Cervical cancer mortality trends in Brazil, 1981-2006

Evolução da mortalidade por câncer do colo do útero no Brasil, 1981-2006

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Abstract

The aim of this study was to describe cervical cancer mortality trends in Brazil for the period 1981-2006. Cervical cancer mortality was corrected on the basis of proportional redistribution of the deaths from "malignant neoplasm of uterus, part unspecified". Time trends were evaluated by means of simple linear regression. After correction, cervical cancer ranked second among the leading causes of death from cancer in the female population up to 2005, with a downward trend for the country as a whole, a decline in the State capitals, and a stable trend in the municipalities in the interior. A downward trend was confirmed in the State capitals in all geographic regions of the country. In the municipalities in the interior, there was an increase in the North and Northeast regions, a decline in the Southeast and South, and a stable trend in the Central-West. Although uneven, the decline began to take consistent shape in the country. Even better results could be achieved by investing in the expansion of screening coverage, especially among the populations at greatest risk.

Uterine Cervical Neoplasms; Mortality; Time Series Studies

Introduction

Unlike some other types of neoplasms, cervical cancer is amenable to prevention and control through screening and early treatment [1,2]. However, in less developed regions it still ranks among the leading types of cancer in the female population [3]. According to estimates, cervical cancer mortality could increase by 10% in the next 10 years if no steps are taken for prevention and treatment [4].

In Brazil, the cervical cancer screening and control program has been implemented at the national level for more than ten years [5]. However, various authors [6,7,8,9,10] have warned that for the country as a whole, mortality from this neoplasm has remained virtually stable in the last 30 years. Importantly, various countries have witnessed a drop in mortality from this type of cancer a few years after organized programs have been implemented [11].

Analyses of cervical cancer mortality trends are frequently jeopardized by imprecision in death certificates, since a substantial portion of uterine cancers are coded as unspecified, i.e., without specifying whether the cancer originated in the cervix uteri or corpus uteri, thus requiring correction of the mortality data in the attempt to present more realistic statistics [12,13]. In Brazil, however, corrections to deal with this situation have only been implemented rarely [14], or have been limited to specific locations [15,16,17,18,19].

The objective of this study was thus to describe cervical cancer mortality trends in Brazil according to geographic regions, State capitals, and other municipalities for the period 1981-2006, using the proportional redistribution of deaths certified as "malignant neoplasm of uterus, part unspecified" [20].

Methods

A study was performed on time series clusters for cancer mortality in the Brazilian female population, for 1981-2006. Mortality data were obtained from the Mortality Information System (SIM) and demographic data came from the Brazilian Institute of Geography and Statistics (IBGE), through the website of the Information Technology Department of the Unified National Health System (DATASUS; http://www.datasus.gov.br). The files were extracted in DBC format, which corresponds to DBase compacted files, and expanded with TabWin (DATASUS. http://portal.saude.gov.br/portal/se/datasus/area.cfm?id_area=732).

Deaths from 1981-1995 were obtained according to the 9th revision of the International Classification of Diseases (ICD-9) [21], and those from 1996-2006 were based on the 10th revision (ICD-10) [22]. The codes included in this study were for neoplasms of: cervix uteri: 180, C53; uterus, part unspecified: 179, C55; and corpus uteri: 182, C54, in the ICD-9 and ICD-10, respectively. Aimed at contextualizing the magnitude of cervical cancer mortality as compared to other tumor sites, the mortality data were also extracted for the other most frequent sites: breast (174-175, C50); lung (162, C33-C34); esophagus (150, C15); stomach (151, C16); and colorectal (153, 154.0-154.1, C18-C20).

The mortality rates were calculated for cervical cancer and the other principal neoplasm sites in the female population (breast, lung, esophagus, stomach, and colorectal). The rates were standardized by five-year age bracket with the direct method, using as the reference the standard world population proposed by Segi [23] and modified by Doll et al. [24].

The cervical cancer mortality rates were initially calculated without correction, considering the total deaths reported by the Mortality Information System that were specifically classified as "cervix uteri". The next step was correction based on redistribution of all the deaths from "neoplasm of uterus, part unspecified" as deaths due to cancer of cervix uteri and corpus uteri, according to their original proportions [20].

