ORIGINAL ARTICLE

Premature Cardiovascular Death and Socioeconomic Status in Argentina. On the Opportunities and Challenges of Representing Vulnerable Populations

Muerte cardiovascular prematura y condición socioeconómica en la Argentina. Acerca de las oportunidades y desafíos de representar a poblaciones vulnerables

ALEJANDRO MACCHIA[1], JAVIER MARIANI[MTSAC,1], DANIEL FERRANTE[MTSAC,2], DANIEL NUL[MTSAC,1], HUGO GRANCELLI[MTSAC,1], HERNÁN DOVAL[MTSAC,1]

ABSTRACT

Background: Premature death is a challenge from the social, medical, sanitary and economic point of view. Many of these deaths are avoidable with the implementation of State policies. Scientific societies may and should participate in the guidance of public policies. However, precise data and an inclusive approach are necessary to accomplish this end.
Objective: The aim of this study was to describe the temporal trend of premature all-cause and cardiovascular deaths in Argentina during the period 2000-2010.
Methods: An ecological model, evaluating the evolution of specific and standardized rates of premature death (≤74 years) was used. Additionally, the relationship between socioeconomic status (SES) and premature death was examined. The 513 departments of Argentina were the analysis unit.
Results: Premature all-cause mortality (median per 10,000 persons/year; p value) declined from 42.65 in 2000 to 38.67 in 2011 ($p<0.001$). A similar result was obtained for cardiovascular death (from 12.75 in 2000 to 10.09 in 2011; $p<0.001$). A significant, linear relationship between SES and premature death was verified without threshold in all years. The velocity and relative reduction were significantly different across different SES strata.
Conclusions: Although the mortality rate was reduced, the gap between SES and premature deaths widened in Argentina, indicating the need to think on whom and how we should pay closer attention.

Key words: Socioeconomic Factors - Healthcare Disparities - Vital statistics

RESUMEN

Introducción: La muerte prematura constituye un desafío desde el punto de vista social, médico, sanitario y económico. Muchas son evitables con la implementación de políticas de Estado. Las sociedades científicas pueden y deben participar en el asesoramiento de políticas públicas. Sin embargo, para esto son necesarios datos precisos y una mirada inclusiva.
Objetivo: Describir la tendencia temporal de muertes prematuras por todas las causas y cardiovasculares en la Argentina en el período 2000-2011.
Material y métodos: Se utilizó un modelo ecológico, que evaluó la evolución de las tasas específicas y estandarizadas de muerte prematura (≤74 años). Asimismo, se examinó la relación entre la condición socioeconómica (CSE) y la muerte prematura. La unidad de análisis fueron los 513 departamentos de la Argentina.
Resultados: La muerte prematura (mediana cada 10.000 personas/año; valor de p) por todas las causas se redujo significativamente desde el año 2000 (42,65) hasta el 2011 (38,7) ($p < 0,001$). Lo propio sucedió con la muerte cardiovascular (de 12,75 en el año 2000 a 10,09 en el año 2011; $p < 0,001$). La muerte prematura tuvo una asociación significativa con la CSE, existiendo un gradiente lineal, sin umbrales en todos los años entre CSE y muerte prematura. La velocidad y la reducción relativa fueron significativamente distintas entre los diversos estratos de CSE.
Conclusiones: Aunque la tasa de mortalidad se redujo, la brecha entre la CSE y la muerte prematura se incrementó, lo que obliga a reflexionar sobre en quiénes y cómo debemos depositar la mirada.

Palabras clave: Factores socioeconómicos - Disparidades en atención de salud - Estadísticas vitales

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Address for reprints: Dr. Alejandro Macchia - GESICA Foundation (Study Group of Clinical Investigation in Argentina) - Avenida Rivadavia 2431, Entrada 4, Piso 4, Oficina 5 – (1034) Ciudad de Buenos Aires – e-mail: alejandro.macchia@fundaciongesica.org

[MTSAC] Full Member of the Argentine Society of Cardiology
[1] GESICA Foundation (Study Group of Clinical Investigation in Argentina).
[2] Cardiovascular Disease Control and Prevention Program, National Ministry of Public Health

Abbreviations

IDC-10	International Disease Classification, 10th version	**INDEC**	National Institute of Statistics and Census
SES	Socioeconomic status	**UBN**	Unsatisfied basic needs
DHSI	Directorate of Health Statistics and Information	**WHO**	World Health Organization
NCD	Non-communicable diases		

INTRODUCTION

Inequity in the incidence of premature death is well documented in North America and Europe. (1-3) Furthermore, for over 30 years it has been continually stated that the distribution is inequitable and that the gradient or gap between different socioeconomic strata gradually widens. (3-6). Inequity in the occurrence of premature deaths cannot be in any way considered a normal part of the life of populations. The State can and should promote actions and establish health policies to reduce inequity in premature death. This effort should receive the commitment and advice that the universities, scientific societies and independent research groups can provide. However, public policy recommendations should arise from consistent information, with sufficiently robust and representative data of the national reality.

