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The Association of Housing Stress, Health, Chronic Disease and Health Care Resources: Results from the 2011 North Carolina BRFSS Survey

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Abstract

Prior research has found an association between mortgage delinquency and foreclosure and poor physical and mental health. A new question on housing stress was included in the 2011 Behavioral Risk Factor Surveillance System (BRFSS) survey. In this study, we analyze 2011 BRFSS survey data to investigate how rates of poor health, chronic conditions and limited access to health resources vary between those who report high levels of worry or stress about not having enough money to pay their rent or mortgage, compared to those who report lower levels of stress. Study outcomes include eight indicators related to self-perceived poor health, high blood pressure, diabetes, doctor-diagnosed depression and limited access to health care. The results show that for all study outcomes, the model-adjusted prevalence rates were statistically significantly higher for the high stress group, compared to the comparable rates for the low stress group. The results of this study support the contention that housing stress is not only a financial or economic concern, but also a public health issue.

Introduction

Since 2008, when home prices fell across the country and home foreclosures became widespread, public health research has found that home foreclosure was strongly associated with poor physical and mental health, chronic disease and limited access to health resources. A study conducted among Philadelphia region home owners undergoing mortgage foreclosure found that those in foreclosure had significantly higher rates of hypertension, heart disease and psychiatric conditions compared with a community sample.¹ An Internet panel study of home owners found that self-rated poor health was significantly higher among those in default or foreclosure, compared to renters, home owners not yet in foreclosure (but had at least one late mortgage payment, or paid 30% or more of their monthly income in housing costs) or home owners with no late payments in the past year.² Mortgage delinquency, defined as two or more months payment-delinquent, has also been found to be highly associated with self-rated poor health and medication non-adherence due to cost.³

In this study, we investigate how rates of poor health, chronic conditions and limited access to health resources vary between those who report high levels of worry or stress about not having enough money to pay their rent or mortgage, compared to those who report lower levels of stress. We postulate that respondents reporting persistent stress or worry about housing costs are likely to have higher rates of adverse health outcomes than respondents reporting lower levels of housing stress, similar to study results for those in the process of home delinquency or in home foreclosure.

Methods

The BRFSS Survey

The BRFSS survey is a random-digit-dial telephone survey of the civilian, noninstitutionalized U.S. population 18 years of age or older that is conducted annually by state health departments in collaboration with the Centers for Disease Control and Prevention (CDC). The BRFSS survey collects information on health behaviors, chronic disease and use of preventive services.

Study Groups

The study groups were derived from the BRFSS survey question: “How often in the past 12 months would you say you were worried or stressed about having enough money to pay your rent/mortgage?” The interviewer would then read five response categories, ranging from always worried to never worried.

Those who responded to the stress question were divided into three study groups. Those who reported *always* or *usually* worried (persistent worry) about housing costs were assigned to the high stress group; those reporting *sometimes* worried about housing costs were assigned to the moderate stress group and those reporting *rarely* or *never* worried about costs were assigned to the low stress group.

Dependent/Outcome Variables

The domain for poor health was derived from two survey questions. The first indicator, *poor general health* was assigned to respondents who reported that in general their health was either fair or poor. The second indicator, *poor recent health* was assigned to respondents who reported having 14 or more days in the past 30 days when their mental or physical health was not good. The chronic disease indicators included those who reported having one or more of the following doctor-diagnosed conditions: depression, diabetes or high blood pressure.^{1,3} The chronic diseases or conditions examined in this report have been studied in previous research. The indicator for health care was comprised of those who reported 1) not having any health insurance, 2) not having a routine check-up in the past year or 3) not being able to visit a doctor in the past year because of cost.

Analysis

In the first analysis we cross-tabulated selected demographic characteristics by the three study groups. The results of this analysis are presented in Table 1.

In the second analysis, we used multiple logistic regression to calculate adjusted prevalence rates for the study outcomes for *each* level of housing stress, after controlling for the effects of additional stress factors, such as low income, divorce or unemployment. These adjusted rates are referred to in the literature as predicted marginals.⁴ We also computed risk-ratios using the adjusted values for high and moderate stress, compared to the values of low stress, the reference group. Separate models were constructed for each outcome, with the Hosmer and Lemeshow goodness-of-fit test used to determine the “best” set of independent variables to include in the model.⁵ The control variables used in developing the models included age, race, sex, education, income, marital status, employment status, renter/owner status and obesity—the latter included only in the model for diabetes.

