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

Homelessness Contributes To Pregnancy Complications

DOI: 10.1377/hlthaff.2018.05156
HEALTH AFFAIRS 38,
NO. 1 (2019): 139–146

ABSTRACT Homelessness during pregnancy poses significant health risks for mothers and infants. As health care providers increase their emphasis on social determinants of health, it is important to understand how unstable housing contributes to complications during pregnancy. We linked data about emergency shelter enrollees with Massachusetts Medicaid claims for the period January 1, 2008–June 30, 2015 to compare health care use and pregnancy complications for 9,124 women who used emergency shelter with those for 8,757 similar women who did not. Rates of mental illness and substance use disorders were significantly higher among homeless women. Adjusted odds of having nine pregnancy complications were also significantly higher for homeless women and remained substantially unchanged after we adjusted for behavioral health disorders. Emergency shelter users also had fewer ambulatory care visits and more months without billable care and were more likely to visit an emergency department. Homelessness and behavioral health disorders appear to be independent factors contributing to pregnancy complications and should be addressed simultaneously.

Robin E. Clark (robin.clark@umassmed.edu) is a professor of family medicine and community health, 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 Quantitative Health Sciences, University of Massachusetts Medical School.

Robert W. Seifert is interim director of the Center for Health Law and Economics, University of Massachusetts Medical School.

Pregnancy can increase a woman's risk of becoming homeless, and pregnant women face significantly greater health risks while unstably housed.[1–4] Homelessness and unstable housing during pregnancy are associated with low birthweight and preterm delivery.[5–8] Adverse pregnancy outcomes while homeless are often attributed to behavioral health comorbidities (such as depression, anxiety, and substance use disorders, which are more prevalent during a period of homelessness) or to underuse of prenatal care.[2,8] Because most studies rely on self-reports or hospital records and typically do not include comparison groups, our understanding of how homelessness, as opposed to co-occurring health conditions, contributes to these outcomes—and, thus, of the potential health benefits of stable housing during pregnancy—is incomplete. Few studies accurately document comorbidities, complications, or patterns of care for pregnant homeless women compared to others with more stable housing, or weigh the relative contributions of comorbidities and housing to women's health during pregnancy. As the emphasis on addressing social determinants of health grows, it becomes more important for health care providers and policy makers to understand the unique influence of homelessness on health outcomes.

The US Department of Housing and Urban Development's *2017 Annual Homeless Assessment Report (AHAR) to Congress* counted more than a half million (553,742) people who were homeless on one night in the winter of 2017, a slight increase from the number for 2016.[9] Estimates vary widely from state to state. About one-third of the people without homes are members of a fam-

ily that includes children.[9] The characteristics and needs of homeless families are often substantially different from those of unaccompanied individuals, who are more likely to be male and have higher rates of addiction, severe mental illness, and other chronic disease.[9–11] Homeless families are typically headed by young women and include young children.[1,9–11] Most pregnant women with low incomes, regardless of housing status, can access health coverage through Medicaid, a program that is jointly managed by federal and state governments and whose coverage during pregnancy has been nationally mandated since 1985.[12]

Housing instability is almost always accompanied by low income, making it difficult to separate the specific effects of homelessness from the more general impact of poverty.[13] Because poverty is associated with multiple social determinants of health—including food insecurity, transportation, unemployment, housing, and other concerns—as well as higher rates of many health conditions, this lack of specificity about the link between social factors and health makes it difficult to prioritize interventions when resources are constrained. Screening tools often address a range of social determinants and needs but offer little guidance to providers about which needs have the greatest impact on health. This is particularly challenging during pregnancy, when women may experience behavioral health disorders such as perinatal depression or anxiety, as well as a range of social concerns including domestic violence, unreliable transportation, and unstable housing.[14,15]

Recent studies showing that housing single homeless patients may reduce emergency department (ED) visits and hospitalizations have helped redefine homelessness and unstable housing as health concerns.[16,17] The Center for Medicare and Medicaid Innovation has launched demonstrations requiring accountable care organizations to screen for social determinants, including unstable housing, and refer their patients to appropriate social services.[18] Still, most attention has been directed to single unaccompanied adults rather than to families, and many questions remain about how housing instability affects health during pregnancy.

