

Cervical cancer mortality among foreign-born women living in the United States, 1985 to 1996

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Abstract

Purpose of study: This study explored the potential influence of increasing immigration to the United States (US) on US cervical cancer mortality trends. **Basic procedures:** Mortality data were derived from the National Center for Health Statistics' Detailed Mortality File. Population estimates were obtained from the US Bureau of the Census. Age-adjusted cervical cancer mortality rates were calculated for women living in the US according to place of birth. **Main findings:** From 1985 to 1996, deaths and death rates from cervical cancer increased for foreign-born women and decreased for US-born women. Increases in death rates among foreign-born women were highest in the South. Cervical cancer deaths and death rates for US-born women decreased uniformly in all regions. **Principle conclusions:** Cervical cancer mortality rates have increased among foreign-born women in the United States, and have influenced overall US cervical cancer mortality trends. Cervical cancer control efforts should be intensified in areas of the United States with large foreign-born communities.

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1. Introduction

Worldwide, cervical cancer is the third most common cancer in women, following breast and colorectal cancer [1]. At least 80% of cervical cancers occur in developing countries [1,2]. Regions of the world with the greatest burden of disease include South and Central America, the Caribbean, sub-Saharan Africa, and parts of Asia [1]. Cervical cancer is less common in the United States (US), where it has the eleventh highest incidence rate of cancers in women, with 12,200 new cases and 4100 deaths projected for 2003 [3].

In both developed and developing countries, cervical cancer incidence and mortality rates have declined over time [1,4,5]. However, that rate of decline has slowed recently [2,5–7]. Few studies have examined immigration and migration as possible influences on cancer mortality trends [8–10]. We analyzed cervical cancer deaths and death rates according to place of birth from 1985 to 1996 to investigate whether increased immigration to the US might be influencing US cervical cancer mortality trends.

2. Methods

2.1. Data sources

2.1.1. Mortality data

We used the Detailed Mortality File compiled at the National Center for Health Statistics, Centers for Disease Control and Prevention (CDC) as the source of mortality data [11]. The Detailed Mortality File data contains information from death certificates filed in each state. Death records for the years 1985 through 1996 coded as 180 for cervical cancer by the *International classification of diseases, 9th ed.* (ICD-9) [12] were retained for this analysis. An ICD-9 code of 180 is inclusive of all invasive carcinomas of the cervix. Each record included the date of death, date of birth, sex, race, ethnicity, state of residence, and place of birth (state or country) of the decedent. State or country of birth of a decedent is assigned to one of the 50 states or the District of Columbia, Puerto Rico, Virgin Islands, Guam, Canada, Cuba, and Mexico. Any other nations identified on the death certificate as the country of birth are classified by the Detailed Mortality Files under the label "remainder of the world." Less than 1% of deaths are classified

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as occurring in persons with unknown state or country of birth [11].

2.1.2. Foreign-born population data

Because of the complexities associated with estimating the size of the foreign-born population in the United States, we used three data sources from the US Bureau of the Census to derive population estimates [13]. Census data are based on self-reported responses.

To estimate the size of the native and foreign-born population within the United States over time, we used the adjusted 1990 census and inter-censal population estimates. These census and post-censal estimates, available from the US Bureau of the Census, were adjusted by the Census Bureau for the documented undercount in 1990 and include institutionalized populations [14]. These are the values typically used by private and government organizations to calculate cancer incidence and mortality rates [3,5,11]. However, these Census Bureau adjusted estimates are not made according to place of birth. Therefore, we estimated the proportion of the population that was foreign-born for age, race, sex and state specific subgroups using the 1980 and 1990 public-use microdata sample (PUMS) [15] and from 1994 to 1996 Current Population Survey (CPS) [16]. We calculated place of birth-specific proportions for the inter-censal years and for the years 1991, 1992, and 1993 using linear interpolation. We used CPS data from 1994 forward, because CPS only began collecting place of birth and citizenship information in 1994. CPS is a household survey that does not include institutionalized persons. Neither PUMS nor CPS adjusts for population undercounts.

The US Bureau of the Census defines a native (US-born) person as an individual born in the United States or a US

territory, or born outside the United States to at least one parent with US citizenship. All other persons born outside the United States are foreign-born [13,17,18]. The foreign-born population identified in the CPS and decennial census includes the following categories of persons: immigrants or those who entered as spouses or children of immigrants; persons admitted as refugees; persons with student or work visas; persons with non-immigrant visas who overstayed; and undocumented persons. Each of these categories of foreign-born persons is included in this analysis.

