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SOME DEMOGRAPHIC CONSEQUENCES OF REVISING THE DEFINITION OF 'OLD' TO REFLECT FUTURE CHANGES IN LIFE TABLE PROBABILITIES

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Abstract

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Sixty-five has long been used to define the beginning of 'old age'. Yet it is clear that the definition is arbitrary, and with continuing reductions in mortality and morbidity rates it will become increasingly inappropriate as time passes. We consider how the definition might be modified to reflect changes in life table probabilities, and how the future numbers and proportions in 'old age' would be affected. In a similar manner we consider also the redefinition of the 'oldest old' from a current definition of 85 and over.

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SOME DEMOGRAPHIC CONSEQUENCES OF REVISING THE DEFINITION OF 'OLD' TO REFLECT FUTURE CHANGES IN LIFE TABLE PROBABILITIES[1]

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1. Introduction

Life expectancies have been increasing for many decades in most parts of the world. In Canada (the country on which we focus), male life expectancy at birth increased from 60.0 in 1931 to 74.6 in 1991, a rate of about 2.4 years of life per decade; female life expectancy increased from 62.1 to 80.9, or 3.1 years per decade. Similarly large gains have occurred in most "developed" countries, and even more rapid gains in some of the "less developed" ones. As Posner (1995, p. 24) observes, "The *rate* of aging . . . is being retarded . . . We cannot eliminate old age, but we can postpone it; we *have* postponed it. We are much less likely to think of a healthy 60-year-old or even 70-year-old as being 'old' than we were thirty years ago."

Gains in life expectancy would suggest that the marker for "old age" should be revised upward. On the other hand, long-run increases in per capita income, and the expanding coverage and liberalization of pension plans, have encouraged earlier withdrawal from the labour force. In consequence, to the extent that the age of retirement or eligibility for pension entitlement reflects society's view of the beginning of old age, that age has been *lowered* rather than raised. In Canada

[1] The work reported in this paper was supported by the Social Sciences and Humanities Research Council of Canada. Computational assistance was provided by Christine Feaver.

in 1965 the age at which one could receive Old Age Security payments was changed from 70 to 65, where it remains today, and in 1987 the youngest age for receipt of (actuarially reduced) Canada Pension Plan benefits was lowered from 65 to 60. Similarly, in the US the youngest age at which one could receive Social Security pension benefits was reduced from 65 to 62, for women in 1956, and for men in 1961. In most developed countries the modal age of retirement has moved down, at least among men (Gower, 1997; Wise, 1997).

Only recently can one point to changes in the opposite direction: the age of eligibility for full Social Security pension benefits in the US is set to increase gradually from 65 to 67 by 2027, and in Sweden pension benefits are now indexed to reflect gains in life expectancy. However, these recent changes would seem to be motivated more by a desire to reduce costs than by a revised view of when old age begins, and for most purposes 65 remains the accepted marker. In research reports and government publications "65 and over" is still the age category used most commonly to represent the older component of the population. That is true whether the reference is historical or relates to projections. The age 65 marker is still widely used.

One result of keeping the marker at 65 for Canada, as for other countries, is an exaggeration of the future increase in the "older population" that will result from the combined effects of the aging of the baby boom generation and continued increases in longevity. The purpose of this paper is to explore some of the implications of revising (or not revising) the definition of old age.

2. Alternative Ways of Defining "Old"

Sixty-five, then, has been long and widely used to define old age, a definition that is strongly

associated with retirement[2]. However, other markers have been suggested. Neugarten (1974, 1975) made a distinction between the 'young old' and the 'old old', associating the former with ages 55 to 75 and the latter with ages 75 and over, although she emphasized that it was "life styles rather than chronological ages that concern us" (1975, p. 7). She chose 55 as the lower bound for the young old since she anticipated that that would become a standard age of retirement by the year 2000. At what turned out to be an influential session of the 1984 meetings of the American Association for the Advancement of Science, Matilda White Riley and Richard Suzman "coined the term 'oldest old' as a refinement of Bernice Neugarten's earlier 'old old' to denote those 85 years and over" (Suzman, Willis, and Manton, 1992, p. 3). Since then, 85 has been widely used. Of particular interest is the fact that the 65 and 85 age markers have been used not only for current description and analysis, but also in projections of the population, sometimes far into the future.