Given the particular vulnerability of women while pregnant[14] and the heightened focus on addressing social determinants of health, it is important to understand what kinds of assistance homeless women need during pregnancy and how unstable housing affects their health and use of care. To address this knowledge gap, we used administrative data to describe health conditions and health care use by women who were pregnant during or shortly before entering emergency shelter for homeless families and compared them to a similar group of pregnant women who did not use emergency shelter. Our objectives were to identify health conditions and patterns of health care use that distinguish pregnant women who use emergency homeless shelter from similar women who do not, and to explore the associations between shelter use and pregnancy complications. With a better understanding of these factors, health care providers and policy makers may be able to develop more effective interventions for homeless pregnant women and target those interventions more efficiently.

Study Data And Methods

We analyzed family shelter enrollment data and Medicaid claims data from Massachusetts, where national surveys show that family homelessness rates are higher than in most states.[9] After linking emergency shelter records with medical claims, we used methods developed by the Agency for Healthcare Research and Quality to identify pregnant women who experienced homelessness (specific codes are described in online appendix 1).[19] Using claims data, we created a second group of women with similar characteristics who were pregnant during the same time frame as the women in the shelter group. We then conducted a series of bivariate and multivariable comparisons to describe differences between the two groups in behavioral health comorbidities, pregnancy complications, and service use. The terms *homeless group* and *shelter group* are used interchangeably throughout the article.

DATA SOURCES We linked administrative data for women who received shelter through the Emergency Assistance (EA) program operated by the Massachusetts Department of Housing and Community Development with MassHealth (Massachusetts's Medicaid program) claims and enrollment data for the period January 1, 2008–June 30, 2015, using additional claims data from 2007 to describe service use before homelessness in 2008. Women could receive shelter in formal congregate emergency housing as well as in apartments and hotels at scattered sites. All qualified homeless families in Massachusetts are legally entitled to publicly funded shelter. Thus, families receiving emergency shelter represent most of the homeless families in the state during this period. To receive emergency shelter, families must be Massachusetts residents; meet income standards similar to those for Medicaid; have a child younger than age twenty-one or include a pregnant woman; and be homeless due to specific causes, such as fire, flood, domes-

tic violence, no-fault eviction, or substantial health and safety risk for a child.[20] A single pregnant woman is eligible for family services through Medicaid and the Department of Housing and Community Development. Emergency Assistance was primarily devoted to sheltering families rather than providing diversion during the study period. The EA benefit for families is managed separately from benefits for single homeless people.

Pregnant women with incomes at or below 200 percent of the federal poverty level ($31,860 for a family of two in 2015) are eligible for MassHealth. Eligibility requirements for EA are similar to those for MassHealth, and most homeless families receive both benefits. EA records for individual family members were linked with MassHealth claims data during the study period based on birth date, Social Security number, and sex. These data were complete in both EA and MassHealth databases, which made linkage mistakes unlikely but not impossible.

COMPARISON GROUP Using an algorithm derived from the Agency for Healthcare Research and Quality's Clinical Classifications Software to define pregnancy for women who received EA while in shelter or in the twelve-month period leading up to shelter entry, we directly matched homeless women to women enrolled in MassHealth who were pregnant at the same time but did not receive EA during the twelve months before or after the corresponding EA recipient entered shelter.[21] Matching criteria included being pregnant during the same year as the corresponding EA recipient, being within the same age category (ages 13–17, 18–29, 30–40, or 41 or older), having a similar risk score according to Diagnostic Cost Group (DxCG) software from a commercial risk adjuster used by MassHealth to predict future costs,[22] and being in the same eligibility category (disability, Temporary Assistance for Needy Families, or other). People whom we later identified as having third-party coverage were removed from both groups, resulting in slightly fewer women in the comparison group than in the homeless group.

DEFINING SHELTER EPISODES Using beginning dates for new EA enrollments (that is, not transfers from other shelter sites), we identified episodes of emergency shelter for each woman. We then constructed monthly (thirty-day) longitudinal measures of service use and spending for up to twelve months before and after each episode's beginning. Pregnancies could occur in the year before or during shelter residence. The Department of Housing and Community Development reports that most EA beneficiaries enter shelter within a few days of approval. Department policy requires a new application if an EA request is not completed within thirty days.[20] Many families experience a period of unstable housing before applying to or being approved for EA.[1]

