

Longer Lives, Changing Life Cycles: Exploring Consumer and Worker Implications

Global Demographics & Pensions Research

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In this report, we present and discuss longevity trends across the world, highlighting their historically unprecedented nature and their growing underlying uncertainty. We discuss how the nature of such longevity trends has implications for consumers and workers at an individual level as well as at an aggregate level for financial markets, governments and the overall economy.

- While increases in longevity are a common trend across most countries, the speed and trajectory of longevity changes have exhibited marked differences. Thus, it is important to consider how both life expectancy at birth and conditional life expectancy (residual life expectancy at older ages) have evolved.
- Life expectancy increases have been accompanied with growing uncertainty regarding future increases. There is both a need for better and “more regular” forecasting of longevity as well as advances in terms of products/approaches towards mitigating longevity risks.
- Economic and Financial Research has paid little attention to changing consumer and worker psychology in aggregate macro models. Life cycle changes have accompanied the unprecedented life expectancy increases. An average individual’s life cycle has included earlier socialization/learning as a toddler, longer years in education through school and college, delayed marriage and parenthood, school-breaks, college-breaks and career breaks, multiple jobs, phased retirement, caring for children and older parents and extended retirement periods.
- The implications for financial markets of these changes are very broad from financial education to developing new products for savings, insurance and investments to risk management and active asset allocation. These life cycle changes create opportunities for new financial services products across banking, insurance, reinsurance, derivatives, and multi-strategy asset allocation. Real estate, infrastructure, hedge funds and private equity will also have a rich and different role to play against the background of changing consumers and workers.
- Increased longevity impacts public finances of countries as it places an onerous burden on governments to finance expenditures on health and pensions. Partial reforms include increased retirement ages in line with longevity, renegotiating old-age entitlements, and increasing old age and female labour force participation rates. Governments need to adopt a holistic policymaking framework that includes Health, Education, Benefits & Taxes, Pensions and Employment for success in dealing with these changes.

Unprecedented increases in human longevity (life expectancy) are occurring all over the world. People are living longer and their behavior as consumers and workers is also changing. Individual life cycles as well as work and consumption patterns have evolved along with the increased longevity. These changing characteristics of workers and consumers do influence not only their own quality of life, but also have a profound impact on aggregate labour force growth, GDP growth and government budgets. In addition, company balance sheets and sector outlooks will also be affected.

In this report, we analyze the longevity trends unfolding in certain selected countries of the world along with their implications for consumers, workers, financial markets and governments. We illustrate the trends in selected countries where we believe the changes are occurring in a notable fashion.

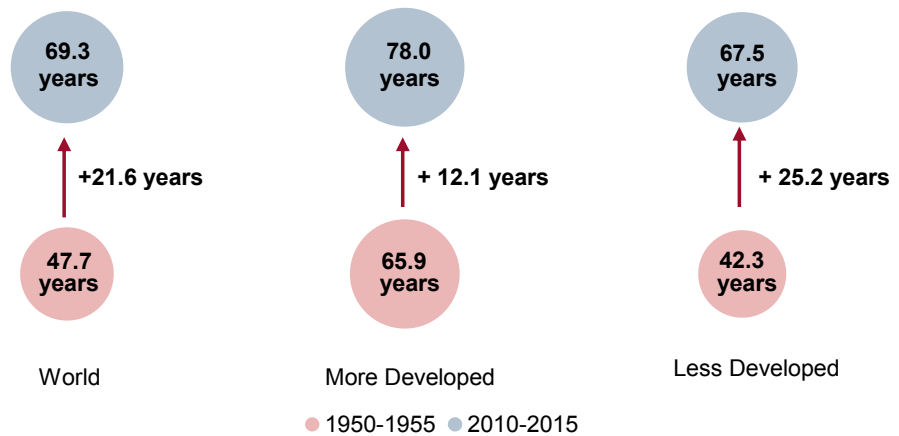
Longevity: Measures, Trends & Forecasts

Human life expectancy or longevity can be measured by considering either life expectancy at birth or residual life expectancy at any particular age (conditional life expectancy) i.e., life expectancy at different ages. Both these measures reveal different patterns of longevity evolution as we discuss later in this section. In an ageing world, there is an increased need to focus on conditional life expectancy at both age 65 and at age 80.

Global life expectancy has increased dramatically from 47.7 years (1950-1955) to 69.3 years (2010-2015), as in Exhibit 1. Even though life expectancy is higher in more developed regions of the world at 78 years (2010-2015), the less developed regions have experienced greater life expectancy increases from 42.3 years (1950-1955) to 67.5 years (2005-2010). The life expectancy gap between rich and poor regions of the world has narrowed.

Exhibit 1: Life expectancy at birth: World, Rich and Poor regions

Years

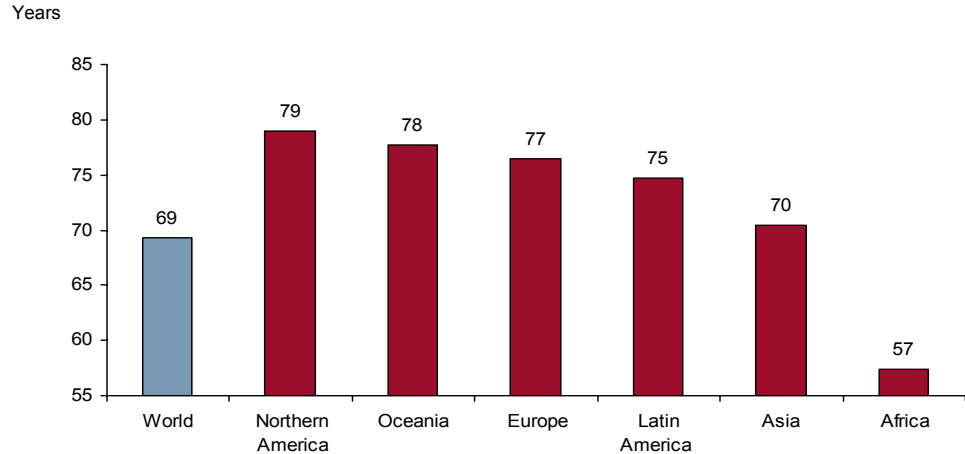


Source: UN, Credit Suisse

Different parts of the world are in very different stages of demographic transition and that explains their diverse experiences in terms of life expectancy trends and age structure.

Exhibit 2 illustrates the life expectancy differences between the major continents. Africa has the lowest life expectancy at 57 years, and the second lowest, Asia, is far ahead of Africa. Africa is the only continent with the life expectancy lower than the world average of 69 years.

Exhibit 2: Life expectancy at birth (Continents): 2010-2015

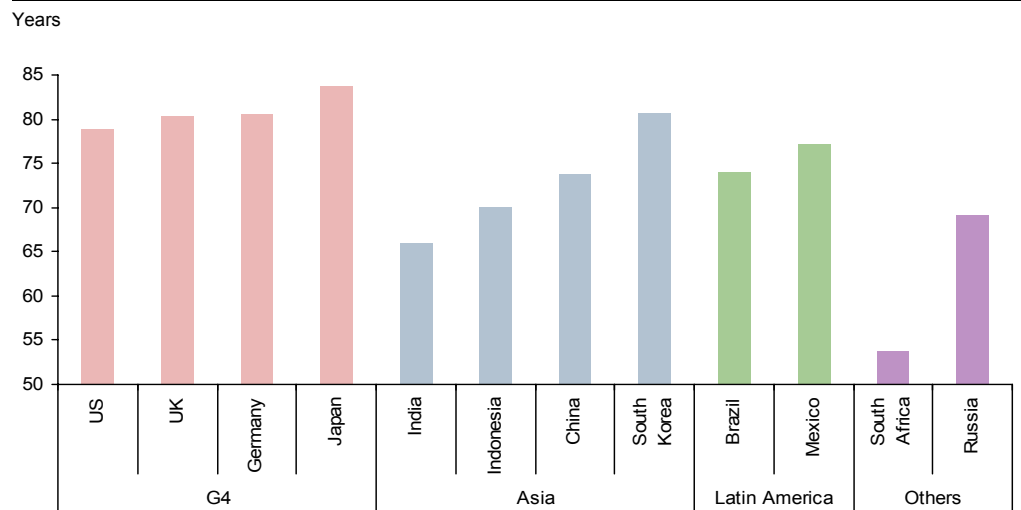


Source: UN, Credit Suisse

We mainly focus on and analyze trends in three groups of selected countries (Exhibit 3):

- Advanced and aged economies/ G4 countries- Germany, Japan, UK and US:** These countries have experienced longevity increases over a long period of time and their current life expectancies are amongst the highest in the world. The average life expectancy at birth of G4 countries is 80.9 years, much higher than that of the world overall. Japan has the highest life expectancy in the world at 83.7 years (2010-2015).
- Emerging and younger economies- Asian countries (China, India, Indonesia and South Korea) & Latin American countries (Brazil and Mexico):** These countries have experienced relatively recent but large increases in longevity and their life expectancy is slightly lower. There is a wide divergence across the countries, especially in Asia. South Korea's longevity trends resemble that of many industrialized countries and are very dissimilar to Asian countries such as India where life expectancy increases have been much lower.
- Countries where longevity trajectories have been strikingly different:** These countries have experienced stagnation or declining longevity in the past decades, such as Russia and South Africa. It is, however, worth noting that few other countries in Emerging Europe (Belarus, Ukraine, etc.) and in Africa (Uganda, Kenya, Zimbabwe, Botswana, etc.) have had similar experiences in longevity.

Exhibit 3: Life expectancy at birth (Selected Countries): 2010- 2015



Source: UN, Credit Suisse

Next we take a closer look at the life expectancy changes over the past three decades. While increases in life expectancy are common across most countries, the speed of these increases has varied as shown in Exhibit 4.

- Longevity increases have been the highest in many Asian and Latin American countries, where life expectancies were at a lower starting level compared to the G4 countries. For example, South Korea¹ has experienced a dramatic increase in life expectancy of 13.3 years in the last three decades surpassing US, UK and Germany. While India and Indonesia have also achieved large increases of 9.8 and 11.2 years, respectively, their life expectancies still lag behind many other Asian countries (such as China, Malaysia, South Korea, Singapore, etc.).
- In Latin America, life expectancy at birth advanced most, by 10.6 years, in Brazil. However, Brazil still trails slightly behind most of its neighbours (such as Venezuela, Argentina, Mexico, Chile, etc.).
- Among the G4 countries, the longevity increases range from 4.4 years in the US to around 7 years in Germany and Japan.
- Overall, the differences in longevity trends of the G4 and Latin American countries are smaller than those in Asia, reflecting the differences in starting levels of life expectancies.

