UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO

FACULTAD DE CIENCIAS

El ajuste de funciones de supervivencia en tablas de mortalidad mexicanas.

T E S I S

QUE PARA OBTENER EL TÍTULO DE:

ACTUARIA

P R E S E N T A:

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Índice general

Introducción.

En la Demografía se estudian los siguentes fenómenos: fecundidad, mortalidad y migración.

La fecundidad analiza el número de nacimientos que se dan dentro de una población en un período de tiempo, la migración estudia el cambio de residencia de los habitantes de la población y la mortalidad hace referencia al número de fallecimientos que ocurren en un período dado dentro de una población. Este fenómeno ha sido de suma importancia a lo largo de la historia debido a que la humanidad desde sus inicios siempre ha buscado evitar la extinción de su especie.

Con el tiempo se han ido mejorando las técnicas para conservar y hacer crecer la población, desde las médicas y tecnológicas hasta las sociales y matemáticas; en éstas últimas se han visto grandes desarrollos a partir de la introducción del concepto "Ley de mortalidad".

Las leyes de mortalidad buscan una semejanza con las leyes de la física, las cuales a través de fórmulas realizan una descripción de los fenómenos de la naturaleza; de esta manera se puede comunicar de una manera más sencilla la descripción del fenómeno mortalidad, sobre todo cuando se involucra a más de una persona en el estudio.

Los primeros postulados corresponden a De Moivre, Gompertz y Makeham.

De Moivre

Abraham De Moivre fue un matemático francés. Nació el 26 de mayo de 1667 en Vitry-le-François, Champagne (Francia) y murió el 27 de noviembre de 1754 en Londres, Inglaterra.

Estudió Lógica en Saumur, es conocido por su Fórmula De Moivre, la cual conecta los números complejos y la trigonometría por su trabajo en la distribución normal y probabilidad. Escribió un libro de probabilidad titulado The Doctrine of Chances.

Como era calvinista, tuvo que salir de Francia después de la revocación del Edicto de Nantes por el de Fontainebleau (1685), y pasó el resto de su vida en Inglaterra.

Fue elegido miembro de la Royal Society de Londres en 1697, y tuvo amistad con Isaac Newton y Edmund Halley.

En 1729 realizó su postulado de Ley de Mortalidad.

Fuerza de mortalidad:

$$\mu(x) = (\omega - x)^{-1}$$

Función de supervivencia:[1]

$$S(x) = 1 - \frac{x}{\omega}$$

donde: $0 \leq x < \omega$

[1] $S(x) = 1 - F(x)$ donde: $F(x)$ es la función de distribución para una persona de edad (x) con una probabilidad asociada al fallecimiento de esa persona.

Gompertz

Benjamín Gompertz, hijo de una distinguida familia judía, nació en Londres en 1779. Su primer papel importante lo realizó en la Royal Society en 1806 al describir la aplicación del método de las diferencias en series. Realizó varias publicaciones para esta asociación, de la cual se convirtió en socio. Se volvió asociado de la Astonomycal Society y en ella desarrolló trabajos sobre instrumentos astronómicos. Su última publicación sobre tópicos astronómicos la realizó en 1829.

Gompertz era un actuario que realizó dos publicaciones importantes sobre contingencias. La primera la realizó en 1820, introdujo una nueva notación para describir las contingencias que ocurren para dos o más vidas. En este trabajo asume que l_x decrece de una forma aritmética o geométrica conforme va aumentando la edad de los individuos en estudio.

La parte más destacada de este trabajo es que contradice lo escrito anteriormente por otros autores sobre el orden en la muerte cuando se tienen dos vidas en estudio: él propone que la probabilidad de morir en primer lugar no se puede ver de una manera similar en los dos casos.

La segunda la realizó en 1825 en la cual desarrolla su famosa ley de mortalidad.

Fuerza de mortalidad:

$$\mu(x) = Bc^x$$

Función de supervivencia:

$$S(x) = exp[-m(c^x - 1)]$$

donde: $B > 0, c < 1, x \geq 0$

La fuerza de mortalidad que él propone solamente considera razones biológicas de muerte y excluye los eventos fortuitos.

Makeham

William Makeham fue un actuario británico quien propuso en 1860 su Ley de Mortalidad basándose en la propuesta por Gompertz. Agrega una constante que contiene los eventos fortuitos que no se habían considerado en la ley anterior.

Fuerza de mortalidad:

$$\mu(x) = A + Bc_x$$

Función de supervivencia:

$$exp\left[-Ax - m\left(c_x - 1\right)\right]$$

donde:$B > 0, A \geq -B, c > 1, x \geq 0$

Objetivo

El objetivo de este trabajo es realizar un ajuste a la función biométrica l_x de la tabla de mortalidad a través de la función Gompertz-Makeham aplicada; es decir, tratar de acercarse lo más que se pueda a los datos observados con una función que es conocida para poder conocer la distribución y propiedades de los datos.

Es de gran importancia realizar este ajuste debido a que a partir de dicha función biométrica, se construirán las tablas de mortalidad para la proyección de población 2005-2025, y lo que interesa destacar es la esperanza de vida que se tendrá en dichos años.

Se presentará el desarrollo de dicha función al igual que la aplicación a las tablas de mortalidad para hombres, mujeres y la población total (ambos sexos) para los años 2005 a 2025.

Capítulo 1

Desarrollo.

1.1. El origen de la función Gompertz.

Se origina con la fuerza de mortalidad, la cual es la probabilidad de morir entre dos edades x y $x+h$, cuando h es muy pequeña. Se representa por $\mu(x)$ y se deriva de lo siguiente:

$$\mu(x) = \lim_{h \to 0} \frac{l(x) - l(x+h)}{(x+h) - x}$$

Se sabe que por definición la derivada de una función es:

$$\frac{\partial}{\partial x} f(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

Utilizando esta expresión y sustituyendo en la función de fuerza de mortalidad se tiene:

$$\mu(x) = -\left(\frac{1}{l(x)}\right)\left(\frac{\partial}{\partial x} l(x)\right)$$

$$\mu(x) = -\frac{\partial}{\partial x} \ln\left(l(x)\right)$$

Ésta última igualdad se da por:

$$\frac{\partial}{\partial x} \ln x = \left(\frac{1}{x}\right)\left(\frac{\partial}{\partial x} l(x)\right)$$

De lo anterior se resuelve la ecuación diferencial, integrando a $\mu(x)$

$$\int_0^x \mu(y)\partial y = -\int_0^x \frac{\partial}{\partial y} \ln(y)\partial(y)$$

$$\int_0^x \mu(y)\partial y = -\ln(y)|_0^x$$

$$\int_0^x \mu(y)\partial y = -\ln l(x) + \ln l(0)$$

$$\int_0^x \mu(y)\partial y = -\ln \frac{l(0)}{l(x)}$$

si y sólo si

$$\frac{l(x)}{l(0)} = e^{-\int_0^x \mu(y)\partial y}$$

si y sólo si

$$l(x) = l(0)e^{-\int_0^x \mu(y)\partial y}$$

Gompertz plantea la hipótesis de la resistencia del hombre a morir, en donde ésta decrece con la edad; es decir, es la inversa de la fuerza de mortalidad.

$$\frac{1}{\mu(x)}$$

Se tiene que:

$$\left(\frac{\partial}{\partial x}\right)\left(\frac{1}{\mu(x)}\right) = -h\left(\frac{1}{\mu(x)}\right)$$

Despejando $-h$ queda:

$$-h = \frac{\frac{\partial}{\partial x}\left(\frac{1}{\mu(x)}\right)}{\frac{1}{\mu(x)}}$$

$$-h = \frac{\partial}{\partial x}\ln\left(\frac{1}{\mu(x)}\right)$$

Integrando la expresión anterior:

$$-\int h\partial x = \int \frac{\partial}{\partial x}\ln\left(\frac{1}{\mu(x)}\right)\partial x$$

Resolviendo la integral:

$$\ln\left(\frac{1}{\mu(x)}\right) + C_1 = -h(x) + C_2$$

Despejando $-h(x)$:

$$\ln\left(\frac{1}{\mu(x)}\right) + (C_1 - C_2) = -h(x)$$

Se sustituye $C_1 - C2 = \ln(B)$ ya que $B = e^{C_1 - C_2}$

$$\ln\left(\frac{1}{\mu(x)}\right) + \ln(B) = -h(x)$$

Utilizando las propiedades del logaritmo natural:

$$\ln\left(\frac{B}{\mu(x)}\right) = -h(x)$$

Que es igual a:

$$\frac{B}{\mu(x)} = e^{-hx}$$

$$\mu(x) = Be^{hx}$$

donde: $C = e^h$

Quedando así la fuerza de mortalidad que se expresa:

$$\mu(x) = BC^x$$

1.2. Variables de la función Gompertz-Makeham ampliada.

Para encontrar las variables de la función Gompertz-Makeham ampliada, se presenta la siguiente igualdad:

$$l(i^o) = ka^i b^{d^i} w^{i^2}$$

donde: $l\,(i^o)$ es el número de personas vivas que se tienen observadas a partir de la construcción de la tabla de mortalidad, k,a,b,d y w son las variables que se quieren encontrar.

Se aplica a la ecuación anterior la función logaritmo natural para facilitar el manejo de los exponentes:

$$\ln(l(i^o)) = \ln(k) + i\ln(a) + d^i \ln(b) + i^2 \ln(w)$$

Utilizando el método de los grupos no superpuestos, el cual consiste en tomar cinco grupos de observaciones de igual tamaño (m), con el fin de que las observaciones no se traslapen.

Primer grupo

$$S_0 = \sum_{i=1}^{m} \ln(l(i^o)) = \sum_{i=1}^{m} \ln(k) + i\ln(a) + d^i \ln(b) + i^2 \ln(w)$$

$$S_0 = m\ln(k) + \ln(a)\sum_{i=1}^{m} i + \ln(b)\sum_{i=1}^{m} d^i + \ln(w)\sum_{i=1}^{m} i^2$$

$$S_0 = m\ln(k) + \frac{m(m+1)}{2}\ln(a) + \frac{d - d^{m+1}}{1-d}\ln(b) + \frac{m(m+1)(2m+1)}{6}\ln(w)$$

Recordando que:

$$\sum_{i=1}^{m} i = \frac{m(m+1)}{2}$$

$$\sum_{i=1}^{m} d^i = \frac{d - d^{m+1}}{1-d}$$

$$\sum_{i=1}^{m} i^2 = \frac{m(m+1)(2m+1)}{6}$$

Segundo grupo

$$S_1 = \sum_{i=m+1}^{2m} \ln(l(i^o)) = \sum_{i=m+1}^{2m} \ln(k) + i\ln(a) + d^i\ln(b) + i^2\ln(w)$$

$$S_1 = m\ln(k) + \ln(a)\sum_{i=m+1}^{2m} i + \ln(b)\sum_{i=m+1}^{2m} d^i + \ln(w)\sum_{i=m+1}^{2m} i^2$$

$$S_1 = m\ln(k) + \left(m^2 + \frac{m(m+1)}{2}\right)\ln(a) + \frac{d^m(d-d^{m+1})}{1-d}\ln(b) + \frac{14m^3+9m^2+m}{6}\ln(w)$$

Tercer grupo

$$S_2 = \sum_{i=2m+1}^{3m} \ln(l(i^o)) = \sum_{i=2m+1}^{3m} \ln(k) + i\ln(a) + d^i\ln(b) + i^2\ln(w)$$

$$S_2 = m\ln(k) + \ln(a)\sum_{i=2m+1}^{3m} i + \ln(b)\sum_{i=2m+1}^{3m} d^i + \ln(w)\sum_{i=2m+1}^{3m} i^2$$

$$S_2 = m\ln(k) + \left(2m^2 + \frac{m(m+1)}{2}\right)\ln(a) + \frac{d^{2m}(d-d^{m+1})}{1-d}\ln(b) + \frac{38m^3+15m^2+m}{6}\ln(w)$$

Cuarto grupo

$$S_3 = \sum_{i=3m+1}^{4m} \ln(l(i^o)) = \sum_{i=3m+1}^{4m} \ln(k) + i\ln(a) + d^i \ln(b) + i^2 \ln(w)$$

$$S_3 = m\ln(k) + \ln(a) \sum_{i=3m+1}^{4m} i + \ln(b) \sum_{i=3m+1}^{4m} d^i + \ln(w) \sum_{i=3m+1}^{4m} i^2$$

$$S_3 = m\ln(k) + \left(3m^2 + \frac{m(m+1)}{2}\right)\ln(a) + \frac{d^{3m}(d - d^{m+1})}{1-d}\ln(b) + \frac{74m^3 + 21m^2 + m}{6}\ln(w)$$

Quinto grupo

$$S_4 = \sum_{i=4m+1}^{5m} \ln(l(i^o)) = \sum_{i=4m+1}^{5m} \ln(k) + i\ln(a) + d^i \ln(b) + i^2 \ln(w)$$

$$S_4 = m\ln(k) + \ln(a) \sum_{i=4m+1}^{5m} i + \ln(b) \sum_{i=4m+1}^{5m} d^i + \ln(w) \sum_{i=4m+1}^{5m} i^2$$

$$S_4 = m\ln(k) + \left(4m^2 + \frac{m(m+1)}{2}\right)\ln(a) + \frac{d^{4m}(d - d^{m+1})}{1-d}\ln(b) + \frac{122m^3 + 27m^2 + m}{6}\ln(w)$$

Ya que se obtuvieron las sumas de las observaciones de cada uno de los grupos, para que sea más sencillo encontrar las variables, se realizan las diferencias de estas sumas, hasta que queden dos sistemas de ecuaciones con dos variables.

$$S_0 = m\ln(k) + \frac{m(m+1)}{2}\ln(a) + \frac{d-d^{m+1}}{1-d}\ln(b) + \frac{m(m+1)(2m+1)}{6}\ln(w)$$

$$S_1 = m\ln(k) + \left(m^2 + \frac{m(m+1)}{2}\right)\ln(a) + \frac{d^m(d-d^{m+1})}{1-d}\ln(b) + \frac{14m^3+9m^2+m}{6}\ln(w)$$

$$S_2 = m\ln(k) + \left(2m^2 + \frac{m(m+1)}{2}\right)\ln(a) + \frac{d^{2m}(d-d^{m+1})}{1-d}\ln(b) + \frac{38m^3+15m^2+m}{6}\ln(w)$$

$$S_3 = m\ln(k) + \left(3m^2 + \frac{m(m+1)}{2}\right)\ln(a) + \frac{d^{3m}(d-d^{m+1})}{1-d}\ln(b) + \frac{74m^3+21m^2+m}{6}\ln(w)$$

$$S_4 = m\ln(k) + \left(4m^2 + \frac{m(m+1)}{2}\right)\ln(a) + \frac{d^{4m}(d-d^{m+1})}{1-d}\ln(b) + \frac{122m^3+27m^2+m}{6}\ln(w)$$

Primeras diferencias

$$\Delta S_0 = S_1 - S_0$$

$$\Delta S_0 = m^2\ln(a) + \frac{(d^m-1)(d-d^{m+1})}{1-d}\ln(b) + (2m^3+m^2)\ln(w)$$

$$\Delta S_1 = S_2 - S_1$$

$$\Delta S_1 = m^2 \ln(a) + \frac{d^m(d^m - 1)(d - d^{m+1})}{1 - d} \ln(b) + (4m^3 + m^2) \ln(w)$$

$$\Delta S_2 = S_3 - S_2$$

$$\Delta S_2 = m^2 \ln(a) + \frac{d^{2m}(d^m - 1)(d - d^{m+1})}{1 - d} \ln(b) + (6m^3 + m^2) \ln(w)$$

$$\Delta S_3 = S_4 - S_3$$

$$\Delta S_3 = m^2 \ln(a) + \frac{d^{3m}(d^m - 1)(d - d^{m+1})}{1 - d} \ln(b) + (8m^3 + m^2) \ln(w)$$

Segundas diferencias

$$\Delta^2 S_0 = \Delta S_1 - \Delta S_0$$

$$\Delta^2 S_0 = \frac{(d^m - 1)^2(d - d^{m+1})}{1 - d} \ln(b) + 2m^3 \ln(w)$$

$$\Delta^2 S_1 = \Delta S_2 - \Delta S_1$$

$$\Delta^2 S_1 = \frac{d^m(d^m-1)^2(d-d^{m+1})}{1-d}\ln(b) + 2m^3\ln(w)$$

$$\Delta^2 S_2 = \Delta S_3 - \Delta S_2$$

$$\Delta^2 S_2 = \frac{d^{2m}(d^m-1)^2(d-d^{m+1})}{1-d}\ln(b) + 2m^3\ln(w)$$

Terceras diferencias

$$\Delta^3 S_0 = \Delta^2 S_1 - \Delta^2 S_0$$

$$\Delta^3 S_0 = \frac{(d^m-1)^3(d-d^{m+1})}{1-d}\ln(b)$$

$$\Delta^3 S_1 = \Delta^2 S_2 - \Delta^2 S_1$$

$$\Delta^3 S_1 = \frac{d^m(d^m-1)^3(d-d^{m+1})}{1-d}\ln(b)$$

A partir de las terceras diferencias se realiza un cociente para encontrar la variable **d**.

$$\frac{\Delta^3 S_1}{\Delta^3 S_0} = \frac{d^m(d^m-1)^3(d-d^{m+1})(1-d)\ln(b)}{(d^m-1)^3(d-d^{m+1})(1-d)\ln(b)}$$

Los términos iguales se eliminan y queda:

$$\frac{\Delta^3 S_1}{\Delta^3 S_0} = d^m$$

Despejando a **d**, se obtiene:

$$\mathbf{d} = \left[\frac{\Delta^3 S_1}{\Delta^3 S_0}\right]^{\frac{1}{m}}$$

Ahora que ya se conoce el valor de **d**, hay que conocer el valor de **b**.

De las terceras diferencias se obtiene la ecuación:

$$\Delta^3 S_0 = \frac{(d^m - 1)^3 (d - d^{m+1})}{1 - d} \ln(b)$$

Se despeja **b** y se obtiene el siguiente resultado:

$$\mathbf{b} = exp\left[\frac{(1 - d)\Delta^3 S_0}{(d^m - 1)^3 (d - d^{m+1})}\right]$$

Para encontrar **w** se toma de las segundas diferencias la ecuación:

$$\Delta^2 S_0 = \frac{(d^m - 1)^2 (d - d^{m+1})}{1 - d} \ln(b) + 2m^3 \ln(w)$$

Se despeja **w** para obtener:

$$\mathbf{w} = exp\left[\frac{1}{2m^3}\left(\Delta^2 S_0 - \left[\frac{(d^m-1)^2(d-d^{m+1})}{1-d}\ln(b)\right]\right)\right]$$

La variable **a** se obtiene del despeje de la ecuación:

$$\Delta S_0 = m^2\ln(a) + \frac{(d^m-1)(d-d^{m+1})}{1-d}\ln(b) + (2m^3+m^2)\ln(w)$$

de las primeras diferencias.

El valor de la variable **a** es:

$$\mathbf{a} = exp\left[\frac{1}{m^2}\left(\Delta S_0 - \left[\frac{(d^m-1)(d-d^{m+1})}{1-d}\ln(b)\right] - \left[(2m^3+m^2)\ln(w)\right]\right)\right]$$

Ya se tienen los valores de las variables **d**,**b**,**w** y **a**. Falta encontrar el valor de la variable **k**; para encontrar este valor se utilizará el método de mínimos cuadrados.

$$D = \frac{\sum_{i=1}^{5m}\left(l\left(i^o\right) - \widehat{l\left(i\right)}\right)^2}{5m}$$

Reescribiendo:

$$D = \frac{1}{5m} \sum_{i=1}^{5m} \left(l\left(i^o\right) - kv\left(i\right) \right)^2$$

donde:

$$\widehat{l\left(i\right)} = kv\left(i\right)$$

y

$$v\left(i\right) = a^i b^{d^i} w^{i^2}$$

Se deriva **D** respecto de **k**

$$\frac{\partial D}{\partial k} = \frac{2}{5m} \sum_{i=1}^{5m} \left(l\left(i^o\right) - kv\left(i\right) \right) \left(-v\left(i\right) \right)$$

Se iguala a cero

$$\frac{\partial D}{\partial k} = -\sum_{i=1}^{5m} l\left(i^o\right) \left(v\left(i\right) \right) + \sum_{i=1}^{5m} k \left(v\left(i\right) \right)^2 = 0$$

Se despeja a **k** de la ecuación anterior para conocer su valor:

$$\mathbf{k} = \frac{\sum_{i=1}^{5m} l\left(i^o\right) \left(v\left(i\right) \right)}{\sum_{i=1}^{5m} v\left(i\right)^2}$$

Una vez que se conocen las cinco variables, se sustituyen en la función $l(i^o) = ka^i b^{d^i} w^{i^2}$ y se obtiene la estimación de los datos observados:

$$\widehat{l(i^o)} = ka^i b^{d^i} w^{i^2}$$

Al realizarse esta estimación, no se puede decir que sea la más aproximada a los datos, así que para estar lo más cerca posible de los datos observados se va a realizar un método iterativo, el cual se explica en el siguiente apartado.

1.3. Método iterativo.

Para tener mejores estimaciones de los datos observados a través de la función Gompertz-Makeham ampliada, se realiza un método iterativo que consiste en lo siguiente:

A partir de la función Gompertz-Makeham ampliada $Y(i) = ka^i b^{d^i} w^{i^2}$ se obtiene el logaritmo natural para tener la siguiente igualdad:

$$\ln(Y(i)) = \ln(k) + i\ln(a) + d^i \ln(b) + i^2 \ln(w)$$

Se deriva respecto a cada una de las variables y recordando propiedades que hay entre la derivada y el logaritmo natural. Se tienen las siguientes igualdades:

$$\frac{\partial \ln(Y(i))}{\partial Y(i)} = \frac{1}{Y(i)} \partial Y(i)$$

$$\frac{\partial \ln(k)}{\partial k} = \frac{1}{k}\partial k$$

$$\frac{\partial i \ln(a)}{\partial a} = \frac{i}{a}\partial a$$

$$\frac{\partial d^i \ln(b)}{\partial b} = \frac{\partial d^i}{\partial d}\partial \ln(b) + \frac{\partial d^i}{\partial b}\partial \ln(b) = \frac{\partial d^i}{\partial d}\partial \ln(b) + \frac{\partial d^i}{\partial b}\partial b$$

$$\frac{\partial d^i \ln(b)}{\partial b} = id^i \ln(b)\frac{\partial d}{d} + d^i\frac{\partial b}{b}$$

$$\frac{\partial i^2 \ln(w)}{\partial w} = \frac{i^2}{w}\partial w$$

Se sustituyen las igualdades en la ecuación $\ln(Y(i)) = \ln(k) + i\ln(a) + d^i \ln(b) + i^2 \ln(w)$ para obtener:

$$\frac{1}{Y(i)}\partial Y(i) = \frac{\partial k}{k} + i\frac{\partial a}{a} + d^i\frac{\partial b}{b} + id^i\frac{\partial d}{d} + i^2\frac{\partial w}{w}$$

De ambos lados de la ecuación se multiplica por $Y(i)$ y queda:

$$\partial Y(i) = Y(i)\frac{\partial k}{k} + iY(i)\frac{\partial a}{a} + d^iY(i)\frac{\partial b}{b} + id^iY(i)\frac{\partial d}{d} + i^2Y(i)\frac{\partial w}{w}$$

Se renombran cada uno de los elementos de la ecuación de la siguiente manera:

$$i_1 = \partial Y\,(i) \qquad c_2 = \frac{\partial k}{k}$$

$$i_2 = Y\,(i) \qquad c_3 = \frac{\partial a}{a}$$

$$i_3 = iY\,(i) \qquad c_4 = \frac{\partial b}{b}$$

$$i_4 = d^iY\,(i) \qquad c_5 = \ln(b)\frac{\partial k}{k}$$

$$i_5 = id^iY\,(i) \qquad c_6 = \frac{\partial w}{w}$$

$$i_6 = i^2Y\,(i)$$

Y se sustituyen quedando la ecuación de la siguiente manera:

$$i_1 = c_2i_2 + c_3i_3 + c_4i_4 + c_5i_5 + c_6i_6$$

Las i_x con $x = 1, 2, 3, 4, 5, 6$ son conocidas pero las c_j con $j = 2, 3, 4, 5, 6$ no son conocidas, por lo que se va a expresar todo en términos de las c_j de una manera matricial.

$$\begin{vmatrix} \sum i_2i_2 & \sum i_2i_3 & \sum i_2i_4 & \sum i_2i_5 & \sum i_2i_6 \\ \sum i_3i_2 & \sum i_3i_3 & \sum i_3i_4 & \sum i_3i_5 & \sum i_3i_6 \\ \sum i_4i_2 & \sum i_4i_3 & \sum i_4i_4 & \sum i_4i_5 & \sum i_4i_6 \\ \sum i_5i_2 & \sum i_5i_3 & \sum i_5i_4 & \sum i_5i_5 & \sum i_5i_6 \\ \sum i_6i_2 & \sum i_6i_3 & \sum i_6i_4 & \sum i_6i_5 & \sum i_6i_6 \end{vmatrix} = A$$

$$\begin{vmatrix} \sum i_2 i_2 \\ \sum i_3 i_2 \\ \sum i_4 i_2 \\ \sum i_5 i_2 \\ \sum i_6 i_2 \end{vmatrix} = G$$

$$\begin{vmatrix} c_2 \\ c_3 \\ c_4 \\ c_5 \\ c_6 \end{vmatrix} = C$$

$$C = A^{-1}G$$

Ya que se tienen los valores de las c_j, se calculan los nuevos valores de las variables de la función Gompertz-Makeham:

$$k_1 = k\,(1 + c_2)$$

$$a_1 = a\,(1 + c_3)$$

$$b_1 = b\,(1 + c_4)$$

$$d_1 = d\left(1 + \frac{c_5}{\ln(b)}\right)$$

$$w_1 = w\,(1 + c_6)$$

Al sustitur estas nuevas variables en la función se obtiene la segunda estimación de los datos. Cada vez que se realice el método, se deben tomar las

diferencias $\partial Y\,(i)$ de la estimación anterior.

La forma de obtener el valor de las variables en general cuando se quiere calcular la iteración t-ésima es:

$$k_t = k_{t-1}\,(1 + c_2)$$

$$a_t = a_{t-1}\,(1 + c_3)$$

$$b_t = b_{t-1}\,(1 + c_4)$$

$$d_t = d_{t-1}\left(1 + \frac{c_5}{\ln(b_{t-1})}\right)$$

$$w_t = w_{t-1}\,(1 + c_6)$$

donde: $t = 1, 2, ...$

Para ver cómo se va acercando la estimación a los datos observados, se utiliza el coeficiente de correlación. Cuando la diferencia del coeficiente de correlación entre una estimación y otra sea muy pequeña o nula, ya se tiene la mejor aproximación que se puede lograr, así que en ese momento se detienen las iteraciones.

Capítulo 2

Concepto de tabla de mortalidad.

Debido a que este trabajo se enfoca en el ajuste de tablas de mortalidad, es de suma importancia explicar y ejemplificar este concepto.

Una tabla de mortalidad es un cuadro estadístico que resume el impacto de dicho fenómeno demográfico, tenido por una población determinada, en un año o periodo de años.

Las funciones biométricas que la componen son:

- l_0: radix poblacional o el número de personas que llegan con vida a la edad de cero años.

- l_x: número de personas del conjunto l_0 que llegan con vida a la edad x.

- ${}_nP_x$: probablidad que tiene una persona de edad x de sobrevivir n años, es decir, que llegue con vida a la edad x+n.

$$ {}_nP_x = \frac{l_{x+n}}{l_x} $$

- $d_{(x,x+n)}$: número de personas del conjunto l_0 que fallecen entre las edades x y x+n.

$$d_{(x,x+n)} = l_x - l_{x+n}$$

Si del lado derecho de la ecuación se multiplica y divide por l_x, se tiene que:

$$d_{(x,x+n)} = \left(\frac{l_x}{l_x} - \frac{l_{x+n}}{l_x}\right) l_x$$

Lo que se expresa como:

$$d_{(x,x+n)} = (1 -_n P_x)\, l_x$$

$$d_{(x,x+n)} =_n q_x l_x$$

- ${}_nq_x$: probabilidad que tiene una persona de edad x de fallecer entre las edades x y x+n.

$${}_nq_x = 1 -_n P_x$$

Expresando en términos de l_x

$$ {}_nq_x = \frac{l_x}{l_x} - \frac{l_{x+n}}{l_x} $$

$$ {}_nq_x = \frac{d_{(x,x+n)}}{l_x} $$

- ${}_nL_x$: años persona vividos entre las edades x y x+n.

$$ {}_nL_x = n\,(l_x) - \frac{n}{2}\left(d_{(x,x+n)}\right) $$

$$ {}_nL_x = n\,(l_x) - \frac{n}{2}\,(l_x - l_{x+n}) $$

$$ {}_nL_x = n\,(l_x) - \frac{n}{2}\,(l_x) + \frac{n}{2}\,(l_{x+n}) $$

$$ {}_nL_x = \frac{n}{2}\,(l_x + l_{x+n}) $$

- T_x: años persona vividos entre las edades x y ω, donde ésta última representa la edad final de la tabla de mortalidad.

$$T_x = \sum_{i=x}^{\omega} {}_nL_i$$

- e_x: esperanza de vida, número de años que en promedio se espera que una persona de edad x viva.

$$e_x = \frac{T_x}{l_x}$$

2.1. Elaboración de una tabla de mortalidad.

Se ejemplifica la forma de obtener las funciones biométricas de una edad exacta de la tabla de mortalidad de los hombres en el año 2005[1].

La fuente de datos que se utilizaron son las proyecciones de población 2005-2050 que publica CONAPO[2]. Sobre esta base de datos, se trabajó a partir de la probabilidad de muerte de un hombre con edad exacta cinco años.

- ${}_1q_5$: probabilidad que tiene una persona de edad cinco años de fallecer entre las edades cinco y seis años.

$${}_1q_5 = .000356$$

- $d_{5,6}$: número de personas del conjunto l_0[3] que fallecen entre las edades cinco y seis años.

[1] Anexo CUADRO A.1.1.1
[2] Consejo Nacional de Población
[3] l_0 = 100,000

Por la igualdad expresada en la ecuación:

$$d_{(5,6)} =_1 q_5 l_5$$

Se tiene lo siguiente:

$$d_{(5,6)} = (.000356)(97{,}830) = 35$$

El número 97,830 proviene de la siguiente función:

- l_5: número de personas del conjunto l_0 que llegan con vida a la edad cinco años.

De la ecuación:

$$d_{(x,x+n)} = l_x - l_{x+n}$$

Se tiene que:

$$d_{(4,5)} = l_4 - l_5$$

Despejando l_5:

$$l_5 = l_4 - d_{(4,5)}$$

Entonces el número de personas que llegan con vida a la edad cinco años son la diferencia del número de personas que llegaron con vida a edad cuatro años menos el número de personas que murieron entre los cuatro y cinco años; quedando así:

$$l_5 = 97,869 - 39 = 97,830$$

- ${}_1L_5$: años persona vividos entre las edades cinco y seis años.

  Sustituyendo los valores ya obtenidos en la ecuación:

$${}_1L_5 = 1\,(l_5) - \frac{1}{2}\left(d_{(5,6)}\right)$$

  queda de la siguiente manera:

$${}_1L_5 = 1(97,830) - \left[\frac{1}{2}(35)\right] = 97,812$$

- T_5: años persona vividos entre las edades cinco y cien años.

$$T_5 = \sum_{i=5}^{100} {}_1L_i = 97,812 + 97,778 + 97,746 + ... + 1,952 + 817$$

Que representa la suma de todos los valores de la serie ${}_1L_x$ de la edad cinco años hasta la edad cien años. Estos datos se pueden ver en la tabla de mortalidad para hombres del año 2005[4].

Sustituyendo esos valores. se tiene:

$$T_5 = 6,728,749$$

- e_5: número de años que en promedio se espera que una persona de edad cinco años viva.

  Para esta función solamente se requiere hacer el cociente de dos funciones biométricas que ya se tienen construidas, las cuales son: T_5 y l_5.

$$e_5 = \frac{T_5}{l_5} = \frac{6,728,749}{97,830} = 68.78$$

Se utiliza el mismo procedimiento de cálculo de las funciones biométricas para todas las demás edades, también para el caso de las mujeres y ambos sexos[5].

Para el caso en donde se presenta la población total, se requiere obtener el promedio de las probabilidades de muerte de las mujeres y los hombres.

[4]Anexo CUADRO A.1.1.1

[5]Ver en Anexos los CUADROS A.1.1.1, A.1.2.1, A.1.3.1, A.2.1.1, A.2.2.1, A.2.3.1, A.3.1.1, A.3.2.1, A.3.3.1, A.4.1.1, A.4.2.1, A.4.3.1, A.5.1.1, A.5.2.1 y A.5.3.1.

Capítulo 3

Aplicación del método empleado.

Este método se aplicó a las tablas de mortalidad generadas por las probabilidades de muerte que publica CONAPO para la proyección de población 2005-2050. Se tomaron las probabilidades de muerte para hombres y mujeres de los años 2005 a 2025, se construyó su respectiva tabla de mortalidad y se evaluó con la función Gompertz-Makeham ampliada.

Para ejemplificar el uso del método se tomarán los datos de la tabla de mortalidad de los hombres para el año 2005, de la misma forma se aplica para el caso de las mujeres y población total.

3.1. Cómo encontrar las variables de la función Gompertz-Makeham ampliada.

Para la aplicación es necesario obtener las variables k,a,b,d y w de la ecuación $l(i^o) = ka^i b^{d^i} w^{i^2}$. A continuación se presenta la serie de pasos a seguir para obtenerlas.

1. Construir la tabla de mortalidad de la manera que se explicó anteriormente para utilizar la serie l_x.

2. Obtener el logaritmo natural de la serie l_x. En la edad cero años no se va a realizar un ajuste, ya que l_0 es un dato propuesto y no se puede

estimar, por ésto se encuentra un cuadro vacío en lo que correspondería al $ln\,(l_0)$ de la tabla que se muestra a continuación.

3. A partir de este momento se va a trabajar con la serie $ln(l_x)$, por lo que es importante conocer el número de observaciones que se tienen de ésta. En la siguiente tabla tenemos cien observaciones y para aplicar el método de los grupos superpuestos, se divide ésta en cinco grupos del mismo tamaño, quedando las divisiones cada veinte años.

GRUPO	AÑOS COMPRENDIDOS
0	0-20
1	21-40
2	41-60
3	61-80
4	81-100

HOMBRES 2005					
EDAD	l_x	$ln(l_x)$	EDAD	l_x	$ln(l_x)$
0	100,000		50	88,453	11.39
1	98,140	11.49	51	87,829	11.38
2	97,990	11.49	52	87,160	11.38
3	97,918	11.49	53	86,446	11.37
4	97,869	11.49	54	85,682	11.36
5	97,830	11.49	55	84,866	11.35
6	97,795	11.49	56	83,995	11.34
7	97,762	11.49	57	83,065	11.33
8	97,729	11.49	58	82,073	11.32
9	97,696	11.49	59	81,017	11.30
10	97,662	11.49	60	79,893	11.29
11	97,626	11.49	61	78,698	11.27
12	97,587	11.49	62	77,429	11.26
13	97,545	11.49	63	76,082	11.24
14	97,498	11.49	64	74,656	11.22
15	97,445	11.49	65	73,148	11.20
16	97,383	11.49	66	71,555	11.18
17	97,312	11.49	67	69,876	11.15
18	97,230	11.48	68	68,109	11.13
19	97,136	11.48	69	66,254	11.10
20	97,030	11.48	70	64,309	11.07
21	96,911	11.48	71	62,277	11.04
22	96,779	11.48	72	60,157	11.00
23	96,636	11.48	73	57,952	10.97
24	96,482	11.48	74	55,666	10.93
25	96,318	11.48	75	53,303	10.88
26	96,145	11.47	76	50,869	10.84
27	95,964	11.47	77	48,369	10.79
28	95,776	11.47	78	45,814	10.73
29	95,581	11.47	79	43,211	10.67
30	95,380	11.47	80	40,574	10.61
31	95,171	11.46	81	37,913	10.54
32	94,956	11.46	82	35,242	10.47
33	94,733	11.46	83	32,577	10.39
34	94,501	11.46	84	29,934	10.31
35	94,260	11.45	85	27,328	10.22
36	94,009	11.45	86	24,774	10.12
37	93,746	11.45	87	22,284	10.01
38	93,469	11.45	88	19,875	9.90
39	93,178	11.44	89	17,560	9.77
40	92,870	11.44	90	15,356	9.64
41	92,544	11.44	91	13,275	9.49
42	92,197	11.43	92	11,333	9.34
43	91,829	11.43	93	9,541	9.16
44	91,437	11.42	94	7,904	8.98
45	91,018	11.42	95	6,434	8.77
46	90,571	11.41	96	5,135	8.54
47	90,094	11.41	97	4,010	8.30
48	89,583	11.40	98	3,057	8.03
49	89,037	11.40	99	2,269	7.73
			100	1,635	7.40

4. Ya que se tienen bien definidos los grupos, hay que sumar la serie $ln(l_x)$ de cada uno de los grupos.

   Primer grupo:

   $$S_0 = \sum_{x=0}^{20} ln(l_x) = 11.49+11.49+11.49+...+11.48+11.48 = 229.7745$$

   Segundo grupo:

   $$S_1 = \sum_{x=21}^{40} ln(l_x) = 11.48+11.48+11.48+...+11.44+11.44 = 229.2611$$

   Tercer grupo:

   $$S_2 = \sum_{x=41}^{60} ln(l_x) = 11.44+11.43+11.43+...+11.30+11.29 = 227.5548$$

   Cuarto grupo:

   $$S_3 = \sum_{x=61}^{80} ln(l_x) = 11.27+11.26+11.24+...+10.67+10.61 = 220.2882$$

   Quinto grupo:

   $$S_4 = \sum_{x=81}^{100} ln(l_x) = 10.54+10.47+10.39+...+7.73+7.40 = 187.0946$$

5. Se realizan las primeras diferencias de la siguiente manera[1]:

   - $\Delta S_0 = S_1 - S_0$

     $$\Delta S_0 = 229.2611 - 229.7745 = -.5133$$

   - $\Delta S_1 = S_2 - S_1$

     $$\Delta S_1 = 227.5548 - 229.2611 = -1.7064$$

[1]Puede que las diferencias no sean exactas, esto se debe a la extensión decimal.

