University of Massachusetts Medical School

eScholarship@UMMS

Commonwealth Medicine Publications

Commonwealth Medicine

2019-05-01

Infants Exposed To Homelessness: Health, Health Care Use, And Health Spending From Birth To Age Six

Robin E. Clark
University of Massachusetts Medical School

Et al.

Let us know how access to this document benefits you.

Follow this and additional works at: https://escholarship.umassmed.edu/commed_pubs

Part of the Community Health and Preventive Medicine Commons, Health Economics Commons, Health Law and Policy Commons, Health Policy Commons, Health Services Administration Commons, Health Services Research Commons, Maternal and Child Health Commons, and the Preventive Medicine Commons

Repository Citation

Creative Commons License

By Robin E. Clark, Linda Weinreb, Julie M. Flahive, and Robert W. Seifert

Infants Exposed To Homelessness: Health, Health Care Use, And Health Spending From Birth To Age Six

ABSTRACT Homeless infants are known to have poor birth outcomes, but the longitudinal impact of homelessness on health, health care use, and health spending during the early years of life has received little attention. Linking Massachusetts emergency shelter enrollment records for the period 2008–15 with Medicaid claims, we compared 5,762 infants who experienced a homeless episode with a group of 5,553 infants matched on sex, race/ethnicity, location, and birth month. Infants born during a period of unstable housing resulting in homelessness had higher rates of low birthweight, respiratory problems, fever, and other common conditions; longer neonatal intensive care unit stays; more emergency department visits; and higher annual spending. Differences in most health conditions persisted for two to three years. Asthma diagnoses, emergency department visits, and spending were significantly higher through age six. While screening and access to health care can be improved for homeless infants, long-term solutions require a broader focus on housing and income.

Robin E. Clark (robin.clark@umassmed.edu) is a professor of family medicine and community health and of population and quantitative health sciences, University of Massachusetts Medical School in Worcester.

Linda Weinreb is a professor of family medicine and community health, University of Massachusetts Medical School, and vice president and medical director for Medicaid at Fallon Health, in Worcester.

Julie M. Flahive is a biostatistician in the Department of Population and Quantitative Health Sciences, University of Massachusetts Medical School in Worcester.

Robert W. Seifert is executive director of the Center for Health Law and Policy, University of Massachusetts Medical School in Shrewsbury.

Increased understanding of how social factors affect health has led to calls for health care providers to screen patients regularly for social determinants of health.[1–3] Homelessness and poverty are among the social conditions most consistently associated with poor health outcomes and higher costs.[4] Researchers have devoted significant attention to single homeless adults but less attention to homeless families, which have distinctly different characteristics and needs.[5,6]

Families of adults and children younger than age eighteen account for one-third of the US homeless population.[7] Homelessness and poverty go hand in hand, and the two factors are often hard to separate in health care studies. John Buckner proposed a framework according to which homeless children are exposed to three kinds of stress: living in a shelter, problems associated with poverty, and the typical biological and family risks that all children face.[8] Maxia

Dong and colleagues expanded the exposure risk definition to include living in unstable housing (that is, moving often) as well as literal homelessness and found that children exposed to unstable housing had more frequent adverse childhood experiences and, later in life, higher risks of depression, suicide attempts, alcoholism, and smoking.[9] Within Buckner's framework, unstable housing may have direct effects on children's health that are associated with poor housing conditions and indirect effects by exposing children to other adverse experiences, such as abuse or neglect. Stress from these sources may also result in greater use of emergency or intensive health care services.

Several other studies have documented health problems in homeless children and infants at a particular time point.[8,10–12] Homelessness is associated with low birthweight, longer hospital stays, and more frequent admissions to neonatal intensive care units for newborns,[11,13–15] as well as

with higher prevalence of other health conditions among toddlers and children.[10,16]

Many of these cross-sectional studies relied on retrospective interviews with relatively small samples to measure health and health care use, potentially leading to errors of inaccurate reporting or insufficient statistical power to detect important population-level differences.[17] Cross-sectional studies may accurately capture outcomes at a point in time, but they reveal little about the longevity of effects. Understanding how homelessness affects children during the crucial early years is important for deciding which conditions to target and how long interventions are needed.