The time trend for cervical cancer mortality in Brazil, without and with correction, was evaluated through simple linear regression, with year of death as the independent variable, according to the following groupings: geographic regions, State capitals, and other municipalities (interior). The variability in the magnitude of the rates before and after correction of the deaths was determined according to the coefficient of percentage variation {[(corrected rate – uncorrected rate)/ uncorrected rate]× 100}. The analyses were performed with the Stata software, version 9 (Stata Corp., College Station, USA).

The study was approved by the Institutional Review Board of the Institute of Social Medicine, State University of Rio de Janeiro (UERJ).

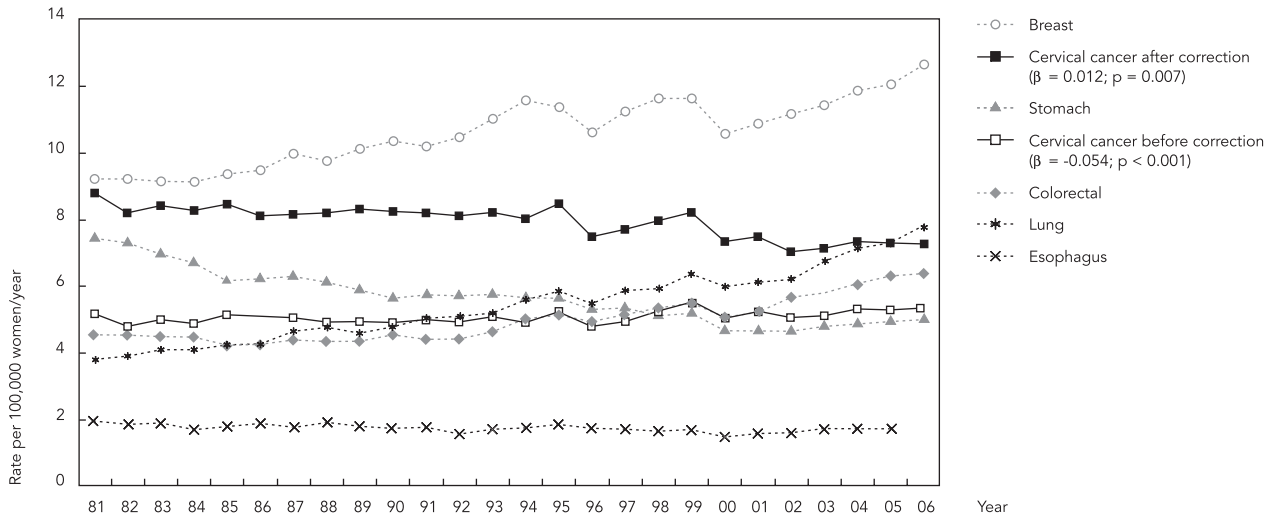
Results

Figure 1 shows the cancer mortality rates in women according to the six principal sites. Uncorrected cervical cancer mortality rates for Brazil as a whole for 1981-2006 showed a slightly upward trend ($\beta = 0.012$; $p = 0.007$), as the fourth cause of cancer mortality in the female population. After correction, the cervical cancer mortality rates showed an important increase, shifting from fourth to second place, next only to breast cancer. However, in the last year of the time series, cervical cancer was also surpassed by lung cancer and thus ranked as the third leading cause of cancer mortality in women. The corrected cervical cancer trend shifted downward ($\beta = -0.054$; $p < 0.001$).

