

Retirement Planning Software and Post-Retirement Risks

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Quick Guide to Major Issues

Some issues are discussed in different contexts throughout the report. This is a list of the major issues identified and where information on these issues can be located.

1. Social Security benefits – pp. 42-3, 54-5, 56-61, 67-8, 75-7, 90-1, 93, 96, 99, 100, 110, 116-7
2. Retirement age – pp. 44, 47, 56-60, 71, 82-3, 94, 95
3. Housing issues – pp. 18-9, 24, 26, 33, 45-6, 49, 54-5, 57, 62-3, 70, 100
4. Health and long-term care insurance – pp. 26, 30, 32-4, 38-9, 43, 57, 59, 60, 63, 70, 80, 87, 91-2, 97
5. Annuities – pp. 23, 26, 37-40, 56-8, 65-7, 69-71, 83, 91-2, 95, 100
6. Target replacement rate – pp. 20, 24, 30, 42-3, 47, 50, 54, 61-5, 80, 83-4, 95, 98
7. What to do if you have insufficient savings – pp. 29, 40, 65-7, 71, 95
8. Benefits for survivors – pp. 43, 65, 69, 82-3, 99
9. Investments – pp. 19, 22, 29-30, 33-39, 45-59, 53, 56-7, 60, 65-68, 70, 72, 86, 96-7, 99
10. Output – pp. 30, 32, 42, 49, 52, 66, 69, 73, 78-87, 90, 92-3, 95, 100
11. Taxes – pp. 18, 35-7, 39, 46, 54, 62, 70, 72, 77, 80-2, 84, 90, 92, 97

Risks covered

1. Rate of return – pp. 27-8, 30-7, 44-5, 49, 52-3, 63, 65, 75, 89, 93, 101
2. Interest rate – pp. 26, 32-3, 37-8, 49, 75, 78, 87-8, 94
3. Inflation – pp. 26-8, 31-4, 38-9, 43-5, 49, 54-5, 63, 70, 75-6, 78, 80, 86-90, 94, 97
4. Longevity – pp. 18, 20, 24, 27, 34, 39-49, 52-5, 58-9, 65, 68, 71, 74, 78, 80, 82-3, 86, 93-5, 98, 100
5. Death of spouse – pp. 26, 28, 32-3, 42, 78, 83, 86, 92, 94, 117
6. Medical expense – pp. 43, 54, 63, 69-70, 90
7. Early retirement – pp. 33, 47, 49, 59, 116

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Foreword

In the current economic climate, individuals planning for retirement are in ever-increasing need of tools to help them make decisions for the future. Trends including the shift from defined benefit to defined contribution plans and growing receipt of lump sum distributions have placed more responsibility on individuals for managing funds in retirement. With this added responsibility for securing their financial well-being in retirement, many have utilized software packages available to them as consumers and through financial professionals for advice. But, how well do these programs consider the risks and challenges that retirees face upon retirement?

Recognizing the growing trend towards individual responsibility and the risks that may be encountered, the Society of Actuaries (SOA) launched a broad research and information initiative in the late 1990s to raise awareness of post-retirement challenges and seek ways to address them. Efforts that have grown out of this initiative include a series of biennial surveys of retirees and pre-retirees on their understanding and attitudes towards post-retirement risks and observations from focus groups on how decisions are made for managing assets in retirement. Reports from these efforts and others related to post-retirement risks can be found on the SOA's web site at:
<http://www.soa.org/research/pension/research-post-retirement-needs-and-risks.aspx>

Amongst these efforts is a landmark study completed in 2003 on the handling of post-retirement risks by retirement planning software. For that effort, the SOA partnered with LIMRA (a U.S. based marketing and research organization serving over 850 financial services companies in over 70 countries), and the International Foundation for Retirement Education (InFRE) to produce a comprehensive look at retirement planning software.

With the passage of several years, the SOA decided it was time to revisit planning software and reassess the state of the art in how they handle post-retirement risks. As a result, the SOA and The Actuarial Foundation are pleased to make available this new, updated study, authored by John Turner and Hazel Witte. In this report, you will find a wealth of information about the risks that retirees face and how software tools deal with these risks both methodologically and through the advice they provide. It is our hope that this study is used to better inform software tool users of program capabilities as well as limitations, and serves as a catalyst for future innovation and improvements.

Steven Siegel
Research Actuary
Society of Actuaries
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EXECUTIVE SUMMARY

Background

This study assesses the extent to which the retirement planning programs analyzed help users understand post-retirement risks. It investigates ways that programs deal with post-retirement risks, highlighting innovative approaches.

With the decline in traditional defined benefit plans, cutbacks in Social Security already legislated, and further ones possibly needed to maintain solvency, retirees increasingly must rely on their own ability to manage their retirement income. Relatively few retirees purchase annuities, leaving them with investment and distribution decisions concerning their accumulated savings. Increasing life expectancy and improved health at older ages raise the issue of whether people should consider postponing retirement as a way of assuring adequate resources during retirement. During retirement, they face complex issues concerning how to manage various risks.

While retirement planning poses challenges for everyone, those challenges differ considerably across people at different income levels. At lower- and middle-income levels, the main pre-retirement planning issues are when to stop working and when to take Social Security. Lower-income people tend to rely largely on Social Security benefits in retirement. Middle-income people must also manage their savings so as to not run out of money. At higher income levels, people still are concerned about having adequate retirement income for their desired consumption, but they are also concerned about tax issues and estate planning.

Increasingly, people planning for retirement have access to financial planning software, much of it available over the internet for free. This software can be categorized into three groups: software concerning investments and portfolios, software concerning how much to save for retirement, and software concerning managing resources and risks in retirement. Some software combines all three types of analysis. The software we examined all provides analysis as to managing resources and risks in retirement.

Methodology

This study of retirement planning software builds on the groundbreaking work presented in the first study of Retirement Planning Software (Sondergeld et al. 2003) sponsored by Society of Actuaries, InFRE, and LIMRA. We examine twelve nonrandomly selected retirement planning software programs. Five of the programs are available for free over the internet (identified in the study as consumer programs). One program is available to consumers at a fee, and six programs are designed for use by financial planners for their clients (identified in the study as professional programs).

The names of the programs we analyze are included in the Appendix. Other than listing the programs there, we do not identify any of the programs by name in the analysis presented in this report. We do not critique individual programs, but rather comment on

the positive and negative features of programs as examples for users and developers of these programs.

While our sample of programs is nonrandom and cannot be used to provide evidence as to prevalence, it represents a variety of programs provided by different types of institutions. The programs have been chosen so that a variety of approaches are included, so that different types of providers are included, and so that some of the most widely used programs are included. Some well-known programs were excluded because they focus on helping the user determine savings and investment decisions pre-retirement, with little or no attention paid to issues arising during the retirement period.

The key focus of the study is post-retirement risk. For each post-retirement risk type we consider, we do a four-step analysis of how the programs deal with that risk.

- We determine whether the programs recognize the specific risk or simply present a single result that does not indicate the range of possible outcomes with respect to that risk. For example, many programs only indicate results for a single age at death, not recognizing the possibility that death might occur at a younger or older age..
- We assess whether the input relating to the risk is provided by the user, and if so, whether the programs provide guidance, or if it is supplied by the program.
- If the programs recognize the risk, we then assess how they deal with the risk.
- We assess whether the programs recognize ways that retirees have of dealing with the risks, for example, by annuitizing to insure against with longevity risk.

This study's methodology consists of several components:

- Selecting and obtaining a sample of software to provide insight on a range of practice
- Focusing on post-retirement risk, creating a context for the study
- Reading documentation, running tutorials, and examining programs to see what capabilities they offer
- Developing case studies to provide situations for testing of the software
- Running the software to determine how it operates, and to provide results for comparison, and an understanding of the capabilities including input and output.

Structure of the Report

The report is divided into an introduction, followed by eight chapters, and a conclusion. It contains three Appendices. The eight chapters discuss different types of post-retirement risks and ways of dealing with them. It also discusses issues relating to financial planning for retirement. It discusses various features that affect the ease of use of the programs.

Results

The results from studying this sample suggest that in spite of substantial advances in some aspects of the software, the major conclusions of the first study still hold. Notably, most programs do not do a good job of evaluating the risks that users face. This study, however, also finds some major improvements in financial planning software. For example, the use of Monte Carlo analysis to highlight risk has increased, though generally most risks are ignored. The ease of use of the software has improved.

Different people thus have different issues and considerations in retirement planning, and software that works well for a specific situation will need to address the relevant issues. However, generally the software does not include a statement as to who it is suitable for, though some programs indicate that they are suitable for people with at least a stated minimum level of assets.

Problems with Retirement Planning Software. The current financial crisis exposes weaknesses in financial planning software. The programs we examined are unable to analyze the risks of variable rate mortgages or large declines in housing prices. They do not anticipate the possibility of the stock market falling by more than 50 percent over two years. They do not consider the possibility of all those things happening at the same time that a person nearing retirement has lost his or her job. In short, they under-represent, or fail to represent, extreme events. For people anticipating the possibility of these events, the software permit the running of “what if” scenarios to investigate the effect of such events. The tools, however, should help people identify risks, rather than relying on the sophistication of the user.

