



The harder they fall? Sex and race/ethnic specific suicide rates in the U.S. foreclosure crisis



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ARTICLE INFO

Article history:

Received 13 September 2016

Received in revised form

14 March 2017

Accepted 17 March 2017

Available online 19 March 2017

Keywords:

Suicide

Foreclosure crisis

Social inequality

ABSTRACT

Previous work shows suicide rates increase during economic recessions, but little research has examined the extent to which the foreclosure crisis—a unique aspect of the Great Recession—has contributed to disparities in rising suicide rates by race and sex. We develop and test two competing hypotheses regarding the association between foreclosures and race by sex specific suicide rates. We link foreclosure data (RealtyTrac) and suicide data (CDC) from 174 metropolitan areas from 2005 to 2010 (1044 MSA-year observations) and find that—net of time invariant unobserved between-metro area differences, national time trends, and time-varying confounders—a rise in the foreclosure rate is associated with a marginal increase in suicide, but this main effect masks considerable heterogeneity across groups. The association is particularly strong for white males, and weaker or non-existent for other race by sex groups.

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1. Introduction

The Great Recession and the concomitant foreclosure crisis was the worst economic disaster since the Great Depression. Between 2005 and 2010, over 15 million homes experienced a foreclosure in the United States (RealtyTrac, 2015a), with devastating consequences for families and communities (Houle, 2014). Given the massive scope of the housing crisis, combined with a spike in suicide rates in recent years (Reeves et al., 2012), it is unsurprising that social scientists have sought to understand the consequences of the widespread foreclosures for population health and well-being (Houle, 2014; Keene et al., 2015; Osypuk et al., 2012; Pollack and Lynch, 2009).

However, while prior research suggests that the economic downturn contributed to rising suicide rates over the recessionary period (Phillips and Nugent, 2014; Reeves et al., 2012; Stuckler and Basu, 2013), comparatively little work has examined to extent to which the strain of wide-spread home foreclosures is associated with racial/ethnic and sex-specific suicide rates in recent years.

Investigating variation in the consequences of the housing crisis provides an opportunity to examine two puzzling trends for health

researchers. On the one hand, Black and Hispanic men and women—who had access primarily to high interest predatory loans—bore the brunt of the foreclosure crisis, and foreclosures were disproportionately concentrated among disadvantaged and minority communities (Hall et al., 2015; Immergluck, 2009; Rugh and Massey, 2010). To the extent that absolute levels of economic deprivation contributes to suicide risks, it is plausible that foreclosures may have had a larger impact on the suicidal behavior of these minority men and women. However, the trends in suicide during the recession do not generally align with this view. For example, Fig. 1 shows that within U.S. metropolitan areas, racial/ethnic-gender disparities in suicide increased during the recession primarily due to the rise in suicides among white men. For nearly all other groups, suicide rates remained stable. Informed by theories of relative deprivation, this provides suggestive evidence that the increase in foreclosures may be especially consequential for groups that traditionally enjoy high status roles (e.g. white men) but experience conflict or threats to this high status during the recession.

In this paper, we offer the first empirical test of these competing hypotheses by examining the links between the U.S. foreclosure crisis and changes in sex and race-specific suicide rates from 2005 to 2010. In doing so, we provide the first test (to our knowledge) of the association between changing foreclosure rates and suicide rates over time at the metropolitan level. The only macro-level analysis of the foreclosure-suicide link has been conducted at the

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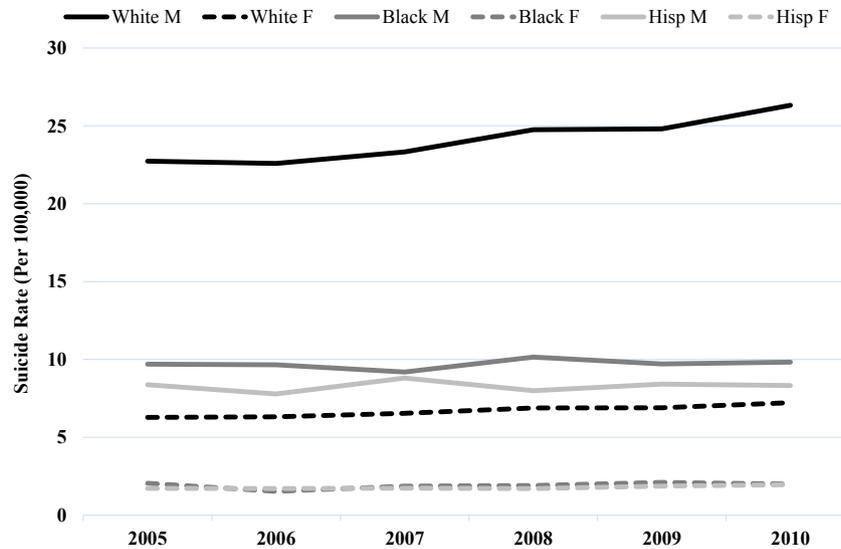


Fig. 1. Suicide rates for race/ethnicity by gender groups, 2005–2010.

state-level (Houle and Light, 2014), thus masking considerable sub-state variation in ways that likely miss important community-level links between concentrated foreclosures and suicide. For example, the foreclosure rate in the Fort Meyers metropolitan area in 2009 was nearly 16 percent, while the foreclosure rate for the state of Florida was only 7.4 percent. By utilizing metropolitan areas as the unit of analysis, our approach provides an opportunity for a more in-depth examination of the foreclosure-suicide link compared to state-level analyses.

2. Background

Decades of social science research suggests that suicide rates climb during economic recessions, and decline during economic booms. Stack and Haas (1984) theorize high unemployment increases suicide rates via an array of mechanisms for both those who do and do not personally experience job loss, including low self-esteem, shame, anxiety, social isolation, economic troubles, fear of unemployment, and stress in social relationships. Modern social science research on recessions and suicide supports these notions, and shows that, over time, increases in the local unemployment rate are associated with a rise in the suicide rate, net of a range of potential confounders (Phillips and Nugent, 2014; Ruhm, 2003). This is especially the case during the Great Recession, when the national unemployment rate exceeded 10% and suicide rates increased rapidly (Reeves et al., 2012). However, the vast majority of this research has neglected the potential contributing role of the foreclosure crisis—a defining characteristic of the recession—to the recent suicide trends.