In this study we linked emergency housing applications with Medicaid claims to identify a cohort of infants who were born in the twelve months before or the twelve months after their mother entered a shelter for homeless families. We compared the infants' health conditions; health care use—focusing on emergency department (ED) visits, hospital admissions, and use of neonatal intensive care units; and Medicaid spending to those of a similar group of infants born during the same month. We followed both groups for up to six years. Guided by Buckner's conceptual model, we aimed to understand the longitudinal effects of homelessness on health, health care use, and health care spending during the early years of life.

Study Data And Methods

We used a retrospective case control design to compare infants who were exposed to homelessness and similar infants who were born to low-income families but did not experience a homeless episode during the study period. Beginning with records of all families who entered emergency shelter in Massachusetts in the period from January 1, 2008, to June 30, 2015, we linked Emergency Assistance enrollment records with Medicaid claims for each family member. Using claims-based diagnoses and procedure codes, we identified all live births during the twelve months immediately preceding or the twelve months after the shelter entry date. Any infant born to a family using shelter during this twenty-four-month period met the operational definition of being exposed to homelessness. We adopted this broader definition of *homelessness* based on research showing that housing instability often precedes shelter entry and that unstable housing is associated with increased health risks and use of health care services.[6,9,18,19] We then used Medicaid claims to create a comparison group of infants born during the same time frame. Medicaid records did not allow us to

accurately link health insurance claims for mothers and children, so this study focused solely on infants and children. We grouped children into six age groups (ages 0–1, >1–2, >2–3, >3–4, >4–5, and >5–6) and contrasted service use and diagnoses for the two groups.

DATA SOURCES All data were from Massachusetts, where qualified homeless families are legally entitled to publicly funded shelter. Eligibility requirements for emergency shelter assistance include being a Massachusetts resident; meeting lower income levels than those for Medicaid (up to 115 percent versus up to 200 percent of the federal poverty level); being pregnant or having a child younger than age twenty-one; and being homeless as a result of any of a range of causes, including fire, flood, domestic violence, no-fault eviction, and substantial health and safety risk for a child. Shelter included formal congregate emergency housing as well as apartments and hotels in scattered sites.

Emergency Assistance benefits for families are administered by the Massachusetts Department of Housing and Community Development and are managed separately from services for homeless individuals. Health care use and diagnosis data were based on analyses of claims and enrollment data from MassHealth (the Massachusetts Medicaid program) claims and enrollment files. All diagnostic codes used the *International Classification of Diseases*, Ninth Revision (ICD-9). Expenditures were derived from MassHealth claims and represented the amounts paid to providers rather than reimbursement to health plans.

Emergency Assistance records for individual family members were linked with MassHealth claims during the study period based on birth date, Medicaid number, and sex.

MATCHING HOMELESS AND COMPARISON GROUPS Homeless and comparison groups were matched on the month and year of birth, sex, race/ethnicity, and region of last residence (Boston region versus other locations). Members of each group were required to have at least one claim during their birth year and were followed for up to six years. Members with additional insurance, such as an employer-sponsored plan, were eliminated from each group because claims data were incomplete.

VARIABLES All diagnoses from claims, regardless of their position on the claim, were grouped using the Clinical Classifications Software (CCS) developed by the Agency for Healthcare Research and Quality.[20] We analyzed individual diagnoses for short gestation (less than thirty-seven weeks), fetal growth retardation, and low birthweight in the year following birth—measures that are typically combined into a sin-

> Health care alone will not solve all of the health problems that infants and children face because of homelessness.

gle CCS measure. We used combinations of diagnosis and *Current Procedural Terminology* codes endorsed by the National Committee on Quality Assurance to identify well-child visits[21] and published algorithms to identify neonatal intensive care unit stays.[22] We also identified hospitalizations other than for delivery and ED visits that did not result in a hospital admission. Claims-based expenditures are also reported for each year.