The following are examples of problems with retirement planning software. Some of these problems are less common among professional software we examined, designed for use by financial planners, than consumer software. Some are common in both types of software. In some cases, an informed user could offset the problem when entering information or when selecting assumptions.

Problems frequently found in the consumer and professional software we examined:

1. It doesn't take into account fees on investments, causing it to use too high a rate of return.
2. It overstates gross rates of return because individual investors tend to under-perform the market due to the timing of their investments.
3. It does a poor job of determining the level of Social Security benefits.
4. It doesn't consider the possibility of annuitization as an option to reduce risk.
5. It does not consider variable rate mortgages.
6. It does not consider the risk of changes in interest rates as that affects the purchase prices of annuities or the interest rates charged on variable rate debt instruments
7. It does not consider the risk of retiring earlier than expected.

8. It under-represents the risk of extreme events, such as the current stock market decline.
9. It does not consider as an option investments in inflation-indexed bonds.
10. The programs generally do not have a statement as to the type of user they are suitable for. The programs tend to be targeted toward a particular segment of the market (which varies by program), but that is generally not indicated in an explicit suitability statement. Different programs are better suited for analyzing different issues, and a suitability statement providing that information would also be helpful.

Problems that occur in both consumer and professional software, but that are less prevalent in the professional software we examined:

11. It could do a better job of checking for data entry errors. This problem is less of an issue for professional software because the professional financial planner is presumably less prone to errors than the consumer-user because the professional financial planner has received professional training and certification..
12. It has a pro-equity, pro-risk bias, particularly the deterministic models. Increasing the amount of portfolio risk raises the amount of resources the model indicates that the user will have. This problem is less common among professional programs because all have Monte Carlo analysis as an option.
13. It doesn't take into account economies of scale in consumption. This problem is less common among professional software, and some seem to overstate the effect of economies of scale (the advantage that a couple has over a single person) by setting too high a target level for the survivor relative to the couple.
14. It doesn't take into account differences in life expectancies across people. All the professional programs, however, allow users to override the default on life expectancy.

Overall, rather than focusing on greater detail on issues that are not important to most people using the programs, we recommend that programs focus on better treatment of key inputs: longevity, rates of return, Social Security benefits, housing, and target consumption, including target consumption for survivors. The issues of importance will vary depending on the target population of the programs.

A common problem with many of the programs examined is that they use rates of return that are too high, either due to user or program specifications. First, historical rates of return may be a poor guide for future rates of return, which may be lower. Second, market rates of return exceed the rates of return individuals receive due to investment fees they pay. Third, individuals tend to under-perform the market because of errors they make in investing, such as selling (or not buying) when the market is low and buying when it is high. Fourth, the rates of return used often do not take into account taxes. Fifth, other studies have shown that individuals tend to overestimate future investment returns. Sixth, it appears that most stochastic programs under-represent the risk of large stock market declines. Seventh, the deterministic programs generally do not reduce expected

rates of return as a way of taking into account risk. In a deterministic setting, an expected rate of return of 10 percent becomes a risk free rate of return of 10 percent.

Program-Generated Recommendations. While generally the programs recommend saving a constant amount per year, one program adjusts its recommended amount each year depending on issues such as whether the user is saving for or paying for college education for children. While generally the programs have the user provide as input their desired consumption or replacement rate, or the programs specify the replacement rate, one program determines the level of sustainable consumption in retirement, based on the assumption that people desire to have a constant level of real consumption.

The programs commonly advise users to consider increasing the risk in their portfolios if they face a financial shortfall, generally ignoring that the user would face an increased risk of market volatility.

While changing portfolios is often recommended, either because of an asset shortfall or because the portfolios are inconsistent with the user's self-reported risk aversion, the programs generally do not take into account the possible tax consequences of doing so with a taxable account, or even mention that as an issue to consider.

Inputs. Some programs express future dollar values in terms of the expected price level in the future. Users never should be required to enter a future dollar value using future prices, which are difficult to predict and to interpret. Data entry should always be done, or at least offered as an option, using current prices.

All of the consumer programs and most of the professional programs we examined can be accessed online, without downloading software. While this makes them easy to use, it also raises questions of the security of the financial information that users are transmitting over the internet. It appears that none of the sites we examined have the same secure transmittal that some financial institutions indicate that they have.

Why Results Differ. The programs differ greatly in how they treat housing assets. Some professional programs allow the user to specify whether he is willing to sell his home to meet retirement expenses. Other programs either assume that the house is illiquid or assume that home equity will be used to meet retirement expenses. Some programs do not permit the user to specify a rate of depreciation in the nominal value of the home. Given that housing prices in some areas have depreciated by 30 percent or more and that housing is such a large part of assets for many Americans as they near retirement, this is a major drawback.

One professional program scales consumption needs by the number of people in the household, taking into account economies of scale in consumption (two can live more cheaply per person than one) and taking into account that the cost of children differs from the cost of adults and varies by their age. The default scale for economies of scale in household consumption is that two adults can live as cheaply as 1.6, or alternatively that it costs one person 62.5 percent as much to live as it does two people. For example, it

generally costs substantially less than twice as much to provide housing for two people living together than for a single person. By comparison, another program assumes that it costs one person 80 percent as much to live as it does two people. Thus, one program assumes that the living expenses of the survivor will be nearly 30 percent higher than the other program. This wide range suggests that this is an area where further work is needed to determine a reasonable value.

Social Security. The treatment of Social Security benefits generally could be improved. Several programs set the cost-of-living increase for Social Security benefits in payment at less than the inflation rate. This level of partial indexation is counter to the legal requirement that Social Security benefits be inflation-indexed.

Some programs calculate Social Security benefits based on the person's birth year, expected retirement age, and a single year of earnings. However, administrative records reveal many different pay patterns over the lifetime, with only 14 percent of workers fitting the classic humped-shape earnings profile (Bosworth, Burtless and Steuerle 1999). About the same fraction had real earnings patterns that sagged during their middle years, another group had flat real earnings profiles, and still another had declining real earnings after some fairly young age. For this reason, a model of pension outcomes that assumes all workers have a common earnings profile is unlikely to capture any employee's pension outcomes. Instead, programs should integrate with the online calculator provided by the Social Security Administration, where users can calculate their Social Security benefits based on their own earnings record.

Life Expectancy. Higher-income persons tend to have longer life expectancy than those with lower income. Studies have shown that individuals tend to underestimate their own life expectancy, apparently not taking into account improvements in life expectancy over time.

Programs that set the length of the planning period do not recognize the large amount of heterogeneity in life expectancy across people. However, programs that allow the user to choose the length of the planning period do not recognize the lack of knowledge among many people as to life expectancy. A program that allows the user to choose the length of the planning period but that provides assistance in doing so, such as providing a longevity calculator based on age, gender, and health risks, may be the best approach.

The combination of overestimating rates of return and underestimating life expectancy would cause financial planning programs to underestimate the financial needs of users. Other errors may offset, however, so that it cannot be concluded that that is the net effect.

One approach to dealing with the length of the planning period would provide information as to the adequacy of resources if death occurs at different ages. For example, in a deterministic framework the output could indicate that a particular individual would have adequate resources if death occurred at age 80 but not if it occurred at age 90 or later. For a couple, the output could indicate that they had adequate resources if death of the surviving spouse occurred at age 90 or earlier but not at age 95

or later. This approach would require deterministic programs to automatically run scenarios with death occurring at ages 80, 90 and 95.

Missing Features. None of the programs examined mention longevity insurance annuities as a payout option. Longevity insurance annuities, which are a relatively new option for annuity purchasers, are annuities that start payment at an advanced age, such as age 85. Attractive features of these annuities are that they are low cost, and they can be used to eliminate the risk due to uncertainty as to length of life, since they payoff if the person lives longer than they anticipate.

A number of post-retirement risks have been identified. In 2008, the Society of Actuaries published *Managing Post-Retirement Risks: A Guide to Retirement Planning* which identifies risks, discusses their predictability and provides information on how they can be managed. It is important to note that often experts do not agree on how to manage specific risks. Two important take-aways from that study and other work help explain the results of this study:

- The issues are complex
- Experts do not agree about the right solutions.

Therefore, it is not surprising that different software provide very different results, and that is a range of practice.

Financial Education and Software. The use of consumer software should be an educational experience. This can occur several ways. First, the software can provide links to related educational information. Second, the software can provide help when it appears that user-provided information, for example life expectancy, may be inaccurate. Third, the software can provide information such as historical rates of return on different asset classes, the average level of Social Security benefits, and the benefits of purchasing an annuity.

Conclusions

Developers of financial planning software face daunting challenges. First, the problem of creating a program that can address the wide range of issues people face is exceedingly complex. Second, on many of the key issues, such as the level of replacement rates, experts do not agree as to the appropriate advice. The financial planning software programs represent a huge amount of programming and design effort and in that sense are a remarkable achievement. They have the possibility of providing users better information about their financial future. At the same time, we see reason to expect that the programs in the future will be greatly improved.