Cervical cancer mortality showed different trends in the State capitals as compared to the interior (Figure 2). In the municipalities in the interior of Brazil, the rates showed an upward trend before correction ($\beta = 0.048$; $p < 0.001$), which stabilized after correction ($\beta = -0.005$; $p = 0.479$). Meanwhile, in the State capitals the rates (uncorrected and corrected) showed a downward trend; after correction, the downward trend increased ($\beta = -0.187$; $p < 0.001$). The magnitude of correction was greater at the beginning of the period until 1995, with a mean percentage variation coefficient of 48% in the State capitals and 78% in the municipalities in the interior, with an important reduction in the subsequent periods, reaching 27% and 43%, respectively, in 2002-2006. In relation to the mortality trend for uterine cancer classified as "part unspecified", there was a significant decrease in the State capitals ($\beta = -0.127$; $p < 0.001$) and the interior ($\beta = -0.053$; $p < 0.001$) during the period analyzed. Importantly, this decrease was greater after the first (1998) and second phase (2002) of intensification of the National Cervical Cancer Control Program, especially in the interior (Figure 2).

Figure 1

Cancer mortality rates in women according to principal tumor sites, including cervical cancer before and after correction. Brazil, 1981-2006.



The country's geographic regions showed distinct patterns, which stood out particularly after correction (Figure 3). In the North and Northeast, there was no change following correction; the State capitals maintained downward trends before (β = -0.139; p = 0.007; β = -0.283; p < 0.001, respectively) and after correcting the rates (β = -0.336; p < 0.001; β = -0.403; p < 0.001, respectively). Meanwhile, the rates in the municipalities in the interior continued to show upward trends (β = 0.175; p < 0.001 and β = 0.157; p < 0.001, respectively). In the Southeast, both in the State capitals and in the interior, the trends remained downward after correction in both areas (β = -0.119; p < 0.001 e β = -0.115; p < 0.001; respectively).

In the South of Brazil, there was a downward trend both before and after correction in the State capitals, but in the interior there was a reversal in the trend during the period studied, with a downward trend after correction (β = -0.064; p = 0.002).

Finally, the Central-West region showed a similar pattern to that of Brazil as a whole. There was a drop in the State capitals before (β = -0.297; p < 0.001) and after correction (β = -0.315; p < 0.001), while in the interior the trend was upward before correction (β = 0.065; p < 0.021) and stable after correction (β = -0.009; p = 0.821).

Discussion

This study's findings show, for the first time, corrected cervical cancer mortality data, broken down for State capitals and other municipalities by geographic region of Brazil for the period 1981-2006. The study showed a downward trend for the country as a whole, with a drop in the State capitals and a stable trend in the municipalities of the interior. The downward trend was statistically significant for the State capitals in all regions of the country, with a differential pattern for the other municipalities.

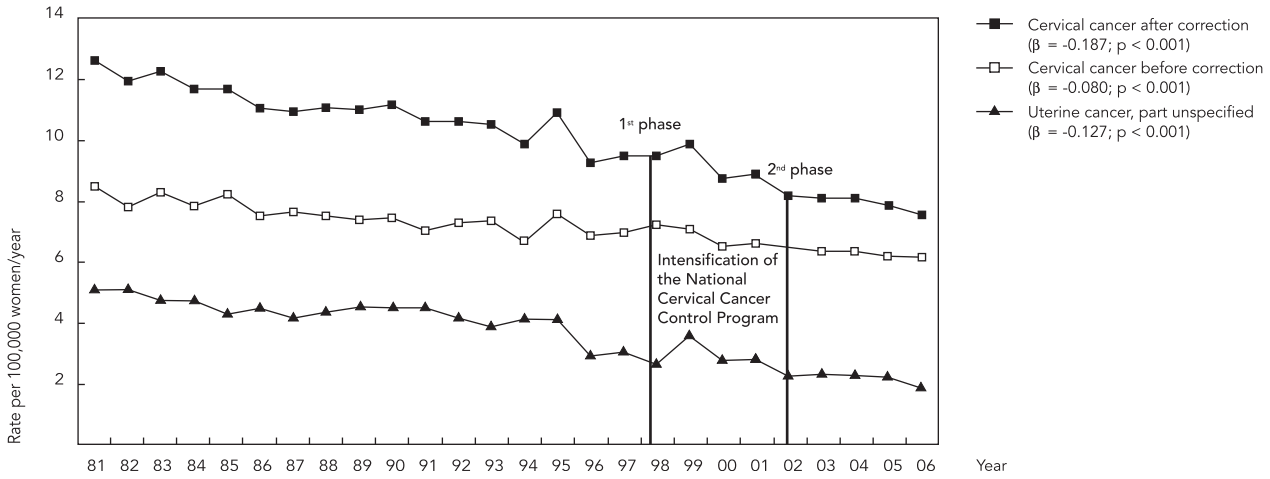
A decrease in cervical cancer mortality had already been detected in some places in Brazil, like the city of São Paulo, but in the period studied (1980-1999) the observed decline was not statistically significant [25]. Antunes & Wünsch-Fillho [15] observed the important impact on cervical cancer mortality in this city after proportionally reallocating the deaths initially classified as "part unspecified" into either cervix uteri or corpus uteri. Studies elsewhere in Brazil, like the cities of Campinas [26] and Salvador [18] and the State of Minas Gerais [17], also showed a recent decrease in mortality from cervical cancer.

