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REVIEW

Social determinants of breast cancer risk, stage, and survival

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Abstract

Purpose Social determinants of health that have been examined in relation to breast cancer incidence, stage at diagnosis, and survival include socioeconomic status (income, education), neighborhood disadvantage, unemployment, racial discrimination, social support, and social network. Other social determinants of health include medical distrust, immigration, status, inadequate housing, food insecurity, and geographic factors such as neighborhood access to health services. Socioeconomic factors influence risk of breast cancer. For all racial/ethnic groups, breast cancer incidence rates tend to be positively associated with socioeconomic status. On the other hand, low socioeconomic status is associated with increased risk of aggressive premenopausal breast cancers as well as late stage of diagnosis and poorer survival. There are well-documented disparities in breast cancer survival by socioeconomic status, race, education, census-tract-level poverty, and access to health insurance and preventive care. Poverty is associated with other factors related to late stage at breast cancer diagnosis and poorer survival such as inadequate health insurance, lack of a primary care physician and poor access to health care.

Results The results of this review indicate that social determinants such as poverty, lack of education, neighborhood disadvantage, residential segregation by race, racial discrimination, lack of social support, and social isolation play an important role in breast cancer stage at diagnosis and survival.

Conclusion To address these social determinants and eliminate cancer disparities, effective interventions are needed that account for the social and environmental contexts in which cancer patients live and are treated.

Keywords African Americans · Education · Food Insecurity · Poverty · Unemployment

Introduction

It is widely appreciated that the social context in which people live and work influences their health [1]. The World Health Organization defined the social determinants of health as the "conditions in which people are born, grow, work, live and age, and the wider set of forces and systems shaping the conditions of daily life" [2].

As defined by the Institute of Medicine [3] the social environment may influence health behavior by, "shaping norms, enforcing patterns of social control, providing or not providing environmental opportunities to engage in particular behaviors, reducing or producing stress, and placing constraints on individual choice." The environmental context of living in area of low or under-employment, high crime, residential crowding, and poorer living conditions contributes to a state of chronic psychosocial stress [4–7]. Accordingly, behavioral and metabolic risk factors are increased disproportionately among those with high psychosocial chronic stress leading to a strain on the coping abilities of individuals [8–10]. The inadequate structural and functional support associated with disadvantaged neighborhoods has also been linked to all-cause mortality [11]. One hypothesized mechanism for the relationship between chronic stress and poor health outcomes lies within the hypothalamus–pituitary–adrenal (HPA) pathway. Increased HPA dysfunction has been identified with lower socioeconomic status, higher cortisol variability, and increased measurements of central adiposity [9, 12]. Chronic stress due to a disadvantaged social environment may independently negatively impact health outcomes.

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Social determinants of health that have been examined in relation to breast cancer incidence, stage at diagnosis, and survival include socioeconomic status (income, education), neighborhood disadvantage, residential segregation, unemployment, racial discrimination, social support, and social network. For example, Mohseny et al. [13] found that level of education and municipal district of residence were associated with breast cancer survival. Other social determinants of health include discrimination, medical distrust, immigration status, inadequate housing, food insecurity, and geographic factors such as neighborhood access to health services [14–18]. Not all of these social determinants have been examined in relation to breast cancer risk, stage at diagnosis, and survival.

Reduced obesity, healthy diet, increased physical activity, and use of health care services can improve health and lessen risk of disease recurrence, and such factors are influenced by social determinants such as income, employment, and education [19, 20]. African Americans are four times more likely than whites to live in lowest socioeconomic status neighborhoods [20]. Poverty rates are two times higher among African Americans (25.4%) compared to non-Hispanic whites (10.4%) [19]. Unemployment rates are more than two times higher among African Americans compared to non-Hispanic whites [19]. There are also substantial disparities in educational attainment. Fewer African Americans graduate from high school (72.5%) than non-Hispanic whites (87.2%).