All programs as outputs should provide results for three ages of death so that people could evaluate the range of possible outcomes and use that to inform their planning process

Social Security is an important part of the planning process for most people. Software programs should connect to the Social Security Benefits Calculator in order to be able to input that data into the program.

Reasonable values for rates of return are critical for post-retirement risk planning. There appears to be a tendency in financial planning to use rates of return that are too high. Information on fees, taxes, and historical rates of return should be provided in a way that users can understand when they make decisions as to reasonable rates of return to use for financial planning.

The report concludes with a list of issues that consumers should be aware of when using financial planning software.

Chapter 1. INTRODUCTION

Retirement planning is a complex and vexing problem for many workers in today's economy. They face mounting challenges in securing adequate retirement income amid sagging housing prices, large stock market losses, declining yields on certificates of deposit, rising unemployment, and rising government deficits, which raise the risk of higher inflation in the future.

While in the past, many retirees could rely on employer-provided defined benefit plans and secure Social Security benefits, retirees increasingly must rely on their own ability to manage their retirement income. With cutbacks in Social Security already legislated, further ones possibly needed to restore financial balance, and the decline in traditional defined benefit plans, retirees increasingly are relying on 401(k)-type savings plans for their retirement income. Relatively few of these plans offer annuities; and when they do, few retirees purchase annuities from these plans, leaving retirees with investment and distribution decisions concerning their accumulated savings. Increasing life expectancy and improved health at older ages raise the issue of whether people should consider postponing retirement as a way of assuring adequate resources during retirement. During retirement, they face complex issues concerning how to manage various risks.

While retirement planning poses challenges for everyone, those challenges differ considerably across people at different income levels. At lower- and middle-income levels, where people rely primarily on Social Security, the main problems are when to stop working, when to take Social Security, and how to provide adequate income for survivors. Middle-income people must also manage their savings so as to not run out of money. At higher income levels, people still are concerned about having adequate retirement income for their desired consumption, but they are also concerned about tax issues and estate planning. Different people have different issues and considerations in retirement planning, and software that works well for a specific situation will need to address the relevant issues. However, generally the software does not include a statement as to who it is suitable for, though some programs indicate that they are suitable for people with at least a stated minimum level of assets.

People in the lower- and middle-income markets generally have relatively little in financial assets, though the amount rises as people approach retirement. In 2007, the median value of financial assets for all families age 55 to 64 was \$72 thousand (Bucks et al. 2009), which in some contexts would be considered a lot of money, but in the context of financing retirement is not very much.

For many people, one of the most important financial decisions is the age at which they retire. Other financial decisions concern the purchase of insurance, paying for children's education, paying down a mortgage, whether to take a reverse mortgage, and the provision of income for survivors.

People planning for retirement can receive assistance by using financial planning software, some of it available over the internet for free. This software can be categorized

into three groups: software providing advice concerning investments and portfolios, software providing advice concerning how much to save for retirement, and software providing advice as to managing resources and risks in retirement. Some software provides all three types of advice. The programs we analyze all provide advice or analysis concerning managing resources and risks in retirement.

Congress has recognized the growing importance of financial advice provided by computer programs. Through the Pension Protection Act of 2006, it has required the Labor Department to write regulations concerning the investment advice provided by these programs to pension participants. Among other things, it requires that computer models apply generally accepted investment theories. This regulatory oversight does not extend, however, to the types of financial planning software we analyze in this report.

Some people with more assets and more complex financial arrangements than the average American hire financial planners to assist them with managing their finances. These planners generally use financial planning software in evaluating the finances of their clients. The University of Michigan (2009) provides the following advice to workers concerning financial planners and planning:

Most people want a planner to provide a comprehensive overview of their entire financial situation, including analyses of current finances and long-term objectives. After reviewing your financial circumstances, the planner generally produces a written financial plan. It should include:

- Your prioritized financial goals
- Your net worth
- A monthly budget (income and expenses)
- Your risk assessment—the amount of risk you are willing to take with investments
- A specific plan of action that you agree to follow

This report analyzes software programs that assist workers and retirees as to managing resources and risks in retirement, as well as during the period leading up to retirement. These risks include rate of return risk, interest rate risk, inflation risk, longevity risk, housing market risks, health risks, and job market risks. In analyzing the software, we also analyze some of the key issues in retirement planning, such as the measure of adequacy in savings for retirement, and the type of advice people are receiving.

This study finds a wide range in capabilities across programs, with particular programs being better suited for addressing some issues than others. Some programs are broadly capable of addressing issues, including the more complex issues high-income families sometimes face.

BACKGROUND

Previous Studies

This study builds on the groundbreaking work presented in the earlier study of Retirement Planning Software sponsored by the Society of Actuaries and, LIMRA International, Inc. (a U.S based marketing and research organization serving over 850 financial services companies in over 70 countries), in collaboration with InFRE (the International Foundation for Retirement Education) (Sondergeld et al. 2003). That study found that most retirement planning software programs did not recognize the major post-retirement risks. In fact, the programs masked the risks. They presented a single outcome without considering the range of possible outcomes that would result from different circumstances, such as living longer than expected or the stock market performing worse than expected. The study concluded that programs vary considerably regarding when the user runs out of assets, if at all. Because of this finding, the study recommends that people run multiple programs, use multiple scenarios within programs, and rerun the programs every few years to reassess their financial position.

Warshawsky and Ameriks (2000) conducted a study using a single financial planning program, the Quicken program. Rather than running scenarios, they used data from the Survey of Consumer Finances. They note that the software does not recognize many post-retirement uncertainties facing households, including life expectancy, and returns on financial and human capital assets.

Bodie (2003) examined the financial advice provided by retirement planning software available at four major websites. He found a pro-equity, and thus pro-risk, bias in the advice. He also found that the programs advised reducing equity holdings as the participant's time horizon shortened, while financial theory suggests no such relationship between time horizon and optimal level of risk holdings. He also notes that the focus on the probability of a financial shortfall is not the best measure of success because it ignores the severity of the shortfall.

Kotlikoff (2006) focused on the computational challenge for financial planning software posed by consumption smoothing. His main criticism of traditional financial planning software is that it is based on the participant choosing a spending target in retirement. He sees two problems with this approach. First, it is difficult to accurately determine a spending target. Current consumption levels may be a poor guide for a future spending target if those levels are too high to be sustainable or if they are lower than the sustainable level. Second, even small errors in spending targets can lead to large errors in savings levels because the savings accumulation period and the de-accumulation period both are lengthy. In evaluating the advice provided by four well-known financial services companies, Kotlikoff (2006) found that, according to his calculations, they all advised dramatic oversaving compared to what workers need to maintain a constant level of consumption. Kotlikoff challenges not only standard financial planning software, he challenges the replacement rates methodology used in standard financial planning.

Dowd et al. (2008) examined the treatment of medical care expenditures, a major post-retirement risk, in twelve web-based programs. That study finds that most of the programs that it studied do not consider medical care expenditures as a separate category of expenditures.

In addition, some surveys of financial planning software are not focused on policy issues but rather focus on describing the capabilities of programs from the perspective of a professional financial planner (for example, McClure 2005).

This Study

This study assesses the extent to which these programs help users¹ understand post-retirement risks. It investigates ways that programs deal with post-retirement risks, highlighting innovative approaches.

The internet is revolutionizing the transmission of information, including information on retirement planning and risks. In 2007, 59 percent of households with a household head ages 55-64 used the internet for financial information or financial services, and the percentages were higher for younger age groups (Buck et al. 2009). Because of these changes in the way information is disseminated, this study addresses the changing ways that people receive computer-based assistance for retirement income planning. This assistance is no longer limited to stand alone programs, but includes the programs at websites that attempt to tailor the presentation of information to the self-identified needs of the user through the use of specialized programs for special topics.

This study analyzes 12 retirement planning programs. Most of these programs are available over the internet. Some of them are available online, and some can be downloaded from the internet. To include programs that are commonly used, we analyze five free web-based programs. The free web-based programs are available at some widely visited web sites. In addition, we analyze one fee-based program for individuals. The remaining six programs are fee-based programs for professional financial planners.

In reporting the analysis, we include the one fee-based program for individuals with the professional programs because it is more similar to the professional programs in complexity and sophistication than it is to the free consumer programs. Thus, in this report we discuss the results for those two groups, which we call the consumer and professional programs. The programs in the original study were provided to the study at no charge. We also used that criterion for selecting programs.

We analyze programs that provide guidance during the retirement phase. The programs have also been chosen so that a variety of approaches are included, so that different types of providers are included, and so that some of the most widely used programs are included. Some well-known programs were excluded because they focus on helping the

¹ Users include people who access consumer software or are clients of financial planners who use professional software.

user determine savings and investment decisions pre-retirement, with little or no attention paid to issues arising during the retirement period.

The names of the programs we analyze are included in the Appendix. Other than listing the programs there, we do not identify any of the programs by name in the analysis presented in this report. We do not critique individual programs, but rather comment on the positive and negative features of programs as examples for users and developers of these programs.

