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Association of Neighborhood Context with Offspring Risk of Preterm Birth and Low Birthweight: A Systematic Review and Meta-Analysis of Population-based Studies

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Abstract

Findings from studies investigating associations of residential environment with poor birth outcomes have been inconsistent. In a systematic review and meta-analysis, we examined associations of neighborhood disadvantage with preterm birth (PTB) and low birthweight (LBW), and explored differences in relationships among racial groups. Two reviewers searched English language articles in electronic databases of published literature. We used random effects logistic regression to calculate odds ratios (and 95% confidence intervals) relating neighborhood disadvantage with PTB and LBW. Neighborhood disadvantage, most disadvantaged versus least disadvantaged neighborhoods, was defined by researchers of included studies, and comprised of poverty, deprivation, racial residential segregation or racial composition, and crime. We identified 1,314 citations in the systematic review. The meta-analyses included 7 PTB and 14 LBW cross-sectional studies conducted in the United States (U.S.). Overall, we found 27% [95%CI: 1.16, 1.39] and 11% [95%CI: 1.07, 1.14] higher risk for PTB and LBW among the most disadvantaged compared with least disadvantaged neighborhoods. No statistically significant association was found in meta-analyses of studies that adjusted for race. In race-stratified meta-analyses models, we found 48% [95%CI: 1.25, 1.75] and 61% [95%CI: 1.30, 2.00] higher odds of PTB and LBW among non-Hispanic white mothers living in most disadvantaged neighborhoods compared with those living in least disadvantaged neighborhoods. Similar, but less strong, associations were observed for PTB (15% [95%CI: 1.09, 1.21]) and LBW (17% [95%CI: 1.10, 1.25]) among non-Hispanic black mothers. Neighborhood disadvantage is associated with PTB and LBW, however, associations may differ by race. Future studies evaluating causal mechanisms underlying the associations, and racial/ethnic differences in associations, are warranted.

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Statement of no Ethics Approval Required

The data used in this systematic review and meta-analysis were extracted from published literature available through electronic academic databases. No human subjects ethics approval was required for this study.

Keywords

USA; Neighborhood; Perinatal epidemiology; Birth weight; Preterm birth; Social epidemiology; Systematic review; Meta-analysis

Introduction

Preterm birth (PTB) and low birthweight (LBW) place an infant at increased risk of morbidity and mortality from neurological, pulmonary and ophthalmic disorders (WHO, 2002). They also increase risk for poor health over the life course, including risk for chronic diseases such as cardiovascular disease (Martin, Hamilton, Ventura, Osterman, & Mathews, 2013) and type II diabetes mellitus (Martin et al., 2013), costing the nation billions of dollars in health care expenditures and lost earnings potential due to premature death or morbidity. Several risk factors including maternal biological characteristics (e.g. age at delivery) and behaviors (e.g. tobacco and alcohol consumption) have been identified for LBW (David & Collins, 1997; Mumbare et al., 2012) and PTB (Stewart & Graham, 2010; Tepper et al., 2012). Further, disparities in risk for PTB or LBW among racial/ethnic and socioeconomic groups have been well documented. Researchers have looked beyond individual characteristics for factors that may explain risk for LBW and PTB as well as observed disparities (Alio et al., 2010; Wells, 2010). Previous findings from studies examining residential environment, the neighborhood in which mothers lived before or during pregnancy, in relation to LBW and PTB have been inconsistent. Most, although not all (Cubbin et al., 2008), researchers have reported that neighborhood disadvantage increases the risk for poor birth outcomes even after adjusting for maternal covariates (Auger, Giraud, & Daniel, 2009; J. W. Collins Jr, David, Rankin, & Desireddi, 2009; Janevic et al., 2010; Luo, Wilkins, & Kramer, 2006; Schempf, Strobino, & O'Campo, 2009).

Living in a more disadvantaged economic and social environment can lead to relative deprivation, increased exposure to crime, decreased access to nutritious foods, increased risk of intimate partner abuse, strain from economic instability, and stunted economic growth and social mobility opportunities, all of which can contribute to maternal stress. Maternal stress can lead to higher levels of corticotropin-releasing hormone and cortisol which could trigger contractions and/or the premature rupture of the membrane resulting in PTB (Hodgson & Lockwood, 2010). Maternal stress also leads to the release of catecholamines, such as dopamine, norepinephrine, and epinephrine, into the blood which can cause placental hypoperfusion, a consequence of which is constraint of nutrients and oxygen to the fetus(Rondo et al., 2003) resulting in intrauterine growth retardation and LBW (Wu, Bazer, Cudd, Meininger, & Spencer, 2004).

