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IS THERE A LINK BETWEEN FORECLOSURE AND HEALTH?

Janet Currie
Erdal Tekin

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ABSTRACT

We investigate the relationship between foreclosures and hospital visits using data on all foreclosures and all hospital and emergency room visits from four states that were among the hardest hit by the foreclosure crisis. We find that living in a neighborhood with a spike in foreclosures is associated with significant increases in urgent unscheduled visits, including increases in visits for preventable conditions. The estimated effects cannot be accounted for by increasing unemployment, declines in housing prices, migration, or by people switching from out-patient providers to hospitals. We conclude that the estimates are consistent with the hypothesis that stress associated with foreclosure harmed people's health.

Janet Currie
Princeton University
316 Wallace Hall
Princeton, NJ 08544
and NBER
jcurrie@princeton.edu

Erdal Tekin
Department of Economics
Andrew Young School of Policy Studies
Georgia State University
P.O. Box 3992
Atlanta, GA 30302-3992
and NBER
tekin@gsu.edu

I. Introduction

Foreclosure rates reached historically high levels in the United States during the recent economic crisis. According to Realtytrac, a leading firm that monitors and markets foreclosed homes, a record 2.82 million homes faced foreclosure in 2009, a 21 percent rise from 2008 and a huge 120 percent jump from 2007.[1] One in 45 homes (2.23 percent of all housing units in the U.S.) received at least one foreclosure filing during 2010. As policymakers have debated measures to stabilize the housing market and minimize the damage to the U.S. economy, researchers have turned their attention to understanding the consequences of rising foreclosures.

While a number of studies have investigated the effect of the foreclosure crisis on outcomes such as home prices and sales, residential investment, and durable consumption (e.g., Immergluck and Smith, 2006; Calomiris, Longhofer, and Miles, 2008; Rogers and Winter, 2009; Harding, Rosenblatt, and Yao, 2009; Mian, Sufi, and Trebbi, 2010), there has been no large-scale investigation of the effect of the crisis on health. The foreclosure crisis represents a significant shock to the financial well-being of many households, reaching beyond those that actually suffered foreclosure through its effects on housing values, and thus provides a fresh opportunity to examine the relationship between financial distress and health. Financial distress may have direct effects on health, but can also cause changes in health behaviors, which in turn have negative health consequences.

The goal of this paper is to investigate whether the foreclosure crisis is having an adverse effect on health. To accomplish this goal, we assemble quarterly data on all foreclosures, Emergency Room (ER) visits, and hospitalizations from four states (Arizona, California, Florida,

[1] See http://www.realtytrac.com/content/foreclosure-market-report.

and New Jersey) which are among the 10 states that have been hardest hit by the crisis. Unfortunately, there are no individual-level longitudinal sources of data linking foreclosure and health. In the absence of such data, we match data on foreclosures, hospitalizations, and ER visits at the zip code level.

Our main specifications control for zip code and county by quarter by year fixed effects so that our effects are identified by changes *within* zip codes (rather than comparisons of, for example, rich and poor neighborhoods). We find strong evidence that increases in foreclosure are associated with increases in non-elective (i.e. urgent and unscheduled) hospital and ER visits and with increases in visits that could be prevented by appropriate preventive care. An important question is whether these associations represent a causal relationship between the stress of foreclosure and health, or some other mechanism?

We consider several possibilities. First, it is possible that for many people, ill health causes foreclosure. However, the huge run-up in foreclosures over the period we examine was unlikely to be caused by an epidemic of ill health among American homeowners. Thus, the foreclosure crisis offers a way to rule out this hypothesis as a major explanation for our results, and allows us to focus on the question of whether foreclosures affect health rather than vice versa.

Second, given the previous literature linking unemployment and ill health, it might be the case that the relationship we observe represents a response to unemployment rather than to foreclosure per se. We explore this hypothesis in three ways: By estimating models at the county level and including both foreclosure and unemployment; by recalling that the beginnings of the foreclosure crisis preceded the increase in unemployment and estimating our models using data only through the first quarter of 2008; and by including interactions of county, quarter, and

year of our sample time period in our zip-code level models in order to account for all time-varying features of local labor markets including unemployment rates. We consistently find stronger effects of foreclosure than of unemployment.

A third possibility is that foreclosure affects health by depressing housing prices. This is an interesting hypothesis because it implies that the health effects could be driven by people who were not necessarily themselves subject to foreclosure, but who might have experienced the spillover effects of foreclosures onto housing prices. However, we show that controlling for housing prices has little impact on the estimated effect of foreclosure, and that housing prices themselves seem to have relatively little impact on health.

A fourth possibility is that people in financial distress may stop going to outpatient providers and visit emergency rooms instead. That is, the increases in visits that we see could represent patients switching venues rather than an increase in health conditions that warrant medical care. We address this concern by estimating models using a subset of serious acute conditions that almost always result in emergency visits to the hospital, so that there is little scope for venue switching. These conditions include: Heart attack, stroke, respiratory failure, gastrointestinal hemorrhage, kidney failure, and poisonings (including drug overdoses). We find that foreclosures are associated with significant increases in hospitalizations for all of these conditions.

Our findings indicate that a rise in foreclosures is associated with significant increases in hospital and emergency room visits for stress-related conditions including mental health problems, heart attack, and stroke, as well as for conditions, such as hypertension, that could be prevented by appropriate care. Our estimated effects are larger for prime aged individuals and their children, who are likely to have been among the most severely affected by the foreclosure

crisis. They are also stronger for neighborhoods with a high concentration of minority residents and in low income neighborhoods. Although we do not directly observe measures of stress, our results are consistent with the idea that the stress of foreclosure affects health both directly, and through changes in behavior that result in reductions in preventive care. Hence, our work provides additional evidence about the nature of links between financial, mental, and physical health.

The rest of the paper is laid out as follows. In Section II, we provide some background information about the foreclosure crisis, and previous work on the relationship between economic activity and health. We then discuss our data in Section III and methods in Section IV, followed by the results in Section V and extensions in Section VI. We provide a brief conclusion in Section VII.

II. Background

Whatever the root causes, delinquencies and foreclosures soared starting in late 2006 (Campbell, Giglio, and Pathak, 2009; Calomiris, Longhofer, and Miles, 2008, Harding, Rosenblatt, and Yao, 2009, Lin, Rosenblatt, and Yao, 2009; Immergluck and Smith, 2006).[2] The turmoil in the housing market spread to capital markets and helped to generate the current continuing economic malaise (e.g., Green, 1997; Leamer, 2007; Gauger and Snyder, 2003).

a) How Could Foreclosures Affect Health?

Before considering how foreclosure could affect health, we acknowledge the literature

[2] Explanations that have been offered for the foreclosure crisis include a relaxation in underwriting standards and the expansion of mortgage credit to subprime borrowers (e.g., U.S. Department of Housing and Urban Development, 2009; Dell'Ariccia, Igan, and Laeven, 2008; Demyanyk and Van Hemert, 2011), mortgage securitization having an adverse effect on the screening practices of lenders (e.g., Keys et al., 2010), widespread negative equity caused by the willingness of mortgage lenders to issue mortgage-debt on homes in which the owners had little or no equity (e.g., Gerardi, Ross, and Willen, 2009, 2011), and a rapid increase in interest rates after a period of historically low levels that fueled a housing bubble (e.g., Mayer and Hubbard, 2008).

arguing that ill health is an important cause of foreclosure (e.g. Warren et al., 2007; Pollack and Lynch, 2009).[3] We argue however, that the foreclosure crisis represents a sharp shock to wealth that has not been caused by a sudden epidemic of ill health among U.S. homeowners. Moreover, while in hindsight many commentators have said that a crash was inevitable, the timing and severity of it were certainly a surprise to almost all observers (Mian and Sufi, 2010; Calomiris, Longhofer, and Miles, 2008; Demyanyk and Van Hemert, 2011). It is this feature of the foreclosure crisis that presents a unique opportunity to explore the consequences of foreclosure on health. While it is reasonable to suppose that there is always a baseline level of foreclosures that is caused by misfortunes including ill health, there is no reason to suppose that the spike in foreclosures was caused by the health problems of individual homeowners.

High levels of foreclosure in a neighborhood may affect health because housing is the major source of wealth for most people. Therefore, declines in housing prices represent a significant negative shock to wealth, not just for those who suffer foreclosure, but also for their neighbors. For example, Mian, Sufi and Trebbi (2011) conclude that a one standard deviation increase in foreclosures in a zip code results in a growth rate in housing prices that is two-thirds of a standard deviation lower.

A second potential mechanism is through stress. Stress is thought to affect health both by depressing the immune system and through the direct action of "stress hormones" on factors such as blood pressure and cardiovascular health (McEwen, 1998a, 1998b). Stress can also have harmful consequences through psychological responses such as depression. A growing literature suggests that stressful life experiences are associated with both physical and mental illnesses

[3] See Deaton (2002) for a concise survey of the literature linking health and wealth.

(Goldberger and Breznitz, 1993; McEwen, 1998a, 1998b; Cooper, 2005; Schneiderman, Ironson, and Siegel, 2005). In related work, Deaton (2011) finds negative effects of the Lehman Brother's failure on self-reported stress and well-being.

