

# The impact of the demographic bonus in the pension systems of social security



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# INTRODUCTION

Nowadays Mexico faces one of the biggest demographic challenges in its history: the population ageing. This phenomenon will bring with it many challenges of various kinds, including those concerning to pension systems in Social Security, however, during this process Mexico has presented a phenomenon known as the demographic bonus (also known as the demographic dividend), which has as its main characteristic the decrease of the dependency ratio as a consequence of the constant increase in the proportion of working age population.

One area that is believed may be benefited from the demographic bonus is Social Security in particular in the financing of the retirement pensions so, the aim of this investigation is to analyze under what circumstances this would be possible, considering the conditions of unemployment and informal employment, and finally, to conclude if it is possible to take advantage of this phenomenon for the benefit of the pensions under the Pay As you Go system.

# THE DEMOGRAPHIC SITUATION IN MEXICO

## Mexico's crude birth rate\* 1960-2013

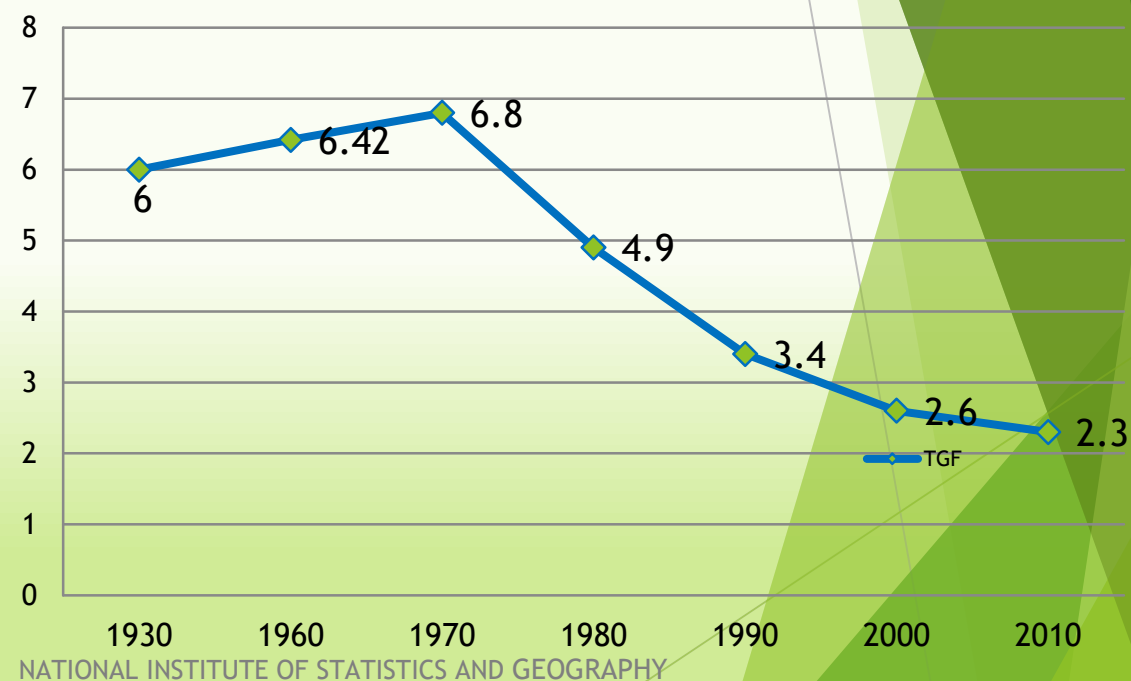
In Mexico, the reduction in the number of births has influenced the behavior of the crude birth rate

Year	1960	1970	1980	1981	1982	1983	1984	1985	1986
Rate	45	41.7	34.9	33	32	32	31	30	30
Year	1987	1988	1989	1990	1991	1992	1993	1994	1995
Rate	29	29	29	27.9	27.5	27.1	26.8	26.3	25.9
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004
Rate	25.4	24.8	24.3	23.9	23.4	23	22.6	22.2	21.8
Year	2005	2006	2007	2008	2009	2010	2011	2012	2013
Rate	21.5	21.1	20.8	20.4	20.1	19.7	19.4	19.2	18.9
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\*The CBR represents the number of live births occurring during a period per 1000 population estimated at midyear.

## Mexico's total fertility rate\*1930-2010

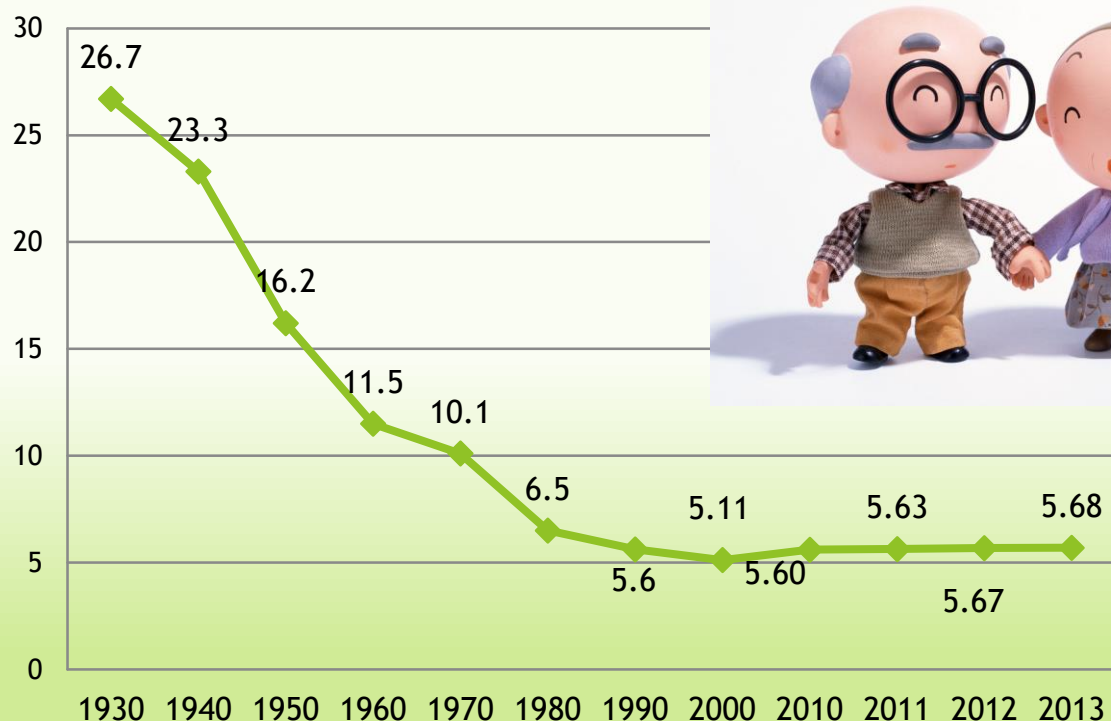
This has also had an impact on the Total Fertility Rate, as we can see in the next graphic.