Besides the inconsistency of previous studies, to our knowledge, there are only two published meta-analyses on the association of neighborhood deprivation with PTB (Vos, Posthumus, Bonsel, Steegers, & Denktas, 2014) and LBW (Metcalfe, Lail, Ghali, & Sauve, 2011), and neither examined how these associations differ among racial subgroups. In the United States (U.S.), despite decline in racial residential segregation over the last few decades, blacks are still disproportionately represented in areas of higher social and economic disadvantage (J. W. Collins Jr, Herman, & David, 1997; Ellen, 2008; Iceland, Weinberg, & Steinmetz, 2002; P. O'Campo, Xue, Wang, & Coughy, 1997; Pickett, Ahern, Selvin, & Abrams, 2002). With different social histories, we assumed it possible that the association between neighborhood disadvantage and birth outcomes could differ between these groups. We conducted a systematic review and meta-analysis of the association of neighborhood disadvantage with PTB and LBW to synthesize the results of individual studies in the published literature, analyze differences in the results of these studies, and examine potential differences among racial groups (Walker, Hernandez, & Kattan, 2008).

Methods

Overview

This systematic review and meta-analysis was based on observational studies conducted in the U.S. using objective measures of primary or secondary data, among native- and foreign-born women, who delivered a live-born infant in the U.S. Data from studies that were conducted among non-Hispanic (NH) white and NH black mothers were used in the current study.

Search strategy and study selection

This study was performed using guidelines established by the Meta-Analysis of Observational Studies in Epidemiology (MOOSE) (Stroup et al., 2000) and Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statements (Moher, Liberati, Tetzlaff, Altman, & Group, 2009). Authors CN and AH searched the electronic databases using established search terms and reviewed titles and abstracts of citations against inclusion/exclusion criteria. Any discrepancies in inclusion were resolved via discussion. Full-text articles corresponding to these citations were identified and read by the primary reviewer (CN), and manual searches of these articles' bibliographies were performed. Articles were managed using EndNote X7.1 software.

The following search terms were entered in PubMed, MEDLINE, EMBASE, CINAHL, PsycINFO, and ProQuest Dissertation and Theses Full Text electronic databases: (premature birth/preterm birth or low birthweight) and (neighborhood or residence area/characteristics). A detailed search strategy for each database was designed in consultation with a Public Health Informationist (Supplementary File 1). The following studies were excluded: 1) studies that only described prevalence/incidence of LBW or PTB, without analysis of associations of neighborhood measures with these outcomes, 2) studies that described measurement of neighborhood context without analyses of its relationship with risk for PTB or LBW, 3) studies comparing various geographic scales of measurement, without the analysis of the neighborhood measure on the outcomes, 4) studies that used city, Metropolitan Statistical Area, county, or larger, as the geographic unit, and 5) studies where the only neighborhood variable used was a measure of pollution (e.g. noise pollution from freeways).

The initial search date of the databases was March 20, 2014. We re-ran the PubMed search on August 26, 2014. The search strategy produced a total of 1,314 citations on March 20,