ANALYSIS Using bivariate statistics including *t*-tests, chi-square tests, and Wilcoxon rank-sum tests as appropriate for each variable's distribution, we contrasted homeless and comparison groups within each of the six age categories. We selected the five most frequently occurring CCS diagnosis groups: upper respiratory infections; other lower respiratory disease; fever of unknown origin; other nutritional, endocrine, and metabolic disorders; and allergic reactions. We also added conditions that have been shown in other studies to occur more often among homeless children and that may have implications for future health, including asthma, low birthweight, substance use disorders (for example, neonatal abstinence syndrome), injuries and conditions due to external causes, and developmental disorders. All analyses were performed using SAS, version 9.2.

The study was reviewed and approved by the University of Massachusetts Medical School's Institutional Review Board.

LIMITATIONS Our study had several limitations. First, although the study sample included a carefully matched comparison group, we could not rule out other differences—such as small disparities in income levels within poverty—that may have affected outcomes.

Second, compared to homeless infants, more comparison infants lost MassHealth coverage during the second study year (22.4 percent versus 14.7 percent), but this did not appear to introduce bias resulting in differences in measured characteristics between the two groups. In subsequent years retention was slightly higher among comparison infants than among those in the homeless group.

Third, claims data offer a reasonably comprehensive view of service use over time, but the inability to follow subjects who switched to another kind of health care coverage or to link mothers' claims with those of their infants is an important limitation. Claims-based diagnoses represent health conditions identified and recorded by a health care provider: They might not reflect all of the health problems that a child experienced.

Fourth, services rendered by providers who were not Medicaid reimbursable were not captured with these data, and diagnoses were not derived by a standardized research method, in contrast to many epidemiological studies.

Finally, we were unable to measure the impact of the time spent in shelter because of unreliable data on exit dates for many families.

Although these limitations affected the scope of the study, we do not believe that they had a significant impact on the conclusions that we drew from our analysis.

Study Results

Using birth dates, we identified 6,118 homeless infants born during the study period. More than 98 percent of these infants matched comparison infants on all four criteria, and all but one of the 93 remaining cases matched on three criteria. The remaining case was eliminated from the analysis. After the initial match, we identified 356 (5.8 percent) infants in the homeless group and 565 (9.2 percent) in the comparison group who were eligible but had no claims during the first year of life, most likely because of third-party insurance coverage. These infants were also removed from the analysis, resulting in a final sample of 5,762 homeless and 5,553 comparison infants (exhibit 1). Medicaid enrollment in the years immediately following birth was slightly higher for homeless infants in all years, because more infants in the comparison group than those in the homeless group lost coverage during the second year, but within-year median months of service use were similar for both groups (data not shown). Eligibility data suggest that average monthly income for both groups was well below the federal poverty level ($1,328 for a family of two in 2015). Homeless families averaged $467 per month versus $796 per month for comparison families. Although length-of-stay in shelter could not be measured for all infants because of missing or unreliable exit data, the mean episode for adults using

EXHIBIT 1

Characteristics of infants born in Massachusetts, by study group, 2008–15

Characteristic	Homeless infants (n = 5,762)		Comparison infants (n = 5,553)		p value
	No.	%	No.	%	
Male	2,988	51.86	2,896	52.15	0.75
Race/ethnicity					0.97
White	1,248	21.66	1,201	21.63	
Black	1,345	23.34	1,290	23.23	
Hispanic	751	13.03	702	12.64	
Other	115	2.00	111	2.00	
Unknown	2,303	39.97	2,249	40.50	
Region at birth					0.99
Boston	1,671	29.00	1,610	28.99	
Other locations	4,091	71.00	3,943	71.01	
Year of birth					0.99
2008	385	6.68	369	6.65	
2009	731	12.69	687	12.37	
2010	692	12.01	657	11.83	
2011	738	12.81	705	12.70	
2012	865	15.01	845	15.22	
2013	1,058	18.36	1,041	18.75	
2014	992	17.22	961	17.31	
2015	301	5.22	288	5.19	
Household income as percent of federal poverty level	—[a]	31.17	—[a]	59.93	0.0001