This is an important omission for two reasons. First, unlike prior recessions—which were primarily employment recessions—the foreclosure crisis was unprecedented in its scope and depth. Spurred by decades of financial deregulation and risky borrowing practices by banks, millions of families lost their homes between 2007 and 2010, with more than 2% of all homes in foreclosure at the recession's peak. During this time, U.S. households lost a great deal of their wealth, as housing values and home equity declined sharply (Wolff, 2012). And while many consider the Great Recession to be in the rearview mirror, foreclosures in April 2015 increased 9% from one year prior, where

one out of every 1000 homes—or nearly 132,000 properties—received a foreclosure filing (RealtyTrac, 2015a). Importantly, the fallout from the foreclosure crisis has mirrored and exacerbated existing social inequalities, disproportionately affecting disadvantaged and minority communities and families (Hall et al., 2015; Immergluck, 2009; Rugh and Massey, 2010).

Second, rising foreclosures may be particularly salient for suicide given the extensive deleterious consequences of the housing crisis at both the individual and contextual level. Our analysis measures suicide and foreclosures at the aggregate (MSA) level, but these aggregate associations reflect both theoretically relevant individual and contextual-level effects of foreclosures on well-being. For those who lose their home to foreclosure, the loss invokes non-material and material stressors. It represents a significant loss of wealth (Nettleton and Burrows, 2000), and invokes feeling of shame, loss, stigma, identity crises, and a sense of failure to maintain the American Dream (Keene et al., 2015; Libman et al., 2012; McCormack, 2012). At the contextual level, the foreclosure crisis transformed the social fabric of many communities in the United States, in ways that are germane to both social integration and suicide. A rise in local area foreclosures is associated with declines in community resources such as home values and family wealth (Harding et al., 2009; Immergluck and Smith, 2006a), tax revenue (Joint Economic Committee, 2007), community investment (Kingsley et al., 2009), social capital (Estrada-Correa and Johnson, 2012), and residential stability (Li and Morrow-Jones, 2010). Foreclosure rates are also associated with a rise in community stressors, such as abandoned properties (Joint Economic Committee, 2007), crime (Arnio et al., 2012; Immergluck and Smith, 2006b), and feelings of insecurity and mistrust (Ross and Squires, 2011). In line with this view, several studies suggest that the experience of foreclosure (Cannuscio et al., 2012; McLaughlin et al., 2012; Pollack and Lynch, 2009; Pollack et al., 2011) and living in high foreclosure areas (Arcaya et al., 2013, 2014; Cagney et al., 2014; Currie and Tekin, 2015; Houle, 2014) is associated with poor health and mental health outcomes. Taken together, this body of work suggests the following hypothesis:

H1. *Rising foreclosure rates in metro areas will be associated with a rise in the overall suicide rate of that metro area.*

Only one study to date has directly examined the link between foreclosures and suicide. Using state-level data from 2005 to 2010, [Houle and Light \(2014\)](#) find that a within-state rise in the foreclosure rate is associated with a within-state increase in suicides, net of the unemployment rate and other state-level sociodemographic characteristics. Notably, they find that the association was most pronounced among the middle-aged (age 40–64), suggesting that there is substantial variation in the effect of foreclosures on suicide across social groups. While the findings from this study are informative, their analytical approach masks variation at the sub-state level and ignores potential heterogeneity in the foreclosure-suicide relationship by race/ethnicity and sex. Given the substantial amount of research on racial/ethnic and sex disparities in suicide ([Kubrin et al., 2006](#); [Wadsworth and Kubrin, 2007](#)), combined with the uneven impact of the foreclosure crisis on minority communities ([Hall et al., 2015](#)), a more nuanced analysis into the foreclosure-suicide nexus is warranted. Below, we present two competing hypotheses regarding the potential impact of the foreclosure crisis on suicide rates by race and sex.

2.1. Foreclosure and suicide: variation by race and sex

2.1.1. A double disadvantage? suicide among minority men and women in the foreclosure crisis

Research on the causes and distribution of the foreclosure crisis show that Black and Hispanic communities and families experienced higher rates of foreclosures than whites ([Hall et al., 2015](#); [Rugh, 2015](#)), in part because these minority groups were segregated, discriminated against, and were disproportionately exposed to predatory subprime loans with poor terms, which had a high risk of default ([Rugh and Massey, 2010](#); [Williams et al., 2005](#)). Even at equivalent levels of foreclosure, Black and Hispanic communities experienced higher social costs to home foreclosure than white communities, as lenders were more likely to allow foreclosed homes in these communities to become abandoned and fall into disrepair ([Houle, 2014](#); [National Fair Housing Alliance, 2012](#)). Supporting this notion, [Houle \(2014\)](#) shows that the negative association between rising foreclosure rates and individual mental health is stronger in minority communities than in whiter, more affluent areas. Moreover, prior research shows that social and economic conditions are predictive of the suicide rate among Hispanics ([Wadsworth and Kubrin, 2007](#)) and Blacks ([Kubrin et al., 2006](#)), which implies that the massive social and economic changes in the recession may have a larger impact on black and Hispanic suicide rates than white suicide rates. Thus, if high foreclosure rates are a risk factor for suicide, and blacks and Hispanics were more exposed to the community and individual-level stressors that resulted from the foreclosure crisis than whites, we might expect these minority groups to experience higher suicide rates in response to rising foreclosure rates. Based on this logic, we hypothesize the following:

H2. *Rising foreclosure rates within metro areas will be more strongly associated with the suicide rates for (a) black men and women and (b) Hispanic men and women rate than white men and women.*

2.1.2. A threat to white male privilege? suicide among white men in the foreclosure crisis

Understanding the extent to which the association between foreclosures and suicide varies across social groups is a particularly important area of social inquiry given that suicide rates increased faster for some demographic groups than others during the recession. Notably, suicide rates rose fastest among white men ([Sullivan et al., 2013](#)), suggesting that the recession may have

disproportionately impacted suicides among this group. This is somewhat puzzling as white men are the most economically and socially privileged group in the United States ([Ridgeway, 2014](#)). This provides suggestive, but not definitive, evidence that the foreclosure crisis may have disproportionately impacted suicide rates of white men relative to other social groups. Why might this be the case?