2014. All studies published in the English Language were considered with no limitation by publication date. From these citations, 270 duplicates were removed, leaving 1,044 for title and abstract review. After application of exclusion criteria, full-text article review, a re-run of the PubMed search, and manual bibliography review, a total of 90 publications (Anthopolos, James, Gelfand, & Miranda, 2011; Anthopolos, Kaufman, Messer, & Miranda, 2014; Baker & Hellerstedt, 2006; Bloch, 2011; Brewin, 2007; Chu, 2010; J. Collins Jr, K. Rankin, & R. David, 2011; J. Collins Jr, Rankin, & Hedstrom, 2012; J. Collins Jr, Rankin, & Janowiak, 2013; J. W. Collins Jr & David, 1990, 1997; J. W. Collins Jr, David, et al., 2009; J. W. Collins Jr, David, Simon, & Prachand, 2007; J. W. Collins Jr et al., 1997; J. W. Collins Jr, K. M. Rankin, & R. J. David, 2011; J. W. Collins Jr, Schulte, & Drolet, 1998; J. W. Collins Jr & Shay, 1994; J. W. Collins Jr, Wambach, David, & Rankin, 2009; Cubbin et al., 2008; Debbink & Bader, 2011; Devine, 2009; Doebler, 2011; Dooley, 2010; English et al., 2003; Fang, Madhavan, & Alderman, 1999; Finch, Lim, Perez, & Do, 2007; Gould & LeRoy, 1988; Grady, 2006, 2010; Grady & McLafferty, 2007; Grady & Ramírez, 2008; Gray, Edwards, Schultz, & Miranda, 2014; Henry Akintobi, 2006; Hillemeier, Weisman, Chase, & Dyer, 2007; Holzman et al., 2009; Howell, Pettit, & Kingsley, 2005; Huynh & Maroko, 2014; Jaffee & Perloff, 2003; Janevic et al., 2010; M. A. Johnson & Marchi, 2009; T. Johnson, Drisko, Gallagher, & Barela, 1999; Kent, McClure, Zaitchik, & Gohlke, 2013; M. Kramer, Dunlop, & Hogue, 2014; Kruger, Munsell, & French-Turner, 2011; Love, David, Rankin, & Collins Jr, 2010; Ma, 2013; Madkour, Harville, & Xie, 2014; Mair & Gruenewald, 2011; Masi, Hawkley, Piotrowski, & Pickett, 2007; Mason et al., 2011a, 2011b; Mason, Kaufman, Emch, Hogan, & Savitz, 2010; Mason, Messer, Laraia, & Mendola, 2009; Mendez, Hogan, & Culhane, 2011; Messer, Kaufman, Dole, Herring, & Laraia, 2006; Messer, Kaufman, Dole, Savitz, & Laraia, 2006; Messer, Kaufman, Mendola, & Laraia, 2008; Messer, Oakes, & Mason, 2010; Messer, Vinikoor, et al., 2008; Messina & Kramer, 2013; Miranda, Messer, & Kroeger, 2012; Morenoff, 2003; Nkansah-Amankra, 2010; Nkansah-Amankra, Dhawain, Hussey, & Luchok, 2010; Nkansah-Amankra, Luchok, Hussey, Watkins, & Liu, 2010; P. O'Campo et al., 2008; Patricia O'Campo, Caughy, Aronson, & Xue, 1997; P. O'Campo et al., 1997; Pardo-Crespo et al., 2013; Phillips, Wise, Rich-Edwards, Stampfer, & Rosenberg, 2009, 2013; Pickett, Collins, Masi, & Wilkinson, 2005; Ponce, Hoggatt, Wilhelm, & Ritz, 2005; Rauh, Andrews, & Garfinkel, 2001; Reagan & Salsberry, 2005; Reed, 2012; Rich-Edwards, Buka, Brennan, & Earls, 2003; Richard, 2006; Roberts, 1997; Schempf, Kaufman, Messer, & Mendola, 2011; Sims & Rainge, 2002; Sims, Sims, & Bruce, 2007; Sims, Sims, & Bruce, 2008; South et al., 2012; Strutz, Dozier, van Wijngaarden, & Glantz, 2012; Subramanian, Chen, Rehkopf, Waterman, & Krieger, 2006; Vinikoor-Imler, Messer, Evenson, & Laraia, 2011; Vinikoor, Kaufman, MacLehose, & Laraia, 2008; D. Wallace, 2011; M. Wallace et al., 2013), corresponding to 60 studies, were included in the systematic review and eligible for inclusion in the meta-analysis. These studies were population-based, cohort, longitudinal, and cross-sectional studies. We did not identify any published case-control study. When multiple articles were published from the same dataset, the article with the most data pertinent to the analysis of interest was selected. See Figure 1 for the flow diagram.

Data collection

The primary reviewer (CN) used data extraction sheets to collect study characteristics and odds ratios (ORs) and 95% confidence intervals (CIs) from each article. ORs of neighborhood-PTB/LBW associations were extracted from studies reporting the fully adjusted models as well as race-stratified models, if available. This information was managed in Microsoft Excel 2013 and provided data to perform the meta-analyses. Attempts were made to contact authors of selected articles for information pertinent to the meta-analyses but not included in the published articles.

Exposure and Outcome Definitions

The operationalization of the independent variable, neighborhood disadvantage, differed among the studies reviewed and was defined by the researchers of the included studies. The neighborhood predictors used in the studies varied: poverty, deprivation, racial residential segregation or racial composition, and crime. Poverty was operationalized as either median household income or the percentage of the neighborhood population living below the poverty level. Deprivation was customarily measured via the compilation of multiple neighborhood characteristics such as employment, income/poverty, education, housing, occupations, and crime. Some studies have also used racial composition, as a measure of segregation (Baker & Hellerstedt, 2006; Mason et al., 2009; Messer et al., 2010) or separately from segregation (Reichman, Teitler, & Hamilton, 2009), though the rationale for its use was not typically stated. Mothers were considered ‘exposed’ if they lived in the most, relative to least, disadvantaged neighborhoods before or during pregnancy. PTB and LBW were the outcome variables. PTB is the birth of an infant prior to 37 completed weeks of gestation, while an infant is considered to have LBW if it weighs less than 2,500 grams at birth (Iams & Romero, 2007).

