits for UTI. This finding should be explored in future studies.

Limitations

This study has several limitations. Parents reported visits for their child, and thus reports may be subject to different types of reporting bias or general confounding by parental characteristics, such as knowledge and perceptions about DD and UTI, and it is unclear if

DD or UTI was diagnosed during pediatric appointments. Thus, incorporating administrative data from the health record would be beneficial. Also, because this is a cross-sectional study, causal associations cannot be determined. Although the study sample was nationally-representative, because participants were recruited from the web-based panel participants, the results may not generalize to people with limited internet access. The diaper need questionnaire is not validated but was developed with expert input and pilot testing and has been used in multiple studies. Despite these limitations, our study reinforces the importance of a sufficient supply of diapers for child health.

Conclusion

In a nationally representative study, we find that lack of a sufficient supply of diapers increases pediatric care utilization for UTIs and DD. Longitudinal studies, ideally with administrative data, are needed to further assess this relationship.⁵⁶ Individual, community, and policy interventions are needed to acknowledge, and better address diaper need as a social determinant of health.

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Abbreviations:

| | |
|-------------|---|
| aOR | adjusted odds ratio |
| CI | confidence interval |
| DD | Diaper dermatitis |
| OR | odds ratio |
| SNAP | Supplemental Nutrition Assistance Program |
| TANF | Temporary Assistance for Needy Families |
| UTI | urinary tract infection |
| WIC | Special Supplemental Nutrition Program for Women, Infants, and Children |

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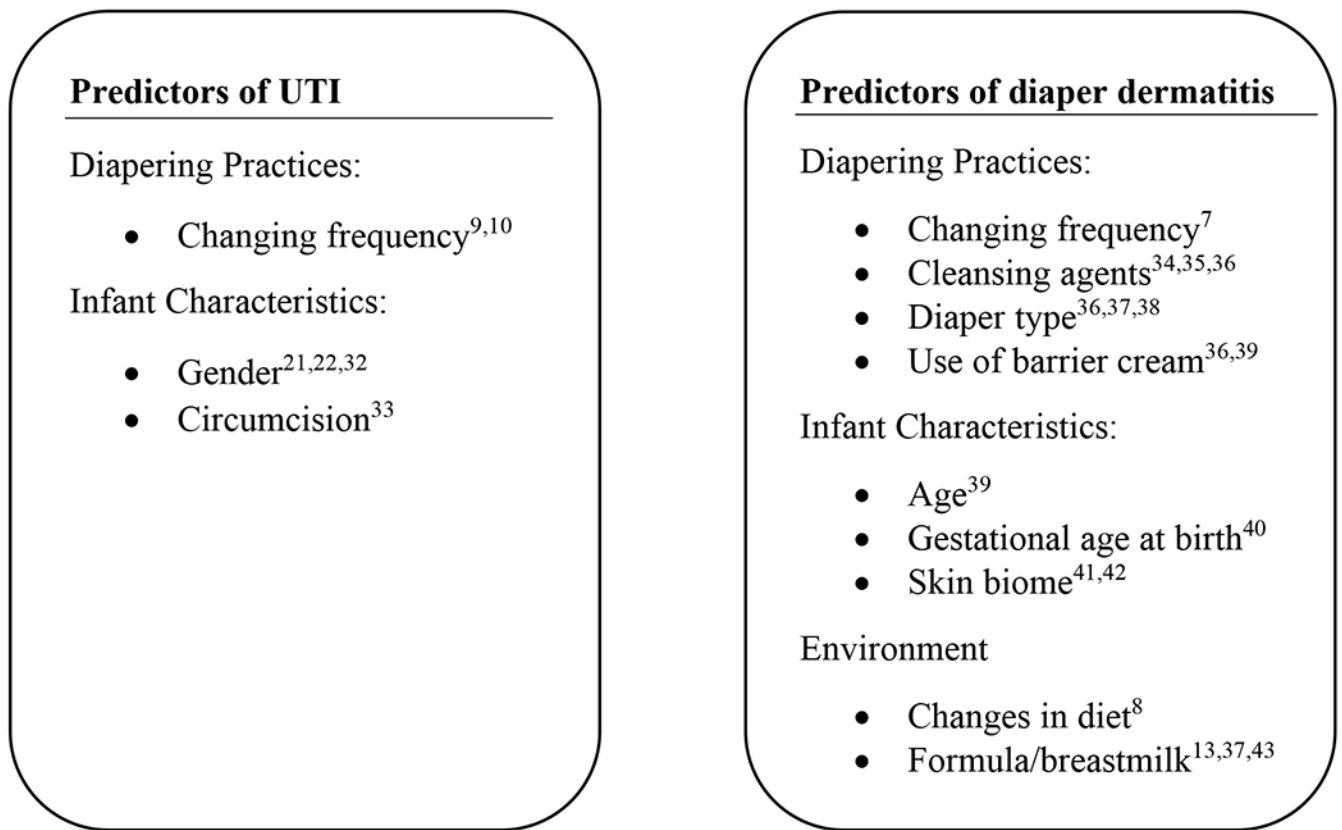


Figure 1.
Predictors of Urinary Tract Infection and Diaper Dermatitis in Children

Table 1.