\*Represents the number of children that would be born per woman if all women lived to the end of their childbearing years and bore children according to the age-specific birth rates on a given period.

## Mexico's crude death rate\* 1930-2013

In the other hand, the mortality has also decreased as we can see in the Crude death rate.

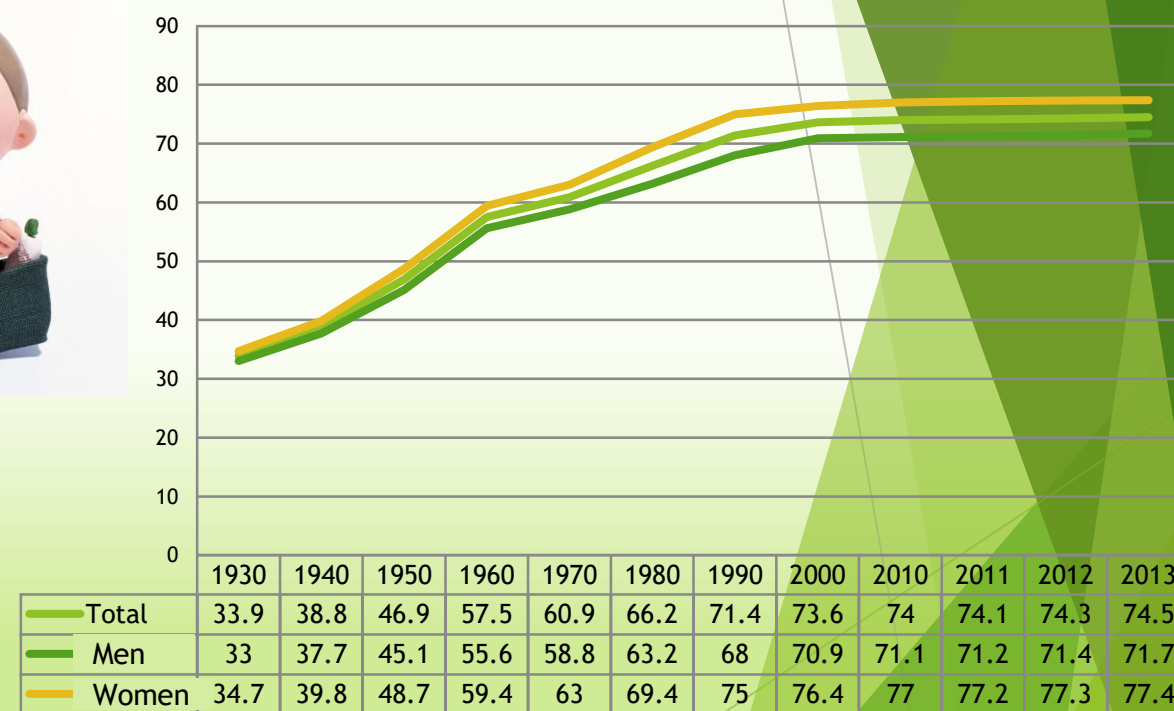


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\*The CDR represents the number of deaths occurring during a period per 1000 population estimated at midyear.

## Mexico's life expectancy\* 1930-2013

The changes in mortality levels, specially in the infant mortality have influenced directly the life expectancy of the population.



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\*Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns on mortality at the time of its birth stayed the same throughout its life