- $\Delta S_2 = S_3 - S_2$

$$\Delta S_2 = 220.2882 - 227.5548 = -7.2665$$

- $\Delta S_3 = S_4 - S_3$

$$\Delta S_3 = 187.0946 - 220.2882 = -33.1936$$

6. Se realizan las segundas diferencias de la siguiente manera:

- $\Delta^2 S_0 = \Delta S_1 - \Delta S_0$

$$\Delta^2 S_0 = (-1.7064) - (-.5133) = -1.1930$$

- $\Delta^2 S_1 = \Delta S_2 - \Delta S_1$

$$\Delta^2 S_1 = (-7.2665) - (-1.7064) = -5.5602$$

- $\Delta^2 S_2 = \Delta S_3 - \Delta S_2$

$$\Delta^2 S_2 = (-33.1936) - (-7.2665) = -25.9270$$

7. Se realizan las terceras diferencias de la siguiente manera:

- $\Delta^3 S_0 = \Delta^2 S_1 - \Delta^2 S_0$

$$\Delta^3 S_0 = (-5.5602) - (-1.1930) = -4.3672$$

- $\Delta^3 S_1 = \Delta^2 S_2 - \Delta^2 S_1$

$$\Delta^3 S_1 = (-25.9270) - (-5.5602) = -20.3669$$

8. Se sustituyen las terceras diferencias en la siguiente fórmula para encontrar la variable **d**.[2]

$$d = \left[\frac{\Delta^3 S_1}{\Delta^3 S_0}\right]^{\frac{1}{m}} = \left[\frac{-20}{-4}\right]^{\frac{1}{20}} = 1.0800310$$

9. Ahora que ya se conoce el valor de **d**, éste se sustituye en la siguiente fórmula para así tener el valor de **b**.

$$\mathbf{b} = exp\left[\frac{(1-d)\Delta^3 S_0}{(d^m-1)^3(d-d^{m+1})}\right]$$

$$\mathbf{b} = exp\left[\frac{(1-1.0800310)(-4.3672)}{\left[(1.0800310)^{20}-1\right]^3\left[1.0800310-(1.0800310)^{21}\right]}\right]$$

$$\mathbf{b} = exp\left[\frac{.349511383}{-194.5737991}\right] = .99820563$$

10. La variable **w** depende de las dos anteriores y se expresa así:

$$\mathbf{w} = exp\left[\frac{1}{2m^3}\left(\Delta^2 S_0 - \left[\frac{(d^m-1)^2(d-d^{m+1})}{1-d}\ln(b)\right]\right)\right]$$

$$\mathbf{w} = exp\left[\frac{1}{2\,(20)^3}\left(-1.1930 - \left[\frac{(1.0800310^{20}-1)^2(1.0800310-1.0800310^{21})}{1-1.0800310}\ln(.99820563)\right]\right)\right]$$

[2]Como quedaron 5 grupos con 20 años por cada grupo, se tiene que $m = 20$.

$$\mathbf{w} = exp\left[\frac{-1.509669691}{16,000}\right] = exp\left[-.00009435435569\right]$$

$$\mathbf{w}{=}.999999$$

11. La variable **a** se obtiene de la siguiente forma:

$$\mathbf{a} = exp\left[\frac{1}{m^2}\left(\Delta S_0 - \left[\frac{(d^m-1)(d-d^{m+1})}{1-d}\ln(b)\right] - \left[(2m^3+m^2)\ln(w)\right]\right)\right]$$

$$\mathbf{a} = exp\left[\frac{1}{(20)^2}\left(-.5133 - \left[\frac{(1.0800310^{20}-1)(1.0800310-1.0800310^{21})}{1-1.0800310}\ln(.99820563)\right] - \left[(2\,(20)^3+(20)^2)\ln(.99999)\right]\right)\right]$$

$$\mathbf{a} = exp\left[\frac{-1.8691808}{400}\right] = exp\left[-.0004672952\right]$$

$$\mathbf{a}{=}.999532$$

12. Por último falta la variable **k** la cual se calculó a partir del método de mínimos cuadrados, es decir,

$$\mathbf{k} = \frac{\sum_{x=1}^{100} l\,(x)\,(v\,(x))}{\sum_{x=1}^{100} v\,(x)^2}$$

donde:

$$v\left(x\right)=a^{x}b^{d^{x}}w^{x^{2}}$$

Solamente se mostrará la forma de obtener los valores de: v_x, v_x^2 y $l_x * v_x$ para la edad cinco años. Se hace de la misma forma para el resto de las edades y los resultados se presentan en la siguiente tabla:

$$v\left(x\right)=\left(.999532\right)^{5}\left(.99820563\right)^{\left(1.0800310\right)^{5}}\left(.999999\right)^{\left(5\right)^{2}}$$

$$v\left(x\right)\text{=}.995034$$
$$v\left(x\right)^{2}\text{=}.995034\ *\ .995034=\ .099009$$
$$l_{(x)}*v\left(x\right)\text{=}97{,}830\ *\ .995034=\ 97{,}344$$

x	$v_{(x)}$	$v^2_{(x)}$	$l_{(x)} * v_{(x)}$	x	$v_{(x)}$	$v^2_{(x)}$	$l_{(x)} * v_{(x)}$
1	0.9976	0.9952	97,904	50	0.8977	0.8059	79,407
2	0.9970	0.9940	97,693	51	0.8913	0.7943	78,278
3	0.9963	0.9927	97,559	52	0.8844	0.7821	77,082
4	0.9957	0.9914	97,448	53	0.8770	0.7691	75,814
5	0.9950	0.9901	97,344	54	0.8692	0.7555	74,472
6	0.9944	0.9887	97,243	55	0.8608	0.7410	73,054
7	0.9937	0.9874	97,143	56	0.8519	0.7258	71,556
8	0.9930	0.9860	97,041	57	0.8424	0.7097	69,976
9	0.9922	0.9845	96,937	58	0.8323	0.6928	68,313
10	0.9915	0.9830	96,830	59	0.8216	0.6750	66,565
11	0.9907	0.9815	96,718	60	0.8102	0.6564	64,730
12	0.9899	0.9799	96,602	61	0.7981	0.6370	62,809
13	0.9891	0.9783	96,480	62	0.7853	0.6166	60,801
14	0.9882	0.9766	96,351	63	0.7716	0.5954	58,709
15	0.9874	0.9749	96,212	64	0.7572	0.5734	56,533
16	0.9864	0.9731	96,063	65	0.7420	0.5506	54,277
17	0.9855	0.9712	95,901	66	0.7259	0.5270	51,944
18	0.9845	0.9693	95,724	67	0.7090	0.5027	49,541
19	0.9835	0.9672	95,532	68	0.6912	0.4777	47,074
20	0.9824	0.9651	95,323	69	0.6724	0.4522	44,551
21	0.9813	0.9629	95,097	70	0.6528	0.4261	41,981
22	0.9801	0.9606	94,855	71	0.6323	0.3998	39,375
23	0.9789	0.9582	94,596	72	0.6108	0.3731	36,746
24	0.9776	0.9557	94,321	73	0.5885	0.3464	34,106
25	0.9763	0.9531	94,031	74	0.5654	0.3196	31,472
26	0.9748	0.9503	93,725	75	0.5414	0.2931	28,858
27	0.9733	0.9474	93,406	76	0.5167	0.2669	26,282
28	0.9718	0.9443	93,072	77	0.4912	0.2413	23,761
29	0.9701	0.9411	92,723	78	0.4652	0.2164	21,313
30	0.9683	0.9377	92,360	79	0.4386	0.1924	18,955
31	0.9665	0.9341	91,982	80	0.4117	0.1695	16,704
32	0.9645	0.9303	91,587	81	0.3844	0.1478	14,575
33	0.9624	0.9263	91,175	82	0.3570	0.1275	12,583
34	0.9602	0.9220	90,743	83	0.3297	0.1087	10,739
35	0.9579	0.9176	90,291	84	0.3024	0.0915	9,053
36	0.9554	0.9128	89,817	85	0.2756	0.0759	7,531
37	0.9528	0.9078	89,317	86	0.2493	0.0621	6,175
38	0.9500	0.9024	88,791	87	0.2236	0.0500	4,984
39	0.9470	0.8967	88,236	88	0.1989	0.0396	3,954
40	0.9438	0.8907	87,649	89	0.1753	0.0307	3,079
41	0.9404	0.8843	87,027	90	0.1530	0.0234	2,349
42	0.9368	0.8775	86,368	91	0.1320	0.0174	1,752
43	0.9329	0.8703	85,670	92	0.1126	0.0127	1,276
44	0.9288	0.8627	84,928	93	0.0948	0.0090	905
45	0.9244	0.8546	84,141	94	0.0788	0.0062	623
46	0.9198	0.8460	83,304	95	0.0645	0.0042	415
47	0.9148	0.8368	82,416	96	0.0519	0.0027	267
48	0.9095	0.8271	81,472	97	0.0411	0.0017	165
49	0.9038	0.8168	80,470	98	0.0319	0.0010	98
				99	0.0243	0.0006	55
				100	0.0181	0.0003	30

Sumando todas las observaciones de $l_x * v_x$ y v_x^2 se obtienen el numerador y denominador de la variable respectivamente, por lo tanto **k** es:

$$\mathbf{k} = \frac{6,213,260.005}{63.0561} = 98,535.58749 = 98,535$$

Se presenta un cuadro resumen de todos los valores de las variables:

d	1.0800310
b	0.9982053
w	0.9999999
a	0.9995327
k	98,535

13. Ya que se tienen todas las variables calculadas, se puede pasar a realizar la estimación del número de personas vivas a edad exacta x de la siguiente manera:

$$\widehat{l_{(x)}} = ka^x b^{d^x} w^{x^2}$$

Se toma $x = 5$ para ejemplificar, ya que para todas las edades se realiza de la misma manera y se pueden observar los resultados en la siguiente tabla.

$$\widehat{l_{(5)}} = ka^5 b^{d^5} w^{5^2}$$

$$\widehat{l_{(5)}} = (98,535)\,(.999532)^{5}\,(.99820563)^{(1.0800310)^{5}}\,(.999999)^{(5)^{2}}$$

$$\widehat{l_{(5)}} = (98,535)\,(.995034) = 98,046$$

Se realizan los mismos pasos para el caso de las mujeres y ambos sexos.

3.2. Cómo aplicar el método iterativo.

En la sección anterior se explicó la forma de obtener una estimación de los datos observados a partir de la función Gompertz-Makeham ampliada, en ésta se expresa paso a paso la manera en la que se puede realizar una mejor aproximación de las observaciones a través de una serie de repeticiones.

1. Cuando se presentó el método iterativo se expresó una ecuación que se utiliza en ésta sección para iniciar la aplicación. La ecuación es:

$$x_1 = c_2x_2 + c_3x_3 + c_4x_4 + c_5x_5 + c_6x_6$$

donde cada una de las x_i con $i = 1, 2, ..., 6$ expresan lo siguiente:

$x_1 = x_{2_2} - x_{2_1}$	Diferencia de las observaciones de la variable x_2.
$x_2 = \widehat{l_x}$	La estimación de las observaciones que se obtuvo de la sección anterior.
$x_3 = x * x_2$	Producto de la edad x con la variable x_2
$x_4 = x_2 * d^x$	Producto de la variable x_2 y la variable **d** elevada a la edad x.
$x_5 = x * x_4$	Producto de la variable x_4 y la edad x.
$x_6 = x^2 * x_2$	Producto de la edad x al cuadrado y la variable x_2.

Se observa que todas las x_i son conocidas y lo que falta por encontrar son las constantes c_j con $j = 2, ..., 6$.

2. Para obtener el valor de las constantes c_j, se expresa todo en términos de matrices.

$$\begin{vmatrix} \sum_{i=1}^{100} x_2x_2 & \sum_{i=1}^{100} x_2x_3 & \sum_{i=1}^{100} x_2x_4 & \sum_{i=1}^{100} x_2x_5 & \sum_{i=1}^{100} x_2x_6 \\ \sum_{i=1}^{100} x_3x_2 & \sum_{i=1}^{100} x_3x_3 & \sum_{i=1}^{100} x_3x_4 & \sum_{i=1}^{100} x_3x_5 & \sum_{i=1}^{100} x_3x_6 \\ \sum_{i=1}^{100} x_4x_2 & \sum_{i=1}^{100} x_4x_3 & \sum_{i=1}^{100} x_4x_4 & \sum_{i=1}^{100} x_4x_5 & \sum_{i=1}^{100} x_4x_6 \\ \sum_{i=1}^{100} x_5x_2 & \sum_{i=1}^{100} x_5x_3 & \sum_{i=1}^{100} x_5x_4 & \sum_{i=1}^{100} x_5x_5 & \sum_{i=1}^{100} x_5x_6 \\ \sum_{i=1}^{100} x_6x_2 & \sum_{i=1}^{100} x_6x_3 & \sum_{i=1}^{100} x_6x_4 & \sum_{i=1}^{100} x_6i_5 & \sum_{i=1}^{100} x_6x_6 \end{vmatrix} = A$$

Se realiza la suma del producto de todas las variables sobre todas las observaciones de la tabla. Se presentan los resultados de dichas operaciones:

$$\begin{vmatrix} 6.E+11 & 2.E+13 & 3.E+13 & 2.E+15 & 1.E+15 \\ 2.E+13 & 1.E+15 & 2.E+15 & 2.E+17 & 6.E+16 \\ 3.E+13 & 2.E+15 & 9.E+15 & 7.E+17 & 2.E+17 \\ 2.E+15 & 2.E+17 & 7.E+17 & 6.E+19 & 1.E+19 \\ 1.E+15 & 6.E+16 & 2.E+17 & 1.E+19 & 3.E+18 \end{vmatrix} = A$$

$$\begin{vmatrix} \sum_{i=1}^{100} x_2x_2 \\ \sum_{i=1}^{100} x_3x_2 \\ \sum_{i=1}^{100} x_4x_2 \\ \sum_{i=1}^{100} x_5x_2 \\ \sum_{i=1}^{100} x_6x_2 \end{vmatrix} = G$$

La matriz **G** indica la suma del producto de todas las variables con la variable x_2 sobre todas las observaciones.

$$\begin{vmatrix} 5.E+09 \\ 3.E+11 \\ 1.E+12 \\ 1.E+14 \\ 2.E+13 \end{vmatrix} = G$$

Por último, la matriz **C** que contiene a todas las constantes:

$$\begin{vmatrix} c_2 \\ c_3 \\ c_4 \\ c_5 \\ c_6 \end{vmatrix} = C$$

Con estas tres matrices se obtiene la siguiente ecuación:

$$C = A^{-1}G$$

3. Ahora hay que encontrar el valor de la matriz A^{-1}, obteniendo la matriz inversa de A.

$$\begin{vmatrix} 2.E-11 & -2.E-12 & -1.E-12 & 1.E-14 & 4.E-14 \\ -2.E-12 & 2.E-13 & 2.E-13 & -1.E-15 & -4.E-15 \\ -1.E-12 & 2.E-13 & 2.E-13 & -2.E-15 & -5.E-15 \\ 1.E-14 & -1.E-15 & -2.E-15 & 2.E-17 & 5.E-17 \\ 4.E-14 & -4.E-15 & -5.E-15 & 5.E-17 & 1.E-16 \end{vmatrix} = A^{-1}$$

4. Se realiza el producto de la matriz A^{-1} y la matriz G para obtener el valor de las constantes.

6.39E-04	C2
0.00E+00	C3
0.00E+00	C4
0.00E+00	C5
0.00E+00	C6

5. Ya con el valor de las constantes, éstas se sustituyen en las siguientes ecuaciones para así obtener el nuevo valor de las variables a, b, d,w y k.

$$k_1 = k\,(1 + c_2)$$

$$a_1 = a\,(1 + c_3)$$

$$b_1 = b\,(1 + c_4)$$

$$d_1 = d\left(1 + \frac{c_5}{\ln(b)}\right)$$

$$w_1 = w\,(1 + c_6)$$

Sustituyendo:

$$k_1 = 98,535\,(1 + 6.39E - 04) = 98,598$$

$$a_1 = .9995327\,(1 + 0) = .9995327$$

$$b_1 = .9982053\,(1 + 0) = .9982053$$

$$d_1 = 1.0800310\,(1 + 0) = 1.0800310$$

$$w_1 = .999999\,(1 + 0) = .999999$$

6. Con éstas nuevas variables se realizan los mismo pasos de la sección anterior para obtener la primera iteración de las estimaciones de los datos observados.

   A continuación se muestra en una tabla las estimaciones que se realizaron y después un cuadro con los coeficientes de correlación, en ésta última se podrá notar que el coeficiente ya no cambia entre la primera y la segunda iteración, razón por la cual se toma como la mejor estimación la primera iteración[3].

[3] $\widehat{l_x^1}$ significa la primera iteración estimada. El superíndice indicará la iteración que se está realizando.

x	l_x	$\widehat{l_x}$	$\widehat{l_x^1}$	x	l_x	$\widehat{l_x}$	$\widehat{l_x^1}$
1	98,140	98,298	98,361	50	88,453	88,471	88,514
2	97,990	98,237	98,300	51	87,829	87,834	87,877
3	97,918	98,175	98,237	52	87,160	87,155	87,197
4	97,869	98,111	98,174	53	86,446	86,431	86,472
5	97,830	98,046	98,109	54	85,682	85,659	85,699
6	97,795	97,980	98,042	55	84,866	84,836	84,875
7	97,762	97,911	97,974	56	83,995	83,959	83,997
8	97,729	97,842	97,904	57	83,065	83,025	83,062
9	97,696	97,770	97,832	58	82,073	82,032	82,067
10	97,662	97,696	97,758	59	81,017	80,975	81,009
11	97,626	97,620	97,682	60	79,893	79,851	79,885
12	97,587	97,542	97,603	61	78,698	78,659	78,691
13	97,545	97,461	97,522	62	77,429	77,393	77,425
14	97,498	97,377	97,438	63	76,082	76,053	76,083
15	97,445	97,291	97,351	64	74,656	74,633	74,663
16	97,383	97,201	97,261	65	73,148	73,133	73,161
17	97,312	97,107	97,168	66	71,555	71,549	71,576
18	97,230	97,010	97,071	67	69,876	69,880	69,905
19	97,136	96,909	96,969	68	68,109	68,123	68,147
20	97,030	96,804	96,864	69	66,254	66,277	66,301
21	96,911	96,694	96,753	70	64,309	64,343	64,365
22	96,779	96,579	96,638	71	62,277	62,319	62,340
23	96,636	96,458	96,517	72	60,157	60,207	60,227
24	96,482	96,332	96,390	73	57,952	58,009	58,027
25	96,318	96,199	96,257	74	55,666	55,726	55,743
26	96,145	96,059	96,117	75	53,303	53,364	53,380
27	95,964	95,912	95,969	76	50,869	50,927	50,942
28	95,776	95,757	95,814	77	48,369	48,422	48,435
29	95,581	95,594	95,650	78	45,814	45,856	45,868
30	95,380	95,421	95,477	79	43,211	43,239	43,250
31	95,171	95,239	95,294	80	40,574	40,581	40,591
32	94,956	95,045	95,100	81	37,913	37,896	37,905
33	94,733	94,841	94,895	82	35,242	35,196	35,204
34	94,501	94,623	94,677	83	32,577	32,497	32,504
35	94,260	94,393	94,446	84	29,934	29,814	29,821
36	94,009	94,148	94,201	85	27,328	27,167	27,172
37	93,746	93,888	93,941	86	24,774	24,572	24,576
38	93,469	93,612	93,664	87	22,284	22,047	22,051
39	93,178	93,318	93,369	88	19,875	19,612	19,616
40	92,870	93,005	93,055	89	17,560	17,284	17,287
41	92,544	92,671	92,721	90	15,356	15,080	15,082
42	92,197	92,315	92,364	91	13,275	13,014	13,016
43	91,829	91,936	91,985	92	11,333	11,100	11,101
44	91,437	91,532	91,580	93	9,541	9,348	9,349
45	91,018	91,101	91,148	94	7,904	7,766	7,766
46	90,571	90,641	90,687	95	6,434	6,356	6,357
47	90,094	90,150	90,196	96	5,135	5,120	5,120
48	89,583	89,626	89,671	97	4,010	4,054	4,054
49	89,037	89,067	89,111	98	3,057	3,150	3,150
				99	2,269	2,399	2,399
				100	1,635	1,788	1,788

	$\widehat{l_x}$	$\widehat{l_x^1}$	$\widehat{l_x^2}$
R^2	0.99998493	0.99998501	0.99998501

Capítulo 4

Resultados.

A continuación se presentan los cuadros resumen de los datos más relevantes de la aplicación del método utilizado para el caso de: hombres, mujeres y ambos sexos.

4.1. Hombres.

En la siguiente tabla se presentan los valores de las variables de la función Gompertz-Makeham ampliada para los años 2005, 2010, 2015, 2020 y 2025. Se puede observar que las variables van incrementando conforme va aumentando el tiempo, ésto se debe a que la proyección de población que presenta CONAPO tiene un aumento en la población conforme va transcurriendo el tiempo.

La única variable que se mantiene constante es la $m = 20$, ya que ésta nos está indicando la partición de las observaciones en cinco grupos de veinte años cada uno.

	HOMBRES				
AÑO	2005	2010	2015	2020	2025
m	20	20	20	20	20
d	1.0800	1.0807	1.0813	1.0816	1.0819
b	0.9982	0.9983	0.9984	0.9985	0.9986
w	1.0000	1.0000	1.0000	1.0000	1.0000
a	0.9995	0.9995	0.9994	0.9994	0.9994
k	98,535	98,872	99,168	99,387	99,570

Éstos coeficientes nos van a indicar la correlación que existe entre los datos observados y los estimados, por lo que entre más cercanos se encuentren del valor de 1, los valores estimados serán muy parecidos a los observados. Como se explicó en la sección del método iterativo, al ya no existir cambios significativos en el coeficiente de correlación entre una iteración y otra, éstas se dejan de realizar para observar cuál es la mejor estimación de los datos.

En éste caso se realizaron tres iteraciones, siendo la primera iteración la mejor estimación a los datos observados, ya que entre el coeficiente de correlación de ésta y de la segunda iteración ya no hay cambios significativos en la décima posición decimal.

	HOMBRES			
R^2	$\widehat{l_x}$	$\widehat{l_x^1}$	$\widehat{l_x^2}$	$\widehat{l_x^3}$
2005	0.9999849347	0.9999850066	0.9999850066	0.9999850066
2010	0.9997339642	0.9999835452	0.9999835452	0.9999835452
2015	0.9989994578	0.9999775090	0.9999775090	0.9999775090
2020	0.9983675325	0.9999768089	0.9999768089	0.9999768089
2025	0.9976852062	0.9999757347	0.9999757347	0.9999757347

Los datos más relevantes son el mejor escenario de estimación para los datos observados y la esperanza de vida. Se presenta el resumen en grupos quinquenales de los años 2005, 2010, 2015, 2020 y 2025[1].

[1]Para ver los resultados en edades desplegadas, ver Anexos CUADROS A.1.1.2, A.2.1.2, A.3.1.2, A.4.1.2, A.5.1.2.

HOMBRES 2005					HOMBRES 2010			
EDAD	l_x	$\widehat{l_x^1}$	e_x		EDAD	l_x	$\widehat{l_x^1}$	e_x
0	100,000		72.20		0	100,000		73.06
5	97,830	98,109	68.78		5	98,145	98,440	69.42
10	97,662	97,758	63.89		10	98,008	98,096	64.52
15	97,445	97,351	59.03		15	97,826	97,721	59.63
20	97,030	96,864	54.27		20	97,459	97,288	54.85
25	96,318	96,257	49.65		25	96,820	96,761	50.19
30	95,380	95,477	45.12		30	95,984	96,085	45.60
35	94,260	94,446	40.62		35	94,991	95,182	41.05
40	92,870	93,055	36.19		40	93,746	93,939	36.57
45	91,018	91,148	31.87		45	92,056	92,199	32.19
50	88,453	88,514	27.72		50	89,668	89,743	27.98
55	84,866	84,875	23.78		55	86,271	86,280	23.97
60	79,893	79,885	20.10		60	81,485	81,447	20.23
65	73,148	73,161	16.71		65	74,877	74,829	16.78
70	64,309	64,365	13.65		70	66,056	66,051	13.67
75	53,303	53,380	10.94		75	54,858	54,956	10.94
80	40,574	40,591	8.57		80	41,757	41,904	8.57
85	27,328	27,172	6.52		85	28,125	28,094	6.52
90	15,356	15,082	4.71		90	15,803	15,579	4.71
95	6,434	6,357	3.00		95	6,621	6,530	3.00
100	1,635	1,788	0.50		100	1,682	1,812	0.50
HOMBRES 2015					HOMBRES 2020			
EDAD	l_x	$\widehat{l_x^1}$	e_x		EDAD	l_x	$\widehat{l_x^1}$	e_x
0	100,000		73.85		0	100,000		74.81
5	98,418	98,729	70.02		5	98,654	98,968	70.82
10	98,307	98,388	65.10		10	98,564	98,645	65.88
15	98,154	98,039	60.20		15	98,437	98,328	60.96
20	97,831	97,656	55.38		20	98,153	97,991	56.13
25	97,260	97,202	50.69		25	97,643	97,598	51.41
30	96,517	96,621	46.06		30	96,985	97,097	46.74
35	95,639	95,837	41.46		35	96,211	96,410	42.10
40	94,527	94,734	36.92		40	95,223	95,426	37.51
45	92,991	93,151	32.49		45	93,829	93,987	33.02
50	90,774	90,865	28.22		50	91,777	91,870	28.70
55	87,565	87,573	24.15		55	88,754	88,775	24.59
60	82,970	82,894	20.34		60	84,373	84,315	20.73
65	76,502	76,385	16.84		65	78,140	78,036	17.17
70	67,700	67,635	13.69		70	69,560	69,495	13.97
75	56,318	56,444	10.94		75	58,318	58,444	11.16
80	42,868	43,150	8.57		80	44,844	45,142	8.75
85	28,873	28,970	6.52		85	30,627	30,735	6.65
90	16,224	16,050	4.71		90	17,552	17,357	4.80
95	6,797	6,692	3.00		95	7,554	7,431	3.04
100	1,727	1,833	0.50		100	1,983	2,110	0.50
HOMBRES 2025								
EDAD	l_x	$\widehat{l_x^1}$	e_x					
0	100,000		75.73					
5	98,857	99,173	71.59					
10	98,784	98,867	66.64					
15	98,679	98,579	61.71					
20	98,430	98,283	56.86					
25	97,977	97,945	52.11					
30	97,396	97,514	47.41					
35	96,716	96,916	42.72					
40	95,839	96,042	38.09					
45	94,579	94,736	33.56					
50	92,684	92,781	29.19					
55	89,845	89,878	25.03					
60	85,677	85,637	21.12					
65	79,687	79,594	17.51					
70	71,345	71,281	14.25					
75	60,270	60,397	11.39					
80	46,810	47,126	8.93					
85	32,409	32,533	6.79					
90	18,936	18,723	4.89					
95	8,369	8,225	3.08					
100	2,269	2,421	0.50					

4.2. Mujeres.

En la siguiente tabla se presentan los valores de las variables de la función Gompertz-Makeham ampliada para los años 2005, 2010, 2015, 2020 y 2025. Se puede observar que las variables van incrementando conforme va aumentando el tiempo, ésto se debe a que la proyección de población que presenta CONAPO tiene un aumento en la población conforme va transcurriendo el tiempo.

La única variable que se mantiene constante es la $m = 20$, ya que ésta nos está indicando la partición de las observaciones en cinco grupos de veinte años cada uno.

	MUJERES				
AÑO	2005	2010	2015	2020	2025
m	20	20	20	20	20
d	1.0917	1.0930	1.0942	1.0956	1.0971
b	0.9994	0.9995	0.9995	0.9996	0.9997
w	1.0000	1.0000	1.0000	1.0000	1.0000
a	0.9997	0.9996	0.9996	0.9996	0.9996
k	98,540	98,806	99,040	99,207	99,349

Éstos coeficientes nos van a indicar la correlación que existe entre los datos observados y los estimados por lo que entre más cercanos se encuentren del valor de 1, los valores estimados serán muy parecidos a los observados. Como se explicó en la sección del método iterativo, al ya no existir cambios significativos en el coefiente de correlación entre una iteración y otra, éstas se dejan de realizar para observar cuál es la mejor estimación de los datos.

En éste caso se realizaron tres iteraciones siendo la primera iteración la mejor estimación a los datos observados, ya que entre el coeficiente de correlación de ésta y de la segunda iteración ya no hay cambios significativos en la décima posición decimal.

	MUJERES			
R^2	$\widehat{l_x}$	$\widehat{l_x^1}$	$\widehat{l_x^2}$	$\widehat{l_x^3}$
2005	0.9995337737	0.9999988544	0.9999988544	0.9999988544
2010	0.9989457394	0.9999950683	0.9999950683	0.9999950683
2015	0.9981960949	0.9999799648	0.9999799648	0.9999799648
2020	0.9980212983	0.9999814412	0.9999814412	0.9999814412
2025	0.9979116809	0.9999825705	0.9999825705	0.9999825705

Los datos más relevantes son el mejor escenario de estimación para los datos observados y la esperanza de vida. Se presenta el resumen en grupos quinquenales de los años 2005, 2010, 2015, 2020 y 2025[2].

[2]Para ver los resultados en edades desplegadas, ver Anexos CUADROA A.1.2.2, A.2.2.2, A.3.2.2, A.4.2.2, A.5.2.2.

MUJERES 2005					MUJERES 2010			
EDAD	l_x	$\widehat{l1_x}$	e_x		EDAD	l_x	$\widehat{l1_x}$	e_x
0	100,000		77.02		0	100,000		77.76
5	98,247	98,353	73.38		5	98,503	98,616	73.93
10	98,118	98,183	68.47		10	98,398	98,451	69.00
15	97,992	98,013	63.56		15	98,294	98,299	64.07
20	97,800	97,827	58.68		20	98,133	98,147	59.18
25	97,552	97,602	53.82		25	97,932	97,972	54.29
30	97,246	97,304	48.98		30	97,688	97,742	49.42
35	96,823	96,879	44.18		35	97,345	97,403	44.59
40	96,192	96,245	39.46		40	96,814	96,874	39.82
45	95,224	95,275	34.83		45	95,971	96,032	35.14
50	93,733	93,784	30.34		50	94,631	94,691	30.60
55	91,448	91,497	26.03		55	92,532	92,573	26.23
60	87,985	88,029	21.95		60	89,285	89,283	22.09
65	82,827	82,866	18.15		65	84,337	84,290	18.23
70	75,365	75,402	14.69		70	77,001	76,950	14.72
75	65,043	65,082	11.61		75	66,590	66,652	11.61
80	51,723	51,751	8.93		80	52,953	53,175	8.93
85	36,271	36,229	6.65		85	37,134	37,309	6.65
90	20,926	20,814	4.73		90	21,424	21,419	4.73
95	8,825	8,799	3.01		95	9,035	8,991	3.01
100	2,249	2,312	0.50		100	2,303	2,315	0.50
MUJERES 2015					MUJERES 2020			
EDAD	l_x	$\widehat{l1_x}$	e_x		EDAD	l_x	$\widehat{l1_x}$	e_x
0	100,000		78.42		0	100,000		79.32
5	98,724	98,846	74.42		5	98,915	99,037	75.18
10	98,639	98,681	69.48		10	98,846	98,889	70.23
15	98,555	98,543	64.54		15	98,778	98,771	65.28
20	98,420	98,418	59.62		20	98,666	98,670	60.35
25	98,258	98,285	54.72		25	98,535	98,568	55.42
30	98,064	98,112	49.82		30	98,382	98,435	50.51
35	97,787	97,848	44.96		35	98,160	98,223	45.62
40	97,343	97,414	40.15		40	97,790	97,859	40.78
45	96,610	96,686	35.43		45	97,156	97,229	36.03
50	95,411	95,481	30.84		50	96,086	96,154	31.40
55	93,489	93,519	26.42		55	94,331	94,368	26.93
60	90,452	90,398	22.22		60	91,516	91,480	22.68
65	85,708	85,568	18.30		65	87,063	86,944	18.70
70	78,494	78,354	14.74		70	80,197	80,068	15.07
75	68,003	68,092	11.61		75	70,053	70,137	11.87
80	54,076	54,495	8.93		80	56,351	56,755	9.13
85	37,921	38,317	6.65		85	40,132	40,510	6.79
90	21,878	21,983	4.73		90	23,617	23,713	4.81
95	9,227	9,164	3.01		95	10,209	10,146	3.04
100	2,352	2,314	0.50		100	2,682	2,646	0.50
MUJERES 2025								
EDAD	l_x	$\widehat{l1_x}$	e_x					
0	100,000		80.17					
5	99,080	99,203	75.91					
10	99,024	99,069	70.95					
15	98,969	98,967	65.99					
20	98,876	98,886	61.05					
25	98,771	98,809	56.11					
30	98,651	98,708	51.17					
35	98,473	98,541	46.26					
40	98,167	98,238	41.40					
45	97,620	97,692	36.61					
50	96,669	96,736	31.95					
55	95,071	95,115	27.44					
60	92,469	92,449	23.14					
65	88,301	88,200	19.10					
70	81,787	81,668	15.41					
75	72,008	72,090	12.14					
80	58,570	58,963	9.33					
85	42,346	42,709	6.93					
90	25,409	25,498	4.90					
95	11,254	11,192	3.08					
100	3,047	3,013	0.50					

4.3. Población total.

En la siguiente tabla se presentan los valores de las variables de la función Gompertz-Makeham ampliada para los años 2005, 2010, 2015, 2020 y 2025. Se puede observar las variables van incrementando conforme va aumentando el tiempo, ésto se debe a que la proyección de población que presenta CONAPO tiene un aumento en la población conforme va transcurriendo el tiempo.

La única variable que se mantiene constante es la $m = 20$, ya que ésta nos está indicando la partición de las observaciones en cinco grupos de veinte años cada uno.

	POBLACIÓN TOTAL				
AÑO	2005	2010	2015	2020	2025
m	20	20	20	20	20
d	1.0862	1.0871	1.0880	1.0887	1.0896
b	0.9990	0.9991	0.9992	0.9992	0.9993
w	1.0000	1.0000	1.0000	1.0000	1.0000
a	0.9996	0.9996	0.9995	0.9995	0.9996
k	98,492	98,792	99,057	99,248	99,410

Éstos coeficientes nos van a indicar la correlación que existe entre los datos observados y los estimados por lo que entre más cercanos se encuentren del valor de 1, los valores estimados serán muy parecidos a los observados. Como se explicó en la sección del método iterativo, al ya no existir cambios significativos en el coefiente de correlación entre una iteración y otra, éstas se dejan de realizar para observar cuál es la mejor estimación de los datos.

En éste caso se realizaron tres iteraciones siendo la primera iteración la mejor estimación a los datos observados, ya que entre el coeficiente de correlación de ésta y de la segunda iteración ya no hay cambios significativos en la décima posición decimal.

	POBLACIÓN TOTAL			
R^2	$\widehat{l_x}$	$\widehat{l_x^1}$	$\widehat{l_x^2}$	$\widehat{l_x^3}$
2005	0.9999878782	0.9999935057	0.9999935057	0.9999935057
2010	0.9997405761	0.9999935552	0.9999935552	0.9999935552
2015	0.9991644714	0.9999867108	0.9999867108	0.9999867108
2020	0.9988377121	0.9999872115	0.9999872115	0.9999872115
2025	0.9985258786	0.9999873653	0.9999873653	0.9999873653

Los datos más relevantes son el mejor escenario de estimación para los datos observados y la esperanza de vida. Se presenta el resumen en grupos quinquenales de los años 2005, 2010, 2015, 2020 y 2025[3].

[3]Para ver los resultados en edades desplegadas, ver Anexos CUADROS A.1.3.2, A.2.3.2, A.3.3.2, A.4.3.2, A.5.3.2.

POBLACIÓN TOTAL 2005					POBLACIÓN TOTAL 2010			
EDAD	l_x	$\widehat{l_x^1}$	e_x		EDAD	l_x	$\widehat{l_x^1}$	e_x
0	100,000		74.61		0	100,000		75.41
5	98,038	98,222	71.08		5	98,324	98,519	71.68
10	97,890	97,974	66.19		10	98,203	98,277	66.77
15	97,718	97,691	61.30		15	98,060	98,019	61.86
20	97,415	97,354	56.48		20	97,796	97,727	57.02
25	96,935	96,935	51.75		25	97,376	97,373	52.25
30	96,313	96,391	47.07		30	96,836	96,915	47.53
35	95,542	95,658	42.43		35	96,168	96,288	42.84
40	94,531	94,641	37.85		40	95,280	95,398	38.22
45	93,121	93,203	33.38		45	94,013	94,107	33.70
50	91,093	91,145	29.07		50	92,150	92,213	29.32
55	88,157	88,191	24.95		55	89,401	89,432	25.14
60	83,939	83,972	21.07		60	85,385	85,382	21.20
65	77,987	78,035	17.48		65	79,607	79,583	17.55
70	69,837	69,899	14.21		70	71,528	71,518	14.23
75	59,173	59,224	11.30		75	60,724	60,796	11.30
80	46,148	46,133	8.77		80	47,355	47,497	8.77
85	31,799	31,644	6.60		85	32,629	32,638	6.59
90	18,141	17,910	4.72		90	18,613	18,456	4.72
95	7,629	7,579	3.01		95	7,828	7,762	3.01
100	1,942	2,067	0.50		100	1,993	2,082	0.50

POBLACIÓN TOTAL 2015					POBLACIÓN TOTAL 2020			
EDAD	l_x	$\widehat{l_x^1}$	e_x		EDAD	l_x	$\widehat{l_x^1}$	e_x
0	100,000		76.13		0	100,000		77.06
5	98,571	98,778	72.22		5	98,784	98,993	73.00
10	98,473	98,538	67.29		10	98,705	98,772	68.06
15	98,355	98,301	62.37		15	98,607	98,560	63.12
20	98,126	98,048	57.51		20	98,410	98,342	58.25
25	97,759	97,751	52.72		25	98,089	98,091	53.43
30	97,290	97,368	47.96		30	97,684	97,768	48.64
35	96,713	96,838	43.23		35	97,186	97,312	43.87
40	95,935	96,065	38.56		40	96,506	96,634	39.16
45	94,801	94,910	33.99		45	95,493	95,599	34.55
50	93,093	93,169	29.56		50	93,932	94,009	30.08
55	90,527	90,553	25.32		55	91,543	91,580	25.80
60	86,711	86,664	21.32		60	87,944	87,918	21.74
65	81,105	81,003	17.61		65	82,601	82,519	17.98
70	73,097	73,014	14.25		70	74,879	74,804	14.56
75	62,160	62,260	11.30		75	64,185	64,282	11.55
80	48,472	48,775	8.77		80	50,597	50,895	8.96
85	33,397	33,573	6.59		85	35,379	35,541	6.73
90	19,051	18,968	4.72		90	20,584	20,478	4.81
95	8,012	7,930	3.01		95	8,881	8,790	3.04
100	2,039	2,094	0.50		100	2,333	2,405	0.50

POBLACIÓN TOTAL 2025			
EDAD	l_x	$\widehat{l_x^1}$	e_x
0	100,000		77.95
5	98,968	99,179	73.75
10	98,904	98,973	68.80
15	98,824	98,785	63.85
20	98,653	98,597	58.96
25	98,374	98,386	54.12
30	98,023	98,114	49.30
35	97,595	97,724	44.51
40	97,003	97,131	39.76
45	96,100	96,205	35.11
50	94,677	94,756	30.60
55	92,458	92,505	26.27
60	89,073	89,066	22.17
65	83,994	83,929	18.35
70	76,566	76,499	14.87
75	66,139	66,235	11.80
80	52,690	52,986	9.16
85	37,377	37,528	6.87
90	22,173	22,043	4.89
95	9,811	9,711	3.08
100	2,658	2,750	0.50

Capítulo 5

Conclusiones.

