

Trend in infant mortality rate in Argentina within the framework of the Millennium Development Goals

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ABSTRACT

Introduction. Infant mortality rate (IMR) is an indicator of the health status of a population and of the quality of and access to health care services. In 2000, and within the framework of the Millennium Development Goals, Argentina committed to achieve by 2015 a reduction by two thirds of its 1990 infant mortality rate, and to identify and close inter-jurisdictional gaps. The objective of this article is to describe the trend in infant mortality rate in Argentina and inter-jurisdictional gaps, infant mortality magnitude and causes, in compliance with the Millennium Development Goals.

Population and methods. A descriptive study on infant mortality was conducted in Argentina in 1990 and between 2000 and 2013, based on vital statistics data published by the Health Statistics and Information Department of the Ministry of Health of Argentina.

Results. The following reductions were confirmed: 57.8% in IMR, 52.6% in neonatal mortality rate and 63.8% in post-neonatal mortality rate. The inter-provincial Gini coefficient for IMR decreased by 27%. The population attributable risk decreased by 16.6% for IMR, 38.8% for neonatal mortality rate and 51.5% for post-neonatal mortality rate in 2013 versus 1990.

Conclusion. A significant reduction in infant mortality and its components has been shown, but not enough to meet the Millennium Development Goals. The reduction in IMR gaps reached the set goal; however, inequalities still persist.

Key words: *infant mortality rate, Millennium Development Goals, health care disparities, inequality.*

<http://dx.doi.org/10.5546/aap.2016.eng.216>

INTRODUCTION

Infant mortality rate (IMR) is an indicator of the health status and the socioeconomic condition of children and of a population as a whole. It is also a sensitive indicator of the quality of and access to health care services.¹⁻³

There are several determinants affecting infant mortality, depending on children's age. Among younger infants (younger than 27 days old), health care

service determinants prevail (antenatal, childbirth and neonatal care), while among older infants (between 28 and 365 days old), health environmental and socioeconomic factors play a more important role in a child's growth and development.⁴

All births and deaths occurring in Argentina are recorded on a legally binding certificate and included in a statistical report. Live birth statistical reports (LBSRs) and death statistical reports (DSRs) are consolidated at a national and jurisdictional level. Every year, the Health Statistics and Information Department (Dirección de Estadística e Información en Salud, DEIS) of the Ministry of Health (MoH) of Argentina publishes a report called Vital Statistics - Basic information, based on the corresponding statistical reports.⁵

In 2000, Argentina committed, before the United Nations Organization (UN), to meet the Millennium Development Goals (MDGs) by 2015. Among the nine MDGs that have been set forth, MDG 4 (Reduce child mortality) proposes to reduce by two thirds, between 1990 and 2015, the under-five mortality rate and to reduce by 10% inter-provincial inequalities.⁶

The objective of this article is to describe trends in infant mortality rate in Argentina and inter-jurisdictional gaps, infant mortality magnitude and causes, in compliance with the MDGs.

POPULATION AND METHODS

A descriptive study on infant mortality in Argentina was conducted based on vital statistics annual reports. Data were analyzed for 1990 (baseline for MDGs) and for the period between

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Funding: None.

Conflict of interest: None.

Received: 08-31-2015

Accepted: 12-17-2015

2000 (year when commitment to the MDGs was signed) and 2013 (the latest year with published data), based on the achievement of MDGs by 2015: an 8.5‰ IMR, a 5.2‰ neonatal mortality rate (NMR) and a 3.2‰ post-neonatal mortality rate (PNMR).⁷

Analysis included data on all live births and all deaths of infants younger than one year old (subdivided into the two IMR components: neonatal deaths and post-neonatal deaths), occurred in Argentina and recorded by jurisdiction of maternal place of residence.

For the analysis of infant mortality and its components, instead of absolute numbers, rates were used to make comparisons with other populations and over time.

Infant mortality comprises deaths among infants younger than one year old. IMR was related to infant deaths occurred over one year and to the number of recorded live births over that same year in a given place and expressed per 1000 live births.⁸

Infant mortality included neonatal mortality (deaths occurring between birth and 27 days of life) and post-neonatal mortality (deaths occurring between 28 and 365 days of life).

