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Analysis of HIV/AIDS mortality in Mexico from 1990 to 2013: An assessment of the feasibility of millennium development goals by 2015

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Abstract

Objective: *We aimed to assess the feasibility of achieving the goal of Mexican AIDS mortality in the Millennium Development Goals, nationally and by state.* **Methods:** *For the period 1990-2013, we estimated annual rates of decline/increase in AIDS mortality according to five-year interval, using published data from the Mexican Instituto Nacional de Estadística y Geografía and Consejo Nacional de Población. Subsequently, we analyzed the feasibility of achieving the Millennium Development Goals target by 2015 by estimating the year in which the country and each state could achieve them.* **Results:** *We estimated that only 13/32 states (40%) would achieve the goal established for AIDS mortality by Millennium Development Goals. Mexico, as a country, and the remaining 19 states (60%) did not will attain it. It is important to emphasize that seven states, rather than decrease, had an upward trend in mortality in the last five years analyzed.* **Conclusions:** *The free and universal access to antiretroviral treatment against HIV/AIDS has failed to reduce mortality as expected in Mexico. It is urgent to improve access to HIV testing by using more aggressive strategies. Also, it is necessary to apply interventions to link and retain persons in care until they are virologically suppressed.* (Gac Med Mex. 2016;152:732-42)

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Introduction

The United Nations Millennium Summit, celebrated in New York on September 2000, had as a result the Millennium Declaration, a document approved by 189 countries and signed by 147 Heads of State and Government, which established the greatest international agreement in history to promote economic and social development of countries and to improve life, education and health conditions of populations, within a frame of respect to human rights, gender equity and environmental care[1]. One year later, in 2001, the Millennium Development Goals (MDGs) were formulated, which are eight rather ambitious goals that countries were committed to meet by the year 2015. These objectives range from reducing extreme poverty and maternal mortality to achieving universal primary education and stopping the HIV/AIDS epidemic[2].

To monitor MDGs achievement, 21 official goals and 60 indicators were established, so that the United

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Nations publish, since the year 2005, reports showing the achieved advances[3].

The sixth MDG includes two commitments regarding HIV/AIDS: have halted and begun to reverse the spread of HIV/AIDS by 2015, and warrant universal access to HIV/AIDS treatment for all people who need it by the year 2010. To regularly monitor the degree of advance in terms of HIV/AIDS, two goals were internationally defined, but Mexico incorporated four additional goals, including the commitment to reduce AIDS-related mortality to 3.5 deaths per 100,000 population[4].

Since the beginning of the epidemic and until 1996, HIV acquisition was practically considered a death sentence, since available treatments were little efficacious. As of that year, the introduction of a new group of antiretroviral agents, known as protease inhibitors, the prognosis of patients with HIV/AIDS changed radically: a combination of these agents with already existing drugs was shown to delay immune system deterioration, decrease opportunistic infections and substantially improve the quality of life[5]. In 1996, these new therapies started being widely used in the USA and, as a result, the number of HIV/AIDS-related deaths was reduced by almost 50% in 1997, followed by an additional reduction of 20% in 1998[6]. In some European countries the impact was similar, with the number of HIV/AIDS-related deaths being decreased by almost 80% within the first 3 years of use[7]. In Latin America, Brazil and Argentina managed to reduce their AIDS-related mortality rates by 50 and 20%, respectively.

In Mexico, this new therapy started being used with Mexican Institute of Social Security (IMSS - *Instituto Mexicano del Seguro Social*) and Institute of Security and Social Services of State Workers (ISSSTE - *Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado*) patients in 1997[9], but it was until 2003 when it became a free and universal-access public health policy, so that people who lacked social security could be incorporated to this treatment[10]. As a result, by the end of 2012, a total of 84,146 people were receiving antiretroviral treatment. However, in the first decade of universal access, 49,227 people died because of HIV/AIDS, with a mortality rate that remained stable. In other words, universal access to antiretroviral therapy had not reflected in a significant decrease of HIV/AIDS-related mortality in Mexico[11].

The purpose of this study was to assess the feasibility of Mexico to be able to meet the goal of HIV/AIDS-related mortality decrease established by the MDGs for the year 2015, both at the national and state level.

Methods

To obtain information on deaths occurred in Mexico, annual deaths databases were downloaded from the National Institute of Geography and Statistics (INEGI - *Instituto Nacional de Geografía y Estadística*) website[12]. The last available file corresponds to the year 2013, and the oldest is from 1990. Since annual databases were not standardized by type, value catalogue and name of variables, they had to be standardized by applying the criteria recommended for this type of situations and using the ©Microsoft Access software as database manager.

HIV/AIDS-related deaths from 1990 to 1997 were identified with codes 279.5 (Acquired immunodeficiency syndrome) and 279.6 (AIDS-related complexes) of the International Classification of Diseases (ICD) 9th revision[13]. From 1998 on, the ICD 10th revision began to be used in Mexico and, therefore, as of that year and up to 2013, AIDS-related deaths were identified with the following codes: B20 (HIV disease resulting in infectious and parasitic diseases), B21 (HIV disease resulting in malignant neoplasms), B22 (HIV disease resulting in other specified diseases), B23 (HIV disease resulting in other conditions) and B24 (Unspecified HIV disease)[14].