Exhibit 4: Life expectancy at birth changes

Years

		1980-1985	2010-2015	Increase between 1980- 1985 & 2010-2015
G4 Countries	US	74.3	78.8	4.4
	UK	74.1	80.4	6.3
	Germany	73.8	80.6	6.8
	Japan	76.9	83.7	6.7
Asia	India	56.2	66.0	9.8
	Indonesia	58.8	70.0	11.2
	China	67.7	73.8	6.1
	South Korea	67.4	80.7	13.3
Latin America	Brazil	63.4	74.0	10.6
	Mexico	67.7	77.2	9.5
Others	South Africa	58.4	53.8	-4.6
	Russia	67.4	69.2	1.7

Source: UN, Credit Suisse

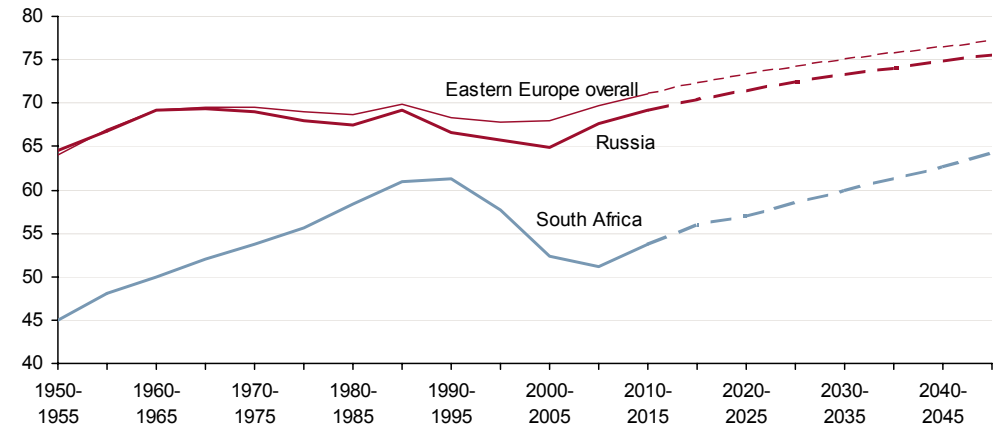
Special Cases - Russia and South Africa

The longevity changes in Russia and South Africa are worth noting separately due to their strikingly different trajectories, as shown in Exhibit 5.

¹ Credit Suisse Demographics Research, Republic of Korea: Demographic Opportunities & Challenges (2010)

Exhibit 5: Life expectancy at birth: Russia and South Africa

Years (Dotted lines represent UN projections)



Source: UN, Credit Suisse

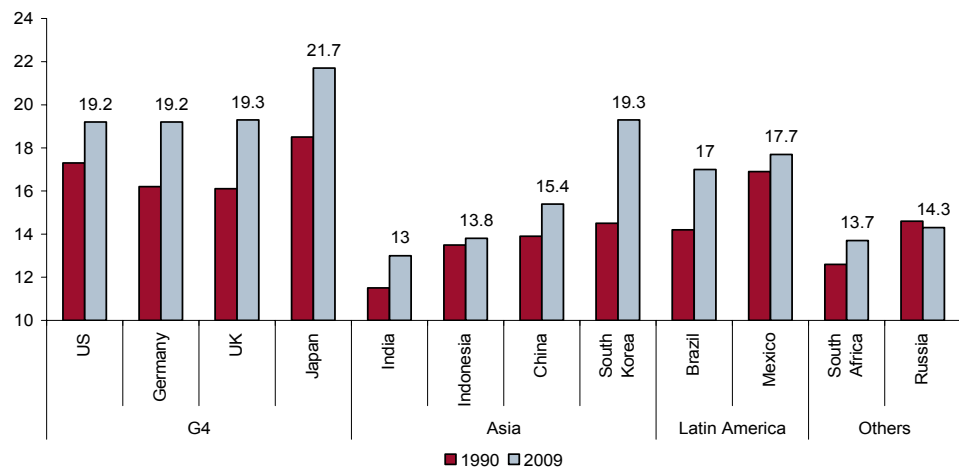
The life expectancy at birth in Russia started to decline in the 1990s, reaching a bottom of 64.9 years in 2000-2005, and then turned to an upward trend. In South Africa, life expectancy started to decline in the mid-1990s and didn't stabilize until very recently. The possible reasons for the different trajectories are discussed in the Appendix.

Conditional Life Expectancy

Another measure, conditional life expectancy, measures the length of remaining life (residual life) at a certain age. It is how long people will live at retirement that matters for most ageing countries. Life expectancy at 65 and life expectancy at 80 have increased substantially in most countries. Currently, Japan has the highest life expectancy at age 65 in the world, followed by South Korea, the UK, Germany and the US, as shown in Exhibit 6. At one extreme, South Korea experienced the largest increase in life expectancy at 65 between 1990 and 2009, of 4.8 years. At the other extreme, Indonesia, which experienced an increase of 2.9 years in life expectancy at birth during the same period, saw an increase of just 0.3 years in life expectancy at age 65. Russia suffered a decline of 0.3 years in life expectancy at age 65. Exhibit 7 displays the life expectancy at age 80 across the same set of countries and we note the differences across countries. This highlights the importance of differentiating between life expectancy at birth and residual life expectancy at an older age.

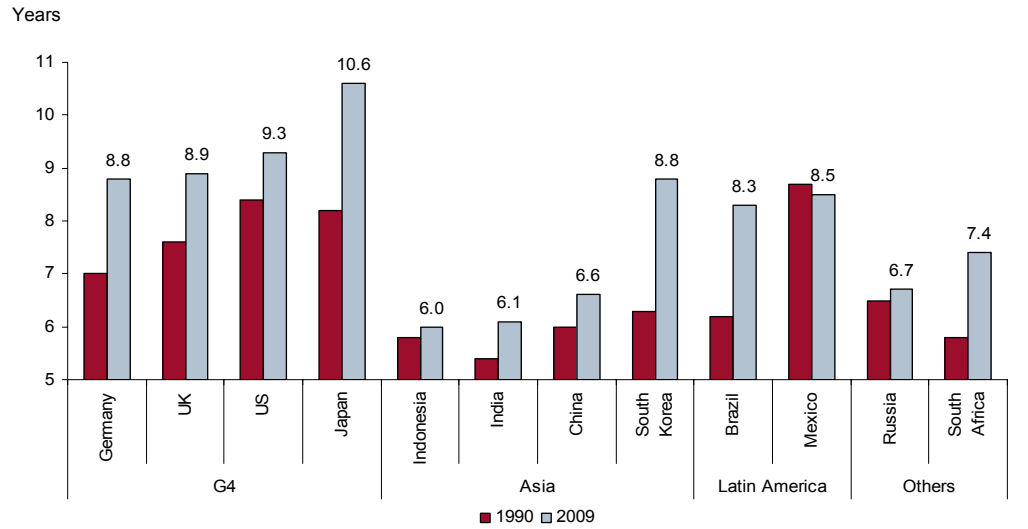
Exhibit 6: Life expectancy at age 65

Years



Source: WHO, Credit Suisse

Exhibit 7: Life expectancy at age 80



Source: WHO, Credit Suisse

Longevity Forecasting

Will these past longevity increases continue in the future? Experts have found it difficult to forecast longevity, and many efforts made in the past have proved to under-estimate life expectancies. Improving on the collective knowledge, efficiency and accuracy of longevity models would yield benefits to insurance companies, pension funds, reinsurance companies as well as governments in the future. The very rapid and unexpected increases in longevity have provided an impetus to study and improve mortality forecast models.

There are three common approaches to forecasting mortality that are listed below:

- **Expectation:** Based on the subjective opinions of experts.
- **Explanation:** Structural or epidemiological models of mortality derived from certain causes of death with known determinants.
- **Extrapolation:** Uses past data to express age specific mortality as a function of time and can be either deterministic or stochastic. Most developments in mortality forecasting have been in extrapolative forecasting.

Leading longevity experts differ on the future of longevity considerably too. In a Watson Wyatt-Cass Business School series of lectures, "Uncertain future of Longevity"², the leading experts of the world do not agree within reasonable norms on the future of human life expectancy:

- The pessimists led by Jay Olshansky argue that life expectancy might level off or decline, considering the impact of obesity, diabetes, global warming, etc.
- The optimists like James Vaupel believe that there is no natural limit to human life and past experience will be reproduced in the future driven by scientific advances.

Thus longevity has not only increased, it has become **more and more uncertain** and the failure to predict it has resulted in the emergence of a major source of risk: Longevity Risk.

² Towers Watson /Cass Business School Public Lectures on Longevity (March 2005), 'Uncertain Future of Longevity'

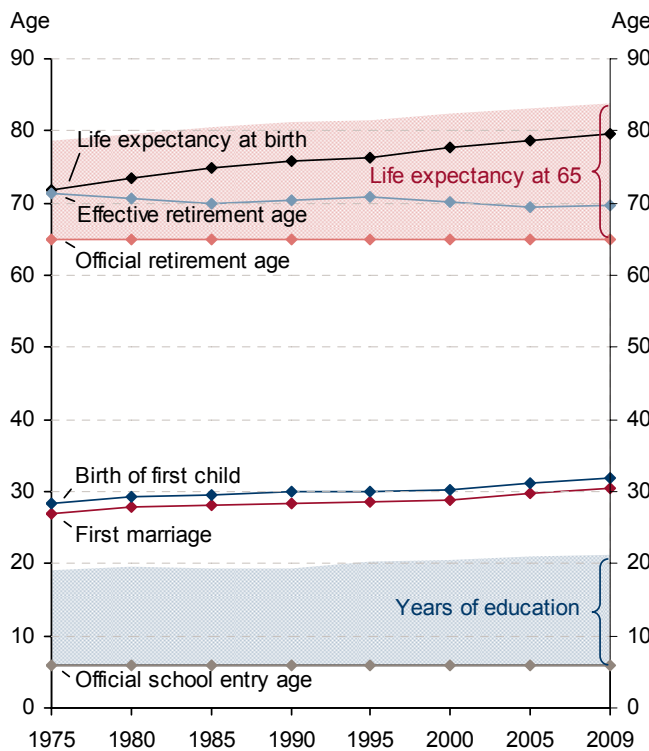
Changing Life Cycles

With the extension of life-spans, different stages of the life cycle are being delayed to later ages. As the country with the longest lived people, Japan is a good example to illustrate the magnitude and extent of changes in the human life cycle.

