



National and regional breast cancer incidence and mortality trends in Mexico 2001–2011: Analysis of a population-based database



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ABSTRACT

Introduction: Breast cancer is the most common malignancy in Mexican women since 2006. However, due to a lack of cancer registries, data is scarce. We sought to describe breast cancer trends in Mexico using population-based data from a national database and to analyze geographical and age-related differences in incidence and mortality rates.

Methods: All incident breast cancer cases reported to the National Epidemiological Surveillance System and all breast cancer deaths registered by the National Institute of Statistics and Geography in Mexico from 2001 to 2011 were included. Incidence and mortality rates were calculated for each age group and for 3 geographic regions of the country. Joinpoint regression analysis was performed to examine trends in BC incidence and mortality. We estimated annual percentage change (APC) using weighted least squares log-linear regression.

Results: We found an increase in the reported national incidence, with an APC of 5.9% (95% CI 4.1–7.7, $p < 0.05$). Women aged 60–65 had the highest increase in incidence (APC 7.89%; 95% CI 5.5–10.3, $p < 0.05$). Reported incidence rates were significantly increased in the Center and in the South of the country, while in the North they remained stable. Mortality rates also showed a significant increase, with an APC of 0.4% (95% CI 0.1–0.7, $p < 0.05$). Women 85 and older had the highest increase in mortality (APC 2.99%, 95% CI 1.9–4.1; $p < 0.05$).

Conclusions: The reporting of breast cancer cases in Mexico had a continuous increase, which could reflect population aging, increased availability of screening, an improvement in the number of clinical facilities and better reporting of cases. Although an improvement in the detection of cases is the most likely explanation for our findings, our results point towards an epidemiological transition in Mexico and should help in guiding national policy in developing countries.

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1. Introduction

Breast cancer is the most common malignancy in women world wide, with nearly 1.7 million cases diagnosed in 2012, representing 25% of all female cancers [1]. In developing countries, the incidence of breast cancer is rising sharply due to changes in reproductive factors, lifestyle, and an increased life expectancy. These rising cancer rates in the developing world are projected to reach a 55%

increased incidence and 58% increased mortality in fewer than 20 years [2].

Mexico is an upper middle-income country of 112, 336, 538 inhabitants [3] with one of the highest per capita incomes in Latin America. Even though Mexico is among the top 20 largest economies in the World, more than half of its population is poor [4]. The distribution of wealth in Mexico is unequal [5], with a 27-fold difference between the average incomes of the top and bottom deciles of the population [6]. This inequality is also true for different regions of the country, with northern states experiencing larger economic growth due to their proximity to the United States, better infrastructure and a greater capacity for producing manufactured goods [7].

As in other developing countries, cancer incidence and mortality have been on the rise in Mexico. Since 2006, breast

Abbreviations: DGE, national epidemiological administration; SINAVE, national system of epidemiological surveillance; INEGI, national institute of statistics and geography; CONAPO, national population council; APC, annual percentage change.

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cancer has been the leading cause of cancer-related mortality in Mexican women, surpassing cervical cancer [8]. A review of the regional geographic trends of breast and cervical cancer mortality between 1979 and 2006 showed a higher risk of dying from breast cancer in women from the northern states, while women from the southern states had higher mortality attributable to cervical cancer [9]. In order to tackle inequities in the access to healthcare, in 2003 the Mexican government instituted a national health insurance program directed at the poorest sectors of the population called *Seguro Popular*, which includes coverage of breast cancer screening, diagnosis and treatment [10].

One of the main barriers for designing strategies to tackle cancer in developing nations is the paucity of statistics regarding its incidence and mortality [11], and the Breast Health Global Initiative has included the assessment of the burden of breast cancer at the national level as one of its top priorities [2]. Due to the fact that Mexico lacks a national population-based cancer registry, information on these indicators usually comes from data extrapolated from neighboring countries, from hospital-based histopathological databases [8] or from the only regional cancer registry, which is located in the western state of Jalisco [12]. For example, data from GLOBOCAN 2012, (which reports an incidence of 35.4 cases of breast cancer per 100,000 person-years in Mexico) are not obtained from any registry, but rather extrapolated from the mortality data obtained from the death certificate database of the *Instituto Nacional de Estadística y Geografía* (National Institute of Statistics and Geography, INEGI) [13], which is considered of high quality. Furthermore, the previous edition of GLOBOCAN, published in 2008, obtained incidence data by using a regional model extrapolated from other territories in Central America and the Latin Caribbean with a high quality population-based cancer registry (Puerto Rico and Costa Rica) [14]. Thus, although the regional and national mortality figures attributable to breast cancer in Mexico come from reliable sources and have been published before [15], the true incidence of the disease is largely unknown and no direct data sources have been used to describe it. Starting in 2000, the *Dirección General de Epidemiología* (National Epidemiological Administration, DGE) of the Mexican Ministry of

Health instituted the weekly mandatory reporting of all new breast cancer cases as part of the *Sistema Nacional de Vigilancia Epidemiológica* (National System of Epidemiological Surveillance, SINAVE) [16]. SINAVE was created in the 1970's and since 1995 it has national coverage, encompassing all the public institutions that constitute the *Sistema Nacional de Salud* (National Health System) and several private institutions. Data reported by SINAVE include confirmed and suspected cases of 142 different diseases, including not only breast cancer but also cervical cancer and cervical dysplasia [17]. These suspected cases are reported on a weekly basis by physicians at nurses at every medical unit or hospital belonging to the institutions included in SINAVE using an online computerized format called *Sistema Único de Información para la Vigilancia Epidemiológica* (Unified Information System for Epidemiological Surveillance, SUIVE) [18]. The reported cases are reviewed by the Sanitary Jurisdiction to which each medical unit belongs and then reported on a state level weekly, monthly and yearly [17].

In this paper, we describe national and regional breast cancer incidence trends using population-based data from the SINAVE database and mortality trends using the INEGI records for the first decade of the 21st century, in order to understand the epidemiological variations generated by recent changes in the country, including growing access to healthcare, increasing coverage of screening methods and the quality of data reporting.

2. Patients and methods

2.1. Study area

Mexico is a federation comprising 31 states and a Federal District (DF), geographically limited by United States border on the north and by the Guatemala–Belize border on the south. We divided the country into three geographic regions and 8 sub regions: North (Northwest and Northeast); Central (North-Central, South Central, West and East) and South (Southeast and Southwest). The location of each region and subregion within the country can be seen in Fig. 1.



Fig. 1. Geographic regions of Mexico.

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