Socioeconomic factors such as unemployment, lack of education, poverty, and income inequality are among the most important social determinants of health. It is well established that low-income people are at increased risk of an array of adverse health outcomes and more likely to die prematurely. Numerous studies have documented a socioeconomic gradient: at leach step along the socioeconomic ladder, there are improved health outcomes over the rung below [21, 22]. Compared to whites, African Americans and Hispanics receive less income at the same education levels and have markedly less wealth at equivalent income levels.

Food insecurity is an important social determinant of health [23]. The U.S. Department of Agriculture defines food insecurity as "a household-level economic and social condition of limited or uncertain access to adequate food" [24]. Low-income, ethnic minority, and female-headed households are at greatest risk for food insecurity [25]. People who experience food insecurity often consume a nutrient-poor diet, which may contribute to breast cancer risk factors such as obesity and diabetes [23, 25, 26]. In order to buy food or because of budget constraints, low-income families may postpone medical care and underuse medicine [23]. Food insecurity is associated with stress, anxiety, depression, and psychological distress [27].

It is well established that socioeconomic factors influence risk of breast cancer [28]. For all racial/ethnic groups, breast cancer incidence rates tend to be positively associated with socioeconomic status [29, 30], perhaps largely due to reproductive patterns. On the other hand, low socioeconomic status is associated with increased risk of aggressive premenopausal breast cancers as well as late stage of diagnosis and poorer survival [31, 32]. There are well-documented disparities in breast cancer survival by socioeconomic status, race, education, census-tract-level poverty, and access to health insurance and preventive care [33–39]. Socioeconomic position is an aggregate construct that includes both resource-based measures (income, wealth, consumer credit) and prestige-based measures (education, social status) that represent both individual social position and access to material goods [14, 40]. Poverty is associated with other factors related to late stage at breast cancer diagnosis and poorer survival such as inadequate health insurance, lack of a primary care physician, and poor access to health care. Numerous studies have examined breast cancer outcomes according to measures of socioeconomic status such as income and education [41–44].

Methods

The present review is based upon bibliographic searches in PubMed and CINAHL and relevant search terms. Articles published in English from 1971 through April 1, 2019 were identified using the following MeSH search terms and Boolean algebra commands: breast cancer AND (incidence OR stage OR mortality) AND (social determinants OR neighborhood disadvantage OR racial discrimination OR immigration OR social support). The searches were not limited to words appearing in the title of an article nor to studies in a particular country or geographic region of the world. The references of review articles were also reviewed. Information obtained from bibliographic searches (title and topic of article, information in abstract, study design, and key words) was used to determine whether to retain each article identified in this way. Only studies written in English that examined social determinants of breast cancer risk, stage, and survival were eligible for inclusion.

A total of 3003 articles were identified in the bibliographic searches. Of these, 19 were eligible for inclusion (Fig. 1). No additional articles were identified in the CINAHL search. The reasons for exclusion of articles included: (a) study protocol, (10%), (b) examined social determinants of breast cancer screening (10%), (c) examined social determinants of breast cancer treatment (5%), (d) or otherwise did not address social determinants of breast

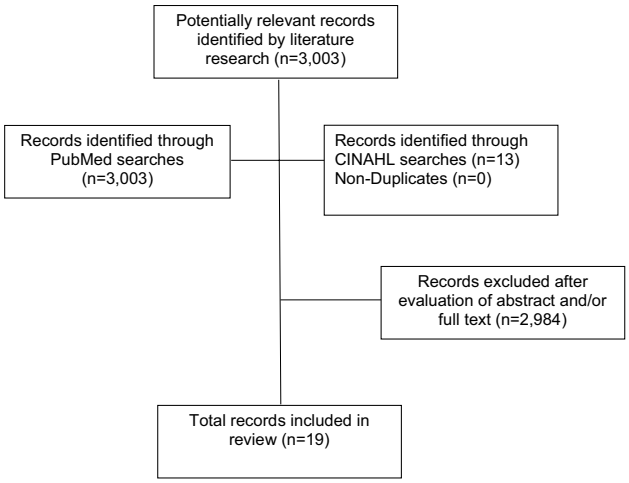

Fig. 1 Flowchart of record selection process

cancer risk, stage, or survival, i.e., outside the scope of the review (75%). A variety of study designs were identified including case–control studies, cohort studies, and population-based studies of cancer registry data.