The aims of this study were to describe the standardized rates of premature all-cause and cardiovascular death in Argentina from 2000 to 2011; to examine the temporal behavior of these rates and to analyze the relationship between socioeconomic status and the aforementioned rates as well as their temporal trend.

METHODS

Design and data sources

This study used an ecological design for the analysis of standardized rates and temporal trends and their associations with SES, using as data sources the records of all deaths in people aged between 0-74 years in Argentina as well as the number of persons and demographic composition of the 513 departments distributed across the 23 provinces of Argentina and the Autonomous City of Buenos Aires. The information provided by the National Institute of Statistics and Census (INDEC), arising from the national 2001 and 2010 population and housing censuses, was used to establish the number of persons aged between 0-74 years living in each of the departments of Argentina. The data takes into account the distribution by age and gender. The component method (7) was used to estimate the size of the population during the intercensal period.

The number of all-cause deaths and deaths for cardiovascular causes by department was based on information provided by the DHSI (Directorate of Health Statistics and Information) of the National Ministry of Public Health. This information comes from processing the death certificates of the departments of Argentina during the period used for the analysis. The cause of death is processed by DHSI with a specific validated algorithm and using the classification provided by IDC-10 (8). The cause of death reported by the program is called the "underlying cause" as recommended by the World Health Organization.

The direct standardization method (9) was used for the calculation of standardized death rates by age and gender (incidence density) at departmental level, using the 2010 Argentine population as standard population. Use of other theoretical populations, like those provided by WHO, did not change the results (data not shown).

Rates are reported on an annual basis of 10,000 residents.

To classify socioeconomic status, a geographic departmental measure of unsatisfied basic needs (UBN) was used. These data come from integrated sources of INDEC (2001 census) and CEPAL (United Nations Economic Commission for Latin America and the Caribbean) (multiple periods). The UBN arise from complex aspects that include the following domains: income, highest educational level attained, housing conditions, overcrowding rateand sanitary conditions, as described in other sources. (10)

With this information, each department of Argentina was rated with a percentage of UBN. This represents the proportion of households in each department with UBN. Subsequently all departments were divided into UBN quintiles, with Q1 corresponding to less UBN (departments with less needs).

Statistical analysis

A multivariate Poisson regression random-effects model for panel data was used. These models are used when the analyzed estimator is a number of discrete events (such as the number of deaths in a year) and the dependent variable has Poisson distribution (mean similar to variance). Panel data also include an error term and a second term that controls for unobserved time-invariant characteristics in the analysis unit. In this specific analysis, they include but are not limited to geographic, historical and socio-cultural department variables.

STATA 13.0 was employed for data processing and analysis.

Ethical considerations

The study protocol was revised and approved by the Institutional Bioethics Committee. All patients signed an informed consent before BCA.

RESULTS

The standardized all-cause death rate was significantly reduced from 2000 to 2011 ($p<0.001$) (Table 1). The rate mainly decreased from 2002 to 2006 and since then had a stable behavior.

The same happened with the standardized rate for cardiovascular death ($p<0.001$) (Table 2).

There was a wide UBN distribution range among the 513 geographical departments across Argentine households (0% to 73%). "Populations" with different demographic characteristics (Table 3) were identified by their division into UBN quintiles. Quintiles 1 and 2 were characterized for housing 22.5% and 30.6% of the population, with an average UBN of 6% and 9.4%,

Table 1. All-cause mortality. Standardized annual rate (median) for the overall population and for each SES quintile.

Year	All	Q1	Q2	Q3	Q4	Q5
2000	42.65	38.95	42.27	44.13	46.22	47.85
2001	42.50	38.99	42.35	44.06	45.38	45.88
2002	42.98	38.56	42.40	44.90	47.00	48.87
2003	42.78	38.79	42.80	44.13	46.56	46.91
2004	40.70	37.50	40.52	41.50	43.70	45.88
2005	39.77	36.43	39.91	40.42	43.31	44.89
2006	38.93	35.61	39.02	39.56	42.27	44.31
2007	40.56	36.87	40.76	41.44	43.88	46.07
2008	39.28	35.38	39.73	39.93	43.02	44.65
2009	39.16	35.07	39.29	39.69	43.43	46.96
2010	39.07	34.92	39.11	39.74	43.28	46.19
2011	38.70	34.79	38.94	39.20	42.52	45.29

Table 2. Death for cardiovascular causes. Standardized annual rate (median) for the overall population and for each SES quintile.

