



Mental health in the foreclosure crisis[☆]



Jason N. Houle

Dartmouth College, 6104 Silsby Hall, Room 111, Hanover, NH 03755, USA

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ABSTRACT

Current evidence suggests that the rise in home foreclosures that began in 2007 created feelings of stress, vulnerability, and sapped communities of social and economic resources. Minority and low SES communities were more likely to be exposed to predatory lending and hold subprime mortgages, and were the hardest hit by the foreclosure crisis. Little research has examined whether and how the foreclosure crisis has undermined population mental health. I use data from 2245 counties in 50 U.S. states to examine whether living in high foreclosure areas is associated with residents' mental health and whether the foreclosure crisis has the potential to exacerbate existing disparities in mental health during the recessionary period. I use county-level data from RealtyTrac and other data sources, and individual-level data from the Behavioral Risk Factor Surveillance Survey from 2006 to 2011. I find that – net of time invariant unobserved between-county differences, national time trends, and observed confounders – a rise in a county's foreclosure rate is associated with a decline in residents' mental health. This association is especially pronounced in counties with a high concentration of low SES and minority residents, which supports the perspective that the foreclosure crisis has the potential to exacerbate existing social disparities in mental health.

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1. Introduction

In 2007, following decades of financial deregulation and increasingly risky borrowing practices, defaults in the subprime mortgage market resulted in the worst economic collapse in the U.S. since the Great Depression. The housing market crash led to a historically unprecedented rise in home foreclosures – from 650,000 in 2007 to a record 2.9 million homes in 2010, when more than 2% of all U.S. homes received a foreclosure notice (RealtyTrac, 2010). However, there is a great deal of variation in the geographic distribution of foreclosures. Some communities escaped relatively unscathed by the crisis, while others were devastated. Because the foreclosure crisis was concentrated in the subprime mortgage market (Immergluck, 2009), low SES and minority communities – who primarily had access to loans with poor terms and high interest rates – bore the brunt of the foreclosure crisis (National Fair Housing Alliance, 2012; Rugh and Massey, 2010). The massive scope of the foreclosure crisis, as well as its disproportionate impact on

vulnerable communities, raises questions about its potential impact on the well-being of the U.S. population.

Recent research shows that foreclosure is a devastating stressful life event that undermines mental health. However, little research examines whether foreclosures undermine the mental health of all community members. In this study, I examine how living in high foreclosure localities is associated with residents' mental health. I ask two questions: First, is a rise in the local foreclosure rate associated with changes in individual residents' mental health and wellbeing? And second, does the foreclosure crisis have the potential to exacerbate existing social disparities in well-being? Put differently, is the foreclosure-mental health association larger in disadvantaged areas than in more advantaged areas?

2. Background

The Great Recession was unique in that it was a three pronged crisis. It was a global financial crisis where credit markets dried up; it was a traditional unemployment crisis with double-digit unemployment rates; and it was the worst housing market crisis in the history of the U.S., where millions of people lost their homes to foreclosure. Deregulation of the banking industry and the rise of subprime and predatory lending are well-documented causes of the foreclosure crisis (Been et al., 2011; Fligstein and Goldstein, 2011; Gerardi et al., 2009). The foreclosure crisis

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E-mail addresses: jason.houle@dartmouth.edu, jnh143@gmail.com.

began in the subprime mortgage market, but high unemployment rates eventually drove the spread of foreclosures into the prime mortgage market, as out of work families struggled to keep up with their mortgages (Been et al., 2011). Despite the massive scope of the foreclosure crisis, we know relatively little about how it is associated with the mental health of the U.S. population.

Recent research shows an association between foreclosure and mental health. Foreclosure and default are associated with worsened mental health (Alley et al., 2011; Currie and Tekin, 2011; McLaughlin et al., 2012; Osypuk et al., 2012), in part because foreclosure is a stressful life event that also invokes feelings of shame, loss, and regret (Nettleton and Burrows, 1998). This is particularly germane to the United States, where homeownership is central to identity and losing one's home is seen as a failure to maintain or achieve the American Dream (Libman et al., 2012). As such, foreclosure is often conceptualized as a stressful life event that undermines the mental health of current and former homeowners and their families.

But while prior research provides important insights on how foreclosure is linked to mental health, most research conceptualizes foreclosure as an individual-level stressful life event that impacts the well-being of those who experience it. Foreclosures are geographically distributed across communities, and some areas have been hit harder than others (Immergluck, 2009; Rugh and Massey, 2010). In areas where foreclosure is most common there is evidence that foreclosures may alter the social fabric of communities and affect the mental health and well-being of all residents, regardless of whether they are homeowners or are going through foreclosure.

