

Independent actuarial valuation of traffic accident victim damages

2ND EUROPEAN CONGRESS OF ACTUARIES

Luis María Sáez de Jáuregui.
Actuary
Ph.D. in Applied Economics.

Brussels, April 21st 2016.

FORMATION OF THE ACTUARIAL WORK GROUP IN THE INSTITUTE OF SPANISH ACTUARIES



- **15/09/2012. FORMATION OF AN ACTUARIAL WORK GROUP AT THE HEART OF THE INSTITUTE OF SPANISH ACTUARIES**
 - **Members of the Actuarial Work Group of the IAE (ISA)**
 - Luis María Sáez de Jáuregui Sanz
 - Manuel Mascaraque
 - Fernando Peribáñez Ayala
 - Francisco de Borja González Salvador
 - Daniel Martos Ruipérez
 - Belén Soriano
 - Mónica Román Arribas
 - Hugo Vicente González Riera
 - Ramón Nadal
 - Manuel De la Rosa
 - Tomas Cardeñoso
 - Eduardo Sánchez Delgado
 - Jean Louis Hernández
 - Jesús Vegas Asensio
 - Ángel Marin Carrasco
 - **In addition, a Technical Group and Database have been established, whose members are:**
 - José Ignacio Pérez
 - Fernando Alarcón
 - Luis Valverde
 - Javier Poza
 - Asunción Blasco
 - Pablo Jiménez
 - Antonio Guardiola
 - Miguel Ángel Vázquez
 - **Work Group Sessions**
 - Successive work group sessions for analysis and assessment have taken place between 2012 and 2014



Content of the technical actuarial bases (BTA)



- **The BTAs of the system comprise three documents, which establish the methodology of compensation calculations for loss of earnings/profit due to:**
 - 1.- Those who are financially dependent on the victim due to their death from a road traffic accident
 - 2.- Those injured and permanently disabled due to a road traffic accident
 - 3.- Those requiring third party aid due to a road traffic accident

- **One of the BTA's important milestones is the development of two actuarial tables:**
 - PEB2014, author: Eduardo Sánchez Delgado,
 - PEIB2014, authors: Jean Louis Hernández and Jesús Vegas Asensio.

- **The actuarial tables and their technical hypotheses have been conceived solely for use as a scale.**



Inspiring principles and how they should be interpreted



- **1.- The BTAs should always be interpreted in the context of the scale and its texts**
- **2.- Aspects defined as such in the scale are not to be the object of interpretation**
 - Hypotheses already exist which are predefined in the text and have been accepted as such.
- **3.- Each hypothesis within the BTAs should be interpreted in its entirety, and never taken individually or separately .**
 - This inspiring principle deals with the fact that the technical actuarial bases do not take into account change hypotheses in the wider sense of the term; that is to say, change brought about by unemployment or disability/handicap
- **4.- Each hypothesis should be reviewed after some years since the BTAs were released**
- **5.- The three documents relate to each other.**
 - They should be interpreted as a whole.



Biometric hypotheses



■ New actuarial table:

- PEB 2014

■ Projections:

- Life expectancy projections at every age are taken as a fundamental base, and are included in the long-term population calculation of the National Institute of Statistics **2012-2052 (INE, 2012)**.
- Death toll figures are taken from **survival data from 2011** of the Spanish population, from the INE's Spanish Population Mortality Table 1991-2011. (INE, 2012).



The PERM model



- **Using mortality figures as a base, and elements of improvement**
 - Generation tables are formed by applying the actuarial model which considers the effect of reducing mortality of each age group by cohort.
 - Without differentiating by generation:

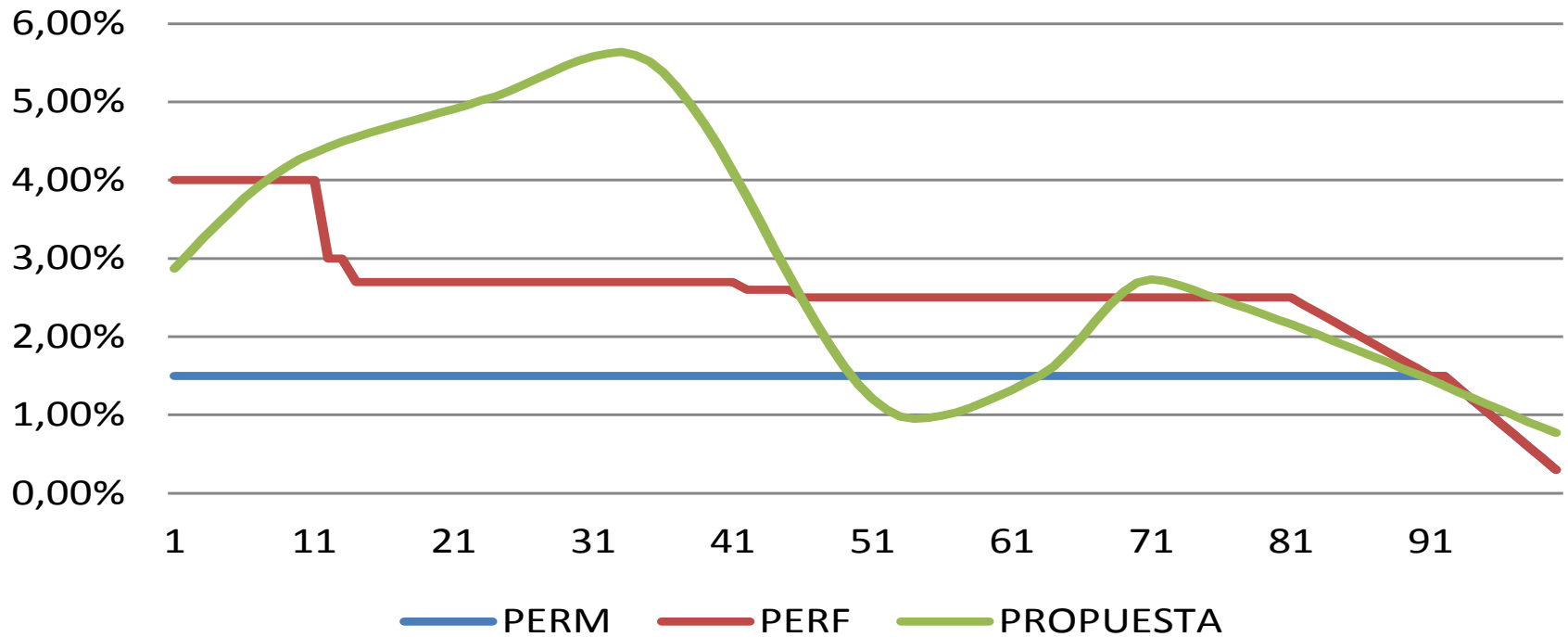
$$q_x^t = q_x^{t_0} \cdot e^{-\lambda_x \cdot x \cdot (t - t_0)}$$



Elements of improvement: Comparison with PERMF2000P



Factores de mejora comparados



Calculation details of PEB2014



- **There are no generational differences**
- **In order to eliminate random anomalies in the gross data,**
 - Especially present within the age groups <35 years old, a cubic-spline technique has been adopted to smooth the data
- **Criteria for choosing the connecting nodes of the cubic functions respect the following principles:**
 - Smoother transition between adjoining age groups.
 - Adhesion between gross and net data.
 - Translate the maximums and minimums observed in the evolution of the improvement factors derived from changes in the behavior trends of mortality by age group. This occurs with ages 32, 53 and 70.
- **From these criteria, 9 nodes have been chosen for the following ages groups: 0-9-23-32-53-62-70-74-97.**



Main economic-financial hypotheses



- **Rate of growth of the Social Security Contributions:**
 - 1.5%.
- **Rate of growth of the Social Security Pension:**
 - 0.50%.
- **Rate of Growth of the Consumer Price Index:**
 - 2%.
- **Rate of Growth of Annual Income:**
 - 1.50%.
- **Type of Technical Interest:**
 - 3.5%.



'Theory of relativity'



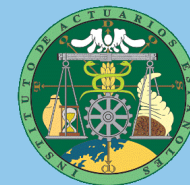
- Individual hypotheses are not what is relevant here, but rather the interaction between them to obtain a final result.

$$\frac{(1+c)}{(1+i)} = \frac{1}{(1+i')} \quad ; \quad i' = \frac{(1+i)}{(1+c)} - 1$$

i	3,00%	3,51%	4,53%	5,55%	6,57%
c	1,00%	1,50%	2,50%	3,50%	4,50%
i'	1,98%	1,98%	1,98%	1,98%	1,98%



Tables for disabled people, and comparisons with PEB2014



Esperanzas de Vida

PEB2014

$e^x(0)$	92,64
$e^x(10)$	81,90
$e^x(20)$	70,76
$e^x(30)$	59,57
$e^x(40)$	48,39
$e^x(50)$	37,59
$e^x(60)$	27,40
$e^x(70)$	17,87
$e^x(80)$	9,84
$e^x(90)$	4,57
$e^x(100)$	0,50

PEIB2014
NIVELES 1 y 2

$e^x(0)$	67,49
$e^x(10)$	62,37
$e^x(20)$	52,67
$e^x(30)$	43,59
$e^x(40)$	34,86
$e^x(50)$	27,30
$e^x(60)$	20,84
$e^x(70)$	14,41
$e^x(80)$	8,24
$e^x(90)$	4,03
$e^x(100)$	0,50