SOURCE Authors' analysis of Emergency Assistance housing data and MassHealth enrollment and claims data. **NOTES** The exhibit shows bivariate comparisons using chi-square tests. The study groups are explained in the text. [a]Not applicable.

shelter during the same period lasted 243 days (median: 193 days; interquartile range: 70–337). Eighty-three percent of infants in the homeless group were born before their mother entered shelter.

During the first year of life, infants born in the year leading up to or the year following emergency shelter entry were significantly more likely to visit the ED or to be hospitalized than infants in the comparison group (exhibit 2). They were also hospitalized more often and had more ED visits and higher median spending. Compared to comparison infants, homeless infants were no more likely to be admitted to a neonatal intensive care unit but had longer median stays when they were admitted.

The two groups did not differ significantly in the rates of infants diagnosed with short gestation periods or fetal growth retardation (exhibit 3). However, rates of low birthweight were significantly higher among infants in the homeless group—a difference of about 4 percentage points.

Among homeless infants, the most frequently diagnosed health conditions were the CCS categories of upper respiratory infection; other lower respiratory disease; fever of unknown origin; allergic reactions; and other nutritional, endocrine, and metabolic disorders. The same five conditions occurred most frequently in the comparison group but significantly less often than in the homeless group. Diagnosed rates of many

EXHIBIT 2

Health care use and spending during the first year of life among infants born in Massachusetts, by study group, 2008–15

	Homeless infants	Comparison infants	p value
ED visits			
Mean number of visits	1.75	0.96	<0.0001
Infants with 1 or more ED visits[a]	3,742	2,553	<0.0001
Hospitalizations			
Mean number of hospitalizations	0.24	0.17	<0.0001
Infants with 1 or more hospitalizations[b]	836	574	<0.0001
Well-child visits			
Mean number of visits	3.53	3.96	<0.0001
Expenditures ($)			
Mean	7,921	6,191	0.004
Median	2,851	2,200	<0.0001
NICU use			
Infants with NICU stay[c]	342	350	0.41
Median NICU length-of-stay (days)	9.0	6.5	0.009
Mean NICU length-of-stay (days)	16	14	0.11

SOURCE Authors' analysis of Emergency Assistance housing data and MassHealth enrollment and claims data. **NOTES** Sample sizes are in exhibit 1. The exhibit shows bivariate comparisons using t-tests, chi-square tests, and Wilcoxon rank-sum tests as appropriate. Use and spending for delivery are excluded, except for stays in the neonatal intensive care unit (NICU). The study groups are explained in the text. A fuller version of the exhibit, showing standard deviations and interquartile ranges, appears in the appendix (see note 23 in text). ED is emergency department. [a]Homeless: 64.9 percent; comparison: 46.0 percent. [b]Excluding delivery, homeless: 14.5 percent; comparison: 10.3 percent. [c]Homeless: 5.9 percent; comparison: 6.3 percent.

EXHIBIT 3

Health conditions during the first year of life among infants born in Massachusetts, by study group, 2008–15

Condition	Homeless infants		Comparison infants		
	No.	%	No.	%	p value
Low birthweight	179	16.13	122	12.07	0.01
Short gestation	450	40.54	404	39.96	0.79
Fetal growth retardation	158	14.23	116	11.47	0.06
Upper respiratory infection	3,408	59.15	2,868	51.65	<0.0001
Other lower respiratory disease	2,531	43.93	1,789	32.22	<0.0001
Fever of unknown origin	2,260	39.22	1,648	29.68	<0.0001
Allergic reaction	2,187	37.96	1,825	32.87	<0.0001
Other nutritional, endocrine, or metabolic disorder	2,156	37.42	1,795	32.32	<0.0001
Injuries due to external causes	702	12.18	486	8.75	<0.0001
Developmental disorder	655	11.37	324	5.83	<0.0001
Asthma	567	9.84	329	5.92	<0.0001