Research shows that foreclosures can lead to a decline in *stress-mitigating community resources* and a rise in *community stressors* in the surrounding area. For example, a rise in local-area foreclosures are associated with declines in economic resources, such as home values, where each additional foreclosure reduces the value of nearby properties by 1% (Harding et al., 2009; Immergluck and Smith, 2006a). Rising foreclosures also lead local governments to scale back on community investments (Kingsley et al., 2009), in part due to declining tax revenues (Joint Economic Committee, 2007), and because foreclosures create expensive administrative costs (Kingsley et al., 2009). Foreclosures are also associated with declines in social capital, civic engagement (Estrada-Correa and Johnson, 2012), and residential instability (Li and Morrow-Jones, 2010). Such community resources are important social resources for mental health and well-being (Araya et al., 2006; Jia et al., 2009; Robert, 1999; Yen and Syme, 1999), and thus a reduction in these resources due to foreclosures may undermine residents' mental health.

Foreclosures are also associated with a rise in community stressors. During the crisis, many foreclosed properties became abandoned and blighted (Joint Economic Committee, 2007). These vacant properties, along with diminished social capital, are associated with elevated crime rates (Arnio et al., 2012; Immergluck and Smith, 2006b; but see Kirk and Hyra, 2012). Moreover, living in high foreclosure communities creates feelings of insecurity and mistrust towards lenders and the government (Ross and Squires, 2011). Such community stressors tax residents' mental health (Kim, 2010; Latkin and Curry, 2003; Ross, 2000), and an increase in these stressors due to rising foreclosures may undermine residents' mental health. Although I do not measure these variables, I expect that these *social costs* of rising foreclosures – reductions in community resources and elevated community stressors – are the primary mechanisms that link the rise in foreclosures to individual resident's mental health. Based on the above literature, I hypothesize the following:

H1. Rising local foreclosure rates will be associated with declines in residents' mental health, net of individual characteristics and area-level confounders.

2.1. Social inequality, rising foreclosures, and mental health

The foreclosure crisis has profound implications for social inequality in the United States (Pfeffer et al., 2013; Rugh and Massey, 2010). Rising foreclosures have disproportionately impacted disadvantaged communities, in part because residents of these communities had access primarily to risky, high cost subprime mortgages (National Fair Housing Alliance, 2012; Rugh and Massey, 2010; Williams et al., 2005). But in addition to facing higher rates of foreclosure, there is evidence that low SES and minority communities faced greater *social costs* – a greater loss of community resources and a higher level of community stressors – than did more affluent, white communities at equivalent levels of foreclosure.

Recent evidence suggests that rising foreclosures could have a stronger association with wellbeing in low SES and minority communities compared to more advantaged communities, in part because these communities face greater social costs to foreclosure. For example, foreclosed homes in Low SES and minority areas tend to be left vacant for longer periods of time, and are more likely to become abandoned than in more affluent, white areas (Immergluck and Smith, 2006b). Low SES and minority communities also experienced a greater decline in wealth and property values than did more affluent communities during the recession (Immergluck, 2009; Pfeffer et al., 2013). Moreover, disadvantaged communities saw greater increases in crime in the wake of the foreclosure crisis than did more affluent areas (Teasdale et al., 2012). Why might this be the case? One potential reason for these differences is lender neglect. At the height of the foreclosure crisis the National Fair Housing Alliance (2012) found massive disparities in lender's upkeep of foreclosed, Real Estate-Owned (REO) homes. Lenders are responsible for maintaining REO properties, and these homes are at-risk of lying vacant and becoming abandoned. REO homes in minority and disadvantaged communities were found to be far more likely to be allowed to fall into disrepair, to lack visible for sale signs, and have boarded up windows. Contrast this with homes in more affluent areas, which were well-maintained, and in some cases security services were hired to protect the lender's investment. As such, disadvantaged communities experienced greater social costs to rising foreclosures than did more affluent communities, which may in turn lead residents of these communities to experience more mental health problems as a result of rising foreclosures.

The above evidence suggests that the foreclosure crisis intersects with existing social inequalities in ways that may exacerbate disparities in mental health. For example, the above evidence suggests that at equivalent levels of foreclosure, disadvantaged communities are likely to face greater social costs to foreclosure than are more affluent communities. If this is the case, we would expect the association between rising foreclosure rates on mental health to be stronger in low SES and minority communities than in more affluent, white communities. Following this logic, I hypothesize the following:

H2a. The association between foreclosure and mental health will be amplified in lower SES areas compared to higher SES areas.