To calculate the adjusted rates (predicted marginals), all respondents were assigned to the same level of housing stress and the fitted model was then used to compute the predicted probability of the outcome for each respondent using the respondent’s actual covariate values (e.g.,

Table 1.
Weighted Percent of Adult Demographic Characteristics By High, Moderate
and Low Housing Stress: 2011 N.C. BRFSS Survey

Demographics	Housing Stress					
	High		Moderate		Low	
	N	%	N	%	N	%
Sex						
Males	441	41.0	517	42.1	2,491	51.1
Females	978	59.0	1,093	57.9	3,760	48.9
Age						
18-44	459	51.4	507	51.6	1,377	41.9
45-64	734	41.1	712	35.8	2,474	36.3
65+	216	7.5	377	12.6	2,341	21.8
Race						
White	1,004	68.1	1,109	63.1	5,009	74.7
Black	253	21.1	350	25.7	844	18.0
Other	151	10.8	140	11.2	364	7.2
Education						
High school, GED* or less	738	54.2	785	52.7	2,152	37.9
Post high school	395	31.8	422	32.1	1,521	30.5
College or more	283	14.0	400	15.2	2,568	31.6
Marital Status						
Married	612	46.8	805	50.7	3,754	60.3
Divorce/separated	411	21.7	308	14.8	847	10.8
Widowed/never married	391	31.5	491	34.5	1,633	28.9
Income						
Less than \$15,000	394	26.2	246	16.4	379	6.7
\$15,000 to \$24,999	390	33.9	373	30.2	799	14.8
\$25,000 to \$34,999	145	11.8	196	12.3	575	10.5
\$35,000 to \$49,999	134	11.3	216	15.5	837	16.2
\$50,000+	186	16.7	377	25.6	2,624	51.7
Employment						
Employed**	587	50.9	799	55.8	2,901	57.1
Unemployed	240	18.6	158	13.2	250	5.3
Unable to work	307	15.7	171	7.6	310	4.5
All other	282	14.7	477	23.4	2,777	33.0
Housing Status						
Home owner	902	61.4	1,136	64.6	5,341	80.6
Renter	517	38.6	474	35.4	910	19.4
Total by Group	1,419	18.0	1,610	19.3	6,251	62.7

* GED (General Equivalency Diploma).
** Includes self-employed.

unemployed, divorced or male). The weighted mean of these individual predicted probabilities is the marginal prediction for each level of housing stress. Predicted marginals allow us to make comparisons between groups, after controlling for the effect of other covariates in the model.⁶ In the report, these multivariate-adjusted means are expressed as a percentage. Hereafter, predicted marginals in this study will be referred to as adjusted rates, or model-adjusted rates. Assumptions made in the calculation and interpretation

of predictive marginals include: the model is correctly specified, that covariates would be unaffected by assignment of individuals to different risk or treatment groups and missing data are missing completely at random.^{4,6}

All results in this study were derived from the SAS-Callable SUDAAN software (SUDAAN release 10.0.2), designed for analysis of complex survey data. Only weighted percentages are shown in this report.

Results

Demographic Characteristics

A total of 1,419 respondents reported high levels of worry or stress regarding paying their mortgage or rent in the past year. A total of 1,610 indicated moderate stress, and 6,251 respondents revealed low levels of stress. Weighting these responses shows that an estimated 18 percent of the state's adult population had high housing stress in 2011, while an estimated 19.3 percent had moderate stress, and the remaining 62.7 percent had low stress (Table 1).

Table 1 shows that females were more heavily represented in both the high (59.0%) and moderate stress groups (57.9%), compared to their distribution in the low stress group (48.9%). Similar patterns existed for age and education. Regarding age, we found a greater percentage of young adults (18–44 years) in the high and moderate stress groups, and, conversely, a much smaller proportion of older adults (65+ years) in the high and moderate stress groups. Similarly, the percentage of those who reported having a high school education or less was higher in both the high and moderate stress groups, compared to those with higher levels of education. Regarding race, there was a somewhat higher proportion of blacks in the high and moderate stress groups, while the reverse was true for whites.

There was also a large gap in household income by levels of housing stress—as could be expected. In the high stress group, about 60 percent of respondents reported annual household incomes (from all sources) below \$25,000; this compares to 46.6 percent in the moderate stress group and 21.5 percent in the low stress group. The percentage of respondents indicating that they were divorced also increased in stepwise fashion from low to high housing stress.

Unemployment among those in the high stress group was 18.6 percent (nearly two in 10 adults), compared to 13.2 percent for the moderate group and 5.3 percent for the low stress group. The proportion of respondents unable to work (15.7%) was also highest among the high stress group.

Regarding home owner and renter status, about one in three respondents in the high or moderate stress groups were renters, compared to about one in five in the low stress group.

Study Outcomes

Table 2 shows that the model-adjusted risk ratios for all study outcomes were statistically significantly higher for

the high stress group, compared to the low stress reference group.

The risk of poor general health was significantly higher for both the high and moderate stress groups, with model-adjusted risk ratios of 1.8 ($p<0.01$) and 1.3 ($p<0.01$), respectively. Similar results were obtained when comparing high versus low stress and chronic conditions. The adjusted rates of high blood pressure and diabetes were both 40 percent higher in the high stress group, compared to the estimates for their low-stress counterparts. Moreover, the adjusted rate for depression was 2.2 times higher in the high stress group. When comparing the risk ratios for moderate versus low stress, the rate of high blood pressure was 1.2 times higher and the rate of depression was 1.5 times higher, both ratios were statistically significant.