Neighborhood disadvantage and breast cancer

Residential segregation by race is an important cause of health disparities and a key mechanism by which the social environment is theorized to affect health outcomes such as breast cancer survival [45]. Residential segregation by race has led to African Americans living in unhealthful environments [29]. Neighborhood conditions are associated with a broad range of exposures related to health, including access to medical care, proximity to grocery stores and the availability of nutritious foods, and safe places to exercise. There is a clear association between unequal living standards and increased levels of comorbid disease such as obesity.

In a study of black and white women diagnosed with breast cancer in California between 1996 and 2004, Warner and Gomez [46] examined the relationships between racial residential segregation and breast cancer stage at diagnosis and all-cause and breast cancer-specific mortality (Table 1). For all-cause and breast cancer-specific mortality, living in neighborhoods with more Blacks was associated with lower mortality among Black women, but higher mortality among white women. Neighborhood racial composition and metropolitan segregation did not explain differences in stage at diagnosis or survival between Black and white women.

In an analysis of Surveillance, Epidemiology, and End Results Medicare data, Haas et al. [47] examined whether racial residential segregation was related to cancer stage at diagnosis. Area of residence was categorized into 4 groups: low segregation/high income (potentially the most advantaged), high segregation/high income, low segregation/low income, and high segregation/low income (possibly the most disadvantaged). No Black/white disparities in stage at diagnosis were observed for breast cancer.

Russell et al. [45] examined the relationships between racial residential segregation and breast cancer and all-cause mortality. The study had three units of analysis: women diagnosed with breast cancer, census tracts where they lived at diagnosis, and the metropolitan statistical area (MSA/micropolitan statistical area (MiSA) where they lived at diagnosis. Disparities in breast cancer mortality were largest in racially mixed tracts located in high MSA/MiSA segregation areas (relative risk [RR] 2.06, 95% CI 1.70, 2.50). For black but not white women, as MSA/MISA racial residential segregation increased, there was an increased risk for breast cancer mortality (hazard ratio [HR] 2.20, 95% CI 1.09, 4.45). MSA/MiSA segregation was not a significant predictor of all-cause mortality. In a separate study of residential racial composition and breast cancer mortality among women in Georgia, Russell et al. [48] found that residential racial composition (percent of Black residents in the census tract) had a small but significant association with breast cancer mortality (HRs 1.4–1.8 per 10% increase in the percent of Black tract residents).

Pruitt et al. [49] examined the relation between residential racial segregation and mortality among Black, white, and Hispanic urban breast cancer patients in Texas. Greater Black and Hispanic segregation were adversely associated with breast cancer-specific and total mortality. For example, in adjusted models, Hispanic segregation was associated with breast cancer-specific mortality (HR 1.24, 95% CI 1.05–1.46). In a separate analysis of the same data [50], it was found that living in higher Hispanic density neighborhoods was generally associated with increased mortality, and that associations differed slightly in magnitude and significance by birthplace and neighborhood poverty.

In a study of triple negative breast cancer, Hossain et al. [51] found that neighborhood concentrated disadvantage index, a measure of physical and social environment, was associated with more advanced stages of breast cancer at diagnosis and poorer stage-specific survival. The results suggest that neighborhood disadvantage contributes to racial disparities in stage at diagnosis and survival among patients with triple negative breast cancer. Measures of socioeconomic risk do not appear to be related to the incidence of triple negative breast cancer [29, 52, 53].

