

Global retirement savings guidelines

Engaging workers in financial planning

Insights into the purpose and development of Fidelity's integrated and globally-consistent set of retirement savings guidelines.

Executive Summary

A decade on from the global financial crisis, a combination of economic and social factors have contributed to a population around the world that may benefit from greater support around retirement planning. Faced with changes in pension schemes, workers could do with help ensuring their financial stability, especially funding their retirement.

Around the world, rates of engagement in retirement planning are low, pointing to a need particularly in facilitating a beginning to the retirement conversation. For example, in Hong Kong, a government survey found that 40.8% of workers over 35 years old had not made any type of financial preparation for retirement beyond retirement protection from work.¹ In the United Kingdom (UK), only 35% of adults have engaged in any sort of retirement planning and only 35% of defined contribution (DC) pension holders knew how much their employers were contributing, according to a financial regulatory body survey.²

There are a number of legislative, social and corporate programs in many countries aimed at helping people improve how they prepare for retirement. These include auto-enrolment and escalating minimum contributions in the UK³, the new pension reform (Betriebsrentenstärkungsgesetz) in Germany⁴, reform of default investment under Mandatory Provident Fund (MPF) in Hong Kong, adjusting the public pension system in line with economic factors in Japan⁵, expansion to the Canada Pension Plan (CPP) in Canada⁶ and the Pension Protection Act in the United States⁷. Despite such efforts, the retirement statistics above point to significant levels of unpreparedness and a lack of retirement planning literacy.

This paper introduces a framework developed by Fidelity aimed at addressing this fundamental lack of engagement with retirement planning. Employers, as part of their workplace benefits offering, can play a key role in helping employees improve their retirement preparedness by offering clear guidelines and engaging tools. The globally-consistent framework and associated guidelines may have particular value for multinational employers, for whom it will provide the ability to evaluate benefits design and monitor/encourage good retirement savings habits in a consistent manner across their regional workforces. That said, these resources can be leveraged more broadly by individuals who are not necessarily part of a workplace savings scheme.

Fidelity's framework - and the Retirement Savings Guidelines produced thereof - fill the underlying need for simple guidelines and tools to help workers maintain their lifestyle when they stop working. The initial focus of the methodology has been on the US, the UK, Canada, Germany, Hong Kong and Japan, because of the swiftly-changing retirement landscapes in those regions.

¹ http://www.digital21.gov.hk/eng/statistics/download/householdreport2013_52.pdf. 'Retirement planning and the financial situation in old age.' Hong Kong Special Administrative Region Census and Statistics Department. Hong Kong, June 2013, p. 222, around 10,000 households surveyed.

² 'Understanding the Financial Lives of UK Adults.' Financial Conduct Authority, 19 Oct. 2017, www.fca.org.uk/publications/research/understanding-financial-lives-uk-adults. 13,000 employees surveyed.

³ 'Increases in Minimum Contributions for Automatic Enrolment Pensions.' The Pensions Regulator, www.thepensionsregulator.gov.uk/doc-library/increases-in-minimum-contributions-automatic-enrolment.aspx; and Peachey, Kevin. 'Q&A: Pension Automatic Enrolment.' BBC News, BBC, 8 Aug. 2013, www.bbc.co.uk/news/business-19589265.

⁴ 'Betriebsrente Wird Attraktiver.' Bundesregierung, 19 Dec. 2017, www.bundesregierung.de/Content/DE/Artikel/2016/12/2016-12-21-betriebsrente-wird-attraktiver.html.

⁵ 'Japan's Pension Payments System Set for Overhaul.' The Japan Times, www.japantimes.co.jp/news/2017/02/03/national/japans-pension-payments-system-set-overhaul/#.WIS1q1LGmQ, 3 February 2017.

⁶ 'Backgrounder: A Stronger Canada Pension Plan.' Department of Finance Canada, 11 Dec 2017. https://www.fin.gc.ca/n17/data/17-122_2-eng.asp.

⁷ 'Pension Protection Act of 2006.' United States Government, 17 Aug 2006. <https://www.gpo.gov/fdsys/pkg/PLAW-109publ280/pdf/PLAW-109publ280.pdf>

Index

The Retirement Maths Framework: An Introduction	4
Four key metrics supporting the Retirement Savings Guidelines	5
Income replacement rate	6
Savings milestones	8
Yearly savings rate	10
Possible sustainable withdrawal rate	12
How the guidelines work together	13
A regional comparison	14
United Kingdom	15
Germany	17
Japan	19
Hong Kong	21
Canada	23
United States	25
Implications for global retirement planning	27
Appendix	28
Managing Complexity	30

The Retirement Maths Framework – An Introduction

The Fidelity Retirement Maths Framework (RMF)⁸ is an integrated model for generating retirement metrics that can be used to set general retirement savings and retirement income guidelines. The Retirement Maths Framework provides an overall planning and analytical model that is designed to provide flexible retirement guidelines to employers and individual investors.

With a minimal set of customer inputs such as current age, current income, and current retirement assets, the Retirement Maths Framework produces an integrated set of retirement metrics which can serve as guidelines for yearly savings rate, income replacement rate, savings milestones, and possible sustainable withdrawal rate. To generate the retirement savings guidelines, the framework makes simplifying assumptions about other factors, including retirement age, retirement horizon, wage growth, asset allocation, and tax-deferred status. The base case assumes a hypothetical 25 year old with no current savings, and no private defined benefit (DB) pension income or other private lifetime income sources. All calculations and outputs are expressed in pre-tax terms. While the guidelines themselves are simple and engaging, a rigorous retirement planning methodology, accounting for regional differences, evaluates relevant income and expenditures data, accounts for complex pension systems and tax effects, and estimates capital market behaviour, underlies the guidelines.

The guidelines are most appropriate for early and mid-career workers whose anticipated pre-retirement salary might be expected to fall within the salary ranges for each region (noted in the regional specific sections of this paper) used to estimate retirement income replacement ratios. For those with anticipated pre-retirement incomes meaningfully outside of these ranges, the relevant income replacement ratio may differ and therefore the applicability of the retirement savings guidelines will be diminished. It should be noted that these income ranges reflect total household income at the point of retirement, and that for the purposes of generating the retirement savings guidelines (notably pensionable income and the resulting state/government and personal income replacement rates), we assume a two person household.

In addition, Fidelity believes that it's generally a good idea for everyone to undertake a comprehensive retirement planning process, using on-line planning tools and/or working with a guidance representative to create a retirement plan. This is particularly important for those within 10 years of retirement,

for whom specific guidelines and suggestions can be provided based on a detailed assessment of individual goals and financial situation.

Due to the metrics' being calculated interdependently, if any of the initial inputs are varied, the RMF will calculate a different, but still consistent set of guidelines. In addition to the internal consistency of output within its analytical framework, an important attribute of the RMF is that it provides a common structure, logical framework, and output (metrics), which, when combined with locally relevant assumptions, allows for the comparison of output (guidelines) and retirement planning behaviours both within and across regions.

The RMF is intended to encourage greater customer engagement in setting retirement savings and retirement income goals. The RMF also facilitates the development of consistent messaging in retirement thought leadership, planning tools, and guidance rules of thumb. The Retirement Maths Framework unifies individual retirement metrics, generating consistent outputs, while also allowing for a more flexible end-user experience.

In short, the framework supports the creation of broadly relevant, internationally consistent, retirement savings guidelines, which address a need for simple guidance and tools to help engage people across the globe in the process of planning for their retirement and helping to ensure that they can maintain their desired lifestyle in retirement. The critical first steps in the retirement planning process are engagement and education – starting the journey and building confidence through learning and exploring. The Retirement Maths Framework and the retirement savings guidelines are designed to engage and to support individuals as they begin their retirement planning process. Because the four metrics are interconnected, people are encouraged to keep each in mind, and to understand how they work together, as they save for retirement and monitor their progress.

⁸ Fidelity Retirement Maths Framework is the underlying methodology that drove the creation of the Fidelity Retirement Savings Guidelines.

The four retirement metrics

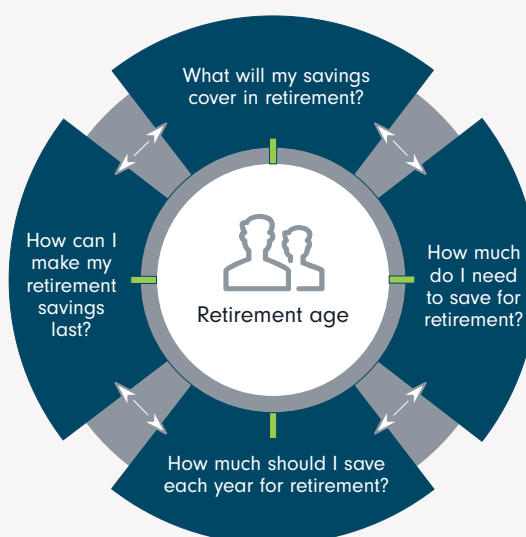
The four key metrics of the retirement savings guidelines

There is a strong need for active engagement in retirement planning across the world. Employers, as part of their workplace benefits offering, can play a key role in helping employees improve their retirement preparedness - although clear guidelines and engaging tools can be leveraged more broadly by individuals who may not be part of a specific workplace benefits scheme.

Since Fidelity launched the US Retirement savings guidelines, they have had a positive impact on both employees' engagement around retirement planning, and on employers' insights into the impact of plan design and education on retirement preparedness within their employee populations. In the US, both employee and employer contribution rates to Fidelity-run DC retirement plans reached an all-time high in 2018, with total average contributions at 13.1% annually⁹. The guidelines have now been extended to the UK, Hong Kong, Germany, Japan and Canada in order to provide a locally relevant and internationally comparable set of guidelines.

While the RMF provides guidelines for a set of four retirement metrics – yearly savings rate, income replacement rate, savings milestones and possible sustainable withdrawal rate – the values for these guidelines will vary across regions due to differences in a variety of region-specific assumptions including observed saving/spending behaviour, taxation, structure of state/government pension and health insurance schemes, mortality, assumed retirement age, wage growth, inflation, and capital market assumptions. Individually and in combination, these differences in assumptions/inputs result in cross-region differences in guideline values.

It is important to note that while the guideline values may differ across regions, the underlying analytical framework that produces those values is globally consistent and produces guidelines that can be compared both across regions and over time. The regional guidelines will be discussed in a later section of this paper.