One explanation is relative deprivation. Theories of relative deprivation emphasize the importance of comparative, rather than absolute social status for health and well-being. Although many theories of social disparities in health and well-being focus on absolute levels of resources ([Link and Phelan, 1995](#)), social psychological theories of relative deprivation predict that the wider the disparity between what one expects and one receives, the greater stress and anxiety they experience ([McLeod, 2014](#)). Thus, we might expect high status groups who are accustomed to their status to experience the greatest increase in anxiety during times of economic and social turmoil. The recession and the foreclosure crisis may represent a particularly salient form of status threat or anxiety for white men, whose traditional high status was threatened, or at the very least, unstable ([Newman, 1999](#)). Social psychological research and theory on status beliefs support this notion. While status beliefs in the U.S. generally serve to privilege white men ([Ridgeway, 2014](#)), these status beliefs can create backlash and blame when these men experience economic turmoil and fail to fulfill their expected role as the primary breadwinner ([Komarovskiy, 1940](#)), thus creating role conflict. [Norris \(2016\)](#) refers to this phenomenon as “status mismatch” where one’s privileged identity status as a white man (provider; breadwinner) conflicts with their current status (foreclosed) and creates distress and a loss of meaning in life. According to Norris, in the face of recession, men (particularly white men) often feel as if they have lost a significant part of their identity and experience threats to their masculine role as providers, while women tend to turn to other aspects of their identity (such as motherhood) in the face economic hardship. Supporting this perspective, [Owens \(2014\)](#) finds that socially advantaged (white; middle-class) homeowners experienced the foreclosure crisis as an individual failure, blaming themselves and “going it alone”; while socially disadvantaged (minority; working class) homeowners found solace in “fellow travelers”, leaning on friends, family, and fellow foreclosed homeowners to help them cope with the crisis. Taken together, this suggests that traditionally advantaged groups (white men) may experience more shame, stigma, and status anxiety in the foreclosure crisis than other groups, and that we might consider these social psychological concepts as a collective phenomenon that could reflect differences in aggregate suicide rates.

Themes of white male anxiety are common in recent social science research. For example, [Carlson \(2015\)](#) shows that white male anxiety surrounding perceived threats to their dominant status explains high rates of gun ownership among whites. [Kimmel \(2006\)](#) also demonstrates that the pressure to be economically successful, particularly in times of economic uncertainty, is a major source of distress among white men. Indeed, the narrative of the erosion of the authority of white men and perceived status threats is evident in the formation of the Tea Party movement and the rise of “men’s rights” groups ([Coston and Kimmel, 2013](#); [Kimmel, 2013](#)).

Research on health and well-being also supports these notions. [Case and Deaton \(2015\)](#) show that suicide rates among white males have increased, which they speculate have been fueled by hopelessness. In response to this study, Philips hypothesized that white men may have experienced greater increases in suicide because they were socialized to believe that

they would experience upward social mobility and economic prosperity in a way that racial minority men were not. In other words, these men had further to fall when the recession hit and foreclosure notices started coming (Singal, 2015).

Taken together, the above theoretical arguments suggest that the impact of foreclosures on suicides may vary by sex and race. Specifically, this body of work posits that the foreclosure crisis is likely to have a larger effect on white male suicides than other race-sex groups, as the recession and foreclosure crisis created role conflict and insecurity for this traditionally privileged group. Based on the above argument and evidence, we hypothesize the following:

H3. *Rising foreclosure rates within metro areas will be more strongly associated with the white male suicide rate than other race by sex specific suicide rates.*

3. Data & methods

We test the above hypotheses using three primary data sources. We extracted suicide data from restricted geocoded suicide deaths provided by the CDC Underlying Cause of Deaths files for 2005–2010, which includes all death records in the United States. To obtain stable estimates of the suicide rate for each sub-group in our study, we chose metropolitan statistical areas (MSAs) that had a minimum of 5000 blacks and Hispanics in 2005. The results are substantively unchanged when we use 10,000 as the population cutoff (results available on request). In addition to providing a more precise examination of the foreclosure-suicide nexus beyond state-level data, metropolitan-level analysis is appropriate for several reasons. First, the overwhelming majority of both suicides and foreclosures occur in metropolitan areas, and 80% of the U.S. population currently reside in metropolitan areas (U.S. Census Bureau, 2015). Second, the use of metropolitan areas has considerable precedent in prior research on the social determinants of suicide (Burr et al., 1999; Denney et al., 2015). Finally, MSAs are particularly apt for understanding the influence of foreclosures because they represent reasonable approximations of housing markets (Iceland et al., 2002). To ensure geographic comparability of the results over time, all measures were aggregated using the Office of Management and Budget (2008) MSA definitions for all years.

Foreclosure measures come from proprietary data collected by RealtyTrac. RealtyTrac collects information on foreclosures from county assessors' offices in 2250 counties, providing coverage for over 90% of the U.S. population and nearly all of the real estate transactions in these counties during our study period. Finally, data on socioeconomic and demographic characteristics of MSA's are drawn from the American Community Survey for 2005–2010 (Ruggles et al., 2010). Combined, these interrelated sources of data provide the most comprehensive resource for examining the foreclosure-suicide link in metropolitan areas during the Great Recession.