SOURCE Authors' analysis of Emergency Assistance housing data and MassHealth enrollment and claims data. **NOTES** The exhibit shows bivariate comparisons using t-tests, chi-square tests, and Wilcoxon rank-sum tests as appropriate. The study groups are explained in the text.

other conditions were higher among homeless than comparison infants in the first year of life. For example, injuries due to external causes 12.2) percent versus 8.8 percent), developmental disorders (11.4 percent versus 5.8 percent), and asthma (9.8 percent versus 5.9 percent) were all more common among homeless infants in the year following birth (exhibit 3). Substance-related problems, including neonatal abstinence syndrome, were infrequent but slightly more common among homeless than comparison newborns (5.5 percent versus 3.0 percent; $p < 0.0001$) (data not shown elsewhere).

In the six years following birth, sample sizes declined with each additional year of follow-up in the homeless (from 5,762 to 1,247) and comparison (from 5,553 to 1,106) groups. Looking at service use over the entire six years, ED use declined in both groups but remained significantly greater in the homeless group than in the comparison group (exhibit 4). Median annual expenditures followed a similar pattern of declining after the birth year but remaining significantly higher in the homeless group. Homeless infants were more likely to be admitted to a hospital during the first two years of life ($p < 0.0001$; data shown in the appendix),[23] but admission rates were not significantly different from the comparison group in subsequent years. Well-child visits during the first year of life were slightly less frequent among homeless infants (3.5 versus 4.0) (exhibit 2). The difference narrowed further but remained significant in year two (see the appendix).[23]

The diagnosed prevalence of most conditions declined steadily for both groups during the first three years of life except for developmental disorders, which grew sharply in the first three years before declining significantly thereafter, and asthma, which increased steadily over the first four years and remained at high levels in the subsequent two years (see the appendix for exact numbers and percentages over the six-year study period).[23] Except for asthma, health conditions experienced by the two groups were no longer significantly different by age six. Differences in fever and allergic diagnoses were significant during the first two years; respiratory, nutritional, and injury diagnoses continued to be significant for three years.

Discussion
Although infants in the homeless and comparison groups had similar characteristics, including low incomes, homeless children were more frequently diagnosed with health conditions such as respiratory infections, fever, and allergies as well as less common ones such as low birthweight, injuries, and developmental disorders. These findings suggest that unstable housing leading to homelessness has a significantly greater impact on newborns than low income alone does. While some researchers and policy makers have hypothesized a well-defined dose-response relationship between unstable housing and health outcomes, we believe that the effects of housing instability cannot be measured simply by counting the days spent in shelter. Most infants in our study were born before their mother entered shelter, and other studies show that housing instability and its associated effects of-