NMR and PNMR were estimated by relating deaths in each age group to live births, and were expressed per 1000 live births.

The unit of analysis was the country and its

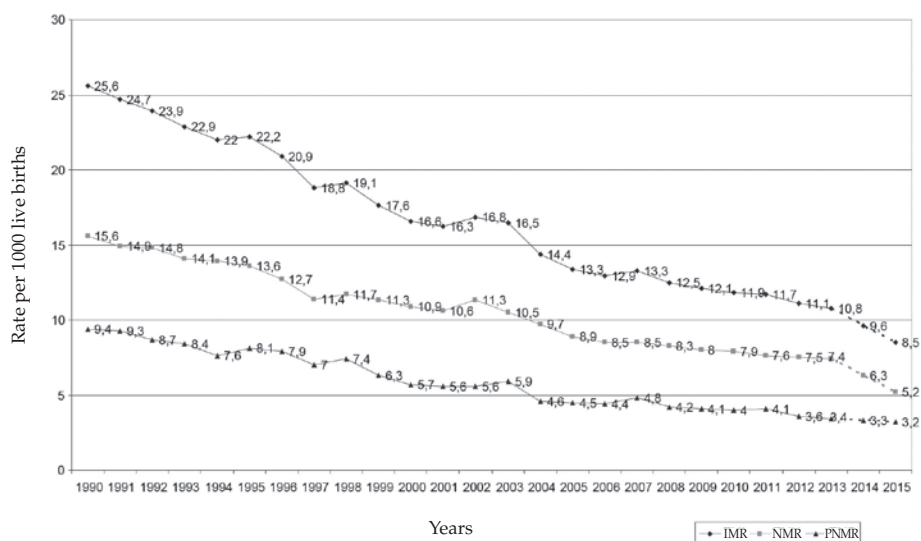
jurisdictions. Health outcome measures used to analyze the magnitude and structure of causes of infant mortality and its components included IMR and the following components: NMR and PNMR (continuous quantitative outcome measures) and proportional mortality by cause (continuous quantitative outcome measure).

For the analysis of inequalities among jurisdictions, trends in the inter-provincial Gini coefficient (continuous quantitative outcome measure) for infant mortality developed by the DEIS were studied. The Gini coefficient provides a summary metric used to measure the level of inequality in terms of risk of death distribution in the first year of life. Possible results may have been stated as a value between 0 (perfect equality) and 1 (absolute inequality).⁹

Another resource used to analyze inequalities was the population attributable risk (PAR) percent, which helped to estimate the proportion of mortality rate studied that would have been reduced if the mortality rate in all jurisdictions had been the same as in the province with the lowest rate (continuous quantitative outcome measure).¹⁰ The PAR for IMR was compared to each IMR component between 1990 and 2013.

Regarding ethical considerations, it should be noted that data used in this study were obtained from a secondary source (Vital Statistics - Basic information). Data processing by the DEIS

FIGURE 1: Trends in infant, neonatal and post-neonatal mortality rates in Argentina, 1990–2013, and reduction targets by 2015 in compliance with the Millennium Development Goals



Source: DEIS. MoH. Year 2013.

IMR: infant mortality rate; NMR: neonatal mortality rate; PNMR: post-neonatal mortality rate.

protects statistical secrecy, so no consent was required for this study.

RESULTS

In 1990, in Argentina, 678 644 live births and 17 348 under-one deaths were recorded (10 606 younger than 27 days old and 6364 between 28 and 365 days old). The difference between infant mortality and neonatal and post-neonatal mortality combined corresponded to other infant deaths without age details). IMR was 25.6‰, NMR was 15.6‰ and PNMR was 9.4‰.¹¹ NMR accounted for 60.9% of IMR.

In 2013, in Argentina, 754 603 live births and 8174 under-one deaths were recorded (5572 younger than 27 days old and 2602 between 28 and 365 days old). IMR was 10.8‰, NMR was 7.4‰ and PNMR was 3.4‰. NMR accounted for 68.5% of IMR¹² (Figure 1).

Between 1990 and 2013, the following reductions were confirmed: 57.8% in IMR, 52.6% in NMR, and 63.8% in PNMR.