Our final sample consists of 1044 MSA-year observations (174 MSA's x 6 years), and is highly representative of large, racially diverse metropolitan areas – accounting for 81%, 92%, and 90% of all metropolitan whites, blacks, and Hispanics, respectively, in 2010. It thus provides an opportunity to explore a wide range of metro-areas of varying levels of foreclosures and suicides and make generalizable conclusions about the links between the foreclosure crisis and group-specific suicide rates.

3.1. Suicide

We utilize several measures of suicide in our analysis. We first

examine the *overall suicide rate*, calculated as the number of suicides in each metro-area per 100,000 residents. We then calculate race/ethnicity by sex specific suicide rates for each race by sex group (e.g. number of white-male suicides per 100,000 white-males; number of black-male suicides per 100,000 black-males, etc.). Suicide deaths are determined by coroners or medical examiners, which raises questions of whether differences in classifications across groups could bias the results. However, most research suggests that differences in classification schemes do not bias estimates of the social determinants of suicide (Klugman et al., 2013; Pescosolido and Mendelsohn, 1986). Moreover, to the extent that there are systematic classification differences, these tend to occur across, rather than within jurisdictions (Klugman et al., 2013). Thus, if there are stable classification differences between-cities, this would be addressed within our MSA by year fixed effects models, and it is unlikely that bias is systematically changing within-cities over the course of the recession in a way that would affect our results (Harper et al., 2015).

3.2. MSA-level foreclosure rates

We measure the foreclosure rate with the number of real-estate owned (REO) foreclosures divided by the number of households in each metropolitan area. We use the REO, rather than total foreclosure rate for several reasons. First, it captures a particularly severe measure of the foreclosure rate, as it signals the repossession of the home by the lender and most owners are forced to leave their homes if they reach this stage of the foreclosure process. In addition, this stage is often the first visible sign of housing distress, thus signaling neighborhood decline to the broader community. Combined, these factors suggest the REO foreclosure rate taps several of the theoretical mechanisms linking foreclosures to population well-being (Houle, 2014; Houle and Light, 2014). Lastly, the use of REO rates provides a standard metric across diverse legal and geographic contexts, as all states require public filings involving bank repossessions. That said, in supplemental models using the total foreclosure rate (homes in any stage of the foreclosure process), we find that the pattern of results is entirely unchanged but the magnitude of the foreclosure coefficients are smaller, in line with prior research (Houle and Light, 2014).

3.3. Control variables

We include a host of time-varying MSA characteristics that are correlated with both rising foreclosures and suicide. These include measures that capture other economic conditions associated with the Great Recession that exacerbated the foreclosure crisis, including the *poverty rate*, *unemployment rate*, and *median household income*. We also control for other potential confounders of the foreclosure-suicide association, including the *percent of residents who are middle-aged* (e.g. Houle and Light, 2014), *percent divorced* and *percent foreign born*. Our results are substantively identical when we use alternative operationalizations of these controls, including median age and an index of social disadvantage. All variables are measured annually from 2005 to 2010, and for all analyses we use measures that match the population at risk in the dependent variable. For example, when examining the overall suicide rate, the unemployment rate is calculated using the total population. But when investigating the white-male suicide rate, the unemployment rate is specific to white men (e.g. the number of unemployed white men divided by the number of white men in the workforce). Lastly, we include measures for the *proportion white*, *proportion black*, and *proportion Hispanic* to account for changes in the racial/ethnic

composition of MSAs over this period. To ensure multicollinearity was not a concern, we calculated variance inflation factors (VIFs) for the substantive predictors for each race-gender group (e.g. separate calculations for the white-male variables, black-male variables, white-female variables, etc.). With the exception of the racial/ethnic proportion measures, all VIFs were less than 4, well below the recommended cutoff of 10. In supplemental analyses, we replicated the models without the racial/ethnic composition variables and the foreclosures results were substantively identical, offering little evidence of problematic multicollinearity. The descriptive statistics for each sub-group in the analysis are shown in Table 1.

3.4. Analytical strategy

Following recent research on recessions and population well-being (Houle, 2014; Houle and Light, 2014; Ruhm, 2003; Tefft, 2011), we use MSA-year fixed effects models to estimate the association between foreclosure and suicide. A strength of this approach is that we can use each MSA as its own control and examine how within-MSA changes in foreclosures are associated with within-MSA changes in suicide, net of all stable between-MSA differences (MSA fixed effects) and national time trends (year fixed effects) (Firebaugh, 2008; Johnson, 1995). Our focus on within-place variation therefore allows us to account for all observed and unobserved confounders that are stable over time, which greatly reduces omitted variable bias and allows for a stricter test of the study hypotheses (Allison, 2005).

Formally, our basic fixed-effects model can be expressed as follows

$$Y_{it} = \alpha_{t1} + \mu_{i1} + \beta_1 \text{Foreclosure Rate}_{it} + \gamma_1 X_{it} + \varepsilon_{it}$$

where Y_{it} is the suicide rate (Y) in MSA i in year t , and X_{it} is the

vector of MSA-level controls. The parameter β_1 represents the effect of the focal measure in the analysis – home foreclosures – which represents a change in the foreclosure rate between 2005 and 2010. The μ_i term represents MSA-specific constants, and thus accounts for all observed and unobserved stable traits between MSAs. In addition, the α_t term represents year fixed effects and captures all secular trends across years that are constant across MSAs. All models are weighted by their respective MSA-year populations and reported with robust standard errors.

Our analysis unfolds in three stages. First, we investigate the relationship between foreclosures and the overall suicide rate. We then examine variation in the relationship between foreclosure and race-sex specific suicide rates (white male, white female, black male, black female, Hispanic male, Hispanic female) Finally, we test the robustness of our findings by considering other potential explanations for our main results.

