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Neighborhood Changes in Concentrated Immigration and Late Stage Breast Cancer Diagnosis

Young Ik Cho · Timothy P. Johnson · Richard E. Barrett · Richard T. Campbell · Therese A. Dolecek · Richard B. Warnecke

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Abstract Immigrant women are at greater risk for late stage breast cancer diagnosis. The rapid increase in the US foreign-born population and new immigration patterns lead us to investigate the association between changes in immigrant population and the likelihood of distant metastasis stage at diagnosis of breast cancer among women in Cook County, Illinois. Analyses employed Illinois State Cancer Registry data for 42,714 breast cancer cases diagnosed between 1994 and 2003 in conjunction with 1990 and 2000 Census tract data. We find that concentration of and increases in immigrant populations within neighborhoods contributed to the risk of late stage breast cancer diagnosis. These findings suggest that, although some health indicators for immigrant populations have improved in recent years, important health disparities in breast cancer diagnosis still remain at the neighborhood level. They further suggest that cancer screening and follow-up resources should be directed to areas experiencing rapid increases in immigrant populations.

Keywords Breast cancer · Stage at diagnosis · Distant metastasis · Immigrants · Neighborhood change

Y. I. Cho (✉)
Survey Research Laboratory, University of Illinois at Chicago, Mail Code 336, 412 S. Peoria St. Room 634, Chicago, IL 60607, USA
e-mail: youngcho@uic.edu

T. P. Johnson
Survey Research Laboratory, University of Illinois at Chicago, Mail Code 336, 412 S. Peoria St. Room 629, Chicago, IL 60607, USA

R. E. Barrett
Department of Sociology, University of Illinois at Chicago, Chicago, IL, USA

R. T. Campbell · T. A. Dolecek
Division of Epidemiology and Biostatistics, School of Public Health, University of Illinois at Chicago, Chicago, IL, USA

R. B. Warnecke
Center for Population Health and Health Disparities, University of Illinois at Chicago, Chicago, IL, USA

Introduction

The failure to detect breast cancer until an advanced stage increases mortality risk and reduces the long-term survival of women with breast cancer [1–4] Several characteristics of patients are known to be risk factors for advanced stage at diagnosis, including low socioeconomic status, low educational attainment, membership in a minority race/ethnic group, and foreign-born or immigrant status [5–11]. Immigrant women, in particular, may be at greater risk of being diagnosed with breast cancer at a later stage since they are more likely to have limited English proficiency, to experience social exclusion, to lack health insurance, to have less knowledge about cancer prevention and to consequently be less likely to receive appropriate cancer screening services [12–23].

In recent years there has been a dramatic increase in the size of the US foreign-born population. For instance, between the 1990 and 2000 censuses, the foreign born proportion of the Cook County, Illinois population rose from 14.1 to 19.8%; of the foreign born, 40.4% entered between 1990 and 2000 (data computed from Tables DP-2, Social Characteristics, STF 3 for 1990 and SF 3 for 2000 [24]). Also, new patterns of immigration have been emerging. It has been observed that the educational attainment and economic power of new immigrants has

improved [25, 26], and they have increasingly tended to settle in suburban neighborhoods [27–29]. Immigrants historically were attracted to enclaves of their own ethnic group in large urban centers, areas that often had high rates of poverty and neighborhood disadvantage [27].

Research also shows that many health status indicators, including general mortality and self-assessed health, consistently have appeared more favorable for immigrant populations compared to the US-born, generally supporting the "healthy immigrant" hypothesis [30, 31]. Over the last decade, foreign-born women have also improved on several important health indicators including 2-year mammography screening and cancer mortality rates [32]. These changes in immigrant populations lead us to explore the effects of neighborhood immigrant composition on the risk of late stage diagnosis.

Neighborhoods with high proportions of immigrants have been posited to provide health-conducive structural contexts such as the presence of ethnic food stores relevant for healthy diet, and to diminish the deleterious effects of poverty [33, 34]. It has been also suggested that the increased population density of immigrant neighborhoods can boost commercial activity and reduce social isolation of residents, immigrants as well as non-immigrants, especially elderly persons [35]. Neighborhood immigrant composition with these structural elements therefore potentially can affect the health of the residents independently of individual-level factors.