VARIABLES We used *International Classification of Diseases*, Ninth Revision (ICD-9), diagnosis codes from claims to describe the most frequent conditions. To simplify presentation, we grouped diagnoses into Clinical Classification System categories,[21] with additional groups for some diagnoses reported at high frequencies in previous studies, such as opioid use disorders. Other behavioral health conditions included alcohol use disorders, nonopioid drug use disorders, adjustment disorders, anxiety disorders, and depressive disorders. Using Clinical Classification System categories and ICD-9 codes, we defined a group of pregnancy indicators, pregnancy complications, and birth indicators (see appendix 1 for the codes used to define these conditions).[19] Birth outcomes for infants, often recorded separately on their claims, were beyond the scope of the current study. Codes for type and place of service were used to define hospital discharges, ED visits not resulting in a hospitalization, and ambulatory care visits. We also used total MassHealth expenditures and dates of service during each month to identify months during which members received or did not receive care or fill a medication prescription.

ANALYSES To compare health conditions and binary service use (any versus none) between the two groups of women, we began with a simple comparison of unadjusted frequencies, contrasting women who used shelter with those who did not. Next we conducted a series of logistic regression models that contrasted rates of frequent health conditions and service use across the two groups, adjusting for each person's race and age at an episode's beginning; year of the episode's start date; and whether before the episode the person had lived in the Greater Boston Metropolitan Area, where provider concentrations and housing stock are substantially different from other regions of the state. Finally, we added six frequently occurring behavioral health comorbidities to the model: alcohol, opioid, and other drug use disorders; and depression, anxiety, and adjustment disorders.

The study was approved by the University of Massachusetts Medical School's Institutional Review Board. All analyses were performed using SAS software, version 9.2.

LIMITATIONS The study had several limitations. First, associations between the use of emergency shelter and a range of health conditions cannot be interpreted as causal.

Second, although we matched the homeless and comparison groups on a range of character-

istics and adjusted for others in our multivariable analyses, there is still a possibility that women in the shelter group shared other unmeasured characteristics that contributed to higher rates of pregnancy complications and behavioral health disorders.

Third, mental health and substance use disorders may increase the likelihood of becoming homeless and may also be exacerbated by the stress of housing instability.[2,23] This bidirectional relationship makes it difficult to completely isolate each factor's effect.

Fourth, the administrative data we used to identify the characteristics and health conditions of study participants provided a more comprehensive measure of health care use than studies that rely only on hospital records or self-reports, but it might not have identified untreated health conditions or other social factors that contribute to greater health risk.

Finally, it is likely that some homeless women who did not seek assistance or who failed to qualify for emergency shelter for administrative reasons were excluded from our sample.

These limitations notwithstanding, we believe that this analysis provides a more comprehensive and rigorous description of differences in health and health care use between pregnant women with low incomes who are housed compared to those who experienced homelessness. To our knowledge, it is the only such study to include a matched comparison group.

EXHIBIT 1

Characteristics of pregnant women with Medicaid coverage in Massachusetts, by homeless status, January 1, 2008–June 30, 2015

Characteristic	Homeless women	Comparison women
Mean age (years)****	25	27
Age in years (standard deviation)	6.8	8.1
Race/ethnicity****		
White	28%	38%
Black	26	13
Hispanic	14	15
Other	2.9	3.4
Unknown	29	32
Region of residence before shelter entry****		
Greater Boston Metropolitan Area	30%	14%
Elsewhere in Massachusetts	70	86
DxCG risk score[a]		
Less than 1	28%	29%
1–2	26	26
More than 2	46	46

SOURCE Authors' analysis of data from the Department of Housing and Community Development and MassHealth. **NOTES** There were 9,124 pregnant women in Massachusetts who used emergency shelter for homeless families in the study period. The comparison group consists of 8,757 similar women who did not use shelter. Significance refers to the results of a *t*-test for age and chi-square tests for race/ethnicity and region. [a]DxCG is Diagnostic Cost Group. A score of less than 1 indicates that a member's annual expenditures were lower than the average for all members, a score of 1 means that expenditures were equal to the average, and a score of 2 means that expenditures were twice the average. ****$p < 0.001$

Study Results

Ninety-six percent of all shelter recipients were matched with MassHealth claims and enrollment data. After removing people with Medicare or private coverage in addition to MassHealth, for whom claims were incomplete, our final sample comprised 9,124 pregnant women who used shelter and 8,757 who did not in the period January 1, 2008–June 30, 2015. Forty-eight percent (4,379) of the women who used shelter were pregnant while in shelter, and 52 percent (4,745) had been pregnant in the year before shelter entry. Twenty-four percent of the women in the shelter group had two or more homeless episodes during the study period. Some differences in demographic characteristics between the shelter and comparison groups remained despite direct matching: Women using shelter were slightly younger, more likely to identify themselves as black, and more likely to live in the Boston area (exhibit 1). These variables were included as covariates in subsequent multivariable analyses. Risk scores were not significantly different.