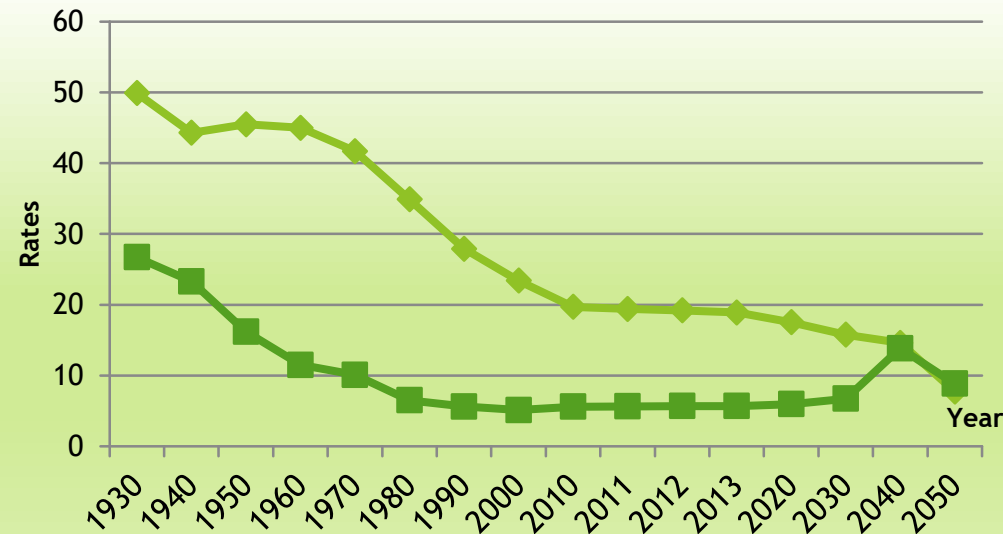
# THE DEMOGRAPHIC TRANSITION

Thus, the combination of an increasing life expectancy and a constant decline in fertility, causes a significant increase in the Average age of the population and a rising proportion of old-age adults.

Remember that the Demographic Transition refers to the transition from high birth and death rates to lower birth and death rates.

On one hand the decline in mortality gives rise to a progressive increase in life expectancy and, consequently, an increasing number of people comes alive to older ages; and on the other hand, the fall in fertility is reflected in the number of births and causes a reduction in the proportion of children and young people in the total population.

## Mexico's birth and death rates 1930-2013



# POPULATION STRUCTURE BY AGE GROUP

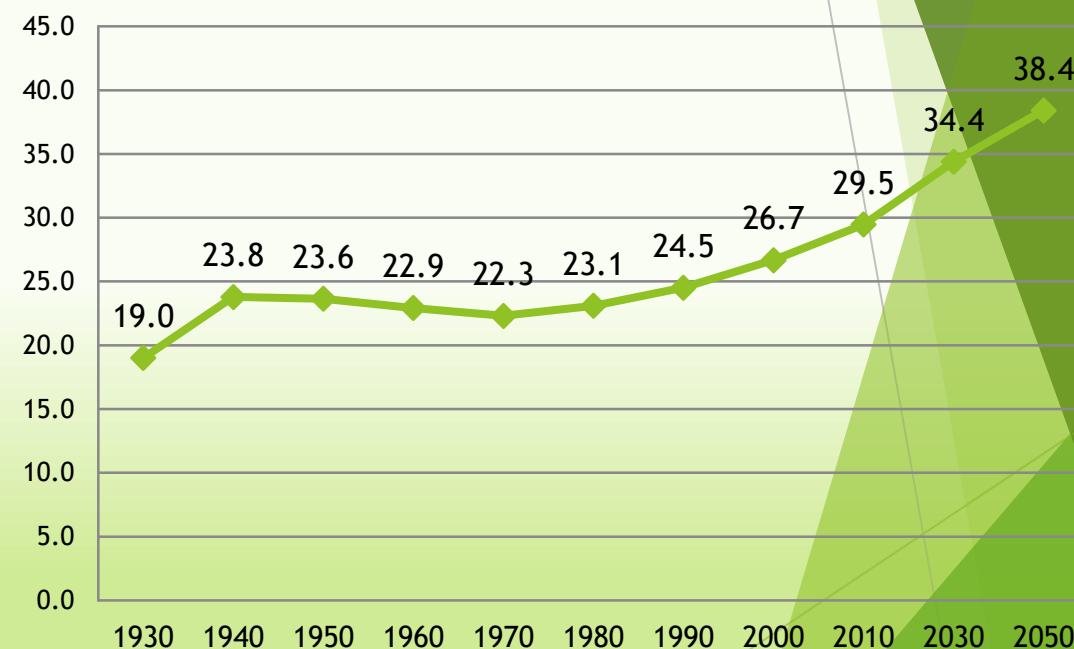
Subsequent changes in mortality and fertility caused important changes in the age structure of the Mexican population



## Population distribution by age group 1930-2013

YEAR/GROUP	TOTAL	0-14	15-64	65+
1930	16,552,722	6,489,850	9,571,034	488,745
%	100	39.21	57.82	2.95
1970	48,225,238	22,286,680	24,147,173	1,791,385
%	100	46.21	50.07	3.71
2000	97,483,412	32,586,973	58,092,327	4,750,311
%	100	33.43	59.59	4.87
2010	112,336,538	32,515,796	71,484,423	6,938,913
%	100	28.94	63.63	6.18
2020	127,091,642	33,094,427	84,173,584	9,823,631
%	100	26.04	66.23	7.73
2030	137,481,336	32,511,789	90,880,315	14,089,232
%	100	23.65	66.10	10.25
2050	150,837,517	31,234,579	95,240,098	24,362,839
%	100	20.71	63.14	16.15
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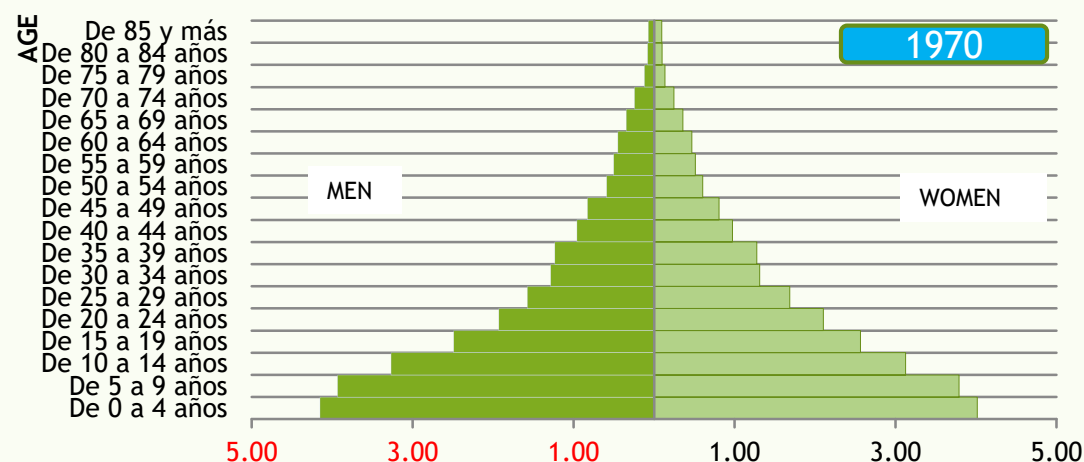
## Average age\* of Mexico ´s population 1930-2050