Studies have also linked neighborhood indicators of poverty and disadvantage to differences in stage at diagnosis, and individuals living in neighborhoods with low socioeconomic levels have had an increased probability of late stage diagnosis [36–38]. The potential effects of *changes* in immigrant population concentration on health outcomes in general, and breast cancer diagnosis in particular, however, have been largely unexplored. This study investigates the association between changes in immigrant population distributions in neighborhoods and the likelihood of late (regional or distant metastasis) stage at diagnosis of breast cancer among women in Cook County, Illinois, one of the immigrants' leading ports of entry in the nation, which consists of the City of Chicago and surrounding suburban areas.

Between 1990 and 2000, census figures show that the foreign-born population of Cook County swelled from 717,300 to 1,064,700, or an increase of about 67%. The dominant elements of the foreign-born population have been those from Latin America, Europe and Asia. While European (27.1%) and Asian migration (21.8%) is significant in Cook County, almost half of its foreign born population (48.7%) originated in Latin America, and 82% of that Latin American-born population was Mexican in 2000 [24].

Methods

Study Population and Measurements

The analysis employed breast cancer stage at diagnosis data from the Illinois State Cancer Registry (ISCR) [39]. Our analysis is based on 42,714 breast cancer cases diagnosed between 1994 and 2003 among women residing in Cook County, Illinois. ISCR data are estimated to be 97 to 100% complete using the North American Association of Central Cancer Registry method for case ascertainment and classification [40]. Cancer registry records provided standardized information on age, race, Hispanic ethnicity,

Table 1 Frequency distribution of variables included in the analysis

Variables	% or Mean	(SD)	Range
Patient level ($N = 42714$)			
Late stage (regional or distant) (%)	32.37		
Age (18 levels with 5-year interval) (Mean)	12.98 [60–64 years]	(2.88)	4 [14–19 years]–18 [85 + years]
Non-hispanic white (%)	68.01		
Non-hispanic black (%)	22.27		
Hispanic (%)	5.94		
Other race/ethnicity (%)	3.78		
Year of diagnosis (year-1990) (mean)	7.05	(1.99)	4–13
Tract level ($N = 1308$)			
Concentrated immigration in 1990 (mean)	−0.01	(0.98)	−0.90–4.26
Concentrated disadvantage in 1990 (mean)	−0.00	(0.98)	−1.01–6.34
Residual change in concentrated immigration between 1990 and 2000 (mean)	0.01	(0.95)	−5.24–8.10
Residual change in concentrated disadvantage between 1990 and 2000 (mean)	0.01	(0.92)	−6.26–8.16

SD standard deviation

Surveillance Epidemiology and End Results (SEER) general summary stage and year of diagnosis [41]. Cases with unknown stage (5.3% of all the reported cases) were excluded from the analysis. Demographic characteristics of all included cases are presented in Table 1. As an outcome measure, distant metastasis and regional stage at diagnosis were coded 1, and in situ and localized stage at diagnosis were coded 0. Cancer cases were geocoded by ISCR to the census block level using residential address at the time of diagnosis. Complete and valid address information was available for more than 98% of the breast cancer cases. Using this information, we were able to code each case to a Cook County census tract.

Neighborhood characteristics were measured using 1990 and 2000 US Census tract level data for Cook County, Illinois [42]. We constructed two indices to measure neighborhood characteristics using 1990 census data: concentrated immigration and concentrated disadvantage [43]. The concentrated immigration index was composed of two measures: percent foreign-born, and percent linguistically-isolated households (i.e., percent of households lacking at least one member who speaks English well or very well). Concentrated disadvantage was defined as the percentage of families in the census tract with incomes below the poverty line, and percentage of persons in the tract who are unemployed. Principal components analysis confirmed that the variables used for each index were highly interrelated and loaded on a single component. Following Sampson and colleagues [43], we first calculated z-scores for each variable (in all census tracts in Cook County, $N = 1{,}343$) to be used in constructing each of the two indices and averaged them with equal weighting to create each index. Each of these indices (Table 1, bottom panel) has a mean value close to zero and a standard deviation close to one; they deviate slightly from these norms because census tracts with no cases of female breast cancer between 1994 and 2003 were excluded from the multilevel analysis. A total of 1,308 census tracts were included in the final analysis.