Our four retirement metrics

	Income replacement rate
	Savings milestones
	Yearly savings rate
	Possible sustainable withdrawal rate

Note: Employers should ensure their defined contribution (DC) retirement plan design, where the majority of ownership falls to the employee, encourages individuals to begin to save early, save consistently, and save at a level that makes living a comfortable retirement an achievable goal. The right combination of plan design, engaging guidance and innovative tools makes saving and investing easier to understand, which may lead to better outcomes.

⁹ 'Total contribution' includes both employee and employer contributions. Fidelity Investments analysis of 33,050 corporate DC plans (including advisor-sold DC) and 15.3 million participants as of Sept 30, 2018.

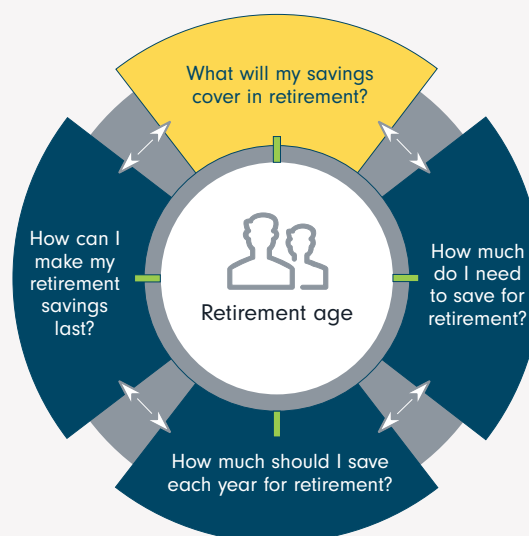
Income replacement rates: What will my savings cover in retirement?

For most individuals/households, state/government pension benefits will provide an income base in retirement, with the remainder of retirement income needs being satisfied by workplace and personal savings. But what is the total income need in retirement, and how much of that should come from personal retirement savings? The Non-state/government (Personal) income replacement guideline represents the percentage of pre-retirement income that an individual/household should target to replace annually from their personal savings (including workplace savings) in retirement.

Our research has shown that within a given country/region, observed pre-retirement expenses as a percentage of pre-retirement income vary by income level, and that a single, one-size-fits-all overall income replacement target may not be appropriate. The analysis of locally relevant income and expenditure data has allowed for the estimation of a schedule of total income replacement percentages by income level.

Analysis of the income replacement capacity of different state/government pension schemes indicates that most schemes, Germany being a notable exception, are progressive in nature – state/government pension benefits replace a higher proportion of pre-retirement income for lower incomes than for higher incomes. As a result, required (target) income replacement from savings (where ‘savings’ refers to all private savings including workplace retirement accounts) is fairly consistent across a range of income levels within regions.

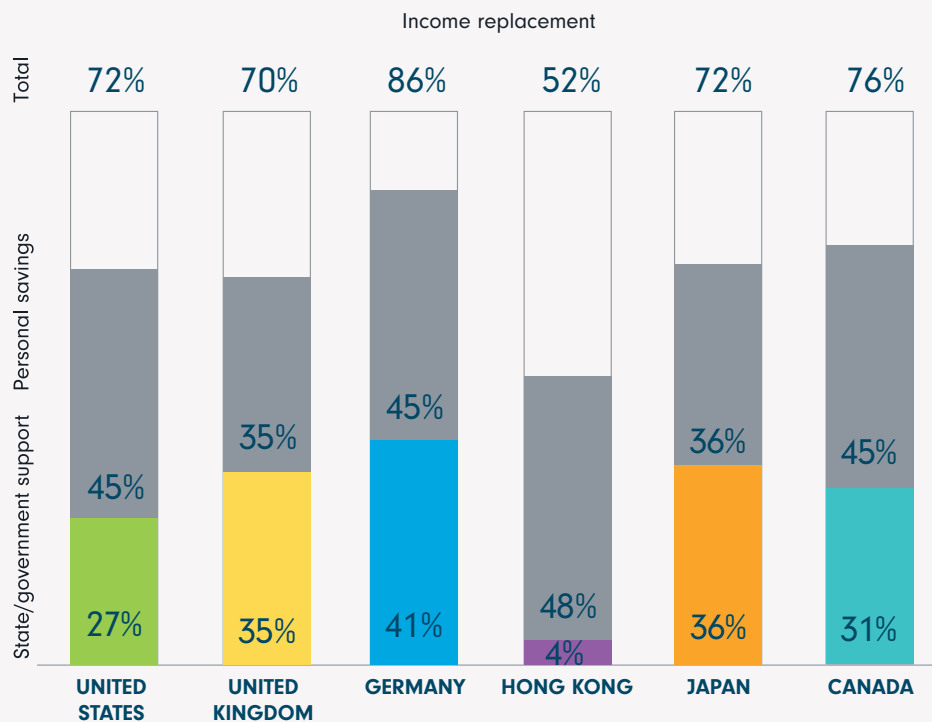
Total income replacement rates vary across regions due to variations in the composition and level of expenditures (personal consumption) and taxation, among other factors. The contribution to income replacement from state/government pension support also varies meaningfully across countries due to differences in the form and level of benefits from state/government pension schemes. The net income replacement ratio represents the difference between estimated total income replacement and estimated pension income replacement. This is the portion of retirement expenses that need to be funded from personal savings, expressed as a percentage of pre-retirement income.



Note: a fundamental assumption of the retirement savings guidelines is that a household should seek to accumulate a retirement savings balance at retirement sufficient to maintain a pre-retirement level of spending in retirement.

Income replacement rate

Fidelity's global income replacement rate



Global income replacement values reflect averages across the ranges of pre-retirement income (income immediately before retirement) as per the below regional ranges. Assumes no retirement savings balance before starting age.

US: Represents household income ranging from \$50k to \$300k annually in the Consumer Expenditure Survey (BLS), Statistics of Income Tax Stat, IRS tax brackets; local and state taxes not included; retirement age = 67 for base case.

UK: Represents household income ranging from £30k - £100k annually. Represents quintiles 3-5 from the Office for National Statistics Income and taxation data from 'The Effects of Taxes and Benefits on Household Income, 2014/15'. Expenditure data from 'Family Spending 2014' compendium; local and state taxes not included; retirement age = 68 for base case.

Germany: Represents household income ranging from €24k-€100k annually. Represents deciles 4-7 from the Sample Survey of Income and Expenditure (EVS) via the German Federal Statistical Office (Destatis); local and state taxes not included; retirement age = 67 for base case.

Hong Kong: Represents household income ranging from \$HK25k-\$HK150k per month. Represents deciles 6-9 from the Census and Statistics Department (Censtatd) publications backed by survey data. Income data from Quarterly Report on General Household Survey 2016 (latest data Q2 2016). Expenditure data from Data from Household Expenditure Survey 2014-15; local and state taxes not included; retirement age = 65 for base case.

Japan: Represents household income ranging from ¥5million - ¥9.5million annually. Represents deciles 3-9 from the Ministry of Internal Affairs and Communications, 2014 National Survey of Family Income and Expenditure Survey; local and state taxes not included; retirement age = 67 for base case. Personal savings of 36% includes 28% savings + 8% RSLP.

Canada: Represents household income ranging from \$55k-\$300k annually. Represents quintiles 3 - 5 from the Statistics Canada, 2016 Survey of Household Spending; local and state taxes not included; retirement age = 65 for base case.

The term "Fidelity" can refer to one or both of Fidelity International and Fidelity Investments. Fidelity Investments and Fidelity International are separate companies that operate in different jurisdictions through their subsidiaries and affiliates.

Savings milestones: How much do I need to retire?

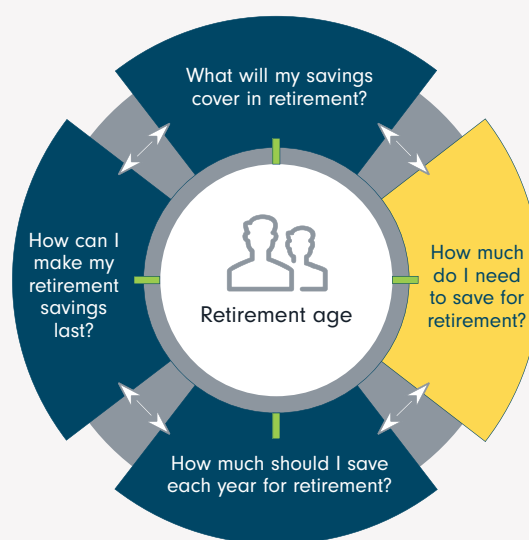
This can be a complex question to answer, particularly when workers are years away from retirement. Fidelity has developed a set of age-based savings milestones which offer a simple way of estimating and monitoring progress toward a retirement savings goal throughout one's working life. These age-based savings milestones are expressed as multiples of current income.

Fidelity's experience in the US indicates that savings milestones expressed as multiples of salary are easy to understand and apply, resonate strongly with both employer and employee, and, importantly, one set of savings milestones can be broadly applied – both within regions and across regions – regardless of the level of current income.¹⁰

The final, pre-retirement savings milestones can be thought of as representing the balance necessary to fund the private replacement portion of pre-retirement income for a given retirement horizon, expressed as a multiple of pre-retirement income (income at the point of retirement). Intermediate values provide milestones along the journey to retirement and offer individuals the opportunity to check in every five years to see whether or not their savings are on track, and most importantly, provide forward-looking savings targets.

The differences across regions in the final, pre-retirement Savings milestones, and the interim age-based savings milestones, can be attributed to a variety of factors, including differences in assumed retirement age, assumed planning (mortality) age – together these define the retirement horizon over which retirement expenses need to be funded – estimated capital markets behaviour, assumed real wage growth, and the assumed rate of inflation. These factors, individually and in combination will influence the Savings milestone values.

Generally, the longer an individual works, the shorter the retirement horizon over which expenses must be funded. Also, in certain regions – US, UK, Canada, Germany, and Japan, the longer an individual works, the more time state/government pension benefits can accrue and the greater the monthly/annual pension benefit. This combination can increase the level of pension payments and may reduce the amount of savings needed to fund retirement income needs (because of a shorter anticipated retirement period). The result is a lower suggested



salary milestone for later assumed retirement ages. Conversely, the earlier the retirement age the longer the retirement horizon over which expenses must be funded. Also, in certain regions – US, UK, Canada Germany, and Japan, the earlier an individual retires (within certain age eligibility limits), the lower the monthly/annual pension benefit. This combination can decrease the level of pension payments and may increase the amount of savings needed to fund retirement income needs (because of the longer anticipated retirement period). The result is a higher suggested salary milestone for later retirement ages.