4. Results

4.1. Foreclosures and total suicide

Table 2 assesses the relationship between foreclosures and the overall suicide rate. Model 1 shows the bivariate association; Model 2 adds MSA and year fixed effects, and Model 3 adds all measured covariates. Consistent with hypothesis 1, we find a strong and significant positive association between foreclosures and the suicide rate, where a one percentage point increase in the REO rate is associated with 1.12 additional suicides per 100,000 ($b = 1.12$; $p < 0.001$). However, we find that this relationship is substantially attenuated when we account for other factors associated with the recessionary period. Turning to our final specification (model 3); while the coefficient on the effect of foreclosures decreases and is measured with less precision

Table 1
Descriptive statistics for race-rthnic by sex groups groups, 2005–2010.

	Mean	Std. Dev.	Range		Mean	Std. Dev.	Range
REO Foreclosure Rate	0.52	0.64	0–5.67				
White Men				White Women			
Suicide Rate	23.71	7.99	1.56–70.63	Suicide Rate	6.67	2.72	0–22.88
Median Household Income	\$80,342	\$15,557	40,000–130,200	Median Household Income	\$73,865	\$14,424	37,900–121,800
% Middle-Aged	49.76	2.51	26.38–56.98	% Middle-Aged	48.69	2.23	27.87–54.10
% Foreign Born	5.11	3.84	0–14.11	% Foreign Born	5.46	3.98	0.15–15.70
Unemployment Rate	6.56	2.67	0.53–25.04	Unemployment Rate	5.9	2	1.05–24.29
Poverty Rate	7.14	2.22	2.26–26.46	Poverty Rate	8.87	2.49	3.15–34.72
% Divorced	9.77	1.9	3.24–18.28	% Divorced	12.47	2.09	6.04–19.99
Black Men				Black Women			
Suicide Rate	9.61	4.43	0–76.95	Suicide Rate	1.93	1.76	0–47.85
Median Household Income	\$46,926	\$10,720	9000–102,800	Median Household Income	\$42,576	\$10,021	9000–106,000
% Middle-Aged	42.8	2.83	16.50–70.44	% Middle-Aged	45.57	2.64	22.56–71.81
% Foreign Born	9.06	9.51	0–85.57	% Foreign Born	8.84	10.13	0–72.14
Unemployment Rate	15.32	5.59	0–45.62	Unemployment Rate	12.54	4.09	0–63.40
Poverty Rate	21.84	6.1	1.80–74.11	Poverty Rate	25.5	6.78	0–71.45
% Divorced	9.9	2.3	0–40.42	% Divorced	13.51	2.5	0–37.77
Hispanic Men				Hispaic Female			
Suicide Rate	8.2	4.57	0–77.88	Suicide Rate	1.78	1.6	0–46.07
Median Household Income	\$52,497	\$7983	21,600–93,955	Median Household Income	\$48,566	\$7622	20,000–86,300
% Middle-Aged	40.56	3.17	7.58–61.30	% Middle-Aged	40.35	3.51	11.57–62.67
% Foreign Born	41.58	10.97	0.79–78.60	% Foreign Born	38.66	10.87	0–73.90
Unemployment Rate	8.58	4	0–44.00	Unemployment Rate	10.35	3.67	0–59.91
Poverty Rate	19.22	5.1	0–69.33	Poverty Rate	23.53	5.62	1.60–71.67
% Divorced	6.33	2	0–27.48	% Divorced	9.55	2.59	0–32.81

N = 1044 (MSA-years).

Source: National Center for Health Statistics; American Community Survey 2005–2010. The descriptive statistics for the racial composition measures are as follows: % White - mean (67.2), std. dev. (14.9); % Black - mean (13.6), std. dev. (10.6); % Hispanic - mean (13.1), std. dev. (13.5).

Table 2
Associations between foreclosures and suicide, 2005–2010.

	Model 1		Model 2		Model 3	
	b	Robust SE	b	Robust SE	b	Robust SE
<i>Focal Measure</i>						
REO Foreclosure Rate	1.12***	0.29	0.23*	0.10	0.23†	0.12
<i>Controls</i>						
Median Household Income (\$10,000)					-0.23	0.29
% Middle Aged					0.00	0.09
% Foreign Born					0.13	0.10
Unemployment Rate					0.05	0.05
Poverty Rate					-0.07	0.05
Divorce Rate					-0.03	0.09
% White					-0.07	0.12
% Black					-0.20	0.14
% Hispanic					-0.09	0.14
Constant	10.42***	0.33	18.42***	1.68	28.32*	12.12
<i>Specification and Summary Information</i>						
Year Fixed Effects	No		Yes		Yes	
MSA Fixed Effects	No		Yes		Yes	
R ²	0.04		0.91		0.91	

†p < .10 * p < 0.05 **p < 0.01 ***p < 0.001 (two-tailed tests).
N = 1044 MSA-years.

(p < 0.06), the coefficient is substantively larger than many of the other covariates in the model and the overall pattern in the data is unchanged – increases in foreclosures are associated with increased suicides. Interpreted substantively, the point estimate in model 3 suggests that a 1 percent increase in the foreclosure rate between 2005 and 2010 increased the suicide rate by 0.23 (per 100,000), net of measured covariates, national time trends, and any stable MSA characteristics.

Taken together, the results in Table 2 generally support hypothesis 1 and suggest that the housing crisis contributed to the rise in suicides in recent years. However, our final specification (model 3) suggests there is considerable noise surrounding the foreclosure point estimate. One potential explanation for

this imprecision is that there is variance in the foreclosure-suicide relationship across sub-groups. That is, the main effect of foreclosures may mask heterogeneity among different race/ethnicity-sex combinations. We explore this possibility in detail in Table 3.

4.2. Foreclosures and race/ethnic by sex specific suicide rates

Table 3 shows results from MSA-by-year fixed effects models predicting the association between the foreclosure rate and race/ethnic-by-sex-specific suicide rates. Two notable findings stand out. First, of the six different racial/ethnic-sex models shown, the foreclosure effects are statistically significant at the p < 0.05 level

Table 3
Associations between foreclosures and race/Eth. By sex specific suicide, 2005–2010.