Infant mortality by cause

Infant mortality structure by cause of death in Argentina showed a similar distribution across the years included in the analysis (Table 1).

The leading cause of death in 1990 and in the 2000-2013 period were perinatal conditions (prematurity, conditions typical of the perinatal period, such as omphalitis, neonatal sepsis or hyaline membrane disease), whose relative

significance ranged between 49% and 52.4%. The second leading cause of death were congenital malformations, whose relative significance in infant mortality has increased (from 18.1% in 1990 to 26.1% in 2013).^{11,12}

Similar values were observed in proportional mortality caused by respiratory diseases in the analyzed period, which peaked in 2003, 2007 and 2011.

In addition, a slow but steady reduction was observed in the relative significance of infectious diseases, which was interrupted in 2011 and then reduced once again (Table 1).

Neonatal mortality by cause

In the studied years, a similar structure was observed in relation to neonatal mortality causes: perinatal conditions and congenital malformations accounted for more than 95% of neonatal deaths. Although perinatal conditions predominated over the entire period, their relative significance decreased, while that of deaths caused by congenital malformations increased. In 1990, perinatal conditions accounted for 77.3% of neonatal deaths, while congenital malformations corresponded to 15.8%. In 2013, perinatal conditions accounted for 69.9% of neonatal deaths, while congenital malformations corresponded to 25.9%^{11,12} (Table 2).

Post-neonatal mortality by cause

The structure of post-neonatal mortality

TABLE 1: Trends in infant mortality by leading causes expressed in absolute numbers and as proportional mortality. Total for the country. Argentina. Years 1990 and 2000-2013

Year	Total	Perinatal conditions		Congenital malformations		Respiratory diseases		Infectious and parasitic diseases		External causes		Other causes	
		N	%	N	%	N	%	N	%	N	%	N	%
1990	17 348	8600	49.6	3148	18.1	1464	8.4	1219	7	776	4.5	2141	12.3
2000	11 649	5955	51.1	2471	21.2	823	7.1	489	4.2	566	4.9	1345	11.5
2001	11 111	5588	50.3	2462	22.2	825	7.4	523	4.7	500	4.5	1213	10.9
2002	11 703	6101	52.1	2479	21.2	825	7	539	4.6	430	3.7	1329	11.4
2003	11 494	5775	50.2	2423	21.1	1107	9.6	518	4.5	389	3.4	1282	11.2
2004	10 576	5538	52.4	2410	22.8	770	7.3	384	3.6	352	3.3	1122	10.6
2005	9507	4924	51.8	2206	23.2	673	7.1	330	3.5	335	3.5	1039	10.9
2006	8986	4402	49	2253	25.1	727	8.1	362	4	293	3.3	949	10.6
2007	9300	4557	49	2096	22.5	875	9.4	413	4.4	318	3.4	1041	11.2
2008	9341	4724	50.6	2285	24.5	741	7.9	363	3.9	220	2.4	1008	10.8
2009	9026	4446	49.3	2257	25	726	8	346	3.8	262	2.9	989	11
2010	8961	4487	50.1	2275	25.4	675	7.5	305	3.4	260	2.9	959	10.7
2011	8878	4329	48.8	2220	25	764	8.6	528	5.9	262	3	775	8.7
2012	8227	4068	49.4	2175	26.4	609	7.4	288	3.5	247	3	840	10.2
2013	8174	4160	50.9	2134	26.1	565	6.9	287	3.5	230	2.8	798	9.8

Source: DEIS. MoH. Year 2013.

by cause of death was similar across the years included in the analysis^{11,12} (Table 3).

Congenital malformations were the leading cause of post-neonatal deaths, ranging from 20% to 26.6%, followed by respiratory diseases, ranging from 19.8% to 25.5%, except in 2002, 2003 and 2007, when respiratory diseases became the leading cause of death.

The greatest relative significance (16.2%) of infectious diseases as a cause of death was observed in 1990, while in the 2000-2013 period they ranged between 8.4% and 11.5%.

Proportional mortality caused by perinatal conditions and external causes behaved similarly in the analyzed period (Table 3).