Women who used shelter had significantly higher rates of alcohol, opioid, and nonopioid drug use disorders; adjustment, anxiety, and depressive disorders; injuries due to external causes; and complications during pregnancy and birth than the comparison group (exhibit 2). Shelter users also had higher rates of injuries and substance use and mental health disorders in the year before pregnancy (data not shown).

Except for spontaneous abortion, the adjusted odds of having pregnancy-related conditions and complications were significantly higher among homeless than among comparison women, after we adjusted for age, year of pregnancy, nonwhite race, unknown race, and region of last residence (exhibit 3). Adjusted odds remained substantially the same after further adjustment for the presence of co-occurring alcohol, opioid, and nonopioid drug use disorders and adjustment, anxiety, and depressive disorders. Compared to women who did not use homeless shelter, those who did had more than twice the odds of experiencing a complication that affected their health during birth (adjusted odds ratio: 2.6) and almost twice the odds (AOR: 1.9) of preterm labor or a hemorrhage during pregnancy, as well as significant differences in other complications. Stillbirths were infrequent and not significantly higher in the shelter group ($n = 32$; 0.35 percent) than in the comparison group ($n = 23$;

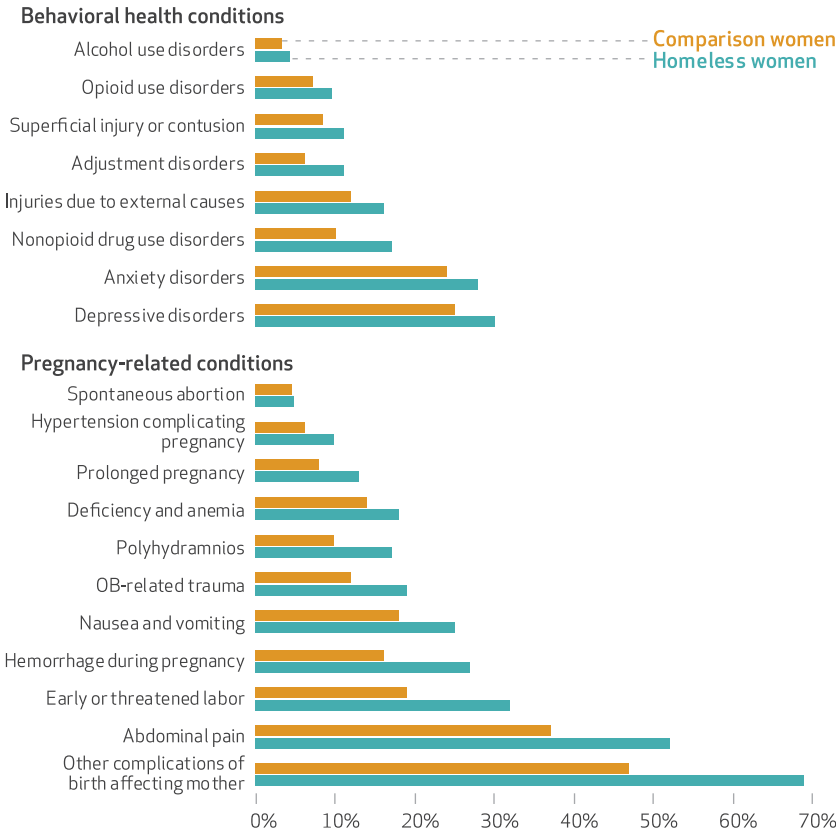
0.26 percent; $p = 0.29$) (data not shown).

The groups also varied in the services they used while pregnant. Women in the shelter group had significantly fewer ambulatory care visits during pregnancy, despite having more complications (exhibit 4). More than half of the members of each group visited the ED one or more times while pregnant, but ED use was more widespread in the shelter group (76 percent versus 59 percent). The mean number of ED visits per 100 person-months during pregnancy varied substantially within groups but was similar for the shelter and comparison groups: twenty-four in the shelter group and twenty-five in the comparison group. Pregnant women in the shelter group also had many more months during which they received no reimbursable health care (61 percent versus 18 percent). Induced abortion rates were much lower in the shelter group ($n = 763$; 8.4 percent) than in the comparison group ($n = 1{,}448$; 17 percent; $p < 0.0001$) (data not shown).