5.1. Incremento en la esperanza de vida.

Debido a que la medicina ha tenido grandes avances en los últimos 100 años, se ha provocado que las personas se recuperen más fácilmente de las enfermedades que tienen o que éstas se controlen por más tiempo, teniendo como resultado que las personas prolonguen más su vida.

Existen otros factores por los cuales las personas han prolongado su vida, uno de ellos es el tipo de vivienda. El cambio de los pisos de tierra a los de cemento ha traido una gran disminución en las enfermedades en la población.

A este incremento en el tiempo de vida se le conoce como incremento en la esperanza de vida.

En las siguientes tablas podemos ver el incremento en años que se da desde el 2005 hasta el 2025.

5.1.1. Hombres.

En las siguiente gráficas se muestran las esperanzas de vida para los hombres de los años 2005, 2010, 2015, 2020 y 2025, por edades desagregadas.

Realizando una comparación entre ellas podemos observar cómo va au-

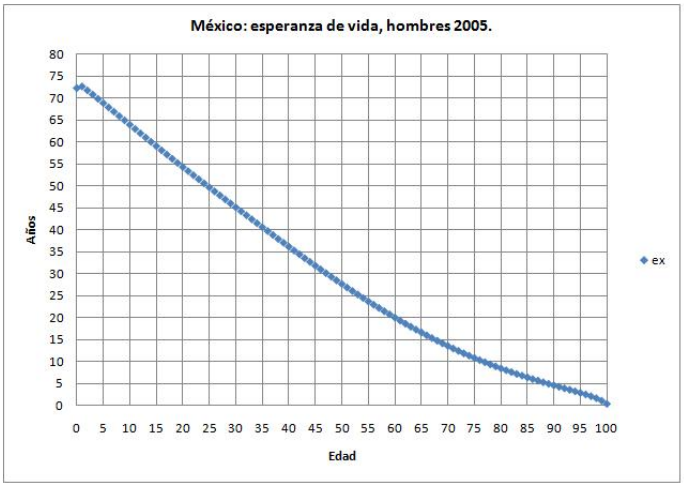
mentando la esperanza de vida conforme pasan los años, comenzando con 72.20 años en el 2005 y terminando con 73.75 años para el 2025.

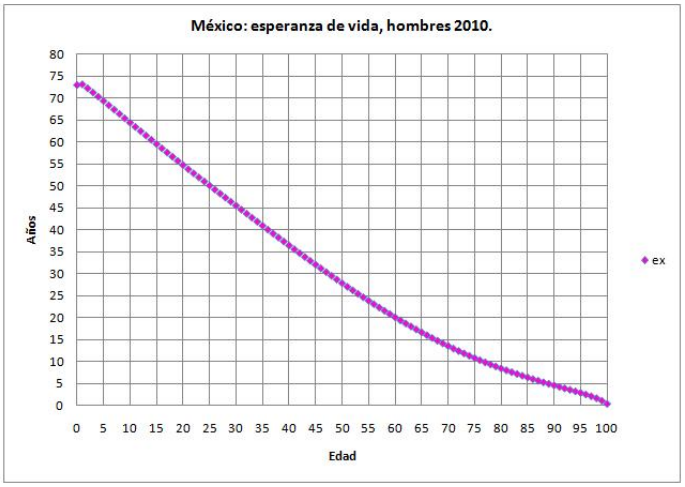
Analizando un poco más a fondo, se puede notar que conforme avanzamos en el tiempo la descripción de los datos de la esperanza se van ajustando cada vez mas a una recta, ya que en la gráfica del año 2005 podemos notar que a partir de la edad 65 años se ve una ligera curva hacia la edad 100 años, lo que está indicando que a partir de esa edad disminuye de una manera un poco más pronunciada el número de años que se espera vivir.

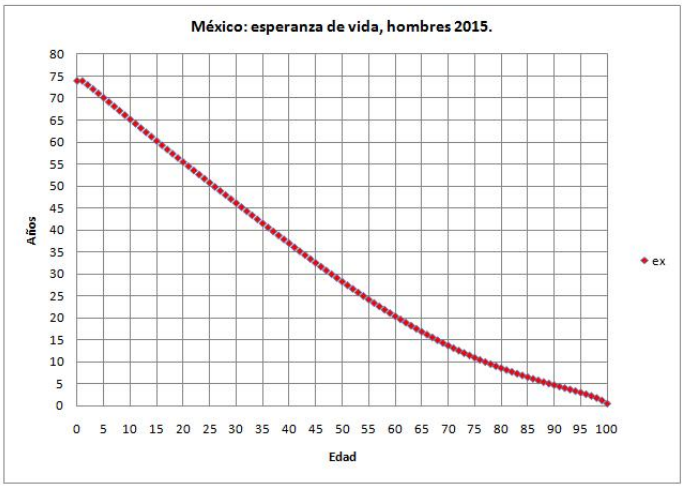
Para el año 2025, este comportamiento se ve un poco diferente ya que conforme se avanza en la edad se espera vivir un poco más de años.

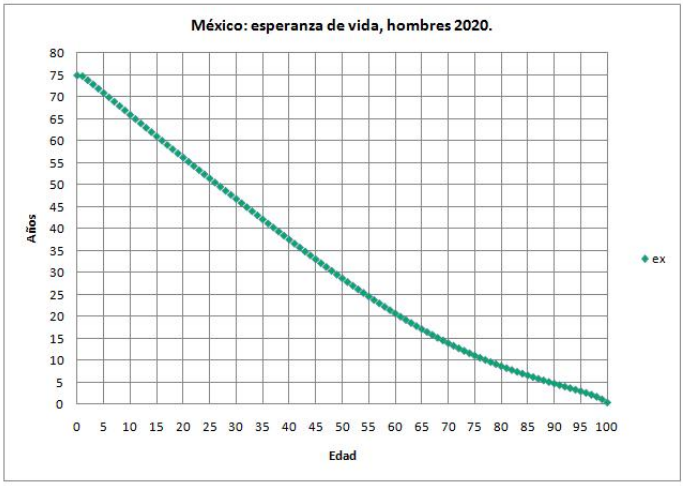
La ganancia de la esperanza de vida que se tiene del año 2005 al 2010 es de 0.86 años, del 2010 al 2015 es de 0.79 años, del 2015 al 2020 es de 0.96 años y del 2020 al 2025 es de 0.92 años. El total de los años ganados del 2005 al 2025 son aproximadamente 1.55 años.

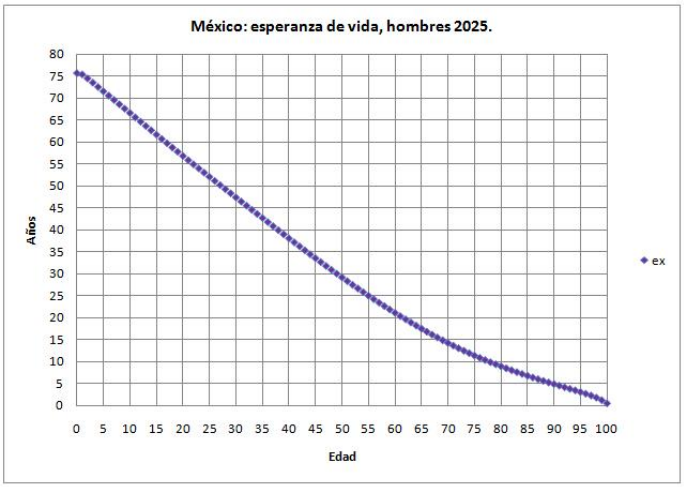
La descripción de éstos valores, como se muestra en la gráfica, nos represetan un crecimiento lineal en el incremento de la esperanza de vida, lo que nos indica que se espera un aumento lento en la ganancia de años a nuestras vidas y no uno rápido como a veces se especula.

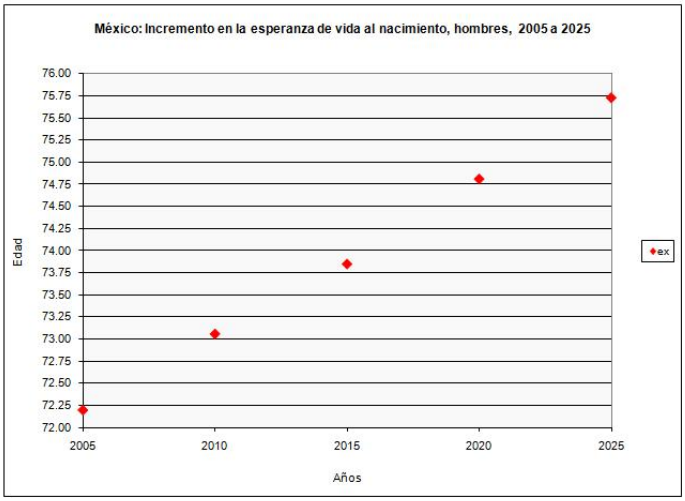

México: esperanza de vida, hombres 2005.
Años
Edad
ex


México: esperanza de vida, hombres 2010.
Años
Edad
ex


México: esperanza de vida, hombres 2015.
Años
Edad
ex


México: esperanza de vida, hombres 2020.
Años
Edad
ex


México: esperanza de vida, hombres 2025.
Años
Edad
ex


México: Incremento en la esperanza de vida al nacimiento, hombres, 2005 a 2025
Edad
Años
ex

5.1.2. Mujeres.

En las siguientes gráficas se muestran las esperanzas de vida para las mujeres de los años 2005, 2010, 2015, 2020 y 2025, por edades desagregadas.

Realizando la comparación entre dichas gráficas, se puede resaltar un comportamiento muy similar al de los hombes; es decir, que con el paso de los años la tendencia de la esperanza de vida va tomando la forma de una línea recta, excepto a partir de la edad de 90 años, ya que desde ahí se tiene un comportamiento un poco diferente al de una línea recta.

De los 90 años en adelante se ve una ligera curva que crece hasta la edad 100 años, ésto indica que las personas que alcanzan dichas edades, conforme va pasando el tiempo, se espera que vivan algunos años más.

La ganancia de vida de 2005 al 2010 es de 0.80 años, del 2010 al 2015 es de 0.72 años, del 2015 al 2020 es de 0.93 años y del 2020 al 2025 es de 0.89 años. El total de años ganados del 2005 al 2025 son aproximadamente 3.34 años.

La descripción de la gráfica de los valores de ganancia en la esperanza de vida nos describen una recta; aunque éstos valores sean mayores a los que se tuvieron en el caso de los hombres, el incremento de años entre uno y otro aún no es tanta como para dar una descripción distinta a la de una recta, pero sí se puede indicar que es una recta con una mayor pendiente que en el caso de los hombres.

Haciendo una comparación entre la esperanza de vida que hay entre hombres y mujeres podemos resaltar lo siguiente:

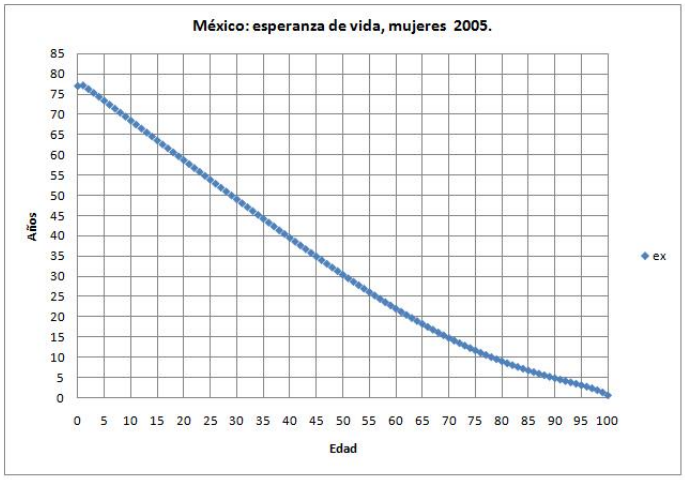
ESPERANZA DE VIDA		
AÑO	HOMBRES	MUJERES
2005	72.20	77.02
2010	73.06	77.76
2015	73.85	78.42
2020	74.81	79.32
2025	75.73	80.17

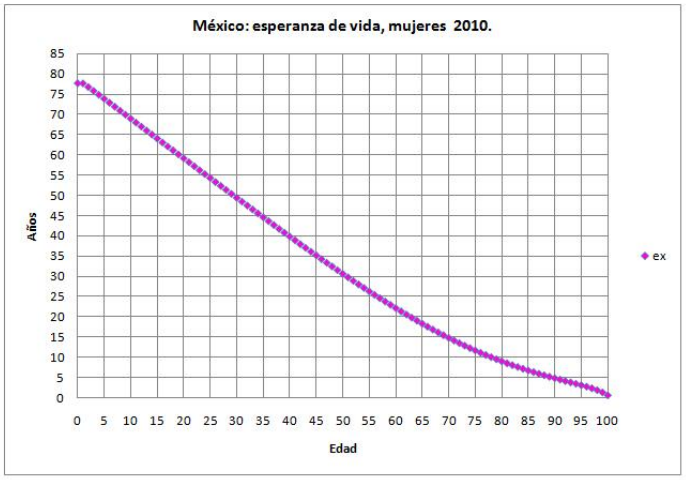
En promedio las mujeres viven 4.61 años más que los hombres, aunque la diferencia conforme van pasando los años se hace cada vez más estrecha, ya que en el año 2005 hay una diferencia de 4.82 años, en el 2010 de 4.70 años, en el 2015 de 4.57 años, en el 2020 4.51 años y para el 2025 se espera una diferencia de 4.44 años.

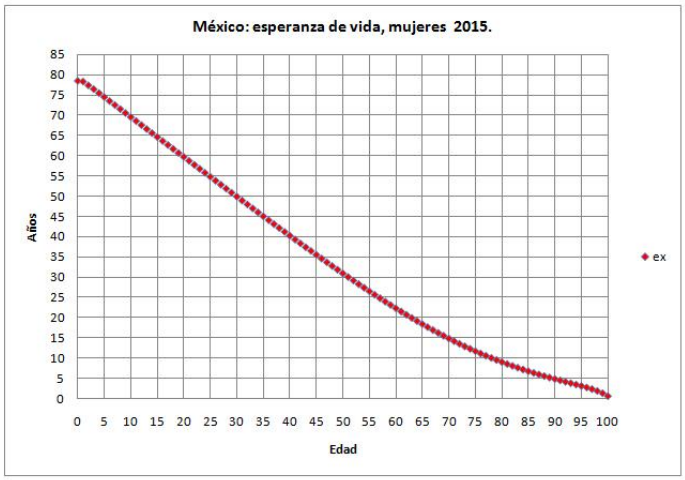
Lo que podemos concluir de los datos con los que se cuenta es que las mujeres son más longevas que los hombres.

Sería muy interesante conocer las causas por las que se espera éste tipo de comportamiento, al igual que todas la variables que se encuentren involucradas.

Con ésto se podrá ver la forma en la que se ve afectado cada sexo por las enfermedades, ya sean virales o congénito-degenerativas, alimentación, trabajo, educación, etc., ya que en la sociedad se han dado grandes cambios pero sobre todo en las mujeres, quienes se han integrado al mercado laboral y han incrementado su nivel educativo así como han reducido el número de hijos.

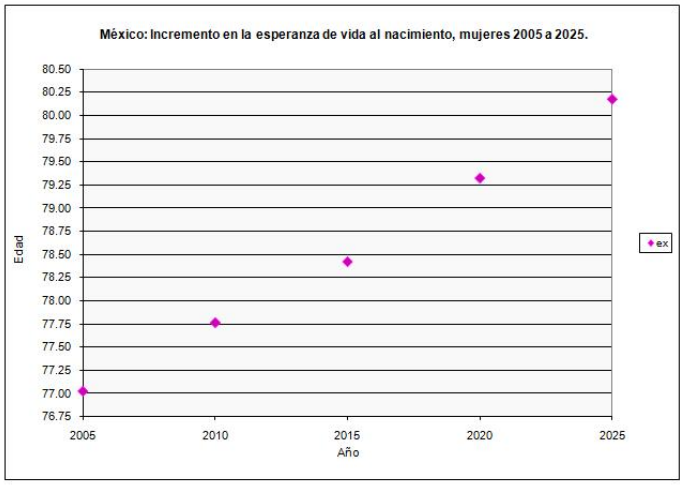

México: esperanza de vida, mujeres 2005.
Años
Edad
ex


México: esperanza de vida, mujeres 2010.
Años
Edad
ex


México: esperanza de vida, mujeres 2015.
Años
Edad
ex


México: esperanza de vida, mujeres 2020.
Años
Edad
ex


México: esperanza de vida, mujeres 2025.
Años
Edad
ex


México: incremento en la esperanza de vida al nacimiento, mujeres 2005 a 2025.
Edad
Año
ex

5.1.3. Población total.

En las siguientes gráficas se ven los resultados promedio de la esperanza de vida que hay entre hombres y mujeres en México en los años 2005, 2010, 2015, 2020 y 2025.

Tanto la esperanza de vida como la ganancia que hay en ella se encuentra acotada entre lo que se tiene de los hombres como límite inferior y como superior lo que se tiene por parte de las mujeres.

La proyección está hecha con el supuesto de que todo siga teniendo un comportamiento como el que hasta ahora ha presentado la sociedad en cuanto a las causas de mortalidad. Creo que un tema muy interesante para investigar sería el asociar por separado las causas de mortalidad con los hábitos alimenticios, deportivos y de higiene para resaltar el cambio que se da en éstos últimos, y con ello, el cambio que se puede esperar en las causas de muerte. Me parece que se pueden encontrar algunos resultados inesperados al realizar un ajuste a la tabla de mortalidad para obtener la esperanza de vida.

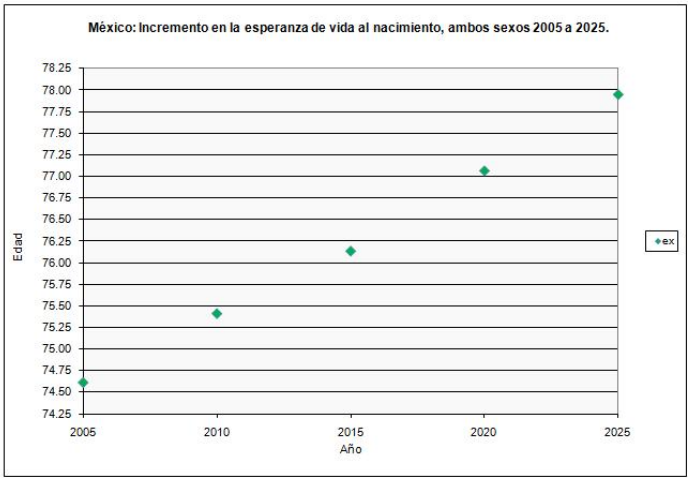

México: esperanza de vida, ambos sexos 2005.
Años
Edad
ex


México: esperanza de vida, ambos sexos 2010.
Años
Edad
ex


México: esperanza de vida, ambos sexos 2015.
Años
Edad
ex


México: esperanza de vida, ambos sexos 2020.
Años
Edad
ex


México: esperanza de vida, ambos sexos 2025.
Años
Edad
ex


México: Incremento en la esperanza de vida al nacimiento, ambos sexos 2005 a 2025.
Edad
Año
ex

Bibliografía

[1] Mina Valdés, Alejandro. *Estimación de los fenómenos demográficos*. Publicaciones del Departamento de Matemáticas de la Facultad de Ciencias, UNAM. 2003.

[2] Mina Valdés, Alejandro. *Funciones de Sobrevivencia empleadas en el análisis demográfico*. Papeles de Población, abril-junio, número 28. Universidad Autónoma del Estado de México. 2001.

[3] Mina Valdés, Alejandro. *Ley de Mortalidad Mexicana*. Revista Estudios Demográficos y Urbanos. 2003.

[4] Bowers, Gerber, Hickman, Jones y Nesbitt. *Actuarial Mathematics*. The Society of Actuaries. 1997.

[5] Página web. *www.actuaries.org.uk*.

[6] Página web, J J O'Connor y E F Robertson. $www-history.mcs.st-andrews.ac.uk/Biographies/De_Moivre.html$.

Anexos.

Año 2005

Hombres

Tabla de mortalidad

2005	CUADRO A.1.1.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.018596	100,000	1,860	99,070	7,219,581	72.20
1	0.001537	98,140	151	98,065	7,120,510	72.55
2	0.000733	97,990	72	97,954	7,022,445	71.67
3	0.000497	97,918	49	97,893	6,924,492	70.72
4	0.000400	97,869	39	97,849	6,826,598	69.75
5	0.000356	97,830	35	97,812	6,728,749	68.78
6	0.000338	97,795	33	97,778	6,630,936	67.80
7	0.000334	97,762	33	97,746	6,533,158	66.83
8	0.000339	97,729	33	97,713	6,435,412	65.85
9	0.000351	97,696	34	97,679	6,337,700	64.87
10	0.000370	97,662	36	97,644	6,240,021	63.89
11	0.000396	97,626	39	97,606	6,142,377	62.92
12	0.000432	97,587	42	97,566	6,044,770	61.94
13	0.000482	97,545	47	97,521	5,947,204	60.97
14	0.000547	97,498	53	97,471	5,849,683	60.00
15	0.000630	97,445	61	97,414	5,752,211	59.03
16	0.000729	97,383	71	97,348	5,654,798	58.07
17	0.000842	97,312	82	97,271	5,557,450	57.11
18	0.000967	97,230	94	97,183	5,460,178	56.16
19	0.001097	97,136	107	97,083	5,362,995	55.21
20	0.001229	97,030	119	96,970	5,265,912	54.27
21	0.001358	96,911	132	96,845	5,168,942	53.34
22	0.001480	96,779	143	96,707	5,072,097	52.41
23	0.001594	96,636	154	96,559	4,975,390	51.49
24	0.001698	96,482	164	96,400	4,878,831	50.57
25	0.001793	96,318	173	96,231	4,782,431	49.65
26	0.001880	96,145	181	96,055	4,686,200	48.74
27	0.001959	95,964	188	95,870	4,590,145	47.83
28	0.002035	95,776	195	95,679	4,494,275	46.92
29	0.002109	95,581	202	95,481	4,398,596	46.02
30	0.002185	95,380	208	95,276	4,303,115	45.12
31	0.002264	95,171	215	95,064	4,207,840	44.21
32	0.002350	94,956	223	94,844	4,112,776	43.31
33	0.002444	94,733	232	94,617	4,017,932	42.41
34	0.002549	94,501	241	94,381	3,923,314	41.52
35	0.002668	94,260	251	94,135	3,828,934	40.62
36	0.002801	94,009	263	93,877	3,734,799	39.73
37	0.002950	93,746	277	93,607	3,640,922	38.84
38	0.003118	93,469	291	93,323	3,547,314	37.95
39	0.003304	93,178	308	93,024	3,453,991	37.07
40	0.003512	92,870	326	92,707	3,360,967	36.19
41	0.003741	92,544	346	92,370	3,268,261	35.32
42	0.003994	92,197	368	92,013	3,175,890	34.45
43	0.004272	91,829	392	91,633	3,083,877	33.58
44	0.004577	91,437	418	91,228	2,992,244	32.72
45	0.004909	91,018	447	90,795	2,901,017	31.87
46	0.005272	90,571	477	90,333	2,810,222	31.03
47	0.005666	90,094	511	89,839	2,719,889	30.19
48	0.006095	89,583	546	89,310	2,630,051	29.36
49	0.006560	89,037	584	88,745	2,540,740	28.54

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.007063	88,453	625	88,141	2,451,995	27.72
51	0.007609	87,829	668	87,495	2,363,854	26.91
52	0.008198	87,160	715	86,803	2,276,359	26.12
53	0.008836	86,446	764	86,064	2,189,556	25.33
54	0.009524	85,682	816	85,274	2,103,492	24.55
55	0.010268	84,866	871	84,430	2,018,218	23.78
56	0.011070	83,995	930	83,530	1,933,788	23.02
57	0.011935	83,065	991	82,569	1,850,258	22.27
58	0.012869	82,073	1,056	81,545	1,767,689	21.54
59	0.013875	81,017	1,124	80,455	1,686,144	20.81
60	0.014960	79,893	1,195	79,295	1,605,689	20.10
61	0.016129	78,698	1,269	78,063	1,526,393	19.40
62	0.017388	77,429	1,346	76,755	1,448,330	18.71
63	0.018744	76,082	1,426	75,369	1,371,575	18.03
64	0.020204	74,656	1,508	73,902	1,296,206	17.36
65	0.021775	73,148	1,593	72,351	1,222,304	16.71
66	0.023466	71,555	1,679	70,715	1,149,952	16.07
67	0.025286	69,876	1,767	68,992	1,079,237	15.45
68	0.027242	68,109	1,855	67,181	1,010,244	14.83
69	0.029346	66,254	1,944	65,281	943,063	14.23
70	0.031607	64,309	2,033	63,293	877,782	13.65
71	0.034036	62,277	2,120	61,217	814,489	13.08
72	0.036646	60,157	2,204	59,055	753,272	12.52
73	0.039446	57,952	2,286	56,809	694,217	11.98
74	0.042452	55,666	2,363	54,485	637,408	11.45
75	0.045676	53,303	2,435	52,086	582,923	10.94
76	0.049132	50,869	2,499	49,619	530,837	10.44
77	0.052836	48,369	2,556	47,091	481,218	9.95
78	0.056801	45,814	2,602	44,513	434,127	9.48
79	0.061046	43,211	2,638	41,892	389,614	9.02
80	0.065585	40,574	2,661	39,243	347,722	8.57
81	0.070437	37,913	2,670	36,577	308,478	8.14
82	0.075619	35,242	2,665	33,910	271,901	7.72
83	0.081148	32,577	2,644	31,255	237,992	7.31
84	0.087044	29,934	2,606	28,631	206,736	6.91
85	0.093470	27,328	2,554	26,051	178,105	6.52
86	0.100477	24,774	2,489	23,529	152,055	6.14
87	0.108120	22,284	2,409	21,080	128,526	5.77
88	0.116458	19,875	2,315	18,718	107,446	5.41
89	0.125556	17,560	2,205	16,458	88,728	5.05
90	0.135485	15,356	2,080	14,315	72,270	4.71
91	0.146321	13,275	1,942	12,304	57,954	4.37
92	0.158143	11,333	1,792	10,437	45,651	4.03
93	0.171514	9,541	1,636	8,722	35,214	3.69
94	0.186060	7,904	1,471	7,169	26,491	3.35
95	0.201870	6,434	1,299	5,784	19,323	3.00
96	0.219035	5,135	1,125	4,572	13,538	2.64
97	0.237646	4,010	953	3,534	8,966	2.24
98	0.257792	3,057	788	2,663	5,432	1.78
99	0.279559	2,269	634	1,952	2,769	1.22
100	1.000000	1,635	1,635	817	817	0.50

Estimación

2005	CUADRO A.1.1.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	98,140	98,298	98,361	98,424	98,487
2	97,990	98,237	98,300	98,363	98,425
3	97,918	98,175	98,237	98,300	98,363
4	97,869	98,111	98,174	98,236	98,299
5	97,830	98,046	98,109	98,171	98,234
6	97,795	97,980	98,042	98,105	98,167
7	97,762	97,911	97,974	98,036	98,099
8	97,729	97,842	97,904	97,966	98,029
9	97,696	97,770	97,832	97,894	97,957
10	97,662	97,696	97,758	97,820	97,883
11	97,626	97,620	97,682	97,744	97,807
12	97,587	97,542	97,603	97,666	97,728
13	97,545	97,461	97,522	97,584	97,647
14	97,498	97,377	97,438	97,501	97,563
15	97,445	97,291	97,351	97,414	97,476
16	97,383	97,201	97,261	97,324	97,386
17	97,312	97,107	97,168	97,230	97,292
18	97,230	97,010	97,071	97,133	97,195
19	97,136	96,909	96,969	97,031	97,093
20	97,030	96,804	96,864	96,925	96,987
21	96,911	96,694	96,753	96,815	96,877
22	96,779	96,579	96,638	96,699	96,761
23	96,636	96,458	96,517	96,578	96,640
24	96,482	96,332	96,390	96,451	96,513
25	96,318	96,199	96,257	96,318	96,380
26	96,145	96,059	96,117	96,178	96,240
27	95,964	95,912	95,969	96,031	96,092
28	95,776	95,757	95,814	95,875	95,936
29	95,581	95,594	95,650	95,711	95,772
30	95,380	95,421	95,477	95,538	95,599
31	95,171	95,239	95,294	95,355	95,416
32	94,956	95,045	95,100	95,161	95,222
33	94,733	94,841	94,895	94,956	95,016
34	94,501	94,623	94,677	94,738	94,798
35	94,260	94,393	94,446	94,507	94,567
36	94,009	94,148	94,201	94,261	94,322
37	93,746	93,888	93,941	94,001	94,061
38	93,469	93,612	93,664	93,723	93,783
39	93,178	93,318	93,369	93,428	93,488
40	92,870	93,005	93,055	93,114	93,174
41	92,544	92,671	92,721	92,780	92,839
42	92,197	92,315	92,364	92,423	92,482
43	91,829	91,936	91,985	92,043	92,102
44	91,437	91,532	91,580	91,638	91,697
45	91,018	91,101	91,148	91,206	91,264
46	90,571	90,641	90,687	90,745	90,803
47	90,094	90,150	90,196	90,253	90,311
48	89,583	89,626	89,671	89,728	89,786
49	89,037	89,067	89,111	89,168	89,225

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	88,453	88,471	88,514	88,570	88,627
51	87,829	87,834	87,877	87,933	87,989
52	87,160	87,155	87,197	87,252	87,308
53	86,446	86,431	86,472	86,527	86,582
54	85,682	85,659	85,699	85,753	85,808
55	84,866	84,836	84,875	84,929	84,983
56	83,995	83,959	83,997	84,050	84,104
57	83,065	83,025	83,062	83,115	83,168
58	82,073	82,032	82,067	82,120	82,172
59	81,017	80,975	81,009	81,061	81,113
60	79,893	79,851	79,885	79,936	79,987
61	78,698	78,659	78,691	78,741	78,792
62	77,429	77,393	77,425	77,474	77,524
63	76,082	76,053	76,083	76,132	76,180
64	74,656	74,633	74,663	74,710	74,758
65	73,148	73,133	73,161	73,208	73,254
66	71,555	71,549	71,576	71,622	71,667
67	69,876	69,880	69,905	69,950	69,995
68	68,109	68,123	68,147	68,191	68,234
69	66,254	66,277	66,301	66,343	66,385
70	64,309	64,343	64,365	64,406	64,447
71	62,277	62,319	62,340	62,380	62,419
72	60,157	60,207	60,227	60,265	60,304
73	57,952	58,009	58,027	58,064	58,101
74	55,666	55,726	55,743	55,779	55,815
75	53,303	53,364	53,380	53,414	53,448
76	50,869	50,927	50,942	50,974	51,007
77	48,369	48,422	48,435	48,466	48,497
78	45,814	45,856	45,868	45,898	45,927
79	43,211	43,239	43,250	43,278	43,305
80	40,574	40,581	40,591	40,617	40,643
81	37,913	37,896	37,905	37,929	37,953
82	35,242	35,196	35,204	35,226	35,249
83	32,577	32,497	32,504	32,524	32,545
84	29,934	29,814	29,821	29,840	29,859
85	27,328	27,167	27,172	27,190	27,207
86	24,774	24,572	24,576	24,592	24,608
87	22,284	22,047	22,051	22,065	22,080
88	19,875	19,612	19,616	19,628	19,641
89	17,560	17,284	17,287	17,298	17,309
90	15,356	15,080	15,082	15,092	15,101
91	13,275	13,014	13,016	13,024	13,032
92	11,333	11,100	11,101	11,109	11,116
93	9,541	9,348	9,349	9,355	9,361
94	7,904	7,766	7,766	7,771	7,776
95	6,434	6,356	6,357	6,361	6,365
96	5,135	5,120	5,120	5,124	5,127
97	4,010	4,054	4,054	4,056	4,059
98	3,057	3,150	3,150	3,152	3,154
99	2,269	2,399	2,399	2,401	2,402
100	1,635	1,788	1,788	1,789	1,790

Mujeres

Tabla de mortalidad

2005	CUADRO A.1.2.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.014844	100,000	1,484	99,258	7,701,934	77.02
1	0.001208	98,516	119	98,456	7,602,676	77.17
2	0.000672	98,397	66	98,363	7,504,220	76.27
3	0.000474	98,330	47	98,307	7,405,856	75.32
4	0.000373	98,284	37	98,265	7,307,549	74.35
5	0.000314	98,247	31	98,232	7,209,284	73.38
6	0.000277	98,216	27	98,203	7,111,052	72.40
7	0.000253	98,189	25	98,177	7,012,850	71.42
8	0.000237	98,164	23	98,153	6,914,673	70.44
9	0.000230	98,141	23	98,130	6,816,520	69.46
10	0.000229	98,118	22	98,107	6,718,391	68.47
11	0.000236	98,096	23	98,084	6,620,284	67.49
12	0.000251	98,073	25	98,060	6,522,199	66.50
13	0.000273	98,048	27	98,035	6,424,139	65.52
14	0.000301	98,021	30	98,007	6,326,104	64.54
15	0.000332	97,992	33	97,976	6,228,097	63.56
16	0.000364	97,959	36	97,942	6,130,122	62.58
17	0.000395	97,924	39	97,904	6,032,180	61.60
18	0.000422	97,885	41	97,864	5,934,276	60.62
19	0.000447	97,844	44	97,822	5,836,412	59.65
20	0.000469	97,800	46	97,777	5,738,590	58.68
21	0.000488	97,754	48	97,730	5,640,813	57.70
22	0.000506	97,706	49	97,682	5,543,083	56.73
23	0.000525	97,657	51	97,631	5,445,401	55.76
24	0.000545	97,606	53	97,579	5,347,770	54.79
25	0.000567	97,552	55	97,525	5,250,191	53.82
26	0.000593	97,497	58	97,468	5,152,666	52.85
27	0.000623	97,439	61	97,409	5,055,198	51.88
28	0.000659	97,379	64	97,347	4,957,789	50.91
29	0.000700	97,314	68	97,280	4,860,442	49.95
30	0.000748	97,246	73	97,210	4,763,162	48.98
31	0.000802	97,174	78	97,135	4,665,952	48.02
32	0.000864	97,096	84	97,054	4,568,817	47.05
33	0.000933	97,012	90	96,966	4,471,764	46.10
34	0.001010	96,921	98	96,872	4,374,797	45.14
35	0.001096	96,823	106	96,770	4,277,925	44.18
36	0.001192	96,717	115	96,660	4,181,155	43.23
37	0.001297	96,602	125	96,539	4,084,495	42.28
38	0.001413	96,477	136	96,408	3,987,956	41.34
39	0.001541	96,340	148	96,266	3,891,547	40.39
40	0.001682	96,192	162	96,111	3,795,281	39.46
41	0.001836	96,030	176	95,942	3,699,170	38.52
42	0.002005	95,854	192	95,758	3,603,228	37.59
43	0.002190	95,662	210	95,557	3,507,470	36.67
44	0.002393	95,452	228	95,338	3,411,914	35.74
45	0.002616	95,224	249	95,099	3,316,576	34.83
46	0.002859	94,975	272	94,839	3,221,477	33.92
47	0.003126	94,703	296	94,555	3,126,638	33.02
48	0.003417	94,407	323	94,246	3,032,083	32.12
49	0.003736	94,084	351	93,909	2,937,837	31.23

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.004085	93,733	383	93,541	2,843,928	30.34
51	0.004466	93,350	417	93,142	2,750,387	29.46
52	0.004884	92,933	454	92,706	2,657,245	28.59
53	0.005340	92,479	494	92,232	2,564,539	27.73
54	0.005839	91,985	537	91,717	2,472,307	26.88
55	0.006384	91,448	584	91,156	2,380,590	26.03
56	0.006980	90,865	634	90,547	2,289,433	25.20
57	0.007632	90,230	689	89,886	2,198,886	24.37
58	0.008344	89,542	747	89,168	2,109,000	23.55
59	0.009122	88,795	810	88,390	2,019,832	22.75
60	0.009972	87,985	877	87,546	1,931,442	21.95
61	0.010900	87,107	949	86,632	1,843,896	21.17
62	0.011914	86,158	1,027	85,644	1,757,264	20.40
63	0.013022	85,131	1,109	84,577	1,671,619	19.64
64	0.014230	84,023	1,196	83,425	1,587,042	18.89
65	0.015550	82,827	1,288	82,183	1,503,617	18.15
66	0.016990	81,539	1,385	80,846	1,421,434	17.43
67	0.018560	80,154	1,488	79,410	1,340,588	16.73
68	0.020273	78,666	1,595	77,869	1,261,178	16.03
69	0.022141	77,071	1,706	76,218	1,183,309	15.35
70	0.024176	75,365	1,822	74,454	1,107,091	14.69
71	0.026394	73,543	1,941	72,572	1,032,638	14.04
72	0.028809	71,602	2,063	70,570	960,065	13.41
73	0.031439	69,539	2,186	68,446	889,495	12.79
74	0.034299	67,353	2,310	66,198	821,049	12.19
75	0.037411	65,043	2,433	63,826	754,852	11.61
76	0.040792	62,609	2,554	61,332	691,026	11.04
77	0.044465	60,055	2,670	58,720	629,693	10.49
78	0.048453	57,385	2,780	55,995	570,973	9.95
79	0.052778	54,604	2,882	53,163	514,979	9.43
80	0.057466	51,723	2,972	50,236	461,815	8.93
81	0.062543	48,750	3,049	47,226	411,579	8.44
82	0.068037	45,701	3,109	44,147	364,353	7.97
83	0.073974	42,592	3,151	41,017	320,207	7.52
84	0.080386	39,441	3,171	37,856	279,190	7.08
85	0.087381	36,271	3,169	34,686	241,334	6.65
86	0.095011	33,101	3,145	31,529	206,648	6.24
87	0.103334	29,956	3,095	28,409	175,119	5.85
88	0.112407	26,861	3,019	25,351	146,711	5.46
89	0.122297	23,841	2,916	22,384	121,360	5.09
90	0.133071	20,926	2,785	19,533	98,976	4.73
91	0.144800	18,141	2,627	16,828	79,443	4.38
92	0.157561	15,514	2,444	14,292	62,615	4.04
93	0.170952	13,070	2,234	11,953	48,323	3.70
94	0.185520	10,836	2,010	9,830	36,370	3.36
95	0.201354	8,825	1,777	7,937	26,540	3.01
96	0.218544	7,048	1,540	6,278	18,603	2.64
97	0.237182	5,508	1,306	4,855	12,325	2.24
98	0.257357	4,202	1,081	3,661	7,470	1.78
99	0.279154	3,120	871	2,685	3,809	1.22
100	1.000000	2,249	2,249	1,125	1,125	0.50