Obviously there is great diversity of health status and behavioural patterns among those of any given age, and that restricts the usefulness of statistical groupings for some purposes. Nonetheless, there are two arguments in favour of standard age markers. One is administrative simplicity: age is easily determined, and hence those eligible for age-based benefits need not be subject to means testing or other invasive and sometimes demeaning scrutiny[3]. The other argument is that (as Neugarten

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[2] Hudson (1997, p. 3) observed that "In addition to old age having long been a proxy for need, it has also been a meaningful marker of an inability to work." He goes on to note that the appropriateness of the marker of older age as "a proxy for negative events is central to any discussion of the future of age-based benefits".

[3] Hudson (1997, p. 16) distinguishes between aged-based programs, in which "one of the criteria for eligibility is having attained a specified chronological age," and age-related programs, which "substantially benefit older people even though the basis for eligibility is independent of chronological age". He states that the Older Americans Act is the only public program in the US in which eligibility is determined by virtue of age alone. Justice (1997, p. 168) observes that "the act is constrained in its ability to address the most intensive service needs of older people ... [by its] relatively meager federal resources".

stated) age markers can be used to define groups that have broadly similar life styles and social needs, at least as compared to other age groups. As such they can be viewed as rough indicators of "need" for health care or other publicly provided services[4]. But with continued reductions in morbidity and mortality, and concomitant increases in health and life expectancy, age markers such as 65 and 85, which might be (let us assume) considered appropriate now, are unlikely to be appropriate several decades in the future[5]. It would be preferable to have markers that adjust to changes in objective circumstances.

Life tables can be used to derive a range of alternative definitions of what we shall call here the "old" and "oldest old" populations. In what follows we employ definitions of two kinds, in addition to the fixed age 65 and age 85 ones. We explore the implications for the sizes and percentage shares of the "old" and "oldest old" populations under each type of definition. The definitions are as follows:

Definition 1: Age 65 remains the marker for 'old' and age 85 the marker for 'oldest old'.

Definition 2: Each marker rises (as mortality rates decline) so that the mean years of life (life expectancy) remains constant.

Definition 3: Each marker rises so that the mean years of life remaining *as a percentage of*

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[4] In the words of Marmor (1970, p. 17), older people are "one of the few population groupings about whom one could not say the members should take care of their financial-medical problems by earning and saving more money."

[5] While the gains in life expectancy are undoubted, there is less certainty about the portion of the gains experienced in good health. Most studies focus on disability, and specifically on measures of functional disability. Lee and Skinner (1999, p. 129) find it reassuring that "most studies point to a long-term decline in the prevalence of disability" among older people. A recent Canadian study also provides evidence of continued improvements in health; it concludes that the "lower odds of heart disease, high blood pressure, arthritis and activity limitation suggest that recent cohorts are healthier than the cohorts who preceded them" (Chen and Millar, 2000, p. 9).

years already lived remains constant.

Definitions 2 and 3, along with 17 others, are discussed and applied to Canadian life tables for the period 1951-1991 in Denton and Spencer (1999). The two that we have chosen here are representative of the full set of 19 dealt with in that paper; the other definitions would produce results generally similar to the ones that we report below.

3. Future Increases in the "Old" and "Oldest Old" Populations Under Alternative Definitions

We have made a range of projections of the "old" and "oldest old" populations, both as numbers of people and as percentage shares of the total population. The projections are based on the three alternative definitions given above, coupled with three different sets of assumptions about future mortality, fertility, and migration rates. The results are shown in Tables 1 - 3 for the years 2016 and 2041, together with census-based figures for 1991. The projections were made using the demographic component of the MEDS projection system. (MEDS stands for "Models of the Economic-Demographic System"; for a general description, see Denton, Feaver, and Spencer, 1994.)