Sensitivity analyses that compared complications for women before and after entering shelter and adjusted for all of the variables in the full model used in exhibit 3 showed higher rates of hemorrhage (AOR: 1.5; 95% confidence interval: 1.3, 1.6) and birth complications that affected the mother (AOR = 1.2; 95% CI: 1.1, 1.3) while in shelter compared to before shelter entry. Other complication rates were not significantly different in the two periods.

EXHIBIT 2

Health conditions during pregnancy in homeless and comparison women in Massachusetts, January 1, 2008–June 30, 2015



SOURCE Authors' analysis of data from Emergency Assistance records and MassHealth claims. **NOTES** The pregnant and comparison groups are explained in the notes to exhibit 1. All comparisons between the two groups are significant ($p < 0.001$), except for spontaneous abortion. Polyhydramnios refers to excessive accumulation of amniotic fluid. More detailed descriptions of some of the conditions are in exhibit 3. OB is obstetrics.

Discussion

Women who used emergency shelter for homeless families had significantly greater odds of a range of complications during pregnancy and childbirth, compared to a similar group that did not use shelter. Associations between shelter use and pregnancy complications were not explained by mental health or substance use disorders, which also occurred more often in the shelter group than in the comparison group. Higher injury rates, while not traceable to specific causes with the available data, indicate that homeless women also faced significantly greater physical risks in the periods during and surrounding pregnancy. The persistent strong effect of homelessness after matching and adjustment for a range of other characteristics and conditions suggests that it is an independent risk factor for pregnancy complications, or that unique social factors associated with homelessness place women at greater risk. Treating behavioral health disorders—an important contributor to pregnancy complications—alone might not be sufficient to reduce risk if women continue to be unstably housed.

Pregnancy complications ranged from those that are fairly common during pregnancy (such as nausea) to less common, even life-threatening, ones (such as hemorrhage and threatened labor). Some are associated with preterm birth and low birthweight—which, in turn, may have long-term health consequences for infants and children.[24–26] With the exception of spontaneous abortion, all complications were significantly more likely among women who used shelter. Most complications were higher in the homeless group before as well as after shelter entry. Families often experience several months of stressful events, unstable housing, or both before becoming literally homeless and qualifying for emergency shelter. Shelter-based interventions to improve prenatal care are likely to be helpful but may be received too late to reduce risk to a level comparable to that of women living in more stable housing.

Less consistent health care use before and

EXHIBIT 3

Odds of homeless pregnant women with Medicaid coverage in Massachusetts having selected pregnancy-related conditions compared with women in the comparison group, by homeless status, January 1, 2008–June 30, 2015

	Adjusted odds ratios	
Condition	**Partial model[a]**	**Full model[b]**
Spontaneous abortion	1.1	1.1
Hypertension complicating pregnancy, childbirth, or the puerperium	1.5	1.5
Prolonged pregnancy	1.7	1.7
Deficiency and other anemia	1.3	1.3
Polyhydramnios and other problems of amniotic cavity	1.8	1.7
OB-related trauma to perineum and vulva	1.5	1.6
Nausea and vomiting	1.5	1.3
Hemorrhage during pregnancy, abruptio placenta, or placenta previa	1.9	1.9
Early or threatened labor	2.0	1.9
Other complications of birth affecting management of the mother	2.6	2.6

SOURCE Authors' analysis of data from the Department of Housing and Community Development and MassHealth. **NOTES** The pregnant and comparison groups are explained in the notes to exhibit 1. All comparisons between the two groups are significant ($p < 0.001$), except for spontaneous abortion. A version of this exhibit showing 95% confidence intervals is in the appendix (see note 19 in text). [a]Adjusted for age, year of pregnancy, nonwhite race, unknown race, and region. [b]Adjusted for the characteristics in the partial model and for alcohol, opioid, and nonopioid drug use disorders; and adjustment anxiety, and depressive disorders.

during pregnancy likely contributed to more frequent pregnancy and birth complications in the shelter group. Women in that group had fewer ambulatory care visits and a greater probability of one or more ED visits, and they also had substantially more months with no billable care at all. Many of the conditions treated in EDs could have been avoided with more consistent preventive care. Though the goal is to place families in shelter near their former residence and source of prenatal care, limited shelter availability and need for rapid placement sometimes result in women's being placed in a more distant location. Placements outside of their original community, coupled with transportation problems, may disrupt established relationships with providers