Table 1 Studies of neighborhood disadvantage and breast cancer risk, stage, and survival

Author	Design	Outcomes	Sample size	Results
Warner and Gomez [46]	Population-based study of Black and white women diagnosed with breast cancer in California between 1996 and 2004	Breast cancer stage at diagnosis and all-cause and breast cancer-specific mortality	104,154 women	For all-cause and breast cancer-specific mortality, living in neighborhoods with more Blacks was associated with lower mortality among Black women, but higher mortality among white women. Neighborhood racial composition and metropolitan segregation did not explain differences in stage at diagnosis or survival between Black and white women
Haas et al. [47]	Analysis of SEER-Medicare data for older women with breast cancer between 1992 and 2002	Breast cancer stage at diagnosis	86,723 women	Area of residence was categorized into 4 groups: low segregation/high income (potentially the most advantaged), high segregation/high income, low segregation/low income, and high segregation/low income (possibly the most disadvantaged. No Black/white disparities in breast cancer stage at diagnosis were observed
Russell et al. [48]	Population-based study of breast cancer mortality between 1999 and 2003 in 14 metropolitan statistical areas or 23 micropolitan statistical areas in Georgia	Breast cancer mortality	22,088 women	Disparities in breast cancer mortality were largest in racially mixed tracts located in high segregation areas (relative risk [RR] 2.06, 95% CI 1.70, 2.50). For Black but not white women, as racial residential segregation increased, there was an increased risk for breast cancer mortality (hazard ratio [HR] 2.20, 95% CI 1.09, 4.45). Racial residential segregation was not a significant predictor of all-cause mortality
Pruitt et al. [49]	Population-based study of mortality among urban women with breast cancer in Texas between 1995 and 2009	Breast cancer-specific and total mortality	109,749 women	Greater Black and Hispanic segregation were adversely associated with breast cancer-specific and total mortality. In adjusted models, Hispanic segregation was associated with breast cancer-specific mortality (HR 1.24, 95% CI 1.05–1.46)
Hossain et al. [51]	Population-based study of women diagnosed with triple negative breast cancer in Louisiana between 2010 and 2012	Stage at diagnosis and breast cancer-specific mortality	1216 women	Neighborhood concentrated disadvantage index, a measure of physical and social environment, was associated with more advanced stages of breast cancer at diagnosis and poorer stage-specific survival

Racial discrimination and breast cancer

Forms of racial discrimination include institutional (differential access to the goods, services and opportunities of society), personally mediated (prejudice and discrimination), and internalized (acceptance by members of stigmatized races of negative messages about their abilities and intrinsic worth) [54]. These forms of racism and discrimination affect numerous systems in the United States, including housing, education, and employment [55]. The experience of racism may contribute to breast cancer disparities through numerous pathways, including lack of access to health care, increased risk of obesity and other breast cancer risk factors, and biological changes resulting from prolonged exposure to chronic stress (e.g., inflammation and oxidative stress) [55]. Exposure to racism has been associated with cancer-related health behaviors such as smoking, binge drinking, and being overweight or obese [56]. In addition to increasing stress and maladaptive coping mechanisms (e.g., alcohol use or poor diet), racism may deter utilization of health care because of patient mistrust and negative encounters patients had during previous encounters [56].

Beyer et al. [55] derived spatially continuous indices of racial bias in mortgage lending and redlining using the Home Mortgage Disclosure ACT database and then examined the association between these new measures and breast cancer survival among African American women in the Milwaukee, Wisconsin metropolitan area (Table 2). For all-cause mortality, racial bias in mortgage lending was associated with a greater hazard rate when measured as an area average value (HR 1.16, 95% CI 1.04, 1.29) or a binary categorization (HR 1.49, 95% CI 1.13, 1.96). For breast cancer-specific mortality, the redlining index was associated with a lower hazard rate (HR 0.76, 95% CI 0.59, 0.98). The racial bias index and race and ethnicity adjusted redlining index were not significantly associated with breast cancer-specific mortality.

