DEMOGRAPHYC MODEL OF THE DYNAMICS OF MEXICO

October 2015
Designed models on DEMODIN

- Demographyc components monitoring
  - National model by breakdown age
  - State models by breakdown age (32 models)
  - State model by gross rates
  - Simplified model with factors of change

- Population model of Aguascalientes basin for Environment model.
Designed models on DEMODIN

➢ SEDESOL program model:

• Life insurance for female head of family

➢ Model of the Illiterate population (under construction)
Demographic components monitoring
Number of Births by different resources, 1995-2015

Difference of 4.5%
General deaths according to resource, 1990-2012

Projection keeps above death records

INSTITUTO NACIONAL DE ESTADÍSTICA Y GEOGRAFÍA
Net loss due international migration according to resource, 1995-2015

Difference of 45%
Demographic indicators for 2010-2015 quinquennial according to resource

*Annual averages*

<table>
<thead>
<tr>
<th>Indicator</th>
<th>CONAPO¹</th>
<th>INEGI</th>
<th>CELADE²</th>
<th>United Nations³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population 2010 (millions)</td>
<td>114.2 millions</td>
<td>112.3 millions⁴</td>
<td>115.3 millions</td>
<td>118.6 millions</td>
</tr>
<tr>
<td>Population 2015 (millions)</td>
<td>121.0 millions</td>
<td>119.7 millions</td>
<td>121.8 millions</td>
<td>127.0 millions</td>
</tr>
<tr>
<td>Births (annual average in millions)</td>
<td>2.25 millions</td>
<td>2.34 millions⁵</td>
<td>2.25 millions</td>
<td>2.37 millions</td>
</tr>
<tr>
<td>Deaths (annual average in thousands)</td>
<td>662 thousands</td>
<td>604 thousands⁶</td>
<td>574 thousands</td>
<td>585 thousands</td>
</tr>
<tr>
<td>Migration (annual average in thousands)</td>
<td>-220 thousands</td>
<td>-120 thousands⁷</td>
<td>-373 thousands</td>
<td>-105 thousands</td>
</tr>
</tbody>
</table>

1. CONAPO. Projections of the population of Mexico 2010-2050
Model for the Population of Río San Pedro, Aguascalientes
Population of Río San Pedro, Aguascalientes

- It includes the population of 7 of 11 municipalities.

- The 2005 population was considered as basis.

- The Dynamic Demographic of Aguascalientes was taken as base of estimation.

- A factor of change was used in each one of components, it lets to have a model 15% more little than first one.
Pyramid of Population of Río San Pedro, Aguascalientes
2005

Population: 979,510 persons

Fuente: estimaciones propias a partir del Conteo de Población y Vivienda 2005 y el Censo de Población y Vivienda 2010.
Pyramid of Population of Río San Pedro, Aguascalientes
2030

Population: 1,483,835 persons

Fuente: estimaciones propias a partir del Censo de Población y Vivienda 2005 y el Censo de Población y Vivienda 2010.
Model for program: Life insurance for female head of family (SEDESOL)
General features

• The Program is directed to female heads of family who are under vulnerability conditions to include them in a life insurance.

• To be insured the women must be 12 till 68 years old and having sons less than 24 years old.

• Main purpose is protect or promote scholar assistance of sons in case of death of mother.

• The program coverage is at national level.
Estimation of amount of profit granted to sons of female heads of family that have deceased, 2010-2050

Fuente: INEGI. Estimaciones propias a partir del XII Censo General de Población y Vivienda 2000; Censo de Población y Vivienda 2010.
Model of Illiterate population
National Literacy Campaign and reducing the educational gap 2013-2018

• To alphabetize 2.2 millions of persons

• To reduce the number of persons that don’t know to read and write, to reach 3.5% en 2018
Demographic prospective exercise

• Using the same principle of the projections of population by demographic components.

• For the similar of Fertility, it would consider the illiterate rate of 15 years old.

• For the similar of Mortality, it would consider the life expectancy from CONAPO’s projections of population and the illiterate rates.

• In case of Migration, we propose don’t consider it because the internal and international migration rates of the illiterate population are small.
Diagram that shows the demographic prospective method

- **Illiterate population at $t_0$**
  - Mortality
  - Literacy

- **Illiterate population at $t_1$**
  - "Births" (Tasas * $P_{15}$)

- **Illiterate population of 15 years old**
  - Mortality
  - Literacy

_Tasas_ refers to the rates or percentages in the context of population analysis.
Estimation of Illiterate population 2010-2030
Estimation of Illiterate population by sex, 2010-2030

Millones de analfabetas

Año


Millones de analfabetas

Hombres

Mujeres

5.4 millions

4 millions

2.4 millions

Fuente: INEGI. Estimaciones propias.
Pyramids of illiterate population, 2010-2030

Fuente: INEGI, Estimaciones propias.
Illiteracy rates of the population of 15 years or more by sex, 1990-2018

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Hombres</th>
<th>Mujeres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>124.4</td>
<td>94.6</td>
<td>150.4</td>
</tr>
<tr>
<td>2000</td>
<td>96.5</td>
<td>68.2</td>
<td>113.2</td>
</tr>
<tr>
<td>2010</td>
<td>74.4</td>
<td>44.0</td>
<td>80.2</td>
</tr>
<tr>
<td>2018</td>
<td>55.3</td>
<td>35.1</td>
<td>52.2</td>
</tr>
</tbody>
</table>

