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Distribution of cancer mortality rates by province in South Africa

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ABSTRACT

Introduction: Cancer mortality rates are expected to increase in developing countries. Cancer mortality rates by province remain largely unreported in South Africa. This study described the 2014 age standardised cancer mortality rates by province in South Africa, to provide insight for strategic interventions and advocacy.
Methods: 2014 deaths data were retrieved from Statistics South Africa. Deaths from cancer were extracted using 10th International Classification of Diseases (ICD) codes for cancer (C00-C97). Adjusted 2013 mid-year population estimates were used as a standard population. All rates were calculated per 100 000 individuals.
Results: Nearly 38 000 (8%) of the total deaths in South Africa in 2014 were attributed to cancer. Western Cape Province had the highest age standardised cancer mortality rate in South Africa (118, 95% CI: 115–121 deaths per 100 000 individuals), followed by the Northern Cape (113, 95% CI: 107–119 per 100 000 individuals), with the lowest rate in Limpopo Province (47, 95% CI: 45–49 per 100 000). The age standardised cancer mortality rate for men (71, 95% CI: 70–72 per 100 000 individuals) was similar to women (69, 95% CI: 68–70 per 100 000). Lung cancer was a major driver of cancer death in men (13, 95% CI: 12.6–13.4 per 100 000). In women, cervical cancer was the leading cause of cancer death (13, 95% CI: 12.6–13.4 per 100 000 individuals).
Conclusion: There is a need to further investigate the factors related to the differences in cancer mortality by province in South Africa. Raising awareness of risk factors and screening for cancer in the population along with improved access and quality of health care are also important.

1. Introduction

The International Agency for Research on Cancer estimated previously that 47 350 cancer deaths occurred in South Africa in 2012 [1]. Cancer mortality rates are related to cancer incidence which is likely to be affected by an aging demographic, communicable diseases, obesity, and physical inactivity along with tobacco use [2]. These factors have been associated with cancer morbidity and mortality rates in the South African population [3]. Efforts to combat non-communicable diseases, such as cancer, have been minimal due to the competing burden of the HIV/AIDS epidemic in the country [4]. Studies have reported some declines in mortality rates, for tracheal, bronchial, and lung cancers from 2001 to 2006 [4,5] and for oesophageal cancer, which dropped by 25% from 1999 to 2006. On the other hand, mortality rates for prostate cancer increased by 12%, breast cancer by 21%, and cervical cancer by 16% during the same period [4]. Cancer incidence rates for 2012 provided by the National Cancer Registry, a pathology-based cancer registry, places the top three incident cancers based on age standardised rates in South Africa as breast, cervical and primary site unknown in women and prostate, lung and colorectal cancer in men, respectively [6].

Cancer mortality rates provide a measure of success in cancer screening and treatment programmes, and along with cancer incidence, an indication of cancer risk factors. Cancer mortality rates are also affected by reporting and misclassification without histological diagnosis. According to the Second National Burden of Disease Study for South Africa, there is considerable variation in the cause of death between provinces [7]. There is however, little or no information available about the distribution of cancer mortality rates in South Africa by province. At present, the nine provinces in the country have variations in resources for healthcare and different levels of urbanisation. Some provinces were historically better resourced and remain more prosperous and urbanised. Access to quality healthcare is expensive and unavailable for many South Africans [8], and risk factors for specific cancers may vary across the provinces.

Rigorous and robust statistics on cancer mortality distribution are

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an important prerequisite for informing cancer research programmes and prevention strategies. Investigating regional cancer mortality can assist in evidence-based prevention and treatment programmes for cancer through awareness, policy review, and advocacy. Therefore, the aim of this study was to document the 2014 cancer mortality rates by province in South Africa.

2. Materials and methods

2.1. Study population

The 2014 general mortality data, as captured from death certificates in South Africa, was retrieved from Statistics South Africa (Stats SA) [9]. Since the data obtained included deaths due to all causes, we used the primary underlying cause of death to extract data for individuals who died of cancer. The 10th International Classification of Diseases codes (ICD-10) [10] from C00 to C97 were considered to be deaths due to cancer, while ICD 10 codes from DO3 to D48 were excluded because they were not classified as malignant.

2.2. Statistical analysis

Data management was done using Stata 14.2, and analysis was conducted using Microsoft Excel 2010 spread sheets. Age was categorised into five year age groups as presented by the adjusted 2013 mid-year population for Stats SA [11]. The province where the deceased resided in was used to calculate mortality rates by province.

The 2014 proportion of deaths from cancer was computed using the number of deaths from cancer as the numerator and total number of deaths from all causes as the denominator. Mortality rates were computed for gender, age group and by province. The crude mortality rate for each age group was calculated as $r_i = {}^{N_d}/_{P_i}$ where N_d is the number of deaths in each age group and P_i is the population at risk in each age group in a specific province.