2.1.3. Immigration data

We obtained data on immigration patterns to the United States from the Immigration and Naturalization Service (INS). These data are published annually in the *Statistical yearbook of the immigration and naturalization service* [13,17,19].

2.1.4. Statistical analysis

We calculated mortality rates using point estimates of numbers of deaths for four three-year time periods between 1985 and 1996 and the July 1 population estimate. We age-adjusted the mortality rates by the direct method using the 1990 US population as the standard. We calculated standard errors and 95% confidence limits using standard methods [20].

We evaluated trends in rates using simple ordinary least-square linear regression. We determined the significance of the differences of the trends in rates between groups by regressing the arithmetic differences in the time-period-specific rates from each subgroup on the midpoint of the three-year time groups [21]. We considered fewer than 20

Table 1
Cervical cancer mortality among women living in the United States by age, race, ethnicity, and region according to place of birth, 1985–1996^a

	US-born women		Foreign-born women		Rate ratio (95% CI)
	Average annual deaths	Average annual rate (95% CI)	Average annual deaths	Average annual rate (95% CI)	
Total	4064	3.23 (3.20, 3.26)	453	3.66 (3.56, 3.76)	1.13 (1.10, 1.17)
Age group (years)					
<50	1306	1.51 (1.49, 1.53)	143	1.58 (1.50, 1.65)	1.05 (0.99, 1.10)
≥50	2758	8.24 (8.15, 8.33)	310	9.70 (9.39, 10.01)	1.18 (1.14, 1.22)
Race or ethnic group					
White	3067	2.78 (2.75, 2.81)	331	3.46 (3.35, 3.57)	1.24 (1.20, 1.29)
Black	954	7.31 (7.17, 7.44)	37	5.86 (5.26, 6.45)	0.80 (0.72, 0.89)
Asian/Pacific Islander	11	0.89 (0.73, 1.04)	61	3.66 (3.36, 3.96)	4.11 (3.37, 5.01)
Hispanic ^b	119	3.78 (3.57, 3.98)	119	5.31 (5.02, 5.60)	1.40 (1.30, 1.52)
Regions of the United States					
Northeast	824	3.16 (3.10, 3.22)	122	3.10 (2.93, 3.26)	0.98 (0.93, 1.04)
South	1664	3.70 (3.65, 3.75)	107	3.89 (3.67, 4.10)	1.05 (0.99, 1.11)
West	589	2.61 (2.56, 2.68)	169	4.04 (3.86, 4.22)	1.55 (1.47, 1.62)
Midwest	988	3.08 (3.02, 3.13)	55	3.55 (3.26, 3.83)	1.15 (1.06, 1.25)

^a Columns may not sum to total because of missing values.

^b This does not represent a national estimate. The states included in this estimate, in which the Hispanic variable was missing in less than 10% of the deaths reported in each year from 1985 to 1996, were: Arkansas, Arizona, California, Colorado, Georgia, Indiana, Mississippi, Nebraska, New Mexico, New York, Ohio, Texas, and Utah.

Table 2
Numbers of cervical cancer deaths in the United States by recorded place of birth, three-year time periods, 1985–1996^a

	Overall	US-born	Foreign-born				
			All	Canada	Cuba	Mexico	Remainder of the world
1985–1987	13488	12270	1175	80	24	218	853
1988–1990	13561	12177	1322	74	41	247	922
1991–1993	13737	12240	1430	65	50	306	1009
1994–1996	13645	12082	1512	53	66	338	1055

^a Columns may not sum to total because of missing values.

deaths per year in any subgroup to be too small a number from which to calculate a stable rate.

3. Results

For the overall period 1985–1996, cervical cancer mortality rates were higher among foreign-born than US-born women who were older, white, Asian and Pacific Islander, Hispanic or located in the West and Midwest (Table 1). Cervical cancer mortality rates were higher among US-born than foreign-born women who were black.

The proportion of all cervical cancer deaths occurring in foreign-born women steadily increased, from 8.7% of total deaths occurring in foreign-born women in 1985–1987 to 11.1% of deaths occurring in foreign-born women in 1994–1996 (Table 2). Overall, there was a downward trend in the number of deaths in the United States over the three time periods among women born in developed countries (the United States and Canada) and an upward trend among women born in those developing countries which were explicitly identified in the mortality files (Cuba and Mexico) (Table 2).