Statistical analysis

The objective of this meta-analysis was to calculate the odds of PTB and LBW related to living in disadvantaged neighborhoods, and explore any differences among racial groups. Overall, 27, 11, and 22 of the 60 identified studies had LBW, PTB, and both PTB and LBW as their primary outcome(s), respectively. Therefore, we assessed 33 studies for PTB and 49 studies for LBW. Seven of the 33 PTB studies reported an adjusted OR of the association with neighborhood disadvantage that compared those living in the most, relative to least, disadvantaged areas and contributed to the summary OR describing association of PTB with neighborhood disadvantage. Three of the seven studies controlled for race; the four remaining studies had sufficient data to perform analyses for NH white mothers, and three of these studies sufficient data for NH black mothers. One study included eight cities/counties, with research at each site conducted by independent researchers and these data were analyzed as independent studies, resulting in 11 ORs for NH white mothers and 10 ORs for NH black mothers. Fourteen of the 49 LBW studies contributed to the summary OR describing association of LBW with neighborhood disadvantage. Eight of the 14 studies controlled for race; of the remaining studies, five had sufficient data to perform analyses among NH white and five among NH black women. One study included data from five counties, which were included separately, resulting in nine ORs each for analyses among NH whites and NH blacks.

Summary ORs were calculated using DerSimonian and Laird (DerSimonian & Laird, 1986) (random effects) models which incorporate inter-study variation in estimating the summary measure. Heterogeneity was assessed using I^2 and Cochran's Q test statistic. I^2: 0% for no observed variability and 100% for high variability. I^2 is used to assess the inconsistency of effect sizes among the studies reviewed, i.e. the proportion of the total variance that is true, while Cochran's Q P-values were used to measure statistical significance of heterogeneity (Borenstein, Hedges, Higgins, & Rothstein, 2009; Higgins, Thompson, Deeks, & Altman, 2003). The summary OR, along with 95% CI, was the principal summary measure. Publication bias was examined using the Egger's regression asymmetry test (Egger, Davey Smith, Schneider, & Minder, 1997) and Begg's adjusted rank correlation test (Begg & Mazumdar, 1994). Statistical analyses were performed using Stata, version 13.1, software (Stata Corporation, College Station, Texas).

Results

Information on the characteristics of each study described in the articles (e.g. location, sample size, population, inclusion/exclusion criteria) was abstracted (Supplementary File 2). For the majority (53%) of articles, the census tract was the geographical unit of analysis at the neighborhood level. Overall, those living in the most disadvantaged neighborhoods had a 27% higher risk for PTB compared with those living in the least disadvantaged neighborhoods (OR: 1.27 [95% CI: 1.16, 1.39]); there was high variability among these studies (I^2 = 83.8%, P<0.001) and the heterogeneity was statistically significant. This association was not evident among studies adjusting for race (OR: 1.01 [95% CI: 0.94, 1.09]), where there was no observed heterogeneity among the studies' effect sizes (I^2 = 0.0%, P=0.749). Among NH whites, women living in the most disadvantaged neighborhoods had 48% higher risk of PTB compared with women living in the least disadvantaged neighborhoods (OR: 1.48 [95% CI: 1.25, 1.75]); variability among the studies was high (I^2 = 87.3%, P<0.001) and heterogeneity statistically significant. Among NH blacks, women living in the most disadvantaged neighborhoods had 15% higher risk of PTB compared with women living in the least disadvantaged neighborhoods (OR: 1.15 [95% CI: 1.09, 1.21]); heterogeneity was not statistically significant and variability among these studies was low (I^2 = 13.3%, P=0.320) (Figure 2).

