Article

Are gentrifying neighborhoods more stressful? A multilevel analysis of self-rated stress

Joseph Gibbons

San Diego State University, 5500 Campanile Dr, San Diego, CA 92182, USA

A B S T R A C T

Gentrification, the increase of affluent residents into low-income neighborhoods, is thought to heighten self-rated stress, especially for residents of color. However, the relationship between gentrification and stress has not been directly measured. This study took advantage of the 2008 and 2010 waves of the Public Health Management Corporation's Southeastern Pennsylvania Household Health Survey, the 2000 Census, and the 2006–2010 American Community Survey to investigate the relationship of gentrification to above-average self-rated stress. We paid attention to how racial/ethnic differences in gentrification may uniquely affect stress. We also measured factors associated with gentrification with implications for one's stress including housing cost insecurity and community connection. Using multilevel modeling, we found that gentrifying tracts marked by increases in White residents and declines in non-Whites were more likely to report above-average stress. This study provides evidence that gentrification is related to stress, emphasizing the important role racial/ethnic change has in this process. These findings call for research to unpack the causal mechanisms through which gentrification affects stress.

Introduction

Stress is a critical link in the causal chain between local context and health. Stress has been found to relate to poorer self-rated health (Matthews & Yang, 2010). Also, stress affects health behaviors, encouraging harmful activities like smoking (Finney Rutten, Augustson, Moser, Beckjord, & Hesse, 2008) as well as deterring healthy behaviors like regular exercise (Senn, Walsh, & Carey, 2014). Understanding sources of stress is thus a way to reduce health problems. To this end, the neighborhood is a critical context to understand. Neighborhoods are not only a source of stressors, but also stress buffers, social and physical resources to moderate stress (Yang & Matthews, 2010). The conditions of neighborhoods, however, are not always constant. Gentrification, the increase in socio-economic affluence to previously disadvantaged neighborhoods, is thought to have an important relationship with perceived stress.

Gentrification has been argued by the Center for Disease Control (2013) to be a stressor for low-income and non-White residents. While the Social Stress framework has cited marginal status as a source of stress (Turner, Wheaton, & Lloyd, 1995), direct empirical support for gentrification's relation to stress has been lacking. Several studies had explored the relation of gentrification to mental health (Shmool et al., 2015; Smith, Lehning, & Kim, 2017), though none had directly explored

the relationship of gentrification to perceived stress. Moreover, many of the existing studies on gentrification overlooked the potential role of racial/ethnic change with gentrification (Gibbons & Barton, 2016). Does gentrification marked by increases in non-Hispanic White (henceforth, White) residents have a different impact on stress for residents than that characterized by increases in non-Hispanic Blacks (henceforth, Black) or racially/ethnically mixed populations?

This study addressed this gap by directly measuring the association of gentrification to self-rated stress with Multilevel Modeling (MLM). This method allowed us to nest individual respondents into their respective neighborhoods to determine how gentrification moderated both individual variations of self-rated stress as well as the relevant individual predictors of stress (Yang & Matthews, 2010). We distinguished the racial/ethnic character of gentrification to determine if some forms of gentrification were more related to stress than other forms. This study contributes to the emerging gentrification and health literature, providing much needed empirical evidence of gentrification's relationship to health. In the following sections, we will discuss at length one stress buffer, community connection, and four stressors which may be connected to gentrification: housing insecurity, socio-economics, residential stability, and race/ethnicity.

Community connection

Community connection may serve as a stress buffer that reduces self-rated stress from gentrification. 'Community connection' refers to ones sense of trust of their neighbors, willingness to cooperate with their neighbors, and sense of belongingness to their neighborhood (Gibbons & Yang, 2016). A person's sense of community connection is a resource they can draw upon to manage local stressors (Kawachi & Berkman, 2003; Ross & Mirowsky, 2009; Thoits 1995). For example, social support from neighbors can offset one's insecurity about housing costs (Desmond, 2016). Further, residents with strong community connection are more likely to monitor and dissuade stress-causing social disorder in their neighborhoods (Sampson, 2012; Shaw & McKay 1942). However, whether strong community connection can help residents endure stress related to gentrification is not clear from the previous literature (Schlichtman, Patch, & Hill, 2017).

Residential stability

Gentrification may upend the buffering role of community connection by destabilizing neighborhood populations (Schlichtman et al.,2017). Stability in neighborhood populations has an important relationship with community connection as it takes time for ties between residents to form (Desmond, 2016; Sampson, 2012, 1988). Gentrification means an influx of new residents with potentially limited knowledge of the existing community of the neighborhoods wherein they were moving (Hwang, 2016). Consequentially, gentrifiers have been found to be socially isolated from longstanding residents. Meanwhile, established residents were not familiar with these new residents coming into their neighborhood (Anderson 1990). This is not to say that gentrifiers cannot form their own communities in these neighborhoods (Schlichtman et al.,2017). The question becomes how long this process takes and how connected this new community would be to that of the existing residents.

There has been some disagreement over neighborhood stability's relationship with gentrification and community connection. First, not all scholarship has agreed that stability in neighborhood population is a facilitator of community. Stable neighborhoods can also point to people trapped in disordered neighborhoods who lacked the financial means to escape (Ross & Mirowsky, 2009). Also, low-income neighborhoods have a difficult time sustaining community over time (Sampson, 2012). As such, stable neighborhoods may also contribute to stress if they contain high poverty residents. Second, some scholarship has suggested gentrification results in long-term stability. Homeownership rates in gentrifying neighborhoods tend to increase over time (Glick, 2008). However, this stability does not necessarily mean more community for all.

Shaw & McKay (1942) once observed neighborhoods with diverse populations often had multiple communities with competing interests for their neighborhoods. Thus, gentrifying neighborhoods could contain separate communities for both the gentrifiers and the longstanding residents which could undermine a neighborhood's overall community (Anderson 1990; Hwang, 2016; Schlichtman et al., 2017). This stratified sense of community could, in turn, exacerbate the sense of isolation for some residents in these neighborhoods (Anderson 1990), thereby contributing to stress.

Housing cost insecurity

A common concern surrounding gentrification is that rising housing costs will displace longstanding residents. There is considerable debate as to the extent to which displacement takes place (Ding, Hwang, & Divringi, 2016; Newman & Wyly, 2006). Nonetheless, many have argued that the *fear* of displacement due to the increase of housing costs can be a considerable source of stress (CDC, 2013; Huynh & Maroko, 2014; Shmool et al., 2015).