The Mexican List for Selection of the Main Causes of Mortality was used with the purpose to know the place occupied by AIDS as a cause of death, both in the general population and by gender and age groups[15].

For HIV/AIDS-related death rates calculation, the formula employed by Mexico in the MDGs was used[16], which results from dividing the number of HIV/AIDS-related deaths in a specific year by mean total population of that year, multiplied by 100,000. No mortality rates adjustment was made, since the MDGs mortality goal uses crude mortality rates, in spite of epidemiology recommending always using adjusted rates.

For rates calculation, the national and state-wise population estimates generated by the National Population Council (CONAPO - *Consejo Nacional de Población*) for the years 1990-2013 were used, which, owing to their legal attributions, have the status of official estimates[17,18].

To know the degree of advance of the MDGs goals for Mexico, the last published official report, which contains the data until 2012[4], was reviewed, as well as the 2013 figures incorporated in a website that, in spite of lacking a government domain name, displays the Republic Presidency and the INEGI logos and, therefore, these figures were also considered to be official[16].

Subsequently, the mortality increase/decrease annual rate for the 1993-2013 period was calculated by dividing the time interval into four 5-year periods in order to determine mortality behavior on different years and to better make the mortality figures projection for the year 2015, both nationally and state-wise.

Finally, the resulting estimates were compared with the goal Mexico was committed to comply with, in order to establish if the country as a whole and which states might comply with the MDGs HIV/AIDS-related mortality goal.

Results

In the 1990-2013 period, a total of 100,524 people in Mexico died because of HIV/AIDS, which represents approximately one out of every 100 deaths of the period. HIV/AIDS-related deaths were steadily increased in the 1990-2008 period, by going from 1,515 in 1990 to 5,183 in 2008, which is the year where the highest figure was recorded, resulting in an increase of the crude mortality rate from 1.18 to 4.66 per 100,000 population. In 2013, HIV/AIDS occupied the fifteenth place as a cause of death in the general population, with a total of 4,965 deaths and a rate of 4.19 per 100,000 population (Table 1). This means that 13-14 people died every day because of HIV/AIDS in Mexico.

In general, the HIV/AIDS-related mortality rate in males has been five-fold higher than that recorded in females. The highest mortality value in males was recorded in 1996, with a rate of 7.96 per 100,000 population; it decreased to 7.47 in 2003, which was the year universal access was achieved, and with different increasing and decreasing variations it was established at 7.07 in 2013. In females, the situation has been paradoxical: before, during and after partial and universal access to antiretroviral drugs, the mortality rate has steadily increased, except for some years, over the entire analyzed period, so that the mortality rate in 2013 is the same of 2003 and higher to that recorded in 1996, a year where there was no access to antiretroviral drugs (Fig. 1).

In 2015, the states with the highest rates of AIDS-related mortality were Tabasco (10.58 per 100,000 population), Quintana Roo (9.02) and Veracruz (8.65). In contrast, Zacatecas (1.03), Guanajuato (1.43) and Hidalgo (1.92) had the lowest rates. The diversity of figures between states, and the fact that the difference between those with the highest and the lowest rate (Tabasco and Zacatecas) is more than seven-fold are findings that call our attention (Fig. 2).

But most worrying is that, making a balance of mortality in the 2003-2013 period, i.e., between the year that universal and free access to antiretroviral treatment was achieved in Mexico and the year of the most recent mortality figures, the rate of AIDS-related mortality was increased instead of being decreased in 50% of states (16/32) (Fig. 3).

According to the estimates made in this study, Mexico will have a HIV/AIDS-related mortality rate of 4.01 deaths per 100,000 population by the year 2015, a figure that will exceed by 15% the goal of 3.5 established in the MDGs. Therefore, the proposed goal will most probably not be reached, unless an abrupt decrease occurs in the number of deaths in 2014-2015, which is highly unlikely in view of the mortality trend observed.

This situation has already been somehow acknowledged in official reports, which claim that, of the six promised goals in matters of HIV/AIDS, Mexico has already accomplished three of them and that the other two will surely be complied with by 2015. The only goal with a "stagnant progress or deterioration" is the reduction of AIDS-related mortality to 3.5 deaths per 100,000 population (Table 2)[4,16].