Inter-jurisdictional gaps in infant mortality and its components

Between 1990 and 2013, the inter-provincial Gini coefficient for IMR decreased by 27% (Table 4).

The PAR for IMR also decreased by 16.6% in the studied years. While the PAR was 34.4% in 1990, it decreased to 28.7% in 2013.

TABLE 2: Trends in neonatal mortality by leading causes expressed in absolute numbers and as proportional mortality. Total for the country. Argentina. Years 1990 and 2000-2013

Years	Total	Perinatal conditions		Congenital malformations		Other causes	
		N	%	N	%	N	%
1990	10606	8201	77.3	1679	15.8	726	6.8
2000	7650	5603	73.2	1645	21.5	402	5.3
2001	7264	5293	72.9	1615	22.2	356	4.9
2002	7829	5772	73.7	1708	21.8	349	4.5
2003	7345	5423	73.8	1599	21.8	323	4.4
2004	7172	5212	72.7	1656	23.1	304	4.2
2005	6307	4598	72.9	1460	23.1	249	3.9
2006	5903	4136	70.1	1497	25.4	270	4.6
2007	5964	4270	71.6	1428	23.9	266	4.5
2008	6196	4429	71.5	1531	24.7	236	3.8
2009	5956	4141	69.5	1532	25.7	283	4.8
2010	5942	4130	69.5	1553	26.1	259	4.4
2011	5751	3957	68.8	1507	26.2	287	5
2012	5541	3807	68.7	1507	27.2	227	4.1
2013	5572	3897	69.9	1441	25.9	234	4.2

Source: DEIS. MoH. Year 2013.

TABLE 3: Trends in post-neonatal mortality by leading causes expressed in absolute numbers and as proportional mortality. Total for the country. Argentina. Years 1990 and 2000-2013

Years	Total	Congenital malformations		Respiratory diseases		Infectious and parasitic diseases		Perinatal conditions		External causes		Other causes	
		N	%	N	%	N	%	N	%	N	%	N	%
1990	6364	1431	22.5	1264	19.9	1031	16.2	268	4.2	616	9.7	1754	27.6
2000	3999	821	20.5	791	19.8	391	9.8	341	8.5	467	11.7	1188	29.7
2001	3847	847	22	782	20.3	444	11.5	293	7.6	417	10.8	1064	27.7
2002	3874	771	19.9	778	20.1	423	10.9	329	8.5	366	9.4	1207	31.2
2003	4149	824	19.9	1057	25.5	462	11.1	352	8.5	338	8.1	1116	26.9
2004	3402	754	22.2	743	21.8	335	9.8	325	9.6	279	8.2	966	28.4
2005	3200	746	23.3	650	20.3	283	8.8	326	10.2	289	9	906	28.3
2006	3083	756	24.5	685	22.2	324	10.5	266	8.6	242	7.8	810	26.3
2007	3336	668	20	830	24.9	358	10.7	287	8.6	271	8.1	922	27.6
2008	3145	754	24	708	22.5	318	10.1	295	9.4	183	5.8	887	28.2
2009	3070	725	23.6	689	22.4	291	9.5	305	9.9	226	7.4	834	27.2
2010	3019	722	23.9	639	21.2	253	8.4	357	11.8	224	7.4	824	27.3
2011	3127	713	22.8	711	22.7	321	10.3	372	11.9	220	7	790	25.3
2012	2686	668	24.9	582	21.7	238	8.9	259	9.6	207	7.7	732	27.3
2013	2602	693	26.6	535	20.6	235	9	263	10.1	184	7.1	692	26.6

Source: DEIS. MoH. Year 2013.

The PAR for NMR also reduced between 1990 and 2013, by 38.8%. While it was 39.7% in 1990, it decreased to 24.3% in 2013.

A reduction of 51.5% was proven in the PAR for PNMR in the studied years. While it was 78.7% in 1990, it decreased to 38.2% in 2013 (Table 5).

DISCUSSION

In order to compare these results with those of other countries at a regional and worldwide level, it was necessary to use sources from international organizations. However, heterogeneity in the quality of vital statistics among the different countries required using adjustment mechanisms.

The UN Inter-agency Group¹³ publishes its annual estimations of IMR corrected for each country.