EXHIBIT 4

Service use by pregnant women with Medicaid coverage in Massachusetts, by homeless status, January 1, 2008–June 30, 2015

	Year before index pregnancy		Year during index pregnancy	
	Homeless women ($n = 6,971$)	**Comparison women ($n = 6,977$)**	**Homeless women ($n = 9,124$)**	**Comparison women ($n = 8,757$)**
EMERGENCY DEPARTMENT USE				
Number with any use	5,072	4,447	6,949	5,143
Percent with any use	56	51	76	59
Mean number of visits per 100 person-months	19	23	24	25
SD	55	59	62	63
AMBULATORY CARE				
Mean number of visits per 100 person-months	56	86	89	110
SD	110	140	89	110
Months with no expenditures				
Number	58,235	19,484	62,400	15,832
Percent	68	25	61	18
Expenditures per month ($)				
Mean	251.65	790.49	569.19	1,193.35
SD	1,160.20	2,640.74	2,110.23	3,382.84
Median	0.00	210.77	0.00	301.96
Interquartile range	0.00, 107.87	0.13, 631.00	0.00, 284.77	36.42, 819.83

SOURCE Authors' analysis of data from the Department of Housing and Community Development and MassHealth. **NOTES** The pregnant and comparison groups are explained in the notes to exhibit 1. The index pregnancy is the first pregnancy occurring for each woman during the study period. All comparisons between the two groups are significant ($p < 0.001$).

Behavioral health disorders and housing instability are independent factors that should be addressed simultaneously.

and require women to look for new ones, which makes it difficult to maintain continuity of care and leads them to have fewer ambulatory care visits and rely more heavily on EDs for care.[27] Greater exposure to domestic violence may also have played a role in the outcomes.[28]

Significantly higher rates of induced abortion among women in the comparison group cannot be fully explained with the data available for this study. However, pregnancy has been associated with a higher risk of homelessness, and pregnancy termination may reduce that risk.[1–4] The variation in rates is likely not a consequence of differential insurance coverage, since abortion is covered by MassHealth with state funds.

Policy Implications

Recent increased attention to the social determinants of health and efforts by the Centers for Medicare and Medicaid Services to support an expanded role for health care providers in identifying and referring patients who need social assistance are important steps toward addressing the Triple Aim of providing better care at lower cost, with improved health. Policies that encourage health care providers to identify pregnant women in unstable housing and help them quickly access safe, affordable housing during pregnancy are essential for ensuring healthy pregnancies. Where safe, affordable housing is not available, public incentives or interventions may be needed to increase access. This analysis and previous work indicate that the timing of interventions is also critical. Early and regular screening of pregnant women for unsafe or unstable housing is necessary to ensure continuous care, reduce pregnancy complications, and lower costs.[29]

Working closely with housing and social service agencies to stabilize housing during pregnancy is an important goal. However, given the role of domestic violence and other unsafe situations leading to homelessness, it is not feasible or even desirable to prevent all housing transitions during pregnancy. Our analyses suggest that health care providers and systems could improve the experience and outcomes of pregnancy by ensuring that pregnant women receive appropriate prenatal care that follows them as they transition from one housing situation to another.

Treatment of mental health and substance use disorders during pregnancy is clearly also important. Higher rates of depressive, anxiety, adjustment, and substance use disorders contribute to pregnancy and birth complications.[30] Concern about the safety of using psychotropic medications during pregnancy often leads to discontinuation of treatment and relapse.[31] Our findings indicate that behavioral health disorders and housing instability are independent factors that should be addressed simultaneously.

Although homelessness is strongly associated with the health of mothers and children, it is unlikely that health care providers alone can adequately address the conditions that place homeless women at greater risk during pregnancy. Family homelessness is linked to policies that govern eviction, housing supply, income support, living costs, domestic violence, and a variety of other conditions over which health care providers have little influence.[14] Health care providers can address the more immediate consequences of homelessness for families. Ultimately, the most effective and efficient solutions to family homelessness require action at the federal, state, and local policy levels that goes well beyond health care alone. The long-term health consequences and costs that accompany low birthweight and other conditions associated with risky pregnancies justify a substantial investment in prevention.[24,32,33] ■

All of the authors' work on this article was supported by the Health Resources and Services Administration (HRSA) (Grant No. R40MC30755), an operating division of the Department of Health and Human Services (HHS). Robin Clark is the principal investigator. The authors thank the Massachusetts Department of Housing and Community Development and the Office of MassHealth for granting permission to use the data analyzed in this article. The authors especially thank William Bartosch for his assistance in acquiring and understanding the Emergency Assistance data and for comments on an earlier version of the article. The contents are solely the responsibility of the authors and do not necessarily represent the official views of HRSA, HHS, or any Commonwealth of Massachusetts agency or program.

