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A gathering of scientists NAFTA project is topic of Society's 1st AAAS session

by Michael Sze and
Jacqueline Bitowt,
SOA Public Relations Specialist

Each year, one six-day annual event in the United States attracts 5,000 scientists as well as other individuals with a strong interest in science. The Society of Actuaries was formally represented this year for the first time at the event, the annual meeting of the American Association for the Advancement of Science (AAAS), held Feb. 12-17 in Philadelphia.

An eminent panel discussed the 1997-98 SOA research project, "Impact of Mortality Improvement on Social Security: Canada, Mexico, and the United States," in a session on Feb. 17. The SOA's session was

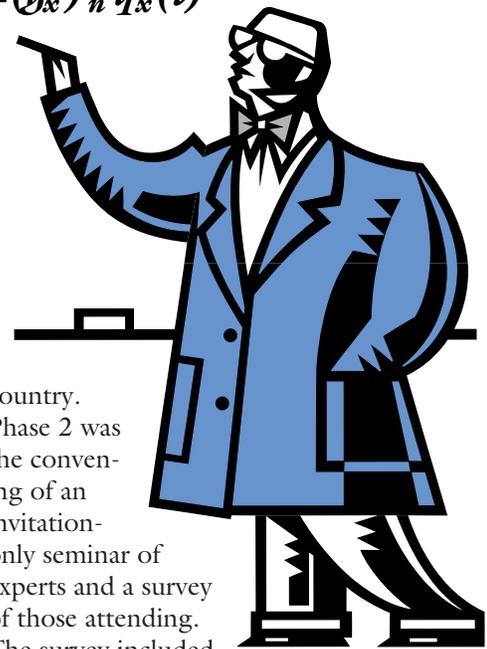
entitled "Social Security in the NAFTA Countries: What if People Stop Dying?" Results and an overview of the project were presented by:

- José Gómez de León, national coordinator, Program for Education, Health, and Nutrition, Mexico
- Stephen Goss, deputy chief actuary, U.S. Social Security Administration
- Sam Preston, dean, School of Arts and Sciences, University of Pennsylvania
- Anna M. Rappaport, president, Society of Actuaries, and principal, William M. Mercer Incorporated
- Michael Sze, faculty member, University of Michigan, and president, Sze Associates, Ltd.
- Irwin Vanderhoof, clinical professor, Stern School of Business, New York University

Canadian, U.S. results

The SOA project sought to determine the impact that mortality improvement could have on the social security programs of the NAFTA countries. (See "Social security 'summit,'" *The Actuary*, January 1998, and "NAFTA countries support study on social security mortality," *The Actuary*, November 1997.) Phase 1 of the three-phase project was a literature review and summary of the existing knowledge of mortality forecasting and an analysis of the historical mortality improvement trend in each NAFTA

$${}_nq_x(t+k) = (q_x)^k {}_nq_x(t)$$



country. Phase 2 was the convening of an invitation-only seminar of experts and a survey of those attending. The survey included questions about expected mortality improvements, and the results served as a basis for Phase 3, a test of the impact of alternative mortality improvement rates on social security financing.

A mortality improvement range of 0-2% was given as plausible by nearly 40 experts who provided numerical responses to the survey. The social security offices of each NAFTA country considered that range, and those of Canada and the United States tested alternative mortality improvement rates, based on the range given by the experts, on the impact of social security financing. The results of those tests,

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A gathering of scientists (continued from page 1)

which found that financing needs based on the alternative rates did not differ significantly from current projections, were announced at the SOA's session at the annual meeting of the AAAS (called "triple-a-s").

In general, the results indicated that social security financing in the United States and Canada is relatively immune from even the highest rate of mortality improvement predicted by the experts. However, while the experts said life span will continue to lengthen and there will be larger populations of the elderly, there is much variability in the predicted rate of mortality improvement. The SOA project's organizers believe this wide variability shows an uncertainty that can and should be accounted for in mortality projections on which social security financing is based.