In Exhibits 8 and 9, we illustrate the life cycle changes for a Japanese man and woman from 1975. In 1975, an average Japanese woman would leave school and join the labour market at the age of 18.2, spending 12.2 years in education, enter marriage at 24.7 years old, have her first child at 25.7, retire effectively at 65.8, and spend 15.8 years in retirement. Now all these events are delayed to later ages. A typical Japanese woman in 2009 would leave school and start working at the age of 21, spending 15 years in education, enter marriage at 28.6, give birth to her first child at 29.7, exit fully from the labour market at 67.3, and enjoy 21.7 years of post-retirement life. **We stress the changes at all stages of the life cycle, not just at older ages.**

Exhibit 8: Changing life cycle in Japan: Men

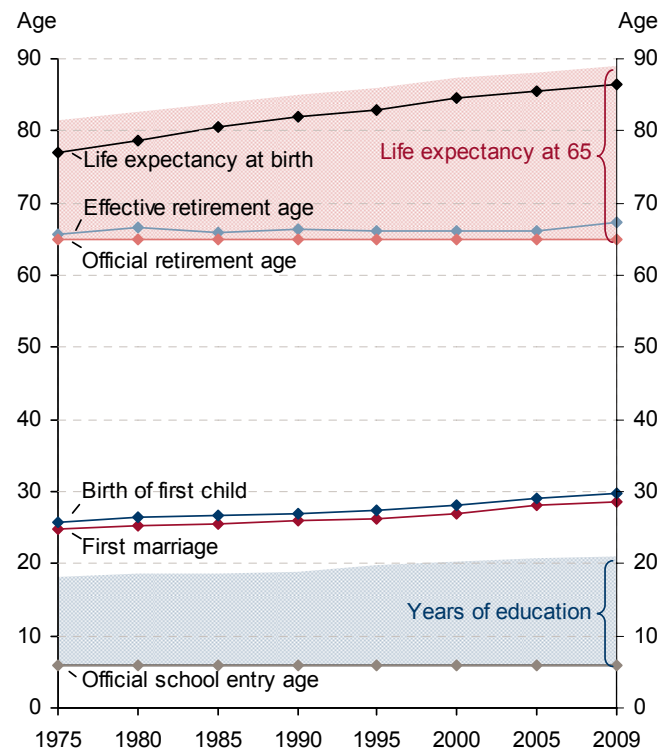
Average age of life events



Source: Ministry of Health, Labour and Welfare of Japan, OECD, UNESCO, Credit Suisse

Exhibit 9: Changing life cycle in Japan: Women

Average age of life events

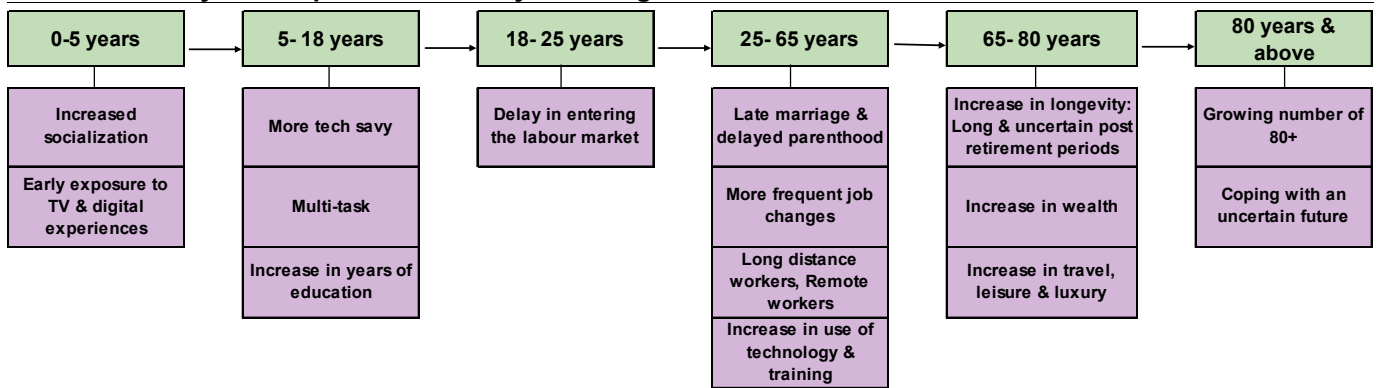


Source: Ministry of Health, Labour and Welfare of Japan, OECD, UNESCO, Credit Suisse

Japan, Germany, Switzerland and Italy are amongst the oldest countries in the world in terms of life expectancy. Life cycle changes have accompanied life expectancy changes in all these countries.

Exhibit 10 depicts our broad conceptualization of different life-cycle changes across six stylized phases.

Exhibit 10: A stylized depiction of Life Cycle changes



Source: Credit Suisse

The first phase as a toddler sees an increased degree of socialization, early learning and digital/TV experiences. With working mothers, young toddlers are increasingly spending time in nurseries and crèches, which leads to greater social exposure to others--toddlers and adults.

In the second phase, we see a further exposure to digital media, on-line games, on-line activities and a multitude of gadgets, instruments, devices that children start dealing with and become expert in as they go through their school lives. The breadth rather than depth of the subjects in the official learning curricula has also increased tremendously. In addition, very high percentages on high school graduation rates go hand in hand with people spending more years in formal education, completing school and then progressing to university/college.

Over the last couple of decades, entry procedures for large employers have meant increased qualifications, standardized tests, interviews for college graduates. Entry ages into the formal job arena have increased. In addition, that has had a knock-on effect on delays in marriages, leading to a higher age at first marriage.

Delayed marriages lead to delayed parenthood due to both career focus as well as increasing costs of parenting for families belonging to all income groups- lower, middle and high (see Exhibit 11). For a middle income earning family in the US, the cost of raising a child to age 17 has risen from \$165,630 (2000) to \$226,920 (2010). In addition, the demise of the norm of single employer careers has gone hand in hand with more frequent job changes- long-distance workers, hot-deskers, remote workers add to the diversity of the working population. Training courses have become a continuous and important part of career progression and skill development. The older workers are forced to become more adept at using technology to order goods and services as costs/time become issues in an increasingly demanding and challenging workplace and world.

The phase of the traditional retiree 65-80 or even 60-80 in many countries has become transformed as they are relatively richer, better connected, better informed and able to avail of global travel, global communications offerings in their retirement phase. The uncertainty regarding the length of their post-retirement period and the costs of health as well as living exposes them to the longest and biggest financial planning exercise that any cohort has faced at that stage of the life cycle.

There are a growing number of 80+ people in the world; they number around 105 million and straddle a wide geographical area around the globe, with very varied living arrangements, varied status also in families, coping with an uncertain future without the general prospects of wage/salary income to add to wealth or savings.

Exhibit 11: Cost of raising a child in the US – husband and wife families

Current US\$

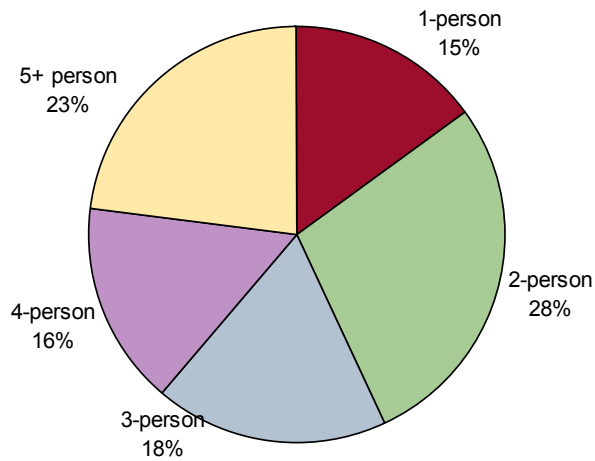
	2000			2010		
	< \$38000	\$38000 - \$64000	> \$ 64000	< \$57600	\$57600 - \$77500	> \$77500
Pretax income						
Average pre-tax income	\$23,800	\$50,600	\$95,800	\$36,840	\$77,500	\$174,530
Cost of raising a child to age 17	\$121,230	\$165,630	\$241,770	\$163,440	\$226,920	\$377,040
of which: child care and education	\$9,480	\$16,560	\$26,520	\$22,710	\$39,420	\$84,870
% on child care and education	8%	10%	11%	14%	17%	23%

Source: USDA, Credit Suisse

A consequence of this is a rapid emergence of smaller-sized families that has implications for every product and service that individuals consume over their life cycle.

Exhibit 12: Distribution of US households by size: 1965

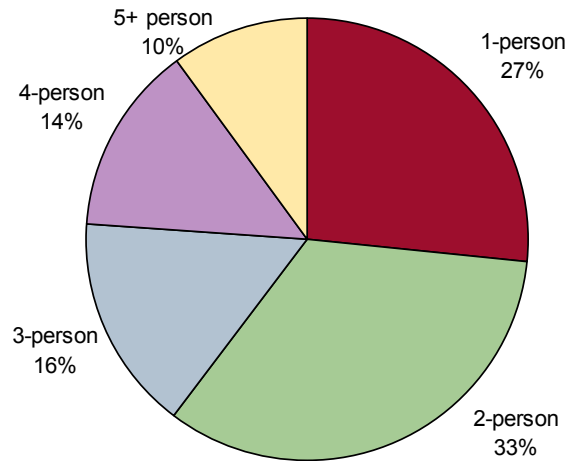
%



Source: US Census Bureau, Credit Suisse

Exhibit 13: Distribution of US households by size: 2010

%



Source: US Census Bureau, Credit Suisse

As Exhibit 12 and Exhibit 13 show, there has been a decline in the share of households with 5 people or more and a corresponding rise in the share of 1 person and 2 people households in the US from 1965 to 2010.

Changing Consumers & Workers

Having highlighted the changing life cycle paradigm that we see in terms of the Japanese case study and the stylization that we presented above, we now turn to certain facets of how consumers and workers have changed in terms of education, use of technology, spending patterns, savings patterns, etc.

The rapid pace of technological development is impacting all stages of the life cycle. Exhibit 14 illustrates the increase in reported internet usage for individuals in the US between just two years. The increase is fairly uniform across all ages with the highest increase in the 18-34 and 65+ age groups. The internet usage statistics are very high for the employed, which shows the importance of technology in work life today. Improved technological development also enables workers, especially women and old people, to work flexibly to better manage work and home life.