Housing cost insecurity can both directly and indirectly relate to stress (Hernández, Phillips, & Siegel, 2016). High housing costs, including rent, mortgage, and utility bills, can lead to a general insecurity for the future, a potent stressor (Pollack, Griffin, & Lynch, 2010). Further, the specter of a move to new housing, even if not forced, is an example of anticipatory stress – stress over hypothetical future problems (Nowok, van Ham, Findlay, & Gayle, 2013; Hicken, Lee, & Hing, 2018). Such insecurity can also lead residents to neglect other health needs, such as seeking out quality food (Kushel, Gupta, Gee, & Haas, 2006), securing medical supplies, and having regular doctor's visits (Desmond & Kimbro, 2015). All of this further contributes towards stress. Not all residents have the same housing insecurity; homeowners are less likely than renters to experience stress as a result of housing costs (Pollack et al., 2010). However, both renters and owners alike may experience more insecurity with housing related costs like utility bills due to the increase of other costs beyond housing, like more expensive local groceries, as a consequence of gentrification (Sullivan & Shaw, 2011). Despite this evidence, it is not clear if gentrification is related to stress from housing insecurity. Some have argued housing issues in economically disadvantaged neighborhoods present a much stronger predictor of stress than gentrification (Desmond, 2016).

Neighborhood socio-economics

A broader issue surrounding gentrification is the overall socio-economic changes it introduces to a neighborhood. Ample literature has explored how neighborhood socio-economics relate to stress. High poverty neighborhoods often suffer from disorder due to various factors, including lack of collective resources, trash on the street, and high crime rates (Sampson, 2012), all of which have been connected to stress (Shmool et al., 2015; Yang & Matthews, 2010). A recurring theme in this literature is that the residents of these impoverished neighborhoods have dealt with a sense of threat and powerlessness that increases their distress (Ross & Mirowsky, 2009).

Gentrification's relation to socio-economics and stress is not clear. For one, there is some cause to suspect gentrification may be a stress buffer for low-income communities. Neighborhoods experiencing gentrification are known to see improved access to local amenities and services due to the growing representation of middle and upper-class residents (Freeman, 2006; Sullivan & Shaw, 2011). Moreover, gentrifying neighborhoods are often marked by reductions of violent crime (Barton, 2016a, 2016b). These shifts should, hypothetically, reduce stress. However, there has been some debate as to how accessible these new resources are for all residents. Research on gentrification and neighborhood businesses, for example, has noted longstanding residents do not feel the new resources are 'for them' (Sullivan & Shaw, 2011). Moreover, low-income residents in gentrifying neighborhoods have reported feeling alienated from more affluent people in their neighborhoods, even if they have known them for some time (Anderson 1990; Jackson, 2003). Thus, even if gentrification brings improvements to a neighborhood, it may still serve as a stressor.

Race/Ethnicity

One final way that gentrification can affect one's stress is through changes in racial/ethnic composition. Black and Hispanic populations have been found to experience disproportionately high levels of stress as a consequence of racial discrimination (Krieger, Kosheleva, Waterman, Chen, & Koenen, 2011). Gentrification has been associated with increases in White residents in previously majority non-White areas. Qualitative research has argued that the rise of Whites in mostly non-White neighborhoods increases the amount of discrimination non-Whites experience (Shmool et al., 2015). However, the effects of this demographic change are not always direct discrimination. Gentrification can have more subtle effects. Black households can be affected by population shifts in their neighborhoods due to their often localized

family structure (Riina, Lippert, & Brooks-Gunn, 2016). The changes associated with gentrification could have an adverse effect on Black community by diminishing these bonds. Even without discrimination, the 'Whitening' of neighborhoods could be a cause for concern for non-White residents, who have frequently stated in interviews that they no longer felt at home in gentrifying neighborhoods (Anderson 1990; Freeman, 2006; Sullivan & Shaw, 2011). This resulting sense of isolation reflects a decline in community connection and could be a source of stress (Sampson, 2012). The root of stress from gentrification, in this case, is cultural displacement (Gibbons & Barton, 2016), as residents may be able to remain in their homes but felt they no longer belonged in their neighborhoods. Indeed Shmool et al. (2015) qualitative work found that residents of color identified the demographic changes associated with gentrification as a distinct and more severe issue than housing cost insecurity.

Not all gentrification has been associated with increases in White residents, however. "Black Gentrification," the process wherein middle-class Blacks enter neighborhoods populated primarily by lower class Black residents, has gained attention in the scholarship. While socio-economic differences between working class and more affluent Blacks in gentrifying communities may inhibit the formation of social ties (Anderson 1990; Freeman, 2006; Jackson, 2003; Pattillo, 2007), the social ties between these residents may be stronger than was found in areas experiencing White gentrification. Close to nothing has been said about gentrifying neighborhoods experiencing an increase in non-Black minorities or increases of both Whites and non-Whites. Using the Black experience as a reference, it is likely this gentrification would carry less stress if it is happening in areas with an influx of non-Whites, however class differences may present a roadblock to close social ties forming.

Hypotheses

Based on the past research, we tested the following hypotheses. We tested the importance of community connection as a stress buffer with *Hypothesis 1. Residents who report high community connection will be less likely to report above-average stress*. Next, as has been argued, residential stability has a structural effect, potentially moderating individual community connection's relation to stress. We tested the potential relationship of stability with stress through *Hypothesis 2. Residents in stable neighborhoods will be less likely to report above-average stress*. Also, we tested housing cost insecurity with *Hypothesis 3. Gentrification's relationship to above-average stress can be explained by housing cost insecurity*. With this hypothesis, our goal was to see if gentrification is related to housing cost insecurity. Finally, we tested whether racial/ethnic change underlying gentrification was important with *Hypothesis 4. Non-White residents in neighborhoods experiencing White gentrification are more likely to report above-average stress than those living in neighborhoods that are not gentrifying; Hypothesis 5. Non-White residents in neighborhoods undergoing Black or racially/ethnically mixed gentrification are less likely to report above-average stress than those living in other gentrifying neighborhoods*. For these final two hypotheses, we used as our reference group neighborhoods which are gentrifiable, meaning they had incomes below the city median in 2000, but did not gentrify. Our definition of gentrification will be elaborated upon shortly. While our study was cross-sectional in design, these neighborhoods were thought to point to what gentrifying neighborhoods would have looked like if they had not changed and thus offered insight into gentrification's unique relation to health outcomes (Gibbons & Barton, 2016).