The first set of projections we label Standard. In summary, the assumptions of the Standard set are a total fertility rate that remains constant at its 1997 level of 1.55 live births per woman, annual immigration of 225 thousand (higher than recent levels but consistent with stated government target levels), and age-sex-specific mortality rates that continue to fall, but at progressively slower rates. The second set of projections assumes a total fertility rate that rises to the natural replacement level of 2.1 by the year 2026 and a slower decline in mortality rates; we term it the Less Rapid Population Aging (LRPA) projection set. The third one, the More Rapid Population Aging (MRPA) set, assumes that the total fertility rate falls to 1.25 by 2026 and that there is a faster decline in mortality rates. To put some flesh on the mortality assumptions, life expectancy rises between 1991

and 2041 in the Standard projections by 6.0 years for males and 3.6 for females; in the LRPA projections the increases are 4.0 and 1.4, and in the MRPA projections they are 7.8 and 5.6.

The projections based on the Standard demographic assumptions are shown in Table 1 for the two selected future years, and in Figures 1 and 2 for all years from 1991 to 2041. The "old" population, both sexes combined, numbered 3,217 thousand in 1991, or 11.5 percent of the total population, and the "oldest old" numbered 288 thousand, or 1.0 percent of the total. Under definition 1, with its fixed age markers, the "old" population is projected to rise to 9,355 thousand by 2041, or 24.9 percent of the total, and the "oldest old" is projected to rise to 1,577 thousand, or 4.2 percent of the total. Such is the much heralded aging of the Canadian population, based on fixed age markers.

Does modifying the definitions to reflect increased longevity eliminate the prospect of population aging? No, most certainly not. However, it does cast a different light on the demographic outlook, and it does reduce the projected increases. Definition 2 reduces the projected 2041 "old" population by some 16 percent, compared with definition 1, and definition 3 reduces it by 12 percent. The greatest (proportional) effects, though, are in the projection of the "oldest old." Using definition 2 rather than definition 1 yields a projection for that group that is 37 percent lower; using definition 3 yields a projection that is 32 percent lower. Rather than rising from 1.0 percent to 4.2 percent of the total population over the 50-year projection period, as with definition 1, the share of the "oldest old" increases to only 2.6 or 2.8 percent. The impact of "updating" the definition of "old" over the projection period as mortality rates decline is thus significant but the impact of updating the definition of the "oldest old" is much greater, under the Standard projection assumptions.

Changing the demographic assumptions affects the results, as one might expect, but the overall conclusions remain intact. The consequences of replacing definition 1 with definition 2 or 3

are reduced under the LRPA projection and increased under the MRPA projection (Tables 2 and 3). In the LRPA projection, mortality rates decline more slowly (so that the shifts in age markers are less pronounced) and fertility rates are higher (so that the proportions of children, and subsequently young adults, are higher). In the MRPA projection, the reverse is true. We regard the range of assumptions as realistic (given the present state of knowledge and general beliefs about the demographic future) but what will actually happen to mortality and fertility rates is of course unknowable. Based on the MRPA projections, though, the "old" population might be as much as 22 percent smaller in 2041 if the age marker is allowed to change, and the "old old" population as much as 50 percent smaller (definition 2). The potential significance of how we define the older population groups is thus seen to be important in any discussion of future population aging, especially at the highest ages.

Figures 3 and 4 compare the percent of the total population in the “old” and “oldest old” age groups, based on definition 2, for each of the three projection sets. As the figures show, the proportions of the population in the older groups continue to rise steadily even when the age markers are gradually moved up. Using definition 2, there is little disagreement among the projections about the extent of increase, and that is true also for definition 3. On the other hand, the situation is rather different when the age markers are fixed (definition 1); in that case the proportions in the older age groups are more sensitive to the projection assumptions.

The foregoing pertains to both of the sexes combined but there are substantial differences between the two. The effects of updating the age definitions to reflect changes in life tables are appreciably greater for males than for females. Under definition 2, the Standard projected number of "old" males in 2041 is about 21 percent lower than it is under definition 1, compared with 13 percent lower for females; under definition 3 the reduction is 16 percent for males, 9 percent for females. Male/female differences exist in the other projection sets also; they vary between the two

but are in the same direction in both. The differences are even more pronounced for the "old old," but again in the same direction in all three projection sets; in all three, the effects of moving the age markers are greater for males than for females. (The largest impact of all occurs with definition 2 in the MRPA projection set: the number of "old old" males in 2041 is 57 percent lower than the definition 1 number in that year; the number of "old old" females is 45 percent lower.) The reason for the differences in both age categories is the projected slower proportional declines in female mortality rates compared with male rates, under all three sets of projection assumptions. The slower proportional declines for females are consistent with trends in recent decades, and are evident in smaller projected gains in life expectancies.