While the press has focused on reports of homeowners being victimized by unscrupulous lenders, it is possible that others who were foreclosed were property speculators with little money at stake, and who may not have found the process particularly stressful. Bajari, Chu, and Park (2008) consider two broad categories of foreclosures: Those among homeowners who rationally decide to "walk away" from a mortgage when it is no longer in their interest to pay; and those who lose their homes due to short-term liquidity constraints caused by conditions such as the credit freeze, interest rate "resets", and balloon mortgages. Bajari et al. conclude that short-term liquidity constraints were at least as important as the decline in housing prices in explaining the increase in defaults. Hence, it is reasonable to believe that many homeowners were "in over their heads" and likely to find the experience of foreclosure stressful.

Reductions in wealth can also affect health through changing health behaviors. Several studies have linked economic crisis to reductions in the utilization of medical care (e.g., Lusardi, Schneider, and Tufano, 2010; Williams and Collins, 1995; Feinstein, 1993). As we will see below, foreclosures are linked to increases in visits to hospitals and ERs for preventable conditions, suggesting that people are cutting back on preventive care and/or increasing unhealthy behaviors in response to financial stress.

b) Effects of Unemployment on Health

While the health effects of foreclosure have been ignored, there is extensive and related literature examining the effects of unemployment and job loss on health. Ruhm (2000, 2003, 2006), Ruhm and Black (2002), Neumayer (2004), and Gerdtham and Ruhm (2006) find that higher

unemployment is associated with lower mortality rates, while Dehejia and Lleras-Muney (2004) find that higher unemployment improves infant health. These patterns have been attributed to recession-induced changes in health behaviors, though the evidence on this channel is mixed (see Xu and Kaestner (2010) and Deb et al. (2011)). Miller et al. (2009) argue that the cyclical changes in mortality are concentrated in the young and the old and so are unlikely to represent changes in health behaviors among working age adults.

Sullivan and Wachter (2009) follow a large sample of individuals subjected to mass layoffs and find significantly higher death rates due to accidents and heart conditions. Eliason and Storrie (2009a, b) examine data from plant closings in Sweden in 1987 and 1988 and find increases in suicide, self harm, accidents, and alcohol-related causes in the 12 years following job displacement. Browning and Heinesen (2012) report similar results for plant closings in Denmark.

While foreclosure and unemployment are both negative economic shocks, they differ in key respects: Foreclosure does not entail increases in leisure and unemployment does not generally have spillovers in terms of other peoples' wealth (though a mass layoff might). Still, the literature suggests that unemployment can have negative health effects. Since the foreclosure crisis has been followed by the worst recession since the Great Depression, it is reasonable to wonder whether the health effects that we find are primarily due to unemployment rather than foreclosure.

Figure 1 shows that the rise in foreclosures preceded the increase in unemployment in our four study states. One way we will try to distinguish between the effects of unemployment and the effects of foreclosure is by conducting sub-analyses on the period 2005 through first quarter 2008 when unemployment was largely constant or falling and foreclosures were rising. We also find that county-level models that control for unemployment directly produce very similar estimates of the effects of foreclosure.

Our zip-code level models will include indicators for each combination of county and time period in our models; these indicators control for the effects of county unemployment rates and all other time-varying county-level characteristics.

III. Data

a) Data from the Panel Study of Income Dynamics

One of the major difficulties to be overcome in a study of the relationship between foreclosures and health is that there are no large longitudinal data sets that have information both about foreclosure and health. The Panel Study of Income Dynamics (PSID) added questions about foreclosure in 2009, but the sample size is small enough that only 327 had experienced a foreclosure since 2001.[4] A sample of this size is far too small to analyze the relationship between foreclosure and health, though the PSID can be used to provide a portrait of what type of households are most likely to suffer foreclosure.

The PSID Housing Distress and Mortgages supplement in 2009 included questions about the family's foreclosure history over the past decade[5]. The PSID also asks about general health questions (on a five point scale) and whether a doctor has ever told respondents that they have a number of specific health conditions. The PSID had 8,682 respondents in 2009.

Table 1 provides an interesting starting point for our analysis. The first two columns divide the sample into those who ever experienced foreclosure (since 2001) and all others. The

[4] The PSID is a biannual survey of American households conducted by the University of Michigan's Institute for Social Research since 1968.

[5] Specifically, the four questions are: "Has your bank or lender started the process of foreclosing on your home?--First/Second Mortgage". "In what month and year did the foreclosure start? --First/Second Mortgage". "During the last 8 years, that is, since 2001, have you, or anyone in your family living there ever owned a home on which a foreclosure was started?" and "In what month and year did the foreclosure start?"

questions pertain to the household head. Those who have suffered foreclosure are generally younger, with relatively few elderly people in that group.[6] Whites are under-represented in the ever foreclosure group, while blacks and Hispanics are over-represented. Those who have been foreclosed are somewhat less likely to be married, but more likely to have children under age 18 in the household. They are less likely than others to report excellent health, but only slightly more likely to report that their health is poor. They are much more likely to smoke, but somewhat less likely to drink than others.

The next four columns of the table look at foreclosure status in 2009. A few points stand out: First, one reason that the elderly respondents are less likely than others to be in foreclosure is that they are more likely to own their homes free and clear. This finding suggests that while elderly people might be impacted by falling housing prices, they would not be as likely as younger households to suffer short-term credit constraints due to changes in the terms of a mortgage. Second, while households with a head who is unemployed are disproportionately more likely than others to be in foreclosure, only 16 percent of those households currently in foreclosure have unemployed heads. Hence, many employed people are also experiencing foreclosure, or living with the threat of foreclosure. A third observation is that those who are currently in foreclosure report worse health than others.

This analysis is suggestive of a negative relationship between foreclosure and health and is helpful for determining what demographic groups might be most affected by foreclosure, but

[6] This finding accords with other available evidence. See Cunningham and Capone (1990) and Anderson and VanderHoff (1999). Shelton (2008) analyzed a random sample of 2.5 million persons from Experian, the credit rating agency. She finds that three quarters of foreclosures in the second half of 2007 were among homeowners aged less than 50. Other work suggests that financial decision making usually improves with age (e.g. Agarwal et al., 2007) and that older people are less likely to borrow on the equity in their homes (e.g., Duca and Kumar, 2010).

the small numbers of foreclosures in the PSID makes it difficult to analyze this relationship in a multivariate model. Hence, we turn to administrative hospital records for that analysis.

b) Foreclosures, Hospitalizations, and Emergency Room Visits

We focus on the states of Arizona, California, Florida, and New Jersey for several reasons. First, we wish to focus on states that have recently had high levels of foreclosures. Together these four states comprised almost 50 percent of all the foreclosure filings in the U.S. in 2008 (RealtyTrac Press Release, January 15, 2009). They were all in the top 10 foreclosure states, posting the third, first, second, and tenth largest totals of foreclosures in the country in 2010, respectively. Second, we wish to use hospital discharge and emergency room data for entire states, rather than from a sample of hospitals, and to focus our analysis at the zip code level, because, as shown in Figure 2, there is a great deal of variation in foreclosure rates within counties. The figure shows the number of foreclosures divided by population in the zip code (from the 2000 Census). The heavy black lines show the county boundaries. Clearly, there is a good deal of variation between zip codes within a county, and even within the boxed area showing central Florida, which was particularly hard hit overall.[7]

It is important to include ER visits in addition to hospitalizations, because financial constraints can affect whether the person first presents at the ER, as well as the probability that someone on the margin is admitted to the hospital if they do appear at the ER. These four states were the only high foreclosure Healthcare Cost and Utilization Project (HCUP)[8] states to both

[7] For example, the National Inpatient Database has a 20 percent sample of hospitals and it is not possible to tell if changes in hospitalizations or ER visits at hospitals in the sample might be counter-balanced by changes in these outcomes at other hospitals outside the sample.

[8] Visit http://www.ahrq.gov/data/hcup/ for more information on HCUP databases. Data on ER visits comes form the State Emergency Department Databases (SEDD), which capture discharge information on all emergency department visits that do not result in an admission. Hospitalization data come from the State Inpatient Databases (SID), which hold the universe of inpatient discharge abstracts. In order for a discharge record to exist, the patient must have

make ER data available and to include the zip code of each patient's residence over our period.

Foreclosure data are available at the zip code level monthly between April 2005 through December 2009 from RealtyTrac. RealtyTrac is a leading foreclosure monitoring and marketing company, which collects data from public records at the local level, which is where legal documents for foreclosures are recorded, posted, and published. With coverage that accounts for more than 90 percent of the U.S. population, the RealtyTrac data have been widely used by the media as well as researchers studying foreclosures (e.g., Mian, Sufi, and Trebbi, 2011; Pettit et al., 2009; Gaffney, 2009).

The foreclosure data include information about both a notice of trustee sales (NTS) and/or a notice of foreclosure sale (NFS). A state generally has either NTS or NFS and this depends on whether the state uses a judicial or a non-judicial process in foreclosures, so we construct measures of foreclosures as NTS+NFS.[9] A judicial process requires court action on a foreclosed home, which usually takes longer. In general, NTS is available only for non-judicial states, while NFS is only available for judicial states. Among our sample states, FL and NJ are judicial foreclosure states. Zip code level data on housing prices in each quarter come from Zillow. Zillow does not compile data for smaller zip codes so including this variable reduces our sample size.