EXHIBIT 4

Median annual expenditures for children in Massachusetts from birth to age 6 and percent of children with 1 or more emergency department (ED) visits, by study group, 2008–15
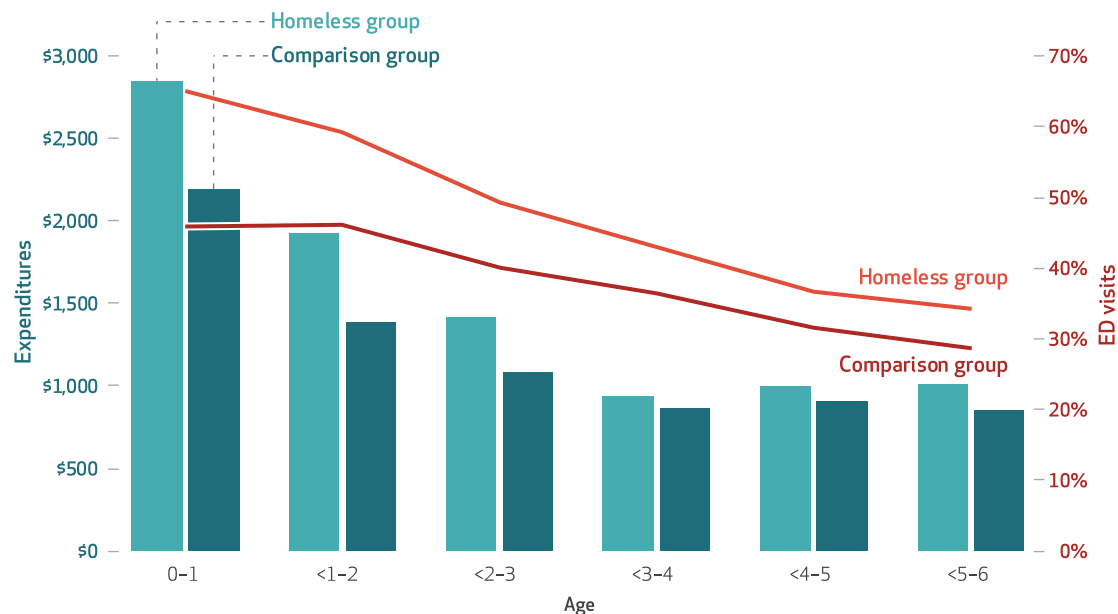
SOURCE Authors' analysis of Emergency Assistance housing data and MassHealth enrollment and claims data. NOTES Expenditures exclude the costs of delivery. The homeless and comparison groups are explained in the text. All differences are significant ($p \leq 0.007$). Exact numbers are in the appendix (see note 23 in text).

ten begin long before families become literally homeless.[9,18] Other research suggests that unstably housed infants are exposed to a variety of risks in addition to those associated with living in emergency shelter.[8,9,13,17,24–26]

Differences in diagnosed health conditions may also have contributed to more frequent hospitalizations and ED visits and to longer neonatal intensive care unit stays during the first year. Slightly fewer well-child visits during the first year of life suggest that missed opportunities for preventive care could also have made a small contribution to poorer health outcomes and use of more expensive services in the years immediately following birth, but they do not adequately explain more persistent differences. Income differences and unmeasured characteristics of the two groups could account for some differences, and social factors such as transportation difficulties or social isolation may have been more challenging for homeless mothers.[24]

Differences in diagnosed health conditions, use, and spending were greatest in the first three years, when homeless infants and children experienced greater risk for many different health conditions—most of which were no longer significant after age three. Still, some differences extended throughout the six-year observation period. Children who experienced homelessness

as infants continued to have significantly higher rates of asthma diagnoses. ED use and spending also remained significantly higher throughout the study period.

These observations show that homelessness during the perinatal period is associated with significantly poorer health in the first two to three years of life—longer than previously documented—and with potentially longer-lasting effects on asthma, health care use, and spending. Additional research is needed to confirm these findings in other locations and to explain the mechanisms by which homelessness contributes to asthma risk. Studies showing the impact of low birthweight, maternal anxiety and depression, stress, and the environment on asthma suggest a number of pathways.[11,27,28] Differences in the prevalence of developmental disorders, which were significant in the first five years of life, may signal heightened risk for educational or behavioral health problems later in childhood.

Our previous analysis of women who used emergency homeless shelter while pregnant showed higher rates of many pregnancy complications, compared to similar women not using shelter.[29] Taken together, the findings indicate that infants exposed to homelessness have significantly poorer health during the first two to

three years of life and that interventions should probably begin before birth. The long-lasting associations between homelessness and service use may indicate that patterns of help seeking through EDs established while homeless persist after families are stably housed. These associations may also reflect continuing low-level group differences in health, such as we observed for asthma. Although low birthweight is often associated with longer term health deficits, we did not find group differences in service use or spending among low-birthweight infants in the two groups after the birth year.