4. Summing Up

If declining mortality rates and increased longevity are judged suitable criteria for reassessing age markers then increases in the elderly population will be lower than would otherwise be projected. The phenomenon of population aging will certainly not be eliminated, but the numbers of people who would be classified as "old" or "old old" will be smaller; the impact on the "old old" will be especially large. In both categories, the effects are likely to be greater for males than for females. All of this is in broad statistical terms, of course. What it probably amounts to in practice (given the propensity to use ages that are multiples of 5) is a greater likelihood of conventions adapting so that 70 gradually replaces 65 as a social standard for the old age threshold, and the definition of the very old gradually approaches 90 and over.

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Figure 1: 'Old' as Percent of Total Population, Alternative Definitions: Standard Projection

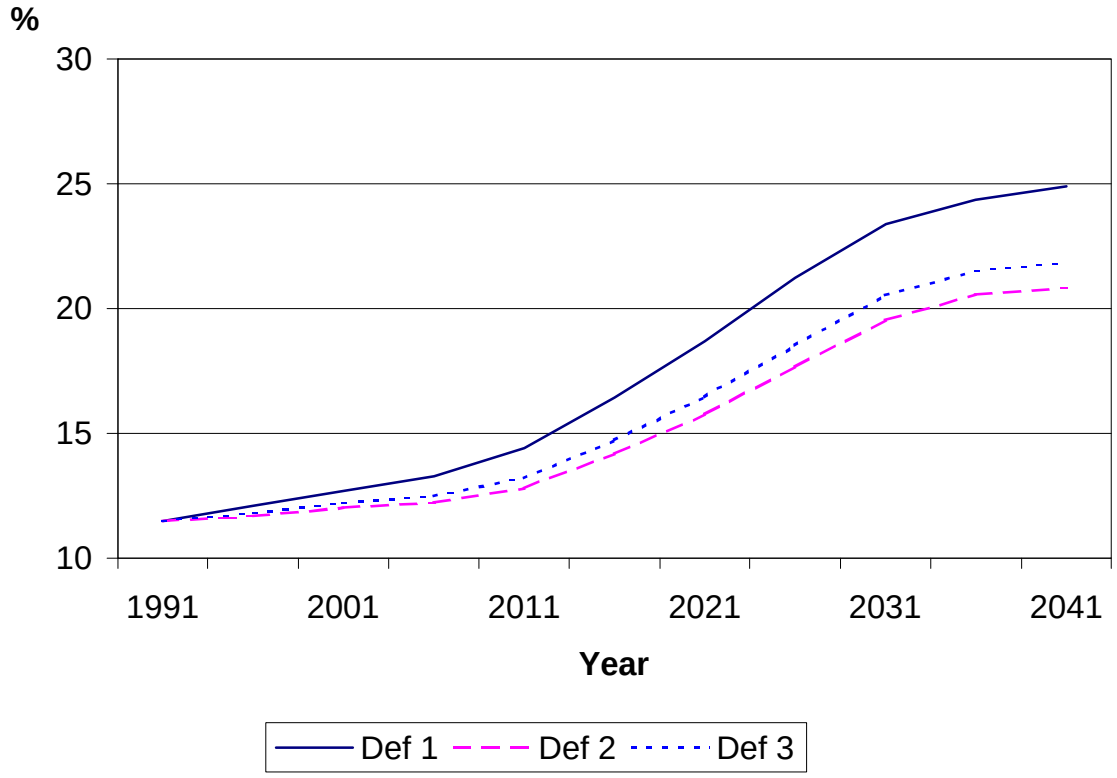

Figure 2: 'Oldest Old' as Percent of Total Population, Alternative Definitions: Standard Projection

