

Demographic predictors of delayed-stage cervical cancer in California

By John W. Morgan, DrPH, CPH

Professor, Loma Linda University
Epidemiologist, Regions 4 and 5 of CRGC

INTRODUCTION: Ignoring other demographic characteristics, non-Hispanic black and Hispanic women experience highest age-adjusted cervical cancer mortality in the United States, followed by non-Hispanic white and Asian/Other women. Nearly all deaths from cervical cancer occur among women diagnosed at delayed-stage (AJCC stages II-IV), while treatment of cervical cancer diagnosed at stage I (early-stage) is frequently curative. The non-modifiable character of race and ethnicity and the mingling of race/ethnic effects with age, socioeconomic status (SES) and marital status challenges how this information can be most efficiently used to target subgroups of California women for intensified screening that prevents the most deaths from cervical cancer. The California Cancer Registry (CCR) comprises the three largest SEER program registries and includes data that provides distinction between age, race/ethnicity, SES and marital status as predictors of delayed- *versus* early-stage cervical cancer.

OBJECTIVES: This research sought to distinguish roles for age, race/ethnicity, SES and marital status as independent predictors of delayed-stage cervical cancer.

METHODS: Researchers at Loma Linda University and the Cancer Registry of Greater California used statewide cancer registry data for 1996-2005 and multivariable logistic regression to distinguish independent roles of age, race/ethnicity, SES and marital status as predictors for odds ratios contrasting delayed- *versus* early-stage cervical cancer. Researchers included cancer registry staff, practicing physicians and epidemiology graduate students and faculty.

FINDINGS: Among the 13,624 California women diagnosed with cervical cancer from 1996-2005 having complete age, race/ethnicity, SES and marital status data, 6,448 (47%) had been diagnosed at delayed-stage. 58% of this total case count included women less than age 50 years at diagnosis, while 54% of the delayed-stage cases were age 50 years and older at diagnosis. Age less than age 50-65 years predicted progressively lower odds of delayed- *versus* early-stage diagnosis, while women older than age 66 years showed highest odds of delayed-stage diagnosis (Trend $p < 0.001$). Race/ethnicity was eliminated as a predictor of delayed-stage diagnosis of cervical cancer when SES and other demographic variables were included in the multiple logistic model, while SES persisted as the strongest independent predictor of delayed-stage, showing an uninterrupted inverse dose-gradient trend with progressively higher odds ratios for lower SES categories (Trend $p < 0.001$). Contrast with married, categories including separated, divorced and widowed and single marital status showed higher odds ratios for delayed- *versus* early-stage cervical cancer diagnosis that were independent of other covariates. Review of counts of delayed-stage cases revealed that 44% were non-Hispanic black or Hispanic, with the majority of delayed-stage cases diagnosed among Asian/Other and non-Hispanic white women. Ignoring other demographic characteristics, 54% of delayed-stage cervical cancers were among women in lowest two SES quintiles and 58% were classified as separated, divorced or widowed or single (unmarried).

DISCUSSION: Lower odds ratios for delayed- *versus* early-stage cervical cancer during reproductive years, with increased odds among women age 50+ years is consistent with more diligent compliance with screening recommendations before menopause, while higher odds of delayed stage diagnosis among women age 66 years and older challenges the recommendation that cervical cancer screening should be stopped after age 65 years. Evidence that lower SES, rather than race/ethnicity, independently predicts higher odds ratios for delayed- *versus* early-stage cervical cancer challenges current intensified screening practices that target specific race/ethnic groups for intensified screening, ignoring others. Further challenging the practice of focusing intensified screening on non-Hispanic black and Hispanic women is the finding that larger numbers of delayed-stage cases were diagnosed among Asian/Other and non-Hispanic white California women. Evidence that the majority of delayed-stage cervical

cancers were diagnosed among unmarried women may present opportunities for intensified screening in this group that is underserved for early diagnosis of cervical cancer. This research illustrates how collaborations between cancer registrars, practicing physicians and epidemiology graduate students and faculty can discover and improve control and prevention strategies for cervical cancer.

Findings from this research were provided in an oral presentation at the annual conference of the American Public Health Association in New Orleans on November 18, 2014, and are currently under review for publication in *Annals of Epidemiology*.