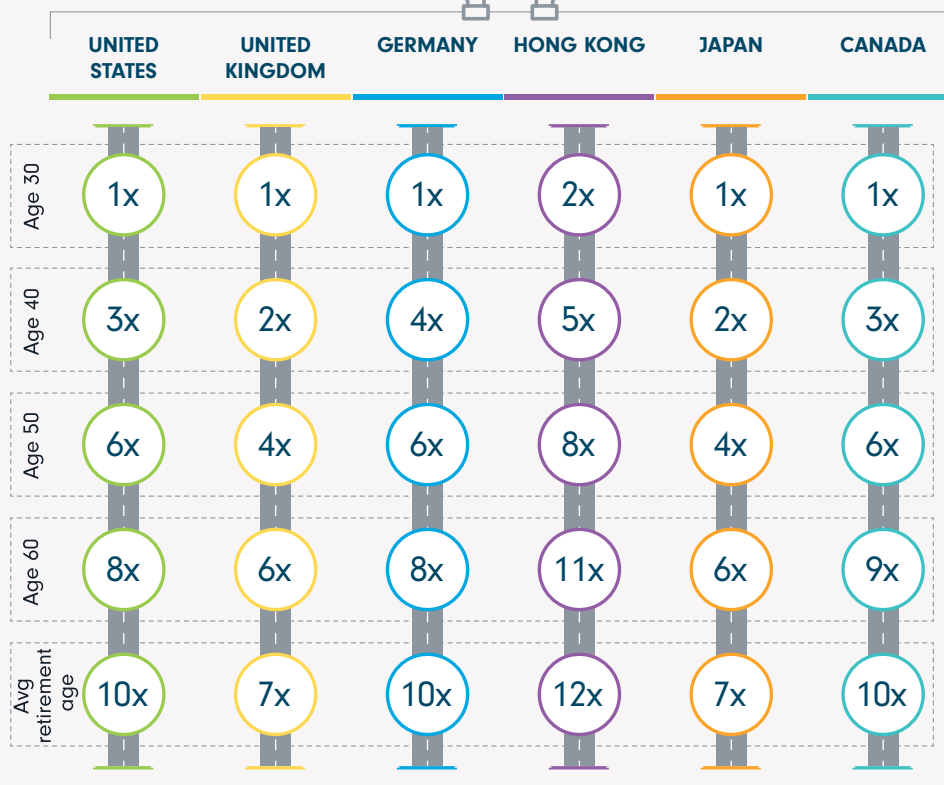
Also, capital market assumptions – estimates of investment risk and return – for both the accumulation and distribution (retirement) periods can influence the savings milestone values. All else equal, the higher the assumed rate of investment return, the lower the required savings milestone. Lower assumed investment returns will result in higher savings milestone values.

¹⁰ 'Total contribution' includes both employee and employer contributions. Fidelity Investments analysis of 33,050 corporate DC plans (including advisor-sold DC) and 15.3 million participants as of Sept 30, 2018. Includes contributions by both employers and employees.

Savings milestones

Fidelity's global savings milestones

Estimating how much you will need to save by the time you retire and along the way. Simply multiply your current income by age to give you a savings target consistent with the savings balance needed to maintain your lifestyle in retirement.



Fidelity's suggested savings milestones (expressed as multiples of current income at different ages) are based on our research, which estimates the savings balances at different ages that are consistent with the accumulation of savings necessary to maintain a pre-retirement lifestyle through retirement. In turn, these savings balances reflect an estimate of the region-specific % of preretirement annual income (assuming no pension income) through a planning age specific to each region that would be necessary to maintain that pre-retirement level of income in retirement.

The region-specific income replacement targets were found to be generally consistent across a range of pre-retirement household incomes – income at the point of retirement.

The savings milestone suggestions may have limited applicability if your pre-retirement income is expected to fall outside that range. Individuals may need to save more or less than the suggest savings rate guideline depending on retirement age, desired retirement lifestyle, assets saved to date, and other factors.

Fidelity developed the savings milestones through multiple market simulations based on historical market data. These simulations take into account the volatility that a variety of asset allocations might experience under different market conditions.

Given the above assumptions for retirement age, planning age, wage growth, and income replacement targets, the results were successful in 8 out of 10 hypothetical market conditions during accumulation and 9 out of 10 during retirement and where the average equity allocation over the full investment horizon was roughly 50% of more for the hypothetical portfolio. Remember, past performance is no guarantee of future results. Performance returns for actual investments will generally be reduced by fees or expenses not reflected in these hypothetical calculations. Returns will also generally be reduced by taxes.

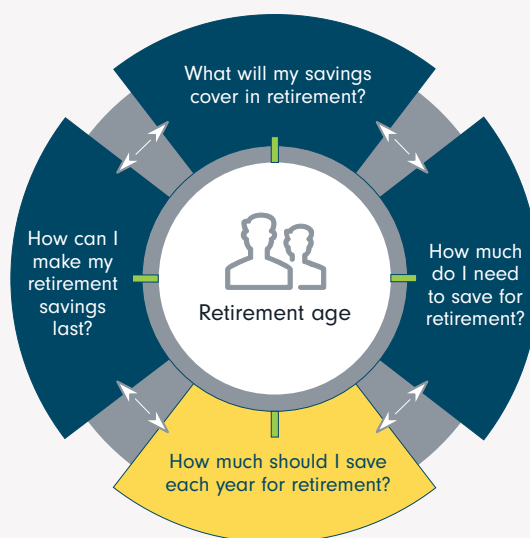
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Annual savings rates: How much should I save each year for retirement?

The yearly savings rate guideline represents the suggested annual rate of (pre-tax) savings over a full working lifetime. The yearly savings rate guideline represent the total of employee and, where relevant, employer contributions.

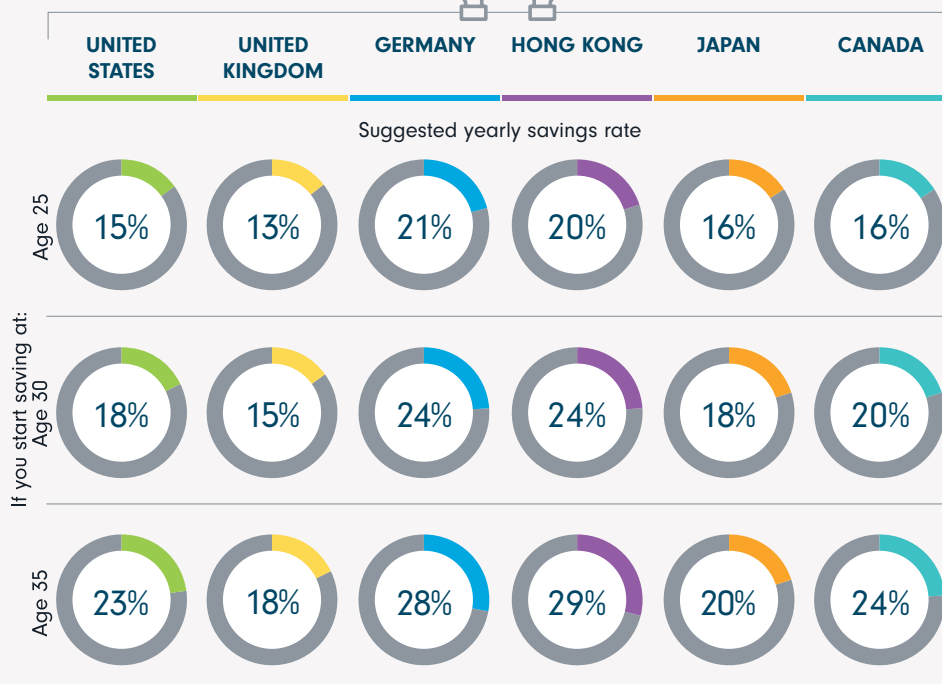
To give workers a high level of confidence in their ability to maintain their lifestyle in retirement, it's best to save consistently throughout one's career. The yearly savings rate values may seem challenging to reach, but they represent all retirement savings across different accounts. Of course, you may not be able to save at the suggested levels every year, but there are always ways to catch up along the way, and even small increases in yearly savings rates can make a difference in retirement.

The forces that influence the saving milestone values also exert a similar directional influence on yearly savings rates. The longer an individual works, the shorter the retirement horizon over which expenses must be funded and the longer the period of time retirement balances have the potential to grow. This combination can increase the level of pension payments and may reduce the amount of savings needed to fund retirement income needs (because of a shorter anticipated retirement period). The result is a lower suggested yearly savings rate for later retirement ages. Conversely, the earlier the retirement age the longer the retirement horizon over which expenses must be funded and the shorter the period of time over which retirement balances have the potential to grow. This, along with state/government pension rules, can decrease the level of pension payments and may increase the amount of savings needed to fund retirement income needs (because of the longer anticipated retirement period). The result is a higher suggested yearly savings rate for later retirement ages. Finally, higher expected investment returns result in lower yearly savings rates, while lower expected investment returns result in higher yearly savings rates.



Yearly savings rate

Fidelity's global retirement savings rate



Fidelity's suggested total pre-tax savings rates (expressed as a % of pre-tax current income) are based on our research, which indicates that most people would need to contribute at these rates **from an assumed starting age of 25** through an assumed retirement age specific to each region (see general disclosure for regional details on retirement ages) to potentially support an income level equal to region-specific % of preretirement annual income (assuming no pension income) through a planning age specific to each region. The region-specific income replacement targets were found to be generally consistent across a range of pre-retirement household incomes – income at the point of retirement.

The savings rate suggestions may have limited applicability if your pre-retirement income is expected to fall outside that range. Individuals may need to save more or less than the suggest savings rate guideline depending on retirement age, desired retirement lifestyle, assets saved to date, and other factors.

Fidelity developed the savings rate targets through multiple market simulations based on historical market data. These simulations take into account the volatility that a variety of asset allocations might experience under different market conditions. Given the above assumptions for retirement age, planning age, wage growth, and income replacement targets, the results were successful in 8 out of 10 hypothetical market conditions during accumulation and 9 out of 10 during retirement and where the average equity allocation over the full investment horizon was more than 50% for the hypothetical portfolio.