PEIB2014
NIVELES 3 y 4

$e^x(0)$	56,41
$e^x(10)$	51,82
$e^x(20)$	42,75
$e^x(30)$	36,07
$e^x(40)$	30,54
$e^x(50)$	25,40
$e^x(60)$	19,90
$e^x(70)$	13,66
$e^x(80)$	8,08
$e^x(90)$	3,79
$e^x(100)$	0,50

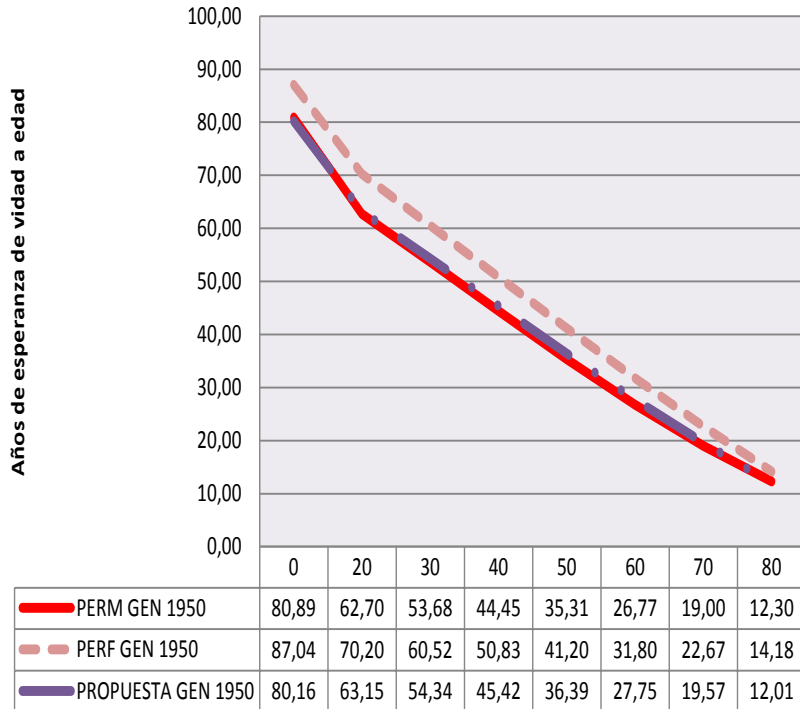


Esperanzas de vidas comparadas



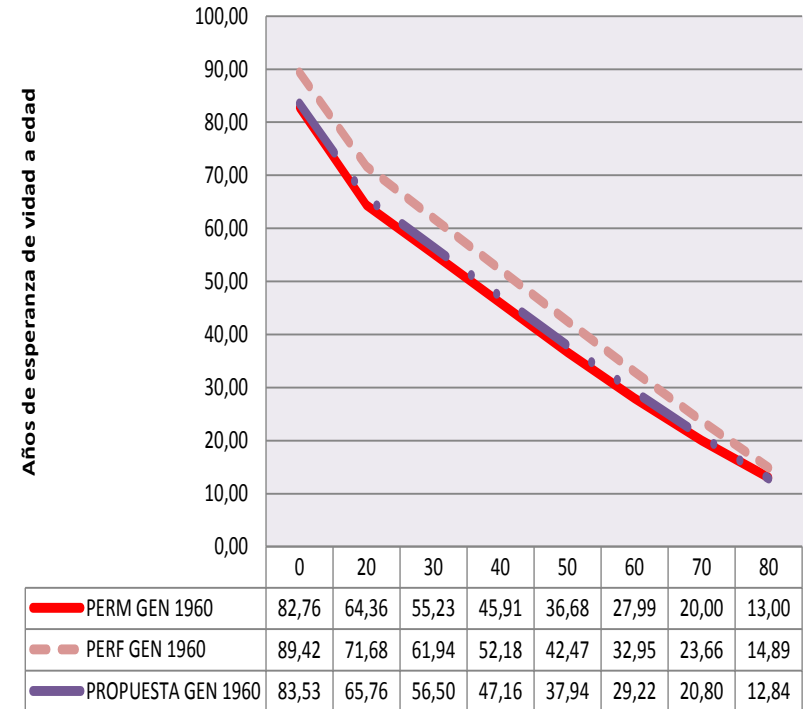
Generación 1950

ESPERANZAS DE VIDA



Generación 1960

ESPERANZAS DE VIDA

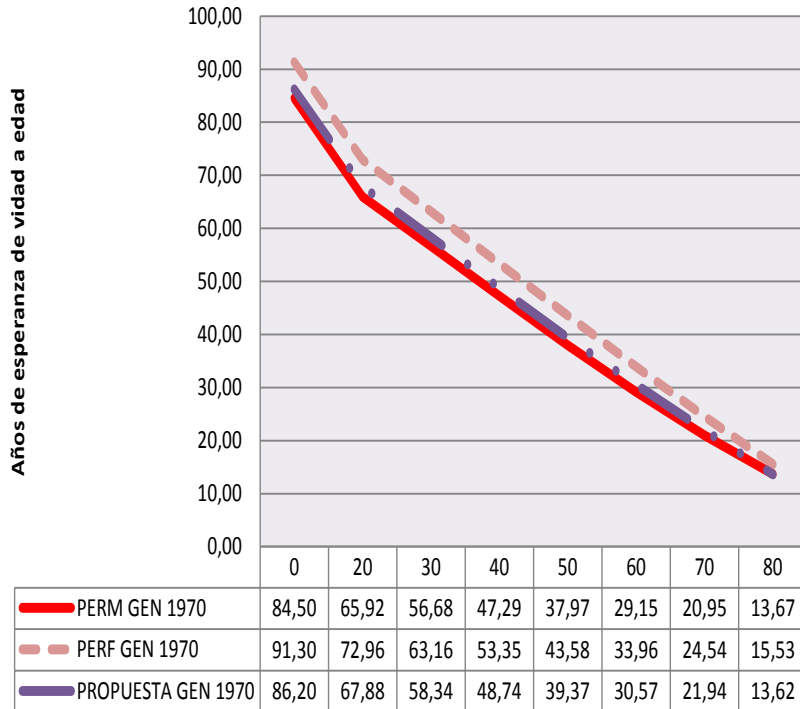


Comparative life expectancy



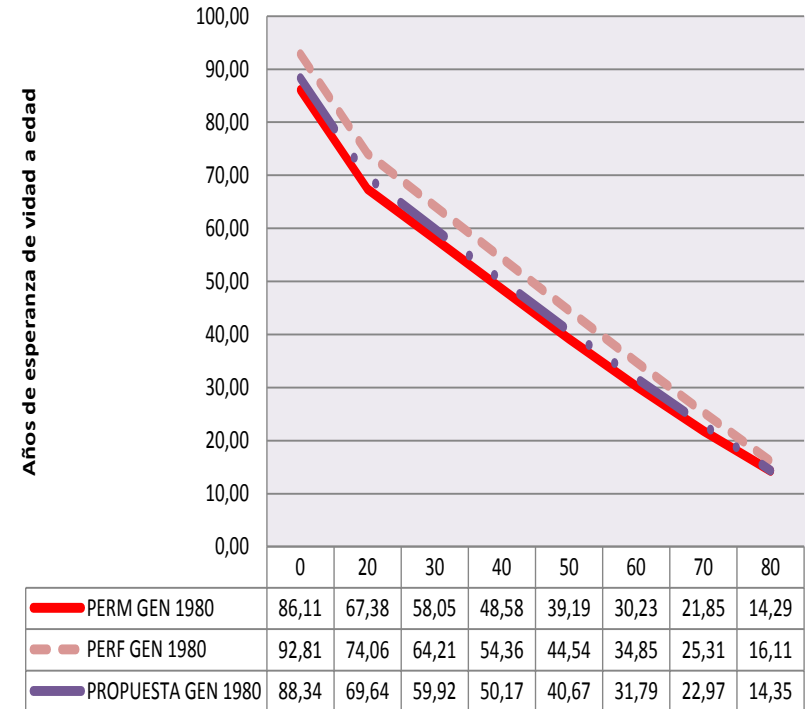
Generation 1970

ESPERANZAS DE VIDA



Generation 1980

ESPERANZAS DE VIDA



Calculation methodology diagram



Lucro cesante por fallecimiento para los perjudicados que dependían económicamente de la víctima.

Indemnización = VAA ingresos futuros – VAA pensiones SS (*)

VAA (ingresos activo + pensión jubilación SS)

(*) VAA: Valor actual actuarial



Actuarial calculation models



$$VAAP_{ING_{xa}} = P_{ING_{xa}} * \sum_{t=1}^r {}_tP_{xa} * V^t * u^{t-1}$$

+

$$VAAP_{PJSS_{xa}} = P_{PJSS_{xa}} * V^{67-X_m} * \sum_{67}^r {}_tP_{X67} * V^t * z^{t-1}$$

-

$$VAAPVSS_{xa} = PVSS_{xa} * \sum_{t=1}^r {}_tP_{xa} * V^t * z^{t-1}$$



Illustrative graph of calculation models