According to this group, in Argentina, IMR was 24‰ in 1990 and 13‰ in 2011 (latest year with published data), which implies a 45.8% reduction.

In the same period, IMR reduced worldwide by 39.3% (1990: 61‰ versus 2011: 37‰). The same authors also reported that IMR decreased by 61.9% in Latin America and the Caribbean as

TABLE 4: Trends in the Gini coefficient for the inter-provincial mortality rate. 1990 and 2000-2013

Year	Gini (IMR)
1990	0.100
2000	0.124
2001	0.122
2002	0.130
2003	0.118
2004	0.117
2005	0.104
2006	0.100
2007	0.090
2008	0.092
2009	0.091
2010	0.088
2011	0.084
2012	0.081
2013	0.073

Source: DEIS. MoH. Year 2013.

IMR: infant mortality rate.

TABLE 5: Comparison among infant, neonatal and post-neonatal mortality rates by jurisdiction and population attributable risk percent. Years 1990 and 2013

Jurisdiction	IMR		NMR		PNMR	
	Year 1990	Year 2013	Year 1990	Year 2013	Year 1990	Year 2013
Total for the country	25.6‰	10.8‰	15.6‰	7.4‰	9.4‰	3.4‰
CABA	16.8‰	8.9‰	11.2‰	6.5‰	5.5‰	2.5‰
Buenos Aires	24.2‰	11‰	14.9‰	7.2‰	8.8‰	3.7‰
Catamarca	34.6‰	9.7‰	19.6‰	7‰	13.3‰	2.7‰
Córdoba	22.2‰	9.6‰	14.2‰	6.5‰	7.5‰	3.2‰
Corrientes	31.7‰	14.9‰	18.1‰	11.4‰	13.3‰	3.5‰
Chaco	35.8‰	11.6‰	21.2‰	6.5‰	14.6‰	5.1‰
Chubut	20.6‰	9.3‰	13.1‰	6.2‰	7‰	3.2‰
Entre Ríos	24.3‰	9.2‰	15.9‰	6.2‰	8.2‰	3‰
Formosa	33.2‰	14.2‰	17.3‰	9.3‰	15.8‰	7.9‰
Jujuy	35.8‰	11.8‰	17.2‰	7.8‰	16.4‰	4‰
La Pampa	22.1‰	9.9‰	15.7‰	7.6‰	5.4‰	2.3‰
La Rioja	28.8‰	12‰	19.3‰	8.6‰	9.5‰	3.4‰
Mendoza	21.1‰	8.5‰	14.1‰	6.2‰	6.9‰	2.3‰
Misiones	31.8‰	10.4‰	19.9‰	6.6‰	12‰	3.8‰
Neuquén	16.9‰	10.3‰	9.4‰	6.6‰	7.6‰	3.7‰
Río Negro	23.1‰	11.4‰	13.6‰	8.2‰	8.7‰	3.3‰
Salta	32.3‰	14.1‰	16.7‰	9.7‰	15.5‰	4.5‰
San Juan	24.4‰	12.3‰	15‰	8.1‰	9.3‰	4.2‰
San Luis	29.7‰	8.6‰	18.6‰	6‰	10.9‰	2.6‰
Santa Cruz	20.7‰	9.5‰	14.4‰	6.7‰	6.3‰	2.8‰
Santa Fe	28.3‰	9.8‰	19.1‰	7.2‰	8.9‰	2.6‰
Santiago del Estero	28.3‰	11.5‰	14.6‰	7.9‰	10.8‰	3.6‰
Tucumán	28.5‰	13.1‰	16.8‰	10.2‰	9.5‰	2.9‰
Tierra del Fuego	27.9‰	7.7‰	25.9‰	5.6‰	2‰	2.1‰
PAR	34.4%	28.7%	28.2%	24.3%	78.7%	38.2%

Source: DEIS. MoH. Year 2013. CABA: Autonomous City of Buenos Aires; IMR: infant mortality rate; NMR: neonatal mortality rate; PNMR: post-neonatal mortality rate; PAR: population attributable risk percent.

a whole, 55% in Europe and Central Asia, 51.9% in the Middle East and North Africa, 35.5% in sub-Saharan Africa, 59.55% in East Asia and the Pacific, and 43.5% in South Asia.¹⁴

That is to say, according to the UN Inter-agency Group, the IMR reduction achieved by Argentina was greater than that observed at a worldwide level and at some regional levels; however, the percentage of reduction was lower than that achieved in other regions, including Latin America.