Conclusion

Children born during a period of family homelessness have significantly greater health risks from birth through early childhood. Our analyses suggest that unstable housing's impact on infants and children goes beyond the more general effects of poverty. Although declining prevalence of several diagnosed conditions indicates that some aspects of infants' and children's health may improve over time, patterns of increased asthma prevalence, greater use of EDs, and higher health care spending persist among children exposed to homelessness as infants.

Women and children face greater risk of a range of adverse events while homeless than when stably housed.[9,13,29] Although this study did not capture the effect of homelessness on health in later years, other studies show that adverse childhood events can have health effects that last through adulthood.[25,26] Unstable housing during childhood is not currently considered an adverse childhood event, but a growing body of research documenting negative outcomes suggests that perhaps it should be added to the list.[9,13,25,26]

Future research using longitudinal data to measure the long-term impact of housing instability on infants and young children is needed to increase understanding of the pathways to poorer health. Understanding interactions between unstable housing during pregnancy and childhood and adverse childhood experiences is also critical for designing effective policy responses and health interventions, as well as for accurately measuring their value to children, families, and society.

Effective screening that could identify unstably housed pregnant and newly postpartum women early, coupled with rapid intervention, could limit exposure to some health risks and reduce homelessness and health care use in future years. Health systems in the United States are just beginning to learn how to work more effectively with social service providers to address social needs that profoundly affect health. Continued government support of demonstrations that link social and health services providers and rigorous evaluation of these efforts is essential.

Although health care settings can and should play a critical role in identifying social needs, health care alone will not solve all of the health problems that infants and children face because of homelessness. Findings from the Family Options Study suggest that housing vouchers and rapid rehousing can stabilize housing and may have some health benefits.[30] While there is always room for improvement in health care delivery, the most effective long-term solutions must also address affordable housing and poverty. This requires an expanded view of health policy that focuses more broadly on the social conditions that underlie poor health and contribute to ever-growing health care spending. ∎

NOTES

1 Garg A, Toy S, Tripodis Y, Silverstein M, Freeman E. Addressing social determinants of health at well child care visits: a cluster RCT. Pediatrics. 2015;135(2):e296–304.

2 Fleegler EW, Lieu TA, Wise PH, Muret-Wagstaff S. Families' health-related social problems and missed referral opportunities. Pediatrics. 2007;119(6):e1332–41.

3 Marmot M, Friel S, Bell R, Houweling TA, Taylor S. Closing the gap in a generation: health equity through action on the social determinants of health. Lancet. 2008; 372(9650):1661–9.

4 LePage JP, Bradshaw LD, Cipher DJ, Crawford AM, Hoosyhar D. The effects of homelessness on veterans' health care service use: an evaluation of independence from comorbidities. Public Health. 2014; 128(11):985–92.

5 Burt MR, Cohen BE. Differences among homeless single women, women with children, and single men. Soc Probl. 1989;36(5):508–24.

6 Shinn M, Greer AL, Bainbridge J, Kwon J, Zuiderveen S. Efficient targeting of homelessness prevention services for families. Am J Public Health. 2013;103(Suppl 2):S324–30.

7 National Alliance to End Homelessness. State of homelessness [Internet]. Washington (DC): The Alliance; [cited 2019 Mar 8]. Available from: https://endhomelessness.org/homelessness-in-america/homelessness-statistics/state-of-homelessness-report/

8 Buckner JC. Understanding the impact of homelessness on children: challenges and future research directions. Am Behav Sci. 2008;51(6): 721–36.

9 Dong M, Anda RF, Felitti VJ, Williamson DF, Dube SR, Brown DW, et al. Childhood residential mobility and multiple health risks during adolescence and adulthood: the hidden role of adverse childhood experiences. Arch Pediatr Adolesc Med. 2005;159(12):1104–10.

10 Weinreb L, Goldberg R, Bassuk E, Perloff J. Determinants of health and service use patterns in homeless and low-income housed children. Pediatrics. 1998;102(3 Pt 1):554–62.