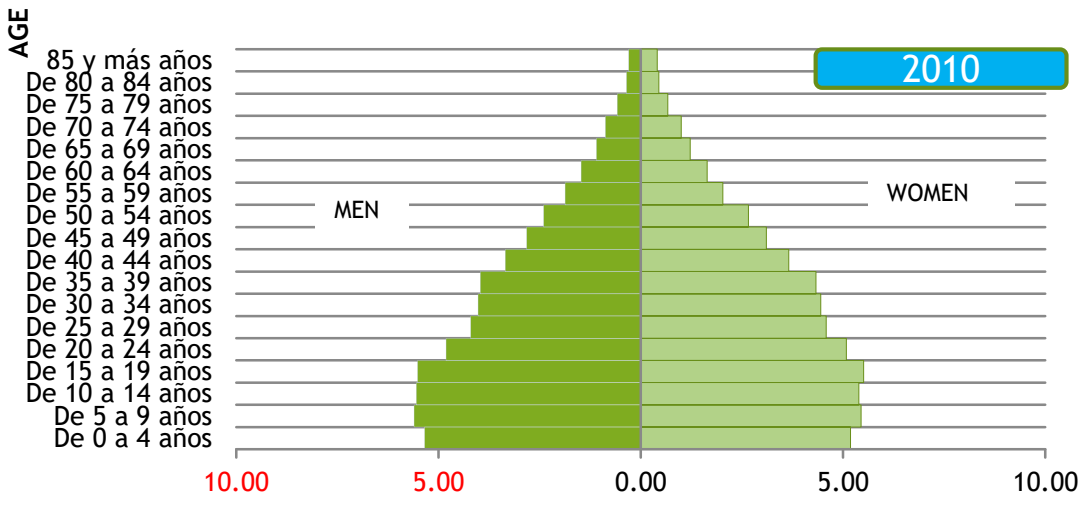
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\*Is the age that most of the people present in a population.

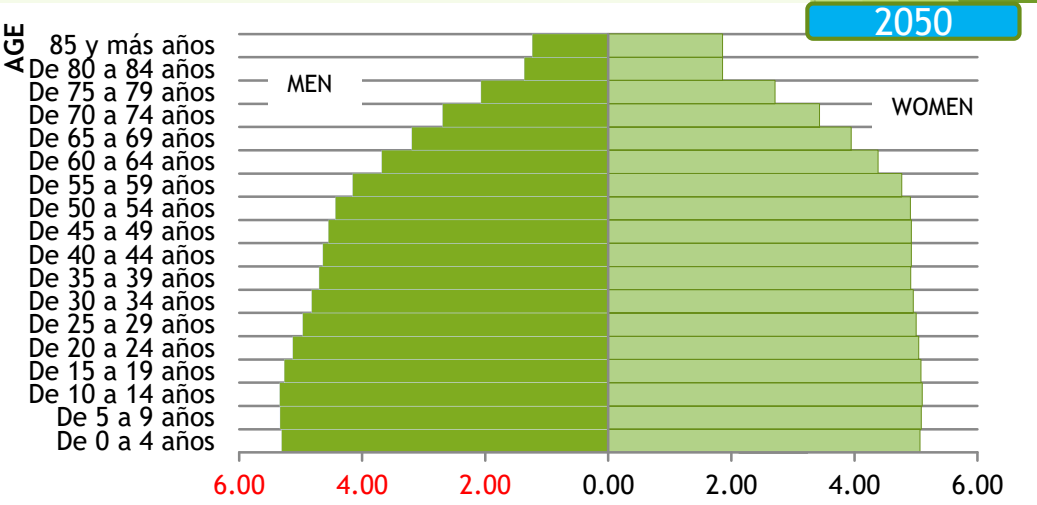
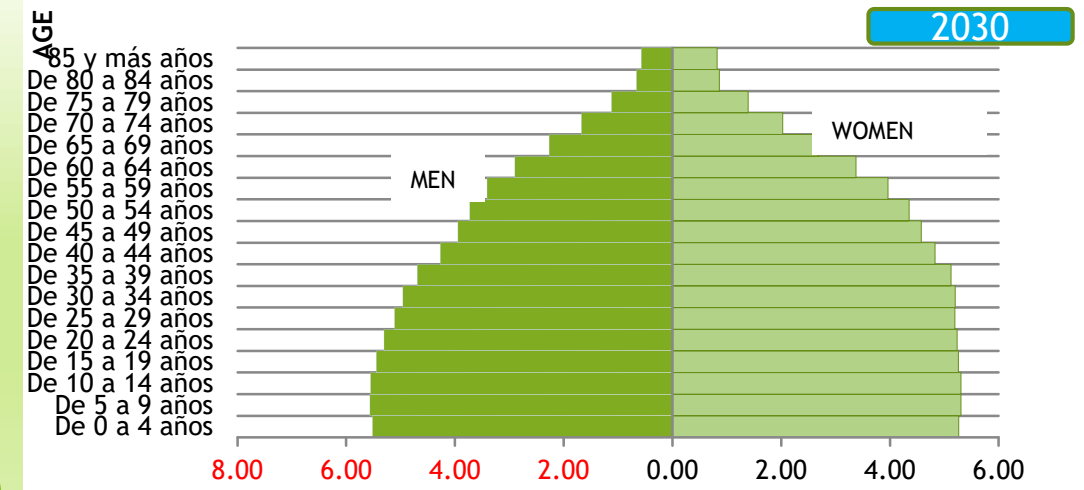
# POPULATION PIRAMYDS