Data and methods

We pooled the 2008 and 2010 waves of the Public Health Management Corporation's (PHMC) Southeastern Pennsylvania Household Health Survey, a cross-sectional community survey of the Philadelphia metropolitan area. We restricted our focus on the city to directly measure gentrification's effects. We chose the city of Philadelphia as our area of study given its continued recognition as a gentrifying place reflective of many United States post-industrial cities (Anderson 1990; Ding et al., 2016; Hwang, 2016). The years 2008 and 2010 were chosen as they were the most recent wherein a question on self-rated stress was included. The PHMC surveys have been found to be a reliable and valid data source to understand health and socio-economic status, with estimates similar to other surveys like the Behavioral Risk Factor Surveillance System (Gibbons & Yang, 2016).

For neighborhood-level measures, we drew on Census tract data from the 2000 Decennial Census and the 2006–2010 American Community Survey (ACS). The PHMC provided geocodes for tracts allowing the nesting of individual responses into neighborhoods. Census tracts are a standardized measure of neighborhoods commonly used in gentrification research (Ding et al., 2016; Gibbons & Barton, 2016). A fundamental limitation of Census data is it changes boundaries over time, which affected both our tract data and PHMC data. We obtained 2000 Census data from the National Historical Geographic Information System (NHGIS), a service which interpolates pre-2010 Census data to 2010 boundaries. We also adjusted the 2008 wave of the PHMC, which was geocoded to 2000 Census borders, to conform to 2010 Census boundaries. We used an algorithm developed by Yang and Matthews (2012) which randomly generated addresses for respondents within their geocoded tract boundaries. Using ArcGIS 10.4, we then overlayed the tract boundaries of 2010 over these geocoded addresses. Through this process, we were able to update the geocodes of respondents for the 2008 wave to 2010 Census tracts. To ensure the accuracy of these geocodes, we generated several sets of coordinates for respondents and reconducted our analysis to ensure consistency in the results with different geocodes. Those sensitivity analyses are available upon request. The finalized dataset consisted of 8710 respondents residing in 383 tracts in the city of Philadelphia. Of our observations 602 had missing values. We employed multiple imputation procedures in our main analysis to manage this issue in our regression analysis (Rubin 1987), which is discussed further below.

Individual-Level variables

Our outcome variable was above-average self-rated stress, which we based on the PHMC survey question:

> *How much stress would you say you have experienced during the past year?*

The result was a score of 1 to 10, with 10 representing the highest level of stress. This variable was dichotomized to depict respondents with above-average stress. In the case of Philadelphia, the average stress reported was 5.35. Any individual with a score above 5.35 was coded 1 whereas below and equal to 5.35 was coded 0. While self-rated stress has not commonly been dichotomized, we chose to do so here as it allows us to better single out above-normal levels of stress (Matthews & Yang, 2010). To ensure robustness in this measure, we conducted sensitivity analyses using the upper 75% quartile of stress, a score above 8, as our threshold. We also conducted sensitivity analysis with the raw continuous measure of self-rated stress. We refer to these analyses in our results. Our measure of self-rated stress did not allow us to determine the direct source of the stress; nonetheless, it was a useful way to measure the day to day stressors affecting individuals in a given location (Lazarus 1990; Yang & Matthews, 2010).

Our independent variables were primarily composed of dichotomous measures (1 = yes, 0 = no). We included common measures of race and socio-economic status such as *race/ethnicity*, classified into *White* (reference group), *Black*, *Hispanic*, and *other* non-Hispanic minorities; *education attainment*, classified as *no high school* (reference group), *high school*, *some college*, and *college educated or higher*; *marital status*, categorized into *single* (reference group), *married* or living with a partner, *widowed/divorced/separated* (*WDS*), and *another marital status*; living below the federal *poverty* line (reference, above poverty); and

homeowner (reference renter). In addition to these dichotomous measures, we included the continuous measure of self-reported *age,* which was standardized in the MLM analysis.

We augmented these measures with predictors of stress potentially associated with gentrification. These include *housing cost insecurity,* based on the PHMC question:

> *Overall, how difficult was it for you to afford your housing costs (the money that you and your household spend on utility bills, rent, mortgage payments and property taxes.) during the past year? Very difficult, somewhat difficult, not very difficult or not difficult at all?*

We coded very difficult and somewhat difficult as 1; not very difficult and not difficult at all as 0. We also included a measure of an individual's sense of neighborhood *community connection* based on Gibbons and Yang's (2016) measure. This community connection score was derived from Principle Components Analysis (PCA) with the R package Factorminer. These components included the respondents *willingness* to help neighbors: *"would you say that most people in your neighborhood are always, often, sometimes, rarely, or never willing to help their neighbors?"* which we coded on a scale of 5 to 1, where 5 signifies always and 1 never (loading 0.738); respondents feeling of *belonging* to their neighborhood: "*do you strongly agree, agree, disagree, or strongly disagree that you belong and are part of your neighborhood*" where strongly agree was coded 4 and strongly disagree was coded 1 (loading 0.795); and a respondent's *trust* of their neighbors: *"do you strongly agree, agree, disagree, or strongly disagree with the statement that most people in your neighborhood can be trusted?"* where 4 indicated strongly agree and 1 indicated strongly disagree (loading 0.776). The PCA results suggested that one factor was sufficient to capture almost 60% of the variance among these three questions. The Cronbach's Alpha for these variables was 0.688. We used the regression method to obtain a means-centered factor score. A higher score indicated stronger community connection.

A potential confounder to our findings was the Great Recession, which mainly affected housing for low-income communities. To capture the possible influence this period has on our results; we included a dummy variable representing the respondents from 2008, which was one of the most severe years of the recession.

A fundamental limitation of our data was there was no direct measure of how long individuals resided in their neighborhood. Thus, we could not directly distinguish longstanding residents from the gentrifiers. While this limited how deep our analysis could go in identifying unique outcomes between old and new residents, evidence suggests community disparities would affect all residents in these neighborhoods (Sampson, 2012). As such, we focused our study on the net effect of gentrification on neighborhood communities overall.