Consistent with previous studies concerned with community change [44–48], standardized residual change scores were employed to measure neighborhood change. First, two additional status indices, concentrated immigration and concentrated disadvantage in 2000, were measured in a manner similar to that described above for the neighborhood status indices in 1990. Each of these indices from 2000 were then regressed on the 1990 status indices (i.e., concentrated immigration and concentrated disadvantage in 1990), and the standardized residuals of the 2000 variable were obtained. As Bohrnstedt [49] demonstrates, residual change scores are statistically independent of the initial status, and they represent the change in the variable that is beyond the expected level on the basis of the initial status. In addition, since all census tracts in Cook County are used to compute the regression equation, these scores represent changes that account for general trends between 1990 and 2000. Thus, a residual change score of "1" in immigration concentration, for example, indicates that there was a one standard deviation greater than expected level of immigrant concentration in that neighborhood in 2000, considering its preexisting status and changes experienced in Cook County as a whole. An alternate approach to conducting this analysis that we considered was to instead employ simple difference scores (i.e., difference between 1990 and 2000 index scores). In comparing these measures, the bivariate correlations between the residual change scores and simple difference scores of concentrated immigration and concentrated disadvantage were .936 and .957, respectively, and models with simple difference scores produce essentially the same results. Consequently, all analyses presented here use residual change scores.

Data Analysis

Multilevel logistic regression, accounting for the nesting of women within census tracts, was employed to predict the log odds of patients presenting with late stage diagnosis of breast cancer, [50]. We estimated two models: (1) a random intercept model with only patient level variables, i.e., age, race/ethnicity, and year of diagnosis; and (2) a random intercept model with both patient level variables and several neighborhood level compositional variables, including neighborhood concentrated immigration status in 1990, concentrated disadvantage status in 1990, and neighborhood changes in concentrated immigration and concentrated disadvantage status between 1990 and 2000. Noticing that the late stage diagnosis is overrepresented among younger minority women with different tumor characteristics [51, 52], we included interaction terms between patient's age at diagnosis and race/ethnicity in the models. These age-race interaction effects may be confounded with neighborhood effects, and hence, needed to be controlled. Using this model, the effects of neighborhood changes in immigration concentration between 1990 and 2000 on the likelihood of late stage diagnosis of breast cancer were assessed. The study was approved by the institutional review board at the University of Illinois at Chicago (Protocol # 2004-0271).

Results

When patient level variables only were included in the model, each was significantly associated in the expected direction with the probability of late stage diagnosis. As shown in Equation 1 in Table 2, age had a curvilinear relationship with late stage diagnosis of breast cancer: the youngest and oldest patients were at increased risk. African

Table 2 A multilevel logistic regression model of change in concentrated immigration and distant breast cancer stage diagnosis 1994–2003

Variables	Equation 1 O.R. (95% C.I.) *P*	Equation 2 O.R. (95% C.I.) *P*
Intercept	5.09 (3.26,7.94)***	5.50 (3.52, 8.61)***
Patient level		
Age	0.75 (0.71,0.80)***	0.76 (0.71, 0.81)***
Age-squared	1.01 (1.01,1.01)***	1.01 (1.01, 1.01)***
Non-hispanic black	1.94 (1.52,2.48)***	1.72 (1.35, 2.20)***
Hispanic	1.91 (1.30,2.78)**	1.64 (1.12, 2.40)*
Other race/ethnicity	1.28 (0.74,2.21)	1.22 (0.71, 2.11)
Non-hispanic black-age	0.98 (0.96,1.00)*	0.97 (0.96, 0.99)**
Hispanic -age	0.96 (0.93,0.99)**	0.96 (0.93, 0.99)*
Other race/ethnicity-age	0.97 (0.93,1.01)	0.97 (0.93, 1.01)
Year of diagnosis	0.90 (0.86,0.95)***	0.90 (0.86, 0.95)***
Year of diagnosis-squared	1.00 (1.00,1.01)**	1.01 (1.00, 1.01)**
Tract level		
Concentrated immigration in 1990		1.04 (1.00, 1.07)*
Concentrated disadvantage in 1990		1.19 (1.14, 1.24)***
Changes in concentrated immigration 1990–2000		1.04 (1.01, 1.08)*
Changes in concentrated disadvantage 1990–2000		1.05 (1.01, 1.10)*

O.R. = Odds Ratio; C.I. = 95% Confidence Interval; *** $P < .001$; ** $P < .01$; * $P < .05$

Population average models with robust standard errors. Independent variables are grand mean-centered

Americans and Hispanics, compared with whites, were each more likely to have a late stage diagnosis. As indicated by the significant effects of interaction between age of patients and African American and Hispanic patients, the late stage diagnosis was overrepresented among younger patients of these two race/ethnic groups, relative to whites. The odds of late stage diagnosis also varied in a curvilinear manner with year of diagnosis, such that they decreased from 1994–2000 and then were essentially unchanged between 2001 and 2003.