To assess the feasibility of reaching the goal statewise, which is the central objective of this study, the data indicate that, in 2013, only 12/32 states in the country had a HIV/AIDS-related mortality rate lower than or equal to the goal established in the MDGs. With estimates made for 2015, the states that most likely will comply with the goal will be Aguascalientes, Chihuahua, Durango, Guanajuato, Hidalgo, México, Michoacán, Oaxaca, Puebla, San Luis Potosí, Sinaloa, Tlaxcala and Zacatecas; i.e., 13/32 states, which represents 40% of the states of the country. On the other hand, estimates were that five states (16% of total) might reach the goal before 2025 (Baja California Sur, Chiapas, Jalisco, Mexico City and Nuevo León), and that other seven states (22% of total) might attain it after 2015 (Baja California, Campeche, Guerrero, Morelos, Tamaulipas, Veracruz and Yucatán). In the case of the remaining seven states (Coahuila, Colima, Nayarit, Querétaro, Quintana Roo, Sonora and Tabasco), the possible year of goal attainment could not be projected, but since they showed a mortality upwards trend for the 2008-2013 period, based on estimates, they will also not be able to comply with the goal (Table 3).

Discussion

The development of efficacious antiretroviral drugs against HIV has been one of the greatest successes

Table 1. Total and AIDS–related deaths according to year of registry. Mexico, 1993–2013*

Year	Total deaths	AIDS–related deaths	AIDS–related deaths percentage	AIDS–related mortality rate
1990	421,182	1,493	0.4	1.71
1991	409,473	2,008	0.5	2.27
1992	407,881	2,529	0.6	2.81
1993	414,250	3,138	0.8	3.43
1994	416,821	3,482	0.8	3.74
1995	427,875	3,986	0.9	4.22
1996	434,185	4,338	1.0	4.52
1997	438,205	4,171	1.0	4.29
1998	442,466	4,082	0.9	4.14
1999	441,647	4,181	0.9	4.19
2000	435,486	4,196	1.0	4.16
2001	441,004	4,317	1.0	4.23
2002	457,680	4,463	1.0	4.32
2003	470,692	4,607	1.0	4.40
2004	472,273	4,719	1.0	4.45
2005	493,957	4,650	0.9	4.34
2006	493,296	4,944	1.0	4.56
2007	513,122	5,093	1.0	4.64
2008	538,288	5,183	1.0	4.66
2009	563,516	5,114	0.9	4.53
2010	590,886	4,857	0.8	4.25
2011	589,646	5,036	0.9	4.35
2012	601,259	4,972	0.8	4.25
2013	610,730	4,965	0.8	4.19
Total	11,525,820	100,524	0.9	–

Mortality rate per 100,000 population.
*Deaths of people residing abroad or whose place of residence was unknown are not included.

of medicine on late 20th century. Fifteen years after its discovery, HIV/AIDS had stopped being a death sentence to become a controllable chronic disease[19].

When this type of treatments was widely used, a spectacular impact was achieved in the reduction of HIV/AIDS-related deaths in USA, Brazil, Argentina and some European countries. However, HIV/AIDS-related mortality in Mexico has not decreased as expected[10] and, therefore, it is highly likely that the objective established in the MDGs will not be reached.

If in Mexico there is universal and free access to antiretroviral treatment since 2003, why has it not had the expected impact after one decade? Although there is a 5.3% decrease in the HIV/AIDS-related mortality rate in males for the 2003-2013 period, mortality has not decreased in females, i.e., the rate remains the same (1.13 per 1,00,000 population): why has access to antiretroviral drugs not had an impact in females? Finally, why did the mortality rate increase in half the states instead of decreasing? For example, a recent