Our health measures come from administrative data bases maintained by our sample states. States collect information about every hospital inpatient and ER visit, which they use to regulate hospitals. Participating states make these data available to researchers through the HCUP, a Federal-

been admitted to the hospital; hence the SID contains records of patients who require more intensive treatment or for whom treatment cannot be provided on an outpatient basis.

[9] Mian, Sufi, and Trebbi (2011) define foreclosures as NTS+NFS+REO using data from the RealtyTrac. However, since we use quarterly data rather than monthly data (because Florida hospital data is not available monthly), there is a possibility that the same property could be counted both as NTS or NFS and as REO. We have also estimated our models including REO as a separate variable and obtained results very similar to those reported below.

State-Industry partnership. These data consist of individual visit level records. They include detailed diagnostic and procedure codes, as well as some information about charges and a few demographic characteristics (age, race, gender, and the patient's zip code of residence).[10]

We combine ER visits that did not result in hospitalizations, plus all hospitalizations other than those for childbirth, contraception, and abortion. We excluded these procedures because fertility may itself respond to foreclosure. We treat ER visits and hospital admissions together, because wealth, demographic characteristics, or changes in health insurance status might be correlated with the decision to admit a patient presenting at the ER, at the margin. HCUP classifies diagnoses using a tool called Clinical Classification Software (CCS).[11] The CCS takes thousands of International Classification of Disease (ICD) codes and groups them into clinically meaningful categories. We use the single level diagnosis codes, and group them into larger aggregates using information from the multi-level diagnosis codes. For example, single codes for Pneumonia, Influenza, Tonsillitis, Bronchitis, and other respiratory infections are grouped together in a category we call "Respiratory Infections", while heart attacks, strokes, chest pain, dysrhythmias and other heart problems are grouped together as "Heart Problems". More information about our aggregates is in the appendix.

An additional hospitalization category that we consider is an index of "Prevention Quality Indicators" (PQIs). These indicators are published by the Agency for Healthcare Research and Quality (AHRQ) and are based on ICD-9-CM diagnosis codes. PQIs are index conditions for

[10] We actually use Zip Code Tabulation Areas (ZCTAs) rather than zip codes as these are the units reported by the Census and remain consistent between Censuses. Zip codes are constructed by the postal service and frequently change. Using ZCTAs allows us to merge population estimates from the 2000 Census to our data. We drop about 10% of the sample that could not be matched to ZCTAs. The final number of ZCTAs in our analysis sample is 3,525.

[11] More information is available at http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp#download.

which good outpatient care can prevent the need for hospitalizations or ER visits, or for which early intervention can prevent complications or more severe diseases. Hospitalizations and ER visits for many other conditions may also be preventable to some extent, but PQIs are those which can almost always be prevented with appropriate care. To the extent that individuals who suffer foreclosure have fewer preventive doctor visits, stop adhering to prescription medicine regimes, or otherwise stop looking after themselves, underlying health problems may be exacerbated by foreclosure activity. Hence, it is particularly interesting to look at PQIs because they reflect patient behavior. The PQI category includes short and long-term complications of diabetes, amputations due to diabetes, and uncontrolled diabetes, perforated appendix, chronic obstructive pulmonary disease, hypertension, congestive heart failure, dehydration, bacterial pneumonia, urinary tract infection, angina without procedure, and adult asthma.

We also look separately at elective procedures. Elective procedures are coded by HCUP, and involve visits that are not urgent, not emergencies, and not trauma care. Typically, these visits are scheduled. Patients have more discretion over the scheduling of elective visits and might decide to forego them or to stretch out the time between visits in response to financial constraints. On the other hand, to the extent that the foreclosure crisis worsens people's health, it might result in greater numbers of both scheduled and unscheduled visits. Hence, the effect of the crisis on elective visits is ambiguous. In contrast, to the extent that foreclosures induce health emergencies, the effect on non-elective procedures should be positive.

In order to match the hospitalization data and the foreclosure data, we calculate the total number of hospitalizations in each category for each zip code and quarter. Similarly, we calculate the total number of foreclosures for each zip code and quarter. We impute zeros for zip codes that appear in RealtyTrac but have no hospitalizations. The result is a balanced panel of 3,525 zip

codes with 19 time periods for a total of 66,975 observations.

Table 2 shows means for all zip codes, as well as for those that were in the top and bottom fifths of the distribution of foreclosures per capita in 2009. While the average zip code in our sample had 46.97 foreclosures per quarter in 2009, zip codes in the top fifth of the distribution had 119.43 foreclosures compared to 2.19 foreclosures per quarter in the least impacted zip codes. The table shows that the number of foreclosures increased more than 15 fold in the most highly impacted zip codes, but only tripled (from very low levels) in the least impacted zip codes between 2005 and 2009. Housing prices also fell more precipitously in the most impacted zip codes, from $341,000 to $205,000, compared to a decline from $479,000 to $420,000 in the least impacted zip codes.

The middle panel of Table 2 shows that high foreclosure zip codes are more densely populated, have lower income, a slightly higher percentage of African-Americans, and much higher percentages of Hispanics (22.89 vs. 9.66%) than low foreclosure zip codes. There is little difference in the fraction of elderly people elderly people.

The ER and hospitalization data is explored in the last panel of Table 2. The first column shows the number of hospitalizations of different types overall, while the second and third columns of Table 2 show types of visits for people in zip codes in the bottom and top fifths of foreclosure activity (as of 2009). Comparing high and low foreclosure zip codes, we see that high foreclosure zip codes have similar rates of elective visits, but higher rates of non-elective visits. They also have higher rates of preventable visits, visits for heart problems or stroke, as well as higher rates of visits for mental health problems and respiratory tract infections. There are identical numbers of visits for cancer, however. Among all the categories of non-elective visits, we focus on heart problems, mental health problems, and respiratory infections both because these are large categories

and because we think these conditions may be especially impacted by financial distress. We also look at cancer as a possible "control" condition. Although stress could possibly make cancer patients sicker, it is unlikely to cause cancer in the short term, and we hypothesize that the impact of foreclosure on visits for cancer may be lower than the impact on other more stress-sensitive conditions.

IV. Research Design and Methods

We estimate a series of models that relate changes in the number of hospitalizations or ER visits at time t to the number of foreclosures in the past year. Specifically, we estimate models of the form:

$$(1) \qquad H_{zqt} = \alpha_0 + \alpha_1 F_{zqt-1} + \alpha_2 F_{zqt-2} + \alpha_3 F_{zqt-3} + \alpha_4 F_{zqt-4} + \mu_z + \lambda_{cqt} + \varepsilon_{zqt},$$

where H_{zqt} is one of our outcome measures in zip code z in quarter q in year t. The variables of interest in equation (1) are $F_{zqt-1} \ldots F_{zqt-4}$, the number of foreclosures in the zip code in the last four quarters. Within a particular quarter, a foreclosure may have taken place after a hospitalization, which is why we focus on lagged values. We took an agnostic, practical approach to determining lag length. Below we show models with one lag as well as models with four lags. We found that adding more lags beyond the four we show here reduces the length of the time series available and added little explanatory power.

The unit of analysis in equation (1) is a zip code, quarter, and year. The data is weighted using the zip code population for the relevant demographic group from the 2000 Census.[12] Indicators for each zip code, μ_z, are included to control for any time-invariant zip code level factors that may be correlated with both foreclosures and health. The vector λ_{cqt} includes an indicator for each possible combination of county, quarter, and year. These indicators control for

[12] Unweighted regressions produced very similar results.

any time varying county level factors that are correlated with both foreclosures and health. For example, the λ_{cqt} absorb the effects of county unemployment in addition to all other characteristics of a county, year, and quarter. The vector ε_{zqt} represents an idiosyncratic random error term. To adjust for correlations within a county, standard errors are clustered at the county level.

Note that we have specified equation (1) in terms of levels. It might be more natural to think of specifying the equation in terms of rates; that is, the rate of hospitalization would be regressed on the rate of foreclosures. However, accurate data on population is only available at the zip code level from the decennial Census. If the measure of population used to construct the rates is a constant, then equation (1) is equivalent to a model specified in rates (since both sides would be divided by the same constant to get the rate). Moreover, including the zip code fixed effect accounts for the fact that some zip codes are much larger than others.

An important concern about (1) is that people who suffer foreclosure may leave the area. Since we do not follow individuals over time, we have no way of determining if the individuals who go to the hospital are the same individuals who suffered foreclosure (or their family members). Equation (1) captures the effect of the last year's foreclosure auctions on those who remain in the neighborhood. The existing literature suggests that while those who suffer foreclosure are more likely to move than others, many of them are likely to remain in the neighborhood for some time. For example, recent work by Molloy and Shan (2011) shows that although people who suffer foreclosure are more likely to move, 80% stay in the same local labor market. This finding suggests that most of those who suffered foreclosure are likely to stay in the same county, and provides an additional reason to estimate county-level models in addition to zip code level models in order to assess the likely impact of migration on our zip-code level estimates.