Equation 2 shows that after controlling for individual-level factors, concentrated immigration in 1990 was positively associated with greater odds of late stage diagnosis among breast cancer patients residing in those neighborhoods. For each unit increase (about one standard deviation) in a census tract's level of concentration of immigrant population in 1990, the odds of late stage diagnosis among breast cancer patients in that neighborhood increased by 4% (odds ratio [OR] = 1.04; 95% confidence interval [CI] = 1, 1.07; $P = .035$). Concentrated disadvantage in 1990 was also independently associated with greater odds of late stage diagnosis among residents with breast cancer (OR = 1.19; 95% CI = 1.14, 1.24; $P < .001$).

Changes in concentrated disadvantage and concentrated immigration status within neighborhoods between 1990 and 2000 were also each independently associated with the odds of late stage diagnosis. Each one unit increase in neighborhood changes in concentrated immigration (i.e., one standard deviation from the expected level of concentrated immigration in 2000), was associated with an increase of 4% in the odds of late stage diagnosis among female breast cancer patients within that neighborhood (OR = 1.04; 95% CI = 1.01,1.08; $P < .026$). Changes in concentrated disadvantage were also associated with the probability of late stage diagnosis. Each unit increase in changes in neighborhood concentrated disadvantage brought about a 5% increase in the odds of late stage diagnosis among breast cancer patients in that neighborhood (OR = 1.05; 95% CI = 1.01–1.10; $P < .013$).

Discussion

Consistent with previous studies, this research confirms that level of neighborhood disadvantage is strongly associated with late stage diagnosis of breast cancer [52, 53]. Yet the dynamic effects of community change also appear to influence late stage diagnosis. Specifically, breast cancer patients residing in neighborhoods that became relatively more disadvantaged over the 1990–2000 decade experienced an additional risk of late stage diagnosis. These findings also demonstrated that increasing concentration of immigrant populations within neighborhoods over the course of that decade additionally contributed to the risk of late stage diagnosis of breast cancer among women in those communities. They further suggest that, as an important

policy implication, cancer screening and follow-up resources should be directed to areas experiencing rapid increases in immigrant populations.

A potential mechanism by which changing neighborhood composition can influence the likelihood of cancer detection at a late stage is that increases in disadvantaged and immigrant populations may contribute to an added burden on the structural capacity of communities to successfully supply quality health care resources to residents. Our findings also suggest that the any potential protective effect of concentrated immigrants may not be applicable to some chronic illnesses indicators such as stage at breast cancer diagnosis, and that community-level structural barriers such as shortages of health care services may be counterbalancing and therefore diminishing any such positive effects.

To our knowledge, this is the first study to examine the effects of changes in neighborhood immigrant population composition on late stage breast cancer diagnosis. This is particularly important in light of a recent study that suggests that single-point-in-time estimates of neighborhood characteristics in multilevel models can mis-specify these effects because they may be changing over time [54]. As in our study, measuring neighborhood change shows whether the direction of change, as well as its initial level, is affecting the health outcomes of interest among the residents of the target area.

There are a number of limitations to our findings. First, we do not have some key patient level measures such as immigration status, as well as information regarding how long women lived in their neighborhood prior to their breast cancer diagnosis and, hence, how long they had been exposed to the neighborhood environment. Caution, therefore, is necessary when interpreting the results as evidence of a causal relationship between neighborhood compositional changes and late stage diagnosis. Additionally, the census tract, which is here used as a proxy for neighborhood, might not be the optimal geographic unit for capturing the effects of the distribution of and changes in immigrant populations. Finally, the available data do not allow us to directly examine issues such as acculturative stress, social support, and changes in access to care across neighborhoods that experience changes in immigrant population. Examining measures such as these would allow us to more clearly elucidate the mechanisms by which change may impact cancer diagnosis among immigrants as well as non-immigrants. Future research should focus on these dimensions in order to improve our understanding of how individual and neighborhood changes influence where, when and how all women obtain the health care necessary to benefit from earlier detection of breast cancer.