Focal Measure	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	White-Men		White-Women		Black-Men		Black-Women		Hispanic-Men		Hispanic-Women	
	b	Robust SE	b	Robust SE	b	Robust SE	b	Robust SE	b	Robust SE	b	Robust SE
<i>Focal Measure</i>												
REO Foreclosure Rate	0.91**	0.29	0.21†wm	0.12	0.69	0.47	0.30wm	0.20	-0.27wm	0.24	0.12wm	0.10
<i>Controls</i>												
Median Household Income (\$10,000)	0.18	0.52	0.10	0.29	-0.33	0.22	0.00	0.23	0.00	0.00	0.00	0.00
% Middle Aged	0.01	0.16	0.00	0.09	0.01	0.08	0.02	0.05	-0.09	0.08	-0.01	0.04
% Foreign Born	0.49†	0.29	0.05	0.13	-0.02	0.08	0.02	0.04	0.07	0.04	0.03	0.02
Unemployment Rate	0.12	0.11	0.00	0.06	0.00	0.04	0.00	0.02	0.04	0.05	0.01	0.02
Poverty Rate	-0.06	0.13	0.06	0.07	-0.06	0.05	0.00	0.02	0.04	0.04	-0.02	0.02
Divorce Rate	-0.14	0.14	0.05	0.07	0.11	0.07	0.01	0.03	0.08	0.08	-0.01	0.04
% White	-0.42	0.30	-0.21	0.16	-0.13	0.41	-0.38*	0.18	-0.69†	0.41	0.06	0.18
% Black	-0.29	0.36	-0.08	0.18	-0.95*	0.46	-0.34†	0.19	-1.04*	0.46	-0.10	0.21
% Hispanic	-0.01	0.38	-0.09	0.19	0.16	0.47	-0.53*	0.22	-0.87†	0.46	0.12	0.18
Constant	69.70*	30.46	22.31	16.08	45.85	41.59	38.02*	17.50	88.14*	38.47	-3.45	16.78
<i>Specification and Summary Information</i>												
Year Fixed Effects	Yes		Yes		Yes		Yes		Yes		Yes	
MSA Fixed Effects	Yes		Yes		Yes		Yes		Yes		Yes	
R ²	0.88		0.74		0.40		0.29		0.61		0.32	

†p < .10 * p < 0.05 **p < 0.01 ***p < 0.001 (two-tailed tests).
N = 1044 MSA-years.

wm effect significantly different than White-Male model based on z-test (p < 0.05).

for white men only, and marginally significant for white women. For both white men and white women, the rise in home foreclosures corresponded with increased suicides, net of economic indicators, population age structure, immigration, divorce rates, racial composition, and MSA and year fixed effects. These results run counter to theoretical expectations that the housing crisis had a *greater* impact on minority suicide rates (*hypothesis 2*). In fact, our results suggest the opposite, consistent with the descriptive trends in suicide over the recessionary period (see Fig. 1).

Second, amongst whites, the foreclosure effect is more precise and far more pronounced for men – on the magnitude of 4 times larger ($b = 0.91$ v $b = 0.21$; z -tests show effects are significantly different). These results align more with expectations rooted in theories of relative deprivation and status threat (*hypothesis 3*). This finding highlights the importance of examining the intersections of sex *and* race/ethnicity. In alternative models where we examined suicides for men and women (regardless of race/ethnicity), we found no significant differences in the effect of foreclosures. From those models we would have drawn the inaccurate conclusion that there were no sex differences in the foreclosure-suicide relationship. However, the findings in Table 3 clearly demonstrate substantial sex differences, but that these differences are limited to whites (z -tests confirm that the gender differences among blacks and Hispanics are non-significant.). Moreover, the magnitude of the coefficient for foreclosures on white males is consequential, such that a one percentage point increase in the REO rate is associated with an additional 0.91 suicides per 100,000 people. Given that suicide rates increased by approximately 4 suicides per 100,000 over the recessionary period, the magnitude relative to the change in the suicide rate is substantively meaningful. Furthermore, when we calculate standardized coefficients in the white male model, we find that the foreclosure effect ($B = 0.07$) is considerably larger than other measures that have featured prominently in macro-level suicide research, such as unemployment ($B = 0.04$).

Though the results in Table 3 suggest that the housing crisis has disproportionately affected suicide among white men, this finding is not entirely unqualified. For while the foreclosure effect in the white-male model is 32 percent larger than in the black-male model, these effects are not significantly different based on z -tests. That said, given the pattern for white men, the weight of the evidence is more in line with the relative deprivation hypothesis than the hypothesis that minority suicide rates were disproportionality affected by the foreclosure crisis.

4.3. Alternative explanations for rising white male suicides

While our choice of control variables is informed by recent theoretical and empirical research, there are other potential explanations for these findings. We consider three key alternative explanations, including group differences in (1) home ownership; (2) gun availability, and; (3) opioid addiction.

Beginning with home ownership, it could simply be that white-men were most at risk when the housing bubble burst due to differences in home ownership rates. Descriptive statistics generally confirm this point; in 2005, the homeownership rate among white men in our sample of MSAs was 77 percent. For black and Hispanic men, the rate of home ownership was only 47 and 48 percent, respectively (comparable figures for white, black, and Hispanic women were 76%, 44%, and 51%, respectively). Thus, it may not be that white-men were more affected by the foreclosure crisis, but that they were most exposed to its effects. However, we find no

support for this explanation in model 1, Table 4, where we include a measure for home ownership (in addition to our full specification from Table 3). In this model, net of ownership rates, the effect of foreclosures on white-male suicides remains positive and significant, and the magnitude of this association is unchanged (compare to model 1, Table 3).

Next we consider the import of gun availability. Studies show significant racial/ethnic and gender differences in gun ownership, with white-men having the highest rates of gun possession (Morin, 2014). Combined with research identifying gun availability as a risk factor for suicide (Miller et al., 2002), our results could be reflecting group differences in the prevalence of guns. To account for this, we use a proxy for gun ownership, measured as the percentage of suicides committed by firearm. The use of a proxy is necessitated by the fact that longitudinal measures of gun ownership that are racial/ethnic-gender specific are not available in surveys or crime statistics at the MSA-level. The validity of this measure has been empirically vetted in prior research, evidencing significant correlations with survey-based measures of gun ownership (Miller et al., 2002). The inclusion of this measure in model 2, Table 4, does not alter our results, suggesting that the foreclosure-suicide nexus is not confounded by the prevalence of guns among white-men.