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# Consequences of the demographic transition: The demographic bonus

## The total dependency ratio

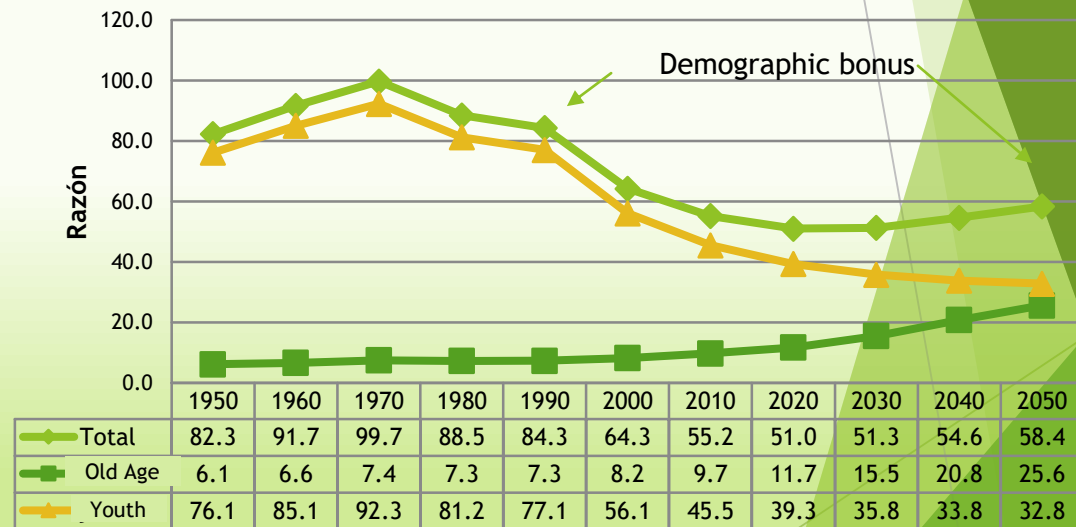
$$((_{15}N_0 + N_{65+}) / (_{50}N_{15})) * 100$$

The total dependency ratio can be decomposed into the youth dependency ratio and the old-age dependency ratio.

At the beginning, the decline in fertility causes that the total dependency ratio trends to decrease. At a later stage, the percentage of children is stabilized while the percentage of older adults grows significantly, consequently, the dependency ratio begins to increase

## The demographic bonus

The demographic bonus is defined as the phase of demographic transition, during which the populations have a mature demographic structure, i.e., it concentrates a high proportion of population in working ages



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This situation creates favorable conditions for society because in this period the volume of the working-ages population is higher in relation to the dependent population.

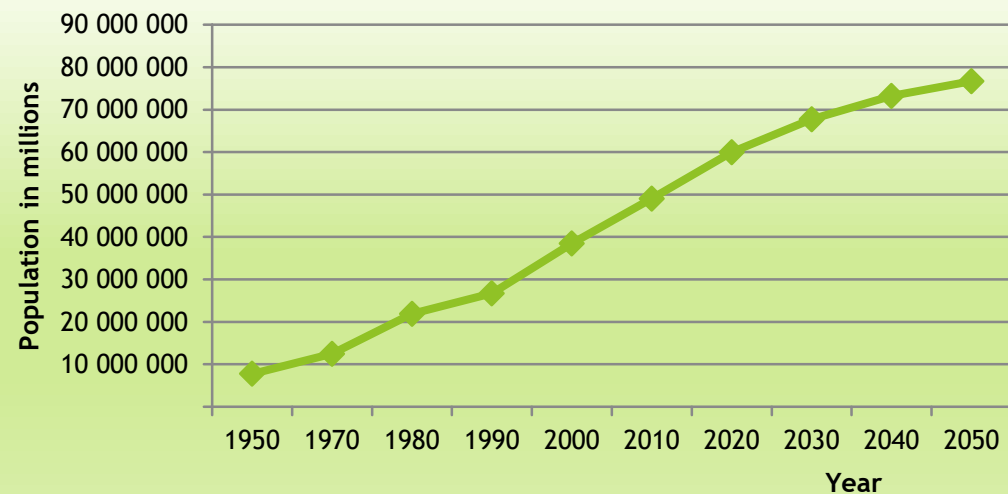


## ECONOMICALLY ACTIVE POPULATION

Age	<i>Economically active population (millions)</i>							
	1980	1990	2000	2010	2020	2030	2040	2050
Total	21866	26.697	38,484	49,021	59,958	67,722	73,231	76,705
15-24	7,331,	7,961	9,646	10,724	11,917	11,567	11,733	11,723
25-34	5,755	7,606	11,533	13,298	15,112	16,264	15,707	15,993
35-44	3,763	5,237	8,053	11,645	13,420	14,874	15,972	15,331
45-59	3,496	4,184	6,849	9,848	14,171	17,421	19,285	21,204
60+	1,520	1,707	2,401	3,505	5,335	7,593	10,533	12,453

<http://www.eclac.cl/celade/>

One of the most important consequences of the demographic transformation that Mexico has experienced over the past four decades has been the steady increase in the population of working ages, and especially of the economically active population (EAP ).