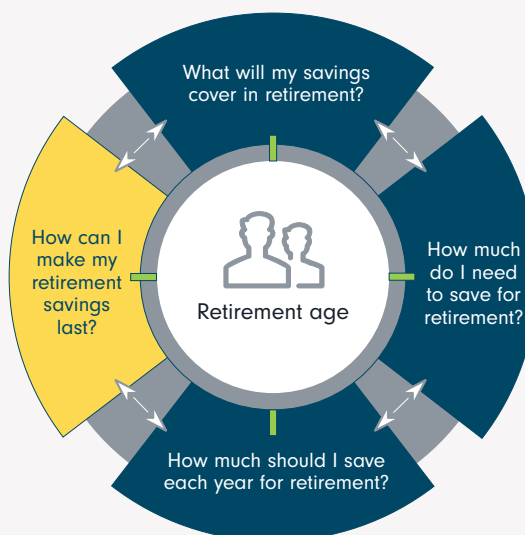
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Possible sustainable withdrawal rates: How can I make my retirement savings last?

One of the most challenging questions many retirees face is how much to withdraw from their savings in retirement. Withdraw too much and they risk running out of money. Withdraw too little and they may not live the life they want to in retirement. The Retirement Maths Framework (RMF) offers a guideline as to the rate (and by extension, the amount) that can possibly be sustainably withdrawn over a full retirement period.

Because the concept of the possible sustainable withdrawal rate (PSWR) value is often the source of misunderstanding, an illustration is included below. (The example is presented in US dollars but the concept applies in all regions.) The possible sustainable withdrawal rate represents the real (inflation-adjusted), annual withdrawal amount expressed as a percentage of the initial (at retirement) asset balance.

Regional differences in the length of the assumed retirement period over which withdrawals will be made and differences in the assumed investment returns account for observed differences in the regional possible sustainable withdrawal rate guidelines. All else equal, the longer the horizon over which expenses must be funded by retirement assets, the lower the annual rate at which retirement assets can be sustainably withdrawn. Also, the lower the assumed investment return, the lower the estimated possible sustainable withdrawal rate. See the Appendix for additional information on assumptions used in this analysis. The topic of investment returns is also addressed later in this paper.



Possible sustainable withdrawal rate: an illustration

John has \$500,000 in retirement savings and plans to retire at age 65. Here's how much he may want to withdraw each year.

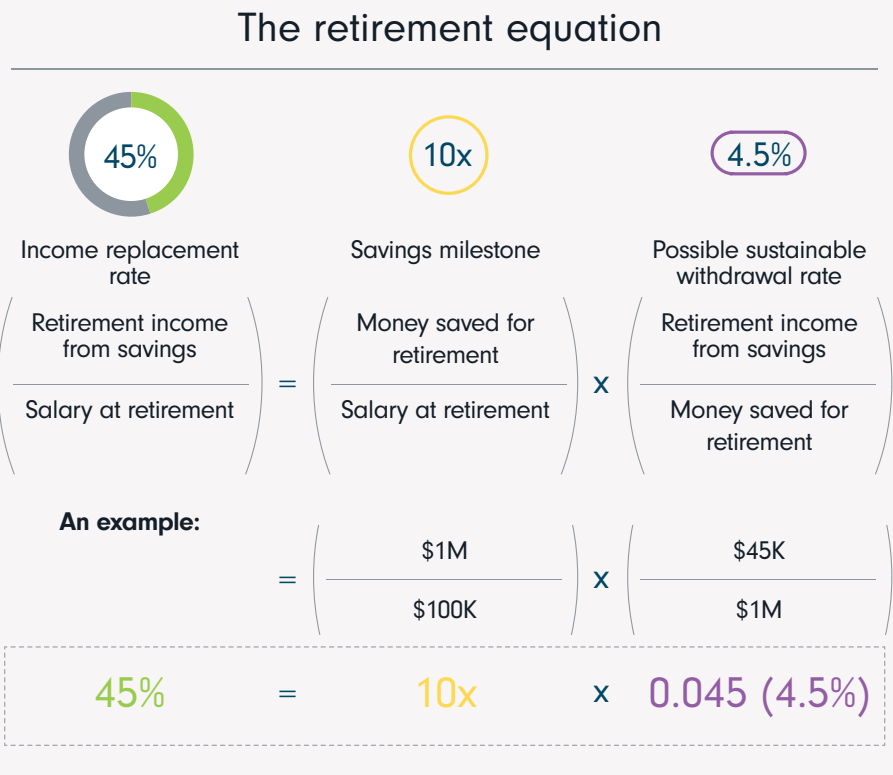
1 st year	Pension savings balance x 4%	= \$20,000
2 nd year	Year 1 amount + inflation	= \$20,500
		↳ 2.5% inflation
3 rd year	Year 2 amount + inflation	= \$21,013
		↳ 2.5% inflation

This example is using US retirement guidelines and is for illustrative purposes only.

Integrating the four metrics

Before transitioning to a discussion of the regional models, the illustration below may be helpful in tying the pieces together. The income replacement rate represents the estimated annual required income from savings expressed as a percentage of pre-retirement salary.

The savings milestone represents the estimate of the accumulated balance at retirement necessary to fund that annual retirement income need throughout retirement, expressed as a multiple of pre-retirement income. The possible sustainable withdrawal rate is the estimate of the annual retirement spending that can potentially be sustainably funded by personal savings, expressed as a percentage of these savings. Finally, the required yearly savings rate can be thought of as the annual savings necessary to accumulate the target Savings milestone at retirement. The relationship among income replacement rate, savings milestone, and possible sustainable withdrawal rate is illustrated in the exhibit below.



A regional comparison

Retirement Savings Guidelines: A Regional Comparison

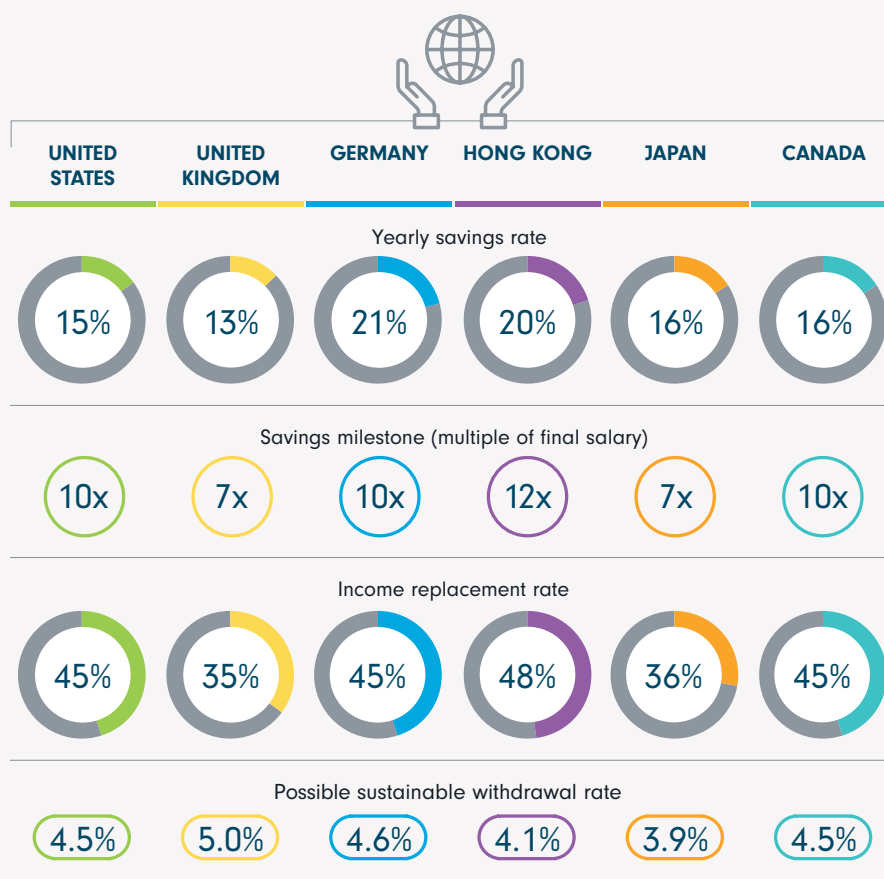
As described in the previous section, the Retirement Maths Framework provides guidelines for a set of four retirement metrics – required yearly savings rate, income replacement ratio, savings milestones and possible sustainable withdrawal rate.

The values for these guidelines will vary across regions due to differences in a variety of region-specific assumptions including observed saving/spending behaviour, taxation, structure of state/government pension and health insurance schemes, mortality, assumed retirement age, wage growth, inflation, and capital market assumptions.

Individually and in combination, these differences in assumptions/inputs result in cross-region differences in guideline values. It is important to note that while the guideline values may be different across regions, the underlying analytical framework that produces those values is globally consistent and produces guidelines that are locally relevant and globally comparable.

Regional results are summarised in the following sections. Additional insights can be gained by reviewing this paper's Appendix materials.

Fidelity's global retirement saving guidelines



Definitions:

Yearly savings rate: The suggested annual rate of (pre-tax) savings over a full working lifetime.

Savings milestones: Age-based savings targets expressed as multiples of current income.

Income replacement rate: The percentage of pre-retirement income that an individual/household should target to replace annually from their personal savings (including workplace savings) in retirement in order to maintain pre-retirement lifestyle.

Possible sustainable withdrawal rate: The real (inflation-adjusted), annual withdrawal amount expressed as a percentage of the initial (at retirement) asset balance.

Footnotes:

Hong Kong savings rate - 20% savings rate is net of an assumed 5% MPF contribution from both employer and employee pay.

Japan's income replacement rate - 28%, which excludes 8% income replacement from an assumed final lump sum salary payment of 2x annual pre-retirement salary.

Canada's income replacement rate assumes CPP enhancement, fully realised in base case (Current Age = 25).

The term "Fidelity" can refer to one or both of Fidelity International and Fidelity Investments. Fidelity Investments and Fidelity International are separate companies that operate in different jurisdictions through their subsidiaries and affiliates.

A regional comparison

United Kingdom

The total proportion of pre-retirement expenses that an individual will need to cover in retirement, how much can be anticipated to come from state/government pension benefits, and how much will need to come from personal savings, may vary based on a variety of factors, including retirement age, anticipated lifestyle in retirement, and current income.

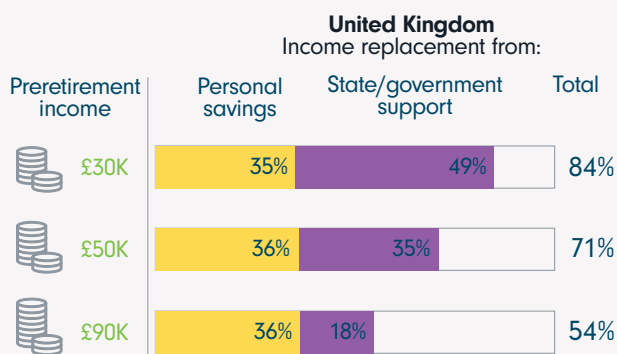
Fidelity analysed income and expenditures data¹¹ specifically for the United Kingdom (UK), and found that those with between £30,000 and £100,000 in annual pre-retirement income should plan to replace a total of between 55% and 85% of their pre-tax, pre-retirement income after they stopped working to maintain their lifestyle in retirement, based on an assumed retirement age of 68.