Molloy and Shan (2011) also find that half of those who begin foreclosure proceedings are still at

the same address two years after the process began. The process takes longer in judicial states than in non-judicial states, so we estimate separate models for the two groups of states as a robustness check. If migration biases our zip code level estimates, then it should be the case that the estimates differ between the two sets of states. We also check the robustness of our results to using foreclosure starts (i.e. the number of households being notified that the foreclosure process is beginning) rather than foreclosure auctions.

If foreclosure does have negative effects on health and those who have suffered foreclosure are more likely to leave, then estimating models at the zip code level is conservative and will tend to underestimate the effects of foreclosure on health. More generally, if migration is a serious concern and a high foreclosure rate results in a loss of population from a zip code, then we would expect the number of hospitalizations/ER visits to fall rather than to rise in models estimated at the zip code level.

We estimate separate models by age group and by characteristics of the neighborhood including race and ethnicity, and income. We disaggregate by age because people in different age groups suffer from different health conditions and have differential access to public health insurance. The age groups we use are: 0 to 19, 20 to 49, 50 to 64, and aged 65 plus.

We estimate separate models for zip codes with high and low fractions of black and Hispanic residents because minority and low-income groups are thought to have been particularly hit hard by the foreclosure crisis (Rugh and Massey, 2010). It has been argued that lenders targeted low-income minority neighborhoods for risky loans (Avery, Brevoort, and Canner, 2007; Bocian, Ernst, and Li, 2008; Calem, Gillen, and Wachter, 2004; Mayer and Pence, 2008; Squires, 2008). Bowdler, Quercia, and Smith (2010) argue that Latinos have been particularly strongly affected.

Finally, in order to evaluate the possibility that our results are driven by people switching providers, we estimate a set of models using visits for serious acute conditions that would almost

always result in a hospital or ER visit. For example, when people suffer a heart attack or respiratory failure, they go to the hospital, not to their primary care physician. Hence, there is little scope for "provider switching" for these diagnoses. We will show that foreclosure is associated with significant increases in visits for these conditions.

V. Results

Table 3 provides an overview of our main results. The first panel shows estimates of an equation with one lag for all non-elective procedures, the subset of non-elective procedures that are preventable, four specific types of conditions, and elective procedures. The estimates suggest that each additional foreclosure in a zip code leads to 2.17 non-elective visits, including 0.199 preventable visits. In terms of types of visits, the effect is largest for respiratory infections (with a coefficient of 0.765) and is statistically significant for heart conditions and mental health conditions. There is no economically or statistically significant effect on cancer visits or elective visits. If we compare this increase to the mean number of visits of each type, our results imply that an additional 20 foreclosures (approximately the mean number of foreclosures in a zip code in our sample) would be associated with a 2.8% increase in non-elective visits.

The second panel of Table 3 shows estimates of (1), that is the model with four lags for foreclosure. The point estimates suggest that the effect of foreclosure is positive at (t-1) and increasing through (t-2). By (t-4), the effect has largely faded out (perhaps because more of the affected people have left by one year after the event). It is convenient to summarize the overall effect by taking the sum of the coefficients on the four lags. The estimates suggest that if there were an additional 20 foreclosures in each of the past four quarters (a total of 80 foreclosures), then there would be an increase of .94% in the number of non-elective visits.

It seems clear that in models with only one lag, the coefficient on the one lag may be picking up the effect of past foreclosures. Hence, in most of the remaining tables, we focus on models with four lags and present the sum of the coefficients on four lags of foreclosure, the P-value for whether this sum is significantly different than zero, and the percentage change in the number of visits assuming (unless otherwise noted) 20 visits in each of the last four quarters.

Table 4 is exactly analogous to Table 3 except that it presents the results of county-level models. We lose much of the variation in foreclosure rates shown in Figure 2 when we move to county-level models, but as discussed above, this level of aggregation has two advantages. First, previous research suggests that most people who suffer foreclosure stay in the same local labor market, so county level models should be less affected by migration. Hence, a comparison of the county and zip code level models may shed light on the extent to which our zip code level estimates are biased by migration, and in particular, on the question of whether zip code level models are likely to yield conservative estimates of the effects of foreclosure. Second, because unemployment rates are available at the county level and not at the zip-code level, we can directly compare the estimated effects of foreclosure to the estimated effect of unemployment in these models.

Panel 1 of Table 4 shows that county-level models with one lag produce estimates that are in fact somewhat larger than those obtained in the zip-code level models. For example, the estimates in the first row suggest that an additional foreclosure is associated with 2.955, rather than 2.17 additional non-elective visits. Since counties have populations 20 times larger than the population of zip codes on average, we evaluate the effect of 400 foreclosures in the last quarter. Row four suggests that non-elective visits increase by 3.445%.

Panel 2 of Table 4 shows estimates using four lags. These models are less precisely

estimated than the zip code level models (which is not surprising) but the results are qualitatively similar. For example, the sum of the coefficient on the four lags of foreclosure is 2.880 in the county level model for non-elective visits, compared to 2.951 in the zip code level model. The county level estimate has a P-value of 0.112 while the sum of the lagged coefficients in the zip code level model is statistically significant. The only estimate that is significant at the 95% level in the county level model with four lags is the model for heart problems, where the coefficient on the sum of the four lags is 0.134, compared to 0.099 in the zip code level model. Like the zip code level models, the county-level models also suggest that foreclosures at (t-2) generally have the largest impacts.

It is striking that the unemployment rate itself is not statistically significant in either of these county-level models. It may be that the county and year effects capture all of the relevant effects of unemployment.

Effects of Housing Prices

Table 5 shows alternative models that include housing prices.[13] The first panel repeats the main results from Table 3 for ease of comparison. The second panel shows estimates from a model similar to (1) except that we use housing prices rather than foreclosure. Although higher housing prices are estimated to have generally negative effects on hospitalizations, the sum of the four lags is never significantly different from zero. Panel 3 shows models that include both housing prices and foreclosures. If the estimated effect of foreclosure worked through housing prices, then including housing prices in the model would be expected to attenuate the estimated effects of foreclosure. However, the estimated effect of foreclosure is unaffected by the addition of housing prices, and housing prices themselves are not statistically significant except in the

[13] Models using log (housing prices) produced similar results.

model for respiratory infection, where they are wrong signed. These results suggest that the estimated effects of foreclosure do not primarily reflect spillover effects through lower housing prices.

Results by Age

Table 6 presents estimates of the effects of foreclosure by age. There are several striking results. First, the largest estimated effects of foreclosure are on children. For example, an additional 80 foreclosures over the past year is estimated to result in a 1.68% increase in non-elective visits including a 1.58% increase in preventable visits among children, and a 3.6% increase in respiratory conditions; comparable figures for prime age adults 20 to 49 are 0.81%, 1.09%, and 2.37%; while for adults 50 to 64, they are 1.09%, 1.04%, and 1.89%. In results not shown, we also found increases in two categories of preventable visits for children: asthma and diabetes. In contrast, foreclosure appears to have little effect on hospital and ER visits among the elderly. These results could reflect the fact that prime aged adults with children are the demographic most likely to face foreclosure (as shown in Table 1). They suggest that in households facing foreclosure children suffer from a deterioration in preventive care, and perhaps also from the general stress within the household. Once again, we do not find any significant effect of foreclosure on visits for cancer, and we find significant (but small) effects on elective conditions only among those 50 to 64.

Estimates by characteristics of zip codes

Table 7 shows estimates for subsets of zip codes defined by the fraction minority, or by mean income. The first panel shows estimates on the subset of zip codes that were greater than 70% African-American or Hispanic in the 2000 Census. The estimates are twice as large as the baseline estimates shown in Table 3. Conversely, zip codes with few minority residents have

estimated effects that are half the size of those in Table 3. Since high minority zip codes have roughly three times the population as low minority zip codes, one might expect roughly three times as many foreclosures (and hospital visits) if foreclosures (and hospital visits) were evenly distributed across zip codes. Accordingly, we evaluate the percentage change in visits with 20 foreclosures per quarter in the low minority zip codes and with 60 foreclosures per quarter in the more densely populated high minority zip codes. The estimates suggest that 240 foreclosures over the past year in the minority neighborhood would be associated with 2.25% more non-elective visits, and 1.95% more preventable visits. The comparable figures for the effect of 80 foreclosures over the past year in the low minority neighborhood are 0.9% and 1.22%. Thus, the results suggest that approximately the same rate of foreclosure activity has a stronger effect on health in the high minority zip codes.[14]

Similarly, the third and fourth panels of Table 6 compare zip codes with the lowest quartile of mean income to those with the highest quartile. Foreclosures generally have larger effects on the number of visits in low income zip codes (with the notable exception of visits for mental health conditions). But the gap is not as great as that between minority and non-minority zip codes.