Taylor et al. [57] examined the association between perceived discrimination and breast cancer incidence in the Black Women's Health Study. In the total sample, there were weak positive associations between breast cancer incidence and everyday and major discrimination. Among women aged less than 50 years, those who

Table 2 Studies of racial discrimination and breast cancer risk, stage, and survival

Author	Design	Outcomes	Sample size	Results
Beyer et al. [55]	Population-based study of mortality from breast cancer in Milwaukee, Wisconsin metropolitan area	Breast cancer-specific and total mortality	1010 women	For all-cause mortality, racial bias in mortgage lending was associated with a greater hazard rate when measured as an area average value (HR 1.16, 95% CI 1.04, 1.29) or a binary categorization (HR 1.49, 95% CI 1.13, 1.96). For breast cancer-specific mortality, the redlining index was associated with a lower hazard rate (HR 0.76, 95% CI 0.59, 0.98). The racial bias index and race and ethnicity adjusted redlining index were not significantly associated with breast cancer-specific mortality
Taylor et al. [57]	Analysis of data from the Black Women's Health Study	Breast cancer incidence	64,524 Black women	There were weak positive associations between breast cancer incidence and everyday and major discrimination. Among women aged less than 50 years, those who reported frequent everyday discrimination were at higher risk than were women who reported infrequent experiences of discrimination. The incidence rate ratio was 1.32 (95% confidence interval [CI] 1.03, 1.70) for those who reported discrimination on the job and 1.48 (95% CI 1.01, 2.16) for those who reported discrimination in housing, job, and police relative to those who reported none

reported frequent everyday discrimination were at higher risk than were women who reported infrequent experiences of discrimination. The incidence rate ratio was 1.32 (95% confidence interval [CI] 1.03, 1.70) for those who reported discrimination on the job and 1.48 (95% CI 1.01, 2.16) for those who reported discrimination in housing, job, and police relative to those who reported none.

Immigration status and breast cancer

Several studies in the United States and Canada have found that breast cancer incidence rates are lower in immigrants as compared to women who were born in the United States, and that breast cancer risk among immigrant women rises over several generations [58–60], as summarized in Table 3. These differences by nativity may reflect lower breast cancer rates in the country of origin, life style factors such as diet and nutrition, reproductive factors, or lower screening mammography rates among immigrants. Country of origin has also been associated with breast cancer stage at diagnosis and survival [61].

In a population-based case–control study of breast cancer among Chinese, Japanese, and Filipino women, Ziegler et al. [58] found that Asian American women with three or four grandparents born in the West had a risk 50% higher than those with all grandparents born in the East. Migrants who had lived in the West for a decade or longer had a risk 80% higher than more recent migrants. In a recent case–control study of Asian American women living in the San Francisco Bay Area, Morey et al. [62] found that immigrant Asian American women had higher risk of breast cancer than U.S.-born Asian American women, which may reflect rising breast cancer rates in the countries of origin or the influx of highly skilled Asian immigrants with a higher socioeconomic status than previous immigrants.

In an analysis of data from the California Cancer Registry, Keegan et al. [59] found that breast cancer incidence rates were 38% higher among U.S.-born Hispanics than among foreign-born Hispanics, with elevations more pronounced for localized than regional/distant disease, and for women > 50 years of age.

Camacho-Rivera et al. [63] examined breast cancer cases in Black women from Long Island and Brooklyn, according to estrogen and progesterone receptor status. Among women with estrogen receptor (ER) and progesterone receptor (PR) negative breast cancer, foreign-born women had worse survival that U.S.-born women. The foreign-born women were predominately from the Caribbean.

