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Trends and predictions to 2020 in breast cancer mortality: Americas and Australasia

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ABSTRACT

Objectives: We considered trends in breast cancer mortality for 12 American and 8 Australasian countries during 1970–2014, and predicted rates for 2020.
Materials and methods: We obtained official death certification data for breast cancer and population figures from the World Health Organization, Pan American Health Organization and United Nations databases. We derived age-standardized rates (world standard population), and predictions for 2020 using joinpoint regression.
Results: Breast cancer mortality trends were favourable in North America and Oceania, and a further 10% reduction in their overall rates is predicted for 2020, to reach values of 11–12/100,000 women, i.e. about 50% lower than their top rates in the later 1980's. Hong Kong, Japan and Korea did not show appreciable trends, but their rates remained below 10/100,000. Mexico, Chile, Colombia, Brazil also had stable rates, below or around 10/100,000. Breast cancer mortality was higher in Argentina, Cuba and Venezuela, and only Argentina showed some favourable trends over recent years, and predictions to 2020 around 16/100,000. Trends and predictions were less favourable in Israel, New Zealand, and the Philippines than in most other countries with predicted rates in 2020 between 13 and 16/100,000.
Conclusion: In several high-income countries, the fall in breast cancer mortality, due to improved treatment and diagnosis, has been the major success in the management of any common cancer over the last three decades. There are, however, persistent disparities in the global decline in breast cancer, which call for urgent management improvements in several areas of the world, particularly in middle-income countries.

1. Introduction

Over the last three decades, breast cancer mortality has been substantially declining in North America [1], and most (western) European countries [2].

Such a major fall in mortality, which has reached 30–40% in age-standardized rates for several countries, has been attributed to improvements in management of the disease, including earlier diagnosis and, chiefly, advancements in treatment [3–8].

Fewer data are available from other areas of the world, and indicate different patterns and trends as compared to North America and Europe, i.e. generally lower rates in the 1980's or 1990's, but less favourable trends thereafter [9].

In previous work, we analysed trends in breast cancer mortality over the period 1970–2014 for 37 European countries, and predicted a further 10% decline in mortality to 2020 in the European Union as a whole [2]. Here, we apply the same approach to 20 countries from the Americas, Asia and Oceania providing valid breast cancer death certification data over the 1970–2014 period.

2. Materials and methods

We obtained official death certification data for breast cancer over the 1970–2014 period (or the most recent available year) from the World Health Organization (WHO) database, as available on

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electronic support [10]. We considered data for 12 American countries and for 8 Asian and Oceanian countries with an over 90% deaths certification coverage (except Brazil, 85%, included due to its large population) and over 3 million inhabitants. We retrieved resident population figures from the WHO, from the Pan American Health Organization (PAHO) and United Nations (UN) databases [10–12].

During the calendar period under study, three different Revisions of the International Classification of Diseases (ICD) were used (8th, 9th and 10th ICD) [13–15]. Since no relevant changes in breast cancer certification were registered, we recoded classification of cancer deaths, for the period and all countries considered, according to ICD-10 (code C50).

From certified deaths and resident population matrices, we computed age-specific mortality rates for each 5-year age group (from 0 to 4 to 85+ years and from 0 to 4 to 80+ for the Americas) and calendar year or quinquennium. We computed age-standardized rates per 100,000 person years, using the direct method on the basis of the world standard population, at all ages and at ages 20–49, 50–69 and 70–79 years [16].

Of the 20 selected countries, for the 16 most populous we fit a logarithmic Poisson count data joinpoint regression model to the number of certified deaths in each 5-year age groups, allowing for up to five joinpoints [17], in order to identify the most recent trend segment. We applied a linear regression model to mortality data for each age group over the most recent trend segment identified by the joinpoint model to compute the predicted age-specific certified numbers of deaths to 2020 and the corresponding 95% prediction intervals (PIs). We estimated predicted age-standardized deaths rates with their corresponding 95% PIs using the predicted age-specific death counts and the predicted population data obtained from WHO, PAHO and UN databases.

We estimated numbers of avoided breast cancer deaths over the years 1990–2020 by comparing observed and expected deaths on the basis of the 1990 age-specific rates, which were close to the top rates in most countries.

3. Results

Table 1 provides the age-standardized mortality rates per 100,000 women from breast cancer at all ages and for three age groups (20–49, 50–69, and 70–79 years) for the 20 selected countries worldwide around 2002 (2000–2004), 2007 (2005–2009) and in 2012 (2011 for the Philippines). Overall, breast cancer rates in North America declined by about 20% from 2002 to 2012 to reach values of about 14/100,000 in both Canada and the United States of America (USA). In Latin America the highest 2012 mortality rates were over 17/100,000 in Argentina and Uruguay, and 14/100,000 in Cuba and Venezuela. Argentina and Uruguay showed some falls over the last decade, Cuba showed a stable pattern, while Venezuela had an upward trend. Rates were much lower (around 10/100,000) in other major Latin American countries, and their trends were stable. Similarly to North America, in 2012 Australia had a rate of 13.2, compared to 16.2 in 2002 (−18%). Hong Kong, Japan and the Republic of Korea showed the lowest rates with, however, stable or increasing patterns. Breast cancer rates for Israel, New Zealand and the Philippines were about 16/100,000 in 2012. Over recent calendar years, Israel and New Zealand had favourable trends, but the Philippines had a rising trends. In young women (20–49 years), all countries showed declining trends, except Brazil, Chile and Venezuela (stable pattern) and the Philippines (+18%). In North America the 2012 rate was 6.6/100,000 for both Canada and the USA; Argentina had the highest Latin American rate (8.5/100,000 women), but an 11% fall between 2002 and 2012. For Hong Kong the decline was 13%, for Japan about 20%. In the 50–69 years age group, breast cancer mortality rates declined by 28% in Canada (42/100,000 in 2012), and by 20% in the USA (44.4/100,000 in 2012). In Argentina breast cancer death rate in 2012 was 58.5/100,000, in Cuba and Venezuela 49/100,000, and in most other countries considered around or slightly over 30/100,000. Australia, New Zealand and Israel had downwards trends, with falls between 2002 and 2012 over 20%. In the older age group considered (70–79 years), North America and Oceania had similar