In a study in the State of Rio Grande do Sul for 1979-1998, the authors [27] observed an increase in cervical cancer mortality but a drop in mortality from unspecified uterine cancer. Another

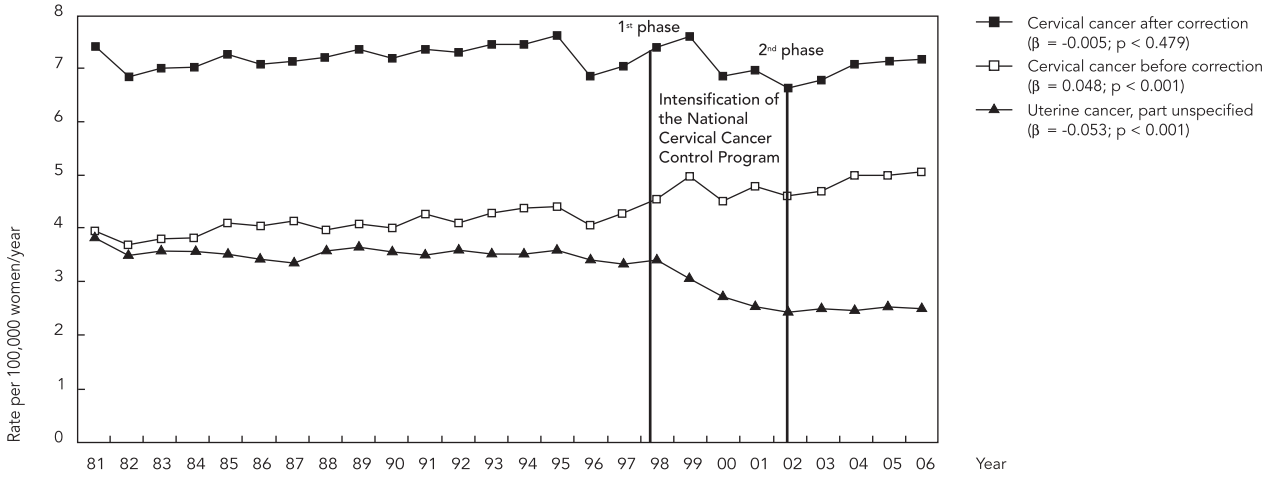
Figure 2

Cervical cancer mortality rates before and after correction and mortality rate for neoplasm of the uterus, part unspecified, in State capitals versus municipalities in the interior. Brazil, 1981-2006.