Estimates for the Most Serious Acute Conditions

Table 8 shows estimates from models that focus on the most serious acute conditions: Heart attack and stroke; severe respiratory conditions; gastrointestinal hemorrhage and kidney failure; and poisonings. This last category includes both prescription and other drug overdoses. Table 8 suggests that while we lose some precision when we go to these smaller categories, the results are consistent with those discussed above. We find that foreclosures two quarters ago

[14] To the extent that high minority neighborhoods have proportionally more foreclosures than low minority neighborhoods, the health effects of foreclosures in high minority zip codes are even higher.

lead to an increase in visits for heart attacks and strokes and for acute respiratory conditions. The sum of the four lags is significant in the model for gastrointestinal hemorrhage and kidney failure, as well as in the model for poisoning. The estimates suggest that an additional 20 foreclosures each quarter would lead to a 0.489% increase in the former, and a 0.933% increase in poisonings. The fact that we find significant effects on visits for these serious conditions suggests that our effects are not driven by patients switching away from other providers to hospitals and emergency rooms.

Additional Estimates

Because the "Great Recession" followed the foreclosure crisis, and because there is a great deal of research linking unemployment and health, it may be tempting to conclude that the estimated relationship between foreclosure and health actually reflects a relationship between unemployment and health. However, we have shown above that relative to the measured effect of foreclosure, the unemployment rate is not a particularly powerful determinant of visits in county-level models. The first panel of Table 9 presents models estimated using data for the second quarter of 2005 through the first quarter of 2008, so that data from the "Great Recession" period has been excluded. The estimated effects of foreclosure are, if anything, slightly stronger than those presented above, suggesting that effects of foreclosure were apparent even in the low unemployment environment that prevailed through the middle of 2008.

Panels 2 and 3 of Table 9 present estimates for judicial and non-judicial states separately. As discussed above, the literature suggests that people in judicial states are able to stay in their homes longer after foreclosure. Hence, if migration were affecting our estimates, we might expect to see different results in the two sets of states. In fact, the estimates are quite similar, and actually appear slightly larger in the non-judicial states.

Panel 4 of Table 9 presents models that use foreclosure starts rather than foreclosure auctions. One difficulty with thinking about foreclosure as a stressful event is that the process typically takes a long time. A homeowner might begin to feel stress when he or she first becomes delinquent on a mortgage (which we do not observe). This stress might escalate when foreclosure is initiated, and reach a peak at the time of the foreclosure auction. There is little a priori evidence to support this type of time line, although we do know that many foreclosure starts do not lead to auctions because homeowners are able to save their homes. Panel 4 shows that models estimated using foreclosure starts produce estimates somewhat smaller than our baseline model, which is consistent with the idea that foreclosure starts are less stressful than foreclosure auctions.

VI. Discussion and Conclusions

This study examines the relationship between foreclosures and hospital visits at a neighborhood level. Our results suggest that individuals in communities that have suffered high rates of foreclosure are more likely to seek treatment in hospitals and emergency rooms for a variety of stress-related conditions such as mental health conditions, heart attack and stroke, as well as for conditions that could be prevented by appropriate care such as hospitalizations for hypertension. The estimated effects are greater for children and prime aged adults, which is consistent with evidence that these families have been most adversely affected. They are also stronger in communities that have a high fraction of minority residents, and in low-income communities.

Our results raise obvious questions about mechanisms. It cannot be the case that the huge increases in foreclosure in heavily affected neighborhoods was due to a wave of ill health among homeowners in those neighborhoods. We also show that the effects cannot be explained by

unemployment alone. That is, showing a relationship between foreclosure and health is not merely another way of measuring the relationship between unemployment and health. In fact, when we estimate models at the county level, the unemployment rate is never statistically significant. Moreover, we see even stronger effects of foreclosure in models estimated on data prior to the second quarter of 2008, when unemployment in our four states was low and stable. Similarly, the estimates are not explained by housing prices. Adding housing prices to the model has little impact on the estimated effect of foreclosure, and housing prices alone have little explanatory power in our models.

We have also considered the question of whether our results could be biased due to migration, since we do not observe individual health before and after foreclosure. If people tend to leave distress areas, then counts of hospital visits should fall rather than rise. In fact, the estimated effects are similar, and somewhat stronger, at the county level than at the zip code level which suggests that the zip code results are biased towards zero and that the true effects of foreclosure are larger than those we emphasize here.

An additional concern is that the results could be driven by patients who switch from seeing providers outside of hospital settings to hospital visits. We address this concern by examining a subset of visits for the most serious illnesses, those which would almost always result in hospital visits. There is little scope for provider switching with respect to these conditions, yet we still see increases in heart attacks and stroke, gastrointestinal hemorrhage and kidney failure, respiratory failure, and poisonings in our data.

Although we do not directly observe measures of stress, our results are consistent with the idea that the stress of foreclosure affects health both directly, and through changes in behavior that result in reductions in preventive care. Hence, our work provides additional evidence about the nature of links between financial, mental, and physical health.

Our estimates imply that an additional foreclosure per quarter leads to an additional 2.95 non-elective hospital visits in a zip code. Hence, the 2.82 million foreclosures in 2009 led to an additional 2.08 million additional non-elective visits. While the cost data available from HCUP is imperfect and covers only hospital costs, a crude cost analysis suggests that non-elective visits impose a cost of an average of $2,521 (in 2009 dollars). Thus, additional visits due to the foreclosure crisis increased the costs of hospitalizations for non-elective conditions by more than $5.2 billion in 2009 alone. [15]

Taken together, these results highlight an important consequence of the foreclosure crisis that has not received much attention from policy-makers. Our estimates imply that many distressed homeowners suffer disruptions in access to preventive medical care so that maintaining access to such care could be a beneficial focus of policy. To the extent that the cost of additional hospital visits is an externality that places costs on the general public (either directly through the provision of indigent care, or indirectly through higher insurance premiums) it may also provide an additional rationale for public interventions into housing markets in order to write-down "underwater" mortgages and prevent foreclosures as Geanakoplos and Koniak (2009), Hockett (2012), and Shiller (2012) have proposed.

[15] HCUP cost data do not include physician costs, which are usually billed separately. Other limitations are that cost data are not available for ER visits in California, so that we had to exclude CA from our calculations of the average cost of a visit. Also, data are presented in terms of "total charges," essentially a list price which few people pay, and "cost-to-charge" ratios (CCR) for the hospital or for groups of hospitals. One must multiply the total charge by the CCR in order to approximate the actual cost of the visit.

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Appendix: Aggregating CCS Single-Diagnosis Codes into Broader Aggregates

We exclude induced abortion (178), normal pregnancy and delivery (196), live born (218), and contraception, complications of pregnancy/abortion (codes 176-195). We have examined all of the categories below, but focus on the categories that are bolded (Cancer, mental health problems, heart problems, and respiratory problems). We found positive effects of foreclosure on visits for most other categories. Note that hypertension, diabetes, and asthma are included in the PQI (preventable) category. The more specific conditions we examine correspond to smaller groups of codes, as described in the text.

1) Infectious Disease – codes 1-10
2) Cancer and Benign Neoplasms– codes 11-45, 46-47
3) Diabetes-codes 49,50
4) Other Endocrine/Metabolic disorders – codes 48, 51-58
5) Hematologic Disorders, disorders of veins -- codes 59-64, 188-121
6) Anxiety related Mental Health-codes 651, 657, 660-661
7) Suicide-code 662
8) All other mental health-codes 650, 652-656, 658, 659, 663, 670
9) Headache-code 84
10) Other Central Nervous System-codes 76-83, 85, 95
11) Eye and Ear-codes 86-94
12) Heart Attack and Stroke-codes 97, 100, 101, 103, 104, 107-117
13) Heart valve disorders, Nonspecific Chest Pain, Conduction Disorders, Dysrhthmias– codes 96, 102, 105, 106
14) Hypertension – code 98, 99
15) Upper Resp. Infection (Pneumonia, Influenza, Tonsillitis, Bronchitis, Other)-codes 122-126
16) Other Resp. excluding Asthma-codes 127, 129-134
17) Asthma-code 128
18) Gastrointestinal including appendicitis-codes 135-155
19) Kidney and Urinary Tract (including urinary tract infections) -codes 156-163
20) Genital disorders (including inflammation and menstrual disorders) -codes 164-175
21) Skin infections, inflammatory conditions, ulcers, other skin-codes 197-200
22) Bone disease and musculoskeletal disease (including arthritis, lupus) -codes 201-212
23) Injuries-codes 225-244
24) Malaise (Miscellaneous symptoms including Fever of unknown origin, lymphadenitis, nausea, abdominal pain, malaise, allergic reactions) -codes 245-253
25) Other (including rehabilitation care, social admissions, medical evaluation, unclassified) -codes 254-259

See http://www.hcup-us.ahrq.gov/toolssoftware/ccs/AppendixASingleDX.txt for a complete list of CCS codes and their mapping into ICD codes.