Estimación

2005	CUADRO A.1.2.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	98,516	98,446	98,495	98,546	98,596
2	98,397	98,409	98,459	98,509	98,560
3	98,330	98,371	98,423	98,474	98,524
4	98,284	98,333	98,388	98,439	98,489
5	98,247	98,294	98,353	98,404	98,454
6	98,216	98,254	98,319	98,369	98,420
7	98,189	98,214	98,285	98,335	98,386
8	98,164	98,173	98,251	98,301	98,352
9	98,141	98,131	98,217	98,268	98,318
10	98,118	98,088	98,183	98,234	98,284
11	98,096	98,044	98,150	98,200	98,251
12	98,073	97,999	98,116	98,166	98,217
13	98,048	97,953	98,082	98,132	98,183
14	98,021	97,905	98,048	98,098	98,148
15	97,992	97,856	98,013	98,063	98,114
16	97,959	97,805	97,977	98,028	98,078
17	97,924	97,753	97,941	97,992	98,042
18	97,885	97,698	97,904	97,955	98,005
19	97,844	97,642	97,866	97,916	97,967
20	97,800	97,583	97,827	97,877	97,927
21	97,754	97,521	97,786	97,836	97,886
22	97,706	97,457	97,743	97,793	97,844
23	97,657	97,390	97,699	97,749	97,799
24	97,606	97,320	97,652	97,702	97,752
25	97,552	97,246	97,602	97,652	97,703
26	97,497	97,169	97,550	97,600	97,650
27	97,439	97,087	97,494	97,544	97,595
28	97,379	97,000	97,435	97,485	97,535
29	97,314	96,909	97,372	97,422	97,472
30	97,246	96,812	97,304	97,354	97,404
31	97,174	96,709	97,232	97,282	97,332
32	97,096	96,600	97,153	97,203	97,253
33	97,012	96,483	97,069	97,119	97,169
34	96,921	96,359	96,978	97,028	97,078
35	96,823	96,227	96,879	96,929	96,979
36	96,717	96,085	96,772	96,822	96,872
37	96,602	95,934	96,656	96,706	96,756
38	96,477	95,772	96,530	96,580	96,630
39	96,340	95,597	96,394	96,443	96,493
40	96,192	95,411	96,245	96,294	96,343
41	96,030	95,210	96,082	96,132	96,181
42	95,854	94,994	95,906	95,955	96,004
43	95,662	94,761	95,713	95,762	95,812
44	95,452	94,511	95,504	95,553	95,602
45	95,224	94,241	95,275	95,324	95,373
46	94,975	93,950	95,026	95,075	95,124
47	94,703	93,636	94,754	94,803	94,852
48	94,407	93,298	94,458	94,507	94,555
49	94,084	92,932	94,136	94,184	94,232

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	93,733	92,537	93,784	93,832	93,880
51	93,350	92,111	93,401	93,449	93,497
52	92,933	91,650	92,984	93,031	93,079
53	92,479	91,152	92,529	92,577	92,625
54	91,985	90,615	92,035	92,082	92,130
55	91,448	90,034	91,497	91,544	91,591
56	90,865	89,407	90,913	90,960	91,006
57	90,230	88,731	90,278	90,324	90,371
58	89,542	88,000	89,588	89,634	89,680
59	88,795	87,212	88,840	88,886	88,931
60	87,985	86,362	88,029	88,074	88,120
61	87,107	85,446	87,151	87,195	87,240
62	86,158	84,460	86,200	86,244	86,289
63	85,131	83,399	85,172	85,216	85,260
64	84,023	82,258	84,063	84,106	84,149
65	82,827	81,032	82,866	82,909	82,951
66	81,539	79,718	81,578	81,619	81,661
67	80,154	78,309	80,192	80,233	80,274
68	78,666	76,802	78,704	78,744	78,785
69	77,071	75,191	77,109	77,148	77,188
70	75,365	73,474	75,402	75,441	75,480
71	73,543	71,646	73,581	73,618	73,656
72	71,602	69,705	71,640	71,677	71,714
73	69,539	67,647	69,578	69,614	69,649
74	67,353	65,472	67,392	67,427	67,461
75	65,043	63,178	65,082	65,116	65,149
76	62,609	60,768	62,649	62,681	62,713
77	60,055	58,243	60,094	60,125	60,156
78	57,385	55,608	57,422	57,451	57,481
79	54,604	52,869	54,638	54,666	54,694
80	51,723	50,034	51,751	51,777	51,804
81	48,750	47,113	48,771	48,796	48,821
82	45,701	44,120	45,712	45,735	45,759
83	42,592	41,070	42,589	42,611	42,632
84	39,441	37,982	39,421	39,441	39,461
85	36,271	34,876	36,229	36,248	36,267
86	33,101	31,776	33,038	33,055	33,072
87	29,956	28,706	29,873	29,888	29,903
88	26,861	25,692	26,761	26,775	26,789
89	23,841	22,763	23,732	23,744	23,756
90	20,926	19,945	20,814	20,825	20,835
91	18,141	17,267	18,036	18,045	18,054
92	15,514	14,752	15,423	15,431	15,439
93	13,070	12,423	13,001	13,008	13,014
94	10,836	10,298	10,788	10,794	10,799
95	8,825	8,391	8,799	8,804	8,808
96	7,048	6,711	7,044	7,048	7,051
97	5,508	5,258	5,525	5,527	5,530
98	4,202	4,029	4,237	4,239	4,242
99	3,120	3,012	3,172	3,173	3,175
100	2,249	2,193	2,312	2,313	2,314

Población total

Tabla de mortalidad

2005	CUADRO A.1.3.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.016720	100,000	1,672	99,164	7,460,757	74.61
1	0.001372	98,328	135	98,261	7,361,593	74.87
2	0.000703	98,193	69	98,159	7,263,333	73.97
3	0.000486	98,124	48	98,100	7,165,174	73.02
4	0.000387	98,076	38	98,057	7,067,074	72.06
5	0.000335	98,038	33	98,022	6,969,016	71.08
6	0.000307	98,006	30	97,991	6,870,994	70.11
7	0.000293	97,975	29	97,961	6,773,004	69.13
8	0.000288	97,947	28	97,933	6,675,043	68.15
9	0.000290	97,919	28	97,904	6,577,110	67.17
10	0.000299	97,890	29	97,875	6,479,206	66.19
11	0.000316	97,861	31	97,845	6,381,330	65.21
12	0.000341	97,830	33	97,813	6,283,485	64.23
13	0.000377	97,797	37	97,778	6,185,672	63.25
14	0.000424	97,760	41	97,739	6,087,893	62.27
15	0.000480	97,718	47	97,695	5,990,154	61.30
16	0.000546	97,671	53	97,645	5,892,460	60.33
17	0.000618	97,618	60	97,588	5,794,815	59.36
18	0.000694	97,558	68	97,524	5,697,227	58.40
19	0.000771	97,490	75	97,452	5,599,703	57.44
20	0.000847	97,415	83	97,374	5,502,251	56.48
21	0.000921	97,332	90	97,287	5,404,877	55.53
22	0.000991	97,243	96	97,194	5,307,590	54.58
23	0.001057	97,146	103	97,095	5,210,395	53.63
24	0.001118	97,044	109	96,989	5,113,300	52.69
25	0.001176	96,935	114	96,878	5,016,311	51.75
26	0.001232	96,821	119	96,761	4,919,433	50.81
27	0.001286	96,702	124	96,640	4,822,671	49.87
28	0.001341	96,577	130	96,513	4,726,032	48.94
29	0.001399	96,448	135	96,380	4,629,519	48.00
30	0.001459	96,313	141	96,243	4,533,138	47.07
31	0.001525	96,172	147	96,099	4,436,896	46.13
32	0.001598	96,026	153	95,949	4,340,797	45.20
33	0.001679	95,872	161	95,792	4,244,848	44.28
34	0.001770	95,711	169	95,627	4,149,056	43.35
35	0.001871	95,542	179	95,452	4,053,429	42.43
36	0.001985	95,363	189	95,268	3,957,977	41.50
37	0.002111	95,174	201	95,073	3,862,708	40.59
38	0.002252	94,973	214	94,866	3,767,635	39.67
39	0.002408	94,759	228	94,645	3,672,769	38.76
40	0.002581	94,531	244	94,409	3,578,124	37.85
41	0.002771	94,287	261	94,156	3,483,715	36.95
42	0.002980	94,026	280	93,885	3,389,559	36.05
43	0.003210	93,745	301	93,595	3,295,674	35.16
44	0.003462	93,444	323	93,283	3,202,079	34.27
45	0.003737	93,121	348	92,947	3,108,796	33.38
46	0.004037	92,773	375	92,586	3,015,849	32.51
47	0.004364	92,398	403	92,197	2,923,263	31.64
48	0.004721	91,995	434	91,778	2,831,067	30.77
49	0.005109	91,561	468	91,327	2,739,289	29.92

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.005531	91,093	504	90,841	2,647,961	29.07
51	0.005990	90,589	543	90,318	2,557,120	28.23
52	0.006488	90,047	584	89,755	2,466,802	27.39
53	0.007029	89,463	629	89,148	2,377,048	26.57
54	0.007616	88,834	677	88,495	2,287,899	25.75
55	0.008253	88,157	728	87,793	2,199,404	24.95
56	0.008945	87,430	782	87,039	2,111,611	24.15
57	0.009695	86,648	840	86,228	2,024,572	23.37
58	0.010508	85,808	902	85,357	1,938,345	22.59
59	0.011390	84,906	967	84,422	1,852,988	21.82
60	0.012346	83,939	1,036	83,421	1,768,565	21.07
61	0.013382	82,903	1,109	82,348	1,685,145	20.33
62	0.014505	81,793	1,186	81,200	1,602,797	19.60
63	0.015722	80,607	1,267	79,973	1,521,597	18.88
64	0.017041	79,339	1,352	78,663	1,441,624	18.17
65	0.018469	77,987	1,440	77,267	1,362,961	17.48
66	0.020017	76,547	1,532	75,781	1,285,693	16.80
67	0.021693	75,015	1,627	74,201	1,209,912	16.13
68	0.023507	73,388	1,725	72,525	1,135,711	15.48
69	0.025472	71,662	1,825	70,750	1,063,186	14.84
70	0.027598	69,837	1,927	68,873	992,437	14.21
71	0.029898	67,910	2,030	66,895	923,563	13.60
72	0.032387	65,879	2,134	64,813	856,669	13.00
73	0.035079	63,746	2,236	62,628	791,856	12.42
74	0.037989	61,510	2,337	60,341	729,229	11.86
75	0.041133	59,173	2,434	57,956	668,887	11.30
76	0.044531	56,739	2,527	55,476	610,931	10.77
77	0.048199	54,212	2,613	52,906	555,456	10.25
78	0.052159	51,599	2,691	50,254	502,550	9.74
79	0.056430	48,908	2,760	47,528	452,296	9.25
80	0.061035	46,148	2,817	44,740	404,768	8.77
81	0.065996	43,331	2,860	41,902	360,029	8.31
82	0.071338	40,472	2,887	39,028	318,127	7.86
83	0.077083	37,584	2,897	36,136	279,099	7.43
84	0.083259	34,687	2,888	33,243	242,963	7.00
85	0.089997	31,799	2,862	30,368	209,720	6.60
86	0.097351	28,937	2,817	27,529	179,351	6.20
87	0.105375	26,120	2,752	24,744	151,822	5.81
88	0.114130	23,368	2,667	22,034	127,078	5.44
89	0.123680	20,701	2,560	19,421	105,044	5.07
90	0.134093	18,141	2,433	16,924	85,623	4.72
91	0.145443	15,708	2,285	14,566	68,699	4.37
92	0.157807	13,424	2,118	12,364	54,133	4.03
93	0.171189	11,305	1,935	10,338	41,768	3.69
94	0.185748	9,370	1,740	8,500	31,431	3.35
95	0.201571	7,629	1,538	6,860	22,931	3.01
96	0.218751	6,092	1,333	5,425	16,071	2.64
97	0.237378	4,759	1,130	4,194	10,645	2.24
98	0.257541	3,629	935	3,162	6,451	1.78
99	0.279324	2,695	753	2,318	3,289	1.22
100	1.000000	1,942	1,942	971	971	0.50

Estimación

2005	CUADRO A.1.3.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	98,328	98,351	98,405	98,459	98,513
2	98,193	98,306	98,360	98,414	98,469
3	98,124	98,260	98,315	98,369	98,423
4	98,076	98,214	98,269	98,323	98,377
5	98,038	98,167	98,222	98,276	98,330
6	98,006	98,119	98,174	98,229	98,283
7	97,975	98,069	98,126	98,180	98,234
8	97,947	98,019	98,076	98,130	98,185
9	97,919	97,967	98,026	98,080	98,134
10	97,890	97,914	97,974	98,028	98,082
11	97,861	97,860	97,920	97,974	98,028
12	97,830	97,804	97,865	97,919	97,973
13	97,797	97,746	97,809	97,863	97,917
14	97,760	97,686	97,751	97,805	97,859
15	97,718	97,624	97,691	97,745	97,798
16	97,671	97,560	97,628	97,682	97,736
17	97,618	97,494	97,564	97,618	97,672
18	97,558	97,424	97,497	97,551	97,604
19	97,490	97,352	97,427	97,481	97,534
20	97,415	97,277	97,354	97,408	97,462
21	97,332	97,199	97,278	97,332	97,386
22	97,243	97,117	97,199	97,252	97,306
23	97,146	97,031	97,115	97,169	97,222
24	97,044	96,940	97,028	97,081	97,135
25	96,935	96,845	96,935	96,989	97,042
26	96,821	96,745	96,838	96,892	96,945
27	96,702	96,640	96,736	96,789	96,843
28	96,577	96,528	96,628	96,681	96,734
29	96,448	96,411	96,513	96,566	96,619
30	96,313	96,286	96,391	96,445	96,498
31	96,172	96,153	96,262	96,316	96,369
32	96,026	96,012	96,125	96,178	96,231
33	95,872	95,863	95,979	96,032	96,085
34	95,711	95,704	95,824	95,877	95,930
35	95,542	95,534	95,658	95,711	95,764
36	95,363	95,353	95,481	95,534	95,587
37	95,174	95,160	95,292	95,345	95,397
38	94,973	94,953	95,090	95,142	95,195
39	94,759	94,733	94,873	94,926	94,978
40	94,531	94,497	94,641	94,694	94,746
41	94,287	94,244	94,393	94,445	94,497
42	94,026	93,973	94,126	94,178	94,230
43	93,745	93,682	93,840	93,892	93,944
44	93,444	93,370	93,533	93,585	93,636
45	93,121	93,036	93,203	93,255	93,306
46	92,773	92,677	92,849	92,900	92,951
47	92,398	92,291	92,468	92,519	92,570
48	91,995	91,877	92,058	92,109	92,160
49	91,561	91,432	91,618	91,669	91,720

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	91,093	90,955	91,145	91,196	91,246
51	90,589	90,441	90,637	90,687	90,737
52	90,047	89,890	90,090	90,139	90,189
53	89,463	89,297	89,502	89,551	89,601
54	88,834	88,661	88,870	88,919	88,968
55	88,157	87,978	88,191	88,240	88,289
56	87,430	87,245	87,462	87,510	87,559
57	86,648	86,458	86,679	86,727	86,775
58	85,808	85,614	85,839	85,887	85,934
59	84,906	84,709	84,938	84,985	85,032
60	83,939	83,739	83,972	84,019	84,065
61	82,903	82,702	82,938	82,984	83,030
62	81,793	81,592	81,831	81,876	81,921
63	80,607	80,405	80,648	80,692	80,737
64	79,339	79,139	79,384	79,427	79,471
65	77,987	77,788	78,035	78,078	78,121
66	76,547	76,349	76,598	76,640	76,683
67	75,015	74,819	75,069	75,111	75,152
68	73,388	73,194	73,445	73,486	73,526
69	71,662	71,472	71,723	71,762	71,802
70	69,837	69,648	69,899	69,938	69,976
71	67,910	67,723	67,973	68,010	68,048
72	65,879	65,694	65,942	65,978	66,015
73	63,746	63,561	63,806	63,842	63,877
74	61,510	61,324	61,567	61,601	61,635
75	59,173	58,985	59,224	59,257	59,290
76	56,739	56,548	56,783	56,814	56,845
77	54,212	54,016	54,245	54,275	54,305
78	51,599	51,396	51,619	51,648	51,676
79	48,908	48,695	48,912	48,939	48,966
80	46,148	45,924	46,133	46,158	46,184
81	43,331	43,094	43,294	43,318	43,342
82	40,472	40,218	40,409	40,431	40,453
83	37,584	37,312	37,493	37,514	37,535
84	34,687	34,395	34,565	34,584	34,603
85	31,799	31,485	31,644	31,662	31,679
86	28,937	28,603	28,751	28,767	28,783
87	26,120	25,772	25,908	25,922	25,937
88	23,368	23,014	23,138	23,151	23,164
89	20,701	20,353	20,464	20,476	20,487
90	18,141	17,810	17,910	17,919	17,929
91	15,708	15,407	15,495	15,503	15,512
92	13,424	13,163	13,240	13,247	13,255
93	11,305	11,095	11,161	11,167	11,173
94	9,370	9,215	9,271	9,276	9,281
95	7,629	7,533	7,579	7,584	7,588
96	6,092	6,052	6,090	6,093	6,097
97	4,759	4,771	4,802	4,804	4,807
98	3,629	3,685	3,709	3,711	3,713
99	2,695	2,784	2,803	2,804	2,806
100	1,942	2,053	2,067	2,068	2,069

Año 2010

Hombres

Tabla de mortalidad

2010	CUADRO A.2.1.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.015706	100,000	1,571	99,215	7,305,733	73.06
1	0.001412	98,429	139	98,360	7,206,518	73.22
2	0.000675	98,290	66	98,257	7,108,158	72.32
3	0.000451	98,224	44	98,202	7,009,901	71.37
4	0.000355	98,180	35	98,162	6,911,699	70.40
5	0.000301	98,145	30	98,130	6,813,537	69.42
6	0.000277	98,115	27	98,102	6,715,407	68.44
7	0.000268	98,088	26	98,075	6,617,305	67.46
8	0.000270	98,062	26	98,049	6,519,230	66.48
9	0.000280	98,035	27	98,022	6,421,181	65.50
10	0.000300	98,008	29	97,993	6,323,160	64.52
11	0.000326	97,979	32	97,963	6,225,166	63.54
12	0.000361	97,947	35	97,929	6,127,204	62.56
13	0.000408	97,911	40	97,891	6,029,274	61.58
14	0.000468	97,871	46	97,849	5,931,383	60.60
15	0.000544	97,826	53	97,799	5,833,535	59.63
16	0.000636	97,772	62	97,741	5,735,736	58.66
17	0.000741	97,710	72	97,674	5,637,994	57.70
18	0.000856	97,638	84	97,596	5,540,320	56.74
19	0.000976	97,554	95	97,507	5,442,724	55.79
20	0.001096	97,459	107	97,406	5,345,218	54.85
21	0.001213	97,352	118	97,293	5,247,812	53.91
22	0.001323	97,234	129	97,170	5,150,519	52.97
23	0.001424	97,105	138	97,036	5,053,349	52.04
24	0.001515	96,967	147	96,894	4,956,313	51.11
25	0.001596	96,820	155	96,743	4,859,419	50.19
26	0.001670	96,666	161	96,585	4,762,676	49.27
27	0.001737	96,504	168	96,421	4,666,091	48.35
28	0.001800	96,337	173	96,250	4,569,670	47.43
29	0.001862	96,163	179	96,074	4,473,420	46.52
30	0.001926	95,984	185	95,892	4,377,346	45.60
31	0.001994	95,799	191	95,704	4,281,455	44.69
32	0.002069	95,608	198	95,509	4,185,751	43.78
33	0.002153	95,411	205	95,308	4,090,241	42.87
34	0.002248	95,205	214	95,098	3,994,933	41.96
35	0.002356	94,991	224	94,879	3,899,835	41.05
36	0.002479	94,767	235	94,650	3,804,956	40.15
37	0.002618	94,532	247	94,409	3,710,307	39.25
38	0.002775	94,285	262	94,154	3,615,898	38.35
39	0.002950	94,023	277	93,885	3,521,744	37.46
40	0.003147	93,746	295	93,598	3,427,859	36.57
41	0.003365	93,451	314	93,294	3,334,261	35.68
42	0.003606	93,136	336	92,968	3,240,968	34.80
43	0.003871	92,801	359	92,621	3,147,999	33.92
44	0.004163	92,441	385	92,249	3,055,378	33.05
45	0.004482	92,056	413	91,850	2,963,129	32.19
46	0.004830	91,644	443	91,422	2,871,279	31.33
47	0.005210	91,201	475	90,964	2,779,857	30.48
48	0.005622	90,726	510	90,471	2,688,893	29.64
49	0.006070	90,216	548	89,942	2,598,422	28.80

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.006555	89,668	588	89,374	2,508,480	27.98
51	0.007081	89,080	631	88,765	2,419,106	27.16
52	0.007649	88,450	677	88,111	2,330,341	26.35
53	0.008264	87,773	725	87,410	2,242,229	25.55
54	0.008928	87,048	777	86,659	2,154,819	24.75
55	0.009645	86,271	832	85,855	2,068,160	23.97
56	0.010431	85,439	891	84,993	1,982,305	23.20
57	0.011279	84,547	954	84,071	1,897,312	22.44
58	0.012197	83,594	1,020	83,084	1,813,242	21.69
59	0.013189	82,574	1,089	82,030	1,730,158	20.95
60	0.014261	81,485	1,162	80,904	1,648,128	20.23
61	0.015419	80,323	1,239	79,704	1,567,224	19.51
62	0.016671	79,084	1,318	78,425	1,487,521	18.81
63	0.018023	77,766	1,402	77,065	1,409,095	18.12
64	0.019484	76,365	1,488	75,621	1,332,030	17.44
65	0.021062	74,877	1,577	74,088	1,256,409	16.78
66	0.022766	73,300	1,669	72,465	1,182,321	16.13
67	0.024606	71,631	1,763	70,750	1,109,856	15.49
68	0.026593	69,868	1,858	68,939	1,039,106	14.87
69	0.028739	68,010	1,955	67,033	970,167	14.27
70	0.031054	66,056	2,051	65,030	903,134	13.67
71	0.033553	64,004	2,148	62,931	838,104	13.09
72	0.036249	61,857	2,242	60,736	775,173	12.53
73	0.039158	59,615	2,334	58,447	714,438	11.98
74	0.042294	57,280	2,423	56,069	655,990	11.45
75	0.045676	54,858	2,506	53,605	599,921	10.94
76	0.049132	52,352	2,572	51,066	546,316	10.44
77	0.052836	49,780	2,630	48,465	495,251	9.95
78	0.056801	47,150	2,678	45,811	446,786	9.48
79	0.061046	44,471	2,715	43,114	400,975	9.02
80	0.065585	41,757	2,739	40,387	357,861	8.57
81	0.070437	39,018	2,748	37,644	317,474	8.14
82	0.075619	36,270	2,743	34,898	279,830	7.72
83	0.081148	33,527	2,721	32,167	244,932	7.31
84	0.087044	30,806	2,682	29,466	212,765	6.91
85	0.093470	28,125	2,629	26,810	183,299	6.52
86	0.100477	25,496	2,562	24,215	156,489	6.14
87	0.108120	22,934	2,480	21,694	132,273	5.77
88	0.116458	20,455	2,382	19,264	110,579	5.41
89	0.125556	18,073	2,269	16,938	91,315	5.05
90	0.135485	15,803	2,141	14,733	74,377	4.71
91	0.146321	13,662	1,999	12,663	59,644	4.37
92	0.158143	11,663	1,844	10,741	46,982	4.03
93	0.171514	9,819	1,684	8,977	36,241	3.69
94	0.186060	8,135	1,514	7,378	27,264	3.35
95	0.201870	6,621	1,337	5,953	19,886	3.00
96	0.219035	5,285	1,158	4,706	13,933	2.64
97	0.237646	4,127	981	3,637	9,227	2.24
98	0.257792	3,146	811	2,741	5,591	1.78
99	0.279559	2,335	653	2,009	2,850	1.22
100	1.000000	1,682	1,682	841	841	0.50

Estimación

2010	CUADRO A.2.1.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	98,429	98,638	98,704	98,772	98,840
2	98,290	98,571	98,639	98,707	98,774
3	98,224	98,504	98,573	98,641	98,708
4	98,180	98,435	98,507	98,574	98,642
5	98,145	98,365	98,440	98,508	98,575
6	98,115	98,293	98,373	98,440	98,508
7	98,088	98,220	98,305	98,372	98,440
8	98,062	98,145	98,236	98,304	98,371
9	98,035	98,068	98,167	98,234	98,302
10	98,008	97,989	98,096	98,164	98,231
11	97,979	97,909	98,024	98,092	98,159
12	97,947	97,826	97,951	98,018	98,086
13	97,911	97,740	97,876	97,943	98,011
14	97,871	97,652	97,799	97,867	97,934
15	97,826	97,561	97,721	97,788	97,855
16	97,772	97,466	97,640	97,707	97,774
17	97,710	97,369	97,556	97,623	97,691
18	97,638	97,267	97,470	97,537	97,604
19	97,554	97,162	97,381	97,448	97,515
20	97,459	97,053	97,288	97,355	97,422
21	97,352	96,939	97,192	97,259	97,325
22	97,234	96,820	97,091	97,158	97,225
23	97,105	96,696	96,986	97,053	97,120
24	96,967	96,566	96,877	96,943	97,010
25	96,820	96,429	96,761	96,828	96,894
26	96,666	96,286	96,640	96,706	96,773
27	96,504	96,136	96,512	96,579	96,645
28	96,337	95,978	96,378	96,444	96,510
29	96,163	95,812	96,236	96,302	96,368
30	95,984	95,637	96,085	96,151	96,217
31	95,799	95,452	95,926	95,992	96,058
32	95,608	95,256	95,757	95,823	95,888
33	95,411	95,049	95,577	95,643	95,708
34	95,205	94,830	95,386	95,451	95,517
35	94,991	94,598	95,182	95,248	95,313
36	94,767	94,352	94,965	95,030	95,096
37	94,532	94,091	94,733	94,799	94,864
38	94,285	93,813	94,486	94,551	94,616
39	94,023	93,518	94,222	94,287	94,352
40	93,746	93,204	93,939	94,004	94,069
41	93,451	92,870	93,637	93,702	93,766
42	93,136	92,515	93,314	93,378	93,442
43	92,801	92,136	92,967	93,031	93,095
44	92,441	91,732	92,596	92,660	92,724
45	92,056	91,301	92,199	92,262	92,326
46	91,644	90,842	91,773	91,836	91,899
47	91,201	90,352	91,317	91,380	91,443
48	90,726	89,829	90,828	90,891	90,953
49	90,216	89,271	90,304	90,366	90,428

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	89,668	88,676	89,743	89,804	89,866
51	89,080	88,042	89,141	89,203	89,264
52	88,450	87,365	88,497	88,558	88,619
53	87,773	86,642	87,808	87,868	87,929
54	87,048	85,872	87,070	87,130	87,189
55	86,271	85,051	86,280	86,340	86,399
56	85,439	84,176	85,436	85,495	85,553
57	84,547	83,245	84,534	84,592	84,650
58	83,594	82,253	83,571	83,628	83,685
59	82,574	81,198	82,543	82,599	82,656
60	81,485	80,076	81,447	81,503	81,559
61	80,323	78,885	80,279	80,334	80,390
62	79,084	77,620	79,037	79,091	79,146
63	77,766	76,280	77,717	77,770	77,823
64	76,365	74,861	76,315	76,367	76,420
65	74,877	73,360	74,829	74,880	74,932
66	73,300	71,775	73,256	73,306	73,357
67	71,631	70,103	71,593	71,643	71,692
68	69,868	68,344	69,839	69,887	69,935
69	68,010	66,494	67,992	68,039	68,086
70	66,056	64,555	66,051	66,096	66,142
71	64,004	62,525	64,015	64,059	64,103
72	61,857	60,406	61,886	61,929	61,971
73	59,615	58,199	59,665	59,706	59,747
74	57,280	55,907	57,353	57,393	57,432
75	54,858	53,533	54,956	54,994	55,031
76	52,352	51,084	52,477	52,513	52,550
77	49,780	48,564	49,924	49,959	49,993
78	47,150	45,983	47,305	47,337	47,370
79	44,471	43,350	44,627	44,658	44,689
80	41,757	40,675	41,904	41,933	41,962
81	39,018	37,971	39,148	39,174	39,201
82	36,270	35,253	36,372	36,397	36,422
83	33,527	32,534	33,593	33,616	33,639
84	30,806	29,833	30,827	30,848	30,870
85	28,125	27,167	28,094	28,113	28,132
86	25,496	24,554	25,411	25,429	25,446
87	22,934	22,013	22,799	22,815	22,831
88	20,455	19,562	20,278	20,291	20,305
89	18,073	17,220	17,865	17,877	17,889
90	15,803	15,005	15,579	15,589	15,600
91	13,662	12,930	13,436	13,445	13,454
92	11,663	11,010	11,450	11,458	11,466
93	9,819	9,254	9,632	9,639	9,646
94	8,135	7,671	7,991	7,996	8,002
95	6,621	6,263	6,530	6,534	6,539
96	5,285	5,031	5,250	5,253	5,257
97	4,127	3,970	4,147	4,150	4,153
98	3,146	3,074	3,214	3,216	3,218
99	2,335	2,332	2,440	2,442	2,443
100	1,682	1,730	1,812	1,813	1,814

Mujeres

Tabla de mortalidad

2010	CUADRO A.2.2.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.012537	100,000	1,254	99,373	7,775,890	77.76
1	0.001122	98,746	111	98,691	7,676,517	77.74
2	0.000609	98,635	60	98,605	7,577,826	76.83
3	0.000418	98,575	41	98,555	7,479,221	75.87
4	0.000320	98,534	32	98,518	7,380,666	74.90
5	0.000265	98,503	26	98,490	7,282,148	73.93
6	0.000227	98,477	22	98,465	7,183,658	72.95
7	0.000203	98,454	20	98,444	7,085,193	71.96
8	0.000188	98,434	19	98,425	6,986,748	70.98
9	0.000181	98,416	18	98,407	6,888,323	69.99
10	0.000182	98,398	18	98,389	6,789,917	69.00
11	0.000189	98,380	19	98,371	6,691,528	68.02
12	0.000204	98,361	20	98,351	6,593,157	67.03
13	0.000225	98,341	22	98,330	6,494,806	66.04
14	0.000251	98,319	25	98,307	6,396,475	65.06
15	0.000279	98,294	27	98,281	6,298,169	64.07
16	0.000306	98,267	30	98,252	6,199,888	63.09
17	0.000331	98,237	33	98,221	6,101,636	62.11
18	0.000353	98,204	35	98,187	6,003,415	61.13
19	0.000371	98,170	36	98,152	5,905,228	60.15
20	0.000386	98,133	38	98,114	5,807,076	59.18
21	0.000398	98,096	39	98,076	5,708,962	58.20
22	0.000410	98,056	40	98,036	5,610,886	57.22
23	0.000422	98,016	41	97,996	5,512,849	56.24
24	0.000435	97,975	43	97,954	5,414,854	55.27
25	0.000451	97,932	44	97,910	5,316,900	54.29
26	0.000471	97,888	46	97,865	5,218,990	53.32
27	0.000494	97,842	48	97,818	5,121,125	52.34
28	0.000523	97,794	51	97,768	5,023,307	51.37
29	0.000557	97,743	54	97,715	4,925,539	50.39
30	0.000597	97,688	58	97,659	4,827,824	49.42
31	0.000643	97,630	63	97,598	4,730,165	48.45
32	0.000696	97,567	68	97,533	4,632,566	47.48
33	0.000756	97,499	74	97,462	4,535,033	46.51
34	0.000825	97,425	80	97,385	4,437,571	45.55
35	0.000901	97,345	88	97,301	4,340,185	44.59
36	0.000987	97,257	96	97,209	4,242,884	43.63
37	0.001082	97,161	105	97,109	4,145,675	42.67
38	0.001188	97,056	115	96,999	4,048,566	41.71
39	0.001305	96,941	127	96,878	3,951,567	40.76
40	0.001434	96,814	139	96,745	3,854,690	39.82
41	0.001577	96,676	152	96,599	3,757,945	38.87
42	0.001734	96,523	167	96,439	3,661,345	37.93
43	0.001906	96,356	184	96,264	3,564,906	37.00
44	0.002096	96,172	202	96,071	3,468,642	36.07
45	0.002304	95,971	221	95,860	3,372,570	35.14
46	0.002532	95,749	242	95,628	3,276,710	34.22
47	0.002783	95,507	266	95,374	3,181,082	33.31
48	0.003057	95,241	291	95,096	3,085,708	32.40
49	0.003357	94,950	319	94,791	2,990,613	31.50

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.003686	94,631	349	94,457	2,895,822	30.60
51	0.004045	94,283	381	94,092	2,801,365	29.71
52	0.004439	93,901	417	93,693	2,707,273	28.83
53	0.004870	93,484	455	93,257	2,613,581	27.96
54	0.005341	93,029	497	92,781	2,520,324	27.09
55	0.005856	92,532	542	92,261	2,427,543	26.23
56	0.006429	91,990	591	91,695	2,335,282	25.39
57	0.007057	91,399	645	91,076	2,243,588	24.55
58	0.007746	90,754	703	90,402	2,152,511	23.72
59	0.008502	90,051	766	89,668	2,062,109	22.90
60	0.009332	89,285	833	88,869	1,972,441	22.09
61	0.010242	88,452	906	87,999	1,883,572	21.29
62	0.011240	87,546	984	87,054	1,795,573	20.51
63	0.012335	86,562	1,068	86,028	1,708,518	19.74
64	0.013536	85,495	1,157	84,916	1,622,490	18.98
65	0.014853	84,337	1,253	83,711	1,537,574	18.23
66	0.016298	83,085	1,354	82,407	1,453,863	17.50
67	0.017881	81,730	1,461	81,000	1,371,456	16.78
68	0.019617	80,269	1,575	79,482	1,290,456	16.08
69	0.021519	78,694	1,693	77,848	1,210,974	15.39
70	0.023604	77,001	1,818	76,092	1,133,127	14.72
71	0.025888	75,183	1,946	74,210	1,057,035	14.06
72	0.028389	73,237	2,079	72,197	982,824	13.42
73	0.031129	71,158	2,215	70,050	910,627	12.80
74	0.034128	68,943	2,353	67,766	840,576	12.19
75	0.037411	66,590	2,491	65,344	772,810	11.61
76	0.040792	64,099	2,615	62,791	707,466	11.04
77	0.044465	61,484	2,734	60,117	644,674	10.49
78	0.048453	58,750	2,847	57,327	584,557	9.95
79	0.052778	55,904	2,950	54,428	527,230	9.43
80	0.057466	52,953	3,043	51,432	472,802	8.93
81	0.062543	49,910	3,122	48,349	421,371	8.44
82	0.068037	46,788	3,183	45,197	373,021	7.97
83	0.073974	43,605	3,226	41,992	327,825	7.52
84	0.080386	40,379	3,246	38,757	285,832	7.08
85	0.087381	37,134	3,245	35,511	247,076	6.65
86	0.095011	33,889	3,220	32,279	211,564	6.24
87	0.103334	30,669	3,169	29,084	179,286	5.85
88	0.112407	27,500	3,091	25,954	150,201	5.46
89	0.122297	24,409	2,985	22,916	124,247	5.09
90	0.133071	21,424	2,851	19,998	101,331	4.73
91	0.144800	18,573	2,689	17,228	81,333	4.38
92	0.157561	15,883	2,503	14,632	64,105	4.04
93	0.170952	13,381	2,287	12,237	49,473	3.70
94	0.185520	11,093	2,058	10,064	37,236	3.36
95	0.201354	9,035	1,819	8,126	27,171	3.01
96	0.218544	7,216	1,577	6,427	19,046	2.64
97	0.237182	5,639	1,337	4,970	12,618	2.24
98	0.257357	4,302	1,107	3,748	7,648	1.78
99	0.279154	3,194	892	2,749	3,900	1.22
100	1.000000	2,303	2,303	1,151	1,151	0.50

Estimación

2010	CUADRO A.2.2.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	98,746	98,714	98,765	98,817	98,870
2	98,635	98,674	98,726	98,779	98,831
3	98,575	98,634	98,688	98,741	98,794
4	98,534	98,592	98,652	98,704	98,757
5	98,503	98,551	98,616	98,669	98,721
6	98,477	98,508	98,582	98,634	98,687
7	98,454	98,465	98,548	98,600	98,653
8	98,434	98,421	98,515	98,567	98,620
9	98,416	98,377	98,482	98,535	98,587
10	98,398	98,331	98,451	98,503	98,556
11	98,380	98,285	98,420	98,472	98,525
12	98,361	98,238	98,389	98,442	98,494
13	98,341	98,189	98,359	98,411	98,464
14	98,319	98,139	98,329	98,381	98,434
15	98,294	98,088	98,299	98,351	98,404
16	98,267	98,035	98,269	98,322	98,374
17	98,237	97,980	98,239	98,292	98,344
18	98,204	97,924	98,209	98,261	98,314
19	98,170	97,866	98,178	98,231	98,283
20	98,133	97,806	98,147	98,199	98,251
21	98,096	97,743	98,115	98,167	98,219
22	98,056	97,678	98,081	98,134	98,186
23	98,016	97,610	98,047	98,099	98,151
24	97,975	97,538	98,010	98,063	98,115
25	97,932	97,464	97,972	98,025	98,077
26	97,888	97,386	97,932	97,984	98,036
27	97,842	97,304	97,889	97,941	97,994
28	97,794	97,217	97,844	97,896	97,948
29	97,743	97,126	97,795	97,847	97,899
30	97,688	97,029	97,742	97,794	97,846
31	97,630	96,927	97,685	97,737	97,789
32	97,567	96,819	97,623	97,675	97,727
33	97,499	96,704	97,556	97,608	97,660
34	97,425	96,581	97,483	97,534	97,586
35	97,345	96,451	97,403	97,454	97,506
36	97,257	96,312	97,315	97,367	97,419
37	97,161	96,163	97,220	97,271	97,323
38	97,056	96,004	97,115	97,167	97,218
39	96,941	95,833	97,000	97,052	97,103
40	96,814	95,650	96,874	96,926	96,977
41	96,676	95,454	96,736	96,787	96,839
42	96,523	95,243	96,584	96,635	96,687
43	96,356	95,016	96,417	96,468	96,520
44	96,172	94,771	96,234	96,285	96,336
45	95,971	94,508	96,032	96,084	96,135
46	95,749	94,224	95,812	95,863	95,914
47	95,507	93,918	95,569	95,620	95,671
48	95,241	93,588	95,303	95,354	95,404
49	94,950	93,231	95,011	95,062	95,112