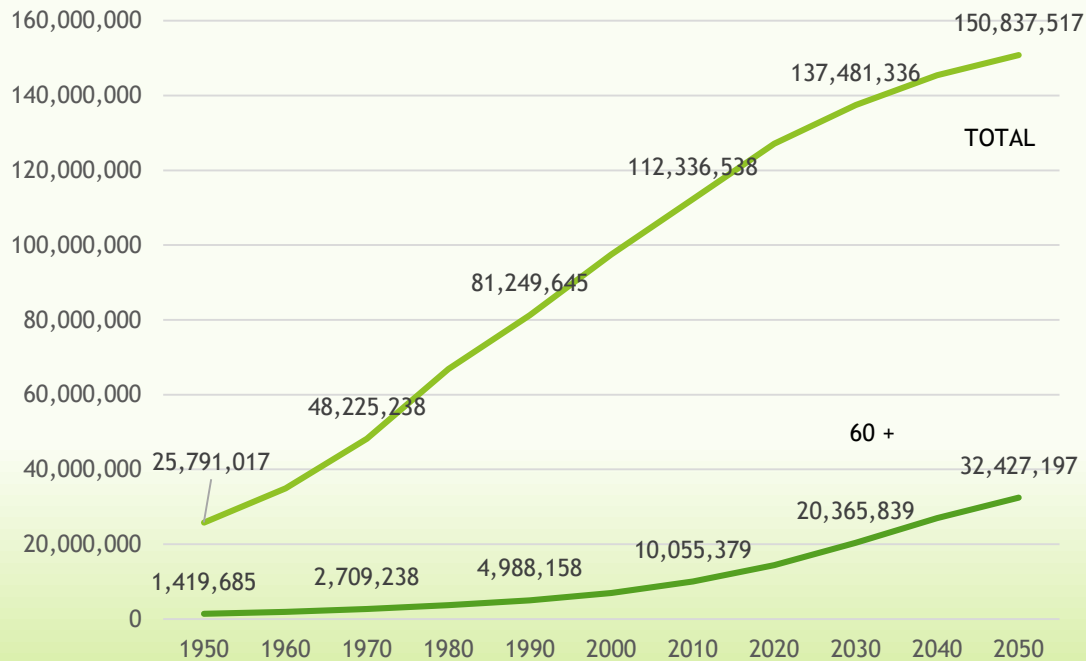


[http://www.eclac.cl/celade/proyecciones/basedatos\\_BD.htm](http://www.eclac.cl/celade/proyecciones/basedatos_BD.htm)



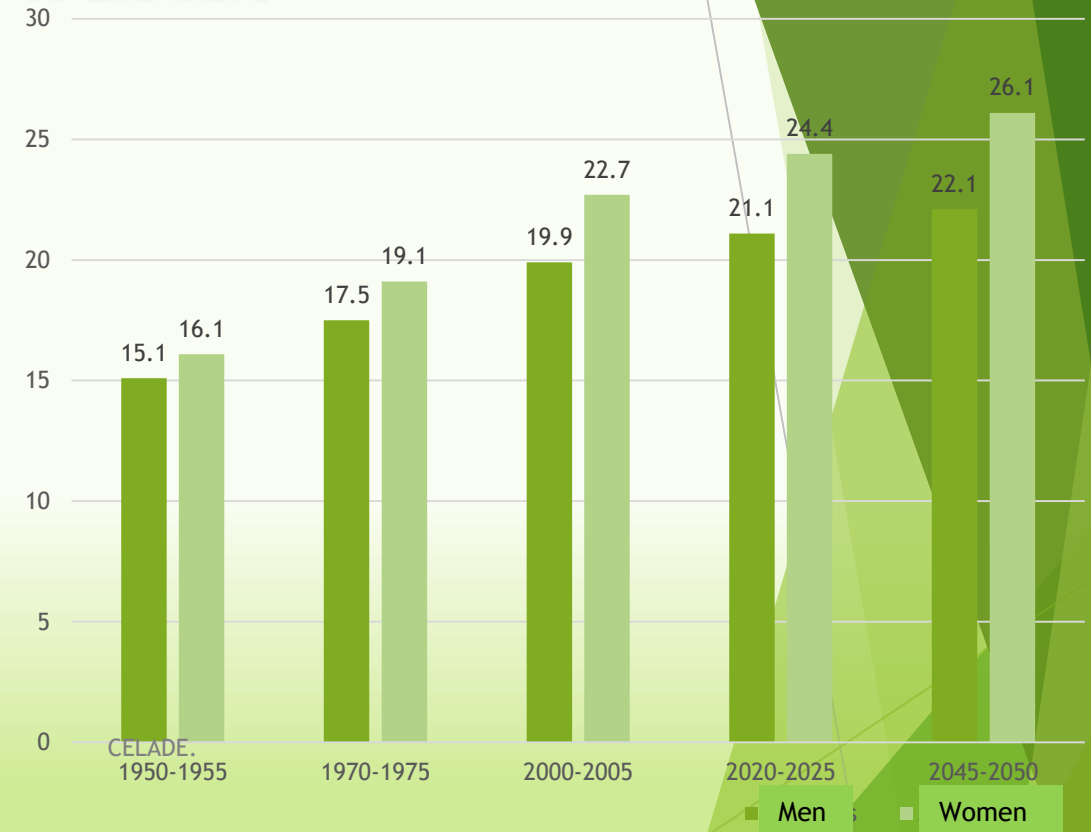
# THE OLD AGE PEOPLE IN MEXICO

## Population aged 60 and more



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## Life expectancy for population aged 60 and more



Due to increased longevity, the weight of people of older ages among the elderly will also increase.

## The elderly and employment

Another major concern generated by this rapid population aging in Mexico is the provision of sufficient monetary resources to attend the necessities of the old-age population.