Neighborhood-Level variables

Our focal neighborhood predictor was *gentrification*, which has been measured in a variety of ways (Barton, 2016a). The current study settled upon the measures devised by Ding et al., (2016). We used their measure for three reasons: First, it has previously been used to study gentrification in Philadelphia (Ding et al., 2016; Gibbons & Barton, 2016). Second, and more importantly, this measure allowed us to compare places that gentrified to those which had the potential, but so far had 'failed' to gentrify. By pairing gentrifying communities to non-gentrifying places, we could better determine how exclusive the disruptive effects of gentrification were to neighborhoods identified as gentrifying (Gibbons & Barton, 2016). Third, the lack of incorporation of racial change in the Ding et al., (2016) measure allowed us to use it as a 'base' measure of gentrification, enabling us to augment it with changes in race/ethnicity to compare effects of White and non-White gentrification. Neighborhoods across the city were classified as gentrifiable in 2000 if they featured a median household income below that of the city (Ding et al., 2016).

Once we determined gentrifiable neighborhoods, we created six dichotomous categories which account for all Census tracts in the region. *Not gentrifiable* were those that featured a median household income above the citywide median in 2000. *Gentrifiable* neighborhoods had a median household income below the citywide median in 2000. A neighborhood was deemed *gentrifying* if it was determined *gentrifiable* in 2000 and experienced an increase in gross rent or median home value above the citywide median and an increase in college-educated residents above the citywide median over the time span. A neighborhood experienced *White gentrification* if it saw increases in the percent White and decreases in percent Black or Hispanic. We also included measures of *Black gentrification* and *mixed-White gentrification*. Black Gentrification only assumed an increase in Black residents in gentrifying neighborhoods because almost all the gentrifying tracts in Philadelphia that experienced increases in Black residents also experienced small increases in Hispanic residents and no notable change in White residents. *Mixed-White* Gentrification includes neighborhoods which experienced an increase in both White residents and non-White residents. This last measure allowed us to test the relationship of gentrification with Whites without measurable racial/ethnic displacement of White gentrification. The change in racial/ethnic character of these neighborhoods is documented in Table 1. *Non-gentrified* neighborhoods were those deemed gentrifiable but failed to meet the criteria of gentrifying over the study time (reference group).

Also, we controlled for the *change in residential stability*, wherein we compared the difference in the averaged standardized scores of the percentage of owner-occupied housing units and percentage of residents who did not move for at least 5 years between 2000 and 2010 (Gibbons & Barton, 2016). The resulting value demonstrates the increase or decrease of stability in a tract over this time. This measure allowed us to determine the independent role stability has on stress.

Results

Descriptives

In Table 2, we delineated the individual predictors and outcome by gentrification type. These results exclude cases via listwise deletion if they have missing data. First, 45.1% (0.451) of the respondents across the city reported above-average levels of stress. Most of the tracts were not gentrifiable (N = 192), followed by non-gentrifying tracts (N = 136). Only a few of the tracts in Philadelphia were gentrifying, 55 in all. Of the gentrifying tracts, most were experiencing mixed-White gentrification (N = 32), followed by Black gentrification (N = 12), and lastly White gentrification (N = 11). With MLM, there is no formally agreed upon minimum number of level two categories (Luke, 2004); however,

Table 1
Change in racial ethnic composition 2000–2010.

Neighborhood	Change in percent	Mean	Min	Max
White Gentrification	White	15.88	1.07	43.35
	Black	-13.71	-33.57	-0.97
	Hispanic	-2.4	-9.21	-0.2
Black Gentrification	White	-11.53	-37.48	14.4
	Black	7.69	0.26	30.18
	Hispanic	1.72	-12.98	10.86
Mixed-White Gentrification	White	3.14	-32.05	34.47
	Black	-10.9	-43.23	-0.17
	Hispanic	3.84	0.09	20.93
Not Gentrifying	White	-4.86	-35.64	29.49
	Black	1.06	-35.37	33.76
	Hispanic	2.93	-9.68	25.53
Non Gentrifiable	White	-8.53	-45.22	36.14
	Black	2.9	-29.21	45.03
	Hispanic	2.63	-12.93	23.38

Table 2
Descriptive statistics by gentrification status.

	Overall	Not gentrifiable	Non-gentrifying	Gentrifying		
				White	Black	Mixed-White
Variable						
Level 1						
Above-average self-rated stress	0.451	0.441	0.459	**0.530**	0.466	0.455
Race/Ethnicity						
White	0.426	**0.599**	**0.151**	0.376	0.426	0.449
Black	0.440	**0.298**	**0.671**	0.485	**0.364**	0.412
Hispanic	0.084	**0.057**	**0.124**	0.079	**0.131**	0.084
Other Race	0.047	**0.033**	**0.067**	**0.035**	**0.085**	0.051
Age[#]	51.146	**52.256**	**49.78**	50.391	**48.79**	50.11
Gender	0.689	0.680	**0.707**	0.668	0.636	0.700
Living in Poverty	0.152	0.093	**0.243**	0.163	0.182	0.143
Married	0.357	**0.437**	**0.253**	**0.292**	**0.244**	**0.300**
Employment						
Full Time Employment	0.426	**0.458**	**0.380**	0.342	0.426	0.435
Part Time Employment	0.103	0.104	0.098	0.149	0.091	0.106
Retired	0.222	**0.238**	**0.199**	0.238	0.210	0.212
Other Employment Status	0.051	0.052	0.051	0.045	0.034	0.047
Unemployed	0.090	0.074	0.114	0.099	0.108	0.092
Education						
No High School	0.112	**0.070**	**0.172**	0.134	0.148	0.124
High School Diploma	0.380	0.360	0.416	0.317	0.364	0.394
Some College Education	0.215	0.213	0.223	0.228	0.239	**0.182**
College Education	0.176	**0.209**	**0.127**	0.188	0.142	0.161
Housing Cost Insecurity	0.518	**0.487**	**0.578**	**0.441**	0.500	0.496
Community Connection[#]	0.001	**0.087**	**-0.607**	-0.411	**-0.579**	-0.371
Homeowner	0.650	**0.721**	**0.559**	**0.639**	0.557	**0.565**
2008	0.503	0.504	0.504	0.500	0.506	0.490
Level 2						
Change in neighborhood Stability[#]	-0.090	**-0.147**	**-0.163**	**0.925**	-0.033	**0.384**
Number of Tracts	383	192	136	11	12	32
Number of Respondents	8108	4427	2793	202	176	510

Notes: Bolded means indicate value was significantly different from overall mean (p ≤ 0.050). [#] Indicates Variables wherein significance tests were conducted with ANOVA. All other significance tests conducted with Chi-squares. Tract Ns reflect counts after listwise deletion.

these counts fall within the commonly agreed upon range (Maas & Hox, 2005). In the following section, we discuss the individual characteristics in Philadelphia by gentrification status.