In the studied period, while NMR in Argentina accounted for 60.9% of IMR in 1990 and increased to 68.5% in 2013, at a global level NMR accounted for 53.6% of IMR in 1990 and increased to 58.2% in 2013.

The analysis of the infant mortality structure by cause in Argentina showed that, since 1990, the leading cause of infant deaths were perinatal conditions, followed by congenital malformations. At a global level, between 1990 and 2010 (the latest year with published data on mortality disaggregated by cause), the structure of infant mortality causes has changed mainly due to a reduction in infectious diseases, which were the leading cause of death in 1990 and were replaced by perinatal conditions in 2010, therefore remaining in the second place. Since 1990, congenital malformations have been the third cause of death.^{15,16}

In relation to neonatal mortality worldwide, over the entire studied period, the leading cause of death were perinatal conditions, similarly to what has been observed in Argentina. With a lower rate, infectious diseases were the second cause (in Argentina, they account for a marginal percent), followed by congenital malformations (the second cause of neonatal mortality in Argentina).^{15,16}

Post-neonatal mortality worldwide was primarily caused, in the studied years, by infectious diseases (62.8% in 1990 and 48.6% in 2010). These were followed by tropical diseases and malaria, nutritional deficiencies, perinatal conditions, congenital anomalies and external causes (5-10% each cause, for each year). The structure of post-neonatal mortality causes was especially different in Argentina, where the leading cause was congenital malformations, followed by respiratory diseases, perinatal conditions, infectious and parasitic diseases, and external causes.^{15,16}

The lower relative significance of infectious and parasitic diseases, respiratory diseases and malnutrition in Argentina, compared to

the structure of infant mortality worldwide, evidences that the level of development in Argentina has been higher.¹⁷

It is worth noting that the structure of infant mortality causes worldwide is strongly determined by the structure of infant death causes in Asia and Africa, which account for more than 90% of under-one deaths at a global level.¹⁴

However, the fact that neighboring countries with a similar development level as Argentina have achieved a higher reduction in their risk of infant mortality underscores the need to deepen strategies aimed at ensuring population access to health care services and the quality of such services.

Knowing the structure of causes of infant mortality and of each of its components is critical for the strategic planning of public policies to improve mother and child health care.

The analysis of neonatal mortality causes demonstrated the need to deepen strategies aimed at improving a timely and adequate access to health care during pregnancy and childbirth, and an optimal newborn care.

The causes of post-neonatal mortality pointed out the need to continue providing health care beyond the neonatal period, especially to patients at a biological or socio-environmental risk.

This study has some weaknesses, such as having analyzed data published by the DEIS, obtained from the Vital Statistics System and based on LBSRs and DSRs, and the fact that event under-recording (birth or death) or an incorrect identification of the cause of death in DSRs may affect analysis results.

Notwithstanding this, and taking into account the strengths of the study, it is worth noting that more than 99.5% of births in Argentina take place in health facilities and that a mandatory requirement for burial implies the concurrent recording of death certificates and DSRs, therefore reducing any potential under-recording of these events.

CONCLUSION

Between 1990 and 2013, in Argentina, reductions in infant mortality and each of its components were confirmed (57.8% in IMR, 52.6% in NMR and 63.8% in PNMR).

In 2013, a 10.8‰ IMR, a 7.4‰ NMR, and a 3.4‰ PNMR were recorded, but these values do not seem to be enough to reach the MDG target, which aim at an 8.5‰ IMR, a 5.2‰ NMR, and a 3.2‰ PNMR by 2015.

Inequalities in IMR and its components have

decreased over the years included in the analysis in Argentina. The inter-provincial Gini coefficient for IMR decreased by 27% in 2013 compared to 1990, which is higher than the MDG target set at a 10% reduction. However, in Argentina inequalities still exist as far as the risk of death in the first year of life. ■

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