## Indicators estimating the illiterate population, 2010-2030

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2010</th>
<th>2015</th>
<th>2018</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>illiterate population</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5 430 349</td>
<td>4 525 146</td>
<td>4 030 329</td>
<td>3 718 786</td>
<td>3 004 438</td>
<td>2 384 128</td>
</tr>
<tr>
<td>Men</td>
<td>2 111 587</td>
<td>1 743 062</td>
<td>1 545 144</td>
<td>1 422 035</td>
<td>1 144 558</td>
<td>909 531</td>
</tr>
<tr>
<td>Women</td>
<td>3 318 762</td>
<td>2 782 084</td>
<td>2 485 185</td>
<td>2 296 751</td>
<td>1 859 880</td>
<td>1 474 597</td>
</tr>
<tr>
<td><strong>New illiterates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>24 839</td>
<td>17 110</td>
<td>13 641</td>
<td>11 725</td>
<td>8 352</td>
<td>5 803</td>
</tr>
<tr>
<td>Men</td>
<td>14 014</td>
<td>10 038</td>
<td>8 166</td>
<td>7 110</td>
<td>5 224</td>
<td>3 733</td>
</tr>
<tr>
<td>Women</td>
<td>10 825</td>
<td>7 072</td>
<td>5 475</td>
<td>4 615</td>
<td>3 128</td>
<td>2 070</td>
</tr>
<tr>
<td><strong>Deceased illiterate population</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>134 113</td>
<td>118 375</td>
<td>113 302</td>
<td>109 401</td>
<td>98 206</td>
<td>85 736</td>
</tr>
<tr>
<td>Men</td>
<td>57 589</td>
<td>49 461</td>
<td>46 207</td>
<td>43 938</td>
<td>38 019</td>
<td>32 111</td>
</tr>
<tr>
<td>Women</td>
<td>76 524</td>
<td>68 914</td>
<td>67 095</td>
<td>65 463</td>
<td>60 187</td>
<td>53 625</td>
</tr>
<tr>
<td><strong>literate population</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>89 377</td>
<td>69 210</td>
<td>59 788</td>
<td>54 431</td>
<td>43 477</td>
<td>34 921</td>
</tr>
<tr>
<td>Men</td>
<td>37 645</td>
<td>29 252</td>
<td>25 270</td>
<td>22 985</td>
<td>18 285</td>
<td>14 662</td>
</tr>
<tr>
<td>Women</td>
<td>51 732</td>
<td>39 958</td>
<td>34 518</td>
<td>31 446</td>
<td>25 192</td>
<td>20 259</td>
</tr>
<tr>
<td><strong>Increase of the illiterate population</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>- 198 651</td>
<td>- 170 475</td>
<td>- 159 449</td>
<td>- 152 107</td>
<td>- 133 331</td>
<td>- 114 854</td>
</tr>
<tr>
<td>Men</td>
<td>- 81 220</td>
<td>- 68 675</td>
<td>- 63 311</td>
<td>- 59 813</td>
<td>- 51 080</td>
<td>- 43 040</td>
</tr>
<tr>
<td>Women</td>
<td>- 117 431</td>
<td>- 101 800</td>
<td>- 96 138</td>
<td>- 92 294</td>
<td>- 82 251</td>
<td>- 71 814</td>
</tr>
<tr>
<td><strong>Population aged 15 or more (DEMODIN Base 112.3 M)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>79 576 327</td>
<td>87 227 648</td>
<td>91 604 452</td>
<td>94 421 165</td>
<td>101 076 171</td>
<td>107 600 104</td>
</tr>
<tr>
<td>Men</td>
<td>38 175 512</td>
<td>41 865 157</td>
<td>44 002 223</td>
<td>45 381 781</td>
<td>48 648 872</td>
<td>51 870 959</td>
</tr>
<tr>
<td>Women</td>
<td>41 400 815</td>
<td>45 362 491</td>
<td>47 602 229</td>
<td>49 039 384</td>
<td>52 427 299</td>
<td>55 729 145</td>
</tr>
<tr>
<td><strong>Illiteracy rates (per thousand.)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>68.2</td>
<td>51.9</td>
<td>44.0</td>
<td>39.4</td>
<td>29.7</td>
<td>22.2</td>
</tr>
<tr>
<td>Men</td>
<td>55.3</td>
<td>41.6</td>
<td>35.1</td>
<td>31.3</td>
<td>23.5</td>
<td>17.5</td>
</tr>
<tr>
<td>Women</td>
<td>80.2</td>
<td>61.3</td>
<td>52.2</td>
<td>46.8</td>
<td>35.5</td>
<td>26.5</td>
</tr>
</tbody>
</table>

Source: INEGI. Own estimates.
Conclusions

• DemoDin México satisfies the needs of Demographic Analysis Directorate to monitor differences among observed statistics respect to hypothesis of the projections and their effects on the estimates of population.

• The modeling tool was used in other projects that have been adecuated in Dynamic Systems.

• We observe a considerable potential of the use of Dynamic Systems in diverse fields, they allow construct the Probable, Possible and Desirable evolution of phenomena for modeling.
Thank you!!