The programs for professional planners often contain options for analysis at different levels of detail or complexity. When analyzing the features and capabilities of programs, we take into account the availability of options, even though they may not be accessed by all users.

The programs for use by professional planners generally are designed for upper-income people and for people with higher levels of financial assets. One company indicates in a brochure that the financial planning service it provides is for people with at least \$100,000 in financial market investments. One program indicates that users should have at least \$500,000 in assets under management. By way of reference, in 2007, 52 percent of households with a head age 65 to 74 held retirement account assets, and for that group the median value of assets was \$77,000 (Bucks et al. 2009).

METHOD OF ANALYSIS

Professional software used by financial planners generally is capable of analyzing many of the complex financial situations encountered by upper-income individuals. The free, web-based software should be viewed as educational tools to help users address major issues in financial planning, rather than for making detailed projections. One free, web-based program lists its goals as follows:

- How much you may have available to spend each month in retirement
- The likelihood your savings will last throughout your retirement
- Options to make up for potential shortfalls

Methodology

This study's methodology consists of several components:

- Selecting and obtaining a sample of software to provide insight on a range of practice
- Focusing on post-retirement risk and what is meant to create a context for the study
- Reading documentation and examining programs to see what capabilities they offer
- Developing case studies to provide situations for testing of the software

- Running the software to determine how it operated, and to provide results for comparison, and an understanding of the capabilities including input and output.

In this section, we discuss the criteria we use to assess how the programs handle different aspects of post-retirement risks. In the analysis, we consider capabilities available within a software program or available at the website. Making features available as options at a website may be more efficient for many users than incorporating them in a single program. Users are able to click on the special programs relevant for particular questions they have.

Four-Step Analysis of How Programs Deal with Risk

For each post-retirement risk type we consider, we do a four-step analysis of how the programs deal with that risk.

- We determine whether the programs recognize the specific risk or simply present a single result that does not indicate the range of possible outcomes with respect to that risk.
- We assess whether the input relating to the risk is provided by the user, and if so, whether the programs provide guidance, or if it is supplied by the program.
- If the programs recognize the risk, we then assess how they deal with the risk.
- We assess whether the programs recognize ways that retirees have of dealing with the risks, for example, by annuitizing to insure against with longevity risk.

Because the sample of programs we study is small and not randomly selected, we do not provide descriptive statistics indicating the prevalence of programs with different features. Rather, we focus on the lessons learned from the positive and negative aspects of the programs we analyzed.

Financial planners distinguish between goals-based and cash-flow based financial planning software. Goals-based software focuses on the issue of whether the user has sufficient assets to last throughout retirement. Cash-flow based software involves considerably more detail, generally is aimed at higher-income clients, and focuses on cash flow during retirement. While we consider both types of software - and some programs contain both features - this report focuses on the goals-based aspect of the software. We focus on the adequacy of retirement savings and the risks that affect the adequacy.

MEASURE OF SUCCESS

A key aspect of retirement planning is the criteria for judging whether savings are adequate. Risk can be measured against the criteria for savings adequacy. The criteria for

judging whether savings are adequate involve the goal to be achieved and the probability that it will be achieved.

In analyzing the results of the software, the measure of success of the results can be thought of as having five elements:

1. The length of the planning period
2. The conceptual measure of adequacy of retirement income
3. The numerical standard of adequacy
4. The measure of the resources available
5. The probability that adequacy will be achieved over the entire planning period.

Length of Planning Period. The length of the planning period and the measure of adequacy of benefits together make up the goal. The extent of the range of values used indicates that generally accepted standards do not exist for any of these parameters affecting the measure of success. Clearly, some programs take a more conservative approach than do others.

Measure of Adequacy of Retirement Income. Analysts have used different measures of adequacy, but frequently some version of the replacement rate is used.

Standard of Adequacy. If a replacement rate is used, different values can be used for the target, such as 70 percent or 85 percent.

Measure of Resources Available. Some programs consider housing equity to be available as an asset for retirement consumption, while some consider it to be completely illiquid. Some programs instruct the user to include expected inheritances, while others ignore that.

Probability of Adequacy. The probability of having sufficient resources in a future year depends both on the probability of being alive that year and on the probability of having sufficient resources if alive. Thus, an approach that would appear to be superior to that used by some programs would be to weight the desired level of consumption by the probability of being alive in that time period rather than assuming a 100 percent probability of being alive to age 95. With this approach, the probability of being alive in a period would affect the desired resources allocated to that period. Alternatively, the output could show what would be appropriate is to see the effect of a change to the expectancy period of plus or minus five years. Another alternative approach to considering the probability of success is to consider what cushion, in terms of extra savings, the user needs to feel adequately protected against risk. This approach might be more intuitively appealing to some users than the approach that uses a high life expectancy or long planning horizon, such as age 95, that a user may feel is unrealistic.

HOW THIS STUDY FITS WITH OTHER SOA WORK

For more than ten years, the Society of Actuaries has been concerned about the management of post-retirement risk as an important part of retirement planning. This study is one of several studies that are designed to improve our understanding and management of these risks. *Segmenting the Middle Market: Retirement Risks and Solutions*, published in 2009, offers an analysis of the population aged 55-64 to help us understand their economic status as they move into retirement years. It focuses on the 25 to 75 percentiles by income of the population, and develops some profiles, defining two groups of Americans, middle-mass and middle-affluent. The profiles developed were used to inform the development of the case studies used in this work and help us to understand what the most important issues are for many middle-mass Americans.

A number of post-retirement risks have been identified. In 2008, the Society of Actuaries published *Managing Post-Retirement Risks: A Guide to Retirement Planning* which identifies risks, discusses their predictability and provides information on how they can be managed. It is important to note that often experts do not agree on how to manage specific risks. Two important take-aways from that study and other work help explain the results of this study:

- The issues are complex
- Experts do not agree about the right solutions.

Therefore, it is not surprising that different software provide very different results, and that there is a range of practice.

Readers interested in learning more about the other work of the Society of Actuaries Committee on Post-Retirement Needs and Risks can find its reports on the Society of Actuaries website: <http://soa.org/research/pension/research-post-retirement-needs-and-risks.aspx>

The remaining chapters of this report analyze the software programs. Retirement planning software developers can benefit from this report's suggestions for improving software. Financial services professionals must decide what programs to use in their practice. This report provides guidance to users and to financial planners on the capabilities to look for as well as the weaknesses.

Chapter 2. POST-RETIREMENT RISK

One of the main purposes of this study is to examine how retirement planning software addresses risks that people face in retirement. Risks relate to events that cannot be perfectly foreseen. These risks include:

- living longer than expected
- death of a spouse
- financial market downturn
- rising interest rates (for those with variable rate mortgages, consumer credit debts, and long-term bonds)
- declining interest rates (for those who rely on interest income)
- increase in the inflation rate
- high health care and long-term care costs
- housing market price decline (for homeowners who expect to sell their home or borrow against its value sometime in the future)

Many people experience declining resources in old age, with a significant minority having low income or being in poverty. The risk of financial distress increases with advancing age.

This chapter discusses the risks that people face in preparing for retirement and during retirement. It then discusses how financial planning software programs address various risks.

APPROACHES TO ADDRESSING POST-RETIREMENT RISKS

Financial planning software is designed to help people avoid financial distress at older ages. A recent study, however, has found that 44 percent of retirees with financial advisors have not had their exposure to retirement risks addressed by their advisor (Society of Actuaries et al. 2009).

Several different methods can be used to manage and understand risk:

- Stochastic vs. deterministic calculations to aid in understanding the risk
- Transferring the risk: i.e., buying insurance or annuities to cover risk
- Running multiple scenarios as part of an analysis process
- Using conservative assumptions in projections and analysis
- Aggressive investing, which is recommended in some programs to deal with a projected shortfall of retirement income, but can be a risky approach
- Reducing spending

The two basic analytical approaches for understanding risks in analytical projections and calculations are deterministic and stochastic.

How Programs Using a Deterministic Approach Deal with Risk

In the deterministic approach, the program produces a single estimate of the likely outcome, based on the inputs and the assumptions of the model. Deterministic programs pick as inputs a single age at death and a single rate of return and do not recognize their variability and unpredictability.

With deterministic programs, several approaches can be used to analyze the effects of risk. With the scenarios approach, deterministic programs can be run multiple times with different assumptions, providing information as to the sensitivity of the results to different assumptions.

To deal with risk, some deterministic programs suggest using conservative assumptions, such as extended life and low rates of return on investments. Several of the deterministic programs use the assumption of living to an age greater than life expectancy, such as to age 95 or 100.

How Programs Using a Stochastic Approach Deal with Risk

In the stochastic approach, one or more of the parameters are random. The model produces a range of outcomes, each having a different probability of occurring. The stochastic approach uses the Monte Carlo method. The Monte Carlo method recognizes the inherent uncertainty in variables such as future rates of return. Calculations are performed hundreds or thousands of times, producing an array of results. The program then analyzes the results statistically, including calculating a probability of running out of money.