### EAP of 60 and more

1980	1,520,382
1990	1,707,825
2000	2,401,026
2010	3,505,168
2020	5,335,946
2030	7,593,660
2040	10,533,022
2050	12,453,178

Fuente: <http://www.eclac.cl/celade>

## The elderly and Social Security

### Affiliation Conditions of population aged 60 and more, 2013

AGE	Not Affiliated	Affiliated	Type of Institution				
			IMSS	ISSSTE	Seguro Popular	Another Public Institution	Another Private Institution
Total 60 +	2 125 814	10 730 111	5 257 215	1 108 920	3 850 077	464 780	49 119
MEN 60+	1 004 950	4 880 496	2 418 702	487 699	1 727 592	222 097	24 406
WOMEN 60+	1 120 864	5 849 615	2 838 513	621 221	2 122 485	242 683	24 713

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### Pensioned Population aged 60 and more, 2013

AGE	IMSS			ISSSTE		
	Total	MEN	WOMEN	Total	MEN	WOMEN
60 +	2 197 182	1 586 422	610 760	429 090	247 249	181 841

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As mentioned above , over the years, the number of older adults will continue to increase and also the number of pensioners, so, new financing models that cover this future demand for pensions for the growing number of older adults will be needed

# THE DEMOGRAPHIC BONUS AND THE PENSION SYSTEMS IN SOCIAL SECURITY

As it was mentioned before, in this investigation we want to analyze the possible benefits that this phenomenon could have on the pension systems of Social Security

The main characteristic of this demographic phenomenon is the constant increase of the working-age population, so the creation of enough formal employment it's a priority.

## Unemployment rate and informality rate

YEAR	Unemployment Rate	Informal employment Rate
2000	2.68	26.91
2005	3.58	28.2
2010	5.33	28.46
2011	5.23	28.45
2012	4.94	28.81
2013	4.94	28.48
2014	5.04	27.87
2015	5.24	27.92
2020	6.22	28.15
2030	8.18	28.63
2040	10.14	29.11
2050	12.11	29.58

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Once the rates are projected it is possible to obtain the employed and unemployed population and also the population employed in the formal and informal sector.

Año	Economically Active Population	Employed population	Informal employment	Formal employment	Unemployment population	IMSS Insured	Another Institution
2013	49,517,037	47,072,885	13,406,393	33,666,492	2,444,152	16,072,462	17,594,030
2014	50,429,292	47,886,568	13,345,675	34,540,892	2,542,724	16,393,911	18,146,981
2015	51,337,196	48,647,942	13,581,002	35,066,940	2,689,254	16,721,789	18,345,151
2020	55,136,288	51,706,982	14,557,948	37,149,034	3,429,306	18,365,969	18,783,065
2030	60,008,152	55,098,140	15,774,761	39,323,379	4,910,012	20,242,713	19,080,666
2040	61,810,576	55,540,020	16,165,416	39,374,604	6,270,556	20,850,729	18,523,875
2050	61,076,808	53,682,026	15,879,937	37,802,089	7,394,782	20,897,522	16,904,567

## PENSIONED POPULATION OF THE MEXICAN INSTITUTE OF SOCIAL INSURANCE

### Old age pensioners

Year	Cesanty and old age
2013	1,587,150
2014	1,649,433
2015	1,712,996
2020	2,050,009
2025	2,419,024
2030	2,820,041
2040	3,718,079
2050	4,744,123
IMSS	

### Survivor pensioners

Year	Survivors Pensions
2013	737,796
2014	757,339
2015	777,107
2020	879,317
2025	987,143
2030	1,100,586
2040	1,344,322
2050	1,610,525
IMSS.	

### Disability pensioners

Year	Disability pensioners
2013	272,729
2014	270,400
2015	277,112
2020	312,207
2025	349,886
2030	390,175
2040	478,646
2050	577,673
IMSS	

### Total pensioners

Año	Total Pensioners
2013	2,597,675
2014	2,677,172
2015	2,767,214
2020	3,241,533
2025	3,756,053
2030	4,310,803
2040	5,541,047
2050	6,932,321
IMSS	

### Cost of the pensions and wages (millions of MXN)

Year	Pensions at payment	Temporary pensions	Total	Wages
2013	145,260	1,068	146,328	1,581,726
2014	152,363	1,279	153,642	1,639,553
2015	159,128	1,431	160,559	1,698,959
2020	199,169	1,905	201,074	2,004,280
2025	259,485	2,494	261,979	2,281,310
2030	332,180	3,123	335,303	2,502,112
2040	482,270	4,197	486,467	2,827,336
2050	437,779	4,545	442,324	3,080,002
IMSS				

On the other hand once we got the contributors of the IMSS we need to know the number of pensioners, the cost of their pensions and the wages of the workers, this will let us calculate the Average pension and the PAYG premium needed to finance the pensions.

With the projections obtained in the previous sections it is possible to obtain the total pensioners as follows:

$$\begin{aligned}
 &\text{Total Pensioners} \\
 &= \text{Old Age pensioners} \\
 &+ \text{disability pensioners} \\
 &+ \text{Survivor pensioner}
 \end{aligned}$$

## Average pension & PAYG Premium

Once that we have the contributors, pensioners, cost of the pensions and the wages of the contributors we can obtain the Average pension and Pay As You Go Premium.

$$100 * \text{premium} = \left( \frac{\sum_{j=1}^m \text{pension of the worker } j}{\sum_{h=1}^n \text{salary of the worker } h} \right)$$

$$\text{Average pension}_{\text{year } t} = \frac{\text{total cost of the pensions}_{\text{year } t}}{\text{total pensioners}_{\text{year } t}} * 1,000,000$$

Performing these calculations the following results are obtained:

Year	Average pension	PAYG premium
2013	56,330	9.25%
2014	57,390	9.37%
2015	58,022	9.45%
2020	62,031	10.03%
2025	69,748	11.48%
2030	77,782	13.40%
2035	85,931	15.75%
2040	87,793	17.21%
2045	77,045	16.23%
2050	63,806	14.36%
IMSS		

We can appreciate that the PAYG premium is very high and continues to increase significantly in the coming years so if we want a lower PAYG premium it is necessary to increase the formal employees.