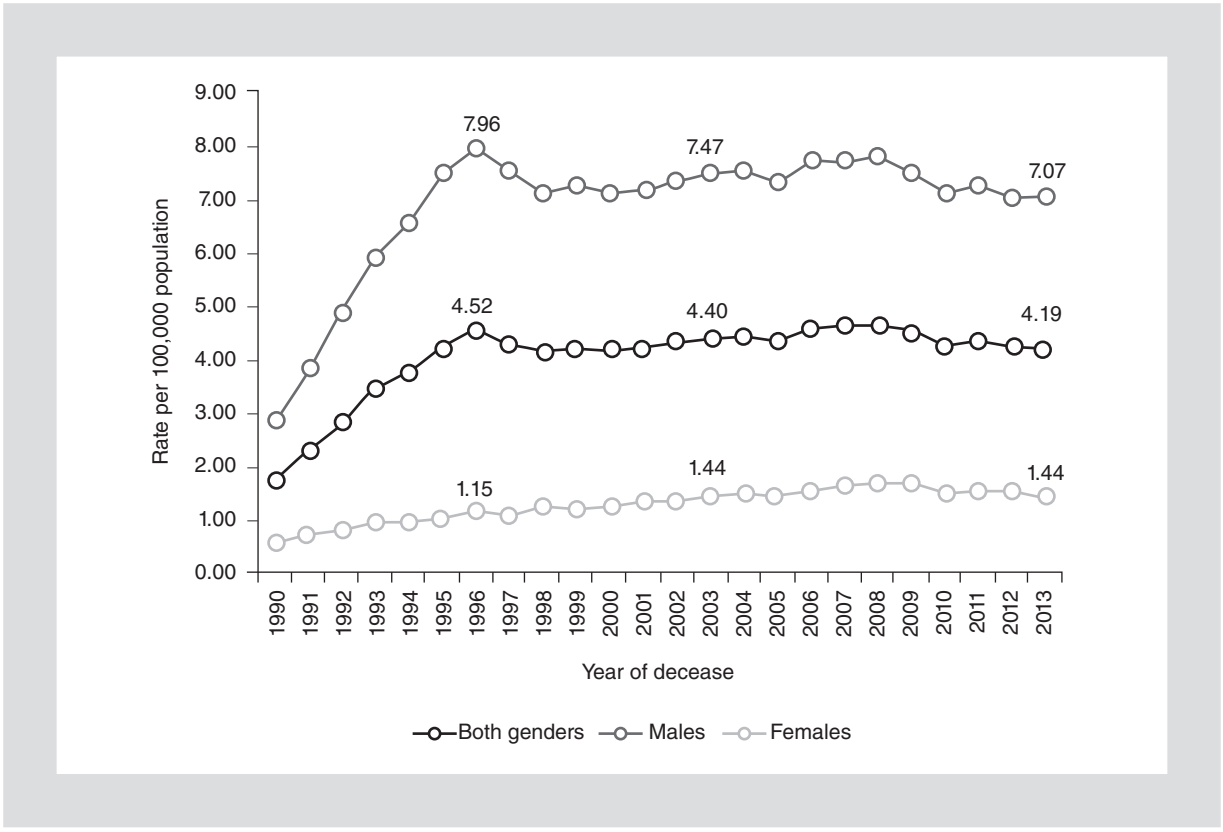

Figure 1. *AIDS-related mortality. Mexico, 1990-2013.*

study confirmed that while AIDS-related mortality in Mexico City decreased by 59% in the 1990-2011 period, in Tabasco it increased by 245% over the same time interval[20].

As usual, with this type of epidemiological phenomena there are no single and simple answers, but a series of factors can be identified that, to a greater or lesser extent, may be negatively influencing.

An instrument that helps to analyze these factors is the "continuum of care" of the people who live with HIV, colloquially known as "treatment cascade". This idea was initially conceived by Greenberg et al.[21] for Washington, D.C.[21], and later was developed by Gardner et al.[22] for the USA as a whole[22]. The treatment cascade allows for medical care received by people to be monitored since the moment they are detected with HIV until they manage to achieve virologic control. The first version of the cascade for Mexico was presented in Vancouver in 2014[23], and one year later it was updated by the National Center for the Prevention and Control of HIV/AIDS (Censida - *Centro Nacional para la Prevención y el Control del VIH/SIDA*) and diffused by the Pan American Health Organization[24]. Using information from this instrument and from some additional studies, six explanatory factors can be highlighted:

1. *Low coverage in the detection of people with HIV.* According to official estimates, in Mexico there were 180,000 people living with HIV in 2013. However, only 112,663 (63%) had been detected by health services, which means that 67,337 (37%) are infected with HIV and ignore it[24]. It is a low coverage, especially when compared with countries such as the USA and France, which have coverage rates higher than 80%[25,26]. Nevertheless, Mexico is committed with the 90-90-90 target established by the WHO and UNAIDS for the year 2020. This target includes the following goals: 90% of all people living with HIV will know their serologic status, 90% of all people with diagnosed HIV will be receiving antiretroviral therapy; and 90% of all people receiving antiretroviral treatment will achieve viral suppression[27]. These are without any doubt highly ambitious goals. For example, to reach 90% coverage by the year 2013, the number of people detected in Mexico should have been 162,000, that is, almost 50,000 people