An alternative to the Monte Carlo approach is the pseudo Monte Carlo approach, where each time a simulation is run, the exact same scenarios are run. For example, if the pseudo Monte Carlo involved 500 scenarios, the same 500 scenarios would be run each time in terms of the stochastic variable or variables. Otherwise, a user with the exact same input would get different results each time a Monte Carlo simulation was run.

The free consumer programs we examined that are stochastic only treat financial market rates of return as variable. Longevity, inflation, health care costs, and all other parameters are treated as fixed. Thus, financial market risk is treated with much greater sophistication than other risks in these programs.

Most of the professional programs we examined, and a couple of the consumer programs, could be considered hybrids between deterministic and stochastic. The default program is deterministic, but the user can select Monte Carlo analysis as an option. The number of simulations ranges from 150 to 10,000, with the consumer programs at the lower end and the professional programs at the upper end (table 2.1).²

² The number of simulations run ranges from 150 to 250 to 500 to 1,000 to 5,000 to 10,000.

Some professional programs treat only financial market rates of return as stochastic.³ However, some also include a stochastic inflation rate and stochastic treatment of longevity. These simulations generally take into account the historical correlation in returns between different asset classes, such as the correlation between small cap equities and long-term bonds.⁴ When inflation is treated stochastically, the historical correlation between inflation and rates of return is incorporated.

Several professional programs have the option of including longevity as a stochastic variable. Both the date of death of the husband and wife are treated as stochastic, with separate mortality risks by gender and age. One of the programs, in supplemental material, explains the operation of the Monte Carlo simulations for longevity risk this way:

1. Generate a uniformly distributed random number between 0 and 1.
2. Assume that a random number of 0 means that the client is the first person to die in the entire group (that have lived up to the client's current age) and that a random number of 1 means that they are the last person to die in the entire group.
3. Determine from the mortality table the likelihood the person will not live past each age (starting with their current age and assuming they've already lived to their current age) Stop at the first age where the mortality is greater than the random number.
4. Use that age to determine the client's year of death.

Most stochastic financial planning models rely on historical data, but the future may not follow the patterns of the past. When users provide rate of return data, they are presumably providing their projections of future rates of return, but their capacity to do so in an expert manner is probably lacking in most cases. One of the programs provided by a mutual fund company uses estimates of the means of future rates of return for different asset classes.

³ One program notes that when using dynamic programming methods, it is computationally difficult to incorporate more than one variable. Doing so slows down run time.

⁴ Several of the programs using Monte Carlo analysis caution that extreme market movements may occur more frequently than in the simulations. If asset markets are becoming more volatile, or the Monte Carlo methods do not adequately deal with the volatility, that may be an area for further research. In addition, one program notes that market crises can cause asset classes to perform similarly, causing assumptions concerning correlations to be invalid during those periods. It further notes that average periods of bull and bear markets may be longer than modeled by the simulations.

Limitations of the Monte Carlo Approach

One criticism of the Monte Carlo approach as it is currently used for financial planning is that with only 150 or 500 or even 1,000 runs, the programs generally do not simulate unlikely events, such as the 1987 stock market crash (Farrell 2001) or the current one. A further criticism arises because many of the Monte Carlo models assume that rates of return follow a normal bell-shaped pattern. This assumption has been criticized for not assigning sufficiently high probability to large increases or decreases in stock market prices. This problem is sometimes called the “fat tails” problem, referring to the tails of the distribution having higher probability of occurring than is represented by normal bell-shaped curves. Some programs are considering changing their distribution assumptions so that market declines such as the one experienced from 2007 to 2009 have a higher probability (Laise 2009).

Another issue is that most programs using Monte Carlo analysis assume that households do not adjust their consumption to whether the stock market performs well or poorly. Historical evidence indicates that some people reduce their consumption when the stock market does poorly. The programs, however, assume the user continues consuming at the same level until running out of money, regardless of the performance of the stock market.

The stochastic programs disclose the magnitude of the expected shortfall in retirement resources, if one occurs. This is done generally by providing information on the additional savings needed. They also disclose the probability standard for determining a success, but that information is often more difficult to find, and may only be disclosed in technical notes. The professional programs generally indicate the probability of success, but may also provide their opinion as to whether the probability is adequately high.

One stochastic professional program allows the user to adjust the level of consumption as well as the level of risk in the investment portfolio. As the level of risk in the investment portfolio increases, the user needs to reduce their consumption in order to maintain a given risk of having insufficient resources. An alternative approach would be to have the level of consumption adjust to the portfolio outcomes.

Program	Number analyzed	Stochastic		
		Stochastic automatically or as option	Simulations of 1,000 or more	Magnitude of failure disclosed
Free consumer software	5	3	1	3
Professional	7	7	2	7

Source: Authors' compilation

Many users may not have a good understanding of the Monte Carlo simulations. For example, they may consider these programs as dealing with risk broadly, rather than understanding that, currently, the programs generally only deal with a single source of

risk. Whether the program only treats a single variable as stochastic or it treats two or more variables as stochastic, the output looks the same. A range of outcomes is described. Thus, unsophisticated users may not understand the advantages of treating more than one variable as stochastic.

Vanderhei (2006) compares the results from a deterministic model with those of a stochastic model. Vanderhei's results using the stochastic model indicate that, compared to a deterministic model, when longevity, investment, and health-related risks are incorporated, much higher replacement rate targets are needed than have been calculated in other studies.

The descriptions of the Monte Carlo simulations would be improved if they clearly disclosed:

1. The length of the planning period
2. The probability standard for success
3. The measure of retirement income adequacy; and if that is a replacement rate the income measure in the numerator and the denominator
4. A clear statement of which variables are stochastic, along with their means and standard deviations.
5. A statement on the limitations of the stochastic approach.
6. A quantitative measure of the impact of failure.

Even though the Monte Carlo programs currently in use are not perfect, they are an advance over deterministic methods. A major advantage is that they encourage people to think about risk.

HOW CLEARLY IS THE RISK ASSOCIATED WITH THE RESULTS PRESENTED AND EXPLAINED?

A minimal requirement for risk to be presented in the output of a program is that the program must provide more than one result, such as an average result and a low result. The deterministic programs inherently are not capable of doing this in a single run. The user must create scenarios to accomplish this. Surprisingly, one of the stochastic programs only presents one result. Since most of the stochastic programs only deal with investment risk, the presentation of risk often focuses on that risk.

One of the consumer programs presents an average result and a low result. One possibility with this format is that users focus on the average or most likely result. One professional program using Monte Carlo simulations presents results at the 5th, 25th, 50th, 75th and 95th percentiles in terms of adequacy of retirement resources. This display provides a clear visual presentation of the range of possible outcomes.

The results of Monte Carlo programs can be difficult to interpret. For example, it can be unclear what the rate of return assumptions are, or what the average rate of return is.

Some programs, however, clearly indicate the mean and standard deviation of the different asset classes that are treated as stochastic.

A professional program with one of the clearest and most thorough presentations of risk starts out showing the results with an average rate of return received every year. It then shows the one-year rate of return in the year with the worst rate of return since 1970 for the portfolio the user holds. It shows what would happen if two bad years occurred early in the planning period. The two bad years are the two worst years in the historical record since 1970. Then it provides a time graph showing one of the worst scenarios out of 100 Monte Carlo simulations. It then shows 100 Monte Carlo simulations graphed. It finally shows the probability of success out of 10,000 Monte Carlo simulations.

Research is needed on how people interpret Monte Carlo results, and on how their interpretation is affected by different formats in which they are presented.

TAKE AWAYS

1. The free consumer programs examined that are stochastic only treat financial market rates of return as variable. Longevity, inflation, health care costs, and all other parameters are treated as fixed. Most of the professional programs examined could be considered hybrids between deterministic and stochastic. The default program is deterministic, but the user can select Monte Carlo analysis involving one or two stochastic variables as an option. It may be difficult for users to understand what is varied and what is not.
2. Most programs using Monte Carlo analysis assume that households do not adjust their consumption based on whether the stock market performs well or poorly. They assume the user continues consuming at the same level until they run out of money, regardless of the performance of the stock market.
3. Even though the Monte Carlo programs currently in use are not perfect, they are an advance over deterministic methods. A major advantage is that they encourage people to think about risk. A disadvantage is that they may be hard to understand. The probability of large increases or decreases in stock market prices may be too small.
4. Research is needed on how people interpret Monte Carlo results, and on how their interpretation is affected by different formats in which they are presented. Clarity in the presentation and explanation of risk is uneven and varies.

Chapter 3. DEALING WITH POST-RETIREMENT RISKS

The previous study of financial planning software by Sondergeld et al. (2003) concludes that most of the programs it studied hid risks. The same can be concluded to varying degrees for the programs considered here. Programs that provide only a single output value clearly fall into that category. However, even the stochastic programs, which may give the user the impression that risk is being investigated, generally only consider a single risk.