Pre-retirement salary (income at the point of retirement) plays a significant role in determining both what total percentage of your income you will need to replace in retirement and what percentage can be expected to come from state/government pension benefits. People with higher incomes are observed to spend a small portion of their income during their working years, and that means a lower total income replacement goal to maintain your lifestyle in retirement.

For many people, a significant portion of retirement income comes from state/government pension, but that share is relatively higher for lower-income people. As you can see in the exhibit to the right, a person earning £30,000 a year at the point of retirement could expect state/government pension to replace about 49% of income with the rest coming from savings. Someone who made £50,000 each year might expect to get 35% of that income from state/government pension. If you made £90,000, only 18% would likely come from state/government pension.

As the next exhibit illustrates, while the proportion of pre-retirement income that state/government pension can be expected to replace varies based on income, the proportion of pre-retirement salary required to come from savings remains stable – at roughly 35% - across a range of incomes.

Your salary affects how much income you will need to replace in retirement - and where it will come from.



Represents household income ranging from £30k - £100k annually. Represents quintiles 3-5 from the Office for National Statistics Income and taxation data from 'The Effects of Taxes and Benefits on Household Income, 2014/15'. Expenditure data from 'Family Spending 2014' compendium; local and state taxes not included; retirement age = 68 for base case.

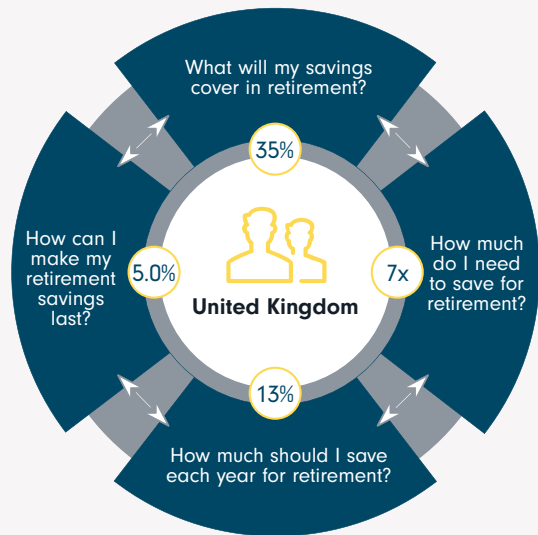
¹¹ 'The Effects of Taxes and Benefits on Household Income, 2014/15', Office for National Statistics Family Spending 2014 compendium, UK Data Service Living Costs and Food Survey, and Pension data from gov.uk (<https://www.gov.uk/>).

A regional comparison

For the hypothetical 25 year old individual assumed to retire at age 68 and planning for a retirement until age 92, to achieve the target of 35% income replacement will require an annual yearly savings rate of 13% and an accumulated balance at retirement of 7x pre-retirement salary, which in turn is based on an estimated possible sustainable withdrawal rate of 5%.

The UK guidelines additionally reflect the impact of changes introduced to the British pension system. For example, auto-enrolment, ensures that people are in a good position to begin saving by automatically enrolling them in a workplace pension plan if they are employed and meet certain conditions. The minimum contribution will rise to 8% (employer contributing minimum 3% and employee contributing minimum 5%) from April 2019.¹² However, these minimum savings levels might not be sufficient yearly savings rates – the mandated 8% is short of the 13% rate Fidelity believes to be necessary save sufficiently to continue with an equivalent lifestyle in retirement.

“Although the UK’s pension reform has some positive effect on levels of saving, it risks leaving people unengaged in their pension schemes,” **Carolyn Jones, Head of Fidelity Pension Policy & Workplace Investing in the UK**, says. “Guidelines like these are meant to help combat that problem, in order to ensure that people can understand how to achieve their retirement goals.”



¹² <http://www.thepensionsregulator.gov.uk>, The Pensions Regulator. 'Contributions and Funding.' The Pensions Regulator, The Pensions Regulator, Napier House, Trafalgar Place, Brighton, BN1 4DW, 2017, www.thepensionsregulator.gov.uk/employers/contributions-funding-tax.aspx

A regional comparison

Germany

Fidelity's analysis of income and expenditures data¹³ for Germany, suggests that those with between €25,000 and €75,000 in annual pre-retirement income (income at the point of retirement) should plan to replace a total of between 80% and 90% of their pre-tax, pre-retirement income in order to maintain their lifestyle in retirement, based on an assumed retirement age of 67.

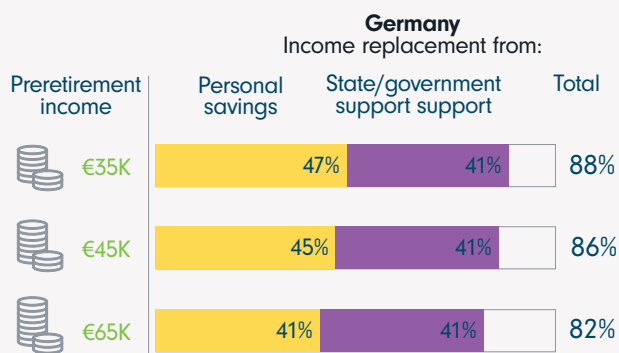
As is the case for other regions, the level of pre-retirement salary plays a significant role in determining what total percentage of income will need to be replaced in retirement and to a lesser extent, what percentage will be required to come from private retirement savings. People with higher incomes are observed to spend a smaller portion of their income during their working years, and that means a lower total income replacement goal in percentage terms to maintain pre-retirement lifestyle in retirement.

One noteworthy aspect of the retirement guidelines modelling for Germany - unlike the progressive structure of state/government pension schemes in other regions, the state/government pension scheme in Germany provides benefits that as a proportion of pre-retirement income are constant at 41% across all income ranges.

For Germany, the total required income replacement rate declines as pre-retirement incomes increase. Given the constant proportion of pre-retirement income replacement from state/government pension, the proportion of pre-retirement salary required to come from personal savings varies from 47% for lower incomes to 41% for higher incomes, with an average for the broad income range considered in the study of 45%.

For the hypothetical 25 year old individual assumed to retire at age 67 and planning for a retirement until age 91, to achieve the average target of 45% income replacement will require an annual yearly savings rate of 21% and an accumulated balance at retirement of 10x pre-retirement salary, which in turn is based on an estimated possible sustainable withdrawal rate of 4.6%.

Your salary affects how much income you will need to replace in retirement - and where it will come from.



Represents household income ranging from €24k-€100k annually. Represents deciles 4-7 from the Sample Survey of Income and Expenditure (EVS) via the German Federal Statistical Office (Destatis). Local and state taxes not included, retirement age = 67 for base case.

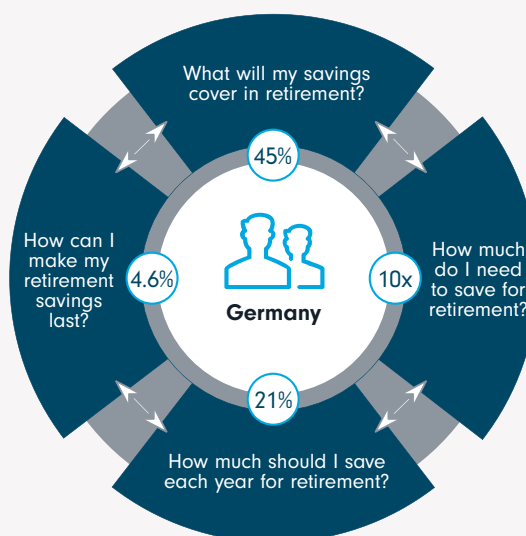
¹³ German Federal Statistical Office (Destatis) Sample Survey of Income and Expenditure (EVS), OECD Pensions at a Glance.

An ageing workforce and low birth rate is of concern in Germany. In 2016, 11% of the workforce was made up of workers age 65-74 - up from 5% a decade ago, according to a government microcensus.¹⁴ In order to address demographic shifts, the government has raised the statutory retirement age from 65 to 67 for those born in and after 1959.¹⁵

Even more significantly, the country has reformed its pension system and, as of January 2018, has introduced defined contribution only schemes to the German market for the first time (as opposed to defined contribution - defined benefit hybrids). The reform, called the 'Law strengthening occupational pensions' (Betriebsrentenstärkungsgesetz), took effect in January 2018. It offers employers 'simple, stable and efficient' occupational pensions,¹⁶ while also reducing pension gaps, for certain people, such as mobile workers.¹⁷ Although still voluntary for employers and employees, this reform intends to boost people's savings and to help them get higher returns for their investment. (Note: The base case used to generate the guidelines for Germany reflects this increase in statutory retirement age to 67.)

"We have 80 million people in Germany and 2 trillion in pension assets. In the Netherlands, there are 10 million people but pension assets are a multiple of 6," says **Christof Quiring, Fidelity's Head of Business Development, Workplace Investing, Germany.**

"In Germany, we have a lot of other private savings vehicles for retirement with some tax support. These are usually used privately, but in future, an example of these, Riester pensions, will also be attractive for employers."



¹⁴ https://www.destatis.de/EN/PressServices/Press/pr/2017/07/PE17_240_122.html. '11% of the 65 to 74-year-olds are in employment.' Federal Statistical Office (Destatis). July 2017.

¹⁵ http://www.bmas.de/SharedDocs/Downloads/DE/PDF-Publikationen/a360-16-strategische-sozialberichterstattung-englisch.pdf?__blob=publicationFile&v=1. '2016 Strategic Social Reporting: Germany'. Federal Ministry of Labour and Social Affairs, 2016. P. 27.

¹⁶ <http://www.aba-online.de/en/docs/attachments/01030ada-bdd5-460a-839f-992afe7c0749/20170330-BRSG.pdf>. 'Current developments in Germany: Betriebsrentenstärkungsgesetz (Law strengthening occupational pensions)'. Arbeitsgemeinschaft für betriebliche Altersversorgung e.V., 2017. P. 9

¹⁷ '2016 Strategic Social Reporting: Germany,' P. 26.