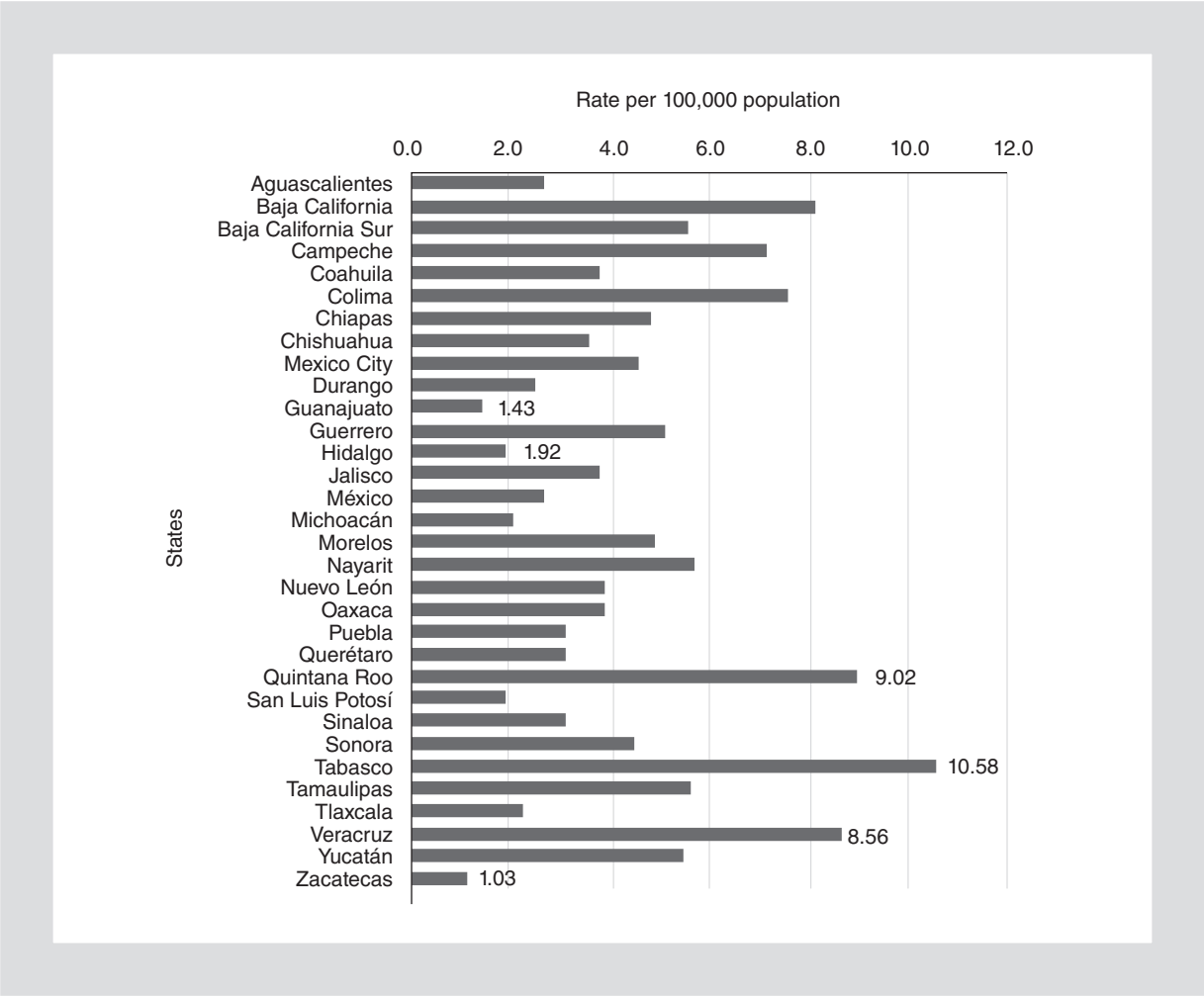

Figure 2. *State-wise AIDS-related mortality. Mexico, 2013.*

additional to those cumulatively detected until that year. This is an enormous gap. Although Mexico is most likely not to reach the 90% goal by the year 2020, significantly increasing detection coverage within the next few years is urgently needed. Otherwise, it will be very difficult to reduce HIV/AIDS-related mortality on the short term.

2. *Late diagnosis and treatment initiation in people with HIV.* People who are diagnosed with HIV in a late form are more prone to develop the clinical form of AIDS, to suffer from opportunistic infections, to have lower response to antiretroviral therapy and, consequently, higher risk for death[28]. According to Censida data for the 2008-2013 period, 49% of patients admitted by the Ministry of Health for antiretroviral therapy already had their immune system affected (CD4 < 200 cells/ml), which means that one out of every two people was started on treatment in a late form; however, it is important pointing out that there was a global reduction of 10% in late initiation between 2008 (53%) and 2013 (45.6%). By gender, the proportion of males with late start (53%) significantly surpassed the proportion in females (39%)[29]. Another study carried out with the same source of information, but complemented with a representative survey of the sites of medical care, found that late diagnosis and late treatment initiation are the most important factors determining early AIDS-related mortality, since added to viral load values, account for 44.4% of early mortality variability between different medical care centers[30]. Within this context, if the opportune diagnosis and treatment positive trend continues, Mexico can be expected to achieve a significant decrease in HIV/AIDS-related mortality in the next few years.