A comparison of the current and the previous study (table 3.1) indicates that among the programs analyzed, more programs are using Monte Carlo analysis in this study than in the first. While the selection criteria for both studies preclude a conclusion concerning financial planning programs generally, two commentators have suggested that there is a trend toward more programs using Monte Carlo analysis (Daly and Kotlikoff 2004).

Table 3.1. Comparison of current and previous studies concerning stochastic variables			
Risk	Previous study	Current study	
	Number of programs\ (out of 19)	Number of consumer programs (out of 5)	Number of professional programs (out of 7)
Stochastic programs	7	3	7
Stochastic variables			
Longevity	0	0	2
Order of death	0	0	2
Interest rate	0	0	0
Rate of return on stocks	7	3	7
Inflation rate	1	0	2
Health care costs	0	0	0
Long-term care costs	0	0	0
Sources: Sondergeld et al. (2003) and authors' compilation			

Most of the risks that people face are not treated stochastically by the programs (table 3.2). Some of the programs recognize ways that retirees have of dealing with risk, such as postponing retirement, changing the portfolios mix, purchasing health insurance, and purchasing long-term care insurance.

Table 3.2. Treatment of risks			
Risk	Number of programs that recognize risk (by treating it as stochastic)	Input provided by user	Program recognizes ways that retirees have of dealing with the risk
Longevity	2	9	8
Order of death	2	9	8
Interest rate	0	0	0
Equity rate of return	10	9	5
Inflation rate	2	7	1
Health care costs	0	0	7
Long-term care costs	0	1	7
Housing risks	0	9	0
Poor planning	0	0	0
Unexpectedly early retirement	0	0	0
Source: Authors' compilation.			

RISKS IN POST-RETIREMENT

This section first considers financial market risks and then other types of risks. It discusses how the variables are handled by the different programs as well as how their risks are incorporated.

Rate of Return Risk

In 2007, 57 percent of households age 65 and older received some income from financial market investments (Purcell 2008). Thus, this source of risk is an issue for slightly more than half of older households. However, it is likely that most persons using the software have investments in financial market assets

Most consumer programs analyzed allow the user to input two different portfolios, one for the accumulation phase and one for the retirement phase. With the growing popularity of life-cycle funds as an option in 401(k) plans, where the asset mix adjusts automatically as the person ages, programs need to add that option to be of use to people investing in them. One program provided by a mutual fund company allows the user to specify a life

cycle fund, where the portfolio automatically moves toward bonds as the user's expected retirement date approaches.

The free consumer programs differ widely in the rates of return on financial market investments they specify or set as defaults, with one program setting a default of 5 percent on investments in a 401(k) account, while another sets the rate of return on equity at 10 percent. The large differences in rates of return have a large effect on the outcomes of the programs. One program allows the user to enter a rate of return of 20 percent over an extended period of time.

For one program, if the user selects small cap equity for the portfolio of his investments, he is assigned a rate of return of 15 percent, which in deterministic runs becomes a risk-free rate of return of 15 percent. The lowest rate of return for any category of equity investments in that program, based on historical returns, is 10 percent. These rates of return are based on data on long-term historical averages. In treating them as risk free rates, the program hides the investment market risk that the user is facing and provides the implicit advice that a failing financial plan can be rescued by investing in higher risk assets. For deterministic runs, the user would be better served by the program providing a lower rate of return, which would build into the projections a cushion for adverse investment returns. At a minimum, the programs need to provide a discussion about return variability.

One program assumes long run average rates of return gross of fees of 10 percent for stocks, 6.5 percent for long-term bonds, and 4.75 percent for short term bonds. In calculating net rates of return, it assumes expense ratios of 1.211 percent for stocks, 0.762 percent for long-term bonds, and 0.648 percent for short-term bonds. Other programs ignore fees and use gross rates of return.

Two of the consumer programs allow the user to specify the rate of return. Neither program recognizes a relationship between the inflation rate and the nominal rate of return. Both programs allow the user to set a negative real rate of return, where the inflation rate exceeds the rate of return. That is an error that the programs should not permit. While negative real rates of return have occurred over extended periods of time, that result would not be a reasonable assumption for the purposes of retirement planning over a period of several decades. In three of the consumer programs, rates of return are treated as a technical parameter that is specified by the program. Some programs allow the user to specify a different rate of return in different time periods, such as before and after retirement, or for a greater number of different time periods, which is one way to account for a changing asset mix over time.

One of the professional programs allows the user to specify up to 10 different portfolios to apply at different times. They can be applied separately to the pension (401(k)) and non-pension portfolios. The consumer programs we examined do not permit specifying different portfolios for pension and non-pension assets.

A common problem with many of the programs examined is that they use rates of return that are too high, either due to user or program specifications (table 3.2). First, market rates of return exceed the rates of return individuals receive due to investment fees they pay. Second, historical rates of return may be a poor guide for future rates of return, which may be lower.⁵ Third, individuals tend to under-perform the market because of errors they make in investing, such as selling (or not buying) when the market is low and buying when it is high. For these reasons, individual investors have earned more than 1 percent less than a broad market average for the New York Stock Exchange over long periods (Dichev 2007). Fourth, the rates of return used ignore whether the investments are in tax preferred or taxable accounts, often not taking into account taxes. While it would be preferable for taxes to be treated separately from before-tax rates of return, often taxes are ignored. Fifth, other studies have shown that individuals tend to overestimate future investment returns (see Sondergeld and Greenwald 2005). Sixth, deterministic programs do not adjust historical rates of return for risk. Seventh, stochastic programs often under-represent the risk of large stock market declines.

Even some of the professional programs fail to take into account the effect of fees on investment returns, using gross rates of return based on historical averages. Over a long period, fees can reduce account balances by 20 percent or more, causing programs that don't take into account fees to considerably overstate the amount of retirement resources users with substantial investments will have.

Deterministic programs can deal with financial market risk to some extent by requiring the use of a conservative rate of return. Thus, deterministic models should use conservative rates of return, but some allow the user to input a high rate of return, and some recommend the use of historical average rates of returns.

In order to demonstrate financial market risk, one of the professional programs provides three different runs for the user's plan: 1) a deterministic run with average rates of return, 2) a deterministic run with low rates of return in two years as chosen by the user (bad timing), and 3) Monte Carlo simulations. The bad timing run adjusts the returns in other years so that the average is the same over the period as for the run with average returns every year, thus demonstrating the effect of bad timing when the average rate of return is unaffected. The bad timing run picks the worst two-years of rates of return for the portfolio chosen in the time period since 1970. One program shows results based on a randomization of the historical return sequence for the selected portfolio.

⁵ Saving (2009) argues that in the short run returns may be higher due to an increased equity risk premium because of the perception of greater risk than in the past due to the sharp decline in the stock market in 2008 and early 2009. He argues that this effect will dissipate over time.

Program	Can the user specify the rates of return?	Across programs, what is the range in default, suggested, or required rate of return on stocks?
Free consumer software	2	5% - 10%
Professional	7	7% - 15%

Source: Authors' compilation

Some of the professional programs provide an option to fill out a questionnaire about risk aversion, and for some that is a required input (table 3.4). The risk aversion information is used to determine the user's recommended portfolio. Two consumer programs we examined assess the user's degree of risk aversion by asking questions about the willingness to bear risk. Both consumer programs use this information to determine the portfolio mix assigned to the user. One professional program has indicated it will include the effect of risk aversion on decisions about spending and asset draw down in future versions.

Program	Is the user's risk aversion assessed?	Is it used for determining the user's asset allocation or recommended allocation?	Can user specify a changing asset mix at different ages?	Is the level of risk aversion used for determining the user's asset draw down?
Free consumer software	2	2	2	0
Professional	3	3	3	0

Source: Authors' compilation

The programs differ as to how investments are entered. One consumer program has the user indicate whether her attitude toward risk is conservative, moderate, or aggressive, and that information is used to define the user's portfolio mix. One program has the user indicate the expected rate of return on his portfolio. One program tells the user to indicate the percentage of her portfolio in stocks, bonds, and short-term investments. The program then sets the rates of return. This approach has the advantage that the user may be more likely to know his investment portfolio than the long term rates of return on his investments.

For investments in pension plans, where they are taxable in the future but not in the present, future tax rates pose a risk. A few programs allow users to specify changes in

future tax rates, but few users would have the sophistication to make reasonable estimates of future tax rates.

Does Investing More Aggressively Raise the Probability of Success?

Do the programs have a bias toward investing more aggressively by encouraging users to increase the percentage of their portfolio invested in equity?

In deterministic programs, investing more aggressively raises the rate of return and raises the projected amount of resources the person has at retirement. Depending on the amount of savings the person has, the effect on the projected accumulated assets can be large.

The stochastic programs indicate a more complex effect of investing more aggressively, with that generally raising the risk of failure and the amount of failure, as well raising the expected return.

In all of the programs we examined, investing more aggressively, by increasing the proportion invested in stock or raising the expected rate of return, improves the probability of success. One stochastic consumer program indicates that investing more aggressively, by moving from conservative to moderate to aggressive, raises the amount accumulated at retirement. It also indicates that moving from conservative to moderate risk raises the level of assets in both the poor performance outcome and the average outcome.