The overall mortality rate for all women living in the US decreased from 3.48 to 3.08 per 100,000 women from 1985–1987 to 1994–1996 (Fig. 1). Among women born in the US, death rates decreased 17% (3.50–2.99 per 100,000 women from 1985–1987 to 1994–1996) while among

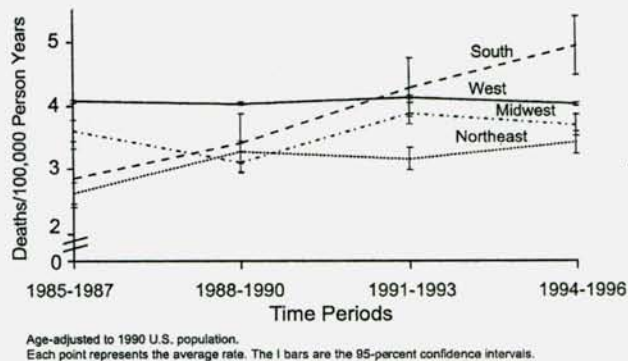


Fig. 2. Age-adjusted death rate from cervical cancer among foreign-born women in the United States by census region, 1985–1996.

foreign-born women, death rates increased 22% (3.26–3.99 per 100,000). The trend lines for the two mortality rates diverged, and the difference in the divergent slopes was statistically significant.

By region, the most dramatic increase in cervical cancer mortality among foreign-born women occurred in the South, where death rates increased over the 12-year period by 70%, from 2.86 to 4.93 deaths per 100,000 women (Fig. 2). In the Northeast and Midwest, mortality rates increased over time, although at a slower rate than in the South. While cervical cancer mortality risk for foreign-born women was highest in the West (rate ratio = 1.55 for 1985–1996), the cervical

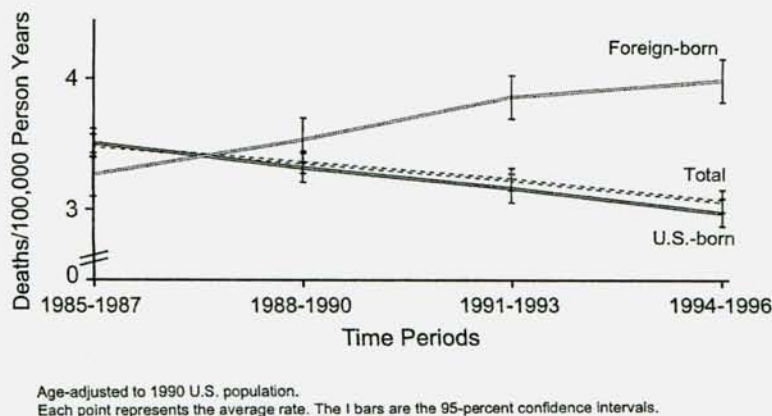


Fig. 1. Age-adjusted death rate from cervical cancer among US-born vs. foreign-born women in the United States, 1985–1996.

cancer mortality rate in the West remained constant over the entire time period.

We could not examine the effects of ethnicity and race on these mortality trends. Stable rates among ethnic- and race-specific groups could not be determined because of missing values and/or small numbers.

4. Discussion

While many reasons have been proposed as potentially slowing the decades-long decline in cervical cancer mortality rates (e.g. an increase in human papilloma virus (HPV) infection rates) [6], limited studies have addressed population dynamics within the United States as a potential influence on changing mortality trends [9,10]. Other studies have examined mortality rates among foreign-born versus US-born populations and made comparisons of trends in these two populations, but this has not been done specifically to evaluate cervical cancer trends [22–24]. Our report shows that immigration has influenced the recent epidemiology of cervical cancer in the United States and highlights an important public health concern regarding increasing cervical cancer mortality among foreign-born women, in the face of continued decreasing rates among US-born women. In an event as rare as a cervical cancer death, the changes in cervical cancer deaths and death rates documented in this paper are practically and statistically significant, despite the small absolute magnitude of change.