Demographic Characteristics of Caregivers of Young Children from a 2017 Nationally Representative Web-based Panel Survey

| Characteristics | Total N ^a (%) ^b | Visited clinician for Diaper rash n ^a (%) ^b | P Value | Visited clinician for UTI n ^a (%) ^b | P Value |
|---|--|---|---------|---|---------|
| All | 981 (100) | 292 (100) | | 109 (100) | |
| Gender | | | .09 | | <.001 |
| Female | 578 (55.9) | 160 (51.9) | | 43 (36.9) | |
| Male | 403 (44.1) | 132 (48.1) | | 66 (63.1) | |
| Age, mean (SE), y | 32.28 (0.22) | 31.69 (0.41) | .09 | 31.7 (0.67) | .37 |
| Race | | | .30 | | .77 |
| White or Caucasian | 754 (72.9) | 216 (70.3) | | 87 (76.0) | |
| Black or African American | 87 (11.3) | 31 (13.4) | | 11 (12.4) | |
| Asian or Pacific Islander | 57 (5.8) | 20 (6.1) | | 6 (5.5) | |
| Native American or Alaskan Native | 18 (2.1) | 7 (2.9) | | 1 (2.2) | |
| Mixed racial background | 35 (4.4) | 7 (2.8) | | 2 (1.9) | |
| Other | 30 (3.4) | 11 (4.5) | | 2 (2.0) | |
| Education level | | | .07 | | .06 |
| High school graduate or less | 188 (22.9) | 51 (22.9) | | 18 (19.6) | |
| Some college/ Associate's degree/technical school | 328 (30.2) | 92 (30.2) | | 25 (20.9) | |
| Bachelor's degree | 292 (25.6) | 77 (25.6) | | 36 (35.0) | |
| Master's degree/ Post-graduate or professional degree | 173 (21.3) | 56 (21.3) | | 26 (24.5) | |
| Employment status | | | .22 | | .001 |
| Employed | 673 (70.5) | 210 (73.4) | | 89 (83.4) | |
| Unemployed | 308 (29.5) | 82 (26.6) | | 20 (16.6) | |
| Household income, \$ | | | .41 | | .34 |
| < \$25,000 | 155 (17.6) | 54 (20.4) | | 14 (14.6) | |
| \$25,000 to \$34,999 | 95 (8.8) | 30 (9.4) | | 5 (4.4) | |
| \$35,000 to \$49,999 | 141 (13.5) | 46 (14.5) | | 14 (12.1) | |
| \$50,000 to \$74,999 | 207 (17.8) | 51 (14.6) | | 26 (19.1) | |
| \$75,000 to \$99,999 | 145 (14.0) | 49 (15.3) | | 24 (20.7) | |
| \$100,000 to \$149,999 | 154 (15.8) | 37 (13.1) | | 18 (17.9) | |
| \$150,000 or more | 77 (12.4) | 22 (12.7) | | 7 (11.2) | |
| Partnered | | | .007 | | .74 |
| Yes | 857 (87.7) | 244 (82.7) | | 97 (88.9) | |
| No | 124 (13.2) | 48 (17.3) | | 12 (11.1) | |
| Caregiving responsibility | | | <.001 | | <.001 |
| Primary caregiver | 546 (54.3) | 192 (64.7) | | 80 (73.2) | |
| Share responsibility with someone else | 435 (45.7) | 100 (35.3) | | 29 (26.8) | |
| Geographic location | | | .02 | | .003 |
| Urban | 279 (29.6) | 106 (36.4) | | 49 (43.3) | |