Two deterministic consumer programs in this study indicate that raising the expected investment returns raises the amount the user will have accumulated at retirement. They do not provide any indication that doing so may lead to greater risk. Programs that focus on the probability of success and ignore the risk of failure may lead to overinvestment in equities (Kotlikoff undated).

In one of the professional programs, the issue of investing more aggressively is discussed in a scenario provided in the help section on the web site. It indicates that the amount of risk a person is willing to take depends on the person's degree of risk aversion. It further indicates that a person who invests aggressively needs to consume defensively or risk a considerable decline in their living standard.

Interest Rate Risk

The programs examined do not consider interest rate risk on variable rate mortgages and consumer debt, such as credit card debt (table 3.5) (case 5, Appendix A). Higher interest rates affect people differently if they are a net buyer or a net lender. Higher interest rates mean higher mortgage payments on adjustable rate mortgages and higher payments on consumer debt, but also result in higher income from interest-bearing assets. The programs generally do not consider the option of annuitization and how that is affected by interest rate risk. Lower interest rates reduce the payments from annuities purchased during low-interest rate periods.

The effect of interest rate changes on bond rates of return is considered in some of the stochastic programs, where different duration bonds are considered among the asset classes. Generally, reinvestment risk for maturing interest-rate instruments is not considered.

Program	Is interest rate risk included?	Is interest rate risk considered with respect to annuitization?	Is the interest rate linked to the inflation rate?	Does the model allow for different interest rates over time?
Free consumer software	0	0	0	0
Professional	0	0	0	0

Source: Authors' compilation

Inflation Risk

All of the free consumer programs, and most of the professional programs examined, do not treat inflation as a risk (table 3.6). Inflation remains constant over the period analyzed. In some consumer programs, the user can input a higher or lower inflation rate than the default, but in most consumer programs the program specifies a fixed inflation rate. The professional programs generally provide a default inflation rate, but allow the user to change it.

Two of the free consumer programs have the user input the inflation rate. Both provide guidance in doing so. The inflation rate arguably should be viewed as a technical parameter and should be supplied by the program for consumer programs, and perhaps also for professional programs. An argument for programs treating the inflation rate as a parameter is that the program can then establish the appropriate relationship between the inflation rate and other parameters, such as financial market rates of return and wage growth rates.

The default rate for inflation or the rate set by the programs varies across the programs examined from 2.3 percent to 4.6 percent. This difference can make a substantial difference over a period of 30 years when some benefits (such as employer-provided defined benefit pensions) and liabilities (such as a mortgage) are fixed in nominal terms.

Two of the consumer programs set the rate of inflation on health care at a higher rate (7 percent in both cases) than the general inflation rate. This is a desirable feature that should be incorporated into more programs. Some of the programs set the rate of increase on education expenses as being higher than the general inflation rate.

Mortgages are often fixed in nominal terms, and one consumer program we examined and some professional programs recognize this. Often, however, mortgage payments for fixed rate mortgages rise over time because they are bundled with insurance and tax payments. One consumer program has a general inflation rate of 3.5 percent, an inflation rate of 7.0 percent on health care expenditures, and an inflation rate of 0 percent on mortgage payments.

Generally, private sector defined benefit plan benefits are not indexed for inflation, though indexing is common in the public sector. Some of the consumer programs and most of the professional programs take this into account, allowing the user to set a zero percent cost-of-living-adjustment (case 3, Appendix A). Many users, especially those far from retirement, will have a difficult time estimating their future benefits from a defined benefit plan.

Most of the consumer programs assume that wages for people who are still working will increase at the rate of inflation, which may be an adequate approximation for many older workers, while one program assumes that wages grow at 1.1 percentage points faster. Some of the programs allow the user to input their anticipated rate of growth of wages.

None of the consumer software examined considers the option of purchasing an inflation indexed investment product, such as a Treasury inflation-indexed bond, or an inflation-indexed annuity, as a low-risk investment and as a way of dealing with inflation risk. One of the professional programs includes this investment as an option. Some of the professional programs include asset classes of 10 or more types, but without including inflation-indexed bonds.

Table 3.6. Inflation rate					
Program	Default rate or set rate, range across programs (%)	Inflation rate an input	Inflation rate greater than investment returns	Wage growth rate greater than inflation rate	Different inflation rate for health care
Free consumer software	2.3-3.5	2	2	1	2
Professional	3 – 4.6	5	NR	NR	0
Source: Authors' compilation NR = not relevant. It is assumed that the professional using the software provides reasonable input.					

Length of the Planning Period

An unresolved issue in financial planning and financial planning software is the appropriate length of the planning period. The length of the planning period is determined by the age at retirement and the final age to which the person makes financial plans for

supporting his or her consumption. Presumably people recognize the probabilities of living to different ages.

People should plan for a longer period than their personal life expectancy because they have a chance of living longer. However, there is a tension between setting a long planning period to avoid the risk of living longer than expected, and setting a shorter planning period to avoid the risk of living a shorter period of time and not having consumed at a higher level. These issues are complicated by the possible role of annuities in providing insurance against the former risk and bequests as an outcome of the latter risk. These issues are not resolved here. Rather we provide evidence on the range of practice, perhaps resulting from the lack of consensus on these issues.

One program provides the following advice:

“Rather than base your retirement plans on average life expectancy, we suggest you base your plan on the likelihood you may live longer. Today there is a 25% chance that a healthy 65-year-old man will reach age 92, a woman age 94, and for one spouse in a married couple to live to age 97.”

The length of the planning period differs across the programs. Some consumer programs use a fixed planning period, with no variation across users. If the planning period is too short, people risk being forced to reduce their consumption at older ages when they live past their planning period. As long as people have annuitized income, such as from Social Security, they would not run out of money, but they might run out of financial assets and have insufficient resources to maintain their accustomed level of consumption. If the planning period is too long, people risk dying with extra resources, having given up opportunities for consumption during their lifetime, but leaving extra bequests to their heirs.

Because of the uncertainty as to the length of the retirement period, the choice of the planning period is based on balancing these two risks. One program advises that users should plan based on living to their maximum life span, which it sets as a default of 100 years. The reason to plan this way, according to the program documentation, is that it might happen. However, for most people the probability of it happening is low.

The programs analyzed take a variety of approaches for determining the length of the planning period (table 3.7). One consumer program ignores life expectancy and calculates expenses to age 95, while another consumer program recommends using age 100. One consumer program assumes that the retirement period will last 30 years from the date of retirement, ignoring differences in life expectancy between men and women, and assuming that people who retire earlier die earlier. One consumer program assumes that people will live to their 25 percent life expectancy, which it defines as the age at which 25 percent of a group of people born the same year is still alive. Several programs we examined allow the user to input his or her own life expectancy, which then becomes the length of the planning period, which for many people is too short a planning horizon. One professional program asks the user to select his or her maximum age at death. While

the professional programs analyzed allow the user to enter life expectancy, generally with a default provided, the free consumer programs generally do not take into account differences in life expectancy across people.

Individual differences in life expectancy are considerable. Older persons generally live an average of 18 years after they reach age 65, but there is considerable variability, with some people living twice that long. Studies have indicated differences of a decade or more across identifiable demographic and economic groups, for example low-income African American men compared to high-income Asian women (Murray et al. 2006). In addition, groups differ based on healthy behaviors, such as between nonsmokers and smokers and between nondrinkers and heavy drinkers.

Table 3.7. Length of planning period				
Program	User can set life expectancy	Age 95 or higher, set by program or as default	25% or 30% life expectancy set by program or as default	30-year retirement period set by program
Free consumer software	2	2	1	1
Professional	7	2	2	0
Source: Authors' compilation				
Note: this table refers to the planning period either set automatically or set by default				

While people should use a planning horizon longer than their life expectancy, their planning horizon should presumably be based on their life expectancy. An important issue is the effect on financial planning of user errors concerning life expectancy. These errors can occur either because the software does not accurately represent the individual's life expectancy when it provides that input or the individual does not have an accurate expectation of his or her own life expectancy when the user provides that information as an input.

Survey data indicate that many people underestimate their life expectancy. A study by the Society of Actuaries (2004) found that a majority (67 percent of pre-retirees) of the male respondents underestimated the life expectancy of the average 65-year-old man. Of that group, 42 percent underestimated average life expectancy by 5 years or more. Roughly half (54 percent) of pre-retiree females underestimated the life expectancy of the average 65-year-old woman. Thus, people may underestimate their life expectancy when they supply that information as an input to financial planning software. For that reason, when they are asked to provide information on their life expectancy, they may need guidance from the program. Providing probabilities by the age and gender of the user of living to different ages would be helpful.

One program allows the user to estimate his or her life expectancy based on nine factors: age, gender, marital status, height, weight, blood pressure, alcohol consumption, use of tobacco products, and exercise. By varying the inputs, the user can see how changes in health habits, such as losing weight, affect life expectancy. The software provides both life expectancy and the age to which the user has a 25 percent probability of survival. This side program is a desirable feature that most programs do not have. It allows for a personalized estimate of life expectancy, based on scientific evidence. However, it may also lead to a perception among users of a false sense of precision.