Age-standardised mortality rates were calculated to enable a comparison of the levels of cancer-specific deaths experienced by each province. Adjusted 2013 mid-year population estimates for South Africa were used to calculate the age-standardised rates [11], instead of the WHO world standard population [12], to enable local applicability. The mid-year population estimates were obtained from Dorrington et al. [11] who adjusted 2013 Stats SA mid-year estimates to account for more recent fertility and migration data that was obtained from the 2011 Census [13,14]. Individuals whose sex and age were unspecified or unknown were removed from the analysis as the mid-year population estimates only have data with defined age and sex group by province.

Direct standardisation method was used for calculating all age adjusted mortality rates [15]. The direct method is presented as $\Sigma r_i \ N_{is}/\Sigma_{N_{is}}$ where r_i is the age specific crude mortality rate, N_{is} is the mid-year population in the specific age group of the South African standard population at risk by province and country, and ΣN_{is} is the sum of adjusted 2013 mid-year population of all age group under study in the country. All crude and adjusted rates were reported per 100 000 individuals. Age adjusted mortality rates were also calculated for the top six cancer specific causes of death by province and sex. Ethics approval was not required as this was secondary analysis of routinely collected data, without the researchers having any access to identifying information.

3. Results

There were more than 450 000 deaths from all causes in 2014 in South Africa (Table 1). Of the total deaths, 37 812 (8.1%) was attributed to cancer as the primary underlying cause of death. The percentage distribution of deaths due to all causes was higher in men (52.2%) than women (47.3%). However, the percentage distribution of deaths from cancer was similar for men (49.4%) and women (50.5%) in Table 1. The sex identity of some deceased was not specified or unknown, which accounted for less than 1% of total deaths and deaths due to cancer. There were no significant sex differences in the median age of death due to all causes or cancer.

Table 1
Sex distribution of deaths by cancer and all causes in South Africa.

Sex	Cancer (n = 37,812)	Age at death due to cancer in years Median (IQR)	Overall death (n = 467,773)	Age at death in years Median (IQR)
Men	18,668 (49.4%)	64 (54–74)	244,023 (52.2%)	50 (32–66)
Women	19,098 (50.5%)	62 (50–73)	221,056 (47.3%)	56 (34–75)
Unknown	–	–	111 (0.02%)	0 (0–1)
Unspecified	46 (0.1%)	54 (39–76)	2583 (0.6%)	21 (0–46)

IQR: Interquartile ranges.

Table 2
The 2014 crude and age standardised cancer mortality rates across 9 provinces for both sexes in South Africa.

Provinces	Crude mortality rates per 100 000 (95% CI)	Age-standardised mortality rates per 100 000 (95% CI)
Eastern Cape (EC)	75 (73–77)	67 (65–69)
Free State (FS)	82 (79–85)	78 (75–81)
Gauteng (GAU)	65 (64–66)	72 (70–74)
KwaZulu-Natal (KZN)	52 (51–53)	56 (55–57)
Limpopo (LP)	46 (44–48)	47 (45–49)
Mpumalanga (MP)	50 (48–52)	55 (53–57)
Northern Cape (NC)	124 (117–131)	113 (107–119)
North West (NW)	66 (63–69)	65 (62–68)
Western Cape (WC)	131 (128–134)	118 (115–121)
South Africa	70 (69–71)	69 (68–70)

CI: confidence intervals.

The influence of age distribution on provincial cancer mortality rates were investigated and are presented in Table 2 and illustrated in Fig. 1. The South African cancer mortality rate in 2014 was 69 (95% CI: 68–70) deaths per 100 000 individuals. The provincial mortality rates showed that the Western Cape had the highest age standardised rates of 118, 95% CI: 115–121, followed by Northern Cape 113, 95% CI: 107–119, and Free State 82, 95% CI: 79–85. Mpumalanga and Limpopo provinces have the lowest age standardised cancer mortality rates of 55 (95% CI: 53–57) and 47 (95% CI: 45–49) respectively. Age standardised cancer mortality rates increased geographically from the north-east to the south-west of the country (Fig. 1).

In Fig. 2, the national age standardised cancer mortality rates were found to be similar for men and women in 2014 with 71 (95% CI: 70–72) deaths per 100 000 versus 69 (95% CI: 68–70) deaths per 100 000 individuals respectively. Western Cape had the highest mortality rates for both men and women followed by the Northern Cape. The Eastern, Northern and Western Cape have statistically significantly higher cancer mortality rates for men than women. Women's cancer mortality rate was significantly higher than men in the Mpumalanga Province.

Fig. 3 provides the top six cancer specific age standardised mortality rates by province in 2014. Lung cancer was the main cause of cancer death in South Africa, followed by cervical cancer. There were notable variations between provinces in mortality rates for specific cancers. Lung cancer was the single leading cause of cancer death in five provinces, and the highest age standardised mortality rates were reported in the Western Cape (27, 95% CI: 26–28 per 100 000) and the Northern Cape (21, 95% CI: 18–24 per 100 000). Oesophageal cancer had the highest age standardised mortality rate and was the leading cause of cancer death in the Eastern Cape (10, 95% CI: 9–11 per 100 000).

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