H2b. The association between foreclosure and mental health will be amplified in areas with a larger proportion of minority residents compared to those that have a lower proportion of minority residents.

2.2. The current study

The current study builds on prior research by conceptualizing foreclosure not only as an individual-level stressor, but as a community-level stressor that is associated with the mental health of all residents. Specifically, I examine how changes in county-level foreclosure rates from 2006 to 2011 are associated with changes in residents' mental health. This study has key strengths and makes several contributions. First, nearly all of the prior research on recessions and mental health focuses on the unemployment rate as the key indicator of recession (Dooley et al., 1996; Tefft, 2011). Little is known about how the foreclosure crisis that characterizes the Great Recession is related to population mental health, net of other economic factors associated with the recession. To address this question, I use unique proprietary foreclosure data to longitudinally track most foreclosures in the U.S. from 2006 to 2011 (RealtyTrac, 2010). Second, I use county-by-year fixed effects models to examine how within-county changes in foreclosure are associated with within-county changes in mental health, net of time invariant between-county differences and national time trends. This strategy improves on research that uses between-person or between-place research designs. I also employ several unique falsification tests to increase confidence in the findings. Third, I consider how rising foreclosure rates are associated with *disparities* in mental health, such that residents in Low SES and minority communities may face greater mental health consequences to foreclosure than more advantaged communities. Thus, this is one of the few studies to consider how the foreclosure crisis intersects with existing social inequalities to influence mental health. Fourth, while a few recent studies have considered how living in high foreclosure areas is associated with health outcomes (Arcaya et al., 2013, 2014) and hospital visits (Currie and Tekin, 2011) – these studies tend to focus on single communities or cities and focus on physical health. No study to my knowledge has examined the mental health consequences of rising foreclosures in a nationally representative sample of the U.S. population.

3. Data and methods

I draw data from five individual and county-level data sources. Individual-level data are from the 2006–2011 surveys of the Behavioral Risk Factor Surveillance System (BRFSS). BRFSS is a state-based annual, nationally representative repeated cross-section of the health and health behaviors of United States residents (U.S. Centers for Disease Control and Prevention, 2013). Annual county-level foreclosure data from 2006 to 2011 are from RealtyTrac. RealtyTrac collects foreclosure data from public records in nearly 2250 counties and covers more than 90% of US households. Additional annual county-level data were drawn from the American Community Survey (ACS), The Bureau of Labor Statistics (BLS), and the Small Area Income and Poverty Estimates (SAIPE). The ACS is an annual nationally representative survey of conducted by the U.S. Census Bureau to create estimates of social and economic characteristics of the U.S. population, and has very high response rates (2013a). The BLS data (2009) is from the Local Area Unemployment Statistics series, which provides the official unemployment measures in the United States. Finally, the SAIPE provides model-based estimates of single year sociodemographic characteristics of localities in the U.S., based on information from administrative records, decennial censuses, and the ACS (U.S. Census Bureau, 2013b). County-level SAIPE and ACS data were retrieved via Censtats (censtats.census.gov).

I linked the individual-level BRFSS data to county-level foreclosure and sociodemographic information using Federal Information Processing Standards (FIPS) codes. Study coverage includes

BRFSS respondents from all 50 states plus Washington, DC, from 2006 to 2011, representing 1,891,144 person-years clustered within 2245 counties.

3.1. Individual-level mental health

My dependent variable is a single-item measure of mental health. In each BRFSS survey, respondents are asked “thinking about your mental health, which includes stress, depression and problems with emotions, for how many days during the past 30 days was your mental health not good?” This measure is a part of the Centers for Disease Control and Prevention's (CDC) “healthy days” Health Related Quality of Life (HRQOL) measure (Moriarty et al., 2003). It is frequently used as a measure of mental health in research that uses BRFSS data (e.g., Moriarty et al., 2009) and has similar psychometric properties and a distribution to common measures of psychological distress, such as the CES-D. Although the BRFSS does include more detailed measures of mental health, such questions are asked only in select states and select years, and are not asked consistently across the study period. Thus, it is not possible to conduct an over-time, within-place analysis of change using these measures.