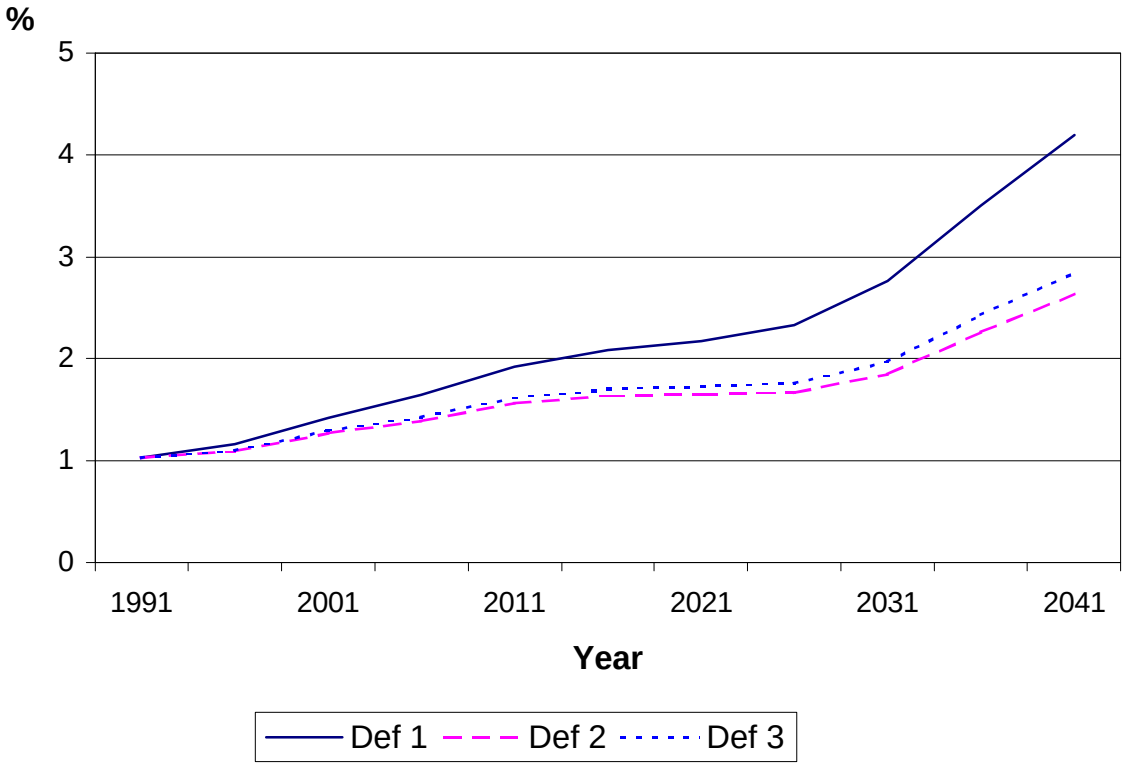

Figure 3: 'Old' as Percent of Total Population, Definition 2: Alternative Projections