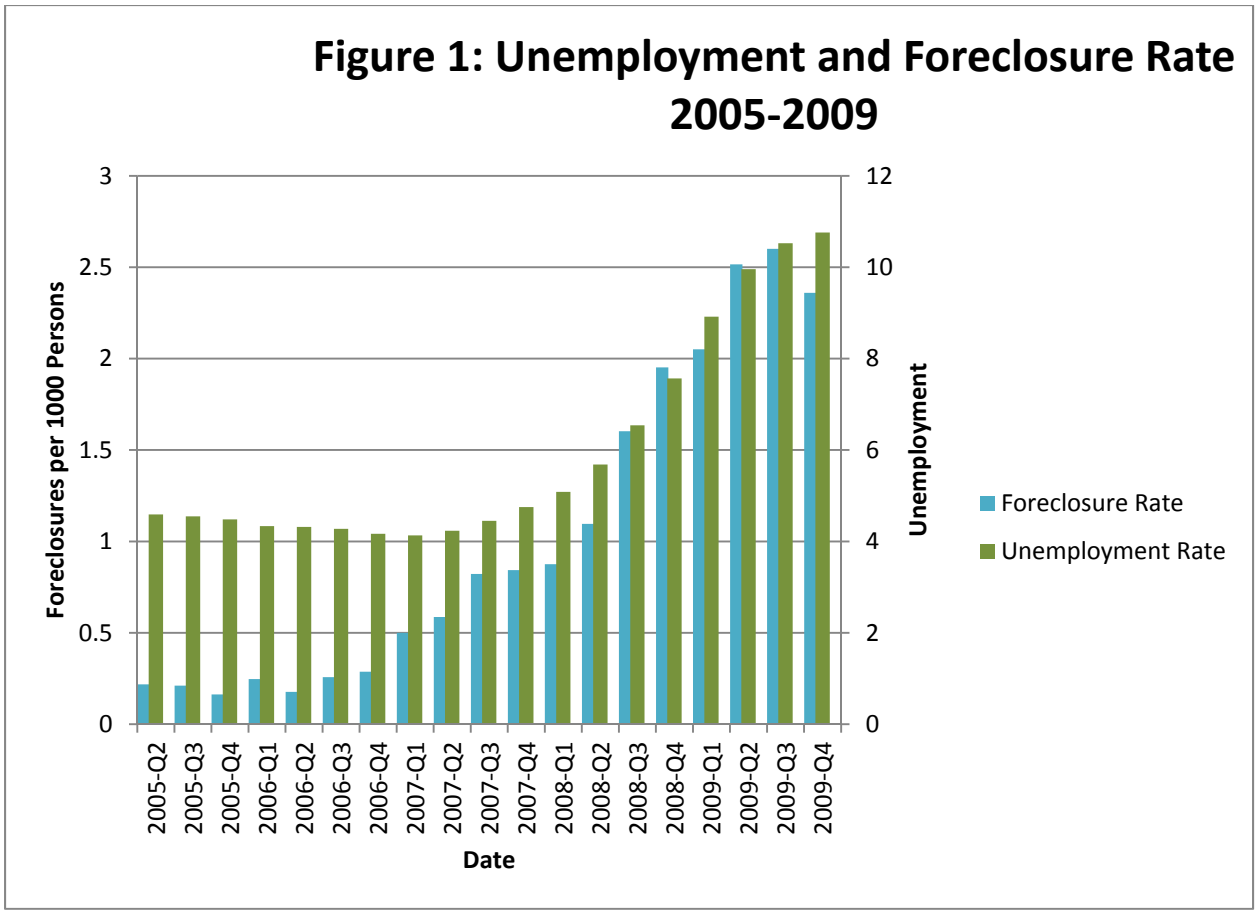
Figure 1: Unemployment and Foreclosure Rate 2005-2009
Foreclosures per 1000 Persons
Unemployment
Date
Foreclosure Rate
Unemployment Rate
0
0.5
1
1.5
2
2.5
3
0
2
4
6
8
10
12
2005-Q2
2005-Q3
2005-Q4
2006-Q1
2006-Q2
2006-Q3
2006-Q4
2007-Q1
2007-Q2
2007-Q3
2007-Q4
2008-Q1
2008-Q2
2008-Q3
2008-Q4
2009-Q1
2009-Q2
2009-Q3
2009-Q4

Figure 2: Foreclosures by Zip Code Within Counties, Florida 2009

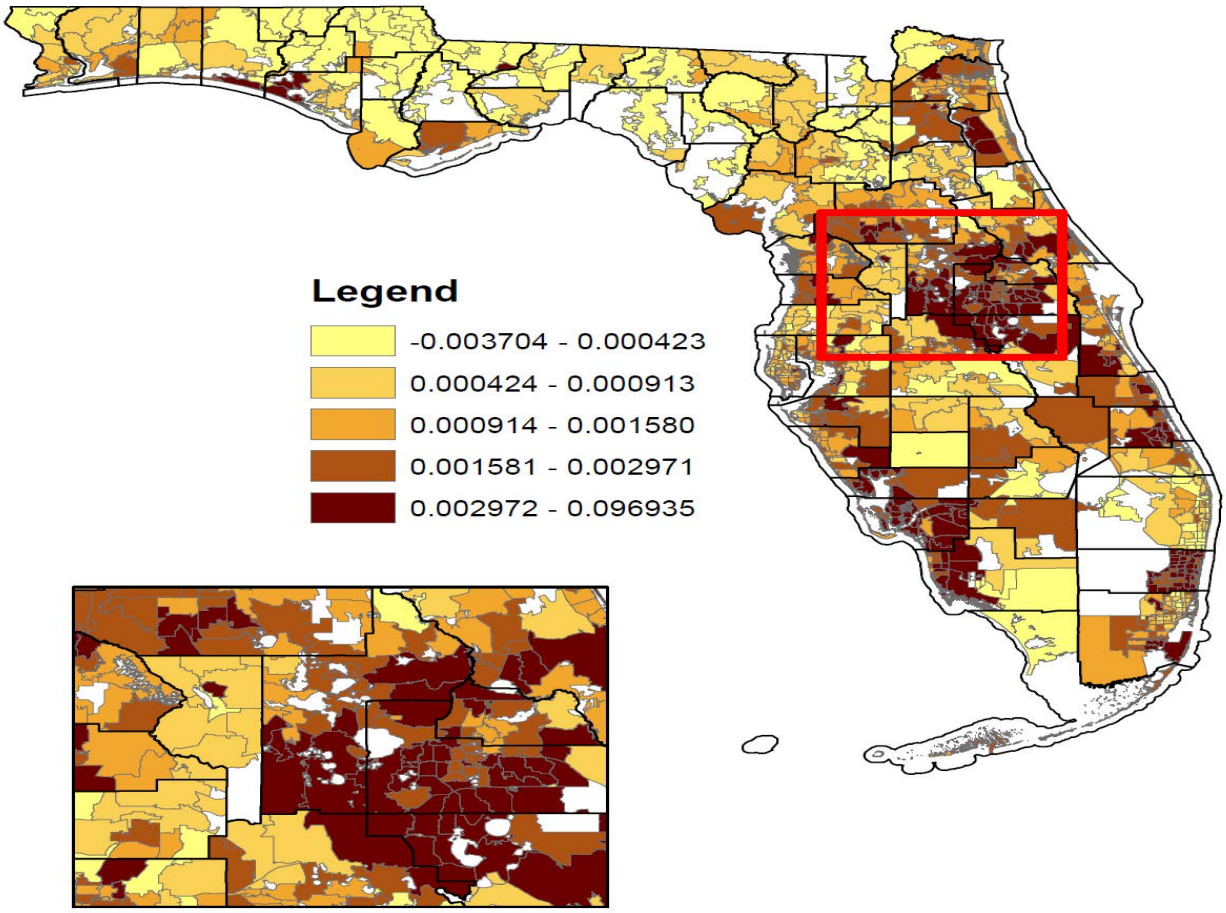

Table 1: Characteristics of Those With and Without Foreclosure (PSID)

	Never Foreclosure	Ever Foreclosure	2009 No Foreclosure	2009 Current Foreclosure	2009 Own, No Mortgage	2009 Rent
Age 20-49	0.490	0.648	0.515	0.489	0.140	0.668
Age 50-64	0.285	0.277	0.358	0.422	0.314	0.188
65 and over	0.222	0.075	0.127	0.090	0.546	0.138
Non-Hispanic White	0.744	0.651	0.788	0.693	0.849	0.620
African American	0.145	0.197	0.094	0.171	0.072	0.252
Hispanic	0.086	0.129	0.087	0.136	0.058	0.108
Head Unemployed	0.070	0.107	0.045	0.159	0.028	0.105
Married	0.473	0.431	0.675	0.470	0.564	0.203
Children Under 18	0.287	0.506	0.396	0.463	0.128	0.279
Health is Excellent	0.178	0.095	0.214	0.059	0.131	0.159
Health is Poor	0.052	0.073	0.025	0.109	0.082	0.058
Head Smokes	0.197	0.315	0.147	0.218	0.134	0.285
Head Drinks	0.650	0.609	0.710	0.631	0.561	0.637
Number of Observations	8,355	327	3445	41	1,204	3,273

Notes: Means are weighted using the 2009 PSID sample weights. Sample in the first two columns includes people for whom the date of foreclosure is missing.