3.2. County-level foreclosure rates

The foreclosure process varies widely across states, but typically begins with a notice of default (NOD), where homeowners are notified that they are delinquent. This is followed by a *Lis Penden*, a legal notice filed by the lender that initiates the process of foreclosure. If the homeowner has not found a way to settle their debts to the lender, or short sell their property, the foreclosure results in a public auction or sale. If at auction or sale the lender is unable to sell the property for at least the remaining value of the loan, the lender repossesses the property and it becomes real estate-owned (REO). I construct two annual county-level measures of the foreclosure rate from RealtyTrac data. The first is the *total foreclosure rate*, which includes all foreclosed properties in any stage of the foreclosure process divided by the number of households in the county in a given year. The second is the *REO foreclosure rate*, which is the number of REO foreclosures divided by the number of households. The REO rate is a measure of severe crisis, as most owners are forced to leave their homes if they reach this stage of the foreclosure process, it is up to the lender to upkeep and maintain the properties, and many REO homes during the foreclosure crisis were at risk of abandonment (National Fair Housing Alliance, 2012). I also construct an NOD rate, which reflects the percentage of homes that received a notice of default in a given county and year.

3.3. County-level sociodemographic characteristics

I include a range of annual county-level sociodemographic characteristics that may confound the association between foreclosure and mental health. Unemployment rates were a key antecedent of rising foreclosures in the crisis (Been et al., 2011) and are also predictive of mental health (Tefft, 2011). Thus, I control for a lagged annual measure of the local unemployment rate, drawn from the BLS. I also control for county-level measures of socioeconomic status and racial composition, both of which are associated with rising foreclosures (Rugh and Massey, 2010). These include annual measures of the poverty rate (drawn from the SAIPE) and the percent of the population that is African American (drawn from the ACS). To test hypotheses 2a and 2b, I also stratify models by race and socioeconomic status using five-year estimates of the percent of adults age 25+ who have a college degree or more

and the percent of the population that is African American from the ACS, which I describe below.

3.4. Individual level sociodemographic characteristics

I include a vector of individual-level, annual, sociodemographic characteristics that may confound the association between foreclosure rates and mental health. These are: age (in years), age squared, sex (1 = female), race/ethnicity (non-hispanic black, hispanic, other, white [reference]) marital status (never married, widowed, divorced/separated, married [reference]), full time employment status (1 = yes), and educational attainment (in years).

3.5. Analysis strategy and falsification tests

I use county-by-year fixed effects models to estimate the association between the foreclosure rate and mental health. A key strength of these models, relative to Ordinary Least Squares (OLS) Regression, is that they allow the researcher to use each county as its own control, and examine how *within* county changes in foreclosure is associated with *within* county changes in mental health over time. This is an improvement over standard OLS models, which would provide between-county comparisons, and are plagued by omitted variable bias. Fixed effects models greatly reduce omitted variable bias and account for all unobserved variables that are stable across counties over time and national time trends (Firebaugh, 2008; Johnson, 1995). Thus, any unobserved confounders that are stable over time – such as between-county differences in socioeconomic status – are accounted for in this framework. Moreover, this method is commonly used in research that examines the effects of living in states and counties that are hard hit during recessions (e.g. have high unemployment rates) on health and mental health (Houle and Light, 2014; Ruhm, 2003; Tefft, 2011), in part because it provides estimates that are less biased than other methods. As such, the fixed effects strategy allows a stricter test of the hypotheses under study. The fixed effects model is shown below:

$$Y_{ict} = \alpha + \beta_1 F_{ct} + \beta_2 X_{ct} + \beta_3 V_{ict} + w_c + k_t + e_{ict}$$

Where Y is the mental health outcome for individual i in county c at time t , F is the foreclosure rate in county c at time t , X is a vector of county level controls (e.g. the unemployment rate) in county c at time t , V is a vector of individual-level controls (e.g. race, marital status, age) for individual i in county c at time t . w_c , the county fixed effects, account for all observed and unobserved stable traits between counties. k_t , the year fixed effects, account for all observed and unobserved secular trends across years that are constant across counties (e.g. national trends). E is the error term. In all models, the foreclosure rate is lagged one year to ensure the correct temporal ordering, and because the impact of foreclosure rates on residents' mental health is unlikely to be immediate. Similarly, the unemployment rate is lagged one year prior to when foreclosure is measured, because the unemployment rate drives both foreclosure and mental health. Standard errors are corrected for clustering across counties.