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	94,631	92,846	94,691	94,741	94,792
51	94,283	92,430	94,340	94,390	94,441
52	93,901	91,980	93,956	94,006	94,056
53	93,484	91,494	93,536	93,585	93,635
54	93,029	90,968	93,076	93,125	93,175
55	92,532	90,401	92,573	92,622	92,672
56	91,990	89,787	92,024	92,073	92,122
57	91,399	89,124	91,424	91,473	91,522
58	90,754	88,408	90,771	90,819	90,867
59	90,051	87,635	90,059	90,107	90,155
60	89,285	86,800	89,283	89,331	89,379
61	88,452	85,900	88,440	88,488	88,535
62	87,546	84,930	87,525	87,571	87,618
63	86,562	83,884	86,531	86,577	86,624
64	85,495	82,759	85,455	85,500	85,546
65	84,337	81,549	84,290	84,335	84,380
66	83,085	80,250	83,031	83,075	83,120
67	81,730	78,855	81,673	81,716	81,760
68	80,269	77,362	80,210	80,253	80,296
69	78,694	75,764	78,637	78,679	78,721
70	77,001	74,058	76,950	76,991	77,032
71	75,183	72,240	75,143	75,183	75,223
72	73,237	70,306	73,212	73,251	73,290
73	71,158	68,253	71,155	71,193	71,231
74	68,943	66,081	68,968	69,005	69,042
75	66,590	63,787	66,652	66,687	66,723
76	64,099	61,373	64,204	64,239	64,273
77	61,484	58,841	61,629	61,661	61,694
78	58,750	56,194	58,928	58,959	58,990
79	55,904	53,439	56,107	56,137	56,167
80	52,953	50,584	53,175	53,203	53,232
81	49,910	47,639	50,142	50,169	50,195
82	46,788	44,617	47,021	47,046	47,071
83	43,605	41,535	43,829	43,852	43,876
84	40,379	38,410	40,584	40,606	40,628
85	37,134	35,264	37,309	37,329	37,349
86	33,889	32,121	34,029	34,047	34,065
87	30,669	29,005	30,770	30,786	30,803
88	27,500	25,946	27,562	27,576	27,591
89	24,409	22,970	24,434	24,447	24,460
90	21,424	20,108	21,419	21,431	21,442
91	18,573	17,386	18,546	18,556	18,566
92	15,883	14,831	15,843	15,852	15,860
93	13,381	12,466	13,336	13,343	13,350
94	11,093	10,311	11,047	11,053	11,059
95	9,035	8,380	8,991	8,995	9,000
96	7,216	6,680	7,178	7,182	7,185
97	5,639	5,214	5,611	5,614	5,617
98	4,302	3,978	4,287	4,289	4,291
99	3,194	2,959	3,194	3,195	3,197
100	2,303	2,141	2,315	2,316	2,317

Población total

Tabla de mortalidad

2010	CUADRO A.2.3.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.014122	100,000	1,412	99,294	7,540,812	75.41
1	0.001267	98,588	125	98,525	7,441,518	75.48
2	0.000642	98,463	63	98,431	7,342,992	74.58
3	0.000434	98,400	43	98,378	7,244,561	73.62
4	0.000338	98,357	33	98,340	7,146,183	72.66
5	0.000283	98,324	28	98,310	7,047,842	71.68
6	0.000252	98,296	25	98,284	6,949,532	70.70
7	0.000235	98,271	23	98,260	6,851,249	69.72
8	0.000229	98,248	22	98,237	6,752,989	68.73
9	0.000231	98,226	23	98,214	6,654,752	67.75
10	0.000241	98,203	24	98,191	6,556,538	66.77
11	0.000258	98,179	25	98,167	6,458,347	65.78
12	0.000282	98,154	28	98,140	6,360,180	64.80
13	0.000316	98,126	31	98,111	6,262,040	63.82
14	0.000359	98,095	35	98,078	6,163,929	62.84
15	0.000411	98,060	40	98,040	6,065,852	61.86
16	0.000471	98,020	46	97,997	5,967,812	60.88
17	0.000536	97,974	52	97,947	5,869,815	59.91
18	0.000604	97,921	59	97,892	5,771,868	58.94
19	0.000672	97,862	66	97,829	5,673,976	57.98
20	0.000740	97,796	72	97,760	5,576,147	57.02
21	0.000804	97,724	79	97,685	5,478,387	56.06
22	0.000865	97,645	84	97,603	5,380,702	55.10
23	0.000920	97,561	90	97,516	5,283,099	54.15
24	0.000972	97,471	95	97,424	5,185,583	53.20
25	0.001020	97,376	99	97,327	5,088,160	52.25
26	0.001066	97,277	104	97,225	4,990,833	51.31
27	0.001111	97,173	108	97,119	4,893,608	50.36
28	0.001157	97,065	112	97,009	4,796,489	49.42
29	0.001204	96,953	117	96,895	4,699,480	48.47
30	0.001256	96,836	122	96,775	4,602,585	47.53
31	0.001312	96,715	127	96,651	4,505,810	46.59
32	0.001376	96,588	133	96,521	4,409,158	45.65
33	0.001447	96,455	140	96,385	4,312,637	44.71
34	0.001528	96,315	147	96,242	4,216,252	43.78
35	0.001620	96,168	156	96,090	4,120,010	42.84
36	0.001723	96,012	165	95,930	4,023,920	41.91
37	0.001840	95,847	176	95,759	3,927,991	40.98
38	0.001970	95,671	188	95,576	3,832,232	40.06
39	0.002115	95,482	202	95,381	3,736,656	39.13
40	0.002277	95,280	217	95,172	3,641,275	38.22
41	0.002456	95,063	233	94,946	3,546,103	37.30
42	0.002653	94,830	252	94,704	3,451,156	36.39
43	0.002870	94,578	271	94,442	3,356,452	35.49
44	0.003109	94,307	293	94,160	3,262,010	34.59
45	0.003370	94,013	317	93,855	3,167,850	33.70
46	0.003656	93,697	343	93,525	3,073,995	32.81
47	0.003968	93,354	370	93,169	2,980,470	31.93
48	0.004308	92,984	401	92,783	2,887,301	31.05
49	0.004679	92,583	433	92,366	2,794,518	30.18

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.005082	92,150	468	91,916	2,702,151	29.32
51	0.005520	91,681	506	91,428	2,610,236	28.47
52	0.005996	91,175	547	90,902	2,518,807	27.63
53	0.006513	90,629	590	90,334	2,427,905	26.79
54	0.007075	90,038	637	89,720	2,337,571	25.96
55	0.007684	89,401	687	89,058	2,247,852	25.14
56	0.008356	88,714	741	88,344	2,158,794	24.33
57	0.009086	87,973	799	87,573	2,070,450	23.54
58	0.009880	87,174	861	86,743	1,982,877	22.75
59	0.010744	86,313	927	85,849	1,896,133	21.97
60	0.011684	85,385	998	84,886	1,810,285	21.20
61	0.012706	84,388	1,072	83,851	1,725,398	20.45
62	0.013817	83,315	1,151	82,740	1,641,547	19.70
63	0.015027	82,164	1,235	81,547	1,558,807	18.97
64	0.016342	80,930	1,323	80,268	1,477,260	18.25
65	0.017773	79,607	1,415	78,900	1,396,992	17.55
66	0.019329	78,192	1,511	77,436	1,318,092	16.86
67	0.021022	76,681	1,612	75,875	1,240,656	16.18
68	0.022864	75,069	1,716	74,210	1,164,781	15.52
69	0.024866	73,352	1,824	72,440	1,090,571	14.87
70	0.027044	71,528	1,934	70,561	1,018,130	14.23
71	0.029413	69,594	2,047	68,570	947,569	13.62
72	0.031988	67,547	2,161	66,467	878,999	13.01
73	0.034789	65,386	2,275	64,249	812,532	12.43
74	0.037834	63,112	2,388	61,918	748,283	11.86
75	0.041144	60,724	2,498	59,475	686,366	11.30
76	0.044542	58,225	2,593	56,929	626,891	10.77
77	0.048210	55,632	2,682	54,291	569,962	10.25
78	0.052170	52,950	2,762	51,569	515,672	9.74
79	0.056441	50,187	2,833	48,771	464,103	9.25
80	0.061046	47,355	2,891	45,909	415,332	8.77
81	0.066007	44,464	2,935	42,997	369,422	8.31
82	0.071347	41,529	2,963	40,048	326,426	7.86
83	0.077093	38,566	2,973	37,080	286,378	7.43
84	0.083267	35,593	2,964	34,111	249,298	7.00
85	0.090005	32,629	2,937	31,161	215,187	6.59
86	0.097358	29,692	2,891	28,247	184,027	6.20
87	0.105381	26,802	2,824	25,389	155,780	5.81
88	0.114135	23,977	2,737	22,609	130,390	5.44
89	0.123684	21,241	2,627	19,927	107,781	5.07
90	0.134096	18,613	2,496	17,365	87,854	4.72
91	0.145445	16,117	2,344	14,945	70,489	4.37
92	0.157807	13,773	2,174	12,687	55,543	4.03
93	0.171190	11,600	1,986	10,607	42,857	3.69
94	0.185748	9,614	1,786	8,721	32,250	3.35
95	0.201572	7,828	1,578	7,039	23,529	3.01
96	0.218752	6,250	1,367	5,567	16,489	2.64
97	0.237378	4,883	1,159	4,303	10,923	2.24
98	0.257541	3,724	959	3,244	6,619	1.78
99	0.279325	2,765	772	2,379	3,375	1.22
100	1.000000	1,993	1,993	996	996	0.50

Estimación

2010	CUADRO A.2.3.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	98,588	98,654	98,710	98,768	98,826
2	98,463	98,605	98,663	98,720	98,778
3	98,400	98,556	98,615	98,672	98,730
4	98,357	98,506	98,567	98,625	98,682
5	98,324	98,455	98,519	98,577	98,634
6	98,296	98,403	98,471	98,529	98,586
7	98,271	98,350	98,423	98,481	98,538
8	98,248	98,296	98,375	98,432	98,490
9	98,226	98,240	98,326	98,383	98,441
10	98,203	98,184	98,277	98,334	98,392
11	98,179	98,126	98,227	98,284	98,342
12	98,154	98,066	98,176	98,234	98,291
13	98,126	98,005	98,125	98,182	98,240
14	98,095	97,942	98,073	98,130	98,187
15	98,060	97,877	98,019	98,076	98,134
16	98,020	97,810	97,964	98,021	98,079
17	97,974	97,741	97,908	97,965	98,022
18	97,921	97,669	97,850	97,907	97,964
19	97,862	97,594	97,790	97,847	97,904
20	97,796	97,516	97,727	97,784	97,842
21	97,724	97,436	97,663	97,720	97,777
22	97,645	97,351	97,595	97,652	97,709
23	97,561	97,263	97,525	97,582	97,639
24	97,471	97,171	97,451	97,508	97,565
25	97,376	97,074	97,373	97,430	97,487
26	97,277	96,972	97,292	97,348	97,405
27	97,173	96,865	97,205	97,262	97,319
28	97,065	96,752	97,114	97,171	97,228
29	96,953	96,633	97,017	97,074	97,131
30	96,836	96,507	96,915	96,971	97,028
31	96,715	96,374	96,805	96,862	96,918
32	96,588	96,233	96,688	96,745	96,801
33	96,455	96,083	96,564	96,620	96,677
34	96,315	95,924	96,431	96,487	96,543
35	96,168	95,755	96,288	96,344	96,400
36	96,012	95,575	96,135	96,191	96,247
37	95,847	95,382	95,970	96,026	96,082
38	95,671	95,177	95,793	95,849	95,905
39	95,482	94,958	95,603	95,659	95,715
40	95,280	94,724	95,398	95,454	95,510
41	95,063	94,473	95,178	95,233	95,289
42	94,830	94,205	94,940	94,995	95,051
43	94,578	93,917	94,683	94,738	94,794
44	94,307	93,609	94,406	94,461	94,516
45	94,013	93,278	94,107	94,162	94,217
46	93,697	92,923	93,784	93,839	93,894
47	93,354	92,542	93,436	93,490	93,545
48	92,984	92,133	93,059	93,114	93,168
49	92,583	91,693	92,653	92,707	92,761

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	92,150	91,221	92,213	92,267	92,321
51	91,681	90,714	91,739	91,792	91,846
52	91,175	90,169	91,226	91,280	91,333
53	90,629	89,583	90,673	90,726	90,779
54	90,038	88,954	90,076	90,129	90,182
55	89,401	88,278	89,432	89,485	89,537
56	88,714	87,552	88,738	88,790	88,842
57	87,973	86,773	87,990	88,041	88,092
58	87,174	85,937	87,183	87,234	87,285
59	86,313	85,040	86,316	86,366	86,416
60	85,385	84,079	85,382	85,432	85,482
61	84,388	83,050	84,379	84,428	84,477
62	83,315	81,948	83,302	83,350	83,399
63	82,164	80,769	82,146	82,194	82,242
64	80,930	79,510	80,908	80,955	81,003
65	79,607	78,166	79,583	79,630	79,676
66	78,192	76,734	78,167	78,213	78,259
67	76,681	75,209	76,656	76,701	76,746
68	75,069	73,588	75,047	75,091	75,134
69	73,352	71,869	73,335	73,378	73,421
70	71,528	70,048	71,518	71,559	71,601
71	69,594	68,122	69,593	69,634	69,674
72	67,547	66,092	67,559	67,598	67,638
73	65,386	63,956	65,414	65,453	65,491
74	63,112	61,714	63,160	63,197	63,234
75	60,724	59,368	60,796	60,832	60,867
76	58,225	56,920	58,327	58,361	58,395
77	55,632	54,376	55,755	55,788	55,820
78	52,950	51,741	53,088	53,119	53,150
79	50,187	49,023	50,332	50,361	50,390
80	47,355	46,232	47,497	47,525	47,552
81	44,464	43,379	44,596	44,622	44,648
82	41,529	40,478	41,642	41,666	41,690
83	38,566	37,546	38,652	38,674	38,697
84	35,593	34,600	35,644	35,664	35,685
85	32,629	31,660	32,638	32,657	32,676
86	29,692	28,748	29,657	29,674	29,692
87	26,802	25,886	26,724	26,739	26,755
88	23,977	23,098	23,863	23,877	23,891
89	21,241	20,407	21,099	21,111	21,123
90	18,613	17,837	18,456	18,466	18,477
91	16,117	15,410	15,956	15,965	15,975
92	13,773	13,145	13,621	13,629	13,637
93	11,600	11,059	11,468	11,475	11,482
94	9,614	9,165	9,512	9,518	9,523
95	7,828	7,473	7,762	7,766	7,771
96	6,250	5,986	6,222	6,226	6,230
97	4,883	4,703	4,893	4,896	4,899
98	3,724	3,619	3,768	3,770	3,772
99	2,765	2,722	2,836	2,838	2,839
100	1,993	1,997	2,082	2,084	2,085

Año 2015

Hombres

Tabla de mortalidad

2015	CUADRO A.3.1.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.013221	100,000	1,322	99,339	7,384,791	73.85
1	0.001294	98,678	128	98,614	7,285,452	73.83
2	0.000621	98,550	61	98,520	7,186,838	72.93
3	0.000408	98,489	40	98,469	7,088,318	71.97
4	0.000314	98,449	31	98,433	6,989,849	71.00
5	0.000254	98,418	25	98,405	6,891,416	70.02
6	0.000225	98,393	22	98,382	6,793,011	69.04
7	0.000214	98,371	21	98,360	6,694,629	68.06
8	0.000213	98,350	21	98,339	6,596,269	67.07
9	0.000222	98,329	22	98,318	6,497,930	66.08
10	0.000242	98,307	24	98,295	6,399,612	65.10
11	0.000268	98,283	26	98,270	6,301,317	64.11
12	0.000301	98,257	30	98,242	6,203,047	63.13
13	0.000344	98,227	34	98,210	6,104,805	62.15
14	0.000399	98,193	39	98,174	6,006,595	61.17
15	0.000469	98,154	46	98,131	5,908,421	60.20
16	0.000554	98,108	54	98,081	5,810,290	59.22
17	0.000650	98,054	64	98,022	5,712,209	58.26
18	0.000756	97,990	74	97,953	5,614,187	57.29
19	0.000866	97,916	85	97,874	5,516,234	56.34
20	0.000976	97,831	95	97,783	5,418,360	55.38
21	0.001081	97,736	106	97,683	5,320,577	54.44
22	0.001180	97,630	115	97,572	5,222,894	53.50
23	0.001269	97,515	124	97,453	5,125,321	52.56
24	0.001348	97,391	131	97,326	5,027,868	51.63
25	0.001418	97,260	138	97,191	4,930,543	50.69
26	0.001480	97,122	144	97,050	4,833,352	49.77
27	0.001536	96,978	149	96,904	4,736,301	48.84
28	0.001588	96,829	154	96,753	4,639,397	47.91
29	0.001640	96,676	159	96,596	4,542,645	46.99
30	0.001694	96,517	164	96,435	4,446,049	46.06
31	0.001752	96,354	169	96,269	4,349,613	45.14
32	0.001818	96,185	175	96,097	4,253,344	44.22
33	0.001892	96,010	182	95,919	4,157,247	43.30
34	0.001977	95,828	189	95,733	4,061,328	42.38
35	0.002076	95,639	199	95,539	3,965,594	41.46
36	0.002189	95,440	209	95,336	3,870,055	40.55
37	0.002317	95,231	221	95,121	3,774,719	39.64
38	0.002464	95,011	234	94,894	3,679,598	38.73
39	0.002628	94,777	249	94,652	3,584,704	37.82
40	0.002813	94,527	266	94,395	3,490,052	36.92
41	0.003020	94,262	285	94,119	3,395,658	36.02
42	0.003249	93,977	305	93,824	3,301,539	35.13
43	0.003501	93,672	328	93,508	3,207,714	34.24
44	0.003780	93,344	353	93,167	3,114,207	33.36
45	0.004085	92,991	380	92,801	3,021,040	32.49
46	0.004418	92,611	409	92,406	2,928,239	31.62
47	0.004782	92,202	441	91,981	2,835,832	30.76
48	0.005178	91,761	475	91,523	2,743,851	29.90
49	0.005608	91,286	512	91,030	2,652,328	29.06

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.006075	90,774	551	90,498	2,561,298	28.22
51	0.006580	90,222	594	89,926	2,470,800	27.39
52	0.007127	89,629	639	89,309	2,380,874	26.56
53	0.007719	88,990	687	88,646	2,291,565	25.75
54	0.008358	88,303	738	87,934	2,202,919	24.95
55	0.009049	87,565	792	87,169	2,114,985	24.15
56	0.009817	86,772	852	86,347	2,027,816	23.37
57	0.010651	85,921	915	85,463	1,941,470	22.60
58	0.011554	85,006	982	84,514	1,856,006	21.83
59	0.012534	84,023	1,053	83,497	1,771,492	21.08
60	0.013596	82,970	1,128	82,406	1,687,995	20.34
61	0.014748	81,842	1,207	81,239	1,605,589	19.62
62	0.015996	80,635	1,290	79,990	1,524,350	18.90
63	0.017349	79,345	1,377	78,657	1,444,360	18.20
64	0.018815	77,969	1,467	77,235	1,365,703	17.52
65	0.020404	76,502	1,561	75,721	1,288,468	16.84
66	0.022126	74,941	1,658	74,112	1,212,747	16.18
67	0.023991	73,283	1,758	72,404	1,138,635	15.54
68	0.026011	71,525	1,860	70,594	1,066,231	14.91
69	0.028199	69,664	1,964	68,682	995,637	14.29
70	0.030568	67,700	2,069	66,665	926,955	13.69
71	0.033133	65,630	2,175	64,543	860,290	13.11
72	0.035909	63,456	2,279	62,316	795,747	12.54
73	0.038912	61,177	2,381	59,987	733,431	11.99
74	0.042162	58,797	2,479	57,557	673,444	11.45
75	0.045676	56,318	2,572	55,031	615,887	10.94
76	0.049132	53,745	2,641	52,425	560,855	10.44
77	0.052836	51,105	2,700	49,754	508,431	9.95
78	0.056801	48,404	2,749	47,030	458,676	9.48
79	0.061046	45,655	2,787	44,261	411,646	9.02
80	0.065585	42,868	2,812	41,462	367,385	8.57
81	0.070437	40,056	2,821	38,646	325,923	8.14
82	0.075619	37,235	2,816	35,827	287,277	7.72
83	0.081148	34,419	2,793	33,023	251,450	7.31
84	0.087044	31,626	2,753	30,250	218,427	6.91
85	0.093470	28,873	2,699	27,524	188,177	6.52
86	0.100477	26,175	2,630	24,860	160,653	6.14
87	0.108120	23,545	2,546	22,272	135,794	5.77
88	0.116458	20,999	2,445	19,776	113,522	5.41
89	0.125556	18,554	2,330	17,389	93,745	5.05
90	0.135485	16,224	2,198	15,125	76,357	4.71
91	0.146321	14,026	2,052	13,000	61,232	4.37
92	0.158143	11,974	1,894	11,027	48,232	4.03
93	0.171514	10,080	1,729	9,216	37,205	3.69
94	0.186060	8,351	1,554	7,574	27,990	3.35
95	0.201870	6,797	1,372	6,111	20,415	3.00
96	0.219035	5,425	1,188	4,831	14,304	2.64
97	0.237646	4,237	1,007	3,733	9,473	2.24
98	0.257792	3,230	833	2,814	5,739	1.78
99	0.279559	2,397	670	2,062	2,926	1.22
100	1.000000	1,727	1,727	864	864	0.50

Estimación

2015	CUADRO A.3.1.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	98,678	98,936	99,007	99,080	99,153
2	98,550	98,864	98,936	99,010	99,083
3	98,489	98,791	98,867	98,940	99,013
4	98,449	98,716	98,797	98,870	98,943
5	98,418	98,641	98,729	98,802	98,875
6	98,393	98,563	98,660	98,733	98,806
7	98,371	98,485	98,592	98,665	98,738
8	98,350	98,404	98,524	98,597	98,670
9	98,329	98,322	98,456	98,529	98,602
10	98,307	98,239	98,388	98,461	98,534
11	98,283	98,153	98,320	98,392	98,465
12	98,257	98,064	98,251	98,323	98,396
13	98,227	97,974	98,181	98,254	98,326
14	98,193	97,880	98,111	98,183	98,256
15	98,154	97,784	98,039	98,112	98,184
16	98,108	97,685	97,966	98,039	98,111
17	98,054	97,583	97,892	97,964	98,036
18	97,990	97,477	97,815	97,888	97,960
19	97,916	97,367	97,737	97,809	97,881
20	97,831	97,254	97,656	97,728	97,800
21	97,736	97,135	97,572	97,644	97,716
22	97,630	97,012	97,485	97,557	97,629
23	97,515	96,884	97,395	97,467	97,539
24	97,391	96,750	97,300	97,372	97,444
25	97,260	96,610	97,202	97,273	97,345
26	97,122	96,463	97,098	97,169	97,241
27	96,978	96,310	96,988	97,060	97,132
28	96,829	96,148	96,873	96,944	97,016
29	96,676	95,979	96,751	96,822	96,894
30	96,517	95,800	96,621	96,693	96,764
31	96,354	95,613	96,484	96,555	96,626
32	96,185	95,414	96,337	96,409	96,480
33	96,010	95,205	96,181	96,252	96,324
34	95,828	94,984	96,015	96,086	96,157
35	95,639	94,749	95,837	95,907	95,978
36	95,440	94,501	95,646	95,717	95,787
37	95,231	94,238	95,441	95,512	95,582
38	95,011	93,959	95,222	95,292	95,363
39	94,777	93,663	94,987	95,057	95,127
40	94,527	93,348	94,734	94,804	94,874
41	94,262	93,013	94,462	94,531	94,601
42	93,977	92,657	94,169	94,239	94,308
43	93,672	92,278	93,854	93,924	93,993
44	93,344	91,874	93,516	93,585	93,654
45	92,991	91,443	93,151	93,220	93,289
46	92,611	90,984	92,759	92,827	92,896
47	92,202	90,495	92,336	92,404	92,473
48	91,761	89,973	91,881	91,949	92,017
49	91,286	89,416	91,392	91,459	91,527

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	90,774	88,823	90,865	90,932	90,999
51	90,222	88,189	90,298	90,365	90,432
52	89,629	87,514	89,689	89,755	89,821
53	88,990	86,793	89,033	89,099	89,165
54	88,303	86,025	88,329	88,395	88,460
55	87,565	85,206	87,573	87,638	87,703
56	86,772	84,333	86,762	86,826	86,890
57	85,921	83,403	85,892	85,955	86,019
58	85,006	82,414	84,960	85,022	85,085
59	84,023	81,360	83,961	84,023	84,086
60	82,970	80,241	82,894	82,955	83,016
61	81,842	79,051	81,753	81,813	81,874
62	80,635	77,788	80,535	80,595	80,654
63	79,345	76,449	79,237	79,295	79,354
64	77,969	75,030	77,855	77,912	77,970
65	76,502	73,530	76,385	76,442	76,498
66	74,941	71,944	74,826	74,881	74,936
67	73,283	70,272	73,173	73,227	73,281
68	71,525	68,510	71,425	71,477	71,530
69	69,664	66,658	69,579	69,630	69,682
70	67,700	64,715	67,635	67,685	67,735
71	65,630	62,681	65,591	65,640	65,688
72	63,456	60,556	63,449	63,495	63,542
73	61,177	58,342	61,208	61,253	61,299
74	58,797	56,042	58,872	58,916	58,959
75	56,318	53,660	56,444	56,486	56,528
76	53,745	51,200	53,929	53,969	54,009
77	51,105	48,669	51,334	51,372	51,410
78	48,404	46,075	48,665	48,701	48,737
79	45,655	43,428	45,934	45,968	46,002
80	42,868	40,738	43,150	43,182	43,214
81	40,056	38,019	40,328	40,358	40,387
82	37,235	35,284	37,482	37,509	37,537
83	34,419	32,550	34,628	34,653	34,679
84	31,626	29,832	31,784	31,808	31,831
85	28,873	27,150	28,970	28,991	29,013
86	26,175	24,521	26,205	26,225	26,244
87	23,545	21,966	23,511	23,528	23,545
88	20,999	19,502	20,906	20,922	20,937
89	18,554	17,149	18,413	18,427	18,440
90	16,224	14,924	16,050	16,061	16,073
91	14,026	12,842	13,833	13,843	13,854
92	11,974	10,917	11,779	11,788	11,796
93	10,080	9,160	9,899	9,906	9,914
94	8,351	7,577	8,202	8,208	8,214
95	6,797	6,171	6,692	6,697	6,702
96	5,425	4,944	5,370	5,374	5,378
97	4,237	3,890	4,233	4,236	4,239
98	3,230	3,002	3,272	3,274	3,277
99	2,397	2,268	2,477	2,478	2,480
100	1,727	1,675	1,833	1,834	1,835

Mujeres

Tabla de mortalidad

2015	CUADRO A.3.2.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.010553	100,000	1,055	99,472	7,841,749	78.42
1	0.001041	98,945	103	98,893	7,742,277	78.25
2	0.000551	98,842	54	98,815	7,643,383	77.33
3	0.000367	98,787	36	98,769	7,544,569	76.37
4	0.000273	98,751	27	98,738	7,445,800	75.40
5	0.000222	98,724	22	98,713	7,347,062	74.42
6	0.000185	98,702	18	98,693	7,248,349	73.44
7	0.000162	98,684	16	98,676	7,149,656	72.45
8	0.000149	98,668	15	98,660	7,050,980	71.46
9	0.000143	98,653	14	98,646	6,952,320	70.47
10	0.000144	98,639	14	98,632	6,853,674	69.48
11	0.000151	98,625	15	98,617	6,755,042	68.49
12	0.000165	98,610	16	98,602	6,656,425	67.50
13	0.000185	98,594	18	98,585	6,557,823	66.51
14	0.000208	98,575	21	98,565	6,459,238	65.53
15	0.000233	98,555	23	98,543	6,360,673	64.54
16	0.000256	98,532	25	98,519	6,262,130	63.55
17	0.000277	98,507	27	98,493	6,163,610	62.57
18	0.000294	98,479	29	98,465	6,065,117	61.59
19	0.000307	98,450	30	98,435	5,966,652	60.61
20	0.000316	98,420	31	98,405	5,868,217	59.62
21	0.000324	98,389	32	98,373	5,769,812	58.64
22	0.000331	98,357	33	98,341	5,671,439	57.66
23	0.000338	98,325	33	98,308	5,573,098	56.68
24	0.000346	98,292	34	98,275	5,474,790	55.70
25	0.000357	98,258	35	98,240	5,376,516	54.72
26	0.000372	98,222	37	98,204	5,278,276	53.74
27	0.000390	98,186	38	98,167	5,180,072	52.76
28	0.000413	98,148	41	98,127	5,081,905	51.78
29	0.000441	98,107	43	98,085	4,983,777	50.80
30	0.000474	98,064	46	98,041	4,885,692	49.82
31	0.000513	98,017	50	97,992	4,787,651	48.84
32	0.000558	97,967	55	97,940	4,689,659	47.87
33	0.000611	97,912	60	97,883	4,591,719	46.90
34	0.000670	97,853	66	97,820	4,493,837	45.92
35	0.000738	97,787	72	97,751	4,396,017	44.96
36	0.000814	97,715	80	97,675	4,298,266	43.99
37	0.000900	97,635	88	97,591	4,200,591	43.02
38	0.000995	97,547	97	97,499	4,103,000	42.06
39	0.001101	97,450	107	97,397	4,005,501	41.10
40	0.001220	97,343	119	97,284	3,908,104	40.15
41	0.001350	97,224	131	97,159	3,810,820	39.20
42	0.001495	97,093	145	97,020	3,713,662	38.25
43	0.001655	96,948	160	96,868	3,616,641	37.30
44	0.001831	96,787	177	96,699	3,519,774	36.37
45	0.002025	96,610	196	96,512	3,423,075	35.43
46	0.002238	96,415	216	96,307	3,326,562	34.50
47	0.002472	96,199	238	96,080	3,230,255	33.58
48	0.002728	95,961	262	95,830	3,134,175	32.66
49	0.003010	95,699	288	95,555	3,038,345	31.75

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.003319	95,411	317	95,253	2,942,790	30.84
51	0.003657	95,095	348	94,921	2,847,537	29.94
52	0.004027	94,747	382	94,556	2,752,616	29.05
53	0.004433	94,365	418	94,156	2,658,060	28.17
54	0.004877	93,947	458	93,718	2,563,903	27.29
55	0.005363	93,489	501	93,238	2,470,185	26.42
56	0.005913	92,988	550	92,713	2,376,947	25.56
57	0.006520	92,438	603	92,136	2,284,235	24.71
58	0.007188	91,835	660	91,505	2,192,098	23.87
59	0.007925	91,175	723	90,814	2,100,593	23.04
60	0.008736	90,452	790	90,057	2,009,780	22.22
61	0.009631	89,662	864	89,230	1,919,722	21.41
62	0.010617	88,799	943	88,327	1,830,492	20.61
63	0.011703	87,856	1,028	87,342	1,742,165	19.83
64	0.012899	86,828	1,120	86,268	1,654,823	19.06
65	0.014217	85,708	1,218	85,099	1,568,555	18.30
66	0.015668	84,489	1,324	83,827	1,483,457	17.56
67	0.017266	83,165	1,436	82,448	1,399,629	16.83
68	0.019026	81,730	1,555	80,952	1,317,182	16.12
69	0.020963	80,175	1,681	79,334	1,236,230	15.42
70	0.023095	78,494	1,813	77,587	1,156,895	14.74
71	0.025441	76,681	1,951	75,706	1,079,308	14.08
72	0.028021	74,730	2,094	73,683	1,003,602	13.43
73	0.030860	72,636	2,242	71,515	929,919	12.80
74	0.033980	70,395	2,392	69,199	858,404	12.19
75	0.037411	68,003	2,544	66,731	789,205	11.61
76	0.040792	65,459	2,670	64,124	722,474	11.04
77	0.044465	62,788	2,792	61,392	658,351	10.49
78	0.048453	59,996	2,907	58,543	596,958	9.95
79	0.052778	57,089	3,013	55,583	538,415	9.43
80	0.057466	54,076	3,108	52,523	482,832	8.93
81	0.062543	50,969	3,188	49,375	430,310	8.44
82	0.068037	47,781	3,251	46,156	380,935	7.97
83	0.073974	44,530	3,294	42,883	334,779	7.52
84	0.080386	41,236	3,315	39,579	291,896	7.08
85	0.087381	37,921	3,314	36,265	252,317	6.65
86	0.095011	34,608	3,288	32,964	216,053	6.24
87	0.103334	31,320	3,236	29,701	183,089	5.85
88	0.112407	28,083	3,157	26,505	153,388	5.46
89	0.122297	24,926	3,048	23,402	126,883	5.09
90	0.133071	21,878	2,911	20,422	103,481	4.73
91	0.144800	18,967	2,746	17,594	83,058	4.38
92	0.157561	16,220	2,556	14,942	65,465	4.04
93	0.170952	13,665	2,336	12,497	50,522	3.70
94	0.185520	11,329	2,102	10,278	38,026	3.36
95	0.201354	9,227	1,858	8,298	27,748	3.01
96	0.218544	7,369	1,610	6,564	19,450	2.64
97	0.237182	5,759	1,366	5,076	12,886	2.24
98	0.257357	4,393	1,131	3,828	7,810	1.78
99	0.279154	3,262	911	2,807	3,983	1.22
100	1.000000	2,352	2,352	1,176	1,176	0.50

Estimación

2015	CUADRO A.3.2.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	98,945	98,950	99,002	99,057	99,112
2	98,842	98,907	98,961	99,016	99,071
3	98,787	98,863	98,921	98,976	99,031
4	98,751	98,819	98,883	98,937	98,992
5	98,724	98,774	98,846	98,900	98,955
6	98,702	98,728	98,810	98,865	98,920
7	98,684	98,682	98,776	98,831	98,885
8	98,668	98,635	98,743	98,798	98,853
9	98,653	98,588	98,711	98,766	98,821
10	98,639	98,539	98,681	98,736	98,790
11	98,625	98,490	98,652	98,706	98,761
12	98,610	98,440	98,623	98,678	98,733
13	98,594	98,389	98,596	98,650	98,705
14	98,575	98,336	98,569	98,624	98,678
15	98,555	98,282	98,543	98,598	98,652
16	98,532	98,227	98,517	98,572	98,627
17	98,507	98,171	98,492	98,547	98,602
18	98,479	98,112	98,468	98,522	98,577
19	98,450	98,052	98,443	98,497	98,552
20	98,420	97,990	98,418	98,473	98,527
21	98,389	97,925	98,393	98,448	98,502
22	98,357	97,858	98,367	98,422	98,477
23	98,325	97,789	98,341	98,396	98,450
24	98,292	97,716	98,314	98,368	98,423
25	98,258	97,640	98,285	98,340	98,394
26	98,222	97,561	98,255	98,310	98,364
27	98,186	97,478	98,223	98,278	98,332
28	98,148	97,391	98,189	98,244	98,298
29	98,107	97,300	98,152	98,207	98,261
30	98,064	97,203	98,112	98,167	98,221
31	98,017	97,101	98,069	98,123	98,178
32	97,967	96,993	98,021	98,076	98,130
33	97,912	96,879	97,969	98,023	98,078
34	97,853	96,758	97,912	97,966	98,020
35	97,787	96,629	97,848	97,902	97,957
36	97,715	96,491	97,778	97,832	97,886
37	97,635	96,344	97,700	97,755	97,809
38	97,547	96,188	97,614	97,669	97,723
39	97,450	96,020	97,519	97,573	97,627
40	97,343	95,841	97,414	97,468	97,522
41	97,224	95,648	97,296	97,350	97,404
42	97,093	95,441	97,166	97,220	97,274
43	96,948	95,219	97,023	97,076	97,130
44	96,787	94,980	96,863	96,917	96,970
45	96,610	94,723	96,686	96,740	96,794
46	96,415	94,445	96,491	96,544	96,598
47	96,199	94,146	96,275	96,328	96,382
48	95,961	93,824	96,036	96,089	96,142
49	95,699	93,475	95,772	95,825	95,878

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	95,411	93,099	95,481	95,534	95,587
51	95,095	92,692	95,160	95,213	95,265
52	94,747	92,253	94,806	94,859	94,911
53	94,365	91,777	94,417	94,469	94,522
54	93,947	91,264	93,989	94,041	94,093
55	93,489	90,708	93,519	93,570	93,622
56	92,988	90,107	93,002	93,054	93,106
57	92,438	89,458	92,437	92,488	92,539
58	91,835	88,756	91,817	91,868	91,919
59	91,175	87,997	91,139	91,189	91,240
60	90,452	87,178	90,398	90,448	90,498
61	89,662	86,293	89,589	89,638	89,688
62	88,799	85,338	88,707	88,756	88,805
63	87,856	84,308	87,746	87,795	87,843
64	86,828	83,199	86,702	86,750	86,798
65	85,708	82,005	85,568	85,616	85,663
66	84,489	80,721	84,339	84,386	84,433
67	83,165	79,342	83,009	83,055	83,101
68	81,730	77,863	81,572	81,617	81,662
69	80,175	76,279	80,022	80,066	80,111
70	78,494	74,586	78,354	78,398	78,441
71	76,681	72,778	76,564	76,606	76,649
72	74,730	70,853	74,646	74,687	74,728
73	72,636	68,807	72,596	72,636	72,676
74	70,395	66,639	70,412	70,451	70,490
75	68,003	64,347	68,092	68,129	68,167
76	65,459	61,932	65,635	65,671	65,708
77	62,788	59,394	63,043	63,078	63,113
78	59,996	56,739	60,318	60,352	60,385
79	57,089	53,971	57,466	57,498	57,530
80	54,076	51,099	54,495	54,525	54,556
81	50,969	48,133	51,415	51,443	51,472
82	47,781	45,086	48,239	48,266	48,292
83	44,530	41,974	44,984	45,009	45,034
84	41,236	38,816	41,669	41,692	41,715
85	37,921	35,633	38,317	38,338	38,359
86	34,608	32,450	34,954	34,973	34,992
87	31,320	29,292	31,607	31,625	31,642
88	28,083	26,189	28,309	28,325	28,340
89	24,926	23,170	25,090	25,104	25,118
90	21,878	20,264	21,983	21,995	22,007
91	18,967	17,501	19,020	19,031	19,041
92	16,220	14,908	16,232	16,241	16,250
93	13,665	12,509	13,645	13,653	13,661
94	11,329	10,325	11,284	11,290	11,296
95	9,227	8,369	9,164	9,169	9,174
96	7,369	6,652	7,297	7,301	7,305
97	5,759	5,173	5,686	5,690	5,693
98	4,393	3,930	4,328	4,330	4,333
99	3,262	2,909	3,210	3,211	3,213
100	2,352	2,093	2,314	2,315	2,317

