The population of centenarians in Brazil: historical estimates from 1900 to 2010

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How many centenarians are living in the world?
According to the United Nations, there were:

• 450,000 centenarians in 2015 and
• about 60% are living in high-income countries.

According to the HMD, in 2018, there were:

• 2,084 centenarians in Sweden, and
• 70,231 centenarians in Japan.
What do we know about the centenarian population in developing countries?
Little is known.
Why is important to know how many centenarians are living in developing countries?
Background

In Brazil, according to the official statistics there were:

- **13,571** centenarians (100+) in 1991
- **24,576** centenarians in 2000
- **24,236** centenarians in 2010
Prevalence of centenarians

Men

Women

Country
- Brazil-Census
- Norway
- Sweden
- Iceland
- Australia
- New Zealand (non-Maori)
- Netherlands
- Switzerland
- Japan
- USA

Prevalence (per 10,000)
- 0
- 1
- 2
- 3
- 4
- 5

Life Expectancy at Birth

Year


Prevalence

- Men: 0.4
- Women: 0.8

2.3
Prevalence of centenarians

Men

Women

Prevalence (per 10,000)
- 0
- 1
- 2
- 3
- 4
- 5

Country
- Brazil-Census
- Norway
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- Japan
- USA

Life Expectancy at Birth

Year


1.8

2.5

0.02

5.4
What is the size of the centenarian population in Brazil?
Estimate the number of individuals aged 100 or more between 1900 and 2010 in Brazil.
The variable-$r$ method

(Horiuchi and Preston 1988)

\[
5N_x(t) = 5N_y(t)e^{-\sum_{a=y}^x 5r_a(x-y)p_y}
\]

\[
y = 50, 55, 60, 65
\]

\[
x = 100, 105, 110, 115
\]
The variable-\(r\) method

(Horiuchi and Preston 1988)

\[
5N_x(t) = 5N_y(t)e^{-\sum_{a=y}^{x} 5r_a} \quad (x-y)P_y
\]

\(y = 50, 55, 60, 65\)

\(x = 100, 105, 110, 115\)
Methods and Data

Conditional probability of surviving

• Coale and Demeny Life Tables for the period 1900 to 2010 ($e_0$ and $e_{50}$).

• Three mortality models: Kannisto, Weibull and Gompertz for 2000 and 2010 (using Brazilian mortality rates 60-80+).
Estimated number of centenarians in Brazil

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Centenarians</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>1</td>
</tr>
<tr>
<td>1920</td>
<td>2</td>
</tr>
<tr>
<td>1940</td>
<td>20</td>
</tr>
<tr>
<td>1950</td>
<td>25</td>
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<td>1960</td>
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<td>100</td>
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<td>1980</td>
<td>111</td>
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<td>1991</td>
<td>268</td>
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<tr>
<td>2000</td>
<td>685</td>
</tr>
<tr>
<td>2010</td>
<td>2163</td>
</tr>
</tbody>
</table>
Estimated number of centenarians in Brazil

Virtually no centenarian
Number of Centenarians Estimated Versus Census

Extensive over-enumeration of centenarians in the Brazilian censuses.
Number of Centenarians
Estimated Versus Census

Improvements in data collection.

11 x

400 x
Number of Centenarians in Brazil

Gomes&Turra (2009)

UN (2017)

Census

Number of Centenarians

Year
There was virtually no centenarian in Brazil in the first 2 decades of the 20th century.
Only in 2010 the number of centenarians surpassed 1,000 individuals.
There is an extensive over-enumeration of centenarians in the census records.
Limitations

We had to borrow mortality patterns from other countries.

Age-specific growth rates may vary over time due to changes in census data quality.
Discussion

What is the true age pattern of mortality at older ages (65+) in Brazil and in LAC?
Thank you!

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