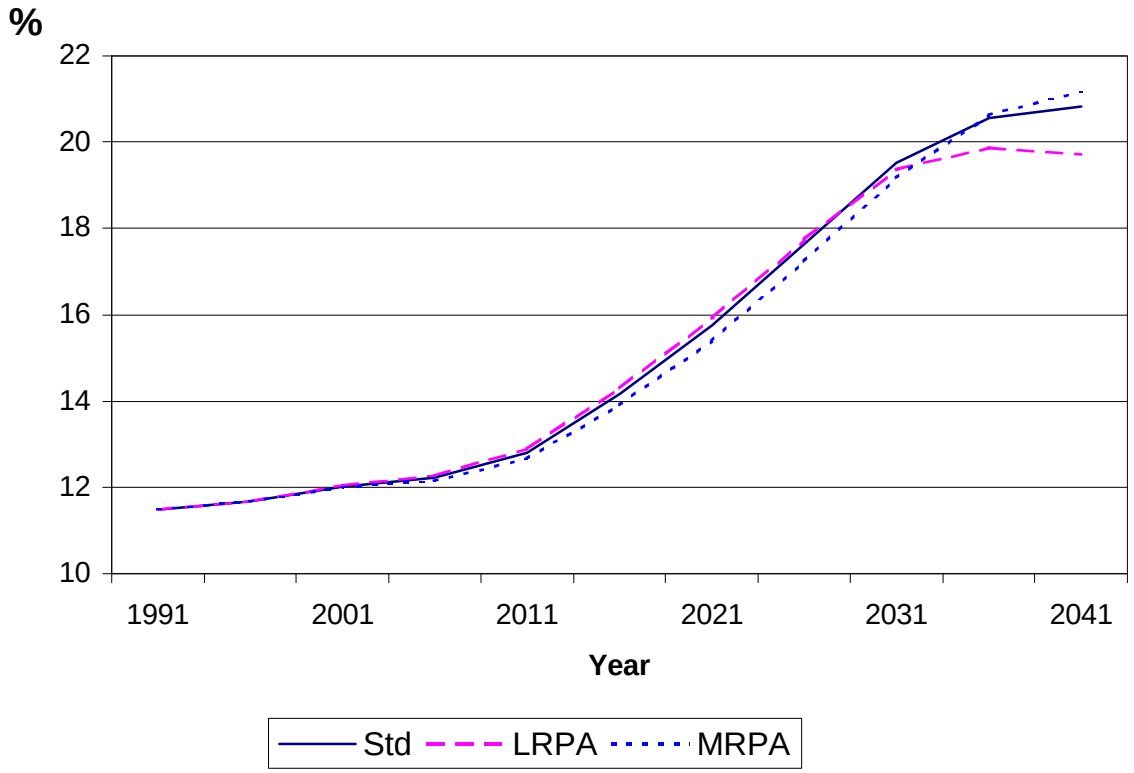

Figure 4: 'Oldest Old' as Percent of Total Population, Definition 2: Alternative Projections