2a) State capitals



2b) Interior



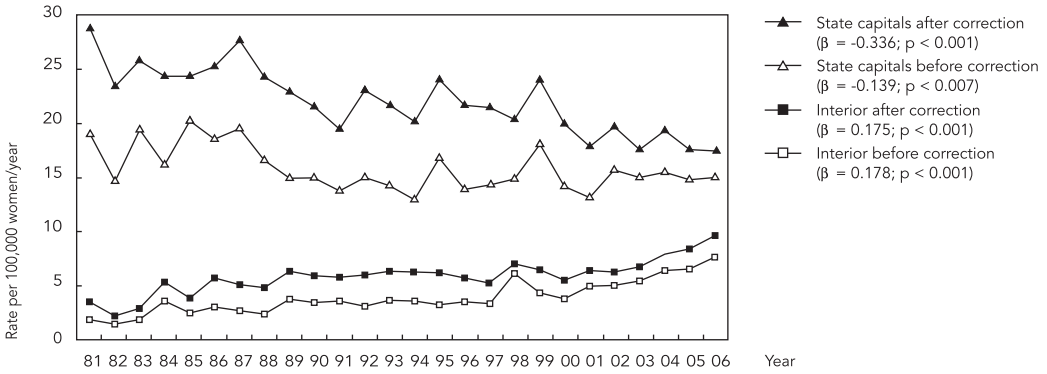
study [16] in the same State and covering a similar period (1979-1995) showed a stable trend when the deaths from cervical cancer and cancer of the uterus, part unspecified, were grouped. Even though these two studies did not show a drop in the rates, the results already suggested the possibility of a downward trend in the future.

Analysis of the corrected rates clearly showed the decrease in mortality, which did not appear when the uterine cancer deaths were classified as "part unspecified". This drop was observed beginning in 1995, when the Brazilian government officially committed itself to develop the National Cervical Cancer Control Program during the 4th World Conference on Women in Beijing, China, followed by implementation of the control program by the Ministry of Health in 1998. The decline before the program's actual implementation could be explained by the cervical cancer screening measures that already existed (even

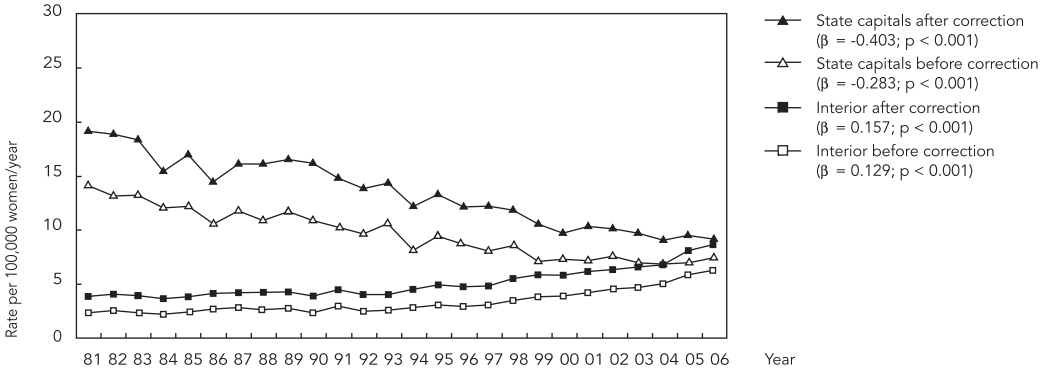
Figure 3

Cervical cancer mortality rates before and after correction, according to geographic regions, divided by State capitals and municipalities in the interior. Brazil, 1981-2006.