Población total

Tabla de mortalidad

2015	CUADRO A.3.3.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.011887	100,000	1,189	99,406	7,613,270	76.13
1	0.001167	98,811	115	98,754	7,513,864	76.04
2	0.000586	98,696	58	98,667	7,415,111	75.13
3	0.000387	98,638	38	98,619	7,316,444	74.17
4	0.000294	98,600	29	98,585	7,217,825	73.20
5	0.000238	98,571	23	98,559	7,119,239	72.22
6	0.000205	98,547	20	98,537	7,020,680	71.24
7	0.000188	98,527	19	98,518	6,922,143	70.26
8	0.000181	98,509	18	98,500	6,823,625	69.27
9	0.000182	98,491	18	98,482	6,725,125	68.28
10	0.000193	98,473	19	98,463	6,626,643	67.29
11	0.000209	98,454	21	98,444	6,528,179	66.31
12	0.000233	98,433	23	98,422	6,429,736	65.32
13	0.000264	98,410	26	98,397	6,331,314	64.34
14	0.000304	98,384	30	98,369	6,232,916	63.35
15	0.000351	98,355	35	98,337	6,134,547	62.37
16	0.000405	98,320	40	98,300	6,036,210	61.39
17	0.000463	98,280	46	98,257	5,937,910	60.42
18	0.000524	98,235	51	98,209	5,839,652	59.45
19	0.000585	98,183	57	98,154	5,741,443	58.48
20	0.000645	98,126	63	98,094	5,643,289	57.51
21	0.000701	98,062	69	98,028	5,545,195	56.55
22	0.000753	97,994	74	97,957	5,447,167	55.59
23	0.000801	97,920	78	97,881	5,349,210	54.63
24	0.000845	97,841	83	97,800	5,251,329	53.67
25	0.000885	97,759	86	97,715	5,153,529	52.72
26	0.000923	97,672	90	97,627	5,055,814	51.76
27	0.000959	97,582	94	97,535	4,958,186	50.81
28	0.000997	97,489	97	97,440	4,860,651	49.86
29	0.001036	97,391	101	97,341	4,763,211	48.91
30	0.001079	97,290	105	97,238	4,665,870	47.96
31	0.001127	97,185	110	97,131	4,568,632	47.01
32	0.001182	97,076	115	97,019	4,471,502	46.06
33	0.001245	96,961	121	96,901	4,374,483	45.12
34	0.001317	96,840	128	96,777	4,277,582	44.17
35	0.001399	96,713	135	96,645	4,180,806	43.23
36	0.001493	96,578	144	96,505	4,084,160	42.29
37	0.001600	96,433	154	96,356	3,987,655	41.35
38	0.001720	96,279	166	96,196	3,891,299	40.42
39	0.001854	96,113	178	96,024	3,795,103	39.49
40	0.002005	95,935	192	95,839	3,699,078	38.56
41	0.002172	95,743	208	95,639	3,603,239	37.63
42	0.002358	95,535	225	95,422	3,507,600	36.72
43	0.002562	95,310	244	95,188	3,412,178	35.80
44	0.002788	95,066	265	94,933	3,316,990	34.89
45	0.003035	94,801	288	94,657	3,222,057	33.99
46	0.003306	94,513	312	94,357	3,127,400	33.09
47	0.003602	94,200	339	94,031	3,033,044	32.20
48	0.003926	93,861	368	93,677	2,939,013	31.31
49	0.004278	93,493	400	93,293	2,845,336	30.43

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.004662	93,093	434	92,876	2,752,044	29.56
51	0.005080	92,659	471	92,423	2,659,168	28.70
52	0.005534	92,188	510	91,933	2,566,745	27.84
53	0.006028	91,678	553	91,401	2,474,812	26.99
54	0.006564	91,125	598	90,826	2,383,411	26.16
55	0.007146	90,527	647	90,203	2,292,585	25.32
56	0.007798	89,880	701	89,530	2,202,382	24.50
57	0.008510	89,179	759	88,800	2,112,852	23.69
58	0.009287	88,420	821	88,010	2,024,052	22.89
59	0.010135	87,599	888	87,155	1,936,043	22.10
60	0.011061	86,711	959	86,232	1,848,887	21.32
61	0.012073	85,752	1,035	85,235	1,762,656	20.56
62	0.013177	84,717	1,116	84,159	1,677,421	19.80
63	0.014382	83,601	1,202	82,999	1,593,262	19.06
64	0.015698	82,398	1,293	81,752	1,510,263	18.33
65	0.017135	81,105	1,390	80,410	1,428,511	17.61
66	0.018704	79,715	1,491	78,970	1,348,102	16.91
67	0.020416	78,224	1,597	77,426	1,269,132	16.22
68	0.022286	76,627	1,708	75,773	1,191,706	15.55
69	0.024327	74,919	1,823	74,008	1,115,933	14.90
70	0.026556	73,097	1,941	72,126	1,041,925	14.25
71	0.028988	71,156	2,063	70,124	969,799	13.63
72	0.031643	69,093	2,186	68,000	899,675	13.02
73	0.034541	66,907	2,311	65,751	831,675	12.43
74	0.037704	64,596	2,436	63,378	765,924	11.86
75	0.041155	62,160	2,558	60,881	702,546	11.30
76	0.044553	59,602	2,655	58,274	641,665	10.77
77	0.048221	56,946	2,746	55,573	583,391	10.24
78	0.052181	54,200	2,828	52,786	527,817	9.74
79	0.056452	51,372	2,900	49,922	475,031	9.25
80	0.061056	48,472	2,960	46,992	425,109	8.77
81	0.066017	45,513	3,005	44,010	378,116	8.31
82	0.071357	42,508	3,033	40,991	334,106	7.86
83	0.077102	39,475	3,044	37,953	293,115	7.43
84	0.083276	36,431	3,034	34,914	255,162	7.00
85	0.090013	33,397	3,006	31,894	220,247	6.59
86	0.097365	30,391	2,959	28,912	188,353	6.20
87	0.105387	27,432	2,891	25,987	159,441	5.81
88	0.114140	24,541	2,801	23,141	133,455	5.44
89	0.123688	21,740	2,689	20,396	110,314	5.07
90	0.134099	19,051	2,555	17,774	89,919	4.72
91	0.145447	16,496	2,399	15,297	72,145	4.37
92	0.157808	14,097	2,225	12,985	56,848	4.03
93	0.171191	11,872	2,032	10,856	43,864	3.69
94	0.185749	9,840	1,828	8,926	33,008	3.35
95	0.201573	8,012	1,615	7,205	24,081	3.01
96	0.218752	6,397	1,399	5,697	16,877	2.64
97	0.237379	4,998	1,186	4,405	11,179	2.24
98	0.257542	3,811	982	3,321	6,775	1.78
99	0.279325	2,830	790	2,435	3,454	1.22
100	1.000000	2,039	2,039	1,020	1,020	0.50

Estimación

2015	CUADRO A.3.3.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	98,811	98,921	98,980	99,041	99,102
2	98,696	98,868	98,928	98,990	99,051
3	98,638	98,814	98,877	98,939	99,000
4	98,600	98,760	98,827	98,889	98,950
5	98,571	98,704	98,778	98,839	98,901
6	98,547	98,648	98,729	98,790	98,852
7	98,527	98,591	98,681	98,742	98,803
8	98,509	98,533	98,633	98,694	98,755
9	98,491	98,474	98,586	98,647	98,708
10	98,473	98,413	98,538	98,599	98,661
11	98,454	98,352	98,491	98,552	98,613
12	98,433	98,288	98,444	98,505	98,566
13	98,410	98,224	98,397	98,458	98,519
14	98,384	98,157	98,349	98,410	98,471
15	98,355	98,089	98,301	98,362	98,423
16	98,320	98,018	98,252	98,313	98,374
17	98,280	97,945	98,203	98,264	98,325
18	98,235	97,870	98,152	98,213	98,274
19	98,183	97,793	98,101	98,161	98,222
20	98,126	97,712	98,048	98,108	98,169
21	98,062	97,628	97,993	98,053	98,114
22	97,994	97,541	97,936	97,997	98,057
23	97,920	97,450	97,877	97,938	97,998
24	97,841	97,355	97,815	97,876	97,936
25	97,759	97,256	97,751	97,811	97,872
26	97,672	97,153	97,683	97,743	97,804
27	97,582	97,044	97,611	97,671	97,732
28	97,489	96,929	97,535	97,595	97,656
29	97,391	96,808	97,454	97,515	97,575
30	97,290	96,681	97,368	97,429	97,489
31	97,185	96,547	97,276	97,337	97,397
32	97,076	96,405	97,178	97,238	97,299
33	96,961	96,255	97,073	97,133	97,193
34	96,840	96,095	96,960	97,020	97,080
35	96,713	95,926	96,838	96,898	96,958
36	96,578	95,745	96,706	96,766	96,826
37	96,433	95,554	96,564	96,624	96,684
38	96,279	95,349	96,411	96,471	96,530
39	96,113	95,131	96,245	96,304	96,364
40	95,935	94,898	96,065	96,124	96,184
41	95,743	94,649	95,870	95,929	95,989
42	95,535	94,383	95,659	95,718	95,777
43	95,310	94,097	95,429	95,488	95,547
44	95,066	93,792	95,180	95,239	95,298
45	94,801	93,464	94,910	94,969	95,028
46	94,513	93,113	94,617	94,675	94,734
47	94,200	92,736	94,298	94,357	94,415
48	93,861	92,331	93,952	94,010	94,069
49	93,493	91,896	93,577	93,635	93,693

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	93,093	91,429	93,169	93,227	93,285
51	92,659	90,928	92,727	92,785	92,842
52	92,188	90,388	92,247	92,305	92,362
53	91,678	89,809	91,727	91,784	91,841
54	91,125	89,187	91,163	91,220	91,276
55	90,527	88,518	90,553	90,609	90,665
56	89,880	87,800	89,891	89,947	90,003
57	89,179	87,028	89,176	89,231	89,286
58	88,420	86,200	88,402	88,457	88,512
59	87,599	85,311	87,567	87,621	87,675
60	86,711	84,358	86,664	86,718	86,772
61	85,752	83,337	85,692	85,745	85,798
62	84,717	82,243	84,644	84,696	84,748
63	83,601	81,072	83,516	83,568	83,619
64	82,398	79,820	82,304	82,355	82,406
65	81,105	78,484	81,003	81,053	81,103
66	79,715	77,058	79,609	79,658	79,707
67	78,224	75,540	78,116	78,165	78,213
68	76,627	73,924	76,522	76,570	76,617
69	74,919	72,209	74,823	74,869	74,915
70	73,097	70,391	73,014	73,059	73,104
71	71,156	68,468	71,093	71,137	71,181
72	69,093	66,437	69,058	69,101	69,144
73	66,907	64,300	66,908	66,949	66,990
74	64,596	62,054	64,641	64,681	64,721
75	62,160	59,703	62,260	62,299	62,338
76	59,602	57,248	59,767	59,804	59,841
77	56,946	54,694	57,165	57,201	57,236
78	54,200	52,046	54,460	54,494	54,528
79	51,372	49,313	51,661	51,693	51,725
80	48,472	46,504	48,775	48,806	48,836
81	45,513	43,631	45,817	45,845	45,874
82	42,508	40,709	42,800	42,826	42,853
83	39,475	37,753	39,740	39,765	39,789
84	36,431	34,781	36,657	36,680	36,703
85	33,397	31,814	33,573	33,593	33,614
86	30,391	28,875	30,509	30,528	30,547
87	27,432	25,985	27,491	27,508	27,525
88	24,541	23,170	24,544	24,560	24,575
89	21,740	20,453	21,695	21,708	21,722
90	19,051	17,858	18,968	18,980	18,991
91	16,496	15,408	16,388	16,398	16,408
92	14,097	13,124	13,977	13,986	13,994
93	11,872	11,022	11,754	11,762	11,769
94	9,840	9,116	9,735	9,741	9,747
95	8,012	7,415	7,930	7,934	7,939
96	6,397	5,923	6,343	6,347	6,351
97	4,998	4,639	4,975	4,978	4,981
98	3,811	3,556	3,819	3,821	3,824
99	2,830	2,663	2,864	2,866	2,868
100	2,039	1,944	2,094	2,096	2,097

Año 2020

Hombres

Tabla de mortalidad

2020	CUADRO A.4.1.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.011092	100,000	1,109	99,445	7,480,954	74.81
1	0.001185	98,891	117	98,832	7,381,508	74.64
2	0.000570	98,774	56	98,746	7,282,676	73.73
3	0.000368	98,717	36	98,699	7,183,931	72.77
4	0.000278	98,681	27	98,667	7,085,231	71.80
5	0.000213	98,654	21	98,643	6,986,564	70.82
6	0.000183	98,633	18	98,624	6,887,921	69.83
7	0.000170	98,615	17	98,606	6,789,298	68.85
8	0.000168	98,598	17	98,590	6,690,691	67.86
9	0.000176	98,581	17	98,573	6,592,102	66.87
10	0.000195	98,564	19	98,554	6,493,529	65.88
11	0.000219	98,545	22	98,534	6,394,975	64.89
12	0.000249	98,523	25	98,511	6,296,441	63.91
13	0.000289	98,499	28	98,484	6,197,930	62.92
14	0.000340	98,470	33	98,453	6,099,446	61.94
15	0.000404	98,437	40	98,417	6,000,992	60.96
16	0.000481	98,397	47	98,373	5,902,575	59.99
17	0.000569	98,350	56	98,322	5,804,202	59.02
18	0.000666	98,294	65	98,261	5,705,880	58.05
19	0.000766	98,228	75	98,191	5,607,619	57.09
20	0.000866	98,153	85	98,110	5,509,429	56.13
21	0.000962	98,068	94	98,021	5,411,318	55.18
22	0.001049	97,974	103	97,922	5,313,298	54.23
23	0.001128	97,871	110	97,816	5,215,375	53.29
24	0.001197	97,760	117	97,702	5,117,560	52.35
25	0.001256	97,643	123	97,582	5,019,858	51.41
26	0.001308	97,521	128	97,457	4,922,276	50.47
27	0.001354	97,393	132	97,327	4,824,819	49.54
28	0.001398	97,261	136	97,193	4,727,492	48.61
29	0.001441	97,125	140	97,055	4,630,298	47.67
30	0.001486	96,985	144	96,913	4,533,243	46.74
31	0.001536	96,841	149	96,767	4,436,330	45.81
32	0.001593	96,693	154	96,616	4,339,563	44.88
33	0.001658	96,539	160	96,458	4,242,947	43.95
34	0.001735	96,378	167	96,295	4,146,489	43.02
35	0.001824	96,211	176	96,123	4,050,194	42.10
36	0.001927	96,036	185	95,943	3,954,071	41.17
37	0.002046	95,851	196	95,753	3,858,127	40.25
38	0.002182	95,654	209	95,550	3,762,375	39.33
39	0.002336	95,446	223	95,334	3,666,825	38.42
40	0.002510	95,223	239	95,103	3,571,491	37.51
41	0.002704	94,984	257	94,855	3,476,387	36.60
42	0.002921	94,727	277	94,589	3,381,532	35.70
43	0.003161	94,450	299	94,301	3,286,944	34.80
44	0.003425	94,152	322	93,990	3,192,643	33.91
45	0.003716	93,829	349	93,655	3,098,652	33.02
46	0.004034	93,481	377	93,292	3,004,997	32.15
47	0.004382	93,103	408	92,899	2,911,705	31.27
48	0.004761	92,695	441	92,475	2,818,806	30.41
49	0.005173	92,254	477	92,015	2,726,331	29.55

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.005621	91,777	516	91,519	2,634,316	28.70
51	0.006106	91,261	557	90,982	2,542,797	27.86
52	0.006632	90,704	602	90,403	2,451,815	27.03
53	0.007200	90,102	649	89,778	2,361,412	26.21
54	0.007815	89,453	699	89,104	2,271,634	25.39
55	0.008479	88,754	753	88,378	2,182,530	24.59
56	0.009211	88,002	811	87,596	2,094,152	23.80
57	0.010006	87,191	872	86,755	2,006,555	23.01
58	0.010869	86,319	938	85,850	1,919,801	22.24
59	0.011806	85,381	1,008	84,877	1,833,951	21.48
60	0.012823	84,373	1,082	83,832	1,749,074	20.73
61	0.013928	83,291	1,160	82,711	1,665,243	19.99
62	0.015127	82,131	1,242	81,509	1,582,532	19.27
63	0.016428	80,888	1,329	80,224	1,501,023	18.56
64	0.017840	79,559	1,419	78,850	1,420,799	17.86
65	0.019372	78,140	1,514	77,383	1,341,949	17.17
66	0.021034	76,626	1,612	75,820	1,264,566	16.50
67	0.022837	75,015	1,713	74,158	1,188,746	15.85
68	0.024793	73,301	1,817	72,393	1,114,588	15.21
69	0.026914	71,484	1,924	70,522	1,042,195	14.58
70	0.029214	69,560	2,032	68,544	971,673	13.97
71	0.031707	67,528	2,141	66,457	903,129	13.37
72	0.034409	65,387	2,250	64,262	836,671	12.80
73	0.037337	63,137	2,357	61,958	772,409	12.23
74	0.040509	60,780	2,462	59,549	710,451	11.69
75	0.043944	58,318	2,563	57,036	650,902	11.16
76	0.047307	55,755	2,638	54,436	593,866	10.65
77	0.050914	53,117	2,704	51,765	539,430	10.16
78	0.054779	50,413	2,762	49,032	487,665	9.67
79	0.058909	47,651	2,807	46,248	438,633	9.21
80	0.063324	44,844	2,840	43,424	392,385	8.75
81	0.068036	42,005	2,858	40,576	348,961	8.31
82	0.073065	39,147	2,860	37,717	308,385	7.88
83	0.078427	36,286	2,846	34,864	270,668	7.46
84	0.084138	33,441	2,814	32,034	235,805	7.05
85	0.090370	30,627	2,768	29,243	203,771	6.65
86	0.097175	27,859	2,707	26,506	174,528	6.26
87	0.104610	25,152	2,631	23,836	148,022	5.89
88	0.112735	22,521	2,539	21,251	124,186	5.51
89	0.121619	19,982	2,430	18,767	102,935	5.15
90	0.131332	17,552	2,305	16,399	84,168	4.80
91	0.141953	15,247	2,164	14,164	67,769	4.44
92	0.153566	13,082	2,009	12,078	53,604	4.10
93	0.166807	11,073	1,847	10,150	41,526	3.75
94	0.181240	9,226	1,672	8,390	31,377	3.40
95	0.196958	7,554	1,488	6,810	22,986	3.04
96	0.214056	6,066	1,299	5,417	16,176	2.67
97	0.232633	4,768	1,109	4,213	10,759	2.26
98	0.252783	3,659	925	3,196	6,546	1.79
99	0.274597	2,734	751	2,358	3,350	1.23
100	1.000000	1,983	1,983	992	992	0.50

Estimación

2020	CUADRO A.4.1.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	98,891	99,163	99,240	99,321	99,402
2	98,774	99,091	99,170	99,251	99,332
3	98,717	99,018	99,102	99,182	99,263
4	98,681	98,944	99,034	99,115	99,195
5	98,654	98,869	98,968	99,048	99,129
6	98,633	98,792	98,902	98,982	99,063
7	98,615	98,714	98,837	98,917	98,998
8	98,598	98,634	98,773	98,853	98,933
9	98,581	98,552	98,709	98,789	98,869
10	98,564	98,469	98,645	98,726	98,806
11	98,545	98,384	98,582	98,662	98,743
12	98,523	98,297	98,519	98,599	98,679
13	98,499	98,207	98,456	98,536	98,616
14	98,470	98,115	98,392	98,472	98,552
15	98,437	98,020	98,328	98,408	98,488
16	98,397	97,922	98,263	98,343	98,423
17	98,350	97,821	98,197	98,277	98,357
18	98,294	97,717	98,130	98,210	98,290
19	98,228	97,609	98,062	98,141	98,221
20	98,153	97,497	97,991	98,071	98,151
21	98,068	97,381	97,918	97,998	98,078
22	97,974	97,260	97,843	97,923	98,003
23	97,871	97,135	97,765	97,845	97,924
24	97,760	97,003	97,684	97,763	97,843
25	97,643	96,866	97,598	97,678	97,757
26	97,521	96,723	97,509	97,588	97,668
27	97,393	96,573	97,414	97,494	97,573
28	97,261	96,415	97,315	97,394	97,473
29	97,125	96,250	97,209	97,288	97,367
30	96,985	96,076	97,097	97,176	97,255
31	96,841	95,893	96,977	97,056	97,135
32	96,693	95,700	96,850	96,928	97,007
33	96,539	95,496	96,713	96,792	96,871
34	96,378	95,281	96,567	96,645	96,724
35	96,211	95,053	96,410	96,488	96,567
36	96,036	94,812	96,241	96,319	96,398
37	95,851	94,557	96,060	96,138	96,216
38	95,654	94,286	95,864	95,942	96,020
39	95,446	93,998	95,653	95,731	95,809
40	95,223	93,693	95,426	95,504	95,581
41	94,984	93,368	95,181	95,258	95,336
42	94,727	93,022	94,916	94,993	95,070
43	94,450	92,654	94,630	94,707	94,784
44	94,152	92,262	94,321	94,398	94,474
45	93,829	91,844	93,987	94,063	94,140
46	93,481	91,399	93,626	93,702	93,779
47	93,103	90,925	93,237	93,312	93,388
48	92,695	90,419	92,816	92,891	92,967
49	92,254	89,879	92,361	92,436	92,511

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	91,777	89,302	91,870	91,945	92,020
51	91,261	88,688	91,341	91,415	91,489
52	90,704	88,032	90,770	90,843	90,917
53	90,102	87,332	90,154	90,227	90,300
54	89,453	86,586	89,490	89,563	89,636
55	88,754	85,790	88,775	88,848	88,920
56	88,002	84,942	88,006	88,078	88,150
57	87,191	84,038	87,179	87,250	87,321
58	86,319	83,075	86,291	86,361	86,432
59	85,381	82,050	85,338	85,407	85,476
60	84,373	80,959	84,315	84,384	84,452
61	83,291	79,800	83,220	83,288	83,355
62	82,131	78,568	82,048	82,115	82,182
63	80,888	77,261	80,796	80,862	80,927
64	79,559	75,876	79,460	79,524	79,589
65	78,140	74,409	78,036	78,099	78,163
66	76,626	72,858	76,521	76,583	76,646
67	75,015	71,220	74,912	74,973	75,034
68	73,301	69,493	73,206	73,266	73,325
69	71,484	67,676	71,401	71,459	71,517
70	69,560	65,767	69,495	69,552	69,608
71	67,528	63,766	67,487	67,542	67,597
72	65,387	61,674	65,377	65,430	65,483
73	63,137	59,491	63,165	63,216	63,268
74	60,780	57,219	60,853	60,902	60,952
75	58,318	54,862	58,444	58,491	58,539
76	55,755	52,425	55,942	55,987	56,033
77	53,117	49,913	53,352	53,396	53,439
78	50,413	47,334	50,683	50,724	50,765
79	47,651	44,696	47,943	47,982	48,021
80	44,844	42,010	45,142	45,179	45,216
81	42,005	39,289	42,294	42,328	42,363
82	39,147	36,545	39,412	39,444	39,476
83	36,286	33,794	36,513	36,543	36,572
84	33,441	31,054	33,614	33,642	33,669
85	30,627	28,340	30,735	30,760	30,785
86	27,859	25,673	27,896	27,919	27,941
87	25,152	23,071	25,117	25,138	25,158
88	22,521	20,554	22,421	22,439	22,457
89	19,982	18,140	19,827	19,843	19,860
90	17,552	15,849	17,357	17,372	17,386
91	15,247	13,696	15,030	15,042	15,054
92	13,082	11,696	12,861	12,872	12,882
93	11,073	9,860	10,865	10,874	10,883
94	9,226	8,198	9,053	9,060	9,068
95	7,554	6,715	7,431	7,437	7,443
96	6,066	5,411	6,001	6,006	6,011
97	4,768	4,285	4,762	4,766	4,770
98	3,659	3,329	3,708	3,711	3,714
99	2,734	2,534	2,829	2,831	2,833
100	1,983	1,886	2,110	2,112	2,114

Mujeres

Tabla de mortalidad

2020	CUADRO A.4.2.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.008853	100,000	885	99,557	7,931,895	79.32
1	0.000963	99,115	95	99,067	7,832,338	79.02
2	0.000497	99,019	49	98,995	7,733,271	78.10
3	0.000322	98,970	32	98,954	7,634,276	77.14
4	0.000233	98,938	23	98,927	7,535,322	76.16
5	0.000186	98,915	18	98,906	7,436,396	75.18
6	0.000151	98,897	15	98,889	7,337,490	74.19
7	0.000129	98,882	13	98,875	7,238,600	73.20
8	0.000117	98,869	12	98,863	7,139,725	72.21
9	0.000112	98,857	11	98,852	7,040,862	71.22
10	0.000113	98,846	11	98,841	6,942,010	70.23
11	0.000120	98,835	12	98,829	6,843,169	69.24
12	0.000133	98,823	13	98,817	6,744,340	68.25
13	0.000151	98,810	15	98,803	6,645,523	67.26
14	0.000172	98,795	17	98,787	6,546,720	66.27
15	0.000194	98,778	19	98,769	6,447,933	65.28
16	0.000214	98,759	21	98,748	6,349,165	64.29
17	0.000231	98,738	23	98,726	6,250,416	63.30
18	0.000244	98,715	24	98,703	6,151,690	62.32
19	0.000253	98,691	25	98,679	6,052,987	61.33
20	0.000258	98,666	25	98,653	5,954,308	60.35
21	0.000262	98,641	26	98,628	5,855,655	59.36
22	0.000265	98,615	26	98,602	5,757,027	58.38
23	0.000269	98,589	27	98,575	5,658,425	57.39
24	0.000274	98,562	27	98,549	5,559,850	56.41
25	0.000282	98,535	28	98,521	5,461,302	55.42
26	0.000292	98,507	29	98,493	5,362,780	54.44
27	0.000306	98,479	30	98,463	5,264,287	53.46
28	0.000324	98,448	32	98,432	5,165,824	52.47
29	0.000347	98,416	34	98,399	5,067,392	51.49
30	0.000375	98,382	37	98,364	4,968,992	50.51
31	0.000407	98,345	40	98,325	4,870,629	49.53
32	0.000446	98,305	44	98,283	4,772,303	48.55
33	0.000491	98,261	48	98,237	4,674,020	47.57
34	0.000543	98,213	53	98,187	4,575,783	46.59
35	0.000602	98,160	59	98,130	4,477,596	45.62
36	0.000669	98,101	66	98,068	4,379,466	44.64
37	0.000745	98,035	73	97,999	4,281,398	43.67
38	0.000831	97,962	81	97,921	4,183,399	42.70
39	0.000927	97,881	91	97,835	4,085,478	41.74
40	0.001034	97,790	101	97,740	3,987,642	40.78
41	0.001153	97,689	113	97,633	3,889,903	39.82
42	0.001285	97,576	125	97,514	3,792,270	38.86
43	0.001432	97,451	140	97,381	3,694,756	37.91
44	0.001595	97,311	155	97,234	3,597,375	36.97
45	0.001774	97,156	172	97,070	3,500,141	36.03
46	0.001972	96,984	191	96,888	3,403,072	35.09
47	0.002190	96,792	212	96,687	3,306,183	34.16
48	0.002430	96,581	235	96,463	3,209,497	33.23
49	0.002693	96,346	259	96,216	3,113,034	32.31

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.002982	96,086	287	95,943	3,016,818	31.40
51	0.003299	95,800	316	95,642	2,920,874	30.49
52	0.003647	95,484	348	95,310	2,825,233	29.59
53	0.004028	95,136	383	94,944	2,729,923	28.70
54	0.004445	94,752	421	94,542	2,634,979	27.81
55	0.004903	94,331	462	94,100	2,540,437	26.93
56	0.005415	93,869	508	93,615	2,446,337	26.06
57	0.005982	93,360	558	93,081	2,352,723	25.20
58	0.006607	92,802	613	92,495	2,259,641	24.35
59	0.007297	92,189	673	91,852	2,167,146	23.51
60	0.008059	91,516	738	91,147	2,075,294	22.68
61	0.008901	90,779	808	90,375	1,984,146	21.86
62	0.009830	89,971	884	89,528	1,893,772	21.05
63	0.010855	89,086	967	88,603	1,804,243	20.25
64	0.011987	88,119	1,056	87,591	1,715,641	19.47
65	0.013236	87,063	1,152	86,487	1,628,050	18.70
66	0.014614	85,910	1,255	85,283	1,541,563	17.94
67	0.016134	84,655	1,366	83,972	1,456,280	17.20
68	0.017811	83,289	1,483	82,547	1,372,308	16.48
69	0.019660	81,806	1,608	81,002	1,289,761	15.77
70	0.021700	80,197	1,740	79,327	1,208,759	15.07
71	0.023948	78,457	1,879	77,518	1,129,432	14.40
72	0.026426	76,578	2,024	75,566	1,051,914	13.74
73	0.029157	74,555	2,174	73,468	976,348	13.10
74	0.032165	72,381	2,328	71,217	902,880	12.47
75	0.035478	70,053	2,485	68,810	831,663	11.87
76	0.038733	67,567	2,617	66,259	762,853	11.29
77	0.042274	64,950	2,746	63,577	696,594	10.73
78	0.046122	62,205	2,869	60,770	633,017	10.18
79	0.050309	59,336	2,985	57,843	572,247	9.64
80	0.054858	56,351	3,091	54,805	514,404	9.13
81	0.059798	53,259	3,185	51,667	459,599	8.63
82	0.065154	50,074	3,263	48,443	407,932	8.15
83	0.070953	46,812	3,321	45,151	359,489	7.68
84	0.077226	43,490	3,359	41,811	314,337	7.23
85	0.084085	40,132	3,374	38,445	272,526	6.79
86	0.091582	36,757	3,366	35,074	234,082	6.37
87	0.099772	33,391	3,331	31,725	199,007	5.96
88	0.108719	30,060	3,268	28,426	167,282	5.57
89	0.118487	26,792	3,174	25,204	138,857	5.18
90	0.129146	23,617	3,050	22,092	113,652	4.81
91	0.140772	20,567	2,895	19,119	91,560	4.45
92	0.153441	17,672	2,712	16,316	72,441	4.10
93	0.166684	14,960	2,494	13,713	56,125	3.75
94	0.181117	12,467	2,258	11,338	42,411	3.40
95	0.196838	10,209	2,009	9,204	31,074	3.04
96	0.213939	8,199	1,754	7,322	21,870	2.67
97	0.232517	6,445	1,499	5,696	14,548	2.26
98	0.252668	4,946	1,250	4,322	8,852	1.79
99	0.274484	3,697	1,015	3,189	4,530	1.23
100	1.000000	2,682	2,682	1,341	1,341	0.50

Estimación

2020	CUADRO A.4.2.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	99,115	99,127	99,183	99,242	99,302
2	99,019	99,086	99,144	99,203	99,263
3	98,970	99,045	99,107	99,166	99,226
4	98,938	99,003	99,071	99,131	99,190
5	98,915	98,961	99,037	99,097	99,156
6	98,897	98,918	99,005	99,064	99,124
7	98,882	98,875	98,974	99,033	99,092
8	98,869	98,832	98,944	99,003	99,063
9	98,857	98,787	98,916	98,975	99,035
10	98,846	98,742	98,889	98,948	99,008
11	98,835	98,696	98,863	98,922	98,982
12	98,823	98,649	98,838	98,898	98,957
13	98,810	98,602	98,815	98,874	98,934
14	98,795	98,553	98,792	98,852	98,911
15	98,778	98,503	98,771	98,830	98,889
16	98,759	98,451	98,749	98,809	98,868
17	98,738	98,399	98,729	98,788	98,847
18	98,715	98,345	98,709	98,768	98,827
19	98,691	98,289	98,689	98,749	98,808
20	98,666	98,231	98,670	98,729	98,788
21	98,641	98,172	98,650	98,710	98,769
22	98,615	98,110	98,631	98,690	98,749
23	98,589	98,046	98,610	98,670	98,729
24	98,562	97,979	98,590	98,649	98,708
25	98,535	97,909	98,568	98,627	98,686
26	98,507	97,836	98,545	98,604	98,663
27	98,479	97,760	98,521	98,580	98,639
28	98,448	97,680	98,494	98,553	98,612
29	98,416	97,595	98,466	98,525	98,584
30	98,382	97,507	98,435	98,494	98,553
31	98,345	97,413	98,401	98,460	98,519
32	98,305	97,314	98,363	98,422	98,481
33	98,261	97,209	98,321	98,380	98,439
34	98,213	97,097	98,275	98,334	98,393
35	98,160	96,979	98,223	98,282	98,341
36	98,101	96,853	98,165	98,224	98,283
37	98,035	96,718	98,101	98,160	98,219
38	97,962	96,574	98,029	98,088	98,147
39	97,881	96,420	97,949	98,008	98,067
40	97,790	96,254	97,859	97,918	97,977
41	97,689	96,077	97,759	97,818	97,876
42	97,576	95,887	97,647	97,706	97,764
43	97,451	95,682	97,522	97,581	97,640
44	97,311	95,461	97,383	97,442	97,500
45	97,156	95,224	97,229	97,287	97,345
46	96,984	94,967	97,056	97,114	97,173
47	96,792	94,691	96,865	96,923	96,981
48	96,581	94,392	96,652	96,710	96,768
49	96,346	94,069	96,416	96,473	96,531

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	96,086	93,719	96,154	96,212	96,269
51	95,800	93,341	95,864	95,922	95,979
52	95,484	92,932	95,544	95,601	95,659
53	95,136	92,489	95,190	95,247	95,304
54	94,752	92,010	94,799	94,856	94,913
55	94,331	91,491	94,368	94,425	94,482
56	93,869	90,928	93,894	93,950	94,007
57	93,360	90,319	93,372	93,428	93,484
58	92,802	89,660	92,799	92,855	92,910
59	92,189	88,947	92,170	92,225	92,281
60	91,516	88,174	91,480	91,535	91,590
61	90,779	87,339	90,725	90,779	90,834
62	89,971	86,436	89,899	89,953	90,007
63	89,086	85,461	88,998	89,051	89,104
64	88,119	84,408	88,014	88,067	88,120
65	87,063	83,272	86,944	86,996	87,048
66	85,910	82,047	85,779	85,831	85,882
67	84,655	80,730	84,516	84,567	84,617
68	83,289	79,313	83,147	83,197	83,247
69	81,806	77,792	81,666	81,715	81,764
70	80,197	76,162	80,068	80,116	80,164
71	78,457	74,418	78,347	78,394	78,441
72	76,578	72,556	76,498	76,544	76,589
73	74,555	70,572	74,515	74,560	74,605
74	72,381	68,462	72,396	72,439	72,483
75	70,053	66,226	70,137	70,179	70,222
76	67,567	63,862	67,737	67,778	67,819
77	64,950	61,371	65,196	65,236	65,275
78	62,205	58,755	62,516	62,553	62,591
79	59,336	56,019	59,700	59,736	59,772
80	56,351	53,169	56,755	56,789	56,823
81	53,259	50,215	53,689	53,721	53,753
82	50,074	47,168	50,515	50,545	50,576
83	46,812	44,043	47,248	47,276	47,304
84	43,490	40,858	43,905	43,932	43,958
85	40,132	37,633	40,510	40,534	40,559
86	36,757	34,393	37,087	37,109	37,132
87	33,391	31,164	33,664	33,684	33,704
88	30,060	27,974	30,272	30,290	30,308
89	26,792	24,854	26,944	26,960	26,976
90	23,617	21,834	23,713	23,727	23,741
91	20,567	18,945	20,614	20,626	20,639
92	17,672	16,218	17,679	17,690	17,701
93	14,960	13,679	14,940	14,949	14,958
94	12,467	11,352	12,422	12,429	12,437
95	10,209	9,255	10,146	10,152	10,158
96	8,199	7,399	8,128	8,132	8,137
97	6,445	5,790	6,373	6,377	6,381
98	4,946	4,427	4,882	4,885	4,888
99	3,697	3,299	3,645	3,647	3,650
100	2,682	2,390	2,646	2,648	2,650

Población total

Tabla de mortalidad

2020	CUADRO A.4.3.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.009972	100,000	997	99,501	7,706,424	77.06
1	0.001074	99,003	106	98,950	7,606,923	76.84
2	0.000534	98,896	53	98,870	7,507,973	75.92
3	0.000345	98,844	34	98,827	7,409,103	74.96
4	0.000255	98,810	25	98,797	7,310,277	73.98
5	0.000200	98,784	20	98,774	7,211,480	73.00
6	0.000167	98,765	16	98,756	7,112,705	72.02
7	0.000149	98,748	15	98,741	7,013,949	71.03
8	0.000142	98,733	14	98,726	6,915,208	70.04
9	0.000144	98,719	14	98,712	6,816,482	69.05
10	0.000154	98,705	15	98,698	6,717,770	68.06
11	0.000169	98,690	17	98,682	6,619,072	67.07
12	0.000191	98,673	19	98,664	6,520,390	66.08
13	0.000220	98,654	22	98,644	6,421,726	65.09
14	0.000256	98,633	25	98,620	6,323,083	64.11
15	0.000299	98,607	29	98,593	6,224,463	63.12
16	0.000347	98,578	34	98,561	6,125,870	62.14
17	0.000400	98,544	39	98,524	6,027,309	61.16
18	0.000454	98,504	45	98,482	5,928,785	60.19
19	0.000509	98,460	50	98,435	5,830,303	59.22
20	0.000562	98,410	55	98,382	5,731,869	58.25
21	0.000611	98,354	60	98,324	5,633,487	57.28
22	0.000656	98,294	64	98,262	5,535,162	56.31
23	0.000697	98,230	68	98,195	5,436,900	55.35
24	0.000734	98,161	72	98,125	5,338,705	54.39
25	0.000767	98,089	75	98,052	5,240,580	53.43
26	0.000798	98,014	78	97,975	5,142,528	52.47
27	0.000827	97,936	81	97,895	5,044,553	51.51
28	0.000858	97,855	84	97,813	4,946,658	50.55
29	0.000890	97,771	87	97,727	4,848,845	49.59
30	0.000926	97,684	90	97,639	4,751,118	48.64
31	0.000967	97,593	94	97,546	4,653,479	47.68
32	0.001015	97,499	99	97,449	4,555,933	46.73
33	0.001070	97,400	104	97,348	4,458,484	45.77
34	0.001133	97,296	110	97,241	4,361,136	44.82
35	0.001207	97,186	117	97,127	4,263,895	43.87
36	0.001292	97,068	125	97,006	4,166,768	42.93
37	0.001388	96,943	135	96,876	4,069,763	41.98
38	0.001498	96,808	145	96,736	3,972,887	41.04
39	0.001623	96,663	157	96,585	3,876,151	40.10
40	0.001762	96,506	170	96,421	3,779,566	39.16
41	0.001918	96,336	185	96,244	3,683,145	38.23
42	0.002091	96,152	201	96,051	3,586,901	37.30
43	0.002283	95,951	219	95,841	3,490,850	36.38
44	0.002495	95,732	239	95,612	3,395,009	35.46
45	0.002728	95,493	261	95,362	3,299,397	34.55
46	0.002984	95,232	284	95,090	3,204,034	33.64
47	0.003265	94,948	310	94,793	3,108,944	32.74
48	0.003572	94,638	338	94,469	3,014,151	31.85
49	0.003906	94,300	368	94,116	2,919,682	30.96