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References

1. Broeders MJ, Verbeek AL. Breast cancer epidemiology and risk factors. Q J Nucl Med. 1997;41(3):179–88.
2. Publisher. Public health focus: mammography, in morbidity and mortality weekly report. Atlanta, GA: Centers for Disease Control and Prevention; 1992. p. 454–9.
3. Moormeier J. Breast cancer in black women. Ann Intern Med. 1996;124(10):897–905.
4. McCarthy EP, et al. Mammography use helps to explain differences in breast cancer stage at diagnosis between older black and white women. Ann Intern Med. 1998;128(9):729–36.
5. Li CI. Racial and ethnic disparities in breast cancer stage, treatment, and survival in the United States. Ethn Dis. 2005;15(2 Suppl 2):S5–9.
6. Madison T, et al. Endometrial cancer: socioeconomic status and racial/ethnic differences in stage at diagnosis, treatment, and survival. Am J Public Health. 2004;94(12):2104–11.
7. Joslyn SA, et al. Racial and ethnic disparities in breast cancer rates by age: NAACCR Breast Cancer Project. Breast Cancer Res Treat. 2005;92(2):97–105.
8. Henson DE, Chu KC, Levine PH. Histologic grade, stage, and survival in breast carcinoma: comparison of African American and Caucasian women. Cancer. 2003;98(5):908–17.
9. Oakley-Girvan I, et al. Stage at diagnosis and survival in a multiethnic cohort of prostate cancer patients. Am J Public Health. 2003;93(10):1753–9.
10. Farley TA, Flannery JT. Late-stage diagnosis of breast cancer in women of lower socioeconomic status: public health implications. Am J Public Health. 1989;79(11):1508–12.
11. Gornick ME, Eggers PW, Riley GF. Associations of race education, and patterns of preventive service use with stage of cancer at time of diagnosis. Health Serv Res. 2004;39(5):1403–27.
12. Brown ER, et al. Racial, ethnic disparities in access to health insurance, health care. Los Angeles, CA: UCLA Center for Health Policy Research & The Henry J. Kaiser Family Foundation; 2000.
13. Tang TS, Solomon LJ, McCracken LM. Barriers to fecal occult blood testing and sigmoidoscopy among older Chinese-American women. Cancer Pract. 2001;9(6):277–82.
14. Maxwell AE, Bastani R, Warda US. Demographic predictors of cancer screening among Filipino and Korean immigrants in the United States. Am J Prev Med. 2000;18(1):62–8.
15. Goel MS, et al. Racial and ethnic disparities in cancer screening: the importance of foreign birth as a barrier to care. J Gen Intern Med. 2003;18(12):1028–35.
16. Marmot M, Wilkinson RG. Social determinants of health. New York: Oxford University Press; 1999.
17. O'Malley AS, et al. Acculturation and breast cancer screening among Hispanic women in New York City. Am J Public Health. 1999;89(2):219–27.
18. Hubbell FA, et al. Beliefs about sexual behavior and other predictors of Papanicolaou smear screening among Latinas and Anglo women. Arch Intern Med. 1996;156(20):2353–8.
19. Chavez LR, et al. Beliefs matter: cultural beliefs and the use of cervical cancer screening tests. American Anthropologist. 2001;103(4):1114–29.
20. Ramirez AG, et al. Hispanic women's breast and cervical cancer knowledge, attitudes, and screening behaviors. Am J Health Promot. 2000;14(5):292–300.
21. Tortolero-Luna G, et al. Screening practices and knowledge, attitudes, and beliefs about cancer among Hispanic and non-