"Developments in genetic technology and other areas could ease the impact of many diseases and extend human life," said Anna Rappaport. "Also, this project adds to the body of research that indicates more attention must be directed to the support of larger populations of the elderly."

Said Irwin Vanderhoof, one of the project organizers and the SOA's liaison with AAAS, "With the rapid advances in medicine and public health, it's necessary for us to learn to make mortality projections more accurately than we have in the past."

Canadian officials created new mortality projections based on the experts' 95th percentile of highest and lowest projections and starting from the mortality figures for 1997. The new projected financial picture of the Canada Pension Plan (CPP) was very similar to that of existing projections. Officials then looked at the impact on the CPP tax rate under four mortality improvement scenarios: current assumptions and the experts' median, highest, and lowest suggested rates. Less than 1% difference in the required tax rate was projected. The results were:

- current assumptions, a stable CPP tax rate of 9.9%;
- experts' median, 10.1%

- experts' highest rate (experts' median plus 2 standard deviations, corresponding to the experts' 95th percentile), 10.6%;
- experts' lowest rate (zero improvement), 9.7%.

Officials of the U.S. Social Security Administration (SSA) also presented mortality projections for four mortality improvement scenarios. The necessary tax rate for the next 75 years under each scenario was:

- mortality rate under the SSA's current intermediate (rather than highest or lowest) assumption, 14.6%
- experts' median, 14.7%
- experts' median plus 2 standard deviations, 15.3%
- experts' lowest rate (zero improvement), 14.2%.

"These results support the current range of mortality assumptions used by the Social Security Administration," said Steve Goss, SSA deputy chief actuary.

"This offers strong evidence that both the U.S. and Canadian social security plans are relatively immune to mortality fluctuations," noted Mike Sze.

Education, mortality, and biological limits

Sam Preston, in his presentation, echoed the views of about one-third of the experts who responded to the Phase 2 survey's questions on the biological limits to human life. Preston reported evidence that, he said, "casts doubt on the proposition that we are approaching the biological limits to mortality."

In fact, said Preston, based on several mortality improvement studies, "my guess is that mortality will decline faster than the U.S. Social Security Administration projects, and that the deficit in the Social Security system will, as a result, be larger than projected. Whatever adaptation we make is going to be painful."

Preston supported his position by discussing several studies, beginning with those focusing on regional mortality.

- A study of individual U.S. states showed that mortality declined at similar rates in both low- and high-

mortality states from 1980 to 1993. "If the states that had the lowest mortality were close to the biological limits, we should see smaller gains there," Preston said.

- To study a longer timeline, Preston examined the experience of Minnesota, a low-mortality state, from 1940 to 1993. "There's no evidence of contraction. If anything, Minnesota has stretched its lead," Preston said.
- Preston observed Sweden's and Japan's experience, two developed countries that have for some time outpaced the United States in mortality improvement. "Just for the most recent years when we might expect to see a slow down, we do not," Preston noted.

Moving from regional to social factors, Preston focused on education. Studies have long shown that better-educated people live longer; "the question is whether their lead has diminished or stretched." Preston cited three recent papers showing that the mortality of better-educated people has improved. A fourth study comparing mortality improvement by educational level for several industrial nations indicated "the lowest-mortality countries — Norway and Sweden — do not show diminishing returns to advances in education."

Preston believes the U.S. and other nations will have to adapt to larger populations of the elderly. "The most straightforward adaptation is to raise the eligibility age for social security payments," he said. "It should be somewhat easier for people to work longer because the workforce will be better educated, a higher fraction will have desk jobs, and people in their 60s and 70s will be healthier if present trends continue."

Mexico's situation

In July 1997, Mexico implemented a major pension reform as part of a large reform effort in Social Security. The costs of transition to the new system and the impact of mortality improvement were the subjects of José Gómez de León's presentation.

Mortality improvement, rather than fertility or immigration increases, is expected to result in dramatic growth in the country's elderly population. Gómez de León said the dependency ratio — individuals aged 65 and older to those aged 18-64 — is predicted to rise from the 1986 level of 7.5% to 41.6% in 2050.