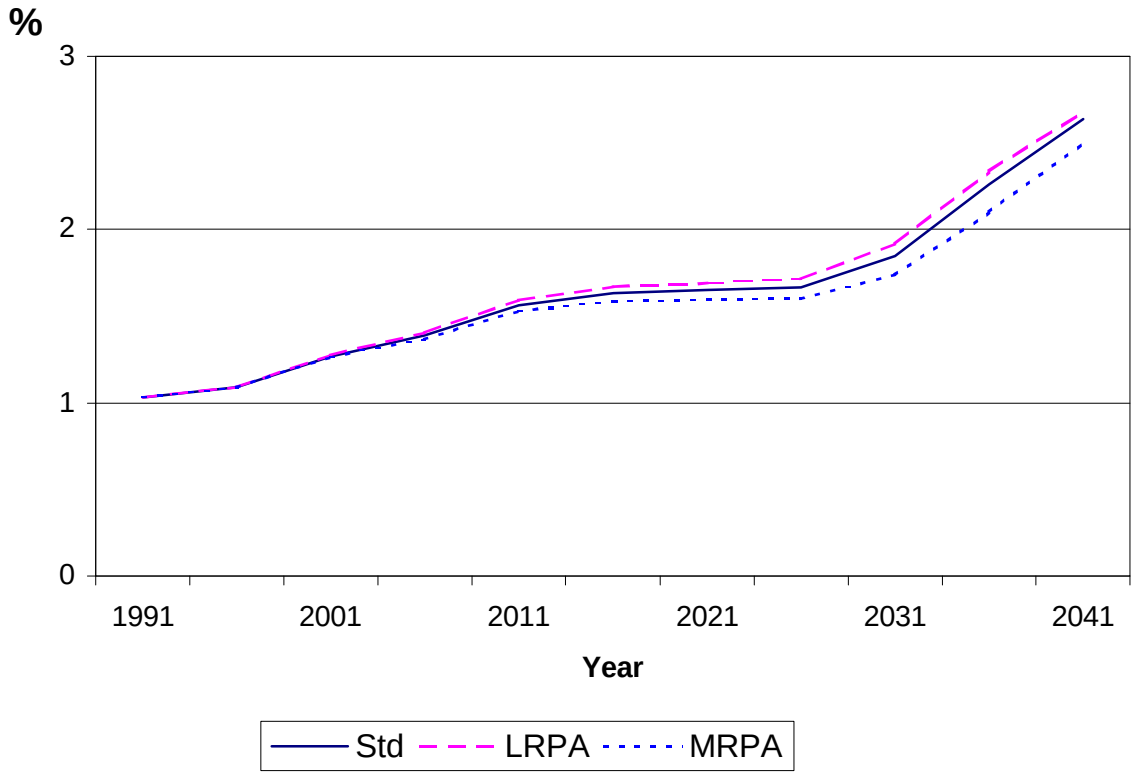

Table 1: Population in Old Age, Alternative Definitions: Standard Projection

Year	Definition 1 Entry Age	Definition 1 Number in category ('000)	Definition 1 as % of total population	Definition 2 Entry Age	Definition 2 Number in category ('000)	Definition 2 as % of total population	Definition 2 as % of Def 1	Definition 3 Entry Age	Definition 3 Number in category ('000)	Definition 3 as % of total population	Definition 3 as % of Def 1
'Old' Population											
						Male					
1991	65.00	1,350	9.7	65.00	1,350	9.7	100.0	65.00	1,350	9.7	100.0
2016	65.00	2,529	14.8	67.47	2,053	12.0	81.2	66.86	2,167	12.7	85.7
2041	65.00	4,242	22.9	69.03	3,365	18.2	79.3	68.06	3,569	19.3	84.1
						Female					
1991	65.00	1,867	13.2	65.00	1,867	13.2	100.0	65.00	1,867	13.2	100.0
2016	65.00	3,151	18.0	66.50	2,842	16.3	90.2	66.09	2,926	16.7	92.9
2041	65.00	5,113	26.7	67.87	4,469	23.4	87.4	67.08	4,640	24.3	90.7
						Male and Female					
1991	65.00	3,217	11.5	65.00	3,217	11.5	100.0	65.00	3,217	11.5	100.0
2016	65.00	5,680	16.4	66.99	4,895	14.2	86.2	66.48	5,093	14.7	89.7
2041	65.00	9,355	24.9	68.45	7,834	20.8	83.7	67.57	8,209	21.8	87.7
'Oldest Old' Population											
						Male					
1991	85.00	88	0.6	85.00	88	0.6	100.0	85.00	88	0.6	100.0
2016	85.00	233	1.4	86.77	163	1.0	70.0	86.49	173	1.0	74.2
2041	85.00	567	3.1	88.09	305	1.6	53.8	87.60	341	1.8	60.1
						Female					
1991	85.00	200	1.4	85.00	200	1.4	100.0	85.00	200	1.4	100.0
2016	85.00	488	2.8	86.29	402	2.3	82.4	86.10	414	2.4	84.8
2041	85.00	1,010	5.3	87.43	686	3.6	67.9	87.08	729	3.8	72.2
						Male and Female					
1991	85.00	288	1.0	85.00	288	1.0	100.0	85.00	288	1.0	100.0
2016	85.00	721	2.1	86.53	565	1.6	78.4	86.30	587	1.7	81.4
2041	85.00	1,577	4.2	87.76	991	2.6	62.8	87.34	1,070	2.8	67.9

Note: The entry ages are defined as follows. Definition 1: 65.0 for 'old' and 85.0 for 'oldest old' in every year. Definition 2: entry age rises so that mean years of life remaining (life expectancy) at that age is constant. Definition 3: entry age rises so that mean years of life as percent of years already lived at that age is constant. Figures for 'Male and Female' are based on the average of male and female entry ages.

Table 2: Population in Old Age, Alternative Definitions: "Less Rapid Population Aging" (LRPA) Projection

Year	Definition 1			Definition 2				Definition 3			
	Entry Age	Number in category ('000)	as % of total population	Entry Age	Number in category ('000)	as % of total population	as % of Def 1	Entry Age	Number in category ('000)	as % of total population	as % of Def 1
'Old' Population											
					Male						
1991	65.00	1,350	9.7	65.00	1,350	9.7	100.0	65.00	1,350	9.7	100.0
2016	65.00	2,507	14.5	67.10	2,102	12.1	83.8	66.58	2,200	12.7	87.8
2041	65.00	3,985	19.9	67.67	3,409	17.0	85.5	67.01	3,546	17.7	89.0
					Female						
1991	65.00	1,867	13.2	65.00	1,867	13.2	100.0	65.00	1,867	13.2	100.0
2016	65.00	3,124	17.6	66.03	2,912	16.4	93.2	65.75	2,969	16.8	95.0
2041	65.00	4,816	23.5	66.05	4,579	22.3	95.1	65.76	4,644	22.6	96.4
					Male and Female						
1991	65.00	3,217	11.5	65.00	3,217	11.5	100.0	65.00	3,217	11.5	100.0
2016	65.00	5,631	16.1	66.57	5,014	14.3	89.0	66.17	5,169	14.7	91.8
2041	65.00	8,801	21.7	66.86	7,988	19.7	90.8	66.39	8,190	20.2	93.1
'Oldest Old' Population											
					Male						
1991	85.00	88	0.6	85.00	88	0.6	100.0	85.00	88	0.6	100.0
2016	85.00	228	1.3	86.48	170	1.0	74.6	86.24	178	1.0	78.1
2041	85.00	495	2.5	86.93	336	1.7	67.9	86.62	360	1.8	72.7
					Female						
1991	85.00	200	1.4	85.00	200	1.4	100.0	85.00	200	1.4	100.0
2016	85.00	475	2.7	85.89	416	2.3	87.6	85.76	425	2.4	89.5
2041	85.00	866	4.2	85.91	750	3.7	86.6	85.78	767	3.7	88.6
					Male and Female						
1991	85.00	288	1.0	85.00	288	1.0	100.0	85.00	288	1.0	100.0
2016	85.00	703	2.0	86.19	586	1.7	83.4	86.00	603	1.7	85.8
2041	85.00	1,361	3.4	86.42	1,086	2.7	79.8	86.20	1,127	2.8	82.8