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.004271	93,932	401	93,731	2,825,567	30.08
51	0.004669	93,530	437	93,312	2,731,836	29.21
52	0.005101	93,094	475	92,856	2,638,524	28.34
53	0.005571	92,619	516	92,361	2,545,667	27.49
54	0.006082	92,103	560	91,823	2,453,306	26.64
55	0.006636	91,543	608	91,239	2,361,484	25.80
56	0.007252	90,935	659	90,606	2,270,245	24.97
57	0.007925	90,276	715	89,918	2,179,639	24.14
58	0.008661	89,560	776	89,173	2,089,721	23.33
59	0.009465	88,785	840	88,365	2,000,548	22.53
60	0.010345	87,944	910	87,489	1,912,184	21.74
61	0.011306	87,035	984	86,543	1,824,695	20.97
62	0.012358	86,051	1,063	85,519	1,738,152	20.20
63	0.013507	84,987	1,148	84,413	1,652,633	19.45
64	0.014764	83,839	1,238	83,220	1,568,220	18.71
65	0.016138	82,601	1,333	81,935	1,485,000	17.98
66	0.017640	81,268	1,434	80,552	1,403,065	17.26
67	0.019283	79,835	1,539	79,065	1,322,513	16.57
68	0.021079	78,295	1,650	77,470	1,243,448	15.88
69	0.023043	76,645	1,766	75,762	1,165,978	15.21
70	0.025190	74,879	1,886	73,936	1,090,216	14.56
71	0.027537	72,993	2,010	71,988	1,016,280	13.92
72	0.030103	70,983	2,137	69,914	944,293	13.30
73	0.032908	68,846	2,266	67,713	874,378	12.70
74	0.035973	66,580	2,395	65,383	806,665	12.12
75	0.039324	64,185	2,524	62,923	741,283	11.55
76	0.042609	61,661	2,627	60,347	678,360	11.00
77	0.046161	59,034	2,725	57,671	618,012	10.47
78	0.049997	56,309	2,815	54,901	560,341	9.95
79	0.054140	53,493	2,896	52,045	505,440	9.45
80	0.058610	50,597	2,965	49,115	453,394	8.96
81	0.063430	47,632	3,021	46,121	404,280	8.49
82	0.068625	44,611	3,061	43,080	358,158	8.03
83	0.074217	41,549	3,084	40,007	315,079	7.58
84	0.080231	38,466	3,086	36,922	275,071	7.15
85	0.086806	35,379	3,071	33,844	238,149	6.73
86	0.093993	32,308	3,037	30,790	204,305	6.32
87	0.101851	29,272	2,981	27,781	173,515	5.93
88	0.110439	26,290	2,903	24,838	145,734	5.54
89	0.119825	23,387	2,802	21,986	120,896	5.17
90	0.130078	20,584	2,678	19,246	98,910	4.81
91	0.141275	17,907	2,530	16,642	79,664	4.45
92	0.153494	15,377	2,360	14,197	63,022	4.10
93	0.166736	13,017	2,170	11,932	48,826	3.75
94	0.181170	10,846	1,965	9,864	36,894	3.40
95	0.196889	8,881	1,749	8,007	27,030	3.04
96	0.213989	7,133	1,526	6,370	19,023	2.67
97	0.232566	5,606	1,304	4,954	12,653	2.26
98	0.252717	4,303	1,087	3,759	7,699	1.79
99	0.274532	3,215	883	2,774	3,940	1.23
100	1.000000	2,333	2,333	1,166	1,166	0.50

Estimación

2020	CUADRO A.4.3.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	99,003	99,121	99,186	99,253	99,320
2	98,896	99,070	99,136	99,203	99,271
3	98,844	99,018	99,087	99,155	99,222
4	98,810	98,966	99,040	99,107	99,174
5	98,784	98,912	98,993	99,060	99,128
6	98,765	98,858	98,947	99,015	99,082
7	98,748	98,803	98,903	98,970	99,037
8	98,733	98,747	98,858	98,925	98,992
9	98,719	98,690	98,815	98,882	98,949
10	98,705	98,632	98,772	98,839	98,906
11	98,690	98,572	98,729	98,796	98,863
12	98,673	98,511	98,687	98,754	98,821
13	98,654	98,449	98,645	98,711	98,778
14	98,633	98,385	98,602	98,669	98,736
15	98,607	98,320	98,560	98,627	98,694
16	98,578	98,252	98,518	98,585	98,652
17	98,544	98,182	98,475	98,542	98,609
18	98,504	98,111	98,432	98,498	98,565
19	98,460	98,036	98,387	98,454	98,521
20	98,410	97,959	98,342	98,409	98,476
21	98,354	97,880	98,296	98,362	98,429
22	98,294	97,796	98,247	98,314	98,381
23	98,230	97,710	98,198	98,264	98,331
24	98,161	97,620	98,146	98,212	98,279
25	98,089	97,526	98,091	98,158	98,224
26	98,014	97,427	98,034	98,100	98,167
27	97,936	97,323	97,973	98,040	98,106
28	97,855	97,215	97,909	97,975	98,042
29	97,771	97,100	97,841	97,907	97,973
30	97,684	96,980	97,768	97,834	97,900
31	97,593	96,852	97,689	97,756	97,822
32	97,499	96,718	97,605	97,672	97,738
33	97,400	96,575	97,515	97,581	97,647
34	97,296	96,424	97,417	97,483	97,550
35	97,186	96,264	97,312	97,378	97,444
36	97,068	96,093	97,198	97,264	97,329
37	96,943	95,912	97,074	97,140	97,205
38	96,808	95,718	96,939	97,005	97,071
39	96,663	95,511	96,793	96,859	96,924
40	96,506	95,291	96,634	96,699	96,765
41	96,336	95,055	96,461	96,526	96,592
42	96,152	94,803	96,272	96,337	96,403
43	95,951	94,532	96,067	96,132	96,197
44	95,732	94,243	95,843	95,908	95,973
45	95,493	93,932	95,599	95,664	95,728
46	95,232	93,599	95,333	95,397	95,462
47	94,948	93,241	95,043	95,108	95,172
48	94,638	92,856	94,727	94,792	94,856
49	94,300	92,443	94,383	94,447	94,511

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	93,932	91,999	94,009	94,073	94,136
51	93,530	91,522	93,601	93,664	93,728
52	93,094	91,008	93,157	93,220	93,284
53	92,619	90,456	92,674	92,737	92,800
54	92,103	89,862	92,150	92,212	92,275
55	91,543	89,224	91,580	91,642	91,704
56	90,935	88,537	90,961	91,022	91,084
57	90,276	87,800	90,289	90,350	90,411
58	89,560	87,007	89,561	89,621	89,682
59	88,785	86,155	88,772	88,832	88,892
60	87,944	85,240	87,918	87,978	88,038
61	87,035	84,259	86,996	87,055	87,114
62	86,051	83,207	85,999	86,057	86,116
63	84,987	82,079	84,924	84,981	85,039
64	83,839	80,872	83,765	83,822	83,879
65	82,601	79,582	82,519	82,575	82,631
66	81,268	78,203	81,179	81,234	81,290
67	79,835	76,732	79,743	79,797	79,851
68	78,295	75,165	78,204	78,257	78,310
69	76,645	73,499	76,559	76,611	76,663
70	74,879	71,729	74,804	74,854	74,905
71	72,993	69,853	72,935	72,984	73,034
72	70,983	67,870	70,950	70,998	71,046
73	68,846	65,777	68,847	68,893	68,940
74	66,580	63,574	66,624	66,669	66,715
75	64,185	61,262	64,282	64,326	64,370
76	61,661	58,842	61,823	61,865	61,907
77	59,034	56,319	59,249	59,289	59,329
78	56,309	53,697	56,565	56,603	56,641
79	53,493	50,983	53,777	53,814	53,850
80	50,597	48,185	50,895	50,930	50,964
81	47,632	45,316	47,930	47,962	47,995
82	44,611	42,387	44,895	44,925	44,956
83	41,549	39,415	41,805	41,834	41,862
84	38,466	36,417	38,681	38,707	38,733
85	35,379	33,413	35,541	35,565	35,590
86	32,308	30,425	32,410	32,432	32,454
87	29,272	27,476	29,312	29,332	29,351
88	26,290	24,591	26,272	26,290	26,308
89	23,387	21,793	23,319	23,334	23,350
90	20,584	19,109	20,478	20,492	20,505
91	17,907	16,562	17,775	17,787	17,799
92	15,377	14,174	15,236	15,246	15,257
93	13,017	11,964	12,881	12,890	12,898
94	10,846	9,948	10,728	10,735	10,742
95	8,881	8,138	8,790	8,796	8,802
96	7,133	6,540	7,076	7,080	7,085
97	5,606	5,155	5,586	5,590	5,594
98	4,303	3,979	4,319	4,322	4,325
99	3,215	3,001	3,263	3,265	3,268
100	2,333	2,208	2,405	2,406	2,408

Año 2025

Hombres

Tabla de mortalidad

2025	CUADRO A.5.1.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.009274	100,000	927	99,536	7,572,803	75.73
1	0.001083	99,073	107	99,019	7,473,266	75.43
2	0.000522	98,965	52	98,939	7,374,247	74.51
3	0.000332	98,914	33	98,897	7,275,308	73.55
4	0.000245	98,881	24	98,869	7,176,411	72.58
5	0.000178	98,857	18	98,848	7,077,542	71.59
6	0.000148	98,839	15	98,832	6,978,694	70.61
7	0.000134	98,824	13	98,818	6,879,862	69.62
8	0.000132	98,811	13	98,805	6,781,045	68.63
9	0.000138	98,798	14	98,791	6,682,240	67.64
10	0.000156	98,784	15	98,777	6,583,449	66.64
11	0.000178	98,769	18	98,760	6,484,672	65.65
12	0.000206	98,751	20	98,741	6,385,912	64.67
13	0.000242	98,731	24	98,719	6,287,170	63.68
14	0.000288	98,707	28	98,693	6,188,451	62.70
15	0.000346	98,679	34	98,662	6,089,758	61.71
16	0.000416	98,645	41	98,624	5,991,096	60.73
17	0.000497	98,604	49	98,579	5,892,472	59.76
18	0.000585	98,555	58	98,526	5,793,893	58.79
19	0.000677	98,497	67	98,464	5,695,368	57.82
20	0.000768	98,430	76	98,392	5,596,904	56.86
21	0.000853	98,355	84	98,313	5,498,512	55.90
22	0.000932	98,271	92	98,225	5,400,199	54.95
23	0.001001	98,179	98	98,130	5,301,974	54.00
24	0.001060	98,081	104	98,029	5,203,844	53.06
25	0.001110	97,977	109	97,923	5,105,815	52.11
26	0.001154	97,868	113	97,812	5,007,892	51.17
27	0.001192	97,755	117	97,697	4,910,080	50.23
28	0.001227	97,639	120	97,579	4,812,383	49.29
29	0.001263	97,519	123	97,457	4,714,804	48.35
30	0.001300	97,396	127	97,333	4,617,347	47.41
31	0.001343	97,269	131	97,204	4,520,015	46.47
32	0.001392	97,139	135	97,071	4,422,811	45.53
33	0.001450	97,003	141	96,933	4,325,740	44.59
34	0.001518	96,863	147	96,789	4,228,807	43.66
35	0.001599	96,716	155	96,638	4,132,017	42.72
36	0.001693	96,561	164	96,479	4,035,379	41.79
37	0.001803	96,397	174	96,311	3,938,900	40.86
38	0.001928	96,224	186	96,131	3,842,589	39.93
39	0.002072	96,038	199	95,939	3,746,459	39.01
40	0.002234	95,839	214	95,732	3,650,520	38.09
41	0.002417	95,625	231	95,509	3,554,788	37.17
42	0.002621	95,394	250	95,269	3,459,278	36.26
43	0.002847	95,144	271	95,008	3,364,009	35.36
44	0.003098	94,873	294	94,726	3,269,001	34.46
45	0.003374	94,579	319	94,420	3,174,275	33.56
46	0.003677	94,260	347	94,087	3,079,855	32.67
47	0.004009	93,913	376	93,725	2,985,769	31.79
48	0.004371	93,537	409	93,333	2,892,043	30.92
49	0.004765	93,128	444	92,906	2,798,711	30.05

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.005193	92,684	481	92,444	2,705,805	29.19
51	0.005658	92,203	522	91,942	2,613,361	28.34
52	0.006162	91,681	565	91,399	2,521,419	27.50
53	0.006707	91,116	611	90,811	2,430,020	26.67
54	0.007297	90,505	660	90,175	2,339,209	25.85
55	0.007935	89,845	713	89,488	2,249,034	25.03
56	0.008632	89,132	769	88,747	2,159,546	24.23
57	0.009389	88,362	830	87,948	2,070,799	23.44
58	0.010213	87,533	894	87,086	1,982,851	22.65
59	0.011108	86,639	962	86,158	1,895,765	21.88
60	0.012081	85,677	1,035	85,159	1,809,608	21.12
61	0.013139	84,641	1,112	84,085	1,724,449	20.37
62	0.014289	83,529	1,194	82,933	1,640,363	19.64
63	0.015539	82,336	1,279	81,696	1,557,431	18.92
64	0.016897	81,056	1,370	80,372	1,475,735	18.21
65	0.018373	79,687	1,464	78,955	1,395,363	17.51
66	0.019976	78,223	1,563	77,441	1,316,408	16.83
67	0.021718	76,660	1,665	75,828	1,238,967	16.16
68	0.023610	74,995	1,771	74,110	1,163,139	15.51
69	0.025664	73,225	1,879	72,285	1,089,029	14.87
70	0.027895	71,345	1,990	70,350	1,016,744	14.25
71	0.030316	69,355	2,103	68,304	946,394	13.65
72	0.032944	67,253	2,216	66,145	878,090	13.06
73	0.035796	65,037	2,328	63,873	811,945	12.48
74	0.038889	62,709	2,439	61,490	748,072	11.93
75	0.042244	60,270	2,546	58,997	686,583	11.39
76	0.045515	57,724	2,627	56,411	627,586	10.87
77	0.049025	55,097	2,701	53,746	571,175	10.37
78	0.052790	52,396	2,766	51,013	517,429	9.88
79	0.056807	49,630	2,819	48,220	466,416	9.40
80	0.061098	46,810	2,860	45,380	418,196	8.93
81	0.065672	43,950	2,886	42,507	372,815	8.48
82	0.070548	41,064	2,897	39,616	330,308	8.04
83	0.075746	38,167	2,891	36,722	290,692	7.62
84	0.081274	35,276	2,867	33,843	253,971	7.20
85	0.087315	32,409	2,830	30,994	220,128	6.79
86	0.093919	29,579	2,778	28,190	189,134	6.39
87	0.101148	26,801	2,711	25,446	160,944	6.01
88	0.109061	24,090	2,627	22,777	135,498	5.62
89	0.117729	21,463	2,527	20,200	112,721	5.25
90	0.127228	18,936	2,409	17,732	92,522	4.89
91	0.137632	16,527	2,275	15,390	74,790	4.53
92	0.149033	14,252	2,124	13,190	59,400	4.17
93	0.162139	12,128	1,966	11,145	46,210	3.81
94	0.176453	10,162	1,793	9,265	35,065	3.45
95	0.192070	8,369	1,607	7,565	25,800	3.08
96	0.209094	6,761	1,414	6,054	18,235	2.70
97	0.227628	5,348	1,217	4,739	12,180	2.28
98	0.247773	4,130	1,023	3,619	7,441	1.80
99	0.269627	3,107	838	2,688	3,823	1.23
100	1.000000	2,269	2,269	1,135	1,135	0.50

Estimación

2025	CUADRO A.5.1.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	99,073	99,356	99,439	99,529	99,618
2	98,965	99,284	99,370	99,460	99,549
3	98,914	99,211	99,303	99,392	99,481
4	98,881	99,138	99,237	99,326	99,415
5	98,857	99,063	99,173	99,261	99,351
6	98,839	98,987	99,109	99,198	99,287
7	98,824	98,909	99,047	99,136	99,225
8	98,811	98,831	98,986	99,075	99,164
9	98,798	98,750	98,927	99,015	99,104
10	98,784	98,668	98,867	98,956	99,045
11	98,769	98,584	98,809	98,898	98,986
12	98,751	98,498	98,751	98,840	98,928
13	98,731	98,409	98,694	98,782	98,871
14	98,707	98,319	98,636	98,725	98,813
15	98,679	98,225	98,579	98,667	98,756
16	98,645	98,129	98,521	98,610	98,698
17	98,604	98,030	98,463	98,551	98,640
18	98,555	97,928	98,404	98,492	98,581
19	98,497	97,823	98,344	98,432	98,521
20	98,430	97,713	98,283	98,371	98,459
21	98,355	97,599	98,220	98,308	98,396
22	98,271	97,481	98,155	98,243	98,332
23	98,179	97,359	98,088	98,176	98,264
24	98,081	97,231	98,018	98,106	98,194
25	97,977	97,097	97,945	98,033	98,121
26	97,868	96,958	97,868	97,956	98,044
27	97,755	96,811	97,787	97,875	97,963
28	97,639	96,658	97,702	97,790	97,877
29	97,519	96,498	97,611	97,699	97,786
30	97,396	96,329	97,514	97,602	97,689
31	97,269	96,151	97,411	97,498	97,586
32	97,139	95,964	97,300	97,387	97,475
33	97,003	95,767	97,181	97,269	97,356
34	96,863	95,558	97,054	97,141	97,228
35	96,716	95,338	96,916	97,003	97,090
36	96,561	95,104	96,767	96,854	96,941
37	96,397	94,857	96,607	96,693	96,780
38	96,224	94,595	96,433	96,520	96,606
39	96,038	94,317	96,245	96,332	96,418
40	95,839	94,021	96,042	96,128	96,214
41	95,625	93,707	95,821	95,907	95,993
42	95,394	93,373	95,582	95,668	95,754
43	95,144	93,017	95,323	95,408	95,494
44	94,873	92,639	95,041	95,127	95,212
45	94,579	92,235	94,736	94,821	94,907
46	94,260	91,805	94,406	94,490	94,575
47	93,913	91,346	94,047	94,132	94,216
48	93,537	90,857	93,659	93,743	93,827
49	93,128	90,335	93,237	93,321	93,405

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	92,684	89,778	92,781	92,865	92,948
51	92,203	89,183	92,288	92,370	92,453
52	91,681	88,549	91,754	91,836	91,918
53	91,116	87,872	91,176	91,258	91,340
54	90,505	87,149	90,552	90,633	90,714
55	89,845	86,378	89,878	89,958	90,039
56	89,132	85,556	89,150	89,230	89,310
57	88,362	84,679	88,366	88,446	88,525
58	87,533	83,745	87,522	87,600	87,679
59	86,639	82,750	86,613	86,691	86,769
60	85,677	81,690	85,637	85,713	85,790
61	84,641	80,563	84,588	84,664	84,740
62	83,529	79,365	83,463	83,538	83,613
63	82,336	78,093	82,258	82,332	82,406
64	81,056	76,743	80,970	81,043	81,115
65	79,687	75,313	79,594	79,665	79,737
66	78,223	73,798	78,126	78,197	78,267
67	76,660	72,198	76,564	76,633	76,702
68	74,995	70,509	74,904	74,972	75,039
69	73,225	68,729	73,144	73,209	73,275
70	71,345	66,858	71,281	71,344	71,408
71	69,355	64,893	69,313	69,375	69,437
72	67,253	62,836	67,240	67,301	67,361
73	65,037	60,686	65,062	65,121	65,179
74	62,709	58,446	62,780	62,837	62,893
75	60,270	56,118	60,397	60,451	60,505
76	57,724	53,706	57,915	57,967	58,019
77	55,097	51,216	55,339	55,389	55,438
78	52,396	48,654	52,677	52,724	52,771
79	49,630	46,028	49,936	49,981	50,026
80	46,810	43,349	47,126	47,169	47,211
81	43,950	40,627	44,260	44,300	44,340
82	41,064	37,877	41,352	41,389	41,426
83	38,167	35,112	38,415	38,450	38,484
84	35,276	32,349	35,469	35,501	35,533
85	32,409	29,605	32,533	32,562	32,591
86	29,579	26,900	29,625	29,652	29,679
87	26,801	24,251	26,769	26,793	26,817
88	24,090	21,680	23,985	24,007	24,028
89	21,463	19,205	21,296	21,315	21,334
90	18,936	16,845	18,723	18,740	18,756
91	16,527	14,618	16,286	16,301	16,315
92	14,252	12,540	14,004	14,016	14,029
93	12,128	10,623	11,892	11,902	11,913
94	10,162	8,878	9,963	9,972	9,981
95	8,369	7,312	8,225	8,233	8,240
96	6,761	5,927	6,684	6,690	6,696
97	5,348	4,723	5,340	5,345	5,350
98	4,130	3,695	4,188	4,191	4,195
99	3,107	2,832	3,219	3,222	3,224
100	2,269	2,125	2,421	2,423	2,425

Mujeres

Tabla de mortalidad

2025	CUADRO A.5.2.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.007402	100,000	740	99,630	8,017,139	80.17
1	0.000891	99,260	88	99,216	7,917,509	79.77
2	0.000448	99,171	44	99,149	7,818,293	78.84
3	0.000281	99,127	28	99,113	7,719,144	77.87
4	0.000198	99,099	20	99,089	7,620,031	76.89
5	0.000155	99,080	15	99,072	7,520,941	75.91
6	0.000122	99,064	12	99,058	7,421,870	74.92
7	0.000102	99,052	10	99,047	7,322,811	73.93
8	0.000091	99,042	9	99,037	7,223,765	72.94
9	0.000087	99,033	9	99,029	7,124,727	71.94
10	0.000089	99,024	9	99,020	7,025,699	70.95
11	0.000095	99,015	9	99,011	6,926,679	69.96
12	0.000107	99,006	11	99,001	6,827,668	68.96
13	0.000123	98,995	12	98,989	6,728,667	67.97
14	0.000142	98,983	14	98,976	6,629,678	66.98
15	0.000161	98,969	16	98,961	6,530,702	65.99
16	0.000178	98,953	18	98,944	6,431,740	65.00
17	0.000192	98,936	19	98,926	6,332,796	64.01
18	0.000201	98,917	20	98,907	6,233,870	63.02
19	0.000207	98,897	20	98,886	6,134,963	62.03
20	0.000210	98,876	21	98,866	6,036,077	61.05
21	0.000211	98,855	21	98,845	5,937,211	60.06
22	0.000212	98,835	21	98,824	5,838,366	59.07
23	0.000213	98,814	21	98,803	5,739,542	58.08
24	0.000216	98,792	21	98,782	5,640,739	57.10
25	0.000221	98,771	22	98,760	5,541,957	56.11
26	0.000229	98,749	23	98,738	5,443,197	55.12
27	0.000239	98,727	24	98,715	5,344,459	54.13
28	0.000254	98,703	25	98,691	5,245,744	53.15
29	0.000272	98,678	27	98,665	5,147,054	52.16
30	0.000295	98,651	29	98,637	5,048,389	51.17
31	0.000322	98,622	32	98,606	4,949,752	50.19
32	0.000355	98,590	35	98,573	4,851,146	49.21
33	0.000393	98,555	39	98,536	4,752,573	48.22
34	0.000438	98,517	43	98,495	4,654,037	47.24
35	0.000489	98,473	48	98,449	4,555,542	46.26
36	0.000548	98,425	54	98,398	4,457,093	45.28
37	0.000615	98,371	61	98,341	4,358,695	44.31
38	0.000691	98,311	68	98,277	4,260,354	43.34
39	0.000777	98,243	76	98,205	4,162,077	42.37
40	0.000873	98,167	86	98,124	4,063,872	41.40
41	0.000981	98,081	96	98,033	3,965,748	40.43
42	0.001102	97,985	108	97,931	3,867,716	39.47
43	0.001236	97,877	121	97,816	3,769,785	38.52
44	0.001386	97,756	135	97,688	3,671,969	37.56
45	0.001551	97,620	151	97,544	3,574,281	36.61
46	0.001734	97,469	169	97,384	3,476,736	35.67
47	0.001936	97,300	188	97,206	3,379,352	34.73
48	0.002159	97,111	210	97,007	3,282,147	33.80
49	0.002404	96,902	233	96,785	3,185,140	32.87

EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.002674	96,669	259	96,539	3,088,355	31.95
51	0.002970	96,410	286	96,267	2,991,816	31.03
52	0.003296	96,124	317	95,965	2,895,549	30.12
53	0.003653	95,807	350	95,632	2,799,583	29.22
54	0.004045	95,457	386	95,264	2,703,951	28.33
55	0.004474	95,071	425	94,858	2,608,687	27.44
56	0.004951	94,646	469	94,411	2,513,829	26.56
57	0.005479	94,177	516	93,919	2,419,418	25.69
58	0.006063	93,661	568	93,377	2,325,499	24.83
59	0.006709	93,093	625	92,781	2,232,122	23.98
60	0.007423	92,469	686	92,125	2,139,341	23.14
61	0.008214	91,782	754	91,405	2,047,215	22.31
62	0.009088	91,028	827	90,615	1,955,810	21.49
63	0.010054	90,201	907	89,748	1,865,195	20.68
64	0.011123	89,294	993	88,798	1,775,448	19.88
65	0.012305	88,301	1,087	87,758	1,686,650	19.10
66	0.013611	87,214	1,187	86,621	1,598,893	18.33
67	0.015056	86,027	1,295	85,380	1,512,272	17.58
68	0.016652	84,732	1,411	84,027	1,426,892	16.84
69	0.018415	83,321	1,534	82,554	1,342,866	16.12
70	0.020364	81,787	1,665	80,954	1,260,312	15.41
71	0.022516	80,121	1,804	79,219	1,179,358	14.72
72	0.024893	78,317	1,950	77,342	1,100,138	14.05
73	0.027517	76,368	2,101	75,317	1,022,796	13.39
74	0.030413	74,266	2,259	73,137	947,479	12.76
75	0.033610	72,008	2,420	70,798	874,342	12.14
76	0.036740	69,587	2,557	68,309	803,544	11.55
77	0.040149	67,031	2,691	65,685	735,235	10.97
78	0.043859	64,340	2,822	62,929	669,550	10.41
79	0.047910	61,518	2,947	60,044	606,621	9.86
80	0.052320	58,570	3,064	57,038	546,577	9.33
81	0.057121	55,506	3,171	53,921	489,539	8.82
82	0.062339	52,335	3,263	50,704	435,618	8.32
83	0.067998	49,073	3,337	47,405	384,914	7.84
84	0.074132	45,736	3,390	44,041	337,510	7.38
85	0.080851	42,346	3,424	40,634	293,469	6.93
86	0.088211	38,922	3,433	37,205	252,835	6.50
87	0.096265	35,489	3,416	33,780	215,630	6.08
88	0.105081	32,072	3,370	30,387	181,850	5.67
89	0.114723	28,702	3,293	27,056	151,462	5.28
90	0.125262	25,409	3,183	23,818	124,407	4.90
91	0.136779	22,226	3,040	20,706	100,589	4.53
92	0.149350	19,186	2,865	17,754	79,883	4.16
93	0.162440	16,321	2,651	14,995	62,129	3.81
94	0.176734	13,670	2,416	12,462	47,134	3.45
95	0.192335	11,254	2,165	10,172	34,672	3.08
96	0.209341	9,089	1,903	8,138	24,500	2.70
97	0.227853	7,187	1,637	6,368	16,363	2.28
98	0.247974	5,549	1,376	4,861	9,995	1.80
99	0.269802	4,173	1,126	3,610	5,134	1.23
100	1.000000	3,047	3,047	1,524	1,524	0.50

Estimación

2025	CUADRO A.5.2.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	99,260	99,277	99,338	99,403	99,469
2	99,171	99,239	99,302	99,367	99,432
3	99,127	99,201	99,267	99,332	99,398
4	99,099	99,162	99,234	99,300	99,365
5	99,080	99,122	99,203	99,268	99,333
6	99,064	99,082	99,173	99,238	99,303
7	99,052	99,042	99,145	99,210	99,275
8	99,042	99,001	99,118	99,183	99,248
9	99,033	98,960	99,093	99,158	99,223
10	99,024	98,918	99,069	99,134	99,199
11	99,015	98,875	99,046	99,111	99,176
12	99,006	98,831	99,025	99,090	99,155
13	98,995	98,787	99,004	99,069	99,134
14	98,983	98,742	98,985	99,050	99,115
15	98,969	98,695	98,967	99,032	99,097
16	98,953	98,648	98,949	99,014	99,079
17	98,936	98,599	98,933	98,998	99,063
18	98,917	98,549	98,917	98,982	99,046
19	98,897	98,497	98,901	98,966	99,031
20	98,876	98,444	98,886	98,951	99,016
21	98,855	98,389	98,871	98,936	99,001
22	98,835	98,332	98,856	98,921	98,986
23	98,814	98,273	98,841	98,905	98,970
24	98,792	98,211	98,825	98,890	98,955
25	98,771	98,147	98,809	98,874	98,938
26	98,749	98,080	98,792	98,856	98,921
27	98,727	98,010	98,773	98,838	98,903
28	98,703	97,937	98,754	98,818	98,883
29	98,678	97,860	98,732	98,797	98,861
30	98,651	97,778	98,708	98,773	98,838
31	98,622	97,693	98,682	98,746	98,811
32	98,590	97,602	98,652	98,717	98,782
33	98,555	97,506	98,619	98,684	98,749
34	98,517	97,404	98,582	98,647	98,711
35	98,473	97,295	98,541	98,605	98,670
36	98,425	97,180	98,494	98,558	98,623
37	98,371	97,056	98,441	98,505	98,570
38	98,311	96,924	98,381	98,445	98,510
39	98,243	96,783	98,313	98,378	98,442
40	98,167	96,632	98,238	98,302	98,366
41	98,081	96,469	98,152	98,217	98,281
42	97,985	96,294	98,056	98,120	98,185
43	97,877	96,106	97,948	98,013	98,077
44	97,756	95,904	97,827	97,892	97,956
45	97,620	95,685	97,692	97,756	97,820
46	97,469	95,449	97,540	97,604	97,668
47	97,300	95,194	97,371	97,435	97,498
48	97,111	94,919	97,182	97,245	97,309
49	96,902	94,620	96,971	97,034	97,098

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	96,669	94,297	96,736	96,800	96,863
51	96,410	93,947	96,475	96,539	96,602
52	96,124	93,568	96,186	96,249	96,312
53	95,807	93,157	95,865	95,927	95,990
54	95,457	92,712	95,509	95,571	95,634
55	95,071	92,228	95,115	95,178	95,240
56	94,646	91,704	94,680	94,743	94,805
57	94,177	91,135	94,201	94,262	94,324
58	93,661	90,518	93,672	93,733	93,795
59	93,093	89,850	93,089	93,150	93,212
60	92,469	89,125	92,449	92,510	92,571
61	91,782	88,339	91,746	91,807	91,867
62	91,028	87,488	90,976	91,035	91,095
63	90,201	86,567	90,131	90,190	90,250
64	89,294	85,571	89,208	89,267	89,325
65	88,301	84,494	88,200	88,258	88,316
66	87,214	83,331	87,101	87,158	87,215
67	86,027	82,076	85,905	85,961	86,017
68	84,732	80,724	84,605	84,660	84,715
69	83,321	79,268	83,194	83,249	83,304
70	81,787	77,705	81,668	81,722	81,775
71	80,121	76,028	80,019	80,071	80,124
72	78,317	74,232	78,242	78,293	78,344
73	76,368	72,313	76,331	76,381	76,431
74	74,266	70,267	74,281	74,330	74,379
75	72,008	68,091	72,090	72,137	72,184
76	69,587	65,784	69,754	69,799	69,845
77	67,031	63,345	67,271	67,315	67,360
78	64,340	60,775	64,643	64,686	64,728
79	61,518	58,078	61,872	61,913	61,953
80	58,570	55,258	58,963	59,002	59,040
81	55,506	52,323	55,922	55,959	55,996
82	52,335	49,284	52,762	52,796	52,831
83	49,073	46,155	49,494	49,526	49,559
84	45,736	42,951	46,136	46,166	46,197
85	42,346	39,693	42,709	42,737	42,765
86	38,922	36,404	39,238	39,264	39,289
87	35,489	33,109	35,749	35,772	35,796
88	32,072	29,837	32,274	32,295	32,316
89	28,702	26,620	28,845	28,864	28,883
90	25,409	23,488	25,498	25,515	25,531
91	22,226	20,476	22,268	22,283	22,298
92	19,186	17,614	19,192	19,204	19,217
93	16,321	14,933	16,301	16,311	16,322
94	13,670	12,459	13,626	13,635	13,644
95	11,254	10,214	11,192	11,200	11,207
96	9,089	8,214	9,018	9,024	9,030
97	7,187	6,468	7,115	7,120	7,124
98	5,549	4,976	5,485	5,488	5,492
99	4,173	3,732	4,122	4,125	4,128
100	3,047	2,723	3,013	3,015	3,017

Población total

Tabla de mortalidad

2025	CUADRO A.5.3.1					
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
0	0.008338	100,000	834	99,583	7,794,971	77.95
1	0.000987	99,166	98	99,117	7,695,387	77.60
2	0.000485	99,068	48	99,044	7,596,270	76.68
3	0.000307	99,020	30	99,005	7,497,226	75.71
4	0.000221	98,990	22	98,979	7,398,221	74.74
5	0.000167	98,968	17	98,960	7,299,242	73.75
6	0.000135	98,952	13	98,945	7,200,282	72.77
7	0.000118	98,938	12	98,932	7,101,337	71.78
8	0.000112	98,927	11	98,921	7,002,405	70.78
9	0.000112	98,915	11	98,910	6,903,484	69.79
10	0.000122	98,904	12	98,898	6,804,574	68.80
11	0.000137	98,892	14	98,886	6,705,675	67.81
12	0.000157	98,879	15	98,871	6,606,790	66.82
13	0.000183	98,863	18	98,854	6,507,919	65.83
14	0.000215	98,845	21	98,835	6,409,065	64.84
15	0.000253	98,824	25	98,811	6,310,230	63.85
16	0.000297	98,799	29	98,784	6,211,418	62.87
17	0.000344	98,770	34	98,753	6,112,634	61.89
18	0.000393	98,736	39	98,716	6,013,882	60.91
19	0.000442	98,697	44	98,675	5,915,165	59.93
20	0.000488	98,653	48	98,629	5,816,490	58.96
21	0.000532	98,605	52	98,579	5,717,861	57.99
22	0.000571	98,553	56	98,525	5,619,282	57.02
23	0.000606	98,496	60	98,467	5,520,758	56.05
24	0.000637	98,437	63	98,405	5,422,291	55.08
25	0.000664	98,374	65	98,341	5,323,886	54.12
26	0.000689	98,309	68	98,275	5,225,545	53.15
27	0.000713	98,241	70	98,206	5,127,270	52.19
28	0.000738	98,171	72	98,135	5,029,064	51.23
29	0.000764	98,098	75	98,061	4,930,929	50.27
30	0.000794	98,023	78	97,985	4,832,868	49.30
31	0.000829	97,946	81	97,905	4,734,883	48.34
32	0.000870	97,864	85	97,822	4,636,978	47.38
33	0.000917	97,779	90	97,734	4,539,157	46.42
34	0.000974	97,690	95	97,642	4,441,422	45.46
35	0.001039	97,595	101	97,544	4,343,780	44.51
36	0.001115	97,493	109	97,439	4,246,236	43.55
37	0.001203	97,384	117	97,326	4,148,797	42.60
38	0.001303	97,267	127	97,204	4,051,472	41.65
39	0.001417	97,141	138	97,072	3,954,268	40.71
40	0.001546	97,003	150	96,928	3,857,196	39.76
41	0.001690	96,853	164	96,771	3,760,268	38.82
42	0.001851	96,689	179	96,600	3,663,497	37.89
43	0.002030	96,510	196	96,412	3,566,897	36.96
44	0.002229	96,314	215	96,207	3,470,485	36.03
45	0.002448	96,100	235	95,982	3,374,278	35.11
46	0.002689	95,864	258	95,735	3,278,296	34.20
47	0.002954	95,607	282	95,465	3,182,560	33.29
48	0.003244	95,324	309	95,170	3,087,095	32.39
49	0.003561	95,015	338	94,846	2,991,926	31.49