To test whether the association between foreclosure and mental health is stronger in low SES and minority counties, I stratify these models by percent of residents with a college degree and percent African American, derived from five-year estimates from the ACS. I stratify models rather than compute an interaction term because I seek to test whether this within-county association varies between different types of counties. In a county-year fixed effects framework, an interaction term would provide a test of whether a within-

county association is moderated by changes in within-county changes in sociodemographic composition over the study period. I am interested in the former, not the latter. I conduct these analyses using the `xtreg` command in STATA 12.0. All significance tests are two-tailed.

I conduct several falsification tests as a robustness check on the results. Importantly, a key limitation of this study is that I lack individual-level measures of default and foreclosure. Thus, any effect of the foreclosure rate on individual mental health could potentially reflect both contextual effects and compositional effects. A significant positive effect of rising foreclosure rates on the number of mentally unhealthy days could reflect the effect of living in a high foreclosure area (the context effect), or it could reflect that individuals in these areas are more likely to experience the stressful life event of foreclosure (the compositional effect). I take several steps to ensure that any results presented here are not driven by compositional effects.

First, I exploit variation in the foreclosure process. As noted above, the foreclosure process typically begins with an NOD (notice of default), then Lis Penden, auction or sale, and some home becomes REO. I argue that we can use this variation to provide confidence that these are indeed context effects. If foreclosures are associated with mental health due to its effects on community resources and community stressors, then we might expect REO or total foreclosures to have a greater association with mental health than simple notice of default – which is more *private*, and is unlikely to lead to declining resources and increasing stressors in the community in the same way that rising foreclosures might. Indeed, experiencing a mortgage default is associated with declines in mental health (Alley et al., 2011). Thus, if we were to find relatively large effects of NOD, it's likely driven by the individual level effects of default on mental health. In this sense, the NOD rate is essentially the placebo.

Second, in supplementary analyses I compare owners and renters. Unfortunately BRFSS does not ask questions on homeownership in every state or every year of study, so I am unable to include this variable in my main analyses. However, if the effects are robust to controls for homeownership, and are significant for both owners (who are at the highest risk of home foreclosure) and renters, this would provide further evidence that this is indeed a context effect.

4. Results

I present descriptive statistics for the primary independent and dependent variables in Table 1. Across the years of study, total foreclosure rates increase from .30 in 2006, reach a peak of 1.13 in 2010, and decline to .87 in 2011. The average foreclosure rate over

Table 1
Mental health and foreclosure rates, 2006–2011.

	Foreclosure rates			Mentally unhealthy days
	Total	REO	NOD	
Year				
2006	.30	.09	.05	3.38
2007	.50	.12	.09	3.37
2008	.74	.23	.11	3.43
2009	1.01	.29	.11	3.49
2010	1.13	.39	.10	3.54
2011	.87	.31	.08	3.86
Mean	.76	.24	.09	3.52
(Range)	(0–20.9)	(0–5.67)	(0–10.09)	(0–30)

$N_{\text{counties}} = 2245$; $N_{\text{person-years}} = 1,891,144$.

Foreclosure and mental health differ significantly across years (ANOVA; $p < .001$).

the study period is .76, or 1 in every 133 homes. These figures are consistent with national estimates of foreclosure rates (RealtyTrac, 2010), suggesting that the 2245 counties in this study are representative of the U.S. The REO rate and NOD rates follow a similar trend. Turning to mental health, the mean number of mentally unhealthy days reported in the BRFSS is 3.52. I find that mental health worsened during the recessionary period – the number of mentally unhealthy days reported in the sample increased by about one-half of one day from 2006 to 2011. This is consistent with prior research that shows mental health declines during recessionary periods (Dooley et al., 1996; Tefft, 2011).

To address the first question in this study – are county-level foreclosure rates associated with mental health? – I present results from a series of models in Table 2. In Panel A I present results where the total foreclosure rate is the independent variable; the REO rate in Panel B; and the NOD rate in panel C. Please note that these are separate models, and I do not include the foreclosure measures in the same models due to multicollinearity. Model 1 of Table 2 shows findings from pooled OLS models with no covariates. In model 2 I add county fixed effects; county and individual-level covariates in model 3; and model 4 includes year fixed effects.

In Table 2, the total foreclosure rate and the REO rate are positively associated with mentally unhealthy days in the pooled OLS models, and the association persists after county fixed effects, year fixed effects, and confounders are added. In the final models, a one percentage point increase in the REO foreclosure rate is associated with a .066 increase in the number of mentally unhealthy days reported by residents in a given county across the years of study. Similarly a one percentage point increase in the total foreclosure rate is associated with a .027 increase in the number of mentally unhealthy days. While these may appear to be small effects, recall that the number of mentally unhealthy days increases by only one-half of a day over the study period and that these changes reflect within county changes over a six year period, rather than between county-differences. Moreover, the foreclosure effects reported here are comparable in size, and actually somewhat larger, to the other county-level variables in this study, including the unemployment rate and poverty rate. Thus, I find support for hypothesis 1, that a within-county increase in the foreclosure rate is associated with a within-county increase in the number of mentally unhealthy days. Note that the NOD rate is not significantly associated with mental health after accounting for county fixed effects. As noted above, this is consistent with evidence for a context effect.