## Scenario 1

### Unemployment & PAYG premium

Year	New unemployed population	New unemployment rate
2013	1,222,076	2.47%
2014	1,271,362	2.52%
2015	1,344,627	2.62%
2020	1,714,653	3.11%
2025	2,088,481	3.60%
2030	2,455,006	4.09%
2040	3,135,278	5.07%
2050	3,697,391	6.05%

We will assume that they will earn the average wage, which was calculated as follows

$$\text{Average wage}_{\text{Year } t} = \frac{\text{Salary of the insured}_{\text{Year } t}}{\text{Insured}_{\text{Year } t}}$$

### PAYG Premium (Scenario 1)

Year	Average Wage	(Y)=Average wage *(New employees)	Wages+ Y	New PAYG premium
2013	0.09841218	120,267	1,701,993	8.60%
2014	0.10000988	127,149	1,766,702	8.70%
2015	0.10160151	136,616	1,835,575	8.75%
2020	0.1091301	187,120	2,191,400	9.18%
2025	0.11658861	243,493	2,524,803	10.38%
2030	0.12360557	303,452	2,805,564	11.95%
2040	0.1355989	425,140	3,252,476	14.96%
2050	0.14738599	544,944	3,624,946	12.20%

## PAYG Premium (Scenario 2)

In this scenario we supposed we could give to all the unemployed population a formal employment.

Year	Average Wage	(Y)=Average wage *(New employees)	Wages+ Y	New PAYG premium
2013	0.09841218	240,534	1,822,260	8.03%
2014	0.10000988	254,298	1,893,851	8.11%
2015	0.10160151	273,232	1,972,191	8.14%
2020	0.1091301	374,240	2,378,520	8.45%
2025	0.11658861	486,986	2,768,296	9.46%
2030	0.12360557	606,905	3,109,017	10.78%
2040	0.1355989	850,281	3,677,617	13.23%
2050	0.14738599	1,089,887	4,169,889	10.61%

## PAYG Premium (Scenario 3)

Year	Average Wage	(Y)=Average wage *(New employees)	Wages+ Y	New PAYG premium
2013	0.09841218	1,068,833	2,650,559	5.52%
2014	0.10000988	1,117,905	2,757,458	5.57%
2015	0.10160151	1,163,946	2,862,905	5.61%
2020	0.1091301	1,387,760	3,392,040	5.93%
2025	0.11658861	1,610,473	3,891,783	6.73%
2030	0.12360557	1,822,052	4,324,164	7.75%
2040	0.1355989	2,185,069	5,012,405	9.71%
2050	0.14738599	2,482,762	5,562,764	7.95%

## Scenario 3

We can see that in the last case the PAYG premium remain at high levels. Therefore we must add a percentage of the population employed in the informal sector, following the same procedure we decreased the informality in two thirds

Year	New Total employees	Unemployed that will have a formal employment	Informal employed that will have a formal employment	New informal employees	New informality rate
2013	10,860,775	2,444,152	8,416,623	4,989,770	10.60%
2014	11,177,947	2,542,724	8,635,223	4,710,452	9.84%
2015	11,455,989	2,689,254	8,766,735	4,814,267	9.90%
2020	12,716,564	3,429,306	9,287,258	5,270,690	10.19%
2025	13,813,292	4,176,961	9,636,331	5,646,958	10.49%
2030	14,740,857	4,910,012	9,830,845	5,943,916	10.79%
2040	16,114,207	6,270,556	9,843,651	6,321,765	11.38%
2050	16,845,304	7,394,782	9,450,522	6,429,415	11.98%



## CONCLUSIONS:

It has been said in various readings that the demographic bonus can boost the productive potential of the country and can be used to improve the situation in different areas, one of these the Social Security. It is argued that this phenomenon may be a solution for financing pension systems under the PAYG scheme of the IMSS

Actually the situation of the old-age population, is not the most favorable and coverage offered by social security systems is not enough, so one of the main concerns, will be to cover the growing demand for old-age pensions. In our scenarios we tried to solve the IMSS problem but, as shown, there still other pension systems that were not analyzed yet.

By making this investigation we wanted to validate or discard this theory , creating different scenarios under which this could be achieved, of this analysis it can be concluded that while the economically active population will increase significantly over the next few years, the situation of unemployment and informality that has been occurring in the country, is not adequate ; according to the projections , the unemployed could reach 7.4 million, while the population employed in the informal sector would reach 15.8 million so the most important condition to take advantage of the demographic bonus is the creation of enough formal jobs for the entire unemployed and informal population which will be difficult task considering that the historical data of these rates have not presented a significant decrease to 2015 .

On the other hand, many of the young population has low levels of schooling so it is not only important to implement policies to promote job creation, but also improve education policies that allow not only expand coverage and access to it but also its quality.

Another of the conclusions that can be reached with this work was that this system has a costing problem because in each of the proposed scenarios, the PAYG premium tends to increase as higher the time is, this due to the increase of the population over 65 years, for example , in the first scenario premium distribution passed from 8.60% in 2013 to 13.94 % in 2050 and finally on scenario 3, the premium increases from 5.52 % to 9.05 %. We see that the PAYG premium will continue increasing significantly in the coming years, making the PAYG system not a viable costing-method for long-term benefits