Access to health care was also associated with housing stress. This was particularly evident in the high stress group. The adjusted rates of not having any health insurance (22.7%), not having a routine check-up in the past year (37.2%) and not being able to afford a doctor visit in the past year (36.3%) were all statistically significantly higher among those reporting high levels of housing stress compared to those with low housing stress.

Discussion

This study found that respondents in the high stress group, compared to the low stress group, had statistically significantly higher model-adjusted rates for all eight of the health-related outcomes examined. The significant findings of excess hypertension and depression found in our sample of those with high housing stress are consistent with findings from the 2008 Philadelphia study. In the latter study, adults in home foreclosure had a significantly higher adjusted odds of hypertension (1.67, $p<0.01$) and depressive symptoms (1.96, $p<0.01$), compared to the odds of the community sample. Likewise, our analysis found that the prevalence risk of hypertension was 1.4 times higher and the risk of doctor-diagnosed depression was 1.9 times higher in the high stress group.

The results of this study also provide some evidence of a gradient of housing stress associated with poor health outcomes and reduced access to medical care. In the Internet panel study (cited earlier), the prevalence of self-rated fair or poor health among home owners with moderate strain (i.e., housing costs at least 30% of monthly income but not in foreclosure), was statistically significantly higher than among homeowners with no strain. We found similar results for poor general health

Table 2. Model-adjusted Rates (Predicted Marginals) of Housing Stress on Poor Health, Chronic Disease, and Access to Health Care: Results from the 2011 N.C. BRFSS Survey

Study Outcomes	Housing Stress			Adjusted Risk Ratios	
	High %	Moderate %	Low %	High vs. Low	Moderate vs. Low
Poor Health Status					
Poor general health	29.0	20.2	16.1	1.8 [†]	1.3 [†]
Poor recent health ^a	26.3	12.3	13.7	1.9 [†]	0.9 (ns)
Chronic Disease					
High blood pressure	41.4	35.7	30.1	1.4 [†]	1.2 [†]
Diabetes	14.6	12.2	10.4	1.4 [†]	1.2 (ns)
Depression	29.2	19.6	13.1	2.2 [†]	1.5 [†]
Access to Health Care					
No health insurance	22.7	20.3	17.4	1.3 [†]	1.2 (ns)
No routine check-up ^b	37.2	27.6	23.5	1.6 [†]	1.2 (ns)
Cost restricted doctor visit ^c	36.3	21.0	9.9	3.7 [†]	2.1 [†]

(ns) not statistically significant; [†]p < 0.01.

^a Self-report of 14 or more days in the past 30 when physical or mental health was not good.

^b Has not visited a doctor in the past year for a routine checkup.

^c Needed to see a doctor in the past 12 months but could not because of cost.

significantly elevated among the moderate stress group, compared to the low stress group. Furthermore, the model-adjusted risk ratios for moderate stress were statistically higher for four of the eight outcomes examined.

The results of this study suggest that persistent worry or stress about insufficient funds for housing costs has a similar association with poor health and limited access to health resources, as does being in home delinquency or foreclosure. When controlling for potential confounders, the results of this study demonstrate that housing stress is an independent risk factor associated with poor health outcomes, including diabetes, depression, hypertension and reduced access to medical care.

The results of this study support the contention that housing stress, or “housing instability,” is not only a financial or economic concern, but also a public health issue. People with high levels of housing stress are a vulnerable and identifiable population that are at risk for poor health and greater difficulty accessing health care than people with low housing stress. Going forward, public health could play a role in addressing housing stress by bringing needed awareness to the health risks associated with housing strain and by building new partnerships with mortgage relief programs, such as the Consumer Credit Counseling services or U.S. Department of Housing and Urban Development (HUD) programs, such as the Home Investment Partnerships program, which provides block grant funding to states and communities for low income housing.

References

1. Pollack CE, Lynch J. Health status of people undergoing foreclosure in the Philadelphia region. *American Journal of Public Health*. 2009;99(10):1833–39.
2. Cannuscio C, Alley DE, Pagán JA, Soldo B, et.al. Housing strain, mortgage foreclosure, and health. *Nursing Outlook*. 2012;60(3):134–42.
3. Alley DE, Lloyd J, Pagán JA, Pollack CE, Shardell M, Cannuscio C. Mortgage delinquency and changes in access to health resources and depressive symptoms in a nationally representative cohort of Americans older than 50 years. *American Journal of Public Health*. 2011;101(12):2293–98.
4. Graubard BI, Korn EL. Predictive margins with survey data. *Biometrics*. 1999;55(2):6752-59.
5. Research Triangle Institute. SUDAAN Language Manual, Release 10.0. Research Triangle Park, North Carolina: Research Triangle Institute; 2008.
6. Bieler GS, Brown GG, Williams RL, Brogan DJ. Estimating Model-Adjusted Risks, Risk Differences and Risk Ratios from complex survey data. *American Journal of Epidemiology*. 2010;171:618–23.

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