Exhibit 14: Internet usage for US individuals

Selected Characteristics	Individual accesses the internet from some location		Individual lives in household with internet access	
	2007	2009	2007	2009
	All	62.4	68.4	67.1
By age group				
3-17 years	56.3	61.6	70.7	76.6
18-34 years	72.5	79.9	68.3	75.7
35-44 years	72.8	78.5	73.5	79.1
45-64 years	66.7	72.5	70.6	76.9
65 years & older	34.9	41.5	45.7	53.3
Total 15 years & older	65.0	71.1	66.7	73.1
By employment status				
Employed	74.0	80.3	73.3	80.3
Unemployed	65.6	73.5	61.6	67.8
Not in labor force	48.9	55.8	55.2	62.4

Source: US Census Bureau, Credit Suisse

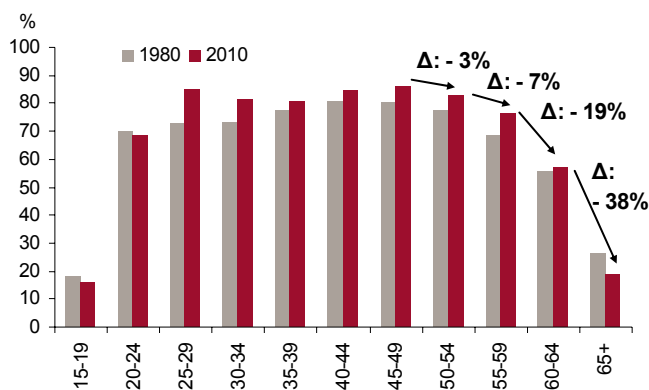
The use of technology and internet/online services for multifarious reasons has impacted people such as consumers, savers, workers and as constituents of social groups. Mark Penn and Kinney Zalesne in their book, “Micro Trends,” devote a chapter to the consumer, worker and social behaviour trends in the U.S. The biggest purchase items for households—homes and cars—are being researched as a part of the decision-making process. Job vacancies, training and development, as well as education in distance-learning or online universities/schools, etc. have transformed the phases within the life cycles of individuals. This has also transformed marketing and advertising from the typical conventional modes developed by the gurus Phillip Kotler and David O’Gilvy.

As consumers, the purchasing experience changes have meant significant on-line ordering of all types of goods and services—education, airline, groceries, computers, cosmetics, health foods, etc.

An increase in the number of years in education, along with delays in the age of marriage and birth of the first child as well as an increase in post retirement periods have resulted in a different pattern of work participation at different ages than what used to exist in the 1980s.

Exhibit 15: Economic activity rates by age: Japan

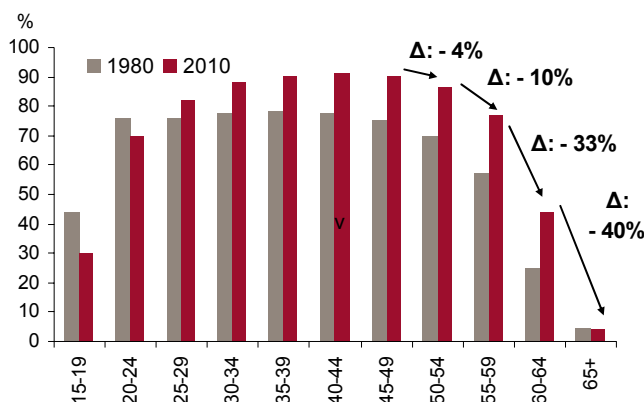
Age groups on X axis, Δ represents the change in economic activity rates in 2010 as we move from one age group to another



Source: ILO, Credit Suisse

Exhibit 16: Economic activity rates by age: Germany

Age groups on X axis, Δ represents the change in economic activity rates in 2010 as we move from one age group to another



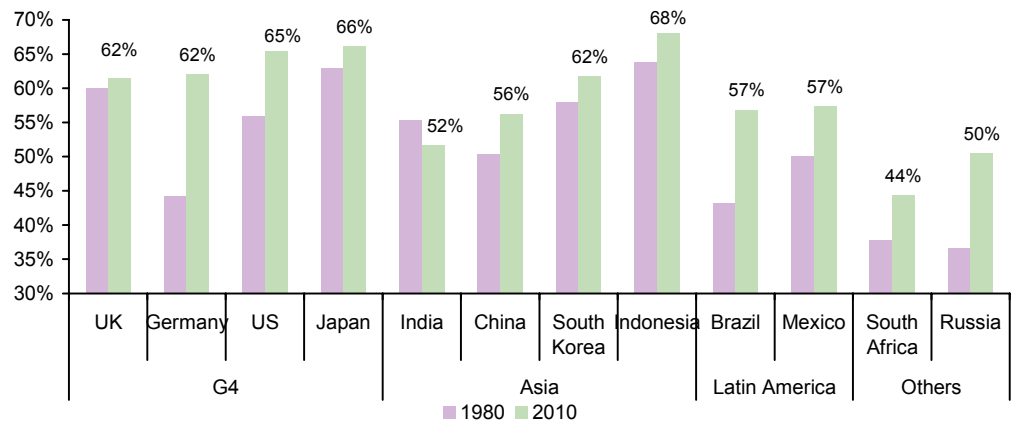
Source: ILO, Credit Suisse

Exhibit 15 and Exhibit 16 illustrate the changes in age specific economic activity rates in Japan and Germany. Age specific economic activity rates measure the ratio of the economically active population to the total population in that particular age group. In these countries, activity rates at younger age groups have fallen due to increases in years of education between 1980 and 2010. For middle aged groups, we see an increase in activity rates, especially in Germany. As we move from one age group to the other, from 45- 49 year onwards, we see a drop in activity rates. The drop accelerates as we move to older age groups. For instance in Japan, economic activity rates fall by 38% in 2010 as we move from 60- 64 years to 65+ year olds and in Germany, they fall by 40%. In fact, the drop in Germany is higher compared to Japan as we move towards older age groups.

The need to finance longer post-retirement life affects the work incentives and behavior of middle-aged and old workers. For old workers, we look at the changes in more detail in Exhibit 17. Economic activity rates for 55-64 year olds have increased and the increase is particularly notable in Germany, Brazil and Russia. Currently the activity rate for 55-64 year olds is the highest in Indonesia and the lowest in South Africa. This perhaps reflects the need to work longer in poorer countries like Indonesia combined with the ability to work between the ages of 55 and 64; being in good enough health to work longer as life spans increase is important too. Health is an important issue for both workers and consumers that we discuss later and becomes far more important at ages beyond 70 and 80.

Exhibit 17: Economic activity rates for old workers: 2010

Economic activity rate for age group 55-64 (%)

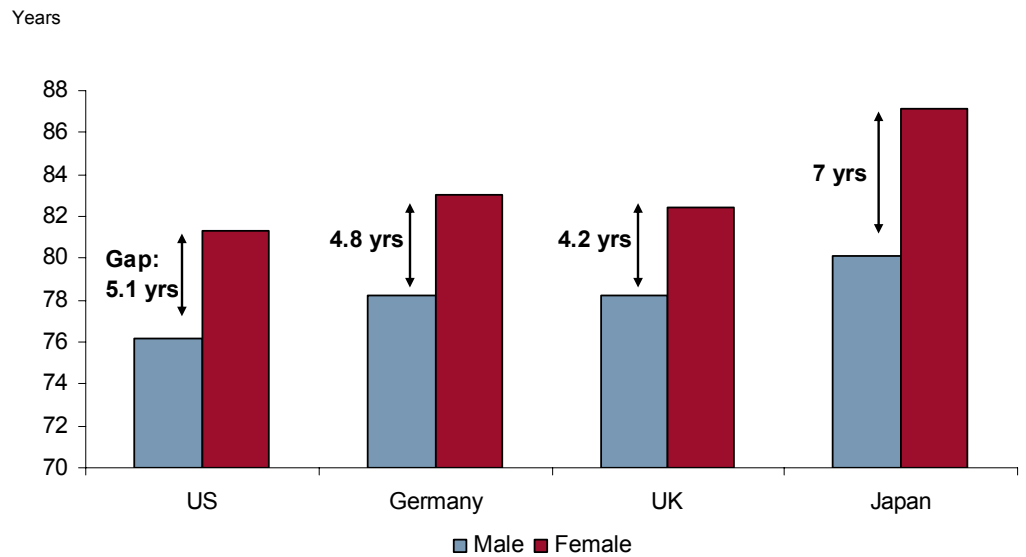


Source: ILO, Credit Suisse

In most developed countries (OECD), the participation rates for men aged 50-64 have fallen substantially since 1970, but there has been an increase in the corresponding participation rates for women. Research by the OECD³ also finds that higher participation for women at younger ages is strongly associated with higher participation rates at older rates, but for men there is no such connection. Exhibit 18 shows that women outlive men and thus they need to work longer to sustain themselves.

³ See OECD (2006), "Live Longer, Work Longer" a summary of country studies commissioned by OECD on Ageing And employment Policies.

Exhibit 18: Male and female life expectancy at birth: 2010- 2015



Source: UN, Credit Suisse

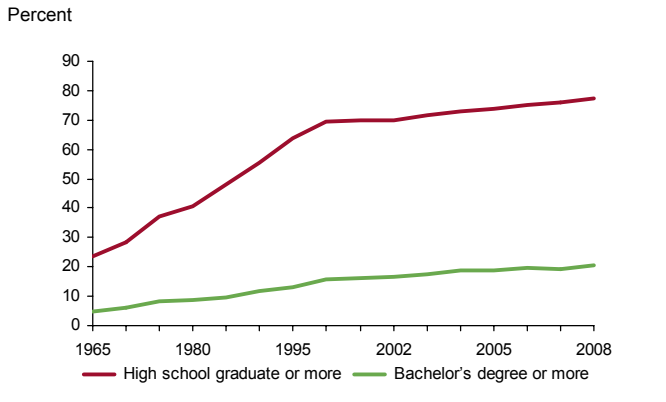
Post the age of 65, the activity rates have decreased in Germany and Japan from 1980 to 2010. In Japan, the fall in activity rates of 65+ workers is quite significant. The prospects of getting a job at older ages are a function of individual willingness to work combined with institutional features that reflect demand for older-aged workers as well as very importantly the stage of business cycle, i.e., strength of economy in terms of growth and employment.