Above-average self-rated stress was most prevalent in neighborhoods that were experiencing White gentrification, with over half of the residents (53%) experiencing above-average stress. This was the only subset mean stress score that was significantly (p ≤ 0.050) different from the overall mean. The neighborhoods with the lowest rates of above-average stress were neighborhoods that were not gentrifiable at 44.1%, which was below the city average of 45.1%.

Socio-economically, respondents residing in tracts that were not gentrifiable were the most advantaged, with the lowest percent reporting poverty (9.3%), unemployment (7.4%) and the highest representation of college-educated (20.9%) in the sample. The most disadvantaged respondents were those residing in non-gentrifying tracts. These respondents were the poorest (24.3%), most unemployed (11.4%), and had the smallest share of college degrees in the sample (12.7%). Among gentrifying neighborhoods, the most disadvantaged respondents were those in gentrifying Black neighborhoods with 18.2% in poverty, only 14.2% college educated, and 10.2% unemployed.

We found the largest share of White respondents were in non-gentrifiable neighborhoods, at 59.9%; the largest share of Black respondents could be found in non-gentrifying neighborhoods (67.1%), the largest percentage of Hispanics could be found in Black gentrifying neighborhoods (13.1%), and some other race in areas experiencing Black gentrification (8.5%).

Turning to our other predictors associated with gentrification, the highest prevalence of housing cost insecurity could be found in non-gentrifying neighborhoods (57.8%). Neighborhoods with the least reported insecurity were experiencing White gentrification (44.1%). This finding was notable given the disproportionately high levels of above-average stress reported in these tracts. White gentrifying neighborhoods were also the tracts with the highest increase in stability, with an above mean score of 0.925 points higher than it had been in 2000. Meanwhile, the least stable were neighborhoods which were non-gentrifying, which saw a decrease of 0.163 points since 2000. We found the lowest community connection in non-gentrifying neighborhoods (-0.607). Individuals with the highest average community connection were in neighborhoods that were not gentrifiable (0.087). While residents in White gentrifying neighborhoods do not have the lowest community connection score, their average value was well below the overall average (-0.411). This finding was an important observation given the increase in stability in these tracts, which one would expect would be associated with high community connection. While these findings supported the potential relationship between gentrification and stress, gentrification may also be stabilizing neighborhoods in some cases. To better understand this possible contradiction, we more fully measured the net effect of gentrification and other local attributes with our MLM analysis.

Multilevel Modeling Results

We calculated the MLM logistic regression results for each covariate. We implemented an unconditional model (without any covariates) to justify the use of MLM analysis. The chi-square value of the unconditional model was 1255.70 (p ≤ 0.001), suggesting that the proportion

Table 3

Odds-ratios of multilevel logistic regression models of above-average self-rated stress.

	Model 1	Model 2	Model 3
Neighborhood-Level			
Gentrification Measures (Ref = Not Gentrifying)			
Not Gentrifiable	0.938		1.059
	-0.049		-0.057
White Gentrification	1.299*		1.402*
	-0.148		-0.16
Non-Black Gentrification	1.082		1.021
	-0.156		-0.165
Mixed White	1.024		1.016
	-0.097		-0.105
Neighborhood Stability			1.059
			-0.03
Individual-Level			
Race/Ethnicity (Ref = White)			
Black		0.698***	0.698***
		-0.051	-0.055
Hispanic		0.651***	0.676**
		-0.126	-0.13
Other Race		0.936	0.95
		-0.157	-0.162
Age		0.707***	0.717***
		-0.032	-0.032
Gender		1.307***	1.310***
		-0.052	-0.052
Living in Poverty		1.13	1.166*
		-0.072	-0.073
Married		0.926	0.927
		-0.052	-0.053
Employment (Ref = Unemployment)			
Full-Time Employment		0.657***	0.658***
		-0.068	-0.069
Part Time Employment		0.590***	0.586***
		-0.09	-0.091
Retired		0.471***	0.476***
		-0.086	-0.087
Other Employment Status		0.500***	0.496***
		-0.119	-0.12
Education (Ref = No High School)			
High School Diploma		0.783***	0.791***
		-0.063	-0.064
Some College Education		1.006	1.021
		-0.071	-0.072
College Education		0.903	0.9
		-0.075	-0.076
Housing Cost Insecurity		1.898***	1.911***
		-0.048	-0.049
Community Connection		0.874***	0.871***
		-0.017	-0.018
Homeowner		1.018	1.008
		-0.055	-0.055
2008		0.887*	0.883**
		-0.047	-0.048
Constant	0.844***	1.031***	0.992***
	-0.038	-0.18	-0.191
Variance Partitioned Coefficient	0.001	0.001	0.001
	-0.031	-0.001	-0.022
Log Likelihood	-5581.62	-5235.90	-5133.79
N	8710	8710	8710

Notes: p ≤ 0.050 *; p ≤ 0.010 **; p ≤ 0.001 ***; Standard Errors in Parentheses.

of those who reported above-average stress were not evenly distributed across neighborhoods and gentrification may play a role in explaining individual stress. In arriving at these results, we used grand means centering for the variables. We also conducted Variance Inflation Factor (VIF) analysis on our models to determine whether multicollinearity was cause for concern in our estimations. All the VIFs were smaller than a conservative cut-off value of 4.

To deal with missing values in our data, we used multiple imputation procedures with the R package JOMO. This methodology used Markov Chain Monte Carlo techniques to draw multiple imputations for both level 1 and level 2 values (Carpenter & Kenward, 2012). Following the strategy of Rubin (1987), we imputed a total of ten datasets which we then analyzed with the MLM models discussed above, leading to ten sets of results. We combined these results with the R package mice and present them in Table 3 as odds-ratios. A fuller discussion of our imputation process is available upon request.