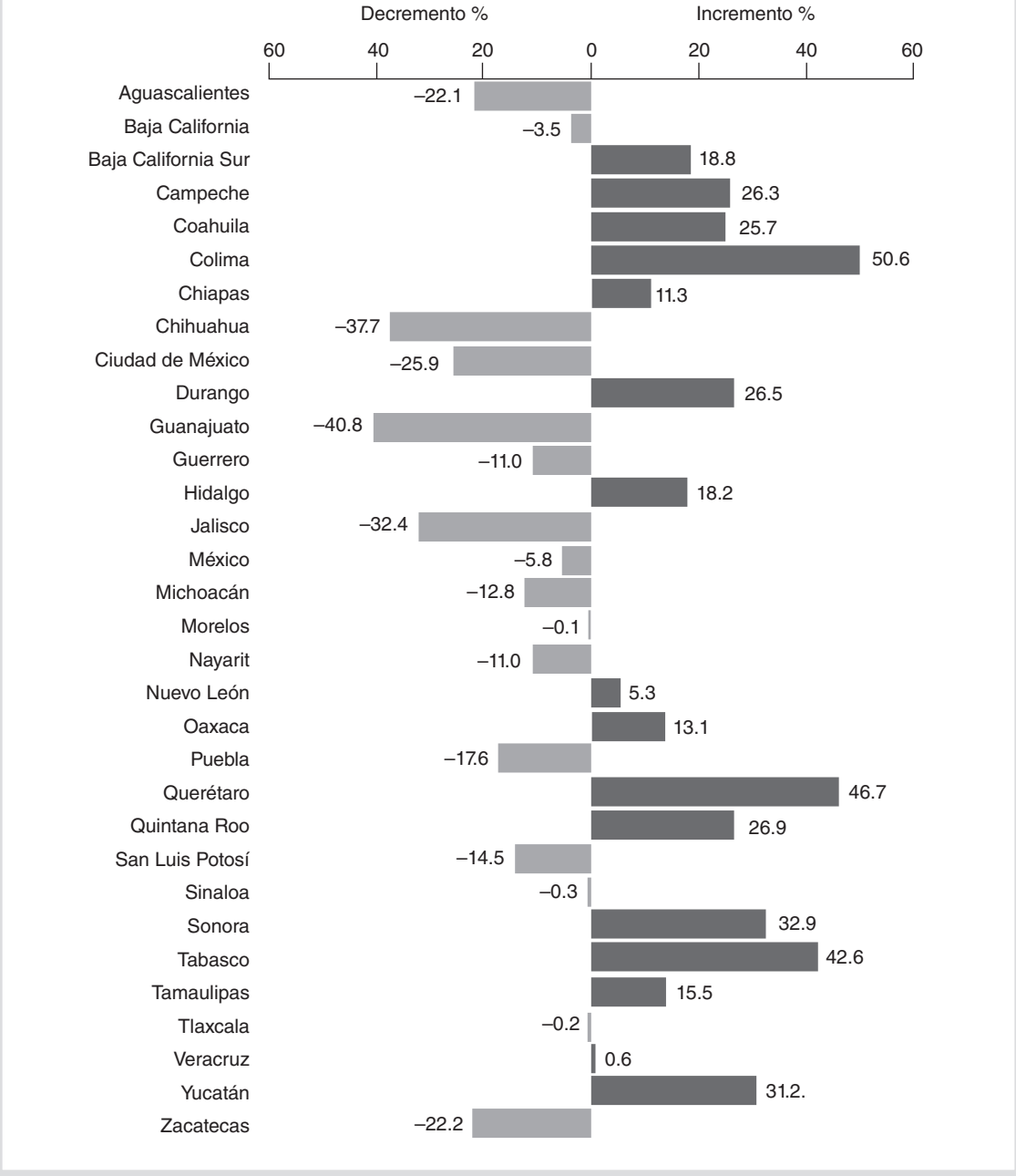

Figure 3. *State-wise AIDS-related mortality increase/decrease percentage. Mexico, 2003-2013.*

3. *Deficient connection of people detected with HIV with health services.* Another group is formed by people who were diagnosed with HIV and their connection with health services. Estimates indicate that only 86% (97,000/112,663) of people detected with HIV are under medical control or on antiretroviral therapy[24]. More than 15,000 people living with HIV have been lost to follow-up. To show the importance of this factor, a study conducted with patients of the Ministry of Health over the 2008-2012 period found a very elevated AIDS-related early mortality (58.9% of all recorded

Table 2. HIV/AIDS-associated indicators in MDGs. Advances of Mexico by 2013

	Objective/goal	2015 goal*	2013 figures†	Origin of the goal	How is Mexico doing?†
6.A.	Have halted by 2015 and begun to reverse the spread of HIV/AIDS				
6.1.	HIV prevalence in adult population (25 to 49 years)	< 0.6	0.23	Reformulated	Goal accomplished
6.2.	Proportion of population that used condom in last intercourse in men who have sex with men (MSM)	> 70.0	73.1	Proposed by Mexico	Goal accomplished
6.11.	AIDS incidence according to year of diagnosis	5.9	6.0	Proposed by Mexico	To be accomplished in 2015
6.12.	HIV/AIDS-related mortality rate (per 100,000 population)	3.5	4.2	Proposed by Mexico	Stagnant progress or deterioration
GBM 6.1.	Percentage of adults and children with AIDS known to continue on treatment 12 months after starting antiretroviral therapy	90.0	90.9	Goals Beyond the Millennium (GBM)	Goal accomplished
6.B.	Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it				
6.5.	Proportion of population with advanced HIV infection with access to antiretroviral drugs	80.0	82.2 (2012)	UN official list	To be accomplished in 2015

*Goal established in the Millennium Development Goals for the year 2015[16].
†Advance of Mexico in goal accomplishment by 2013[4].

deaths), and that the only explanatory factor was treatment late initiation due to late detection or to deficient connection with health services once the diagnosis has been established[31]. Another study carried out in three specialized hospitals from Mexico City found that, out of 128 AIDS-related deaths identified in the period from January 1, 2010, to June 30, 2013, 18% of the people who died was admitted without a HIV diagnosis, 51% had less than 6 months of having been diagnosed and 40.5% had not received previous antiretroviral therapy. The study concludes that 57% of deaths could have been prevented with earlier connection with medical care and opportune antiretroviral therapy[32].