We recommend and hope that the increase in participation rates of 55-64 year olds in the richer countries gets extended next to the 65-74 year olds as we advocated in our launch Demographics Research publication⁴, the need to embrace flexible and part-time working across the retired and semi-retired. The fixed retirement age of 65 needs to be abolished in developed countries experiencing large longevity increases. There is evidence that shows effective retirement ages are later than official retirement ages in many countries already, suggesting the nature of future changes required (see Appendix 1).

Exhibit 19 illustrates the steady increase in education across the older age groups, which is one of the defining changes across the last few decades. Older workers are getting their degrees or diplomas and getting trained. There is a gap between the educational attainment of elderly men and women. In 2008, 77.9% of the men above the age of 65 years were a high school graduate or more while the corresponding figure for women was 77.1%. The gap is higher for a bachelor's degree or more with 26.7% of elderly men and 15.8% of elderly women attaining a bachelor's degree or more.

⁴ Credit Suisse Research, New Jobs, New People- The Demographic Manifesto (2000)

Exhibit 19: Educational attainment of the 65+ aged population in the US



Source: U.S. Census Bureau, Credit Suisse

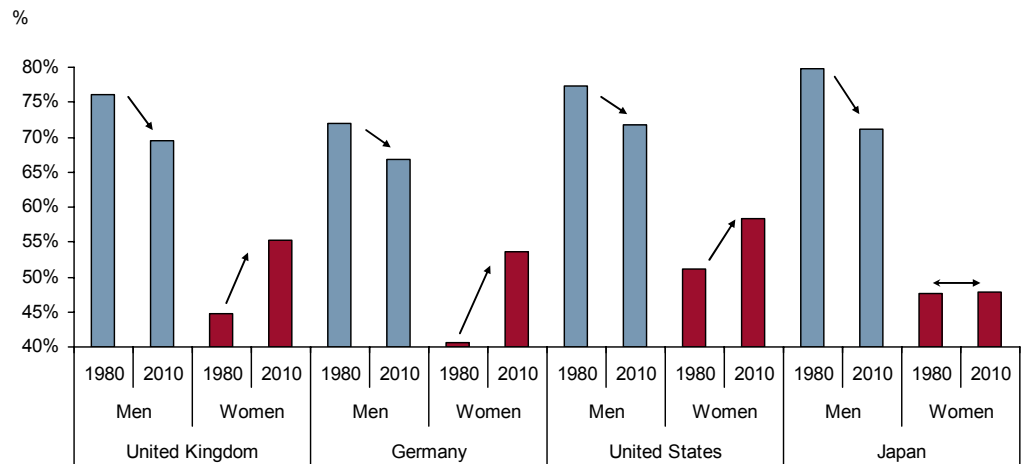
Exhibit 20: Gap in male-female economic activity rates (for all working age,15-64)

	1980	2010
UK	31	14
Germany	31	13
US	26	13
Japan	32	23

Source: ILO, Credit Suisse

Other important policy variables that societies and governments need to pay greater attention to are the overall female economic activity rates (labour participation rates) that lag behind male economic activity rates, despite females performing very strongly at school and college in most developed countries. Presented in Exhibit 20 are the differences in male-female activity rates.

Exhibit 21: Male and female economic activity rates (for all working age,15-64)

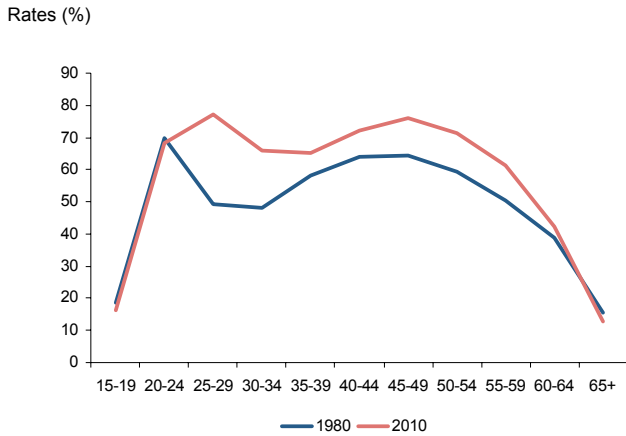


Source: ILO, Credit Suisse

While there has been a narrowing of the gap in the last three decades due to a fall in male activity rates and rise in female activity rates (see Exhibit 21), nearly all the countries can do better by helping narrow the gaps even further. There is a need to accelerate the rise in female economic rates and prevent the male economic activity rates from falling further. **This is imperative if countries are to maintain the living standards for the elderly that we have noted over the past two decades.**

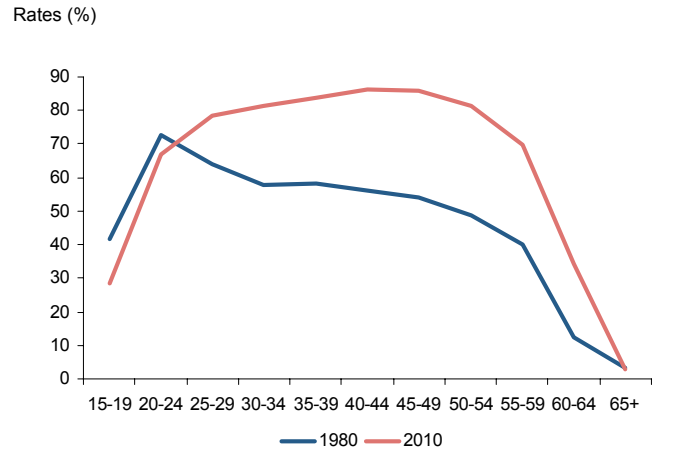
To further elaborate on the female economic activity rate changes, we plot them by age in Exhibit 22 and Exhibit 23. In Japan, the female economic activity rates drop at the child bearing age as women drop out to take care of their kids. In 1980, the fall occurred at 25-29 years while in 2010 it occurs at a later age due to the increase in the age of the mother at the birth of her first child. The drop is also less steep due to the development of child care facilities. In Germany, the drop used to take place in 1980, but it has disappeared in 2010. In fact, female economic activity rates have improved a lot for all ages in Germany.

Exhibit 22: Female economic activity rates by age: Japan



Source: ILO, Credit Suisse

Exhibit 23: Female economic activity rates by age: Germany



Source: ILO, Credit Suisse

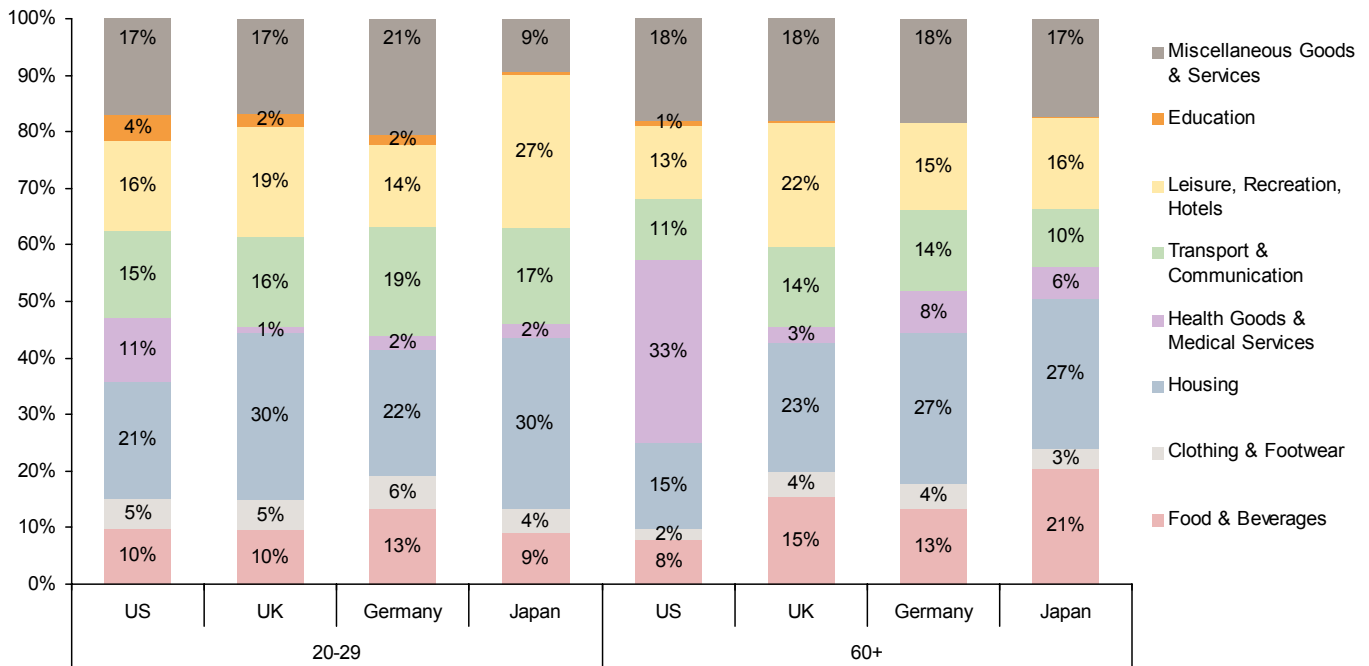
With the increase in the number of old consumers, it is important to analyze how the consumption basket and expenditure as well as saving trends of an elderly consumer differ from that of a young consumer, and how they have changed over time.

Consumption patterns differ across age groups and this is highlighted in Exhibit 24, which presents the decomposition of consumption expenditures for 20-29 year olds vs. those above 60 years. A young consumer tends to spend a higher proportion on education, while an old consumer tends to spend a higher proportion on health goods and medical services.

- In the US, the old spend a very high proportion of their income on health compared to the other three countries and spend a lower proportion compared to the young on all other categories.
- In the UK, the old spend a greater proportion on food and beverages and leisure, recreation, hotels compared to the young.
- The 60+ in Germany spend a greater proportion on housing and leisure, recreation and hotels compared to those between 20-29 years.
- Lastly, in Japan, the old spend more on food & beverages.

Exhibit 24: Consumption baskets for the old and the young differ: 2007

Share of consumption expenditure by categories for selected age groups



Source: Euromonitor, Credit Suisse

Changing household sizes, changing workers and changing consumers influence demand for all products and services across the board. We highlight a few selectively impacted sectors.