Year	All	Q1	Q2	Q3	Q4	Q5
2000	12.75	12.13	13.94	14.71	15.02	15.14
2001	12.58	12.19	13.77	14.29	14.91	14.30
2002	12.65	11.77	13.93	14.90	15.47	14.71
2003	12.22	11.36	13.87	14.20	15.19	14.06
2004	11.46	10.55	13.04	13.15	13.95	14.23
2005	10.90	10.16	12.41	12.51	13.45	13.17
2006	10.53	9.91	11.77	12.20	12.88	12.45
2007	10.78	10.00	12.24	12.66	13.72	13.09
2008	10.14	9.59	11.44	11.93	13.01	12.61
2009	10.01	9.45	11.36	11.68	12.90	13.01
2010	10.29	9.85	11.46	11.97	13.18	13.20
2011	10.09	9.39	11.39	11.87	12.71	12.54

respectively, and quintiles 3-5 for housing more than 17 million persons with an average UBN of 15% to over 30%.

A close relationship between SES and both premature all-cause and cardiovascular death was verified (Figures 1 and 2). In all the years considered, a growing linear relationship without thresholds was observed between SES and standardized rate of death (Figure 1) and cardiovascular death (Figure 2).

Temporal behavior of standardized all-cause mortality rates showed a distinct reduction according to SES (Tables 1 and 2). Thus, comparing the medians of

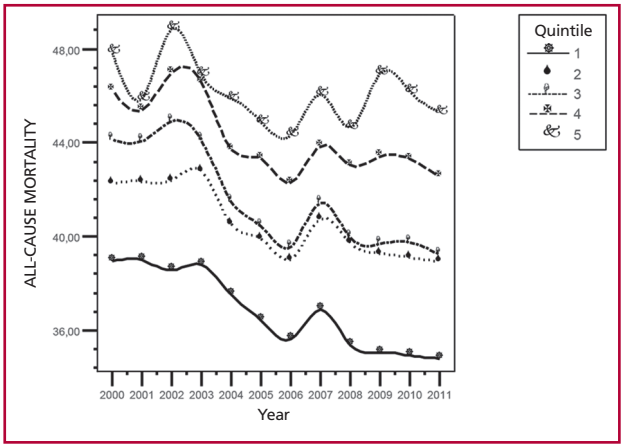

Fig. 1. Socioeconomic condition and temporal evolution of standardized all-cause mortality (median) rate.

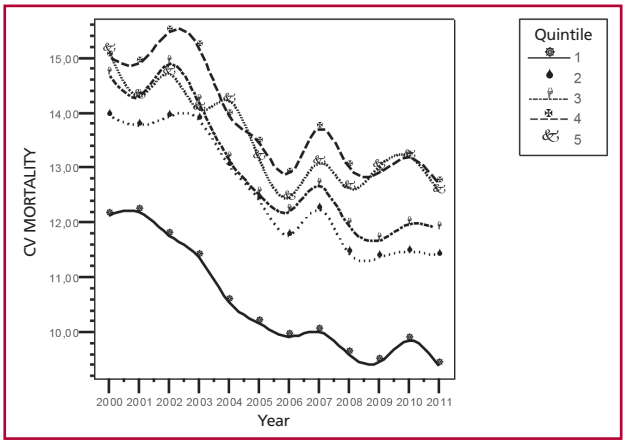

Fig. 2. Socioeconomic condition and temporal evolution of standardized cardiovascular death (median) rate.

Table 3. Demographic characteristics of Argentine SES quintiles.

	Socioeconomic quintiles				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Age (median)	33.8	28.7	26.0	22.8	20.6
Age (mean)	36.6	32.6	30.2	27.7	26.2
Population (millons)	8.17	11.10	10.71	3.92	2.34
% population	22.5	30.6	29.6	10.8	6.4
UBN (SD)	6.0 (1.3)	9.4 (1.1)	14.9 (1.9)	21.2 (1.5)	30.8 (6.8)
UBN range	0 - 7.6	7.6 – 11.3	11.5 – 18.6	18.7 – 24.1	24.1 – 73.2

UBN: Unsatisfied basic needs

standardized rates during the period 2000-2002 with those corresponding to 2009-2011, a relative reduction of 10%, 7.6% and 10.9% was observed for quintiles 1-3, respectively, but only of 6.8% and 2.9% for quintiles 4 and 5.