Overall, those living in the most disadvantaged neighborhoods had an 11% higher risk for LBW compared with those living in the least disadvantaged neighborhoods (OR: 1.11 [95% CI: 1.07, 1.14]); there was high variability and statistically significant heterogeneity among these studies (I^2 = 86.7%, P<0.001). The association between neighborhood disadvantage and LBW was not evident in studies adjusting for race (OR: 1.02 [95% CI: 1.00, 1.04]); however, there was high variability and significant heterogeneity among these studies (I^2 = 81.4%, P<0.001). Among NH whites, women living in the most disadvantaged neighborhoods had 61% higher risk of LBW compared with women living in the least disadvantaged neighborhoods (OR: 1.61 [95% CI: 1.30, 2.00]). Among NH blacks, women living in the most disadvantaged neighborhoods had 17% higher risk of LBW compared with women living in the least disadvantaged neighborhoods (OR: 1.17 [95% CI: 1.10, 1.25]). The variability among the NH white studies was moderate and heterogeneity statistically significant (I^2 = 75.5%, P<0.001), while the heterogeneity was not statistically significant, and variability was low, among the NH black studies (I^2 = 34.4%, P=0.143) (Figure 3).

Findings of Egger's regression asymmetry tests for the meta-analyses performed on the relationship between neighborhood disadvantage and PTB for race-adjusted models (P=0.920), NH white models (P=0.805), and NH black models (P=0.354) were not significant. Similar tests for the meta-analyses performed on the relationship between neighborhood disadvantage and LBW for race-adjusted models (P=0.071), NH white models (P=0.114), and NH black models (P=0.227) were also not significant. Begg's adjusted rank correlation tests were also statistically non-significant (P>0.05).

Discussion

Overall, we found that mothers living in the most disadvantaged, relative to the least disadvantaged, neighborhoods had a 27% higher risk for PTB and 11% higher risk for LBW. Both NH whites and NH blacks were at higher risk for these poor birth outcomes if they lived in the most disadvantaged neighborhoods, albeit the odds ratios were of smaller magnitude among NH blacks. NH white mothers in the most disadvantaged neighborhoods were 48% and 61% more likely to have PTB and LBW infants, respectively, compared with NH white mothers resident in the least disadvantaged neighborhoods. NH black mothers in the most disadvantaged areas were 15% and 17% more likely to have PTB and LBW infants, relative to their counterparts in the least disadvantaged areas.

Notably, we found no association between birth outcomes and neighborhood disadvantage in meta-analyses of studies that adjusted for race. This could be explained by the fact that including race in the model captures aspects of the neighborhood environment that either explain the associations or are closely related to the factors that explain the associations. This is not too surprising as race is a well-documented predictor of where people live in the U.S. (Ellen, Cutler, & Dickens, 2000; Iceland et al., 2002).

A potential explanation for the difference among racial groups in the association between neighborhood disadvantage and PTB/LBW may be that there are unmeasured factors among NH blacks, irrespective of neighborhood context, that increase risk for poor birth outcomes thus minimizing differences observed between groups in the advantaged/disadvantaged neighborhoods. For example, baseline rates of PTB and LBW are 1.5 and 2 times higher, respectively, among NH black mothers, relative to NH whites (Hamilton, Martin, Osterman, & Curtin, 2014). Among NH whites there was moderate to high variability, and statistically significant heterogeneity, among the studies, while for NH blacks heterogeneity was non-significant, and variability low, suggesting relatively consistent estimates of the association of neighborhood disadvantage with PTB and LBW for NH blacks. Studies examining the association between individual-level risk factors and poor birth outcomes have similarly found differences by race in the magnitude of the association (Ahern, Pickett, Selvin, & Abrams, 2003; J. W. Collins Jr & David, 1990; Masi et al., 2007). We could not assess effect modification by race because the studies included in the meta-analyses for NH whites were already heterogeneous.

Findings from previous work and our meta-analysis provide a basis for more work to be done to understand the causal mechanisms at play. To do so, theoretical frameworks describing aspects of neighborhoods potentially related to birth outcomes are needed as they will inform the selection of relevant measures and statistical models. Research into neighborhood effects is relatively new. As a result these theoretical bases and mechanisms are still underdeveloped. Theoretically-founded measures at the biological-, behavioral-, familial-, and neighborhood-levels (M. R. Kramer, Cooper, Drews-Botsch, Waller, & Hogue, 2010; Roberts, 1997; Schempf et al., 2011) will allow for more rigorous and comprehensive study of the complexities likely involved in the relationship between neighborhood context and birth outcomes. The use of spatial measures of neighborhood variables may also be of great benefit to this area of research (Mason et al., 2009) as it cannot be assumed that health is affected only within the lines that make up a census block group or census tract. We have been limited in our ability to study the role of neighborhood context on PTB subtypes because only a minority of articles make a distinction in whether the birth was medically indicated/iatrogenic or spontaneous. The literature is suggestive of a stronger relationship between neighborhood context and spontaneous PTB, but not medically indicated PTB (Phillips et al., 2009), but more research is needed.