In a retrospective cohort study in Ontario, Canada, Shuldiner et al. [60] found that immigrants born in South Asia had the lowest breast cancer incidence rates (age-standardized incidence ratio [SIR] 1.00) compared to long-term Canadian residents (SIR 1.61). Increased length of stay was associated with higher risk of breast cancer. In a population-based study in Ontario, Canada, Iqbal et al. [64] found that immigrant women were less likely than Canadian-born women to be diagnosed with stage I breast cancer (adjusted odds ratio [OR] 0.85, 95% CI 0.79, 0.91, $p < 0.0001$). In a study of cancer among immigrants to Canada, McDonald et al. [65] confirmed the healthy immigrant effect. Recent immigrants to Canada were significantly less likely than their non-immigrant Canadian peers to be diagnosed with breast cancer, and the gap appeared to decline with additional years in Canada.

Social support and breast cancer

Among breast cancer patients, social isolation and socioeconomic disadvantage have been associated with poorer quality of life [66]. Social support and social networks (social connectedness) are key elements of the social determinants of health. Social support can be defined as information, advice, or tangible aid provided through contact with one's social network that has beneficial effects on the recipient [67]. Presence of social network and high levels of social support have been shown to be a protective factor for maintaining good health and quality of life. For example, several studies have shown that breast cancer patients who are married have improved survival [68–72]. Social support has been positively associated with physical and mental health, good self-rated health, reduced depression, and good quality of life, which are important indicators of overall well-being [73, 74]. In addition, social support and network play vital roles in patients' navigating healthcare system and healthcare experiences [75]. Findings show that patients who had adequate social support from their networks had more healthcare access, treatment options, more engaged to their care, more adhered to treatment regimens, fostered more productive relationships with their healthcare providers [75].

In a Nurses' Health Study of women with breast cancer, Kroenke et al. [76] found that socially isolated women were twice as likely to die from breast cancer than socially integrated women (Table 4). Greater numbers of living children, friends, and close relatives were related to lower mortality. In a study of women from the Women's Health Initiative who were diagnosed with breast cancer, Kroenke et al. [77] examined the relation between social networks (spouse or intimate partner, religious ties, club ties, and number of first-degree relatives and post-diagnosis mortality. Social support was marginally, inversely associated with all-cause mortality (adjusted HR 0.98, 95% CI 0.97, 1.00, $p = 0.01$). Being married was inversely related to all-cause mortality (HR 0.82, 95% CI 0.66, 1.01, $p = 0.06$).

Table 3 Studies of immigration status and breast cancer risk, stage, and survival

Author	Design	Outcomes	Sample size	Results
Ziegler et al. [58]	Population-based case–control study of breast cancer among Chinese, Japanese, and Filipino women	Breast cancer risk	597 breast cancer cases and 966 controls	Asian American women with three or four grandparents born in the West had a risk 50% higher than those with all grandparents born in the East. Migrants who had lived in the West for a decade or longer had a risk 80% higher than more recent migrants
Morey et al. [62]	Case–control study of Asian American women in the San Francisco Bay Area	Breast cancer risk	132 women with breast cancer and 438 controls	Immigrant Asian American women had higher risk of breast cancer than U.S.-born Asian American women
Keegan et al. [59]	Population-based study of breast cancer among Hispanic women in California, from 1988 to 2004	Breast cancer incidence	35,134 women diagnosed with invasive breast cancer	Breast cancer incidence rates were 38% higher among U.S.-born Hispanics than among foreign-born Hispanics, with elevations more pronounced for localized than regional/distant disease, and for women > 50 years of age
Camacho-Rivera et al. [63]	Population-based study of breast cancer among Black women in Long Island and Brooklyn, New York, from 2000 to 2010	Breast cancer survival	1097 women	Among women with estrogen receptor (ER) and progesterone receptor (PR) negative breast cancer, foreign-born women had worse survival that U.S.-born women. The foreign-born women were predominately from the Caribbean
Schuldiner et al. [60]	Retrospective cohort study in Ontario, Canada	Breast cancer incidence		Immigrants born in South Asia had the lowest breast cancer incidence rates (age-standardized incidence ratio [SIR] 1.00) compared to long-term Canadian residents (SIR 1.61). Increased length of stay was associated with higher risk of breast cancer
Iqbal et al. [64]	Population-based study of women in Ontario, Canada	Odds of breast cancer	41,213 women with breast cancer	Immigrant women were less likely than Canadian-born women to be diagnosed with stage I breast cancer (adjusted odds ratio [OR] 0.85, 95% CI 0.79, 0.91, $p < 0.0001$)