Table 2
OLS, county fixed effects, and county-year fixed effects regressions of respondents' mentally unhealthy days on county foreclosure rates.

	Model 1	Model 2	Model 3	Model 4
<i>Panel A: Total foreclosures</i>				
Foreclosure rate	.029 (.006)***	.041 (.007)***	.037 (.007)***	.027 (.007)***
<i>Panel B: Real estate-owned</i>				
REO rate	.100 (.026)***	.127 (.019)***	.104 (.019)***	.066 (.020)***
<i>Panel C: Notice of default</i>				
NOD rate	.063 (.014)***	.011 (.016)	.015 (.015)	.016 (.015)
County fixed effects	No	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes
Covariates	No	No	Yes ^a	Yes ^a

* $p < .05$; ** $p < .01$; *** $p < .001$.

$N_{\text{counties}} = 2245$; $N_{\text{person-years}} = 1,891,144$; Average N per county: 790.6.

^a Models include the following covariates: county level: unemployment rate (lagged), percent African American, percent in poverty; individual level: sex (female = 1) race/ethnicity (NH black, Hispanic, other [NH white = ref]), marital status, employment status, educational attainment, age, age squared.

To address the second question in the study – is the association between foreclosure and mental health stronger in more disadvantaged and minority communities? – I present a series of models in Tables 3 and 4. First, I ask if the association between foreclosure and mental health is stronger in low SES compared to high SES counties. In Table 3, I show results from stratified models comparing the association between foreclosure rates and mental health in counties with the lowest quintile of college educated adults to counties with the highest quintile of college educated adults (based on 5-year estimates from the ACS). Second, I ask if the effect of foreclosure on mental health is stronger in counties with a high proportion of African American residents compared to counties with lower proportions of African American residents. In Table 4, I show results from stratified models comparing the association between foreclosure and mental health in counties with the lowest quintile of African American residents to counties with the highest quintile of African American residents. All models include county and year fixed effects and all covariates.

In Table 3, I find some evidence that the association between foreclosure and mental health is stronger in less educated counties than in more educated counties. In Panel A, the coefficient for the total foreclosure rate in the least educated counties (.070) is over twice the size of the coefficient in the most educated counties (.032). However, a z-test revealed that these coefficients are not significantly different from one another at the $p < .05$ level, thus it is difficult to draw strong conclusions. Turning to Panel B, however, the coefficient for the REO rate in the least educated counties (.229) is nearly four times the size of the coefficient for the REO rate in the most educated counties (.059). These coefficients are significantly different at the $p < .05$ level. Thus, I find support for hypothesis 2a that the association between foreclosure and mental health is stronger in lower SES than higher SES counties.

In Table 4 I find strong evidence that the association between foreclosure and mental health is stronger in counties with the highest proportion of African American residents compared to counties that have the lowest proportion of African American residents. In Panel A, the coefficient for the total foreclosure rate is positive and statistically significant in counties with the highest proportion of African American residents ($b = .068$; $p < .001$), and negative and statistically non-significant in counties with the lowest proportion of African American residents ($b = -.025$). These coefficients are significantly different from one another at the $p < .05$ level. Moreover, in Panel B I show that the REO rate coefficient is significantly larger in counties with the largest proportion of African American residents than in counties with the lowest proportion of African American residents (Highest % African American counties $b = .138$, $p < .001$; Lowest % African American

Table 3
County-year fixed effects regressions of respondents' mentally unhealthy days on county foreclosure rates, stratified by the proportion of county residents with a college degree or more.

	Least educated counties	Most educated counties
<i>Panel A: Total foreclosures</i>		
Foreclosure rate	.070 (.027)***	.032 (.010)***
<i>Panel B: Real estate-owned</i>		
REO rate	.229 (.065)***#	.059 (.028)***#
N_{counties}	396	556

* $p < .05$; ** $p < .01$; *** $p < .001$.

#Coefficients in low versus high educated counties are significantly different at $p < .05$ level.

