



Racial/ethnic, area socioeconomic, and geographic disparities of cervical cancer survival in Texas



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ABSTRACT

A better understanding about the factors associated with cervical cancer survival disparities is an important step in developing more effective cervical cancer intervention strategies. This study investigates cervical cancer survival disparities from three different perspectives based on data from the Texas Cancer Registry from 1995 to 2005. These perspectives are race/ethnicity, area socioeconomic status (SES), and geographic locations. We examined the role of both individual- and contextual-level factors in cervical cancer survival disparities using a multilevel survival analysis. Individual-level factors included race/ethnicity, age at diagnosis, year of diagnosis, tumor grade, stage at diagnosis, and type of treatment received. Contextual-level factors are census-tract-level variables, including demographic characteristics, health insurance expenditure, behavioral factors, extent of urbanization, and spatial access to primary care physicians. This study reveals that African-Americans had a higher mortality risk (HR, 1.19; 95% CI, 1.03–1.38) especially if stage was unknown (HR, 1.72; 95% CI, 1.08–2.75) compared with non-Hispanic whites. Among women diagnosed at regional or distant stage, Hispanics had a survival advantage over their non-Hispanic white counterparts (HR, 0.80; 95% CI, 0.69–0.94). We also identified geographic areas where longer-than-expected or shorter-than-expected cervical cancer survival was statistically significant. Only a small portion of these disparities were explained by individual- and contextual-level factors. This study suggests that Race/Ethnicity, SES, and geography are associated with cervical cancer survival in Texas.

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Introduction

Cervical cancer is one of the most commonly diagnosed cancers among women in the United States (American Cancer Society, 2013). Even though overall incidence and mortality rates have declined due to more effective interventions (Jemal et al., 2013), disparities in cervical cancer survival have persisted (American Cancer Society, 2013), particularly among African-American women (Coker, Desimone, Eggleston, White, & Williams, 2009; Eggleston et al., 2006; Grigsby, Hall-Daniels, Baker, & Perez, 2000; Morgan et al., 1996) and those with lower socioeconomic status (SES) (Coker, Desimone, et al., 2009; Eggleston et al., 2006; Morgan et al., 1996; Mundt et al., 1998). Although it is well documented that cervical cancer survival disparities are associated with several individual-level factors, such as age, tumor characteristics,

treatment, health behaviors, and access to healthcare (Brewster et al., 1999; Coker, Desimone, et al., 2009; Eggleston et al., 2006; Farley et al., 2001), an increasing number of studies revealed that health disparities in general are attributed to a wide range of contextual-level factors beyond the individual level (Holmes et al., 2008). Several contextual-level factors have been examined including SES, racial composition, geographic access to healthcare, and other geographic characteristics (e.g. urbanization) (Ashing-Giwa et al., 2009; Brewer, Pearce, Day, & Borman, 2012; Coughlin, Leadbetter, Richards, & Sabatino, 2008; Downs, Smith, Scarinci, Flowers, & Parham, 2008; Lim & Ashing-Giwa, 2011; Lin & Zhan, 2014), but findings about the effects of these factors on cervical cancer survival have been inconclusive and inconsistent.

There were three main gaps in the literature about cervical cancer survival disparity research. First, there were contradictory findings with regard to racial/ethnic disparities (Garner & Newmann, 2012). For example, several studies found that Hispanic women had a survival advantage (Coker, Desimone, et al., 2009; Eggleston et al., 2006), while other studies have reported no such survival difference between Hispanics and non-Hispanic whites

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(Brewster et al., 1999; Mundt et al., 1998). Second, studies examining small-area variations of cervical cancer survival were scarce (Du et al., 2010; Walters et al., 2011). Third, no reported study has examined the impacts of both individual- and contextual-level variables on small-area variations of cervical cancer survival. In this study, we investigated cervical cancer survival disparities in Texas using both individual and contextual data during 1995 and 2005 from three social domains: race/ethnicity, census-tract-level SES, and geographic locations. The large geographic area and diverse population make Texas ideally suited to examine cervical cancer disparities. Findings of this study provide opportunities for developing and implementing more effective interventions focused on modifiable factors aimed at reducing cervical cancer disparities.