Model 1 only included neighborhood-level gentrification covariates. We find that only White gentrification had a significant (p ≤ 0.050) relationship with the likelihood of reporting stress. Those residing in White gentrifying neighborhoods had a 29.9% greater chance (1.299-1 = 29.1) of reporting above-average stress than those living in non-gentrifying tracts. The odds-ratio of White gentrifying neighborhoods was stronger with the introduction of the individual-level controls and neighborhood-level stability into the full model in Model 3 (40.2%). A supplemental analysis (not reported) looking at gentrification, but not racial change, found no relation of gentrification to stress. As such, gentrification was related to above-average stress, but racial/ethnic composition had a role in this relation. However, supplemental analyses using a continuous measure of stress indicated that White gentrifying tracts were not significantly associated with stress. This finding suggests that White gentrification was explicitly associated with above-average stress as opposed to small increases in stress.

The other results reported in Model 3 primarily corresponded to the neighborhood and stress literature (Yang & Matthews, 2010). For example, every 1-year difference in age was related to a 28.5% decrease in the likelihood (0.715–1 = -0.285) of reporting above-average stress. One interesting deviation from previous studies was the relationship of race/ethnicity to stress. Black respondents were 31.2% less likely than Whites in Philadelphia to report above-average stress. Similar results were found in supplemental models where we used a continuous measure of stress or a dichotomous measure of stress with the cutoff set to the upper 75% quartile (available upon request). Most of our added variables had their expected relationships to stress, housing cost insecurity, community connection, and the 2008 dummy were all significant. However, stability had no significant relation. The continued significance of White gentrification with these controls indicated it had an independent effect from community connection, stability, and housing insecurity.

Why was White gentrification-related to above-average self-rated stress? Additional regression analyses were conducted looking only at White gentrifying tracts to uncover any trends unique to these areas. Due to the relatively small N's of this dataset even without the listwise deletion of missing cases (N = 217), in place of MLM we performed conventional logistic regression with robust standard errors calculated with the sandwich R package. A multiple imputation strategy was also adopted for these models. Presented in Table 4, a few results may help to explain White gentrification's relation to above-average stress. First, as seen in Model 4, stability had a significant and positive relationship to above-average stress in this subset. In other words, the more stable a White gentrifying tract was, the greater chance one reported above-average stress. Second, Black and Hispanic respondents both reported a positive relationship to above-average stress. To investigate these effects further, we interacted change in stability with Black and Hispanic respondents in Model 5. The stability X Black interaction term was significant, which suggests a relation between Black stress and stability in White gentrifying neighborhoods.

Table 4

Odds-Ratios of logistic regression models of above-average self-rated stress for white gentrification sub-sample, clustered standard errors.

	Model 4	Model 5
Neighborhood-Level		
Change in Neighborhood Stability	1.735***	1.316***
	(0.193)	(0.237)
Change in Neighborhood Stability X Black		2.005***
		(0.375)
Individual-Level		
Race/Ethnicity (Ref = White)		
Black	1.901***	1.100**
	(0.439)	(0.530)
Hispanic	2.119**	1.951**
	(0.876)	(0.874)
Other Race	0.872	0.865
	(1.074)	(1.076)
Age	1.102***	1.136***
	(0.220)	(0.222)
Gender	0.845**	0.881**
	(0.355)	(0.358)
Living in Poverty	0.964**	0.921*
	(0.481)	(0.487)
Married	1.396***	1.456***
	(0.384)	(0.387)
Employment (Ref = Unemployment)		
Full-Time Employment	0.908**	0.904**
	(0.443)	(0.448)
Part Time Employment	0.686	0.617
	(0.567)	(0.573)
Retired	0.218	0.191
	(0.584)	(0.602)
Other Employment Status	0.566	0.482
	(0.835)	(0.84)
Education (Ref = No High School)		
High School Diploma	0.551	0.521
	(0.437)	(0.443)
Some College Education	0.525	0.511
	(0.486)	(0.493)
College Education	0.977*	0.940*
	(0.511)	(0.51)
Housing Cost Insecurity	1.763***	1.734***
	(0.334)	(0.338)
Community Connection	0.721***	0.729***
	(0.122)	(0.124)
Homeowner	1.763***	1.763***
	(0.375)	(0.378)
2008	0.772**	0.701**
	(0.33)	(0.338)
Constant	0.656	1.057
	(1.245)	(1.273)
Log Likelihood	-121.671	-119.892
N	217	217

Notes: p ≤ 0.050 *; p ≤ 0.010 **; p ≤ 0.001 ***; Standard Errors in Parentheses.

Discussion

The goal of this study was to examine if gentrification was related to above-average self-rated stress. This was done looking at a stress buffer and several stressors related to gentrification. First, the findings for community connection and neighborhood stability suggest a subtle relation between gentrification and stress. Perhaps one of the most unexpected findings was that an increase in stability was significantly related to above-average stress in White gentrifying tracts. In addition to conflicting with our second hypothesis, this finding raised broader questions as for how stability matters for stress. We had suspected from past research that lack of stability could lead to stress in low-income neighborhoods as residents often feel trapped in them and it is challenging to build community connection in these places (Ross & Mirowsky, 2009; Sampson, 2012). However, as shown in Table 2, White gentrifying tracts did not have high levels of socio-economic disadvantage.

Our community connection measure offers more context to how we understand stability, gentrification, and stress. Community connection carried a negative relation with above-average stress across all our models, supporting our first hypothesis. However, even if stability and gentrification had no measurable relation to community connection, there may be a subtler relationship taking place. Based on qualitative research, we suspect that Whites were the ones benefitting from the existing community connection in these tracts, coalescing a new community distinct from the longstanding residents (Anderson 1990; Hwang, 2016; Schlichtman et al., 2017). However, without the ability to distinguish old from new residents, this is impossible to say for sure.

Next, we found while housing cost insecurity was related to above-average stress, we could not find direct evidence that this insecurity explained gentrification. As such, we did not find support for our third hypothesis. This supports the perspective that gentrification's relationship to residential displacement has been overstated (Ding et al., 2016; Newman & Wyly, 2006). Rising housing costs remain a widespread issue, not limited to gentrification (Desmond, 2016). Also, the relationship of self-rated stress and housing insecurity was not likely due to the Great Recession alone, given the independent importance of housing insecurity even with our measure of the recession.

We explored the relationship of gentrification to stress by race/ethnicity more fully with our final two hypotheses. In partial support of our fourth hypothesis, we found White gentrification to be significantly related to the likelihood one will report above-average stress in the city of Philadelphia. This result only held with a dichotomized measure of above-average self-rated stress; meaning White gentrification was not directly related to incremental changes in stress. Meanwhile, Black and mixed-White gentrification did not have a significant relationship with stress. Although we did not have direct support for our fifth hypothesis, the lack of significance for non-White gentrification and significance of White gentrification suggests at least non-White gentrification was not directly connected to stress.