$N_{\text{counties}} = 952$; $N_{\text{person-years}} = 1,152,228$; Average N per county: 790.6.

All models include the following covariates: county level: unemployment rate (lagged), percent African American, percent in poverty; individual level: sex (female = 1) race/ethnicity (NH black, Hispanic, other [NH white = ref]), marital status, employment status, educational attainment, age, age squared.

Table 4
County-year fixed effects regressions of respondents' mentally unhealthy days on county foreclosure rates, stratified by the proportion of African American residents.

	Highest% African American counties	Lowest% African American counties
<i>Panel A: Total foreclosures</i>		
Foreclosure rate	.068 (.019)***#	-.025 (.036)#
<i>Panel B: Real estate-owned</i>		
REO rate	.138 (.045)***#	-.046 (.086)#
N counties	508	193

* $p < .05$; ** $p < .01$; *** $p < .001$.

#Coefficients in low versus high % African American counties are significantly different at $p < .05$ level.

$N_{\text{counties}} = 701$; $N_{\text{person-years}} = 565,410$; Average N per county: 790.6.

All models include the following covariates: county level: unemployment rate (lagged), percent African American, percent in poverty; individual level: sex (female = 1) race/ethnicity (NH black, Hispanic, other [NH white = ref]), marital status, employment status, educational attainment, age, age squared.

counties $b = -.046$, nonsignificant). Thus, I find support for hypothesis 2b that the association between foreclosure and mental health is significantly stronger in counties with a high proportion of African American residents than in counties that have a smaller proportion of African American residents.

4.1. Supplementary analyses

I conducted several sensitivity tests to check the robustness of the results and ensure that the results presented here are indeed context effects, and are not driven by individual-level (compositional) effects. First, as noted above, I estimated the association between the NOD rate and mental health (see Table 1), with the logic that a notice of default is a private event that would not have demonstrable effects on community resources and stressors. I find no significant association between the NOD rate and mental health, but do find a significant association between the total foreclosure, REO, and mental health. This provides indirect evidence that the effects found in this study are indeed context, and not compositional effects.

Second, I also estimated supplementary models accounting for homeownership status (1 = owner; 0 = renter). Accounting for homeownership status diminished the sample size significantly because the homeownership question was asked only in certain states and in a limited number of years. However, when controlling for homeownership, I find statistically and substantively identical results to the results presented here. I also stratified analyses separately for owners and renters. I found that the foreclosure-mental health association was positive and significant among both owners and renters (not shown, available upon request). If the associations found in this study were primarily driven by compositional (individual level) effects, we would expect to see much larger effects on mental health for owners compared to renters, because owners have a much higher risk of foreclosure than do renters. Thus, this provides additional indirect evidence that the results presented here reflect contextual (place-level) effects.

Finally, I conducted several analyses to ensure the results were robust to model specifications, in part because mental health is right skewed (mean: 3.42, median: 0, IQR: 2). These include: logged dependent variable, poisson, and logistic regression models predicting a dichotomous measure of mental health (≥ 14 mentally unhealthy days) (Moriarty et al., 2009). All of the results were substantively and statistically similar to the results presented here.

In sum, I find support for all three study hypotheses. I find that within-county increases in foreclosure rates are associated with subsequent declines in residents' mental health, net of a range of confounders; and, I find that these associations are strongest in

disadvantaged and minority areas, relative to more advantaged, white areas.

5. Discussion

In this study I add to a large body of literature on recessions, and an emerging literature on foreclosure and health, and ask how living in high foreclosure areas is associated with residents' mental health during the recessionary period. I expand on prior research by conceptualizing foreclosure not only as a stressful life event that occurs to homeowners and their families, but as something that has unfolded unequally across places over time, and has disproportionality impacted some places more than others. I develop and test three primary hypotheses.

First, I hypothesize that a rise in the local foreclosure rates is associated with residents' mental health because it leads to a decline in community resources that are protective of mental health (e.g. social capital, community investment, wealth/home prices) and a rise in community stressors (e.g. crime, abandoned homes, insecurity) that are detrimental to mental health. Supporting this notion, I find that a rise in local foreclosure rates is associated with declines in residents' mental health, net of observed and unobserved stable characteristics and national time trends. In addition, I find that the observed associations are stronger for REO foreclosure than the overall foreclosure rate. This is perhaps unsurprising, because the REO rate is a more severe measure of crisis, and is associated with a greater loss in community resources and a rise in community stressors. For instance, rising REO rates indicate that more homes are being repossessed by lenders (which are then up for the lenders to maintain and potentially neglect), and are at a high risk for vacancy and abandonment (Immergluck, 2009; National Fair Housing Alliance, 2012).