Table 4 Studies of social support and breast cancer risk, stage, and survival

Author	Design	Outcomes	Sample size	Results
Kroenke et al. [76]	Analysis of data from the Nurses' Health Study	Breast cancer mortality	2835 women with breast cancer	Socially isolated women were twice as likely to die from breast cancer than socially integrated women. Greater numbers of living children, friends, and close relatives were related to lower mortality
Kroenke et al. [77]	Analysis of data from the Women's Health Initiative	Breast cancer mortality	4530 women with breast cancer	Social support was marginally, inversely associated with all-cause mortality (adjusted HR 0.98, 95% CI 0.97, 1.00, $p=0.01$). Being married was inversely related to all-cause mortality (HR 0.82, 95% CI 0.66, 1.01, $p=0.06$)
Kroenke et al. [78]	Analysis of data from the Life After Breast Cancer Epidemiology Study	Breast cancer-specific mortality	2264 women with breast cancer	Social isolation was unrelated to recurrence or breast cancer-specific mortally. However, socially isolated women (small networks) had higher all-cause mortality (HR 1.34, 95% CI 1.03–1.73) and mortality from other causes (HR 1.79, 95% CI 1.19–2.68). Women with both small social networks and low levels of social support had a significantly higher risk of mortality than women with large networks and high levels of support (HR 1.61, 95% CI 1.10–2.38)
Kroeke et al. [79]	Analysis of data from the After Breast Cancer Pooling Project	Breast cancer-specific and total mortality	9267 women with breast cancer	Associations between social networks and breast cancer outcomes were similar in three of the four cohorts. Socially isolated women had higher risks of recurrence (HR 1.43, 95% CI 1.15, 1.77), breast cancer-specific mortality (HR 1.64, 95% CI 1.33, 2.03), and total mortality HR 1.69, 95% CI 1.43, 1.99), compared to socially integrated women. In the fourth cohort, there were no significant associations with breast cancer-specific outcomes
Reynolds et al. [80]	Population-based study of Black and white women	Stage at diagnosis and breast cancer-specific death rate	525 Black and 486 white women with breast cancer	A summary measure of social networks was modestly associated with late stage disease, due in part to significantly more advanced disease among Black, but not white, women reported few friends and relatives (RR 1.8, 95% CI 1.1, 3.0). The absence of close ties and perceived sources of emotional support were significantly associated with an increased breast cancer-specific death rate. Both Black and white women reporting few sources of emotional support had a higher breast cancer-specific death rate (RR 1.9, 95% CI 1.3, 2.7)
Chou et al. [67]	Population-based study of women with breast cancer from the San Francisco Bay Area beween 1994 and 1997	Breast cancer mortality	584 women with breast cancer	Social network size was not related to survival. However, increased contact with friends/family following diagnosis was associated with a lower risk of death (HR 0.31, 95% CI 0.17, 0.57)