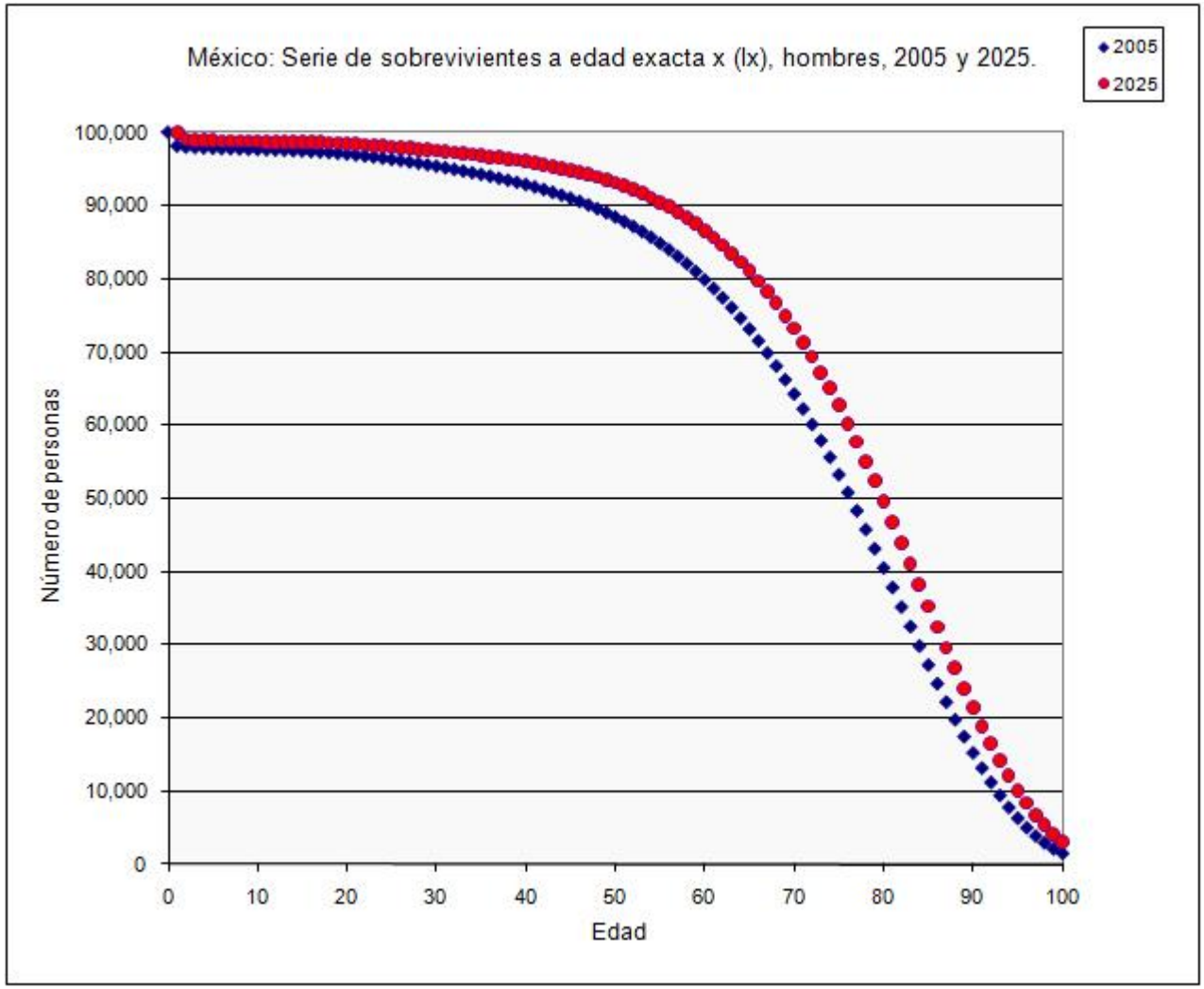
EDAD	${}_1q_x$	l_x	$d_{(x,x+1)}$	${}_1L_x$	T_x	e_x
50	0.003907	94,677	370	94,492	2,897,080	30.60
51	0.004284	94,307	404	94,105	2,802,588	29.72
52	0.004695	93,903	441	93,682	2,708,484	28.84
53	0.005142	93,462	481	93,221	2,614,802	27.98
54	0.005628	92,981	523	92,719	2,521,580	27.12
55	0.006156	92,458	569	92,173	2,428,861	26.27
56	0.006736	91,889	619	91,579	2,336,687	25.43
57	0.007372	91,270	673	90,933	2,245,108	24.60
58	0.008068	90,597	731	90,231	2,154,175	23.78
59	0.008829	89,866	793	89,469	2,063,943	22.97
60	0.009663	89,073	861	88,642	1,974,474	22.17
61	0.010577	88,212	933	87,745	1,885,832	21.38
62	0.011577	87,279	1,010	86,774	1,798,087	20.60
63	0.012672	86,268	1,093	85,722	1,711,313	19.84
64	0.013871	85,175	1,181	84,585	1,625,591	19.09
65	0.015183	83,994	1,275	83,356	1,541,007	18.35
66	0.016621	82,719	1,375	82,031	1,457,651	17.62
67	0.018195	81,344	1,480	80,604	1,375,619	16.91
68	0.019919	79,864	1,591	79,068	1,295,016	16.22
69	0.021806	78,273	1,707	77,419	1,215,948	15.53
70	0.023872	76,566	1,828	75,652	1,138,528	14.87
71	0.026135	74,738	1,953	73,762	1,062,876	14.22
72	0.028612	72,785	2,083	71,744	989,114	13.59
73	0.031325	70,702	2,215	69,595	917,371	12.98
74	0.034294	68,488	2,349	67,313	847,776	12.38
75	0.037544	66,139	2,483	64,897	780,462	11.80
76	0.040719	63,656	2,592	62,360	715,565	11.24
77	0.044154	61,064	2,696	59,716	653,205	10.70
78	0.047868	58,368	2,794	56,971	593,489	10.17
79	0.051882	55,574	2,883	54,132	536,519	9.65
80	0.056219	52,690	2,962	51,209	482,387	9.16
81	0.060900	49,728	3,028	48,214	431,177	8.67
82	0.065948	46,700	3,080	45,160	382,963	8.20
83	0.071388	43,620	3,114	42,063	337,803	7.74
84	0.077242	40,506	3,129	38,942	295,740	7.30
85	0.083653	37,377	3,127	35,814	256,798	6.87
86	0.090676	34,251	3,106	32,698	220,985	6.45
87	0.098366	31,145	3,064	29,613	188,287	6.05
88	0.106789	28,081	2,999	26,582	158,674	5.65
89	0.116009	25,083	2,910	23,628	132,092	5.27
90	0.126101	22,173	2,796	20,775	108,464	4.89
91	0.137143	19,377	2,657	18,048	87,689	4.53
92	0.149215	16,719	2,495	15,472	69,641	4.17
93	0.162312	14,225	2,309	13,070	54,170	3.81
94	0.176614	11,916	2,104	10,864	41,099	3.45
95	0.192222	9,811	1,886	8,868	30,236	3.08
96	0.209236	7,925	1,658	7,096	21,368	2.70
97	0.227757	6,267	1,427	5,553	14,271	2.28
98	0.247888	4,840	1,200	4,240	8,718	1.80
99	0.269727	3,640	982	3,149	4,478	1.23
100	1.000000	2,658	2,658	1,329	1,329	0.50

Estimación

2025	CUADRO A.5.3.2				
i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
1	99,166	99,292	99,363	99,437	99,511
2	99,068	99,243	99,315	99,389	99,463
3	99,020	99,193	99,268	99,342	99,416
4	98,990	99,142	99,223	99,297	99,371
5	98,968	99,090	99,179	99,253	99,327
6	98,952	99,038	99,136	99,210	99,284
7	98,938	98,985	99,094	99,168	99,242
8	98,927	98,931	99,053	99,127	99,201
9	98,915	98,876	99,013	99,087	99,161
10	98,904	98,820	98,973	99,047	99,121
11	98,892	98,763	98,935	99,009	99,083
12	98,879	98,705	98,897	98,971	99,044
13	98,863	98,645	98,859	98,933	99,007
14	98,845	98,584	98,822	98,896	98,970
15	98,824	98,521	98,785	98,859	98,932
16	98,799	98,457	98,748	98,822	98,895
17	98,770	98,390	98,711	98,785	98,858
18	98,736	98,322	98,674	98,747	98,821
19	98,697	98,251	98,636	98,709	98,783
20	98,653	98,178	98,597	98,671	98,744
21	98,605	98,102	98,558	98,631	98,705
22	98,553	98,023	98,517	98,591	98,664
23	98,496	97,941	98,475	98,549	98,622
24	98,437	97,855	98,432	98,505	98,579
25	98,374	97,766	98,386	98,459	98,533
26	98,309	97,672	98,338	98,411	98,485
27	98,241	97,574	98,287	98,360	98,434
28	98,171	97,472	98,233	98,306	98,380
29	98,098	97,363	98,175	98,249	98,322
30	98,023	97,249	98,114	98,187	98,260
31	97,946	97,129	98,047	98,121	98,194
32	97,864	97,002	97,976	98,049	98,122
33	97,779	96,867	97,899	97,972	98,045
34	97,690	96,725	97,815	97,888	97,961
35	97,595	96,573	97,724	97,797	97,870
36	97,493	96,412	97,625	97,698	97,771
37	97,384	96,241	97,517	97,590	97,663
38	97,267	96,058	97,400	97,472	97,545
39	97,141	95,864	97,271	97,344	97,416
40	97,003	95,655	97,131	97,203	97,276
41	96,853	95,433	96,977	97,050	97,122
42	96,689	95,195	96,810	96,882	96,954
43	96,510	94,939	96,626	96,698	96,770
44	96,314	94,666	96,425	96,497	96,569
45	96,100	94,372	96,205	96,277	96,349
46	95,864	94,057	95,965	96,036	96,108
47	95,607	93,718	95,702	95,773	95,844
48	95,324	93,355	95,414	95,485	95,556
49	95,015	92,963	95,099	95,170	95,241

i	l_i	$\widehat{l_i}$	$\widehat{l_i^1}$	$\widehat{l_i^2}$	$\widehat{l_i^3}$
50	94,677	92,542	94,756	94,826	94,897
51	94,307	92,090	94,380	94,451	94,521
52	93,903	91,602	93,971	94,041	94,111
53	93,462	91,078	93,524	93,593	93,663
54	92,981	90,513	93,036	93,106	93,175
55	92,458	89,906	92,505	92,574	92,643
56	91,889	89,252	91,927	91,996	92,064
57	91,270	88,548	91,298	91,366	91,434
58	90,597	87,791	90,614	90,682	90,749
59	89,866	86,978	89,872	89,939	90,006
60	89,073	86,103	89,066	89,132	89,199
61	88,212	85,163	88,193	88,258	88,324
62	87,279	84,154	87,247	87,312	87,377
63	86,268	83,071	86,225	86,289	86,353
64	85,175	81,910	85,120	85,184	85,247
65	83,994	80,667	83,929	83,992	84,054
66	82,719	79,337	82,646	82,708	82,769
67	81,344	77,916	81,266	81,327	81,387
68	79,864	76,400	79,785	79,844	79,904
69	78,273	74,785	78,197	78,255	78,314
70	76,566	73,066	76,499	76,556	76,613
71	74,738	71,241	74,686	74,742	74,798
72	72,785	69,308	72,756	72,810	72,864
73	70,702	67,263	70,705	70,757	70,810
74	68,488	65,107	68,531	68,582	68,634
75	66,139	62,838	66,235	66,285	66,334
76	63,656	60,459	63,817	63,864	63,912
77	61,064	57,971	61,278	61,323	61,369
78	58,368	55,379	58,622	58,666	58,710
79	55,574	52,688	55,856	55,897	55,939
80	52,690	49,908	52,986	53,025	53,065
81	49,728	47,046	50,023	50,060	50,098
82	46,700	44,117	46,979	47,014	47,050
83	43,620	41,134	43,870	43,903	43,936
84	40,506	38,115	40,713	40,744	40,774
85	37,377	35,078	37,528	37,556	37,584
86	34,251	32,045	34,338	34,364	34,390
87	31,145	29,040	31,168	31,191	31,215
88	28,081	26,086	28,044	28,065	28,085
89	25,083	23,210	24,993	25,011	25,030
90	22,173	20,436	22,043	22,059	22,076
91	19,377	17,791	19,222	19,237	19,251
92	16,719	15,298	16,557	16,569	16,581
93	14,225	12,978	14,070	14,080	14,091
94	11,916	10,849	11,783	11,791	11,800
95	9,811	8,926	9,711	9,718	9,725
96	7,925	7,216	7,865	7,871	7,877
97	6,267	5,724	6,250	6,255	6,259
98	4,840	4,448	4,865	4,869	4,872
99	3,640	3,379	3,703	3,706	3,708
100	2,658	2,505	2,750	2,752	2,754

Gráficas


México: Serie de sobrevivientes a edad exacta x (lx), hombres, 2005 y 2025.
2005
2025
Número de personas
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90,000
80,000
70,000
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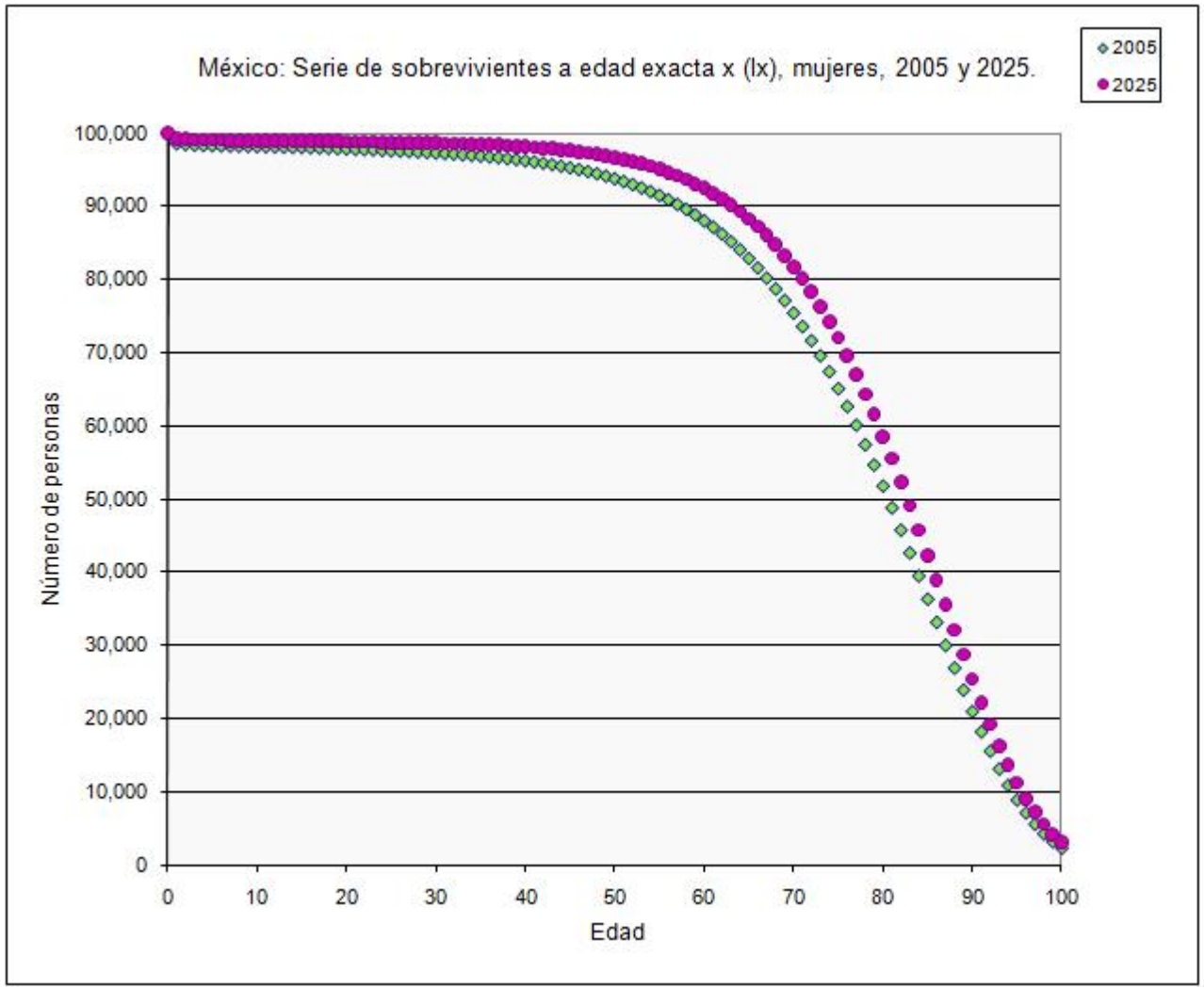
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2005
2025
Número de personas
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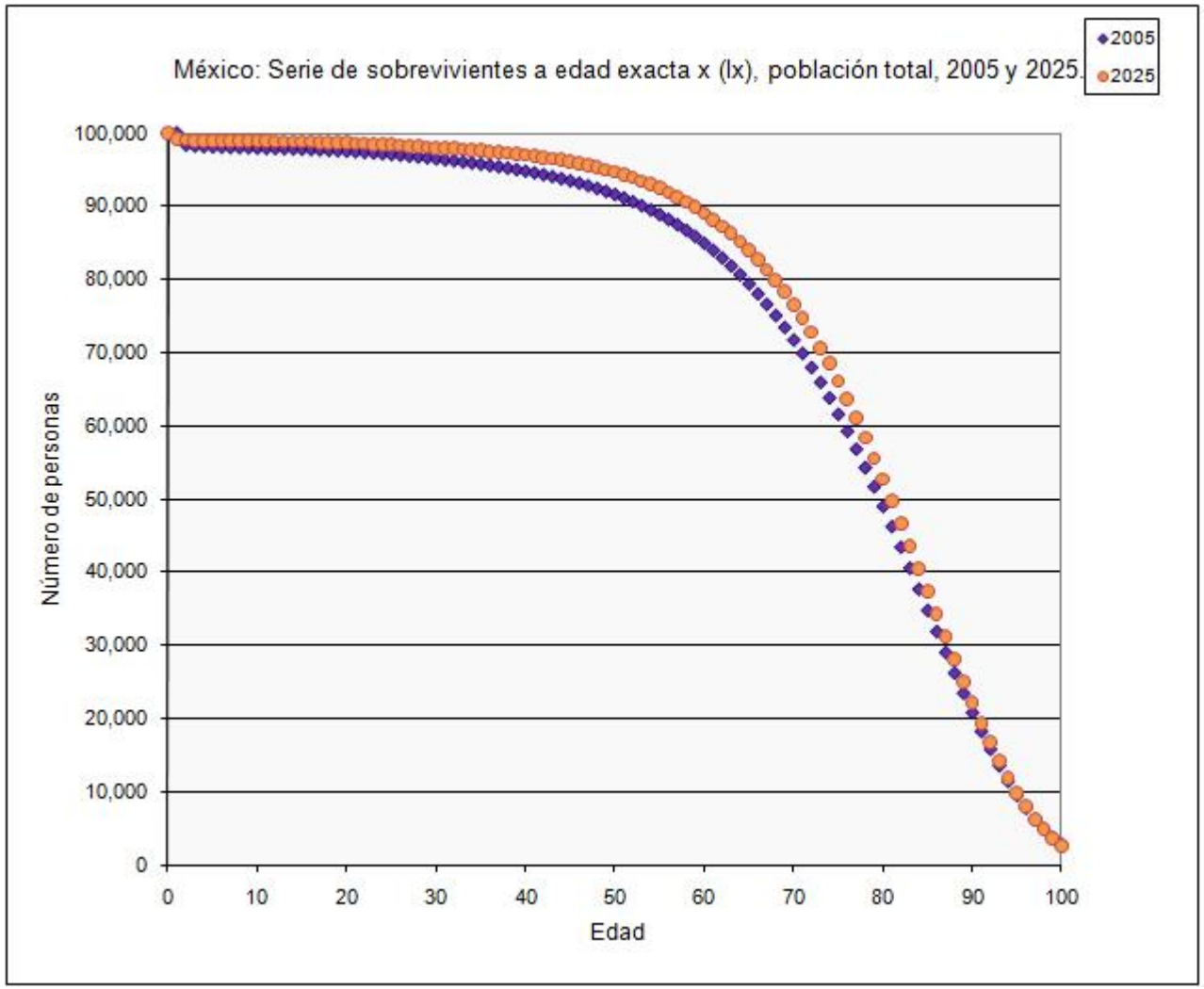
México: Serie de sobrevivientes a edad exacta x (lx), población total, 2005 y 2025.
2005
2025
Número de personas
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40,000
30,000
20,000
10,000
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México: Escenario óptimo, serie lx, hombres 2005.
li observada
li estimada 1° Iteración
Número de personas
100,000
95,000
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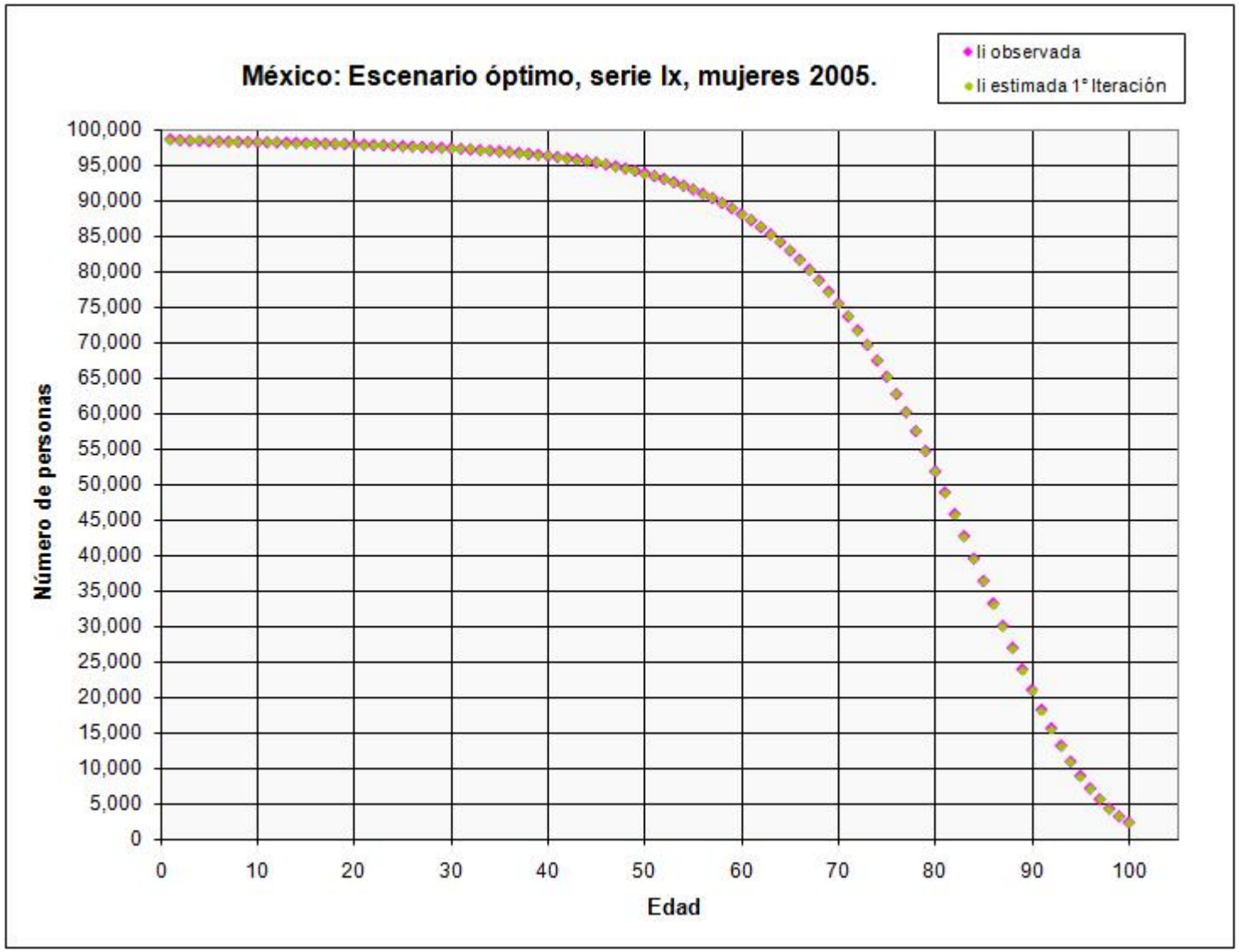
México: Escenario óptimo, serie lx, mujeres 2005.
li observada
li estimada 1° Iteración
Número de personas
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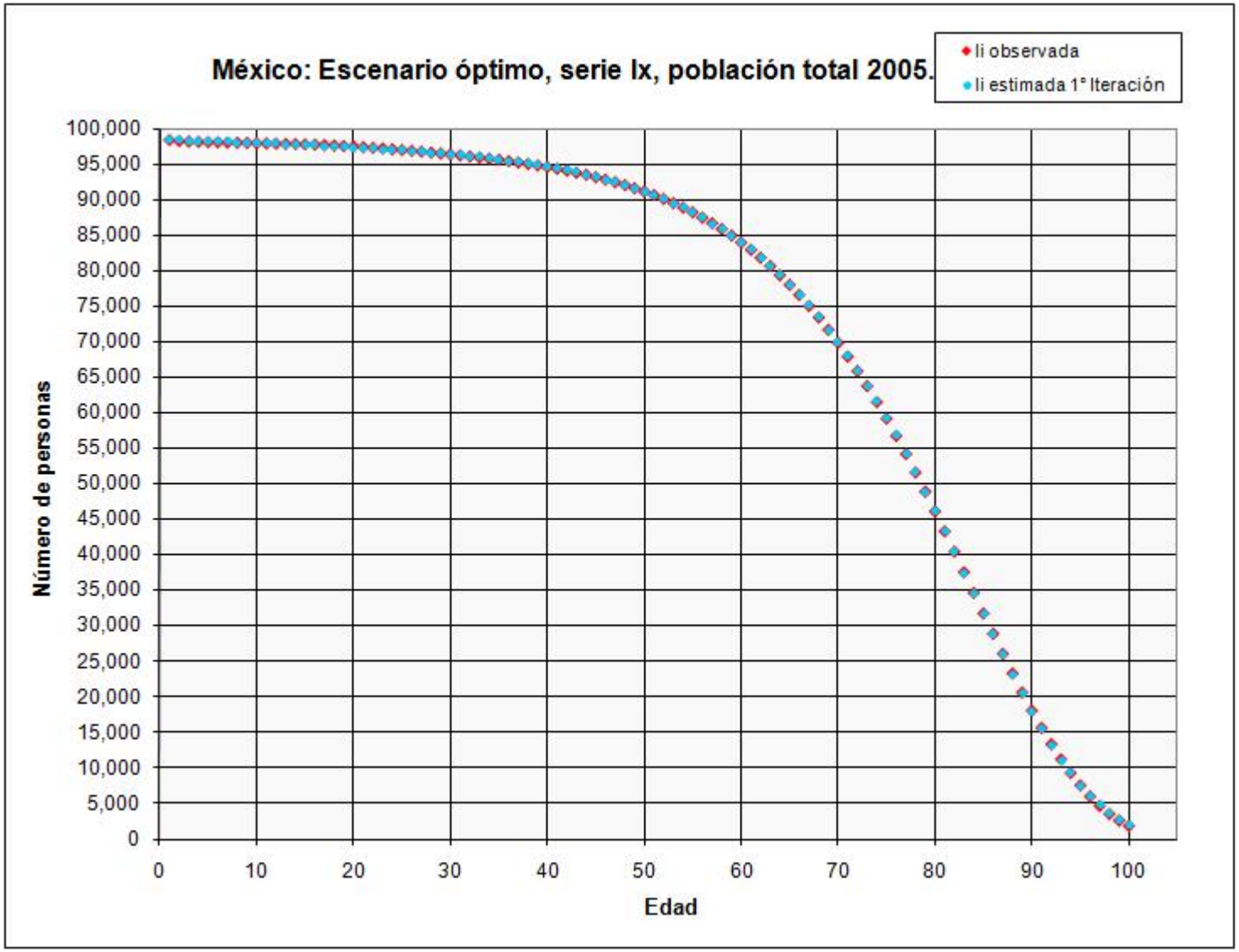
México: Escenario óptimo, serie lx, población total 2005.
li observada
li estimada 1° Iteración
Número de personas
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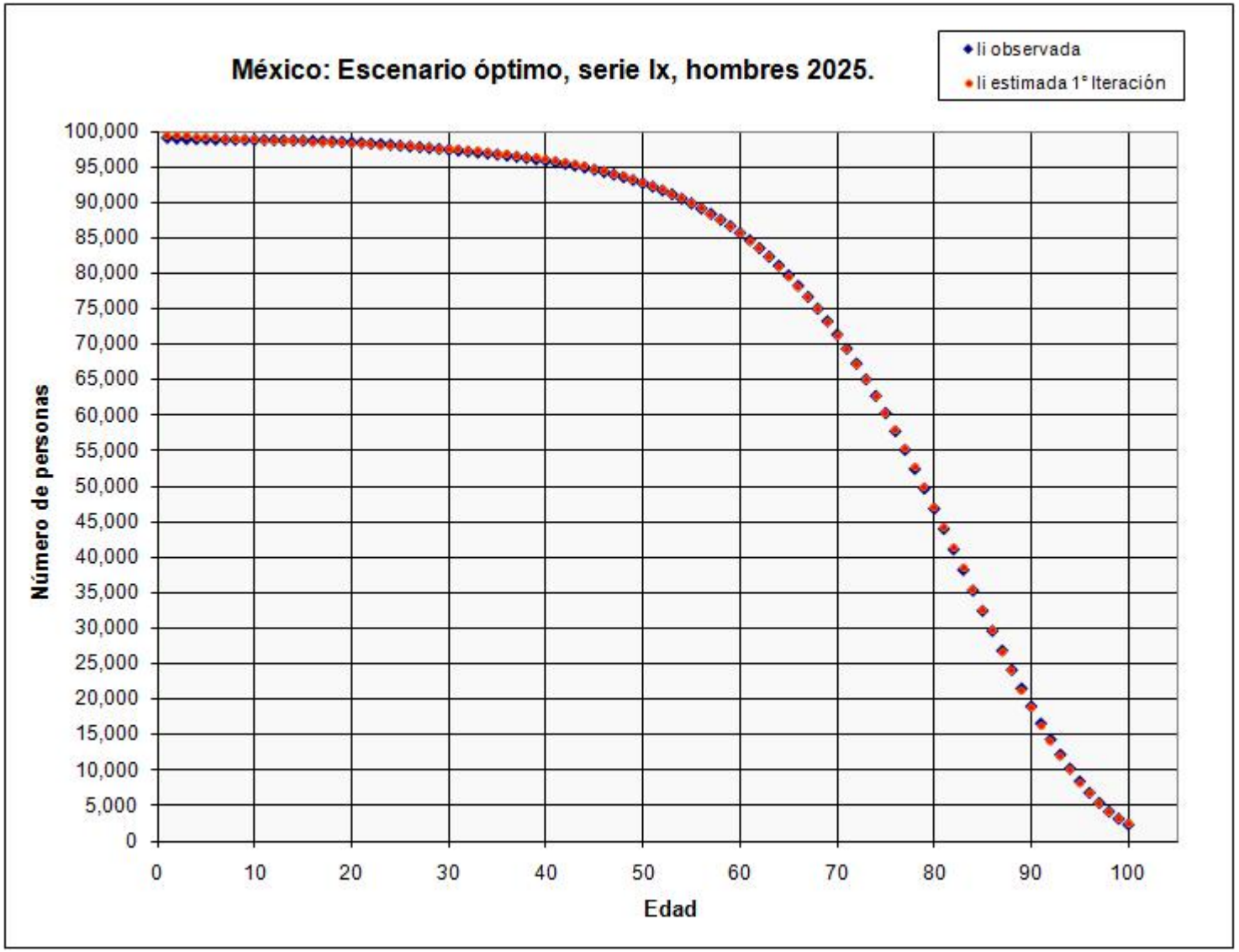
México: Escenario óptimo, serie lx, hombres 2025.
li observada
li estimada 1° Iteración
Número de personas
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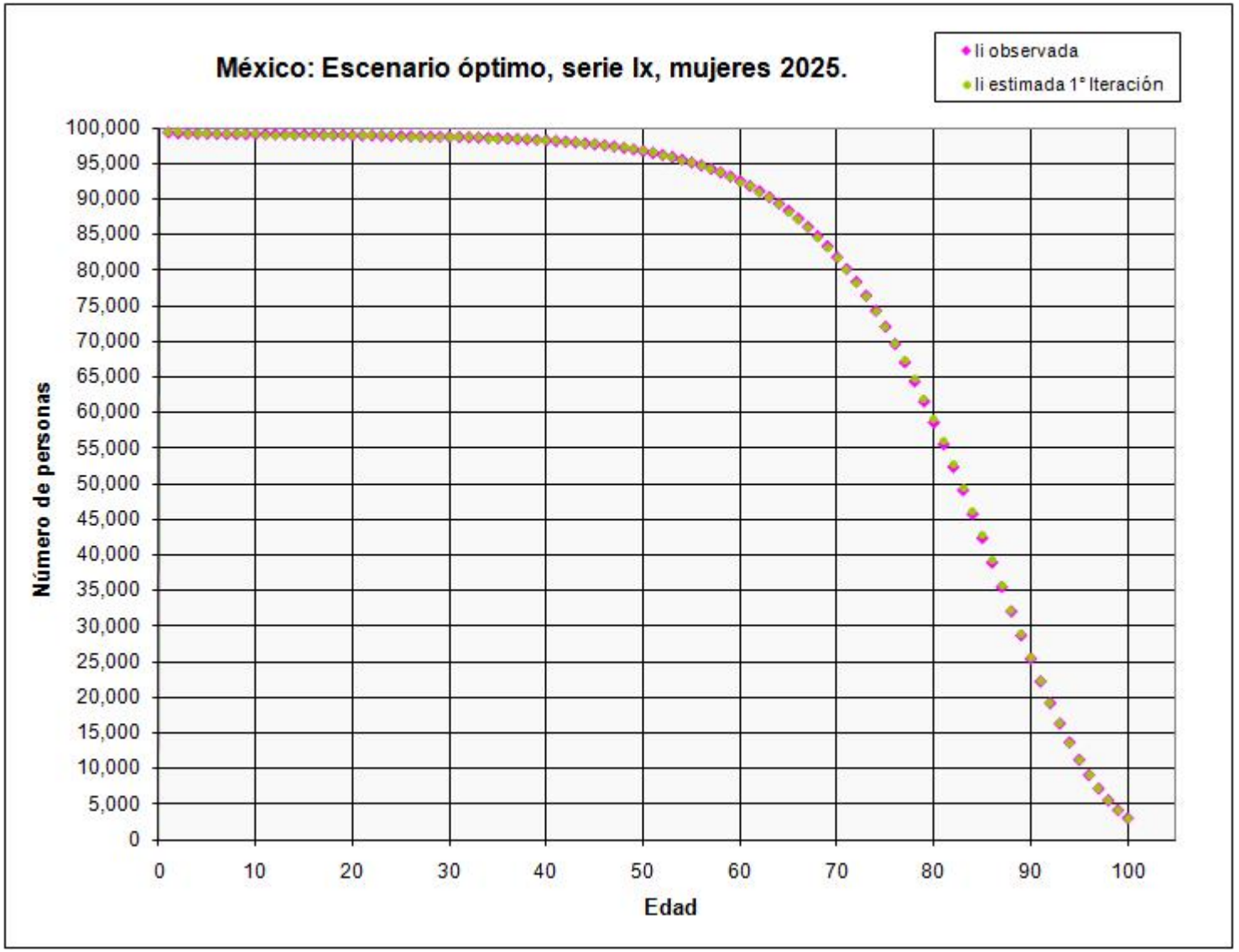
México: Escenario óptimo, serie lx, mujeres 2025.
lı observada
lı estimada 1° Iteración
Número de personas
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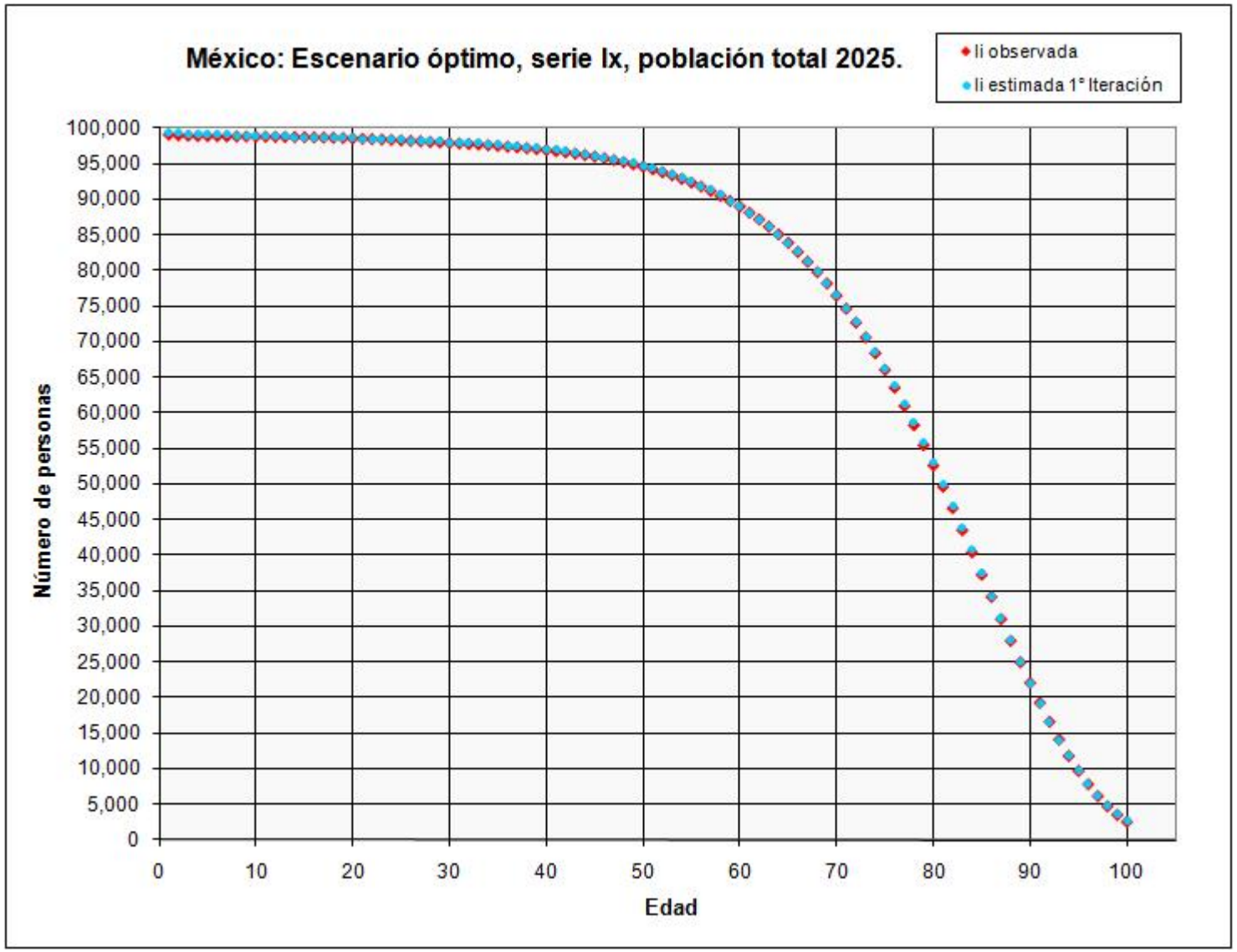
México: Escenario óptimo, serie lx, población total 2025.
lı observada
lı estimada 1° Iteración
Número de personas
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