Second and third, I hypothesize that the foreclosure-mental health association is stronger in a) low SES areas and b) minority areas, in part because the social costs of foreclosure are likely to be greater in these communities. Supporting these hypotheses, I find that the association between foreclosure and mental health is strongest in the most socioeconomically disadvantaged areas and in areas with the highest concentration of African American residents. This raises important questions about the role of the foreclosure crisis in exacerbating existing disparities in mental health and well-being.

A common theme in the emerging literature on foreclosure is that the rise in foreclosures has the potential to exacerbate a range of existing social inequalities, in part because the places that were hit the hardest also tend to be the most disadvantaged (Rugh and Massey, 2010). As such, the foreclosure crisis is inextricably linked to current systems of inequality. Despite this, very little research has considered how rising foreclosures may exacerbate disparities in well-being. We know, for example, that residents who live in areas of concentrated disadvantage tend to have worse mental health outcomes than residents who live in more advantaged areas (Jia et al., 2009; Kim, 2010; Robert, 1999). And, as I show in this study, it was precisely these disadvantaged communities that faced the greatest reduction in mental health as foreclosure rates climbed. This suggests that these place-based disparities in mental health are likely to have increased during the Great Recession as the result of foreclosure. Future research should continue to interrogate changing disparities in health and mental health during recessionary periods.

This study also raises more general questions about the role of recessions and economic crises in reproducing or exacerbating social disparities in health and mental health. Prior research on recessions tends to focus on the "main effects" of state-level unemployment rates on levels of mental health (e.g. Tefft,

2011). I build on this literature in three ways. First, I consider the unique contributions of foreclosures to mental health in addition to more traditional economic indicators of recession. Second, I provide a better approximation of the local conditions by examining county-level, rather than state-level effects. Third, I move beyond a “main effects” approach and consider heterogeneity across different types of places. The results of this study imply that we should consider how recessions intersect with social inequalities to contribute to both levels of, and disparities in, mental health.

This study also has several methodological strengths. Namely, I employ county-by-year fixed effects models to examine the link between changes in within-county foreclosure rates and within-county changes in residents' mental health. This approach is an improvement over traditional OLS estimates and eliminates all stable between county and national observed and unobserved heterogeneity. In addition, I provide several unique falsification tests to ensure that the link between rising foreclosure and mental health is not driven by compositional (individual-level) effects, or other unobserved characteristics.

Despite its strengths, this study is not without limitations. First, I am unable to control for individual-level indicators of default or foreclosure, despite the fact that I provide unique falsification tests to detect context versus compositional effects. Second, the single-item measure of mental health likely has more measurement error than a scale, and is unlikely to capture the full range of mental health problems that may result from rising foreclosures. Thus, it's possible that these results are conservative estimates. Moreover, this study focuses only on mental health, and does not consider the potential impact of the foreclosure crisis on physical health. However, diminished mental health may be an immediate response to the foreclosure crisis, which may over time lead to poor physical health outcomes. Mental health is a key mechanism by which social factors influence physical health outcomes over the life course (Houle, 2013), and recent research shows that rising foreclosures may diminish residents' physical health (Arcaya et al., 2013, 2014). Future research should continue to examine how the foreclosure crisis is linked to population health, broadly defined. Third, using the county-level foreclosure rate as a proxy for the community's experience of foreclosure may be problematic. We may get a more accurate view if we could drill down to a lower level of aggregation, such as the census tract. Fourth, although the fixed effects models used in this study are an improvement over traditional OLS regression models, ultimately I can detect only correlation, and not causation. Finally, I am unable to measure the community-level stressors and resources that I hypothesize are the key mechanisms linking foreclosure rates with individual mental health. As the data become available, future research should further interrogate the link between foreclosure and mental health.

Despite limitations, this study sheds new light on the association between foreclosure and mental health, and shows that the effects are unequally distributed across places in ways that may reinforce and exacerbate existing disparities in mental health. These findings raise important questions about how we might break the link between rising foreclosures and mental health. Policies aimed at reducing foreclosures and keeping property owners in their homes – such as the HUD Neighborhood Revitalization Program, REO to Rental Programs, and loan modification programs such as The Home Affordable Modification Program – may be able to stem the anguish associated with the foreclosure crisis. Future research should continue to examine how recessions and the current economic crisis impact overall levels and disparities in population health, and explore the programs and policies that could break this link.

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