Note: See Note to Table 1.

Table 3: Population in Old Age, Alternative Definitions: "More Rapid Population Aging" (MRPA) Projection

Year	Definition 1			Definition 2				Definition 3			
	Entry Age	Number in category ('000)	as % of total population	Entry Age	Number in category ('000)	as % of total population	as % of Def 1	Entry Age	Number in category ('000)	as % of total population	as % of Def 1
'Old' Population											
					Male						
1991	65.00	1,350	9.7	65.00	1,350	9.7	100.0	65.00	1,350	9.7	100.0
2016	65.00	2,552	15.0	67.84	2,005	11.8	78.6	67.14	2,135	12.6	83.7
2041	65.00	4,485	25.2	70.28	3,323	18.7	74.1	69.03	3,590	20.2	80.0
					Female						
1991	65.00	1,867	13.2	65.00	1,867	13.2	100.0	65.00	1,867	13.2	100.0
2016	65.00	3,178	18.3	66.97	2,773	16.0	87.3	66.43	2,882	16.6	90.7
2041	65.00	5,396	29.1	69.59	4,365	23.6	80.9	68.35	4,637	25.0	85.9
					Male and Female						
1991	65.00	3,217	11.5	65.00	3,217	11.5	100.0	65.00	3,217	11.5	100.0
2016	65.00	5,730	16.7	67.41	4,778	13.9	83.4	66.79	5,017	14.6	87.6
2041	65.00	9,881	27.2	69.94	7,688	21.2	77.8	68.69	8,227	22.6	83.3
'Oldest Old' Population											
					Male						
1991	85.00	88	0.6	85.00	88	0.6	100.0	85.00	88	0.6	100.0
2016	85.00	237	1.4	87.06	156	0.9	65.8	86.74	168	1.0	70.9
2041	85.00	643	3.6	89.28	275	1.5	42.8	88.58	320	1.8	49.8
					Female						
1991	85.00	200	1.4	85.00	200	1.4	100.0	85.00	200	1.4	100.0
2016	85.00	500	2.9	86.68	388	2.2	77.6	86.44	403	2.3	80.6
2041	85.00	1,158	6.3	88.83	633	3.4	54.7	88.29	696	3.8	60.1
					Male and Female						
1991	85.00	288	1.0	85.00	288	1.0	100.0	85.00	288	1.0	100.0
2016	85.00	737	2.1	86.87	544	1.6	73.8	86.59	571	1.7	77.5
2041	85.00	1,801	5.0	89.06	908	2.5	50.4	88.44	1,016	2.8	56.4

Note: See Note to Table 1.

Number	Title	Author(s)
No. 325:	Just-in-Time: A Cross-sectional Plant Analysis	J.L. Callen C. Fader I. Krinsky
No. 326:	PMEDS-D USERS' MANUAL	F.T. Denton C.H. Feaver B.G. Spencer
No. 327:	MEDS-E USERS' MANUAL	F.T. Denton C.H. Feaver B.G. Spencer
No. 328:	Quarterly Earnings Announcements and the Lead/Lag Relationship Between the Stock and Option Markets	I. Krinsky J. Lee
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