A regional comparison

Japan

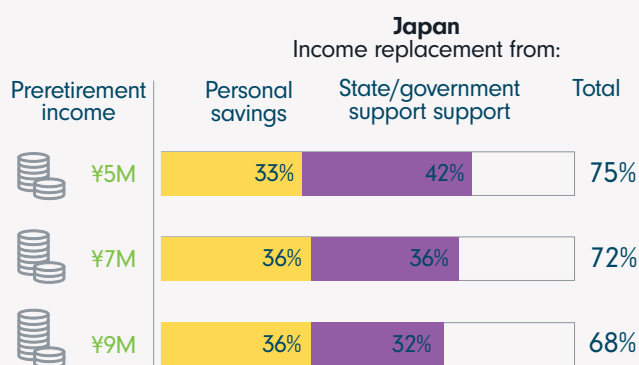
Fidelity's analysis of income and expenditures data¹⁸ for Japan, found that those with between ¥5,000,000 and ¥9,500,000 in annual pre-retirement income (income at the point of retirement) should plan to replace a total of between 70% and 80% of their pre-tax, pre-retirement income after they stopped working to maintain their lifestyle in retirement, based on an assumed retirement age of 67.

As is true for other regions, the level of pre-retirement salary plays a significant role in determining both what total percentage of your income you will need to replace in retirement and what percentage can be expected to come from state/government pension benefits. People with higher incomes are observed to spend a small portion of their income during their working years, and that means a lower total income replacement goal in percentage terms to maintain your lifestyle in retirement.

For many people, a significant portion of retirement income comes from state/government pension, but that share is relatively higher for lower-income people. As you can see in the exhibit to the right, a person estimated to earn ¥5,000,000 per year in pre-retirement income could expect state/government pension benefits to replace about 42% of income with the rest coming from personal savings. Someone with pre-retirement income of ¥9,000,000 per year might expect income replacement of 31% from state/government pension benefits.

While the proportion of pre-retirement income that state/government pension benefits can be expected to replace varies based on income, the proportion of pre-retirement salary required to come from savings remains stable – at roughly 36% – across a wide range of incomes. When modelling income replacement for Japan, retirement lump sum payment equal to 2x pre-retirement salary, resulting in 8% income replacement, was assumed. The income replacement rate net of that retirement lump sum payment is 28%.¹⁹

Your salary affects how much income you will need to replace in retirement – and where it will come from.



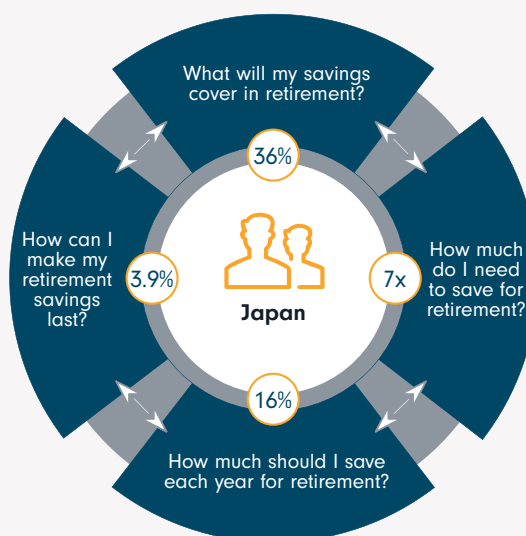
State support includes 8% income replacement from an assumed retirement lump sum payment (RLSP) of 2x annual final salary. The Yearly Savings Rate of 16% and the final Savings Milestone value of 7x are based on the 28% net personal replacement rate value.

¹⁸ Statistics Bureau, Ministry of Internal Affairs and Communications, National Survey of Family Income and Expenditure 2014

¹⁹ Total personal replacement rate is 36%. This includes 8% income replacement from an assumed retirement lump sum payment (RLSP) of 2x annual final salary, resulting in a net personal replacement value of 28%. The yearly Savings Rate of 16% and the final Savings Milestone value of 7x are based on the 28% net personal replacement rate value.

For the hypothetical 25 year old individual assumed to retire at age 67 and planning for a retirement until age 93, to achieve the net target of 28% income replacement will require an annual yearly savings rate of 16% and an accumulated balance at retirement of 7x pre-retirement salary, which in turn is based on an estimated possible sustainable withdrawal rate of 3.9%.

“Although the lump-sum payment provides a good boost to retirement savings, it is important for people in Japan to adopt a mindset of saving more”, says **Satoshi Nojiri, Head of the Fidelity Investor Education Institute in Japan.**



A regional comparison

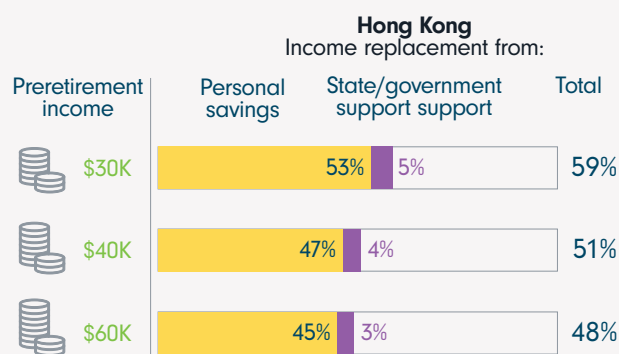
Hong Kong

Fidelity's analysis of income and expenditures data for Hong Kong, found that those with monthly pre-retirement income between \$HK25,000 and \$HK150,000 should plan to replace a total of between 48% and 59% of their pre-tax, pre-retirement income after they stopped working to maintain their lifestyle in retirement, based on an assumed retirement age of 65. One may wonder why total replacement rate for Hong Kong appears to be much lower compared to that of other regions. This is due to Hong Kong's idiosyncratic housing structure. According to Hong Kong Household Expenditure Survey²⁰, only about a half of residents in Hong Kong reside in privately owned housing, and the rest reside in publicly owned or subsidised housing. As a result, rental income and expenses are taken out from spending to ensure a globally consistent framework to study income and expenditure of regions.

As is true for other regions, the level of pre-retirement salary plays a significant role in determining both what total percentage of your income you will need to replace in retirement and what percentage can be expected to come from state/government pension or social security benefits. People with higher incomes are observed to spend a small portion of their income during their working years, and that means a lower total income replacement goal in percentage terms to maintain your lifestyle in retirement.

State/government pension, in the form of Old Age Allowance (OAA) in Hong Kong, represents a relatively modest level of income replacement when compared to state/government pension benefits of the other regions studied. The income replacement from OAA is progressive – representing a larger percentage income replacement for lower earners than for higher earners, but the absolute level of income replacement across all incomes is low. As you can see in the exhibit to the right, across a range of incomes Old Age Allowance benefits would cover between 3% and 5% of pre-retirement income, with the rest coming from savings. The proportion of pre-retirement salary required to come from personal savings varies from 53% for lower incomes to 45% for higher incomes, with an average for the broad income range considered in the study of 48%.

Your salary affects how much income you will need to replace in retirement - and where it will come from.

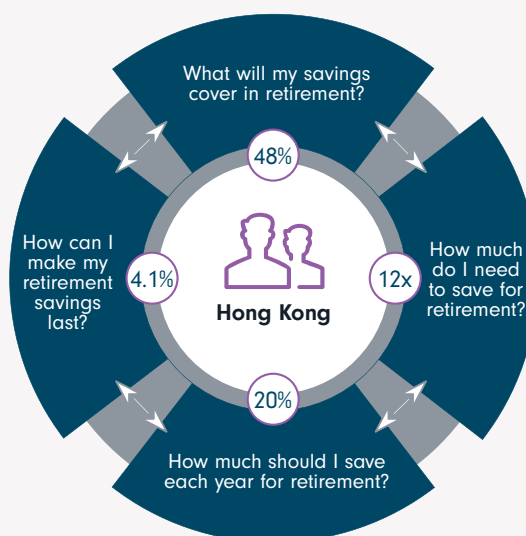


Represents household income ranging from \$HK25k-\$HK150k per month. Represents deciles 6-9 from the Census and Statistics Department (Censtatd) publications backed by survey data. Income data from Quarterly Report on General Household Survey 2016 (latest data Q2 2016). Expenditure data from Data from Household Expenditure Survey 2014-15; local and state taxes not included; retirement age = 65 for base case.

²⁰ 2014/15 Household Expenditure Survey and the Rebasing of the Consumer Price Indices. Census and Statistics Department, The Government of the Hong Kong Special Administrative Region. http://www.censtatd.gov.hk/freedownload.jsp?file=publication/stat_report/consumer_price/B10600082015XXXXB0100.pdf See: The rebasing of the consumer price indices Table 1: Number of households by household expenditure by type of housing.

For the hypothetical 25 year old individual assumed to retire at age 65²¹ and planning for a retirement until age 94, to achieve the net target of 48% income replacement will require an yearly savings rate of 20% and an accumulated balance at retirement of 12x pre-retirement salary, which in turn is based on an estimated possible sustainable withdrawal rate of 4.1%. Note: the 20% required yearly savings rate is net of (after) an assumed MPF contribution rate of 5% for both employee and employer.

“The MPF is an excellent way to boost savings, but it has only been around for 17 years, so the savings captured there so far are not sufficient for retirement,” says **KP Luk, Head of the DC Business in Hong Kong at Fidelity**. “Employees must boost their private savings in order to have a sufficient retirement income.”



²¹ The retirement savings guidelines for Hong Kong assume a retirement age of 65. The Old Age Allowance (OAA) used in the calculation of the income replacement ratio is available starting at age 70. To calculate the Hong Kong retirement savings guidelines for assumed retirement ages less than 70, the model computed a discounted present value of the OAA benefit at age 70 and applied that reduced value to the income replacement framework to compute the net (personal) replacement rate for assumed retirement ages less than 70. For example, the OAA benefit at age 70 was calculated to replace approximately 7% of pre-retirement income. At the baseline retirement age of 65 used to generate the Hong Kong retirement savings guidelines the discounted (reduced) benefit was computed to replace approximately 4% of pre-retirement income.

Another way to think about this – while the OAA benefit will not be payable until age 70, for the purpose of this modelling of retirement ages less than 70 is that Fidelity took the total OAA benefits that would be paid to an individual in retirement and spread them over a longer retirement period.