4. *Low coverage of people receiving antiretroviral therapy.* Estimates indicate that only 49% of people living with HIV are receiving antiretroviral treatment[24]; i.e., more than half do not receive it and, therefore, are at risk for dying due to HIV/AIDS. For example, a HIV/AIDS-related mortality study carried out in Veracruz, which is the state with the second highest rate in the country, found that 50.2% of people without social security who died of AIDS in the 2009-2012 period did not receive antiretroviral therapy from the Ministry of Health[33]. Although the results correspond to a single state, it is likely for this phenomenon to occur, to a greater or lesser extent, in all states of the country. Should this be confirmed, this could be one of the main factors explaining why HIV/AIDS-related mortality has not decreased as expected in Mexico, in spite of universal access to treatment.
5. *Deficient antiretroviral drug prescription.* One of the few studies carried out in Mexico found deficient therapeutic prescription in more than 50% of analyzed cases[34]. Although this situation corresponds to universal access first years, it is most likely that doctors' experience treating people with HIV, as well as treatment schemes' supervision carried out by Censida in the past 3 years, have decreased inadequate medical prescriptions. However, new studies are required to assess if this remains a relevant factor.
6. *Low percentage of therapeutic success.* Antiretroviral therapy ultimate goal is to achieve for the presence of HIV in blood to drop to levels as low as for the laboratory test to classify it as "undetectable" (viral load < 40 copies/ml). Therefore, HIV will no longer affect the patient's immune

Table 3. State-wise AIDS-related mortality rates. Mexico, 1993-2013, and projection for 2015

State	Mortality rate					Annual increase/decrease rate				2015 rate*	MDG year†
	1993	1998	2003	2008	2013	1993-98	1998-03	2003-08	2008-13		
Aguascalientes	1.25	2.36	3.48	1.73	2.72	0.22	0.22	–0.35	0.20	3.11	2003
Baja California	5.52	8.67	8.43	8.98	8.13	0.63	–0.05	0.11	–0.17	7.79	>2025
Baja California Sur	1.60	4.32	4.69	7.27	5.57	0.54	0.07	0.52	–0.34	4.89	2019
Campeche	1.67	3.86	5.67	7.29	7.16	0.44	0.36	0.32	–0.03	7.10	>2025
Coahuila	1.93	2.63	2.95	2.74	3.70	0.14	0.06	–0.04	0.19	4.09	‡
Colima	2.99	5.20	5.04	6.66	7.59	0.44	–0.03	0.32	0.19	7.96	‡
Chiapas	0.67	2.50	4.30	5.48	4.79	0.37	0.36	0.24	–0.14	4.51	2022
Chihuahua	1.94	3.24	5.78	6.29	3.60	0.26	0.51	0.10	–0.54	2.53	2014
Durango	0.98	1.55	2.01	2.33	2.55	0.11	0.09	0.06	0.04	2.63	2007
Guanajuato	1.20	1.75	2.42	1.71	1.43	0.11	0.13	–0.14	–0.06	1.32	2015
Guerrero	3.19	4.59	5.74	5.47	5.11	0.28	0.23	–0.05	–0.07	4.96	> 2025
Hidalgo	1.54	1.65	1.63	1.65	1.92	0.02	0.00	0.00	0.05	2.03	2015
Jalisco	5.80	5.67	5.54	3.87	3.75	–0.03	–0.03	–0.33	–0.02	3.70	2023
Mexico	4.67	3.86	2.79	2.99	2.63	–0.16	–0.21	0.04	–0.07	2.48	2015
Mexico City	9.13	8.67	6.16	5.69	4.57	–0.09	–0.50	–0.09	–0.22	4.12	2018
Michoacán	1.55	2.19	2.30	1.85	2.01	0.13	0.02	–0.09	0.03	2.07	2012
Morelos	5.10	5.68	4.91	4.96	4.91	0.12	–0.15	0.01	–0.01	4.89	> 2025
Nayarit	3.17	3.67	6.39	5.67	5.69	0.10	0.54	–0.14	0.00	5.69	‡
Nuevo León	2.93	3.91	3.71	4.18	3.91	0.20	–0.04	0.09	–0.06	3.80	2020
Oaxaca	1.12	3.53	3.42	5.26	3.86	0.48	–0.02	0.37	–0.28	3.31	2015
Puebla	4.29	4.34	3.72	3.60	3.07	0.01	–0.12	–0.02	–0.11	2.85	2011
Querétaro	1.12	2.34	2.14	1.85	3.14	0.24	–0.04	–0.06	0.26	3.65	‡
Quintana Roo	3.23	4.17	7.11	7.37	9.02	0.19	0.59	0.05	0.33	9.69	‡
San Luis Potosí	1.54	1.52	2.25	2.66	1.92	0.00	0.15	0.08	–0.15	1.63	2012
Sinaloa	1.85	2.78	3.11	4.23	3.10	0.19	0.07	0.22	–0.23	2.65	2013
Sonora	1.21	2.68	3.35	4.22	4.45	0.29	0.13	0.17	0.05	4.55	‡
Tabasco	0.92	4.49	7.42	10.26	10.58	0.72	0.59	0.57	0.06	10.71	‡
Tamaulipas	1.71	2.55	4.92	5.65	5.63	0.17	0.47	0.15	0.00	5.63	> 2025
Tlaxcala	1.94	2.67	2.26	1.91	2.25	0.15	–0.08	–0.07	0.07	2.39	2010
Veracruz	2.68	5.26	8.59	10.29	8.65	0.52	0.67	0.34	–0.33	7.99	> 2025
Yucatán	5.03	5.63	4.17	5.87	5.47	0.12	–0.29	0.34	–0.08	5.32	> 2025
Zacatecas	1.05	0.84	1.33	1.35	1.03	–0.04	0.10	0.01	–0.06	0.90	2010
National total	3.43	4.14	4.40	4.66	4.19	0.14	0.05	0.05	–0.09	4.01	2020