Drawing from research on the rise of opioid dependence in recent years, especially among whites (Case and Deaton, 2015), we also consider group differences in drug activity as a potential explanation for our results. We use the drug overdose mortality rate to measure racial/ethnic-gender differences in drug activity (Light and Ulmer, 2016). Like the gun proxy, measures of drug addiction at the MSA-level for different racial/ethnic-gender groups are unavailable in crime statistics and surveys, thus necessitating the use of an alternative data source. Accounting for this measure in model 3 does not change the main results. Indeed, across models 1–3, the effect of foreclosures on white-male suicides is substantively and statistically indistinguishable. This pattern holds even when we include all three potential confounders simultaneously in model 4, but only for white men. When we introduce these three variables for other groups (e.g. white women, black men, etc.), none of the foreclosure effects are significant at traditional levels (results shown in the Appendix).

Our last set of models addresses a potential timing concern in the main analysis. Namely, foreclosures may have a delayed effect on suicidal behavior. We address this concern by replicating our robustness models with all of the independent variables lagged by one year. Across models 5–8, the pattern in the data is clear. Even though the lagged measures reduce the sample size by one sixth (174 MSA-years), increased foreclosures are significantly associated with rising suicides for white-men. Taken together, the results presented in Table 4 provide further evidence that the link between the housing crisis and white-male suicides is substantively significant.

5. Discussion

The Great Recession and Foreclosure Crisis devastated families and communities, which led to diminished population health and mental health, and contributed to rising suicide rates (Arcaya et al., 2014; Houle, 2014; Houle and Light, 2014; Osypuk et al., 2012; Pollack et al., 2011). However, little is known about whether and how the rise of home foreclosures influenced the suicide rates of some social groups but not others. From our analysis into this question, three key findings emerged. First, we find that as foreclosures increased in U.S. metro areas, suicide rates also increased, offering evidence that the foreclosure crisis is a unique and

Table 4
Does home ownership, gun availability, or drug abuse explain the association between foreclosures and white male suicide?

	Model 1		Model 2		Model 3		Model 4	
	b	Robust SE						
<i>Focal Measure</i>								
REO Foreclosure Rate	0.96***	0.30	0.96***	0.29	0.93**	0.29	1.01***	0.30
<i>Confounders</i>								
Home Ownership	0.11	0.09					0.09	0.09
Gun Availability			-0.04*	0.02			-0.04*	0.02
Drug Activity					0.01	0.00	0.01	0.00
<i>Specification and Summary Information</i>								
Controls	Yes		Yes		Yes		Yes	
Year Fixed Effects	Yes		Yes		Yes		Yes	
MSA Fixed Effects	Yes		Yes		Yes		Yes	
R ²	0.88		0.88		0.88		0.88	
N (MSA-years)	1044		1044		1044		1044	
Lagged Independent Measures								
	Model 5		Model 6		Model 7		Model 8	
	b	Robust SE						
<i>Focal Measure</i>								
REO Foreclosure Rate	0.72*	0.32	0.69*	0.32	0.69*	0.32	0.70*	0.32
<i>Confounders</i>								
Home Ownership	0.06	0.10					0.05	0.10
Gun Availability			0.01	0.02			0.01	0.02
Drug Activity					0.00	0.00	0.00	0.00
<i>Specification and Summary Information</i>								
Controls	Yes		Yes		Yes		Yes	
Year Fixed Effects	Yes		Yes		Yes		Yes	
MSA Fixed Effects	Yes		Yes		Yes		Yes	
R ²	0.89		0.89		0.89		0.89	
N (MSA-years)	870		870		870		870	

*p < 0.05 **p < 0.01 ***p < 0.001 (two-tailed tests).

Notes: Models include all MSA-level controls shown in Table 3, in addition to MSA and year fixed effects.

suicidogenic feature of the great recession, though we would note that this coefficient was only marginally significant in the final model specification. Second, we find that the association between foreclosures and suicide was generally strongest among white men, providing some support for theories of relative deprivation and the perspective that white men experienced status anxiety in the wake of the housing crisis. Finally, we find no evidence that rising foreclosures were more strongly associated with suicide rates of black and Hispanic men and women, who experienced the brunt of the foreclosure crisis.

Overall, the findings of our study align with a growing literature that suggests that whites, and white men in particular, are experiencing worsening health and well-being in a context of economic and social change. Theoretically, our findings dovetail with recent work by social scientists who find that high status groups—who are socialized to believe that they will be successful—experience a great deal of shame and self-blame when they experience social and economic loss (Newman, 1999; Norris, 2016; Ridgeway, 2014). Our results are also consistent with and perhaps provide a partial explanation for recent research that shows that whites—and white men in particular—have experienced increased morbidity and mortality over the past decade relative to other social groups (Case and Deaton, 2015).

This study also informs discussions on the recent decline in life expectancy among white women (Montez and Zajacova, 2014). Within this research, factors such as poverty have been implicated, but the effect of the recession and foreclosure crisis has received limited attention. While our results suggest white men were particularly affected by foreclosures, they also

demonstrate that white women did not emerge unscathed from the housing crash. Future research should consider how the recession and foreclosure crisis may be linked to rising mortality rates among this group.