Table 1
Age-standardized (world population) mortality rates per 100,000 women from breast cancer at all ages and at 20–49, 50–69 and 70–79 years in various countries worldwide around 2002 (2000–2004), 2007 (2005–2009) and in 2012 (unless indicated in parentheses), and corresponding changes in rates.

		All ages				20–49				50–69				70–79			
		2002	2007	2012	% change (2012/02)	2002	2007	2012	% change (2012/02)	2002	2007	2012	% change (2012/02)	2002	2007	2012	% change (2012/02)
North America	Canada	17.61	15.40	13.68	−22.3	7.59	6.84	6.58	−13.3	57.88	49.25	41.96	−27.5	107.78	95.85	85.43	−20.7
	USA	16.81	15.08	13.80	−17.9	8.10	7.08	6.59	−18.6	55.27	49.47	44.36	−19.7	100.92	90.81	84.86	−15.9
Latin America	Argentina	19.75	18.45	17.56	−11.1	9.58	8.81	8.54	−10.9	64.95	61.15	58.50	−9.9	115.80	107.41	99.28	−14.3
	Brazil	10.83	11.17	11.48	6.0	6.38	6.62	6.94	8.8	34.52	35.67	36.80	6.6	56.42	57.51	56.88	0.8
	Chile	10.98	10.54	10.16	−7.5	5.57	5.49	5.36	−3.8	35.31	33.40	31.38	−11.1	63.17	61.53	59.78	−5.4
	Colombia	9.68	9.55	9.69	0.1	5.68	5.38	5.69	0.2	32.86	31.28	30.56	−7.0	46.73	52.87	53.58	14.7
	Costa Rica	10.46	10.53	10.02	−4.2	6.29	5.20	5.20	−17.3	30.15	32.97	28.50	−5.5	62.22	63.66	70.29	13.0
	Cuba	14.62	14.88	14.86	1.6	7.31	7.16	6.47	−11.5	49.59	49.10	48.90	−1.4	77.76	86.92	86.44	11.2
	Mexico	9.03	9.33	9.56	5.9	6.66	6.30	5.97	−10.4	29.66	31.64	33.02	11.3	34.86	38.95	43.84	25.8
	Puerto Rico	13.15	13.22	13.21	0.5	7.13	7.62	6.18	−13.3	46.23	43.53	46.77	1.2	66.61	71.23	71.15	6.8
	Uruguay	21.60	20.67	17.78	−17.7	11.15	10.22	9.26	−17.0	72.12	68.62	56.82	−21.2	115.90	118.43	105.39	−9.1
	Venezuela	12.23	12.36	14.32	17.1	7.94	7.10	7.97	0.4	39.34	42.10	49.16	25.0	60.48	60.20	68.69	13.6
Asia and Oceania	Australia	16.15	14.42	13.21	−18.2	8.18	6.88	5.85	−28.5	54.11	48.10	43.12	−20.3	87.76	79.94	82.72	−5.7
	Hong Kong SAR	8.42	8.54	8.58	1.9	6.03	5.41	5.25	−12.9	27.06	29.47	31.29	15.6	32.84	33.24	25.04	−23.8
	Israel	20.86	18.59	16.81	−19.4	10.31	9.07	8.98	−12.9	64.68	59.41	49.97	−22.7	122.95	104.50	101.58	−17.4
	Japan	8.38	8.86	8.67	3.5	6.30	5.93	5.05	−19.8	29.50	32.21	32.13	8.9	26.20	30.31	33.84	29.2
	Kuwait	14.37	15.91	17.20	19.7	6.12	6.47	3.89	−36.4	43.00	48.44	51.21	19.1	90.16	100.75	80.37	−10.9
	New Zealand	20.37	18.24	15.65	−23.2	11.83	10.02	9.11	−23.0	66.44	59.37	49.06	−26.2	105.81	101.66	86.38	−18.4
	Philippines (2011)	13.76	15.48	16.34	18.8	9.69	10.93	11.42	17.9	45.73	52.07	56.31	23.1	54.72	57.47	59.20	8.2
	Republic of Korea	4.47	4.95	5.05	13.0	4.22	4.43	4.17	−1.2	13.64	15.80	16.95	24.3	12.95	14.73	15.40	18.9

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