This was one of the main factors that led to last summer's reform. "The new pension system moves away from a pay-as-you-go system to a funded system," Gómez de León said. "Pension contributions will be deposited to the individual worker's account, and the accounts will be managed by organizations known as Retirement Fund Administrators (AFORE)." Each beneficiary chooses an AFORE and can switch administrators annually.

The fiscal costs of the transition to the new system will be borne by Mexico's federal government, Gómez de León explained. They include the costs of pensions of current retirees as well as costs due to current workers who choose to retire under the old system's rules. This second cost arises, he said, because the new pension system allows current workers (those who were working at the time of reform) to choose at the time of retirement between the pension based on their accumulated savings and the pension they would have received under the rules of the old pay-as-you-go system.

To project the fiscal costs of transition, two very conservative mortality assumptions were used, Gómez de León said. Under both the Mexican Social Security system's constant mortality rates and an alternate set of declining mortality rates, the transition costs rise from 0.2% of gross domestic product this year to a peak of about 1.5% or 1.6% in 2040, when they decline sharply. Gómez de León said the cost was unlikely to rise past 1.6% "given the conservativeness of both

the actuarial and the demographic assumptions." Also, he said, "mortality assumptions may be an important determinant of these fiscal costs in the medium run [after 2020]. This is an area of research which has been previously unexplored, and it should be taken into account in the future."

Uncertainty ahead

Mike Sze, chair of the project's oversight group, noted that the results of the Phase 2 survey of experts indicated a high degree of uncertainty about the rate of mortality improvement.

"The experts definitely agreed that mortality improvement would continue. However, there are great discrepancies among their predictions for the magnitude of improvement,"



At the AAAS session (L-R): Mike Sze, Anna Rappaport, Sam Preston, Irwin Vanderhoof, José Gómez de León, and Steve Goss.

Sze said. "Also, we need to consider the inflow to the population base of each NAFTA country caused by immigration and the fertility rate. All of this could add up to much larger populations of the elderly. In addition, there are speculations that recent genetic breakthroughs could lead to dramatic extensions of human life. If such speculations were to materialize, they would add to the uncertainties that seem to grow every day.

"So it is increasingly important for retirement planners to face these uncertainties. Fortunately, mathematical processes exist that actuaries can use to identify, quantify, and manage such risks and uncertainties."

VIPs in science, public policy

Scientists and those concerned with the

intersection of science and public policy convene at each year's AAAS annual meeting. This year, U.S. President Bill Clinton gave the keynote address, but he was far from alone among the luminaries, including Supreme Court Justice Stephen Breyer, Nobel prize-winning physicist Murray Gell-Mann, former U.S. Surgeon General C. Everett Koop, and bioethicist Arthur L. Caplan.

The 700 presenters participating in the event's 180 sessions represented most major universities and a wide range of government agencies, private companies, and nonprofit institutions.

This is the 150th anniversary year of the AAAS. The organization celebrated with a one-hour "birthday party" on Feb. 16 and a special historic display.

The latter included videotaped greetings from several organizations' leaders; the SOA was represented by President Rappaport.

The SOA and the AAAS

"Being there helped reinforce the presence of actuaries in a much larger scientific community, and that is very exciting," Sze said. "At the AAAS meeting, we could hear others' ideas and share ours as we

looked for new techniques for our profession and new avenues in which to lend our expertise."

Rappaport, SOA president, considered the SOA session in the context of the AAAS meeting. "We presented a very good, very solid piece of research," she said. "In return, the AAAS gave us some visibility and perhaps more credibility with audiences beyond the world of actuaries."

Michael Sze is chair, project oversight group, for the SOA study, "Impact of Mortality Improvement on Social Security: Canada, Mexico, and the United States." Jacqueline Bitowt is staff editor of *The Actuary*. Their respective e-mail addresses are sze@math.umich.lsa.edu and jbitowt@soa.org.