Limitations

The number of studies included in the meta-analyses was small relative to the number identified in the systematic literature review; as a result there is a potential for selection bias. The majority of studies included in the current systematic review and meta-analysis were cross-sectional in nature, thus limiting the ability to distinguish temporal relationships underlying the association of neighborhood context with PTB and LBW; however, this is a limitation of the studies currently published in this field rather than our study design. As a meta-analysis of observational studies, this study faced the inherent challenge of summarizing the results of studies with differing study designs (Stroup et al., 2000). Differences found between neighborhood disadvantage groupings cannot be attributed solely to that grouping criteria as they may be the result of unmeasured factors associated with definition of the groupings (Borenstein et al., 2009). For studies that included multiple neighborhood predictors, we arbitrarily selected one, usually the more commonly used measure in order to improve comparability with other studies. The definition of neighborhood disadvantage was not predetermined; although this provides a more comprehensive overview of the operationalization of neighborhood disadvantage in this field, it also has the limitation of potentially comparing different constructs. The authors intended to perform meta-regression to examine the extent to which heterogeneity among the studies was a result of the following study-level characteristics: the operationalization of the neighborhood context variable; the scale of the neighborhood variable, i.e. continuous, dichotomous, tertiles, quartiles, or quintiles; the geographic unit used to define the neighborhood; whether or not multilevel modeling was used; and, whether the data was published in a journal article or part of grey literature. However, due to fewer than 10 studies per covariate (Borenstein et al., 2009) these results were not reported. Most studies in this meta-analysis used data from the eastern U.S. The manner in which the history and politics of the country have determined differences in demographics, and social and economic neighborhood environments and other characteristics could limit the generalizability of these findings.

Publication bias is a limitation of systematic reviews and meta-analyses because studies with statistically significant findings and higher effect sizes are more likely to be reported in published literature and thus included in a meta-analysis. To mitigate this concern, we included unpublished theses and dissertations. We also tested the potential for publication bias using Egger's regression asymmetry and Begg's adjusted rank correlation tests. Overall, the tests did not suggest the presence of this bias. Duplication bias is present when studies with statistically significant findings and higher effect sizes are more likely to lead to multiple publications and presentations (Borenstein et al., 2009; Tramer, Reynolds, Moore, & McQuay, 1997) and, therefore, more likely to be selected for inclusion in meta-analysis. It is not always clear when publications come from the same study, however, efforts were made to eliminate duplicates by reviewing author names, geographic location of birth records and years of birth data, as well as contacting researchers when determination of multiple publications could not be made with certainty.

We used Stata software, version 13.1, to employ the DerSimonian and Laird procedure for random effects meta-analysis, which is accurate for a large number of studies (>20). However, the accuracy of the test varies with the heterogeneity (I^2) value (Jackson, Bowden, & Baker, 2010). When there are a small number of studies in a meta-analysis, heterogeneity estimates using the DerSimonian and Laird procedure (random effects) may not be accurate and using fixed effects models is recommended (Borenstein et al., 2009). As a sensitivity analysis, we replicated the PTB model which included three studies that adjusted for race and performed both fixed and random effects models. We obtained the same results, suggesting that there was insufficient information to calculate the I^2 heterogeneity measure. However, using the DerSimonian and Laird procedure the actual coverage probability of a nominal 95% CI with four studies and low heterogeneity is still close to 95% and so the small number of studies may not be of huge concern in this case.

Conclusion

In this systematic review and meta-analysis, we found that overall, neighborhood disadvantage is associated with PTB and LBW in race-stratified, but not race-adjusted, models. Furthermore, we found that associations among NH whites were much stronger than associations among NH blacks.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Research highlights

- Mothers in the most disadvantaged neighborhoods have 27% higher risk for PTB
- Mothers in the most disadvantaged neighborhoods have 11% higher risk for LBW
- The association with neighborhood disadvantage is stronger among whites than blacks