| Characteristics | Total N ^a (%) ^b | Visited clinician for Diaper rash n ^a (%) ^b | <i>P</i> Value | Visited clinician for UTI n ^a (%) ^b | <i>P</i> Value |
|--|--|---|-----------------|---|-----------------|
| Suburban | 492 (50.4) | 125 (43.8) | | 41 (41.4) | |
| Rural | 210 (20.0) | 61 (19.8) | | 19 (15.3) | |
| TANF, SNAP, or WIC recipient | | | <.001 | | <.001 |
| Yes | 649 (66.5) | 134 (56.0) | | 59 (52.5) | |
| No | 332 (33.5) | 158 (44.0) | | 50 (47.5) | |
| Diaper Need | | | <.001 | | <.001 |
| Yes | 362 (35.9) | 167 (55.3) | | 79 (71.3) | |
| No | 619 (64.1) | 125 (44.7) | | 30 (28.7) | |
| Visited organization to get diapers | | | <.001 | | <.001 |
| Yes | 190 (19.1) | 187 (65.6) | | 69 (60.5) | |
| No | 791 (80.9) | 105 (44.0) | | 40 (39.5) | |
| Diaper type | | | .006 | | .001 |
| Disposable only | 868 (91.8) | 244 (84.2) | | 80 (73.5) | |
| Cloth only | 34 (3.3) | 19 (5.7) | | 16 (13.7) | |
| Mix of disposable and cloth | 77 (7.6) | 28 (9.6) | | 13 (12.8) | |
| Other | 2 (0.3) | 1 (0.5) | | 0 (0) | |
| Took child to healthcare provider for UTI during past year | | | <.001 | | |
| One or more times | 109 (11.7) | 78 (27.4) | | ... | |
| Never | 809 (88.3) | 192 (72.6) | | ... | |
| Took child to healthcare provider for diaper rash during past year | | | | | <.001 |
| One or more times | 292 (32.1) | ... | | 78 (27.4) | |
| Never | 631 (67.9) | ... | | 30 (72.6) | |

^aRaw totals vary because of missing values

^bSampling weights are applied to account for differential probabilities of selection and differential nonresponse to derive accurate nationally representative estimates

Boldface indicates statistical significance

Table 2.

Association of Health Care Utilization for Diaper Rash Relating to Demographic and Diapering Variables (n = 922)

| | OR ^b | 95% CI | P Value |
|--|---------------------|-----------|---------|
| Education level | | | |
| High school graduate or less | Ref | . | |
| Some college/Associate's degree/technical school | 0.65 | 0.41–1.02 | .06 |
| Bachelor's degree | 0.76 | 0.47–1.22 | .26 |
| Master's degree/Post-graduate or professional degree | 1.09 | 0.64–1.87 | .75 |
| Social benefit recipient | 0.94 | 0.64–1.39 | .77 |
| Partnered | 0.80 | 0.51–1.33 | .44 |
| Share caregiving responsibility | 0.76 | 0.55–1.06 | .10 |
| Geographical location | | | |
| Urban | Ref | | |
| Suburban | 0.80 | 0.55–1.16 | .25 |
| Rural | 0.94 | 0.61–1.47 | .82 |
| Diaper need | 2.39 ^{***} | 1.71–3.35 | <.001 |
| Visited organization to get diapers | 2.19 ^{***} | 1.46–3.27 | <.001 |
| Diaper type | | | |
| Disposable only | Ref ^a | | |
| Cloth only | 1.49 | 0.69–3.25 | .31 |
| Disposable and cloth | 1.24 | 0.76–2.06 | .39 |
| Other | ... | ... | ... |

^aRef, reference

^bAdjusted models included all other variables in the table

Boldface indicates statistical significance

* $P < .05$

** $P < .01$

*** $P < .001$

Table 3.

Association of Health Care Utilization for Urinary Tract Infection Relating to Demographic and Diapering Variables (n = 916)

| | OR^a | 95% CI | P Value |
|-------------------------------------|-----------------------|---------------|-----------------|
| Male | 2.19 ** | 1.32–3.63 | .002 |
| Employed | 1.71 | 0.90–3.27 | .10 |
| Social benefit recipient | 0.90 | 0.52–1.54 | .70 |
| Geographical location | | | |
| Urban | Ref | | |
| Suburban | 0.82 | 0.48–1.42 | .48 |
| Rural | 0.89 | 0.46–1.75 | .74 |
| Share caregiving responsibility | 0.52 * | 0.30–0.91 | .02 |
| Diaper need | 2.63 *** | 1.54–4.49 | <.001 |
| Visited organization to get diapers | 4.50 *** | 2.63–7.70 | <.001 |
| Diaper type | | | |
| Disposable only | Ref | | |
| Cloth only | 2.57 * | 1.07–6.20 | .04 |
| Disposable and cloth | 1.43 | 0.69–2.98 | .34 |
| Other | ... | ... | ... |

^a Adjusted models included all other variables in the table

Boldface indicates statistical significance

***** $P < .05$

****** $P < .01$

******* $P < .001$