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Is the 1941 CSO Mortality Table flawed?

by Frank P. di Paolo



**on the
lighter
side**

Many years ago, when I was an actuarial student, my mother came across my copy of Jordan's *Life Contingencies*, which had accidentally fallen behind a piece of furniture. As she had an inquisitive mind, she browsed through it with some interest and then asked me about the table on page 287. I told her it was the 1941 CSO Mortality Table used by insurance companies to calculate cash values and reserves. Within a few seconds, she barraged me with questions. To the best of my recollection, the following conversation took place:

"What do l_x and d_x mean?"

" l_x means the number of survivors at age x , which can be any age from 0 to 99; d_x means the number of people who attain age x and die before attaining age $x + 1$. As an example, look at the x column when the age is 20: the entry in the l_x column is 951,483, and the entry in the d_x column is 2,312. These entries mean that out of 1,023,102 people who are born, 951,483 are still alive at age 20, and of them, 2,312 die before attaining age 21."

I then flipped the page over and pointed to age 99 and, with a dramatic flair, I said:

"Of all the people alive at age 20, only 125 are still alive at age 99."

"How many of them will be 100?"

"None."

"None?"

"Yes, none. The table assumes that each one of the 125 people who attain age 99 will die before 100."

"You mean that nobody will be 100?"

"Yes, all will die before 100."

"Well, something is wrong with your table."

"Why?"

"My grandfather was nearly 102 years old when he died, and you tell me that nobody lives past 100?"

"Surely, people can live past 100 if they are healthy enough; however, this table was based on the assumption that nobody lives past 100. This assumption simplifies the construction of the table without detracting significantly from its accuracy."

"I still believe something is wrong with your table. What if I live past 100, will they stop paying me my pension?"

"Mother, don't worry. You have a long way to go before 100. Besides, nobody will cut your pension out if you live past 100."

"I'll bet you the moment I turn 100, some bureaucrat from Ottawa will write me a letter saying: 'Dear Mrs. di Paolo, as you were born 100 years ago, according to our mortality table, you must be dead by now. Therefore, we are terminating your pension benefits as of next month. However, if you believe you are not dead, you have the right to appeal our decision through the courts, etc.'"

Yes, I think there is something wrong with your table, and one day I will prove it to you."

My mother went to a better life in the early hours of Monday, April 4, 1994, the day after Easter Sunday, which she believed was the most important liturgical event of the year. She was 102 years and 31 days old, and the last thing she did in her life was to celebrate her 103rd Easter. I believe she left us with a smile in her heart; I don't think she could have planned it better.

I also believe the smile was a bit mischievous, because she did prove that there is something wrong with the 1941 CSO Mortality Table. She

survived 2 years and 31 days past its Omega. Perhaps not many members of the Society agree with her, but at least two members do. Her son and granddaughter strongly believe that the 1941 CSO Mortality Table is flawed, and the NAIC ought to recall it, by Jove! or "per Giove!," as she would herself have said it.

Oh, yes. When she attained age 100, she did not receive a letter from the Ottawa bureaucrat informing her that her pension benefits had been terminated. Was it because the actuaries of Health and Welfare Canada also believe that the 1941 CSO Mortality Table is flawed?

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New dates for international conference

The International Conference on Affordable Health Care, originally scheduled for September 5-6, 1994, in Singapore, has been rescheduled for February 27 - March 1, 1995. For more information on the conference, please contact Dr. Chiu C. Chang of Nanyang Technological University, Singapore, at his *Directory* address.