A shift in the composition of the immigrant population has likely led to this increase in cervical cancer mortality among foreign-born women. Until the 1950s, European immigrants represented the largest proportion of all immigrants to the United States [17,19]. Since the 1960s, the majority of immigrants have come from Asia and Latin America, where the incidence rates of cervical cancer are high [13,25]. Foreign-born women may be immigrating to the United States with undiagnosed cervical intra-epithelial neoplasia (CIN) and/or cervical cancer that remains undetected because they may not be receiving Papanicolaou (Pap) screening tests either in their country of origin or in the United States [26]. If these foreign-born women remain in the United States with high prevalence rates of undetected CIN or cervical cancer because they are not receiving Pap tests, they might be expected to exhibit increased mortality rates months to years following immigration.

Cervical cancer control efforts should be increased in areas of the United States with large foreign-born communities. Providing health services to this population can be a difficult task since public funding for this purpose is limited by policies aimed at discouraging the use of government programs by residents who enter the US illegally [27,28]. However, the National Breast and Cervical Cancer Early Detection Program (NBCCEDP) is one effort to fill in the gap for this population [29]. This program provides breast and cervical cancer screening services to low-income,

uninsured, and under-insured women in 69 sites, including tribes, territories, and all 50 states. Yet, funding for this program is only able to provide services to an estimated 15–18% of the eligible population (Sajal Chattopadhyay, personal communication). To date, more than 750,000 women have received over 1.1 million cervical cancer screening tests with Pap smears through the NBCCEDP [30]. Efforts to reach foreign-born women who have not been screened can be intensified through culturally appropriate educational materials and mechanisms to make screening services more readily available [26,31]. Health care providers should be aware that foreign-born women, particularly women from developing countries such as those in Latin America and Southeast Asia, are at increased risk for mortality from cervical cancer. Clinicians who care for women who have immigrated from these regions should obtain a careful medical history to determine whether a Pap smear was performed either prior to immigration or since arrival to the US. If a Pap smear cannot be documented by a written report indicating a normal result, then a Pap smear should be offered immediately.

Cervical cancer prevention efforts can also be broadened globally. The World Health Organization (WHO) is proposing alternative and complementary screening strategies for developing countries where cytology-based screening is not anticipated in the foreseeable future [32], including low intensity screening (Pap screening high-risk women once in a lifetime or once every 10 years) and direct cervical evaluation without a Pap smear [33–35].

Our study had several limitations. Information regarding length of residence of foreign-born persons, stage of disease on arrival in the United States, and specific country of birth for most countries is unavailable using the Detailed Mortality File. For the majority of the analysis, we stratified place of birth broadly by persons who are US- or foreign-born, with some further breakdown into specific countries as the mortality dataset would allow (US-born or born in Canada, Cuba, Mexico, or “remainder of the world”). However, INS [19] and census data [13–18] show that most women immigrating to the US originate in Latin America and Southeast Asia. This suggests that women from these regions are making the greatest contributions to our observed cervical cancer mortality increases.

Finally, mortality statistics are based on cause of death obtained from death certificates and current studies are inconclusive in their assessment of the accuracy of the death certificate [11]. However, in a disease like cervical cancer, where the clinical manifestations are readily evident, the discrepancy in cause of death may be particularly low. One study suggested discrepancies in cause of death between the death certificate and autopsy results in up to 29% of cases reviewed, but found that deaths from cancer were diagnosed most accurately [36]. Some of the limitations inherent to mortality data would have been addressed using incidence data. However, in the Surveillance, Epidemiology, and End Results (SEER) dataset, the place of birth

variable is missing in 24% of the cases [5]. This variable is frequently missing from the clinical records used to derive cancer registry data and is therefore difficult to capture.

Our results emphasize that the interpretation of US cervical cancer mortality rates should include an evaluation of mortality in the foreign-born community. Cervical cancer mortality is dependent on a complex network of factors including predisposing risk modifiers for the disease and the availability and efficiency of early detection and treatment. However, place of birth is a general marker for these more specific determinants that is readily available in many vital statistic and census records. It deserves attention at least at the level of public health and programmatic planning to guide interventions aimed at modifying more specific modifiers of cervical cancer risk. As with infectious diseases such as tuberculosis, successful cervical cancer control in the US will also necessitate attention to the global disease burden [37]. Healthy People, a national initiative established to improve the health of Americans, has recently set its goals for 2010 [38]. The goal for cervical cancer is to have no more than two deaths from cervical cancer per 100,000 women by 2010. Augmentation of cervical cancer prevention efforts in the growing foreign-born community in the United States and in developing countries will be required if the Healthy People 2010 objective is to be achieved.

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