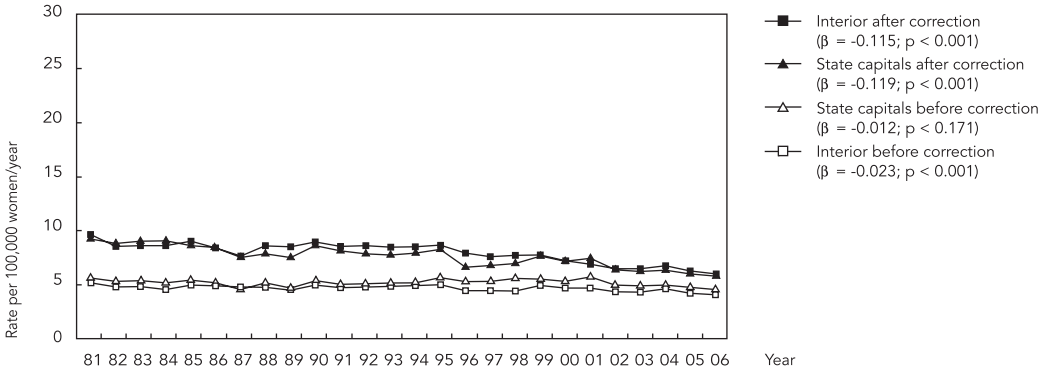
3a) North



3b) Northeast



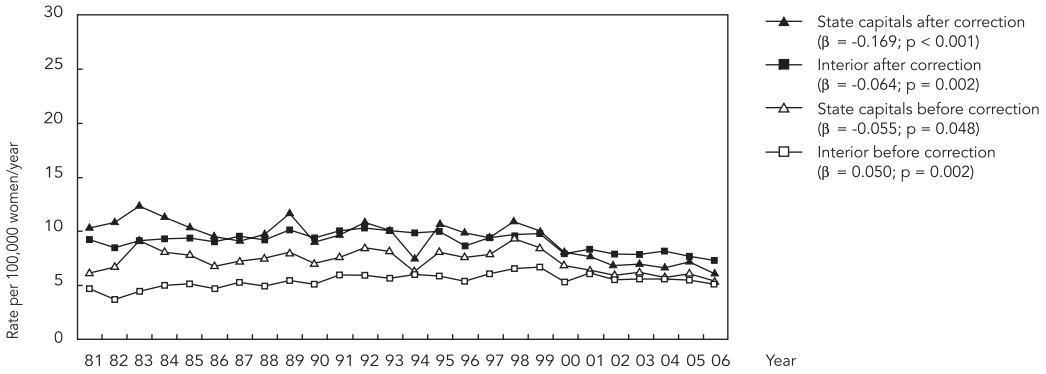
3c) Southeast



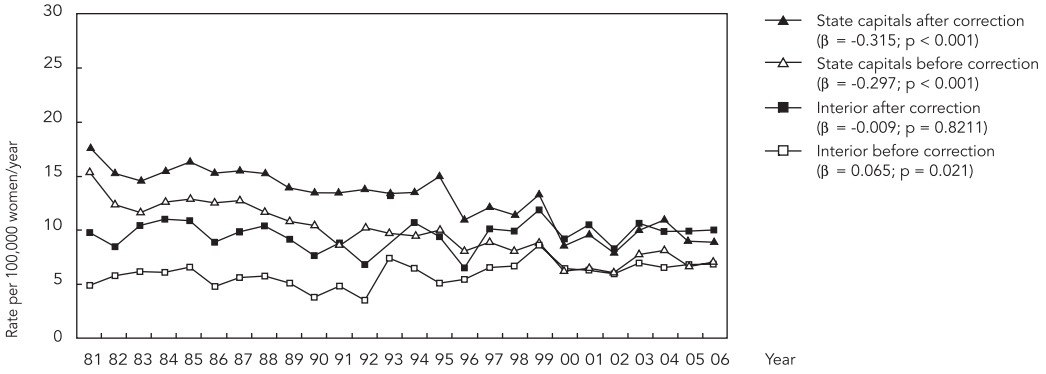
(continues)

Figure 3 (continued)

3d) South



3e) Central



though not in coordinated form) in most regions of Brazil [5]. Similar measures had been considered highly effective in reducing incidence and mortality in some European countries [28].

One can infer that the implementation of the National Cervical Cancer Control Program in 1998, especially through the expanded supply of the Pap smear screening and training for health professionals may have favored increased accuracy in definition of the cause of death. This has contributed to the reduction in mortality from "neoplasm of uterus, part unspecified", and the resulting apparent stability in the cervical cancer mortality trend in Brazil. Other countries have observed the same effect [7,29] shortly after the implementation of cervical cancer control programs, in response to diagnostic precision. Thus, the reduction observed after correction of cervical cancer mortality must reflect the improved access to cervical cancer screening, especially in the country's State capitals.

In addition, it is likely that even more striking decreases in mortality remain masked, since there has also been an improvement in reporting and a decrease in the proportion of deaths attributed to "ill-defined" causes in Brazil [30]. Thus, at least part of the deaths from cervical cancer that have been recorded, especially in the last years of the time series, correspond to deaths that would not have been recorded or would have classified as ill-defined causes in the past.