A regional comparison

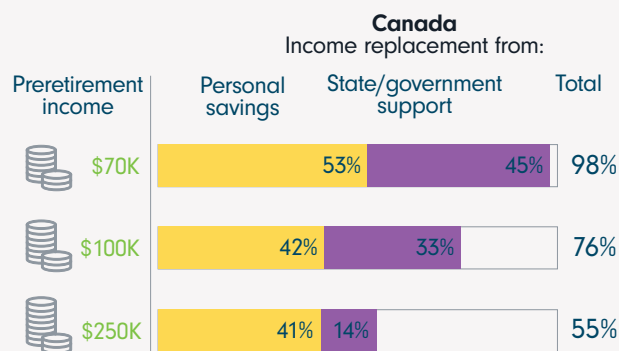
Canada

Fidelity's analysis of income and expenditures data for Canada, suggests that those with between CAD\$55,000 and CAD\$300,000 in annual pre-retirement income (income at the point of retirement) should plan to replace a total of between 50% and 100% of their pre-tax, pre-retirement income in order to maintain their lifestyle in retirement, based on an assumed retirement age of 65, which corresponds to the Canada Pension Plan (CPP) full benefit age.

As is true for other regions, the level of pre-retirement salary plays a significant role in determining both the total percentage of your pre-retirement income you will need to replace in retirement and the percentage that can be expected to come from state/government pension benefits. People with higher incomes are observed to spend a small portion of their income during their working years, which translates to a lower total income replacement goal in percentage terms to maintain a pre-retirement lifestyle in retirement.

State/government pension, in the form of Old Age Security (OAS) and Canada Pension Plan (CPP)/Quebec Pension Plan (QPP) combined, represents about one third of pre-retirement income on average for many people, but that share is relatively higher at the lower end of the income range. As you can see in the exhibit to the right, a person estimated to earn CD\$70,000 per year in pre-retirement income could expect state/government pension to replace about 45% of income, with the remainder (53%) required to come from personal savings. Those with pre-retirement incomes of \$250,000 per year could expect income replacement of 14% from total state/government pension, with the remainder (41%) required to come from personal savings. Overall, Fidelity observes that the proportion of pre-retirement salary required to come from personal savings varies from 53% for lower incomes to 41% for higher incomes, with an average for the broad income range considered in the study of 45%.

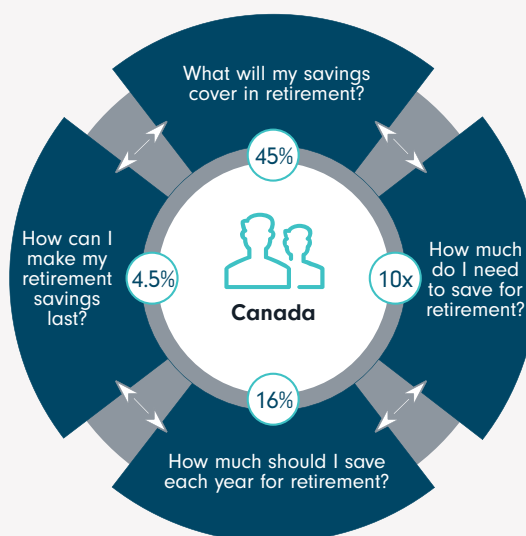
Your salary affects how much income you will need to replace in retirement - and where it will come from.



Represents household income ranging from \$55k-\$300k annually. Represents quintiles 3 - 5 from the Statistics Canada, 2016 Survey of Household Spending. Local and state taxes not included; retirement age = 65 for base case.

For the hypothetical 25 year old individual assumed to retire at age 65 and planning for a retirement until age 93, to achieve the average net target of 45% income replacement will require a yearly savings rate of 16% and an accumulated balance at retirement of 10x pre-retirement salary, which in turn is based on an estimated possible sustainable withdrawal rate of 4.5%.

Note: The Retirement Savings Guidelines for all regions assumes a base case current age of 25. Modelling of state/government support for Canada assumes the full implementation of CPP enhancements. To the extent that one's current age is significantly greater than 25, the state/government support replacement rate may be overstated as the individual will not fully realise the full benefit of the CPP enhancements over their full working lifetime, and the income replacement impact of CPP may therefore be overstated. Consequently, the personal replacement rate and the associated required savings rate and savings milestones may be understated. The impact is modest for those currently 40 or younger, but the appropriateness of the Retirement Savings Guidelines will diminish as current age deviates further from age 25.



A regional comparison

United States

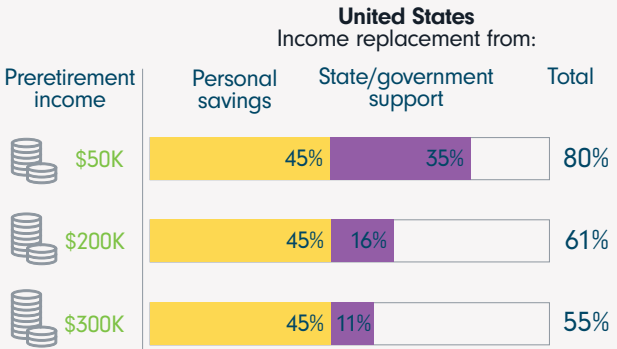
Fidelity’s analysis of income and expenditures data²² for the US, suggests that those with between \$50,000 and \$300,000 in annual pre-retirement income (income at the point of retirement) should plan to replace a total of between roughly 55% and 80% of their pre-tax, pre-retirement income in order to maintain their lifestyle in retirement, based on an assumed retirement age of 67, which represents the Social Security full retirement age for those born in 1960 or later.

As is true for other regions, the level of pre-retirement salary plays a significant role in determining both what total percentage of your income you will need to replace in retirement and what percentage can be expected to come from state/government pension benefits. People with higher incomes are observed to spend a small portion of their income during their working years, and that means a lower total income replacement goal in percentage terms to maintain your lifestyle in retirement.

Social Security benefits represents about 23% of retirement income on average for people within this broad pre-retirement income range, but that share is relatively higher for those with pre-retirement incomes at the lower end of this range. As you can see in the exhibit to the right, a person estimated to earn \$50,000 per year in pre-retirement income could expect Social Security to replace about 35% of income, with the remainder (45%) coming from personal savings. Someone with pre-retirement income of \$100,000 per year might expect income replacement from Social Security of 27%, with the remainder (45%) from personal savings. Those at the high end of the income range – pre-retirement incomes of \$300,000 - could expect income replacement from Social Security of 11%, with the remainder (44%) to come from personal saving.

For the hypothetical 25 year old individual assumed to retire at age 67 and planning for a retirement until age 92, to achieve the net target of 45% income replacement from personal assets will require an yearly savings rate of 15% and an accumulated balance at retirement of 10x pre-retirement salary, which in turn is based on an estimated possible sustainable withdrawal rate of 4.5%.

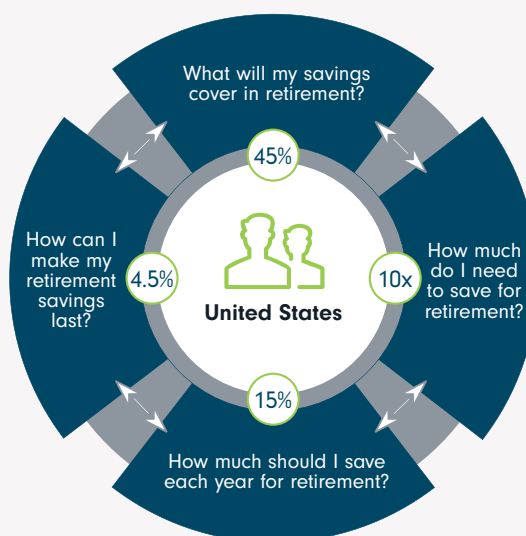
Your salary affects how much income you will need to replace in retirement - and where it will come from.



Represents household income ranging from \$50k to \$300k annually in the Consumer Expenditure Survey (BLS), Statistics of Income Tax Stat, IRS tax brackets, local and state taxes not included; retirement age = 67 for base case.

²² Consumer Expenditure Survey (BLS), Statistics of Income Tax Stat, IRS tax brackets and Social Security Benefit Calculators.

“Fidelity’s commitment to providing retirement guidance has enabled us to create the first set of global retirement guidelines to help workers around the world,” said **Kevin Barry, president of Workplace Investing at Fidelity Investments in Boston**. “Importantly, these guidelines can be part of an innovative international benefits program that is delivered consistently in various geographic regions and provide to employers the ability to evaluate benefits design and monitor/encourage good retirement savings habits in a consistent manner across their regional workforces.”



Implications for global retirement planning

The need for active engagement in retirement planning across the world is acute. Employers, as part of their workplace retirement savings programs, can play a key role in helping employees improve their retirement preparedness by offering clear guidelines and engaging tools.

A workplace retirement plan will be the primary retirement savings vehicle for most of today's younger generations. Because of this, it is more important than ever for them to start saving early, and continue to do so consistently throughout their working lives.

Fidelity believes that these guidelines, and the underlying analytical framework, can provide useful insights to governments and pension regulators interested in evaluating the efficacy of pension design and contemplating modification/enhancement of pension schemes. In particular, the globally-consistent framework and guidelines enable multinational employers to evaluate benefits design and monitor or encourage good retirement savings habits in a consistent manner across their regional workforces.

Employers should ensure their retirement plan design encourages individuals to begin to save early, save consistently, and save at a level that, when combined with state/government pension benefits, makes living a comfortable retirement an achievable goal. The right combination of plan design, engaging guidance and innovative tools makes saving and investing easier to understand, which may lead to better outcomes.

Employers can use these guidelines, and a set of associated metrics, to help design their plans for targeted outcomes (e.g., income replacement ratio) and to evaluate progress and sufficiency of their workforce with respect to achieving these targets.

Employees can use these guidelines as a gauge to help them determine what goals to set in their retirement planning process, and to explore the sensitivity of the guidelines to changes in assumptions/behaviour (e.g., saving more/less, retiring earlier/later, modifying retirement lifestyle). While these can be used as a gauge, Fidelity still recommends that employees engage in a more robust retirement planning session to determine their specific path toward retirement readiness.

Fidelity believes that a comprehensive guidance session, either using online tools or in-person with a guidance representative, is always preferable. A full guidance session will take into consideration a more complete set of financial and personal information, resulting in a more complete and personalised retirement plan, including retirement savings, investment and retirement income guidance. Recognising that not all employees have either the time or inclination to engage in a full guidance session, these guidelines provide a straightforward, engaging introduction to retirement planning using simple guidelines, education, and 'what if' analysis, requiring only a minimal set of inputs.

"Developing a retirement framework that supports the creation of simple retirement savings goals, including interim savings milestones – and interactive 'what if' analysis - promotes and maintains engagement," says Jeanne Thompson, Head of Workplace Solutions Global Thought Leadership.