The significance of White gentrification and above-average stress would appear to support past research asserting the 'Whitening' of gentrifying tracts was related to distress among non-White residents (Anderson 1990; Freeman, 2006; Sullivan & Shaw, 2011). The significance of White gentrification even when accounting for housing cost insecurity is especially notable as it indicates stress over Whites moving in was something separate from displacement fears, something suggested in past qualitative work (Shmool et al., 2015). However, it is difficult to say how, exactly, this process played out with our data. We speculate based on Table 4 that the greater stability found in White gentrifying areas identified in Table 2 was tied to the White residents. A closer look at 2000 Census data and 2006–2010 ACS data does strongly suggest that Whites were driving the increase in stability; while the percentage of White homeowners increased by 7.81% to 41.70% in White gentrifying tracts, the percentage of Black homeownership dropped by 12.3% down to 44.4%. We suspect that as White residents moved into these neighborhoods and bought homes, the shrinking Black population felt more isolated, and thereby stressed (Anderson 1990; Riina et al., 2016). However, we do not have definitive proof of this relationship in Table 4 beyond the relationship between Blacks and stability.

The most substantial limitation of our study was our inability to directly compare insecurity over housing between old residents and new residents. While there is some reason to suspect gentrification will

affect stress in these groups differently, we cannot say this with certainty. Also, due to the cross-sectional nature of this study, we were unable to examine the issue of causal ordering to confirm that stress is an outcome of gentrification. Next, the racial/ethnic compositions used in this study were influenced by the demographics of Philadelphia. Future research should replicate this analysis in other regions, especially those with different racial/ethnic compositions. Further, it should be noted that the Variance Partition Coefficient for our MLM models was low, indicating the overall ability of Census tracts to explain individual variation in stress is limited. Subsequent investigations should consider units of analysis other than Census tracts. While tracts were frequently used as proxies for neighborhoods, they often conflicted with the resident's interpretation of neighborhood boundaries. Finally, future studies should utilize different measures of stress to gain a fuller sense of gentrification's impact onto individual distress.

Conclusion

To surmise, we can answer that yes gentrification is related to above-average stress for some, although racial/ethnic change associated with gentrification has a crucial role in this relationship. Our findings not only contribute to how we understand gentrification, but how we understand neighborhood stability's relation to stress. To mitigate above-average self-rated stress, it is not enough for neighborhoods to have more homeowners. Based on our findings and previous qualitative work (Anderson 1990; Freeman, 2006; Shmool et al., 2015; Sullivan & Shaw, 2011), it would appear that the growing presence of White residents at the loss of Black residents creates an atmosphere of greater stress for the remaining Black community. While gentrification driven by non-Whites does not carry the same implications of stress, it does not bring any measurable reductions in stress, either. Based on these results, we encourage policymakers to rethink neighborhood-based measures to reduce stress through improving local conditions without triggering the kind of gentrification that can make matters worse for non-White residents.

Conflict of interest

I have no conflicts of interest to report.

Financial disclosure

I have no financial support to disclose.

Ethics approval

As this paper uses secondary data, the PHMC's Southeastern Pennsylvania Household Health Survey, the policies of my University's Institutional Review Board are that it is not subject to an ethical review. Information on the individual participants was de-identified by the PHMC, minimizing risk for individual respondents.

References

Anderson, E. (1990). *The village setting. Streetwise: Race, class, and change in an urban community*. Chicago, Illinois: University of Chicago Press.

Barton, Michael S. (2016a). An exploration of the importance of the strategy used to identify gentrification. *Urban Studies, 53*(1), 92–111. https://doi.org/10.1177/0042098014561723.

Barton, Michael S. (2016b). Gentrification and violent crime in New York city. *Crime Delinquency, 62*(9), 1180–1202. https://doi.org/10.1177/0011128714549652.

Carpenter, James R., & Kenward, Michael G. (2012). *Multiple imputation and its application*. New York, NY: Wiley.

Center for Disease Control (2013). *"Health Effects of Gentrification" healthy places*. Center for Disease Control⟨http://www.cdc.gov/healthyplaces/healthtopics/gentrification.htm⟩.

Desmond, Matthew (2016). *Evicted: Poverty and profit in the American City*. New York, NY: Crown.

Desmond, Matthew, & Kimbro, Rachel Tolbert (2015). Eviction's fallout: Housing,

hardship, and health. *Social Forces, 94*(1), 295–324. https://doi.org/10.1093/sf/sov044.

Ding, Lei, Hwang, Jackelyn, & Divringi, Eileen (2016). Gentrification and residential mobility in Philadelphia. *Regional Science and Urban Economics, 61*, 38–51. https://doi.org/10.1016/j.regsciurbeco.2016.09.004.

Finney Rutten, Lila J., Augustson, Erik M., Moser, Richard P., Beckjord, Ellen Burke, & Hesse, Bradford W. (2008). Smoking knowledge and behavior in the United States: Sociodemographic, smoking status, and geographic patterns. *Nicotine Tobacco Research: Official Journal of the Society for Research on Nicotine and Tobacco, 10*(10), 1559–1570. https://doi.org/10.1080/14622200802325873.

Freeman, Lance (2006). *There goes the 'Hood: Views of gentrification from the ground up*. Philadelphia, PA: Temple University Press.

Gibbons, Joseph, & Barton, Michael S. (2016). The association of minority self-rated health with black versus white gentrification. *Journal of Urban Health*, 1–14. https://doi.org/10.1007/s11524-016-0087-0.

Gibbons, Joseph, & Yang, Tse-Chuan (2016). Connecting across the divides of race/ethnicity how does segregation matter? *Urban Affairs Review, 52*(4), 531–558.

Glick, Jonathan (2008). Gentrification and the racialized geography of home equity. *Urban Affairs Review, 44*(2), 280–295. https://doi.org/10.1177/1078087408316971.

Hernández, Diana, Phillips, Douglas, & Siegel, Eva (2016). Exploring the housing and household energy pathways to stress: A mixed methods study. *International Journal of Environmental Research and Public Health, 13*(9), 916. https://doi.org/10.3390/ijerph13090916.

Hicken, Margaret T., Lee, Hedwig, & Hing, Anna K. (2018). The weight of racism: Vigilance and racial inequalities in weight-related measures. *Social Science Medicine, 199*, 157–166. https://doi.org/10.1016/j.socscimed.2017.03.058.