11 Park JM, Fertig AR, Allison PD. Physical and mental health, cognitive development, and health care use by housing status of low-income young children in 20 American cities: a prospective cohort study. Am J Public Health. 2011;101(Suppl 1): S255–61.

12 Bassuk E, Rubin L. Homeless children: a neglected population. Am J Orthopsychiatry. 1987;57(2): 279–86.

13 Cutts DB, Coleman S, Black MM, Chilton MM, Cook JT, de Cuba SE, et al. Homelessness during pregnancy: a unique, time-dependent risk factor of birth outcomes. Matern Child Health J. 2015;19(6):1276–83.

14 Carrion BV, Earnshaw VA, Kershaw T, Lewis JB, Stasko EC, Tobin JN, et al. Housing instability and birth weight among young urban mothers. J Urban Health. 2015;92(1):1–9.

15 Richards R, Merrill RM, Baksh L. Health behaviors and infant health outcomes in homeless pregnant women in the United States. Pediatrics. 2011;128(3):438–46.

16 Bassuk EL, Richard MK, Tsertsvadze A. The prevalence of mental illness in homeless children: a systematic review and meta-analysis. J Am Acad Child Adolesc Psychiatry. 2015; 54(2):86–96.e2.

17 Grant R, Gracy D, Goldsmith G, Shapiro A, Redlener IE. Twenty-five years of child and family homelessness: where are we now? Am J Public Health. 2013;103(Suppl 2):e1–10.

18 Clark RE, Weinreb L, Flahive JM, Seifert RW. Health care utilization and expenditures of homeless family members before and after emergency housing. Am J Public Health. 2018; 108(6):808–14.

19 Wright BJ, Vartanian KB, Li HF, Royal N, Matson JK. Formerly homeless people had lower overall health care expenditures after moving into supportive housing. Health Aff (Millwood). 2016;35(1):20–7.

20 Healthcare Cost and Utilization Project. Clinical Classifications Software (CCS) for ICD-9-CM fact sheet [Internet]. Rockville (MD): Agency for Healthcare Research and Quality; [last modified 2012 Jan 9; cited 2019 Mar 8]. Available from: https://www.hcup-us.ahrq.gov/tools software/ccs/ccsfactsheet.jsp

21 National Committee for Quality Assurance. Well child visits in the first 15 months of life. Washington (DC): NCQA; 2015.

22 Andrade SE, Scott PE, Davis RL, Li DK, Getahun D, Cheetham TC, et al. Validity of health plan and birth certificate data for pregnancy research. Pharmacoepidemiol Drug Saf. 2013;22(1):7–15.

23 To access the appendix, click on the Details tab of the article online.

24 Mayberry LS, Shinn M, Benton JG, Wise J. Families experiencing housing instability: the effects of housing programs on family routines and rituals. Am J Orthopsychiatry. 2014; 84(1):95–109.

25 Hughes K, Bellis MA, Hardcastle KA, Sethi D, Butchart A, Mikton C, et al. The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. Lancet Public Health. 2017;2(8): e356–66.

26 Shonkoff JP, Garner AS. The lifelong effects of early childhood adversity and toxic stress. Pediatrics. 2012; 129(1):e232–46.

27 Dietert RR. Maternal and childhood asthma: risk factors, interactions, and ramifications. Reprod Toxicol. 2011;32(2):198–204.

28 Beasley R, Semprini A, Mitchell EA. Risk factors for asthma: is prevention possible? Lancet. 2015; 386(9998):1075–85.

29 Clark RE, Weinreb L, Flahive JM, Seifert RW. Homelessness contributes to pregnancy complications. Health Aff (Millwood). 2019;38(1): 139–46.

30 Gubits D, Shinn M, Wood M, Bell S, Dastrup S, Solari CD, et al. Family Options Study: 3-year impacts of housing and services interventions for homeless families [Internet]. Rockville (MD): Abt Associates; 2016 Oct [cited 2019 Mar 8]. Available from: https://www.huduser.gov/portal/sites/default/files/pdf/Family-Options-Study-Full-Report.pdf