In a study of women from the Life After Breast Cancer Epidemiology Study who were diagnosed with breast cancer, Kroeke et al. [78] examined associations between social networks, social support, and mortality. Social isolation was unrelated to recurrence or breast cancer-specific mortally. However, socially isolated women (small networks) had higher all-cause mortality (HR 1.34, 95% CI 1.03–1.73) and mortality from other causes (HR 1.79, 95% CI 1.19–2.68). Women with both small social networks and low levels of social support had a significantly higher risk of mortality than women with large networks and high levels of support (HR 1.61, 95% CI 1.10–2.38). In a study of women from the After Breast Cancer Pooling project who were diagnosed with breast cancer, Kroeke et al. [79] found that associations between social networks and breast cancer outcomes were similar in three of the four cohorts. Socially isolated women had higher risks of recurrence (HR 1.43, 95% CI 1.15, 1.77), breast cancer-specific mortality (HR 1.64, 95% CI 1.33, 2.03), and total mortality HR 1.69, 95% CI 1.43, 1.99), compared to socially integrated women. In the fourth cohort, there were no significant associations with breast cancer-specific outcomes.

In a population-based study of Black and white women, Reynolds et al. [80] found that a summary measure of social networks was modestly associated with late stage disease, due in part to significantly more advanced disease among Black, but not white, women reported few friends and relatives (RR 1.8, 95% CI 1.1, 3.0). The absence of close ties and perceived sources of emotional support were significantly associated with an increased breast cancer-specific death rate. Both Black and white women reporting few sources of emotional support had a higher breast cancer-specific death rate (RR 1.9, 95% CI 1.3, 2.7). In a population-based study of women diagnosed with breast cancer, Chou et al. [67] found that social network size was not related to survival. However, increased contact with friends/family following diagnosis was associated with a lower risk of death (HR 0.31, 95% CI 0.17, 0.57).

Discussion

The results of this review indicate that social determinants such as poverty, lack of education, neighborhood disadvantage, residential segregation by race, racial discrimination, lack of social support, and social isolation play an important role in stage at diagnosis, and survival. Low socioeconomic status is associated with many of the characteristics of breast cancers that occur with increased frequency among African American women, including high grade, late stage at diagnosis, and estrogen receptor-negative status [51]. Social determinants of health play a large role in explaining racial disparities in breast cancer outcomes, especially among women with aggressive subtypes [81]. There is convincing evidence that racial disparities in income affect the stage at diagnosis and survival of African American women with triple negative breast cancer [82].

Williams et al. [29] noted that inadequate attention has been paid to the ways that socioeconomic status may contribute to breast cancer risk over the life course. For example, low socioeconomic status is associated with early menarche, which is associated with increased breast cancer risk. As a further example, severe childhood adversity such as emotional and physical abuse has been associated with being overweight or obese in adulthood [29, 83]. Clarifying the role of social determinants of health in breast cancer disparities requires greater attention to how risk factors for breast cancer unfold over the life course [29]. For example, low socioeconomic status and psychosocial stress in early childhood and continuing through adulthood may contribute to increased breast cancer risk among African American women [29].

Although breast cancer incidence rates have been found to be lower among immigrants, the healthy immigrant effect diminishes over several generations. Studies provide convincing that country of origin is associated with breast cancer stage at diagnosis and survival [60]. The later stage at diagnosis among immigrants is likely due to lower breast cancer screening rates.

Studies of the association between food insecurity and breast cancer outcomes have not been conducted and are needed given the high cost for breast cancer treatments that may lead patients to make trade-offs with basic needs. People who experience food insecurity often consume a nutrient-poor diet, which may contribute to breast cancer risk factors such as obesity and diabetes [23, 25, 26]. Food insecurity may contribute to breast cancer incidence and mortality, and this may be especially true among older women and vulnerable populations.

These results demand attention to social determinants as part of care for those with a history of breast cancer. To address these social determinants and eliminate cancer disparities, effective interventions are needed that account for the social and environmental contexts in which cancer patients live and are treated [14]. Outcomes such as incidence, stage at diagnosis, and survival correspond to different stages in cancer carcinogenesis (i.e., initiation, promotion, and progression) [51]. Social determinants may contribute to cancer disparities at each of these stages.

Compliance with ethical standards

Conflict of interest The author declares he has no conflicts of interest.

Ethical approval This article does not contain any studies with human participants performed by the author.

Informed consent Not applicable.

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