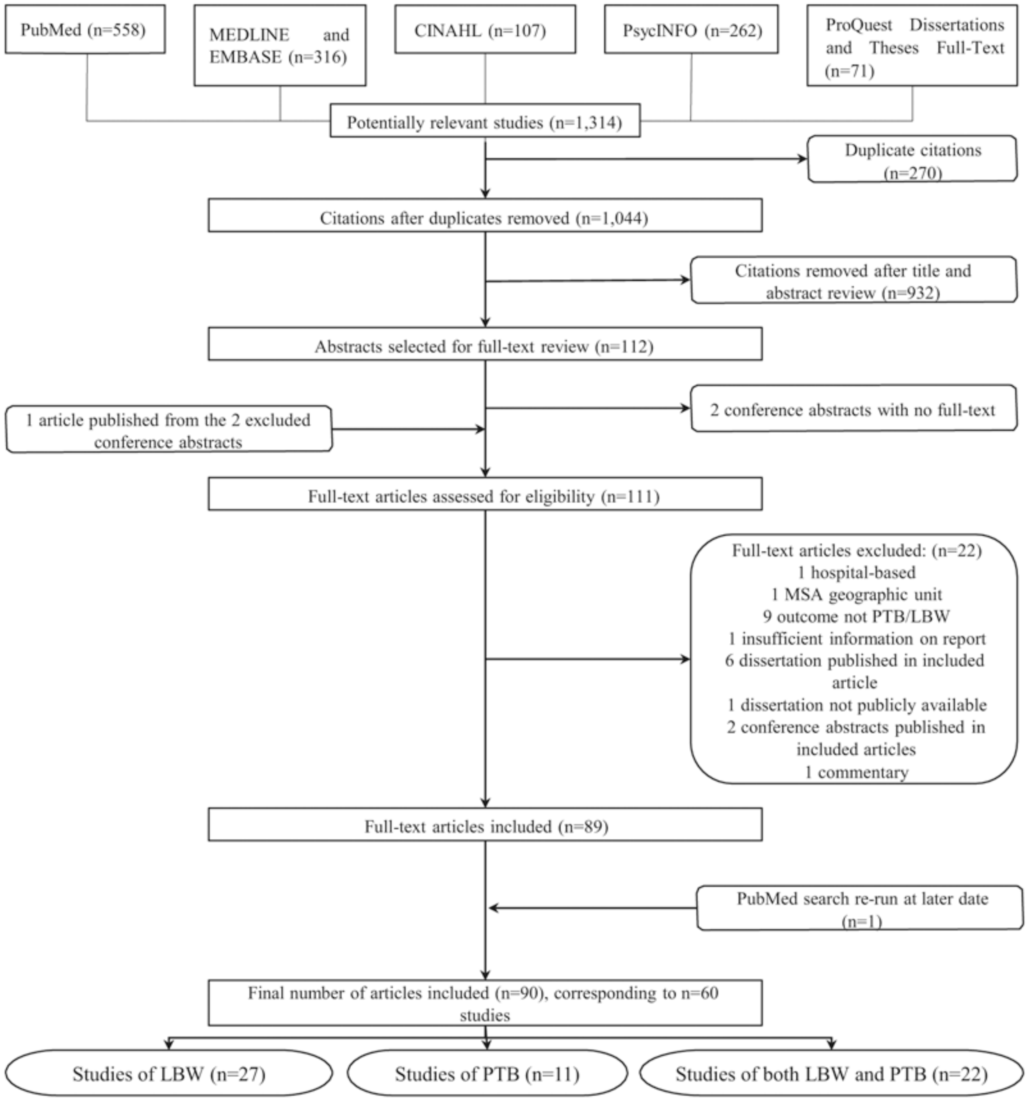

Figure 1.