Despite the observed decline, after correction there was an increase in the rates, making cervical cancer the second leading cause of death from cancer in the female population until 2005, and not the fourth cause as assumed officially on the basis of the uncorrected statistics. This highlights the relevance of cervical cancer in Brazil,

with a corrected rate of 7.26 deaths per 100 thousand women in 2006.

Importantly, the cervical cancer mortality trends showed a differential pattern according to the geographic regions of the country, indirectly reflecting a relationship with the socioeconomic profile of the populations residing in these regions. Among the municipalities in the interior, there was an upward trend in the North and Northeast, a downward trend in the South and Southeast, and a stable trend in the Central-West. In the State capitals, the mortality declined in all the regions of the country.

Considering the municipalities in the interior of the country as a whole (all the municipalities except the State capitals), the mortality trend shifted from upward to stable after correction of the rates. However, in the future a decrease may also be observed, as in the State capitals, as a function of a decrease in (now existing) differences in screening coverage and quality, which clearly illustrate inequality of access, since the country's more developed areas tend to concentrate most of the health services. The extension of cervical cancer screening and adequate treatment for women with altered test results in all the country's municipalities should be a priority for health authorities at all levels. It is thus necessary to continue investing in the expansion of cervical cancer screening, especially in the country's economically underprivileged areas, which concentrate the highest risk populations, with the least access to health services, which hinders early treatment of precursor lesions.

More detailed analyses that include the evaluation of the combined effects of screening and exposure to risk factors could further clarify the program's results in the country. Arbyn et al. [11] suggest that the screening program's effects could be masked by a cohort effect, due to the increased exposure to risk factors in younger cohorts, requiring more specific analyses. These authors also highlight that the cohort effect appears to be stronger in countries without an organized program, as might be the case in some areas of Brazil, especially in the interior.

The correction of cervical cancer mortality as applied in this study not only allowed a more real assessment of the problem, but also represents a necessary stage for improving the SIM, since the code for cancers classified as neoplasm of the uterus, part unspecified, does not correspond to a legitimate mortality category, and thus requires correction. Furthermore, the correction of other aspects may further affect the magnitude and distribution of mortality from this cancer in Brazil, like underreporting, which deserves evaluation in additional studies.

This study's results allow concluding that the downward trend in cervical cancer mortality, although uneven among the country's geographic regions and municipalities, begins to take a consistent shape. Even better results could be achieved through a major investment in increasing the coverage of strategies for the prevention and control of cervical cancer, especially among the populations at greatest risk.

Resumo

Este estudo objetivou descrever a evolução da mortalidade por câncer do colo do útero no Brasil, entre 1981-2006. Foi efetuada correção da mortalidade por esse câncer com base na redistribuição proporcional dos óbitos por câncer do útero, "porção não especificada". A tendência temporal foi avaliada por meio de regressão linear simples. Após correção, as taxas de mortalidade por câncer do colo do útero passaram a ocupar o segundo lugar entre os principais cânceres na população feminina até 2005, com tendência decrescente para o país como um todo, queda nas capitais e estabilidade nos municípios do interior. Confirmou-se tendência decrescente nas capitais em todas as regiões do país. Já nos municípios do interior, houve aumento nas regiões Norte e Nordeste, declínio nas regiões Sudeste e Sul e estabilidade no Centro-oeste. A queda observada, mesmo que ainda de forma desigual, começa a se esboçar consistentemente no país. E poderia alcançar resultados ainda melhores com investimento no aumento de cobertura do rastreamento, especialmente entre as populações de maior risco.

Neoplasias do Colo do Útero; Mortalidade; Estudos de Séries Temporais

Contributors

G. Azevedo e Silva participated in conceiving and planning the study, the literature review, supervision of the analysis, interpretation of the results, and writing the discussion. V. R. Girianelli and C. J. Gamarra collaborated in the literature review, conducting the analyses, production of the illustrations, interpretation of the results, and writing the discussion. M. T. Bustamante-Teixeira contributed to the data analysis, revision of the results, and writing the discussion.

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