- **Financial Services:** Different products are needed at every phase of the life cycle (shown in Exhibit 10) across consumer banking (savings products, life insurance products), investment management (investment products), investment banking (advisory, liquidity, structured products, indices, portfolios, hedging products, securities issuance and secondary trading), insurance and re-insurance, alternatives, etc. as individual needs evolve over time
- **Housing and Real estate:** The real estate demands for rentals or purchases will also vary according to region, life cycle, age, gender, skills. The demands for commercial real estate for manufacturing locations, office spaces, and storage spaces are also very different. Several prototypes of the next generation work, city and manufacturing bases are radically very different to what was the norm in the 1980s and early 1990s.
- **Technology:** this sector has a pervasive ever-evolving impact via Facebook, Twitter, Google, Apple, Netflix for people across all phases and generations that are impacted. This will also impact ways in which people invest their savings and trade on their own account. Newer ways of delivering financial statements, products and informational alerts imply that the investment-technology-trading interface will evolve at an even faster pace than what we have seen before.
- **Pharmaceuticals, Health Care and Biotechnology:** With changing life cycles across their work and personal lives, the way that individuals and companies regard health of employees at young and old ages has also changed. We still have no cures in sight for many cancers, MS, ME, Parkinson's and Alzheimers for the rich world or vaccines against malaria and other tropical infections in Asia, Africa, Latin America.

Household Savings and Finances

The changing behavior of people as consumers and workers translates into their changing behavior as savers. Saving patterns of individuals are very important for financial institutions and increasing and uncertain life spans have led to the emergence of old savers who have to undergo the biggest financial planning exercise that any cohort has faced at that stage of the life cycle. Households as well as pension funds/ asset managers face complicated and uncertain financial decisions, which necessitate the emergence of new products for savings, insurance and investments, which can better handle longevity risk and long durations. Savings differences influence capital flows and current accounts too⁵.

Exhibit 25 illustrates the household finances of the US by age. The annual income in the US has increased from 1989 to 2007 by 18 thousand dollars. The increase has been the highest for the 65- 74 year age group, maybe due to increased labour participation rates of the elderly. Income is the highest for the 45-54 year age group. Asset values and net worth have also increased the most for 65-74 year olds between 1989 and 2007, making them the richest age group in 2007. In 1989, the richest age group was 55-64 year olds. Debt has increased the most for 45-54 year olds and thus the debt values were the highest for them in 2007.

It is paramount for governments, employers and policy-making institutions including regulators to fully appreciate the links between different phases of an individual's life cycle in terms of resource accumulation based on labour income, asset returns, savings alongside the consumer-saver-worker features of people that are influenced by education, skills, experience, health and preferences. A holistic understanding of the underlying heterogeneity of consumers-workers, distinct from looking at representative or average individuals, is critical in today's world of longer-lived different individuals with differing life cycle phases.

Exhibit 25: US household finance by age (thousands of 2007 dollars)

	Age of household head						
	All	Under 35	35-44	45-54	55-64	65-74	75+
2007							
Annual income	84.1	51.7	83.6	112.3	111.0	92.1	45.7
Assets	669.0	195.9	468.7	811.6	1053.1	1101.3	666.1
-- Financial assets	238.8	31.8	119.8	278.2	414.0	450.8	274.8
-- Non-financial assets	467.1	183.5	375.1	560.9	668.2	688.7	441.6
Debt	126.0	100.7	147.8	148.7	131.8	107.6	44.9
Net worth	556.8	106.0	326.6	663.2	935.8	1013.4	639.1
1989							
Annual income	66.0	44.9	80.0	97.3	76.8	57.6	41.2
Assets	366.4	131.2	324.4	538.5	560.0	496.8	407.8
-- Financial assets	121.5	31.9	83.5	153.9	191.1	200.7	203.4
-- Non-financial assets	267.6	112.0	253.3	398.6	399.6	321.6	242.6
Debt	58.2	51.2	77.8	67.1	51.0	27.6	19.9
Net worth	304.9	80.2	239.1	454.0	496.1	470.3	388.8

Source: US Survey of Consumer Finances, Credit Suisse

⁵ Credit Suisse Research, Demographics, Capital Flows and Exchange Rates (Aug 2007) and Credit Suisse Research, Demographics, Japanese Current Account and a Disappearing Savings Rate (October 2009)

In Exhibit 26, we look at Japanese household finances by age. Annual income has fallen for all age groups between 2004 and 2009 and the fall has been the highest for the 50-59 year olds (which also have the highest annual income). Savings are the highest for the 60-69 year olds and they have fallen the most for the 70+ between 2004 and 2009.

Exhibit 26: Japan household finance by age (thousands of nominal yen)

	Age of household head						
	All	Under 30	30-39	40-49	50-59	60-69	70+
2009							
Household size	2.5	1.6	2.9	3.3	2.8	2.2	1.8
Annual income	5,608	3,538	5,420	7,146	7,709	5,052	3,884
Savings	13,969	2,132	5,939	10,228	14,762	19,935	18,166
Liabilities	4,258	1,314	6,983	8,872	5,337	2,243	942
2004							
Household size	2.6	1.6	2.8	3.4	2.9	2.3	1.8
Annual income	5,980	3,697	5,578	7,356	8,079	5,405	4,218
Savings	14,249	2,208	6,146	10,512	16,022	20,632	19,869
Liabilities	4,546	1,492	7,032	8,766	5,382	2,376	1,277

Source: Japan Family Income and Expenditure Survey, Credit Suisse

Overall, the Japanese invest the highest share of their financial assets in time deposits (Exhibit 27) in 2009. The older the age group, the higher the share in time deposits. However, those under 30 invest the highest share of their savings (49% in 2009) in demand deposits. Securities ownership (in stocks, bonds and all securities) increases as we move from a younger age group to an older age group. From 2004 to 2009, the share of life insurance declined for all age groups but more prominently for the younger groups (under 30, 30-39 and 40-49) as they shifted to demand deposits.

Exhibit 27: Japanese holdings of assets by age of household head

	Age of household head						
	Average	Under 30	30-39	40-49	50-59	60-69	70+
2009							
Demand deposits	18%	49%	32%	21%	16%	16%	18%
Time deposits	44%	32%	34%	36%	41%	46%	50%
Life insurance, etc.	22%	10%	22%	30%	28%	21%	16%
Securities	14%	6%	7%	9%	11%	17%	17%
Stocks and shares, unit and open-end trust	8%	4%	5%	6%	7%	9%	9%
Public and corporate bonds, open-end bond trust	5%	2%	2%	2%	3%	6%	6%
Loan trust, money in trust	1%	0%	0%	1%	1%	1%	2%
Others	2%	3%	5%	4%	3%	1%	0%
2004							
Demand deposits	16%	41%	25%	16%	15%	15%	16%
Time deposits	46%	33%	37%	38%	44%	48%	52%
Life insurance, etc.	24%	17%	27%	34%	29%	23%	17%
Securities	12%	4%	5%	8%	9%	14%	16%
Stocks and shares, unit and open-end trust	7%	3%	4%	5%	6%	8%	9%
Public and corporate bonds, open-end bond trust	3%	1%	2%	2%	2%	4%	5%
Loan trust, money in trust	1%	0%	0%	1%	1%	1%	2%
Others	2%	6%	6%	4%	3%	1%	0%

Source: Statistics Bureau of Japan, Credit Suisse

Longevity Risk and Pensions Finance

A major risk faced by longer-lived individuals and pension funds/plans is longevity risk. Longevity risk is the risk that future outcomes in mortality and life expectancy will turn out to be different from those expected and accounted for. Individuals, annuity providers, corporate pension funds and governments alike are all carriers of longevity risk. Those challenged by uncertain longevity have reacted differently in order to mitigate, transfer or share the risk across a larger group. Few of the common responses include:

- A shift by pension funds from offering defined benefits (DB) to defined contributions (DC) and from being unfunded to better funded if not fully-funded.
- Implementation of Investment strategies that better match the profile of the liabilities.
- Use of longevity-linked instruments and pension buy-in or buy-out transactions to remove longevity risk off the balance sheets of existing DB plans.
- Growth in the volume and types of annuity products offered by insurers, and growth of reinsurance market that allows insurers to further transfer longevity risk.
- Pension reform to encourage people to work longer and save more for retirement. As longevity further increases and population ages, some of the old-age promises are likely to be reneged and some renegotiated.

However, there is still a lack of financial instruments in terms of access, volume, and affordable pricing for pension plans to hedge against longevity risk as many capital market developments are still at a nascent stage of development. One of the major trends highlighted by pensions and investment consultants is the rapid growth of Defined Contributions (DC) pensions where employees or plan participants bear the risks of their pensions and decide their asset allocation. This is at the expense of Defined Benefit (DB) plans where employers bear the pensions risk by guaranteeing benefits. Exhibit 28 highlights the changing trends at an aggregate level of the split across DB and DC pension plans in the seven largest pension markets.

Exhibit 28: Pension Assets in the largest seven pensions markets : Defined Benefit (DB) vs. Defined Contribution (DC)

	1999		2010	
	DC	DB	DC	DB
Australia	78%	22%	81%	19%
Canada	12%	88%	5%	95%
Japan	0%	100%	2%	98%
Netherlands	2%	98%	6%	94%
Switzerland	50%	50%	60%	40%
UK	5%	95%	40%	60%
US	44%	56%	57%	43%

Source: Watson Wyatt, Credit Suisse

The growth and success of DC (an example is 401K plans in the US) in terms of adequacy of retirement provisions are going to depend on the availability of such plans, the investment choices offered within such plans and the ability of plan participants to prudently and competently make well-informed choices on investments within such plans. Bodie and Clowes (2006) in "Worry Free Investing" highlight in a very practical way how such choices may be made in order to limit the risks. Financial Education is going to be key in this process to ensure that consumers and workers understand the fundamental determinants that influence their retirement wealth given the investment choices available.

The delivery of such financial education can come from a variety of different sources such as universities, financial media, product providers, industry associations and professional bodies that grant actuarial, CFA and FRM qualifications.