Table 2: Zipcode Means by Rate of Foreclosure in 2009

	All Zipcodes	Zips in Bottom 5th Foreclosures	Zips in Top 5th Foreclosures
Quarterly # of foreclosures 2009	46.97	2.19	119.43
Quarterly # of foreclosures 2005	3.75	0.68	7.63
Housing Prices 2005 ($1000s)	417	479	341
Housing Prices 2009 ($1000s)	306	420	205
Characteristics of Zip Codes in 2000			
Mean population	17,983	9,035	21,206
Mean Income	62,504	66,691	55,416
Percent Black	7.14	6.21	6.91
Percent Hispanic	18.22	9.66	22.89
Percent Over 65	14.48	14.06	13.94
(Hospitalizations and ER Visits by Type/Population in 2000) * 100			
Visits for Elective Procedures	0.64	0.7	0.76
Total Non-Elective	10.92	12.17	13.31
Selected Categories of Non-Elective Visits			
Preventable Visits	1.01	1.11	1.23
Cancer	0.1	0.1	0.1
Any Heart/Stroke	0.98	1.12	1.15
Mental Health	0.45	0.5	0.51
Respiratory Infection	1.42	1.53	1.79

Notes: Characteristics of zip codes come from the 2000 Census.
N=3,525 zip codes (ZCTAs). For hospitalizations, N=3525*19 quarters = 66,975 zip code level observations.

Table 3: Effects of Foreclosures by Zip Code

	Non-Elective	Preventable	Cancer	Heart	Mental	Respiratory Infection	Elective
Zip Code Level , N=52,875, Mean Population=17,983							
Foreclosures (t-1)	**2.170**	**0.199**	0.001	**0.087**	**0.078**	**0.765**	0.006
	(0.449)	**(0.199)**	(0.001)	**(0.028)**	**(0.023)**	**(0.140)**	(0.007)
Number Visits per Quarter	1,567	147	13	139	70	209	88
%Change (20 Foreclosures)	**2.770%**	**2.707%**	0.154%	**1.252%**	**2.229%**	**7.321%**	0.136%
Model with Four Lags							
Foreclosures (t-1)	**0.702**	**0.099**	-0.003	**0.049**	**0.044**	**0.132**	-0.004
	(0.143)	**(0.023)**	(0.004)	**(0.019)**	**(0.016)**	**(0.067)**	(0.009)
Foreclosures (t-2)	**1.18**	**0.135**	0.003	**0.05**	0.013	**0.775**	-0.01
	(0.296)	**(0.046)**	(0.004)	**(0.013)**	(0.013)	**(0.274)**	(0.009)
Foreclosures (t-3)	**0.895**	0.018	-0.005	0.012	**0.038**	0.069	**0.029**
	(0.216)	(0.028)	(0.003)	(0.013)	**(0.019)**	(0.130)	**(0.014)**
Foreclosures (t-4)	0.174	-0.018	**0.009**	-0.012	0.006	0.049	0.001
	(0.198)	(0.032)	**(0.003)**	(0.015)	(0.013)	(0.126)	(0.007)
Sum of lags	**2.951**	**0.234**	0.004	**0.099**	**0.101**	**1.025**	0.016
P value: test sum of lags=0	**0.000**	**0.000**	0.153	**0.002**	**0.001**	**0.000**	0.054
Number Visits per Year	6268	588	52	556	280	836	352
%Change (80 Foreclosures)	**0.942%**	**0.796%**	0.615%	**0.356%**	**0.721%**	**2.452%**	0.091%

Notes: Bold face indicates that estimate is statistically significant at the 95% level.
Standard errors clustered at the county level and shown in parentheses.
Zip-code level regressions include fixed effects for each combination of county, quarter, and year,
as well as for each zip code. Regressions are weighted using 2000 zip code population.
The percent change is evaluated assuming 20 foreclosures per quarter, and dividing by the mean number of visits

Table 4: Effects of Foreclosures by County

	Non-Elective	Preventable	Cancer	Heart	Mental	Respiratory Infection	Elective
County Level, N=2,415, Mean Population=393,718							
Foreclosures (t-1)	**2.955**	**0.203**	-0.003	**0.151**	**0.189**	**0.811**	**-0.195**
	(0.882)	**(0.055)**	(0.003)	**(0.041)**	**(0.053)**	**(0.313)**	**(0.086)**
Unemployment Rate	8.868	-0.752	-0.002	0.454	0.696	-4.365	-0.560
	(9.698)	(1.036)	(0.048)	(0.530)	(0.851)	(5.688)	(1.059)
Number Visits Per Quarter	34,310	3,216	290	3,039	1,539	4,566	1,922
%Change (400 Foreclosures)	**3.445%**	**2.525%**	-0.414%	**1.987%**	**4.912%**	**7.105%**	**-4.058%**
Models with Four Lags							
Foreclosures (t-1)	1.390	-0.010	-0.010	0.000	**0.158**	-0.451	**-0.303**
	(1.350)	(0.157)	(0.006)	(0.043)	**(0.065)**	(0.774)	**(0.050)**
Foreclosures (t-2)	**1.960**	**0.856**	**-0.014**	**0.164**	-0.220	**4.580**	**-0.127**
	(0.524)	**(0.389)**	**(0.006)**	**(0.033)**	(0.162)	**(2.030)**	**(0.023)**
Foreclosures (t-3)	2.500	0.102	0.028	0.286	0.230	-0.039	0.111
	(2.040)	(0.103)	(0.015)	(0.239)	(0.231)	(0.439)	(0.064)
Foreclosures (t-4)	-2.970	**-0.860**	-0.001	-0.316	0.103	**-3.890**	**0.265**
	(1.780)	**(0.285)**	(0.006)	(0.184)	(0.155)	**(1.320)**	**(0.096)**
Unemployment Rate	10.500	-0.976	0.031	0.635	1.030	-5.910	-0.106
	(9.460)	(0.915)	(0.040)	(0.684)	(1.050)	(4.830)	(0.063)
Sum of lags	2.880	0.088	0.003	**0.134**	0.271	0.200	-0.054
P value: test sum of lags=0	0.112	0.386	0.289	**0.022**	0.106	0.470	0.114
Number of Visits for Year	137240	12864	1160	12156	6156	18264	7688
%Change (1,600 Foreclosures)	0.839%	0.274%	0.103%	**0.441%**	1.761%	0.438%	-0.281%

Notes: Bold face indicates that estimate is statistically significant at the 95% level.

Standard errors clustered at the county level and shown in parentheses.

County level regressions include fixed effects for each quarter (19 quarters total) and county.

Regressions are weighted using 2000 county population.

The effects are evaluated assuming 400 foreclosures in each county because counties are roughly 20 times larger than the typical zip code, which has approximately 20 foreclosures per quarter.

Table 5: Zip-Code Level Estimates of Effects of Foreclosures, Housing Prices, and Vacancies

	Non-Elective	Preventable	Cancer	Heart	Mental	Respiratory Infection	Elective
Number Visits in Year	6268	588	52	556	280	836	352
Baseline Zip Code Level Model, N=52,875, Mean Population=17,983							
Sum of 4 Lags Foreclosure	**2.951**	**0.234**	0.004	**0.099**	**0.101**	**1.025**	0.016
P value: test sum of lags=0	**0.000**	**0.000**	0.153	**0.002**	**0.001**	**0.000**	0.054
% Change (80 Foreclosures)	**0.94%**	**0.80%**	0.15%	**0.36%**	**0.72%**	**2.45%**	0.09%
Zip Code Level Model Including House Prices Rather than Foreclosures							
Sum of 4 Lags House Prices	-0.436	-0.024	-0.002	-0.023	-0.004	-0.041	0.014
P value: test sum of lags=0	0.298	0.440	0.320	0.304	0.844	0.724	0.319
% Change ($100,000)	-0.70%	-0.41%	-0.38%	-0.41%	-0.14%	-0.49%	0.40%
Zip Code Level Model Including Both Foreclosures and House Prices							
Sum of 4 Lags Foreclosure	**3.094**	**0.249**	0.005	**0.108**	**0.107**	**1.080**	**0.024**
P value for sum=0	**0.000**	**0.000**	0.100	**0.000**	**0.001**	**0.000**	**0.001**
Sum of 4 Lags House Prices	0.209	0.031	-0.001	0.001	0.018	**0.187**	0.018
P value: test sum of lags=0	0.525	0.175	0.508	0.928	0.329	**0.025**	0.178
% Change (80 Foreclosures)	**0.99%**	**0.85%**	**0.19%**	**0.39%**	**0.76%**	**2.58%**	**0.14%**
% Change ($100,000)	0.33%	0.53%	-0.19%	0.02%	0.64%	**2.24%**	0.51%

Notes: Bold face indicates that the estimate is statistically significant at the 95% level.

Standard errors are clustered at the county level and shown in parentheses.

Regressions include fixed effects for each combination of county, quarter, and year, as well as for each zip code.

Regressions are weighted using 2000 county or zip code population.

The percent change is evaluated assuming 20 foreclosures in each quarter, and a 100,000 drop in property values.