Flow diagram of systematic literature review study selection

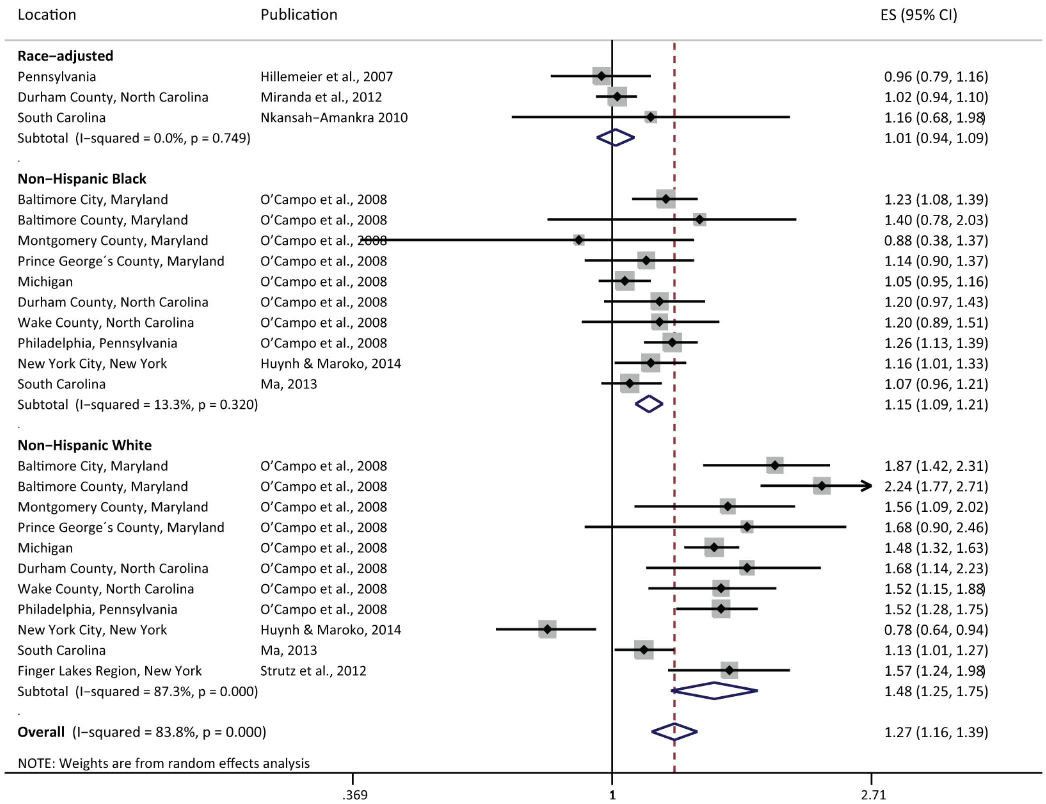

Figure 2.

Odds ratios and confidence intervals of associations between neighborhood disadvantage and preterm birth among race-adjusted and race-stratified models. Summary odds ratios and 95% confidence interval calculated using random effects models

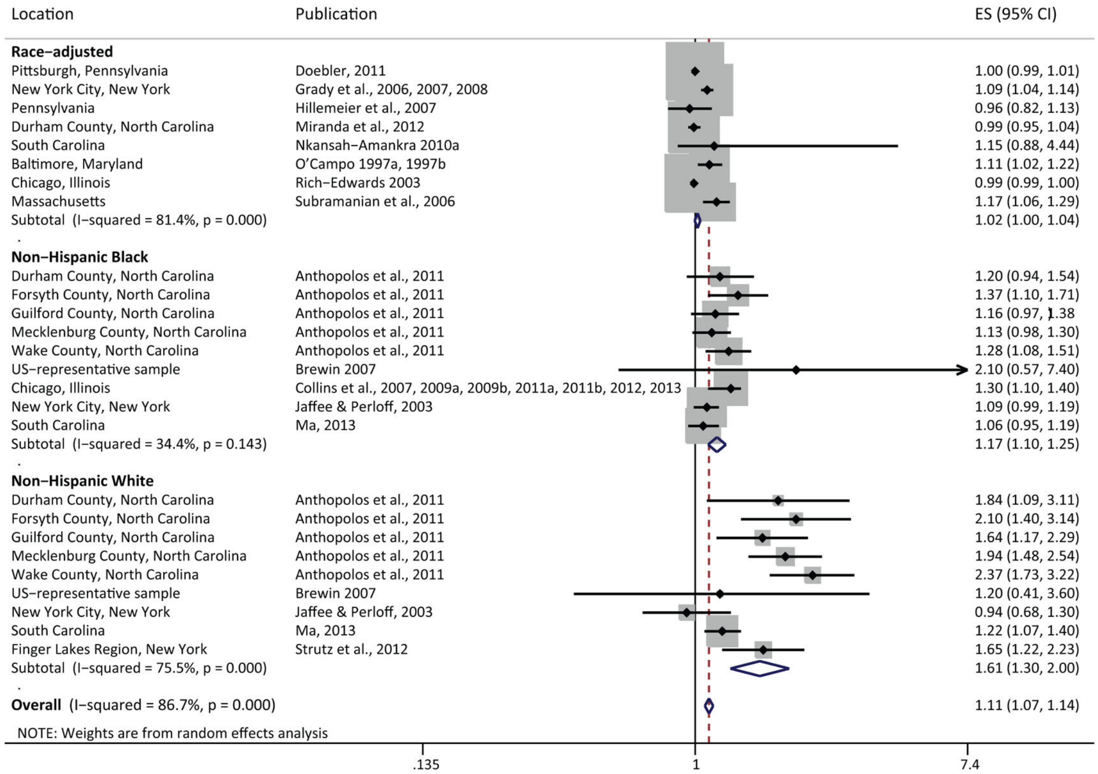

Figure 3.

Odds ratios and confidence intervals of associations between neighborhood disadvantage and low birth weight among race-adjusted and race-stratified models. Summary odds ratios and 95% confidence interval calculated using random effects models