The requirement for greater engagement in proactive retirement planning, saving and goal-setting is clearer than ever before. As governments look to take measures to support global populations in this endeavor, it is also important for people to be engaged proactively with their own financial planning.

As Fidelity extends these retirement savings guidelines to markets around the world, this model and the engagement platforms which can be built on top of it, should serve increasingly as an important reference for people looking to plan, save and set goals along the way to their retirement. Ultimately, the power of these guidelines lies in their ability to help people wherever they are to take control of their retirement planning: to set goals, calculate how much to save, and track progress along the way. Local answers to a global problem.

Important Information

While there are various simplifying assumptions that support the retirement savings guidelines, there are some foundational beliefs that guide the retirement savings research and associated guidelines and educational collateral.



First, the framework considers that a reasonable retirement goal should be to maintain the same lifestyle in retirement as you had before retirement. Evaluating relevant national income and expenditure data sources allows us to estimate the level of retirement income that would support pre-retirement levels of spending across a broad range of incomes. Evaluation of the design of state/government pension schemes allows us to estimate the income replacement capacity of state/government pension benefits across a range of incomes. Finally, subtracting the estimated income replacement from state/government pension benefits from the estimated total required income replacement allows us to estimate the required net income replacement from private sources. All of these income replacement values are expressed as percentages of pre-retirement income, which allows for comparability across incomes within a region as well as across regions.

Second, individuals/households should have a 'strong plan' for retirement. By this, Fidelity means that it is important to recognise that market outcomes are uncertain and therefore plan success should be evaluated based on the ability to achieve a desired outcome – a desired level of income for a desired period of time – even in adverse market conditions. The framework evaluates two separate but related horizons. For the accumulation horizon, the outcome being evaluated is the accumulation of a balance sufficient to meet income needs in retirement. For the distribution (retirement) horizon, the outcome being evaluated is the ability to fund a given level of retirement income for a given retirement period. For the purposes of generating the retirement guidelines, rates of return associated with the 80th percentile (80% of simulated outcomes were greater) were used to evaluate the accumulation phase (savings and investment growth during one's working life) and associated retirement guidelines –

yearly savings rate and interim savings milestones, while rates of return associated with the 90th percentile were used to evaluate the decumulation (retirement) phase (investment performance and withdrawals in retirement) and the associated retirement guidelines – possible sustainable withdrawal rate and the final savings milestone (representing the required savings balance at retirement).

A slightly lower confidence is applied to the pre-retirement analysis as individuals experiencing poor markets can still make changes – such as increasing contributions, retiring later, or adjusting expectations regarding a lower retirement lifestyle – to improve retirement outcomes if necessary. Those in retirement have fewer options and so a higher degree of required confidence is deemed appropriate.

Using the 'strong plan' framework as the basis of the Retirement Maths Framework which underlies the guidelines also helps to isolate the effects of saving and investing. While saving and investing are conceptually quite intertwined, retirement preparedness is generally more of a saving problem than an investing problem. Asset allocation is not the primary determinant of retirement planning success.

While an inappropriately allocated portfolio can certainly derail a retirement plan, asset allocation alone cannot help beyond a certain point if the rate of savings is too low and/or the period of time over which one saves is too short. At conservative confidence levels such as those used in Fidelity's 'strong plan' framework, the probability of success of a retirement plan does not vary dramatically for portfolios above a certain level of lifetime equity. Of course, the projected ending balances at any confidence level would differ based on asset allocation, but retirement planning success based on a 'strong plan' framework helps to focus the discussion on saving

rather than investing. In other words, the yearly savings rate rules of thumb would not be too sensitive to asset allocation once you are broadly inside an age-appropriate range. Hence, for the baseline case, Fidelity assumes a target date asset allocation with a high equity exposure at a younger age, rolling down to a more conservative allocation as you get older.

Two related points to emphasise – First, at extremes of asset allocation, particularly at the conservative extreme where one's lifetime exposure to equities is low, the retirement savings guidelines will become less applicable. As noted above, the guidelines assume a lifetime asset allocation that includes a meaningful (roughly 50% or more) allocation to equities. Second, the guidelines assume a broadly diversified portfolio with exposures in line with market indices. To the extent that one's portfolio is poorly diversified within asset classes, the guidelines will also be less applicable.

One additional point highlighted by the US research and in simulations run for the regions is that the degree of impact of asset allocation varies by the assumed confidence level. At the conservative confidence levels assumed in Fidelity's 'strong plan' framework, the impact of asset allocation on the guidelines is muted. At higher (more optimistic) confidence levels, the differential impact of asset allocation increases as the range of expected returns to different asset mixes increases with the more optimistic confidence levels.

Third, to estimate the retirement savings guidelines, equilibrium (long-term) capital market assumptions are applied in Fidelity's simulations on the grounds that Fidelity is modelling accumulation and distribution (spending in retirement) which separately and jointly encompass long investment horizons. These long-run risk/return estimates are informed by long term historical asset class behaviour of global equities, global investment grade bonds, and cash. Using stable, long-term assumptions for inflation and asset class risk/return provides the additional benefit of generating guidelines which will be relatively stable over time. It is important that the planning confidence levels described above are viewed in this context. As noted below, these guidelines and the modelling framework are intended to reflect the experience of an individual in the early/middle stages of their working life where the assumption of a long investment horizon is appropriate.

To the extent that an individual's planning horizon is significantly shorter - either the accumulation period, the decumulation (retirement) period, or both - the reasonability of Fidelity's modelling assumptions and the applicability of the resulting guidelines will be diminished.

To generate the returns used as inputs to the Retirement Maths Framework, the long-term estimates of investment risk and return are applied to a generic asset allocation roll-down consistent with the structure of a typical 'age-based' or 'target date' retirement solution, and simulations are run to generate a distribution of outcomes under a wide range of market conditions.

Additional notes

Solving for retirement savings guidelines depends on a number of critical factors like asset allocation, household income, age, current savings, accumulation/planning horizons, pensions, taxes, etc. The core of this section is about describing Fidelity's approach to reducing the number of key variables required of a user to the minimum irreducible set of current age and current savings as a multiple of current income. Clearly, a more comprehensive and personalised retirement planning experience would require that these variables, and many more financial details, be specified by the user in order to offer prescriptive, personalised guidance.

Managing Complexity: Taxes

Solving for replacement rates in pre-tax terms and assuming that assets are held in tax-advantaged (tax-deferred) accounts are important steps toward being able to align the various retirement metrics with each other. The consumption-based total replacement rate schedule, which is expressed in after-tax terms and goes down from 90% to 60%, is a better measure for a more robust retirement planning tool interaction or a financial planning exercise undertaken with a financial professional. However, expressing the replacement rate from personal assets in pre-tax terms makes the retirement puzzle much simpler to understand. Young accumulators tend to think of their income and future growth in annual, pre-tax terms. Most of them make pre-tax retirement contributions to tax-deferred accounts. These accumulators plan to pay taxes on this deferred income in retirement when they actually withdraw their money.

The notions of nest eggs – accumulated assets – and possible sustainable withdrawal rates (PSWR) are also generally described and understood in pre-tax terms. Therefore, expressing the personal replacement ratio as a percentage of pre-tax, pre-retirement income helps to reduce the modelling complexity and allows all of the retirement metrics and guidelines – required yearly savings rate, savings milestones, income replacement ratio, and possible sustainable withdrawal rate – to be expressed in common – pre-tax – units.

An important point regarding the estimation of total required pre-retirement income replacement, the income replacement capacity of state/government pension benefits, and the resulting net income replacement required of personal saving – while the income

replacement values are ultimately expressed in pre-tax terms for the reasons cited above, the analysis of expenditure data, state/government pension benefits, and personal retirement savings have first been evaluated with the impacts of taxes explicitly considered – i.e. evaluating pre-retirement (at or near the point of retirement), after-tax expenditures and effective tax rates in retirement, the tax treatment of state/government pension benefits, and the tax treatment of withdrawals from personal savings – in order to appropriately reflect both the after-tax need and the after-tax capacity to meet that need. Then, to make the retirement equation both internally consistent and more readily understandable, these after-tax values have been re-expressed ('grossed up') in pre-tax terms.

Managing Complexity: Other Variables

Income – Expressing all the variables normally expressed in currency units, like savings, spending, and pensions in terms of a percentage of pre-retirement household income helps to reduce the modelling complexity and makes the sensitivities to these factors much more linear. As discussed in an earlier section, while the overall replacement rate varies for different income cohorts, the funding required from personal assets is more uniform within most regions for all income cohorts. The ability to meet the income replacement required from personal assets will certainly vary based on contributions, but since the income replacement ratio itself does not vary significantly based on income level, the required yearly savings rate calculation is not sensitive to income levels – a single required yearly savings rate value can be applied across a range of incomes.

Assets – Given that the personal replacement ratio is constant across a range of incomes, expressing current savings as a multiple of current income further reduces complexity. The solution for a 35 year old earning \$50,000 per year with current savings of \$50,000 would be very similar to another 35 year old earning \$100,000 per year with current savings of \$100,000. Both have current savings of 1x current salary. For the purpose of evaluating required yearly savings rates, all individuals of the same age with the same savings equal to the same multiple of current income can be treated identically, regardless of their incomes.

Retirement Age – Both the personal income replacement ratio and required yearly savings rates are quite sensitive to assumed retirement age. To generate the retirement savings guidelines, a base case retirement age for each region was chosen that reflected either the projected state/government pension full retirement age for Fidelity's base case 25 year old (US, Canada, UK, Germany, Japan), the earliest claiming age, or observed/anticipated claiming behaviour (Hong Kong). The related articles and interactive widgets allow an individual to explore the sensitivity of the guidelines to this and other assumptions.

Planning Age – The sensitivity of the retirement savings guidelines to the assumed planning (mortality) age was found to be modest, both in absolute terms and relative to other assumptions such as retirement age. For the baseline case in each region, the assumed planning age defaults to the 25th percentile mortality for individuals currently at retirement age based on regionally relevant mortality tables. The default age represents a unisex value. No projected mortality improvements are considered.

Pensions – The base case assumption used to generate the retirement savings guidelines is that the household has no private defined benefit pension or other lifetime guaranteed income source, reflecting the current and/or prospective reality across regions. Such income sources can be considered if expressed as a percentage of pre-retirement household income. The income source will simply be treated as a reduction to the net income replacement ratio, and a new, internally consistent set of retirement guidelines can be calculated.

End note: Fidelity refers to one or both of Fidelity International and Fidelity Investments. Fidelity Investments and Fidelity International are separate companies that operate in different jurisdictions through their subsidiaries and affiliates.