Table 6: Zip-Code Level Estimates of Effects of Foreclosures by Age

	Non-Elective	Preventable	Cancer	Heart	Mental	Respiratory Infection	Elective
Age: 65+							
Sum of 4 Lags Foreclosure	0.104	-0.006	0.001	-0.017	0.0006	**0.0212**	0.005
P value: test sum of lags=0	0.100	0.416	0.609	0.359	0.796	**0.000**	0.778
Number of Visits in Year	1180	192	24	248	24	140	152
% Change (80 Foreclosures)	0.18%	-0.06%	0.08%	-0.14%	0.05%	**0.30%**	0.07%
Age: 50-64							
Sum of 4 Lags Foreclosure	**0.5**	**0.05**	0.003	**0.042**	**0.033**	**0.087**	**0.012**
P value: test sum of lags=0	**0.000**	**0.000**	0.213	**0.000**	**0.000**	**0.000**	**0.000**
Number of Visits in Year	920	96	12	136	48	92	84
% Change (80 Foreclosures)	**1.09%**	**1.04%**	0.50%	**0.62%**	**1.38%**	**1.89%**	**0.29%**
Age: 20-49							
Sum of 4 Lags Foreclosure	**0.99**	**0.089**	0.002	**0.055**	**0.049**	**0.289**	-0.005
P value: test sum of lags=0	**0.000**	**0.000**	0.069	**0.000**	**0.014**	**0.000**	0.336
Number of Visits in Year	2432	164	12	148	156	244	76
% Change (80 Foreclosures)	**0.81%**	**1.09%**	0.33%	**0.74%**	**0.63%**	**2.37%**	-0.13%
Age: 0-19							
Sum of 4 Lags Foreclosure	**1.34**	**0.095**	-0.0003	**0.009**	**0.018**	**0.62**	-0.003
P value: test sum of lags=0	**0.000**	**0.000**	0.560	**0.000**	**0.000**	**0.000**	0.086
Number of Visits in Year	1600	120	4	16	36	344	20
% Change (80 Foreclosures)	**1.68%**	**1.58%**	0.00%	**1.13%**	**1.00%**	**3.60%**	-0.30%

Notes: Bold face indicates that the estimates are statistically significant at the 95% level.
Standard errors are clustered at the county level and shown in parentheses.
Regressions include fixed effects for each combination of county, quarter, and year, as well as for each zip code.
Regressions are weighted using 2000 county or zip code population.

Table 7: Effects of Foreclosures by High and Low Minority, and Low, Medium, and High Income Zip Codes

	Non-Elective	Preventable	Cancer	Heart	Mental	Respiratory Infection	Elective
Zip Codes with >70% African-American or Hispanic Residents, N=4,485, Mean Population=30,092							
Sum of 4 Lags Foreclosure	**4.480**	**0.393**	0.008	**0.161**	0.143	**1.53**	-0.007
P value: test sum of lags=0	**0.000**	**0.000**	0.348	**0.000**	0.054	**0.000**	0.703
Number Visits Past Year	11940	1208	96	924	552	1796	460
% Change (240 Foreclosures)	**2.25%**	**1.95%**	0.50%	**1.05%**	1.55%	**5.11%**	-0.09%
Zip Codes with <10% African-American or Hispanic Residents, N=18,870, Mean Population=9,814							
Sum of 4 Lags Foreclosure	**1.400**	**0.168**	-0.003	0.068	0.077	**0.485**	0.001
P value: test sum of lags=0	**0.000**	**0.000**	0.680	0.189	0.053	**0.000**	0.990
Number Visits Past Year	3104	276	32	324	132	352	244
% Change (80 Foreclosures)	**0.90%**	**1.22%**	-0.19%	0.42%	1.17%	**2.76%**	0.01%
Zip Codes in the Lowest Quartile of Income, 2000 Census, N=13,125, Mean Population=17,777							
Sum of 4 Lags Foreclosure	**2.890**	**0.245**	0.001	**0.126**	0.049	**0.993**	0.026
P value: test sum of lags=0	**0.000**	**0.000**	0.233	**0.000**	0.121	**0.000**	0.015
Number Visits Past Year	7312	720	56	568	320	1092	284
% Change (80 Foreclosures)	**0.79%**	**0.68%**	0.03%	**0.44%**	0.31%	**1.82%**	0.18%
Zip Codes in the Highest Quartile of Income, 2000 Census, N=13,215, Mean Population=17,385							
Sum of 4 Lags Foreclosure	**2.206**	**0.154**	**0.015**	**0.101**	**0.109**	**0.582**	**0.086**
P value: test sum of lags=0	**0.000**	**0.002**	**0.004**	**0.017**	**0.009**	**0.000**	**0.008**
Number Visits Past Year	4432	388	48	452	212	484	356
% Change (80 Foreclosures)	**1.00%**	**0.79%**	0.63%	0.45%	**1.03%**	**2.40%**	0.48%

Notes: Bold face indicates that the estimates are statistically signficant at the 95% level.

Standard errors are clustered at the county level and shown in parentheses.

Regressions include fixed effects for each combination of county, quarter, and year, as well as for each zip code.

Regressions are weighted using 2000 county or zip code population.

Table 8: Effects of Foreclosures on Severe Conditions

	Heart Attack & Stroke	Acute Respiratory	Acute Gastro & Kidney	Poisonings
Zip Code Level , N=52,875, Mean Population=17,983				
Foreclosures (t-1)	0.003	-0.001	0.004	0.063
	(0.003)	(0.002)	(0.004)	(0.006)
Foreclosures (t-2)	**0.006**	**0.008**	0.003	-0.002
	(0.003)	**(0.002)**	(0.004)	(0.005)
Foreclosures (t-3)	-0.007	-0.008	0.004	**0.012**
	(0.005)	(0.004)	(0.004)	**(0.004)**
Foreclosures (t-4)	0.005	0.004	0.004	0.006
	(0.006)	(0.003)	(0.005)	(0.005)
Sum of lags	0.007	0.004	**0.014**	**0.022**
P value: test sum of lags=0	0.099	0.260	**0.005**	**0.000**
Number Visits	96	32	56	48
%Change (20 Foreclosures)	**0.142%**	**0.244%**	**0.489%**	**0.933%**

Notes: Bold face indicates that estimate is statistically significant at the 95% level.
Standard errors clustered at the county level and shown in parentheses.
Zip-code level regressions include fixed effects for each combination of county, quarter, and year, as well as for each zip code. Regressions are weighted using 2000 county or zip code population.
Heart attack and stroke includes the following CCS categories: 100 Acute myocardial infarction; 109 Acute cerebrovascular disease; 112 Transient cerebral ischemia; 115 Aortic, peripheral, and visceral artery aneurysms; 116 Aortic and peripheral arterial embolism or thrombosis. Acute respiratory conditions include: 130 Pleurisy; pneumothorax; pulmonary collapse; 131 Respiratory failure, insufficiency, arrest (adult). Acute gastrointestinal and kidney problems include: 153 Gastrointenstinal hemorrhage; 156 Nephritis, nephrosis, renal sclerosis; 157 Acute and unspecified renal failure. Poisoning includes: 241 Poisonings by psychotropic agents; 242 Poisoning by other medications and drugs; 243 Poisoning by nonmedicinal substances.

Table 9: Alternative Zip-Code Level Estimates of Effects of Foreclosures

	Non-Elective	Preventable	Cancer	Heart	Mental	Respiratory Infection	Elective
Second Quarter 2005 through First Quarter 2008							
Sum of 4 Lags Foreclosure	**3.368**	**0.677**	0.001	**0.162**	0.075	**2.93**	-0.015
P value: test sum of lags=0	**0.000**	**0.000**	0.874	**0.082**	0.275	**0.000**	0.488
Number Visits Past Year	6116	580	52	548	268	808	356
% Change (80 Foreclosures)	**1.10%**	**2.33%**	0.04%	**0.59%**	0.56%	**7.25%**	-0.08%
Judicial States Only (NJ and FL), N=22,515							
Sum of 4 Lags Foreclosure	**3.039**	**0.223**	0.007	0.135	**0.092**	**1.097**	0.035
P value: test sum of lags=0	**0.000**	**0.000**	0.271	0.052	**0.002**	**0.000**	0.077
Number Visits Past Year	6684	604	56	620	280	884	364
% Change (80 Foreclosures)	**0.91%**	**0.74%**	0.25%	0.44%	**0.66%**	**2.48%**	0.19%
Non-Judicial States Only (AZ and CA), N=30,360							
Sum of 4 Lags Foreclosure	**2.920**	**0.235**	0.004	**0.093**	**0.101**	**1.010**	0.014
P value: test sum of lags=0	**0.000**	**0.000**	0.254	**0.006**	**0.005**	**0.000**	0.152
Number Visits Past Year	5960	572	52	280	508	796	340
% Change (80 Foreclosures)	**0.98%**	**0.82%**	0.15%	**0.66%**	**0.40%**	**2.54%**	0.08%
Using Foreclosure Starts vs. Foreclosure Auctions, N=52,875							
Sum of 4 Lags Starts	**2.020**	**0.165**	0.002	**0.100**	**0.083**	**0.605**	0.011
P value: test sum of lags=0	**0.000**	**0.000**	0.434	**0.000**	**0.000**	**0.000**	0.213
Number Visits Past Year	6268	588	52	556	280	836	352
% Change (80 Starts)	**0.64%**	**0.56%**	0.08%	**0.36%**	**0.59%**	**1.45%**	0.06%

Notes: Bold face indicates that the estimates are statistically signficant at the 95% level.
Standard errors are clustered at the county level and shown in parentheses.
Regressions include fixed effects for each combination of county, quarter, and year, as well as for each zip code.
Regressions are weighted using 2000 county or zip code population.