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APPENDIX

Appendix 1

Codes used to identify pregnancy complications.

ccslabel	Frequency	Percent	Pregnancy Complications	Pregnancy Indicator
0098 Essential hypertension	121692	0.67	X	
0099 Hypertension with complications and secondary	8469	0.05	X	
0100 Acute myocardial infarction	2346	0.01	X	
0115 Aortic; peripheral; and visceral artery aneur	915	0.01	X	
0116 Aortic and peripheral arterial embolism or thrombosis	370	0	X	
0118 Phlebitis; thrombophlebitis and thromboemboli	12530	0.07	X	
0177 Spontaneous abortion	6418	0.04	X	X
0178 Induced abortion	23066	0.13		X
0179 Postabortion complications	610	0	X	X
0181 Other complications of pregnancy	168322	0.93	X	X
0182 Hemorrhage during pregnancy; abruptio placent	29013	0.16	X	X
0183 Hypertension complicating pregnancy; childbir	19407	0.11	X	X
0184 Early or threatened labor	37711	0.21	X	X
0185 Prolonged pregnancy	9462	0.05		X
0186 Diabetes or abnormal glucose tolerance compli	20112	0.11	X	X
0187 Malposition; malpresentation	6592	0.04		X
0188 Fetopelvic disproportion; obstruction	2907	0.02		X

0189 Previous C-section	11358	0.06		
0190 Fetal distress and abnormal forces of labor	7849	0.04		X
0191 Polyhydramnios and other problems of amniotic	14295	0.08		X
0192 Umbilical cord complication	7576	0.04		X
0193 OB-related trauma to perineum and vulva	9594	0.05		X
0194 Forceps delivery	515	0		X
0195 Other complications of birth; puerperium affe	150889	0.84		X
0196 Normal pregnancy and/or delivery	289585	1.6		X
0218 Liveborn	67611	0.37		X
0219 Short gestation; low birth weight; and fetal	82658	0.46		X
0220 Intrauterine hypoxia and birth asphyxia	3446	0.02		X
0221 Respiratory distress syndrome	12515	0.07		X
0222 Hemolytic jaundice and perinatal jaundice	17721	0.1		X
0223 Birth trauma	2096	0.01		X

Appendix 2

SUPPLEMENTAL EXHIBIT 3: Pregnancy-related Conditions: Homeless vs Comparison with 95% Confidence Intervals

	Partial Model[1] Adjusted Odds Ratios (CIs)	Full Model[2] Adjusted Odds Ratios (CIs)
Spontaneous abortion	1.1 (0.93, 1.2)	1.1 (0.93, 1.2)
Hypertension complicating pregnancy; childbirth and the puerperium	1.5 (1.3, 1.7)	1.5 (1.3, 1.6)
Prolonged pregnancy	1.7 (1.5, 1.9)	1.7 (1.6, 1.9)
Deficiency and other anemia	1.3 (1.2, 1.4)	1.3 (1.2, 1.4)
Polyhydramnios and other problems of amniotic cavity	1.8 (1.6, 1.9)	1.7 (1.6, 1.9)
OB-related trauma to perineum and vulva	1.5 (1.4, 1.7)	1.6 (1.4, 1.7)
Nausea and vomiting	1.5 (1.4, 1.6)	1.3 (1.2, 1.4)
Hemorrhage during pregnancy; abruptio placenta; placenta previa	1.9 (1.8, 2.1)	1.9 (1.7, 2.0)
Early or threatened labor	2.0 (1.9, 2.2)	1.9 (1.8, 2.1)
Other complications of birth affecting management of mother	2.6 (2.5, 2.8)	2.6 (2.4, 2.8)

[1] Adjusted for age, year of pregnancy, non-white race, unknown race, and region

[2] Adjusted for age, year of pregnancy, non-white race, unknown race, region, alcohol, other drug, opioid, adjustment disorder, anxiety, and depression