Rate per 100,000 population.
*Estimated rate for 2015 according to mortality increase/decrease over the 2008-2013 period.
†Year when the state accomplished or will accomplish the 3.5 x 100,000 population rate promised by Mexico in the MDGs.
‡Mortality rate for 2015 could not be estimated for the seven indicated states, since they had a higher rate than the MDGs target for 2013, in addition to an upwards trend for mortality over the previous 5 years.

system and, in addition, treatment will act as a prevention mechanism, since hardly will the virus be able to be transmitted to other person. In Mexico, only one out of every three people with HIV (33%) has achieved an undetectable viral load[24]. Therapeutic success is quite low, especially when compared with countries such as France and the United Kingdom, where therapeutic success is achieved in 52 and 58% of people living with HIV, respectively[26,35].

In addition, there are other factors that are more difficult to analyze and quantify, but that might also have an impact: stigmatization and discrimination of people with HIV, both socially and in the family, and from healthcare personnel; denial of the disease and refusal to start antiretroviral therapy; geographic, economic and social barriers existing against access to health services; and lack of adequate training of treating physicians in some sectors.

All the above reflections and the cited studies reveal growing interest of the scientific community on analyzing this phenomenon. However, from our point of view, further studies are still required to quantify the weight each factor has, in isolation or in combination, on HIV/AIDS mortality rates in Mexico.

In sum, Mexico added the HIV/AIDS-related mortality indicator into the MDGs as an ambitious goal, and even if this goal most probably will not be able to be accomplished by the year 2015, its existence was a strategic measure that managed to bring the subject of comprehensive care of people with HIV into the healthcare institutions agenda as a necessary condition for the reduction of HIV/AIDS-related mortality on a historical moment when the available care system was incipient.

Finally, it should be noted that this work has two important limitations. The first one is that it is based on HIV/AIDS-related deaths officially recognized by the INEGI, i.e., HIV/AIDS-related death under-reporting due to cause of death misclassification is not considered. A recent study made the exercise of correcting HIV/AIDS-related death misclassification and arrived to the conclusion that 107,981 HIV/AIDS-related deaths have accumulated in Mexico between 1983 and 2012, i.e., 11% more than INEGI-reported total deaths[36]. This shows that HIV/AIDS-related mortality is most likely to be higher than that officially recognized.

The second limitation is that the MDGs indicator uses the HIV/AIDS-related mortality crude rate, in spite of epidemiology always recommending using adjusted rates. Should adjustment for age have been made for males and females, AIDS-related mortality rates would have been higher. For example, the latter cited study refers that, for the year 2012, the HIV/AIDS-related mortality adjusted rate in Mexico would be 4.8 deaths per 100,000 population[36]. If this figure is compared with the mortality crude rate calculated in this study (4.25 per 100,000 population), it turns out being 13% higher.

Conclusions

Our projections indicate that Mexico will not reach the HIV/AIDS-related mortality reduction goal established in the MDGs. Sixty percent of states will also fail to accomplish it. There are different explanations about the causes that have contributed to HIV/AIDS-related mortality not to decrease as expected, which confirms the urgent need to increase opportune detection of people with HIV; to efficiently bring detected people in touch with healthcare services; to increase therapeutic retention and adherence of patients on treatment; to improve medical training in order for therapeutic prescription to be increasingly better; and, finally, to increase the percentage of people with viral suppression. In sum, there's still a long way to go.

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