Materials and methods

Study population

We used cervical cancer database from the Texas Cancer Registry (TCR). TCR is a population-based registry with a statewide coverage and is one of the largest cancer registries in the United States with high data quality. TCR data are 90 percent or more complete with fewer than 2 duplicate cases per 1000 records (Risser, Williams, Mokry, Betts, & Miller, 2009). TCR receives funding from the Texas Department of State Health Services, the US Centers for Disease Control and Prevention (CDC), the Texas Higher Education Coordinating Board, the Cancer Prevention and Research Institute of Texas and other sources. Data maintained by TCR meet the high quality data standards of both the CDC and the National Program of Cancer Registries. TCR has the North American Association of Central Cancer Registries (NAACCR) gold certification (Risser, Hakenewerth, & Williams, 2013). There were about 12,144 women diagnosed with invasive cervical cancer (ICD-O-3 codes C530–C539 excluding histology type 9590–9989, 9050–9055, and 9140) in Texas between 1995 and 2005. These patients were residents of the state of Texas at the time of diagnosis. The Institutional Review Boards of both the Texas Department of State Health Services (TDSHS) and Texas State University have approved the use of the data. We excluded 932 women who 1) lived at an address that could not be geocoded to street location; 2) had a survival time of 0 months (i.e., death certificate only cases and those lost to follow-up after diagnosis); or 3) were not Hispanics, African-Americans, or non-Hispanic whites.

Study variables

Outcome variable

Five-year cervical cancer specific mortality was the outcome variable, measured in months from the date of diagnosis to the date of decease, or to the date of last follow-up. TCR adopted a passive follow-up procedure that uses data linkage to update follow-up information, rather than an active procedure through contacting people to update information. In addition, TCR links with the National Death Index which covers more mortality information than Texas does. The last possible day of follow-up was December 31, 2010, which allows at least 5 years of follow-up for all cases. Women who were lost to follow-up, remained alive at the last day of five-year period, or died of other causes were censored.

Individual-level variables

Based on previous work (Schootman, Jeffe, Lian, Gillanders, & Aft, 2009), individual-level variables included three different groups of factors: patient characteristics (race/ethnicity, age at diagnosis, and year of diagnosis), tumor characteristics (stage at diagnosis and tumor grade), and type of treatment received. Age at

diagnosis was categorized into five groups based on the US National Cancer Institute (NCI) recommended categories (Howlander et al., 2013): <34, 35–44, 45–54, 55–64, and >64. For analysis purposes, stage at diagnosis was categorized as early (localized), late (regional and distant), or unknown stage based on the Surveillance Epidemiology and End Result (SEER) summery staging categories (Young, Roffers, Ries, Fritz, & Hurlbut, 2001). Tumor grade was categorized as well differentiated, moderately differentiated, poorly differentiated, undifferentiated, or unknown. Type of first course of treatment included: 1) surgery only; 2) radiation and chemotherapy; 3) radiation or chemotherapy; 4) radiation, chemotherapy, and surgery; 5) radiation or chemotherapy plus surgery; 6) no treatment; 7) unknown treatment.

Contextual-level variables

In this study, contextual variables were defined based on a broad definition commonly used in public health research. They include not only ecological variables that reflect the characteristics of the physical and social environment but also “collective” variables that are area-aggregated based on individual-level attributes (Mobley, Kuo, Driscoll, Clayton, & Anselin, 2008; Probst, Moore, Glover, & Samuels, 2004). Contextual variables in this study include census tract-level demographic variables, health insurance expenditure, behavioral variables, level of urbanization, and spatial access to primary care physicians (PCPs). Details of these variables are given below.

Census Demographic variables were obtained from the 2000 Census Summary Files 1, 3, and 4, including poverty rate (file name DEC_00_SF3_DP3), unemployment rate of females (file name DEC_00_SF3_QTP24), percentage of females with less than college education (file name DEC_00_SF3_P036), percentage of females with less than high school education (file name DEC_00_SF4_QTP20), percentage of households without a car (file name DEC_00_SF3_QTH11), percentage of females living in crowded housing (household with more than one person per room, file name DEC_00_SF3_H020), median home value (file name DEC_00_SF3_DP4), median household income (file name DEC_00_SF3_DP3), percentage of linguistically isolated households (file name DEC_00_SF3_QTP17), percentage of foreign-born females (file name DEC_00_SF4_PCT045), percentage of African Americans (file name DEC_00_SF1_QTP3), and percentage of Hispanics (file name DEC_00_SF1_QTP3). These variables were selected based on suggestions of previous studies (Coughlin et al., 2008; Haas et al., 2011; Lian et al., 2011; Schootman et al., 2009). They reflect the three social domains of socioeconomic, socio-cultural context, and social environment. The concept of “socio-cultural context” was adopted based on a prior study which defines culture as a “unidimensional, static, and immutable character element of a homogeneous population group” (Singer, 2012). Socio-cultural factor consists of several components such as language, religion/world view, as well as beliefs and values. Social environment indicates the social and physical environment of communities, including racial composition (such as percentage of African-Americans in a community), geographic factors, and other factors (Coughlin et al., 2008).

Health insurance expenditure and behavioral variables were measured using six census-tract variables from Simplymap (EASI, 2010): average household health insurance expenditure (public health insurance expenditure), average household commercial health insurance expenditure (private health insurance expenditure), percentage of non-smoking population, percentage of people who eat healthily, percentage of people who exercise regularly, and percentage of nonalcoholic population. These variables are considered as contextual variables in that they are “collective” variables that are area-aggregated based on individual-level

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