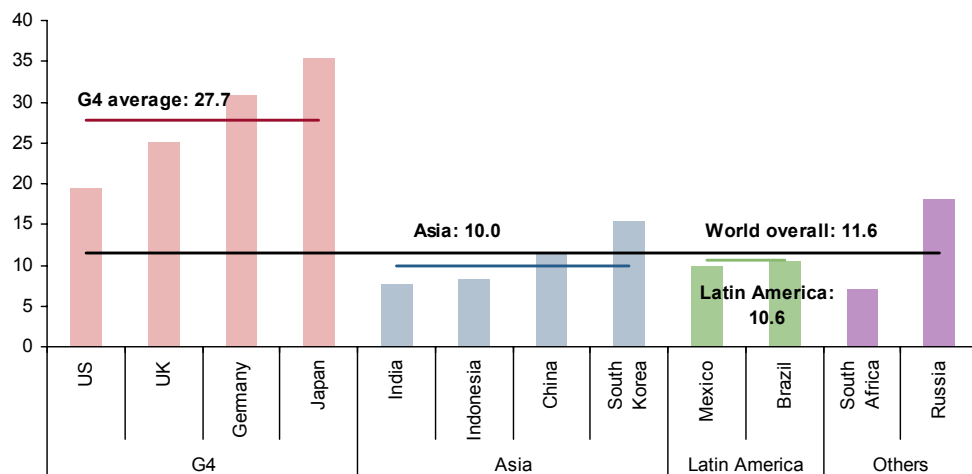
Implications for Governments

The graying of the population in many parts of the world continues to place a huge burden on societies to finance age-related expenditures on pensions, health care and long-term care⁶. Governments and companies in many developed countries are finding it harder to deliver the pension promises made in the past, leading to challenging discussions on pension reforms, and making longevity risk management essential. An important yet not easily accepted policy lesson is that retirement ages ought to be linked to life expectancy. These are probably more likely to be achieved in many Asian and Latin American countries where governments have not had a history of making costly long-dated promises.

Global longevity increases have resulted in a sharp rise in the number of old people in the world. A key indicator to measure the extent of aging is the old-age dependency ratio – people aged 65+ per 100 people aged 15-64. Rising old-age dependency ratio means growing pension and health expenditures for the old, a major part of fiscal expenditure in most countries. Currently, the ratio is much higher in the developed countries than in developing ones, making population aging a more acute issue in the former. The old-age dependency ratio in the G4 countries currently averages 27.7, and ranges from the lowest level of 19.5 in the US to the highest of 35.5 in Japan (Exhibit 29). Japan's old-age dependency ratio rose from the lowest amongst the G4 countries in 1980 (13.4) to the highest in 2010. In Asia and Latin America, the ratio is low overall but relatively higher in China (11.3) and South Korea (15.4). South Korea and China are experiencing a fast pace of aging reflected in their rising old-age dependency ratios.

Exhibit 29: Old-age dependency ratios: 2010

People aged 65+ per 100 people aged 15-64



Source: UN, Credit Suisse

Longevity risk is particularly relevant for the oldest-old population, namely those aged 80 and above. In the case of US for example, annual health expenditure for the 85+ is much higher than that for the 65-74 age cohort. Each additional year lived beyond 85 leads to a disproportionate increase in health and long-term care expenditures relative to those of the 65-74 population. Exhibit 30 illustrates the magnitude of projected increases in age related government expenditures in selected countries. The projected increase is high in countries such as the US, UK, Germany and Russia. The major portion of that projected increase is health in the case of the US, UK and Germany and pensions in the case of Russia.

⁶ Credit Suisse Research, A Demographic Perspective of Fiscal Sustainability: Not Just the Immediate Term Matters (Feb 2010)

In previous research over the last decade, we have recommended that governments start acknowledging the true extent of the pensions and health promises, which would require higher tax burdens on a smaller young population unless changes are made in terms of renegotiating promises for those below 55, encouraging men and women to work longer, save more and expect less from the governments (unless really poor or disadvantaged).

Exhibit 30: Age related government expenditure projections

Percent of GDP

	Pension Expenditure		Public Health Expenditure		Total	
	2010	2030	2010	2030	2010	2030
United States	4.9	6	6.7	11.4	11.6	17.4
United Kingdom	6.7	7.6	8	11.3	14.7	18.9
Japan	10.3	10.1	6.9	9.8	17.2	19.9
Germany	10.2	11.5	7.9	11.6	18.1	23.1
Indonesia	0.9	1.3	1.3	1.9	2.2	3.2
India	1.7	2.1	0.9	1.3	2.6	3.4
China	2.2	2.4	2.2	3.1	4.4	5.5
Korea	0.6	2.2	4	6.3	4.6	8.5
Mexico	2.4	4.5	3.2	4.5	5.6	9.0
Brazil	8.5	9.8	5.1	7.2	13.6	17.0
South Africa	1.3	1.9	3.2	4.3	4.5	6.2
Russia	9.4	14	3.6	5	13.0	19.0

Source: IMF, Credit Suisse

Health

Global longevity increases have been a combined result of improved health and sanitation conditions, better nutrition, and advances in medical care. The diverse health profiles of different countries and the accessibility, costs and efficiency of their health care systems have been partially responsible for the differences in length and quality of life.

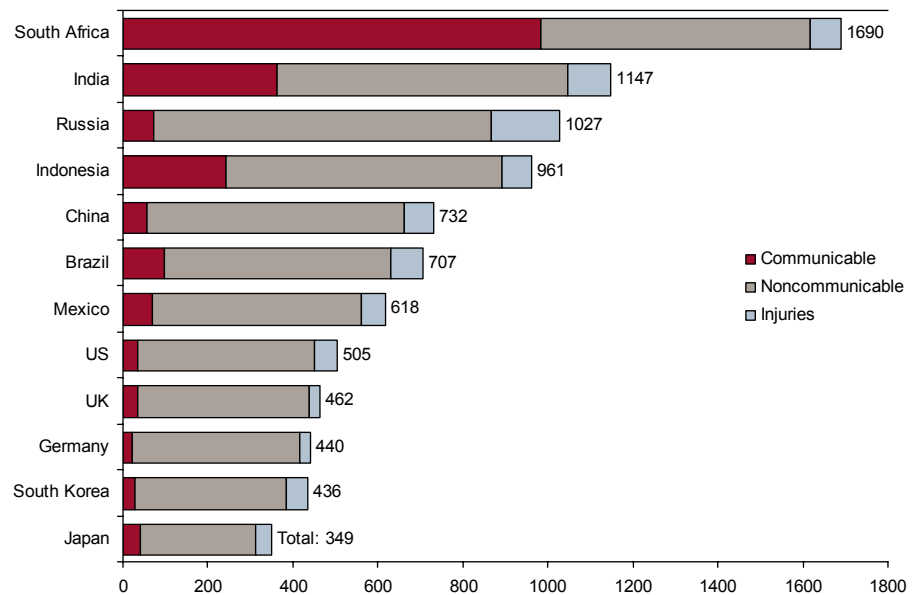
Heterogeneity of longevity exists between different geographic regions, different cohorts, and even individuals within the same cohort. Socio-economic status (education, occupation, income level), gender, marital status, nutrition, living environment (climate, pollution, sanitation, population density), diet, lifestyle and physiological factors can all lead to differences in how long individuals can expect to live. For example, adopting a healthy lifestyle early can help to prevent or postpone disability at older ages. A National Geographic special featured the centenarians in Okinawa and Sardinia. They were characterized by good nutrition, exercise, interests, no-smoking, being part of a social network. In a Credit Suisse research report on Global Obesity, we found that the poorest states dominated by Afro American populations in the US had the highest obesity rates and by extension they also had amongst the lowest life expectancies of comparable developed countries.

Mortality Rates and Causes of Death

The overall mortality rate varies across countries, largely reflecting the differences in their health conditions. We look at the age-standardized mortality rate by cause (Exhibit 31), which removes the effect of variation in age structure. The poorer health conditions in South Africa and India can be seen from their higher total mortality rates. Much of the high mortality rate can be explained by a large number of deaths due to communicable diseases.

Exhibit 31: Age-standardized mortality rate by cause: 2008

Per 100 000 population



Source: WHO, Credit Suisse

Communicable diseases such as Tuberculosis and respiratory diseases have been an important cause of death in younger and less developed Asian countries (India and Indonesia), and HIV in South Africa. Further improvements in health and sanitation facilities can prevent deaths due to these infectious diseases, thereby further prolonging life spans in these countries. In the older and developed countries such as Japan and Germany, non-communicable diseases are the main cause of death. Thus advances in treatment of chronic diseases can play a major role in reducing mortality.

Health Expenditures

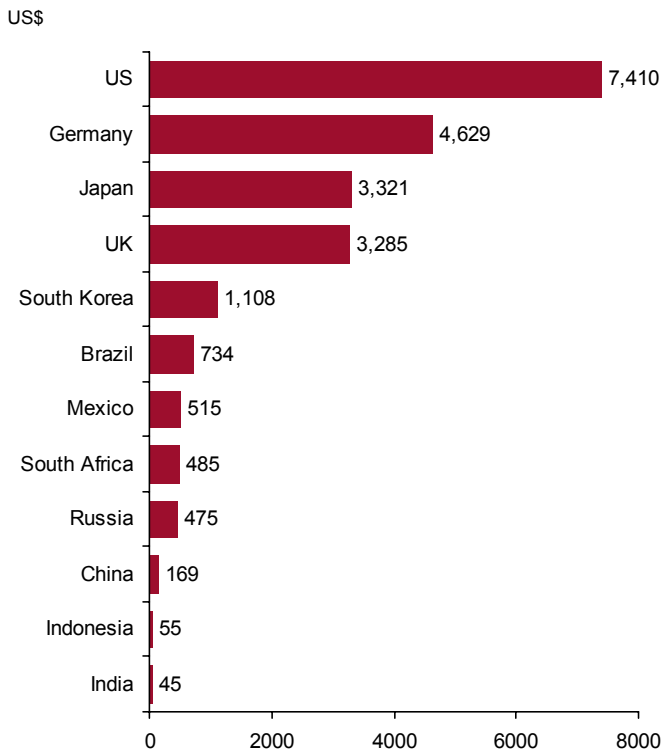
Lower levels of per capita health expenditure in India to some extent explain its worse health conditions and lower longevity. The per capita health expenditure in India is only one third of the corresponding level in China (Exhibit 32), which is a country that vastly under-spends on health care.

Japan has one of the lowest health expenditures among the major developed countries, both in per capita terms and as a share of GDP (Exhibit 33), but longest life expectancy. On the other extreme, the US has the highest health expenditure but disproportionately disappointing health outcomes. It could be a result of many factors such as differences in lifestyle and dietary habits in the two countries, but the inefficiency of the US health care system is inescapably a major cause.