The gap or gradient between the 1st and 5th quintile was 22.8% in 2000 but 30.2% in 2011. The same happened with the gradient between quintile 1 and 4 (from 18.7% in 2000 to 22.2% in 2011) and between quintile 1 and 2 (from 7.8% in 2000 to 10.7% in 2011), but not between quintile 1 and 3 (from 13.3 % in 2000 to 12.6% in 2011).

Premature cardiovascular death showed a significant reduction in all SES quintiles. In quintile 1, the average standardized rate for the triennium 2000-2003 (12.0) decreased to 9.6 in the triennium 2009-2011, implying a relative reduction (RR) of 20.5%. The reductions were smaller in magnitude with increasing UBN rate. In quintile 2 it decreased from 13.9 to 11.4 (RR 17.8%), in quintile 3 from 14.6 to 11.8 (RR 19.1%), in quintile 4 from 15.1 to 12.9 (RR 14.5%) and in quintile 5 from 14.7 to 12.9 (RR 12.2%). As a result of this differential reduction, an increase in the gap between the most favored quintile and those with higher UBN was verified. The gap between quintile 1 and 5 increased from 24.8% in 2000 to 33.6% in 2011. A similar increase was verified between quintile 1 and 4 (23.8% in 2000 to 35.3% in 2011), between quintile 1 and 3 (21.3% in 2000 to 26.4% in 2011) and between quintile 1 and 2 (13.0% in 2000 to 17.5% in 2011).

Excess cardiovascular mortality between 35 and 74 years

In order to estimate the absolute number of early cardiovascular deaths by age groups, the number of residents in quintiles 2-5 that "should" die if they had the same quintile 1 specific death rate per year was calculated. Thus, in the 12-year analysis, the group between 65 and 74 years showed an excess of 36,929 deaths, the group of 55 to 64 years 19,571 deaths, the group of 45 to 54 years 6,849 deaths and the group of 35 to 44 years a total of 2,135 deaths.

Accordingly, a total of 65,484 Argentine people aged between 35 to 74 years died prematurely from cardiovascular causes in the 12 years analyzed, by the mere fact of not having the death rate of the economically most favored quintile. This equates to approximately 5,500 people per year or 15 individuals below 75 years of age per day.

DISCUSSION

Premature death in general and cardiovascular death in particular has been reduced across all social strata in Argentina since 2000. However, regardless, it is also important to emphasize that both the incidence and evolution of death rates were characterized by a profound inequality. In all the years, the higher the unmet basic needs of the geographic department the higher the premature death rate. The gradient was linear, without threshold and present in all the years considered in this study both for all-cause death as for cardiovascular death. In Argentina, as almost worldwide (11), premature death is associated with extensive and continuous poverty gradient.

The gap between the most favored socioeconomic group and all the rest increased in the 12 years considered. Although the increased gradient was the result of a divergent decrease in the standardized death rate, as also reported in other countries, not for being similar there is less room for worrying.

The decrease of premature death is a phenomenon present in most countries with reliable vital statistics and no ongoing armed conflicts. (12)

Overall, the risk of dying prematurely before age 50 is 15% (13.7% in Argentina, 2011) of which 5% corresponds to deaths in children under 5 years (3.7% in Argentina, 2011). Accordingly, the risk of death between 5 and 50 years is about 10%. These deaths are due to non-communicable diseases (NCD) in 25% of cases (27.3% in Argentina in 2011), although NCD account for 80% of premature death between 50 and 70 years (exactly 80% of deaths in Argentina). (13)

As shown in this work, the reduction of premature all-cause death was accompanied/led by the reduction of cardiovascular death. However, this overall decline conceals profound differences between the components of society. People who lived in the socioeconomic most privileged quintiles were benefited with the greatest reduction. This is no accident but an act of commission or omission in planning.