From an empirical standpoint, our findings also demonstrate the importance of exploring heterogeneity in the association between foreclosures and suicide. Had we examined the link between foreclosure and overall suicide rates, we would have failed to see that the foreclosure crisis seemingly had larger impacts on the suicide rates of some groups, but not others. This aligns with a growing theme in the sociological literature that the foreclosure crisis is inextricably linked to current systems of inequality (Rugh and Massey, 2010), and thus has the potential to exacerbate social disparities in well-being (Houle, 2014). Importantly, this finding may help explain why the suicide gap between white men and women increased during the recession in places like Las Vegas – from 31.6 in 2005 to 38.6 in 2010—where the foreclosure rate increased substantially but employment differences between white men and women changed little (from -1.2 in 2005 to 0.84 in 2010). Thus, our study provides clarifying context to recent descriptive research that shows disparities in suicide have changed during the recessionary period (Murphy et al., 2013; Sullivan et al., 2013).

While our study makes an original contribution by providing the first examination of the association between rising home foreclosures and suicide for different sex and racial/ethnic groups, it is not without limitations. First, the ecological fallacy is a concern (Catalano, 1991). Because we use aggregate data, it is not clear from our analysis whether directly experiencing

foreclosure, or living in a high foreclosure area are better predictors of suicide. Theoretically, both processes are likely operative. For example, those who are going through foreclosure may experience feelings of failure and blame from themselves and others for their loss of status, which may increase their risk of poor mental health and suicide. In addition, living in a community gutted by foreclosures may invoke feelings of status loss and insecurity as the local social and economic conditions deteriorate, and family wealth evaporates because of declining home values. To address these issues, future research should employ multi-level data in order to better understand the contextual and individual-level predictors of suicide (Denney et al., 2015). A related limitation of this study is that we do not directly measure our theoretical mechanism (status anxiety/threat) that explains why white men are more prone to suicide in the foreclosure crisis. Although we can adjust for alternative explanations—such as gun ownership, opioid use, and home ownership, at least two of these measures (gun ownership and opioid use) are indirect proxies.

Second, due to small cell counts at the MSA-level, our measures of group-specific suicide rates do not capture all race/ethnicities (e.g. Asians), and do not consider heterogeneity within groups (such as nativity differences among Hispanics). In addition, our analysis only goes up to 2010, and though the foreclosure crisis peaked in that year (RealtyTrac, 2015b), foreclosures remained high after this period. Future research should continue to examine the long-term nexus between foreclosures and suicide, as the health consequences of the housing crisis are likely to be felt for years to come (Houle, 2014; Suhrcke and Stuckler, 2012). Finally, while the longitudinal measures used here help us gain leverage on the foreclosure-suicide link, our analysis still precludes causal conclusions. We have tried to address several alternative explanations, and in supplementary models where we include a measure of residential mobility (the percentage of householders who moved in the past year), the pattern of results is entirely unchanged (available on request). Still, other theoretical explanations for these findings are plausible. Future research should therefore continue to explore the utility of role conflict or status threats for understanding the social determinants of, and social disparities in, suicide. For example, measures of relative social status (such as relative income) may provide more insight into this process than absolute measures of social status (McLeod, 2014). It may also be that

aspects of the social environment (such as social cohesion) may lessen status threats or relative deprivation experienced by advantaged groups. At the very least, our analysis suggests that suicide rates of white men rose most in areas of concentrated home foreclosures.

Despite these limitations, this study provides new evidence on the uneven effects of the foreclosure crisis on suicide across race/ethnic and sex groups. Contrary to conventional wisdom—which would suggest that the most disadvantaged groups that were most exposed to the foreclosure crisis would experience the greatest increase in suicides—we find instead that the impact of foreclosure on suicide was concentrated among white men. This supports the notion that white men—arguably the highest status and most privileged group in U.S. society—experienced status threats as their privileged position began to erode during the foreclosure crisis. That is, those at the top had the furthest to fall.

Our study answers recent calls for work on mental health and suicide to more thoroughly integrate social psychological factors (McLeod, 2015; Schnittker and McLeod, 2005), with our findings suggesting that status anxiety may be an important driver of social disparities in suicide. As social scientists grapple with the importance of relative versus absolute social position for well-being (Link et al., 2013; McLeod, 2014), our study suggests that relative changes in social position, particularly the precarity of privilege, may be an important piece of the puzzle for understanding social disparities in suicide during times of social and economic upheaval.

Acknowledgements

We thank Amy Rui Ning Sun for valuable research assistance, as well as Kathryn Lively, Emily Walton, Janice McCabe, Joe Digrazia, and Kimberly Rogers for helpful comments in preparation of this manuscript. This research was supported by a core grant to the Center for Demography and Ecology at the University of Wisconsin-Madison (P2C HD047873) and by a grant from the Rockefeller Center at Dartmouth College.

Appendix

Associations Between Foreclosures and Race/Eth. by Sex Specific Suicide, 2005–10: Accounting for Home Ownership, Guns, and Drugs.

Focal Measure	Model 1		Model 2		Model 3		Model 4		Model 5		
	White-Women		Black-Men		Black-Women		Hispanic-Men		Hispanic-Women		
	b	Robust SE	b	Robust SE	b	Robust SE	b	Robust SE	b	Robust SE	
<i>Focal Measure</i>											
REO Foreclosure Rate	0.15	0.12	0.64	0.47	0.25	0.19	-0.29	0.25	0.10	0.10	
<i>Confounders</i>											
Home Ownership	-0.01	0.05	0.05	0.04	0.00	0.02	-0.01	0.01	0.03	0.02	
Gun Availability	0.00	0.01	-0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	
Drug Activity	0.02***	0.00	0.00	0.00	0.01**	0.00	-0.02	0.04	0.03***	0.01	
<i>Specification and Summary Information</i>											
Controls	Yes		Yes		Yes		Yes		Yes		
Year Fixed Effects	Yes		Yes		Yes		Yes		Yes		
MSA Fixed Effects	Yes		Yes		Yes		Yes		Yes		
N (MSA-years)	1044		1044		1044		1044		1044		

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$ (two-tailed tests).

Notes: Models include all MSA-level controls shown in Table 3, in addition to MSA and year fixed effects. Due to missing information on gun availability for certain groups, models are calculated on multiply imputed data using Stata's ICE command (5 total imputations).

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