Huynh, M., & Maroko, A. R. (2014). Gentrification and preterm birth in New York City, 2008–2010. *Journal of Urban Health, 91*(1), 211–220. https://doi.org/10.1007/s11524-013-9823-x.

Hwang, Jackelyn (2016). The social construction of a gentrifying neighborhood reifying and redefining identity and boundaries in inequality. *Urban Affairs Review, 52*(1), 98–128. https://doi.org/10.1177/1078087415570643.

Jackson, John L. (2003). *Harlemworld: Doing race and class in contemporary black America*. Chicago: The University of Chicago Press.

Kawachi, Ichiro, & Berkman, Lisa F. (2003). *Neighborhoods and health*. Oxford, UK: Oxford University Press.

Krieger, Nancy, Kosheleva, Anna, Waterman, Pamela D., Chen, Jarvis T., & Koenen, Karestan (2011). Racial discrimination, psychological distress, and self-rated health among US-born and foreign-born Black Americans. *American Journal of Public Health, 101*(9), 1704–1713.

Kushel, Margot B., Gupta, Reena, Gee, Lauren, & Haas, Jennifer S. (2006). Housing instability and food insecurity as barriers to health care among low-income Americans. *Journal of General Internal Medicine, 21*(1), 71–77. https://doi.org/10.1111/j.1525-1497.2005.00278.x.

Lazarus, Richard S. (1990). Theory-Based Stress Measurement. *Psychological Inquiry, 1*(1), 3–13.

Luke, Douglas A. (2004). *Multilevel modeling. Vol. 143. Quantitative applications in the social sciences*. Thousand Oaks, CA: SAGE Publications.

Maas, Cora J. M., & Hox, Joop J. (2005). Sufficient sample sizes for multilevel modeling. *Methodology, 1*(3), 86–92. https://doi.org/10.1027/1614-2241.1.3.86.

Matthews, Stephen A., & Yang, Tse-Chuan (2010). Exploring the role of the built and social neighborhood environment in moderating stress and health. *Annals of Behavioral Medicine, 39*(2), 170–183. https://doi.org/10.1007/s12160-010-9175-7.

Newman, Kathe, & Wyly, Elvin (2006). The right to stay put, revisited: Gentrification and resistance to displacement in New York City. *Urban Studies, 43*(1), 23–57. https://doi.org/10.1080/00420980500388710.

Nowok, Beata, van Ham, Maarten, Findlay, Allan M., & Gayle, Vernon (2013). Does migration make you happy? A longitudinal study of internal migration and subjective well-being. *Environment and Planning A, 45*(4), 986–1002. https://doi.org/10.1068/a45287.

Pattillo, Mary (2007). *Black on the block: The politics of race and class in the city*. Chicago, Illinos: University of Chicago Press.

Pollack, Craig Evan, Griffin, Beth Ann, & Lynch, Julia (2010). Housing affordability and health among homeowners and renters. *American Journal of Preventive Medicine, 39*(6), 515–521. https://doi.org/10.1016/j.amepre.2010.08.002.

Riina, Elizabeth M., Lippert, Adam, & Brooks-Gunn, Jeanne (2016). Residential instability, family support, and parent-child relationships among ethnically diverse urban families: Residential instability, social support, and parent-child relationships. *Journal of Marriage and Family, 78*(4), 855–870. https://doi.org/10.1111/jomf.12317.

Ross, Catherine E., & Mirowsky, John (2009). Neighborhood disorder, subjective alienation, and distress. *Journal of Health and Social Behavior, 50*(1), 49–64.

Sampson, Robert J. (1988). Local friendship ties and community attachment in mass society: a multi-level systemic model. *American Sociological Review, 53*, 766–779.

Sampson, Robert J. (2012). *Great American city: Chicago and the enduring neighborhood effect* (1st ed.). Chicago, Illinos: University of Chicago Press.

Schlichtman, John Joe, Patch, Jason, & Hill, Marc Lamont (2017). *Gentrifier*. Toronto: University of Toronto Press.

Senn, Theresa E., Walsh, Jennifer L., & Carey, Michael P. (2014). The mediating roles of perceived stress and health behaviors in the relation between objective, subjective, and neighborhood socioeconomic status and perceived health. *Annals of Behavioral Medicine, 48*(2), 215–224. https://doi.org/10.1007/s12160-014-9591-1.

Shaw, Clifford R., & McKay, Henry D. (1942). *Juvenile delinquency in urban areas*. Chicago, Illinois: University Of Chicago Press.

Shmool, Jessie L. C., Yonas, Michael A., Newman, Ogonnaya Dotson, Kubzansky, Laura D., Joseph, Evelyn, Parks, Ana, ... Clougherty, Jane E. (2015). Identifying perceived

neighborhood stressors across diverse communities in New York city. *American Journal of Community Psychology, 56*(1–2), 145–155. https://doi.org/10.1007/s10464-015-9736-9.

Smith, Richard J., Lehning, Amanda J., & Kim, Kyeongmo (2017). Aging in place in gentrifying neighborhoods: Implications for physical and mental health. *The Gerontologist*. https://doi.org/10.1093/geront/gnx105.

Sullivan, Monroe D., & Shaw, S. C. (2011). Retail gentrification and race: The case of Alberta street in Portland, Oregon. *Urban Affairs Review, 47*(3), 413–432. https://doi.org/10.1177/1078087410393472.

Thoits, Peggy A. (1995). Stress, coping, and social support processes: Where are we? What next? *Journal of Health and Social Behavior, 35*, 53. https://doi.org/10.2307/2626957.

Turner, R. Jay, Wheaton, Blair, & Lloyd, Donald A. (1995). The epidemiology of social stress. *American Sociological Review, 60*, 104–125.

Yang, Tse-Chuan, & Matthews, Stephen A. (2010). The role of social and built environments in predicting self-rated stress: A multilevel analysis in Philadelphia. *Health Place, 16*(5), 803–810. https://doi.org/10.1016/j.healthplace.2010.04.005.

Yang, Tse-Chuan, & Matthews, Stephen A. (2012). Understanding the non-stationary associations between distrust of the health care system, health conditions, and self-rated health in the elderly: A geographically weighted regression approach. *Health Place, 18*(3), 576–585. https://doi.org/10.1016/j.healthplace.2012.01.007.