Although this is an environmental analysis and as such can only postulate a hypothesis on the reason why rate reductions were dissimilar, it is important to reflect on this. First of all, the determinants and healthy living conditions are distributed unequally among the various social groups. Risk factor surveys in Argentina (14) expressively show that both the load and the evolution of risk factors are concentrated among the segments with the worst social conditions. Amartya Sen associates poverty not only with economic indicators but rather as the absence or limited capacity to make free choices (15). The poor in Argentina -and in the world- are not entirely free to decide what to eat, how to live, when to exercise or work. In fact,to focus recommendations based on a supposed free individual choice is to penalize the individual. Smoking is the factor most closely associated with early deaths. (16). The decision of whether to smoke or not could be considered by some as an entirely free and informed decision. However, the higher prevalence of smokers among the poor deserves a deliberation that should go beyond individual choice. The price of cigarettes in Argentina is the lowest in the region and one of the lowest in the world. Argentina advanced with a series of measures in the fight against tobacco consumption, but the State decision of not ratifying the framework agreement and therefore not increasing the price of cigarettes -the strongest individual measure proven (17)- corresponds to a deliberate maneuver made

against the health of the population, particularly of the poor, and in favor of huge corporation interests (18) influenced by the interference of the tobacco industry, the different perspectives between State areas (especially Health, Economy and Agriculture), legislators from producing provinces and large tobacco producers. This has not merely been a "government" decision but a State policy. If we compare the Argentine situation with that of Uruguay (19) or Brazil the dimension of missed opportunities is obvious. The same happens with the availability, quality and marketing of unhealthy foods with high energy density and low price that render them particularly attractive to those who have fewer resources.

The other aspect to consider when explaining the results is associated with healthcare provision. Healthcare fragmentation in Argentina has relegated public services to the category of structures for the poor. In primary healthcare public services, drug strategies that proved to reduce morbidity and mortality of cardiovascular conditions such as the use of antihypertensive agents and statins have been recently included. The REMEDIAR program began distributing free antihypertensive agents only in 2003 and in cooperation with the REDES program, statin prescriptions were launched in 2014. Not surprisingly, the differences in premature death reduction are different between those who do or do not have access to the medications.

The medical community, particularly universities and scientific societies have a tremendous opportunity and responsibility to highlight the vulnerability of the poor to premature death. In this regard it is important to take initiatives as those done by the Permanent National Registry of Cardiovascular Diseases to Monitor Public Policies (20). However, these initiatives have the challenge of being inclusive and representative of all sectors of our community.

Previous experiences of registries in our country have focused their attention on care centers mainly located in departments belonging to the most economically privileged quintile and often underrepresented by public structures according to the place of survey. The SCAR registry, for example, concluded that in Argentina ST-segment elevation infarctions were reperfused in almost 70% of cases and in 50% of them by primary percutaneous coronary intervention (21). Although this could just be considered a bias, perhaps when using it as an instrument of recommendations/ monitoring of public policies- it could be considered as an exclusion of the poorer sectors. If the registries are not characterized by including those who are most vulnerable and have more prevalence of premature death, the results will generate a recommendation only for those who have access to the surveys.

The Dutch sociologist Saskia Sassen in her book "expulsions" (22) refers to statistics that measure only those who are "visible". Although a matter of econometrics, the concept is similar. The author claims "... what is left out of these measures that show a return to some improvement is that a significant portion of households and places have been expelled from that [economic] space that is being measured and then postulate".....The expelled become invisible for the formal measurements, and thereby the negative dragon growth rates is neutralized....It leads one to wonder if this brutal restructuring was undertaken precisely in order to achieve a smaller but workable economic space that would show growth in GDP according to traditional metrics even if it necessitates the expulsion from the economy, of considerable sectors "...The alternatives to this form of registries are manifold and require interaction with epidemiologists, demographers, sociologists and economists. Obviously the discussion of the specific designs is beyond the scope of this work. However, the idea of at least three good alternatives could be outlined. First, a population study with controlled denominators could be appointed. This was the first major objective of the MONICA survey with the encouragement of local initiatives, a central coordination team and decentralized budgets (23). Challenges are enormous and require strong training and management commitment. Alternatively, and taking advantage of the healthcare fragmentation in Argentina, denominators could be controlled through the use of administrative databases (record linkage analysis) of closed prepaid healthcare systems, social work insurance and law enforcement structures or armed forces. Finally, we can always resort to the laborious and costly study of equiprobability incorporation.

CONCLUSIONS

Every year around 5,500 people under 75 years of age die prematurely from cardiovascular causes in Argentina, by the mere fact of suffering the risk factor of "not belonging" to the 20% of the population with better economic and social status. Our regard must be inclusive and our metrics and designs cannot expel them. As a society we are more than the sum of individuals and -as Saramago said- the responsibility of having eyes when others do not have them (24).

Conflicts of interest

None declared

(See authors' conflict of interest forms in the web/ Supplementary Material).

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