Health is an important issue across the whole age spectrum and not just for the old. The advent of on-line learning, technology for socializing, video-games, etc., has also had an adverse effect on the health and fitness of the school-going and college children. Education regarding nutrition in terms of understanding healthy foods and drinks, as well as promotion of early exercise amongst toddlers and school children are essential to be able to create a healthy group of consumers and workers for the future. Diabetes, orthopedic problems, respiratory problems and allergic conditions are on the rise amongst the very young and this should be a cause of concern for parents, schools, governments and societies. Credit Suisse Bulletin magazine⁷ profiled the various facets of youth globally.

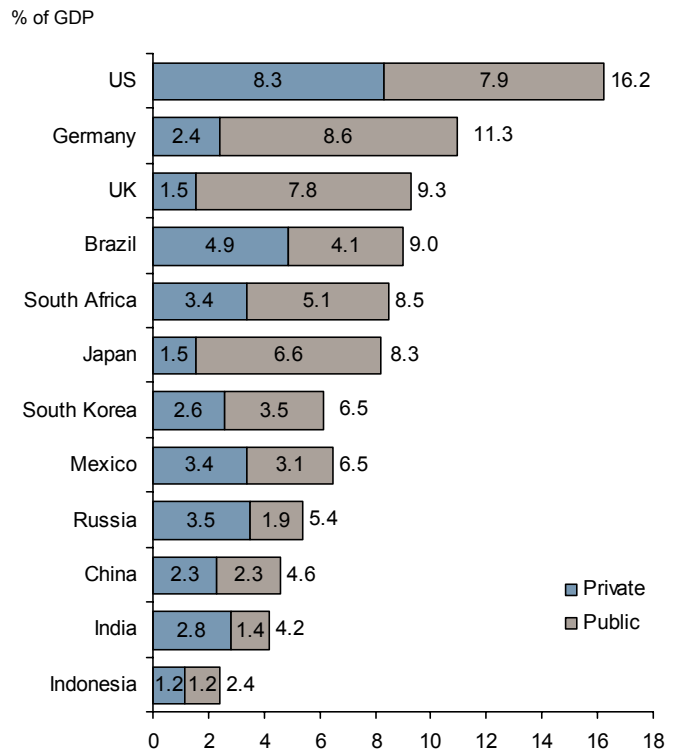
⁷ Credit Suisse Magazine, Bulletin (Issue 5, December 2010)

Exhibit 32: Health expenditure per capita: 2009



Source: WHO, Credit Suisse

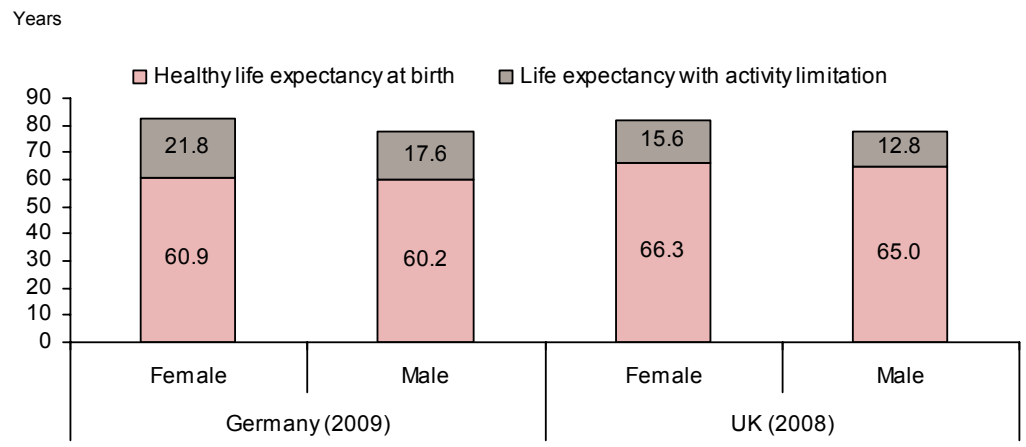
Exhibit 33: Public & private health expenditure: 2009



Source: WHO, Credit Suisse

Good health during old-age is important so that finances (private as well as public) are not overly diverted towards health conditions at older ages that are preventable. We note that while not all old-age health infirmities and illnesses are preventable or even identified/diagnosed early on, many definitely are. We highlight these by focusing on a measure that is called Healthy Life Expectancy (Exhibit 34). For example, for a German female, although the life expectancy is 82.7 years, the healthy life expectancy is only 60.9 years.

Exhibit 34: Healthy life expectancy at birth: Germany and UK



Source: Eurostat, Credit Suisse

Conclusions

The core contribution of this report is focusing on Increased Longevity as well as Changing Life Cycles of Consumers and Workers.

Recent demographic trends suggest that longevity risk has emerged as a key risk affecting individuals, pension plans, insurers and governments in both the developed and emerging world. In Western countries, despite capital market developments, the availability of solutions to tackle longevity risk remains limited. Understanding, measuring and managing longevity risk are essential. Issuance of long-dated bonds that are inflation protected, longevity bonds, swaps that are transparent, liquid and economically priced (inflation, interest, currency and longevity), buy-outs and buy-ins are some of the potential solutions to mitigate those risks.

Changing Life Cycles (Exhibit 8, Exhibit 9 and Exhibit 10) explores the changing paradigms of workers, consumers and savers as their life spans increase. The behaviours are very different across every phase of the life cycle compared to ten or twenty years ago—individuals, companies, markets, investors, governments and society need to understand and appreciate these changes at a deeper level.

We foresee a great need for financial education across the spectrum to help individuals, families, corporations and societies deal with the uncertainties of a longer and more important different post-retirement period. Models of asset allocation based on earlier approaches developed in the 1960s, 1970s and 1980s need to be rethought and re-examined in light of the changing life cycles. They need to deal with 105 million people living beyond 80, many of them women. Investment advisors and funds need to gear up to dealing with two generations of potential retirees from the same family; currently they do not.

We advocate a newer impetus on product development at the retail or individual level that is transparent, focused without too many confusing choices and yet diverse enough to meet the needs of actual and potential retirees whose needs and preferences differ. Risk management should be an integral part of investor portfolios and products need to provide inflation-adjusted and risk-adjusted returns that are easily understood and compared as highlighted by Modigliani-Muralidhar in their book “Rethinking Pension Reform.”

Increased longevity has resulted in major pressures on Public Finances of older countries on account of pensions, health care and long-term care expenditures. Further reforms of pension systems are needed to address the root of the problem, particularly in Western Europe, Japan, US and Canada. These include increased retirement ages, flexible working, increased participation of old and women along with a renegotiation of old-age entitlements, which are unsustainable. For many Asian and Latin American countries, the experiences from the West provide some lessons for the future of their pension systems.

As mentioned in all our earlier research since 2000, (also, see a similar argument by Akerlof-Shiller in their book, “Animal Spirits”), holistically understanding the consumer-saver-worker behaviour in the context of data, is critical for investors rather than focusing on merely counting population and workforce numbers.

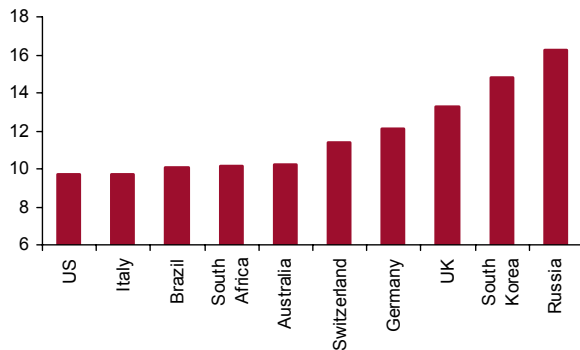
Appendix

(A) Special Cases revisited - Russia and South Africa

The life expectancy at birth in Russia started to decline in the 1990s, reaching a bottom of 64.9 years in 2000-2005, and then turned to an upward trend. There is a rising consensus that alcohol consumption in Russia (Exhibit 35) has been one of the major contributors. In South Africa, life expectancy started to decline in the mid-1990s and didn't stabilize until very recently. This can be attributed to the rising number of deaths caused by HIV (Exhibit 36), reaching 350 thousand in 2005 (0.73% of its population).

Exhibit 35: Alcohol consumption: 2008

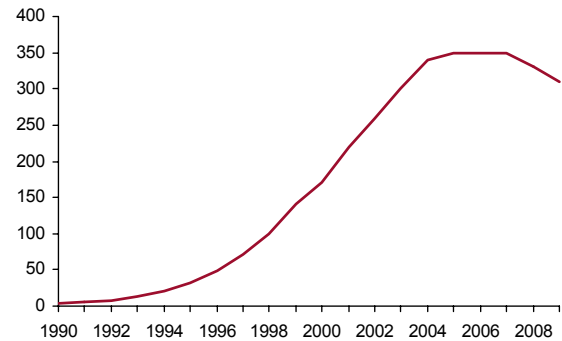
Litres of pure alcohol per person (15+ adult) per year



Source: WHO, Credit Suisse

Exhibit 36: Deaths due to HIV in South Africa

In thousands, annual



Source: WHO, Credit Suisse

(B) Strong Progress on Retirement: Exhibit 37 highlights the very encouraging and positive progress in the countries highlighted in blue where people are effectively retiring later than when they are expected (official retirement ages).

Exhibit 37: Average effective age of retirement versus official pensionable age

Effective retirement age is greater than the pensionable age for blue shaded cells

	Men		Women	
	Effective Retirement Age (2004-2009)	Pensionable Age (2010)	Effective Retirement Age (2004-2009)	Pensionable Age (2010)
France	59.1	60	59.7	60
Germany	61.8	65	60.5	65
Greece	61.9	65	59.6	60
Italy	61.1	65	58.7	60
Japan	69.7	64	67.3	62
Korea	70.3	60	69.8	60
Mexico	72.2	65	69.5	65
Netherlands	62.1	65	62.6	65
Portugal	67.0	65	63.6	65
Spain	61.8	65	63.4	65
Switzerland	65.7	65	63.5	64
Turkey	62.8	60	68.3	58
United Kingdom	64.3	65	62.1	60
United States	65.5	65.8	64.8	65.8

Source: OECD, Credit Suisse

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Disclosure Appendix

Analyst Certification

Amlan Roy, Sonali Punhani and Liyan Shi each certify, with respect to the companies or securities that he or she analyzes, that (1) the views expressed in this report accurately reflect his or her personal views about all of the subject companies and securities and (2) no part of his or her compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this report.

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