Hispanic white women 35 years old or older in Nueces County, Texas. J Natl Cancer Inst Monogr. 1995;18:49–56.
22. Perez-Stable EJ, et al. Self-reported use of cancer screening tests among Latinos and Anglos in a prepaid health plan. Arch Intern Med. 1994;154(10):1073–81.
23. De Alba I, et al. Impact of English language proficiency on receipt of Pap smears among Hispanics. J Gen Intern Med. 2004;19(9):967–70.
24. Bureau, U.S.C. American FactFinder (http://factfinder.census.gov/home/saff/main.html?_lang=en). 2009 [cited 2009 March 1].
25. Kennedy M, Leonard P. Dealing with neighborhood change: a primer on gentrification and policy choices. Washington, DC: The Brookings Institution; 2001.
26. Mazzola M, Urban Gentrification: point/counterpoint planning forum 2003;9: 82–96.
27. Alba RD, Logan JR, Stults BJ. The changing neighborhood contexts of the immigrant metropolis. Social Forces. 2000;79(2): 587–621.
28. Taylor DG, Puente S Immigration, gentrification and chicago race/ethnic relations in the new global Era, in The Conference on Chicago Research and Public Policy: The Changing Face of Metropolitan Chicago. Chicago, IL; 200.
29. Paral R, Norkewicz M. The metro Chicago immigration fact book. Affairs Chicago, IL: Institute for Metropolitan Roosebelt University; 2003.
30. Stephen EH, et al. Health of the foreign-born population: United States, 1989-90. Adv Data. 1994;241:1–12.
31. Frisbie WP, Cho Y, Hummer RA. Immigration and the health of Asian and Pacific Islander adults in the United States. Am J Epidemiol. 2001;153(4):372–80.
32. Singh GK, Hiatt RA. Trends and disparities in socioeconomic and behavioural characteristics, life expectancy, and cause-specific mortality of native-born and foreign-born populations in the United States, 1979–2003. Int J Epidemiol. 2006;35(4):903–19.
33. Patel KV, et al. Evaluation of mortality data for older Mexican Americans: implications for the Hispanic paradox. Am J Epidemiol. 2004;159(7):707–15.
34. Zhou M, Bankston CL. Social capital and the adaptation of the 2nd generation—the case of vietnamese youth in New-Orleans. International Migration Review. 1994;28(4):821–45.
35. Klinenberg E. Heat wave: a social autopsy of disaster in Chicago. Chicago: The University of Chicago Press; 2002.
36. Barry J, Breen N. The importance of place of residence in predicting late-stage diagnosis of breast or cervical cancer. Health & Place. 2005;11(1):15–29.
37. Bradley CJ, Given CW, Roberts C. Race, socioeconomic status, and breast cancer treatment and survival. J Natl Cancer Inst. 2002;94(7):490–6.
38. Schwartz KL, et al. Race, socioeconomic status and stage at diagnosis for five common malignancies. Cancer Causes Control. 2003;14(8):761–6.
39. Publisher, Illinois State Cancer Registry. Public dataset, 1994-2003. Springfield, IL: Illinois Department of Public Health; 2008.
40. Publisher. Illinois Cancer Statistics Review, 1986-2003 (PDF). Springfield, IL: Illinois Department of Public Health; 2006.
41. Young JLJ, et al. SEER summary staging manual—2000: codes and coding instructions. Bethesda, MD: National Cancer Institute; 2001.
42. Publisher. Census CD: neighborhood change data base 1970–2000 tract data. East Brunswick, NJ: GeoLytics, Inc.; 2006.
43. Sampson RJ, Morenoff JD, Earls F. Beyond social capital: Spatial dynamics of collective efficacy for children. American Sociological Review. 1999;64(5):633–60.
44. Morenoff JD, Sampson RJ. Violent crime and the spatial dynamics of neighborhood transition: Chicago, 1970–1990. Social Forces. 1997;76(1):31–64.
45. Bursik RJ, Webb J. Community change and patterns of delinquency. Am J Sociol. 1982;88(1):24–42.
46. Hochstetler AL, Shover N. Street crime, labor surplus, and criminal punishment, 1980–1990. Social Problems. 1997;44(3):358–68.
47. Semyonov M, Scott RI. Industrial shifts, female employment, and occupational differentiation - a dynamic-model for american-cities, 1960–1970. Demography. 1983;20(2):163–76.
48. Kim SW, Pridemore WA. Social change, institutional anomie and serious property crime in transitional Russia. British Journal of Criminology. 2005;45(1):81–97.
49. Bohrnstedt G. Observations on the measurement of change. In: Borgatta EF, editor. Sociological methodology. San Francisco: Jossey-Bass; 1969. p. 113–33.
50. Raudenbush S, et al. HLM 6: hierarchical linear, nonlinear modeling. Lincolnwood, IL: Scientific Software International; 2004.
51. Brinton LA, et al. Recent trends in breast cancer among younger women in the United States. J Natl Cancer Inst. 2008;100(22): 1643–8.
52. Campbell R, et al. Economic, racial and ethnic disparities in breast cancer in the U.S.: toward a more comprehensive model. Health & Place. 2009;15(3):870–9.
53. Barrett RE, et al. Neighborhood change and distant metastasis at diagnosis of breast cancer. Ann Epidemiol. 2008;18(1):43–7.
54. Do DP. The dynamics of income and neighborhood context for population health: do long-term measures of socioeconomic status explain more of the black/white health disparity than single-point-in-time measures? Soc Sci Med. 2009;68(8):1368–75.