In presenting information on life expectancy to users of consumer programs, thought should be given to the language used. For example, presenting information in terms of probabilities of living to different ages may be more helpful than presenting information on life expectancies, which provide only a single age.

One approach to dealing with the length of the planning period would provide information as to the adequacy of resources if death occurs at different ages. For example, in a deterministic framework the output could indicate that a particular individual would have adequate resources if death occurred at age 80 but not if it occurred at age 90 or later. For a couple, the output could indicate that they had adequate resources if death of the surviving spouse occurred at age 90 or earlier but not at age 95 or later. This approach would require deterministic programs to automatically run scenarios with death occurring at ages 80, 90 and 95. Thus, the program would automatically run three mortality scenarios for the user.

With this approach, programs would need to provide information about mortality risk to counter the possibility that many people would underestimate their life expectancy and underestimate the probability of living to advanced ages, both singly and as a couple.

Death of a Spouse

Some of the consumer programs do not permit entering any information about the spouse (table 3.8). Some consumer programs do not adjust for the death of a spouse. For example, they do not change the target replacement rate or consumption level for the death of a spouse. Some programs do not allow the user to specify what sources of income continue after the death of a spouse. One consumer program, however, has a feature that allows the user to specify whether income received by a person continues after their death to their spouse. Some of the professional programs allow a detailed specification of the income that continues after the death of a spouse.

An important issue that the consumer programs generally do not capture is that the reduction in Social Security benefits when one member of a couple dies is much greater for a two-earner couple than for a single-earner couple. The professional programs generally allow for entering detailed information about the spouse, which the consumer programs we examined generally do not.

Program	Spouse considered?	Are survivor benefits from Social Security considered?	Does target income adjust with death of spouse?	Protect against death of a spouse by purchasing life insurance?	Does the program take into account economies of scale in consumption?
Free consumer software	3	1	3	1	0
Professional	7	7	7	7	4

Source: Authors' compilation

Medical Expenses

While none of the consumer programs in the previous study treated medical expenses as a separate category, that is not the case for the programs we analyzed (table 3.9). In two programs, medical care inflation is set at twice the rate of the inflation of other items, causing medical care costs to rise with age because they increase over time. However, it appears that medical care expenditures of the user are not adjusted for increased consumption with age (case 3, Appendix A). The programs we examined do not consider the risk of poor health on expenses, though users could generally do that by running scenarios.

One professional program permits the user to set an expected age at which long-term care would be needed.

Program	Risk of poor health considered on expenses?	Do medical expenses increase with age?
Free consumer software	0	2
Professional	0	0

Source: Authors' compilation

The Risk of Poor Planning

Some people are better at planning than others, and thus a risk that people face is that they may be poor at planning. While financial planning software programs are designed to reduce the risk of poor planning, some of the programs have no checks on bad assumptions, such as overly high rates of return (table 3.10). The calculations of the programs are only as good as the assumptions entered by the users, though programs differ in the extent that users provide inputs.

The free consumer programs contain some protections against the user picking erroneous assumptions. However, three permit entering an expected retirement date of age 80. While some people do retire at that age or older, probably larger numbers think they will never retire, but then subsequently are forced to do so by job loss or ill health. One program allows workers to set the rate of return as high as 20 percent. That software accepts a life expectancy of 100, and an inflation rate of 20 percent. By contrast, another consumer program limits the rate of return assumption to between 3 percent and 7 percent.

The risk of supplying bad assumptions is not addressed for the professional programs because it is assumed that the professional using the programs prevents the client from making that mistake. However, some of the professional programs check for careless errors in entering data.

Table 3.10. Risk of bad assumptions used in planning				
Program	Life expectancy of 75 allowed without question for person age 62	10% equity rate of return allowed	Age 80 retirement age allowed without question	2% inflation rate allowed
Free consumer software	2	2	3	1
Source: Authors' compilation				
Note: The risk of bad assumptions is considered irrelevant for the professional software because the adviser, because of knowledge or training, is assumed to screen out bad assumptions				

Many people have a poor understanding and low level of knowledge about financial issues (Lusardi and Mitchell 2008). Thus, people need assistance in providing inputs for financial planning software. This assistance can be provided in consumer programs through the use of defaults, by providing information relevant to the inputs, such as average levels, by providing inquiries if inputs appear to be out of the normal range, by providing the inputs as parameters (for example, for inflation) and by providing limits if inputs are clearly outside of the normal range. One program has a link to a government report on the Consumer Price Index. One program provides a graph showing male and female life expectancy based on current age. Some people, however, may have difficulty reading the graph. The assistance presumably is provided by financial planners for users of professional financial planning software.

Table 3.11 indicates the results of the previous study (Sondergeld et al. 2003) and the current study concerning assistance provided to prevent the user from entering bad data. For various reasons, the two studies are not directly comparable. Nonetheless, the table suggests that consumer programs could do more to limit the ability to use bad assumptions.

Table 3.11. Program alerts in the previous and current studies			
Previous study		Current study	
Program alert if user specifies	Number of programs (out of 17)	Program alert if user specifies	Number of consumer programs (out of 5)
Life expectancy over 150	4	Life expectancy over 95	1
Inflation rate over 20%	1	Inflation rate over 10%	1
Rate of return over 25%	2	Rate of return over 10%	1
High inflation and low bond returns	0	Inflation rate higher than rates of return	0
High concentration in a single investment	0	Investing all in stocks	2

Source: Sondergeld et al. (2003) and authors' compilation

Housing Risk

Traditionally, housing has not been considered in discussions of risk. However, the experience of recent years has indicated that home ownership can be a major source of financial risk in several respects. First, housing prices can decline substantially. Second, the payments on variable rate mortgages can substantially increase. Third, both can happen at the same time, preventing the possibility of refinancing, preventing refinancing and possibly leading to default and loss of home ownership.

In 2007, 86 percent of households with a household head age 65-74 owned their own home, and 32 percent of households in that age group had a mortgage (Buck et al. 2009). A Society of Actuaries (2009) report found that housing was the largest expense for many middle income people.

Only one of the free consumer software we examined takes into account housing issues (table 3.12). Reverse mortgages are also not considered, though few people use them (Reverse Mortgage Page 2009).

One of the professional programs considers the issue of whether it is advantageous to pay off a mortgage and shows the mortgage balance year-by-year (case 1, Appendix A). One

professional program does not permit the user to specify a rate of depreciation in the nominal value of the home. While depreciation might not be expected over long periods of time, given that housing prices in some areas have depreciated by 30 percent or more over a fairly short period of time, this is a major drawback. Several professional programs allow users to specify the date and price at which their home will be sold, with the difference between the net price (after taxes and commissions) of the house sold and the price of the subsequent house bought being available to finance retirement consumption.

One professional program in its training video states that because it is goal based, rather than cash-flow based, it does not calculate the pay down of mortgages and other liabilities. Other professional programs, however, do track the pay down of liabilities.

Some professional programs allow the user to specify whether he is willing to sell his home to meet retirement expenses. Other programs either assume that the house is illiquid or assume that home equity will be used to meet retirement expenses.

Program	Value of home equity?	Mortgage value?	Reverse mortgage?	Housing change during retirement considered?	Variable rate mortgages
Free consumer software	1	1	0	0	0
Professional	7	7	1	5	0

Source: Authors' compilation

With the decline in the price of houses, many homeowners currently have less home equity than their mortgage, which is sometimes called being “underwater”. The one free consumer program that deals with housing permits the user to enter a negative net housing value.

Nearly all the free consumer programs examined ignore the value of home equity (case 1, Appendix A). For people planning on downsizing and using part of their equity for saving purposes, not taking into consideration housing is a serious omission.

Survey data indicate that most people do not plan to use their home equity to finance retirement consumption, though they do consider the possibility of using it as a form of insurance against unexpectedly large expenditures (Munnell et al. 2009). Thus, it appears that people generally consider their assets in different categories (stocks versus the home) as being for different purposes.

None of the professional programs have the capability of analyzing variable rate mortgages, nor do they consider the risk of declining housing values. One of the professional programs examined allows users to consider reverse mortgages.

Risk of Retiring Unexpectedly Early

Many people retire earlier than they had planned because of unexpected bad luck—poor health, loss of a job, or need to provide care for another person. None of the programs deals with the risk of unexpectedly early retirement. None of them even note it as an issue that people should consider when planning for retirement. As mentioned earlier, poor health is an important reason for retirement for about 20 percent of retirees (Hurd and Rohwedder 2003). If users anticipate this risk, they can evaluate it by running scenarios, but the software should not rely on the user being well informed about different types of risk.

PROBABILITY OF SUCCESS—HOW IS IT MEASURED?

The measure of success used in different programs varies widely, which causes the reported results to vary (table 3.13). The measure of success in one consumer program that uses Monte Carlo analysis is an 80 percent chance that the user's income will last to age 95, given a 70 percent target replacement rate. That approach gives a probability of success for most people that is higher than 80 percent because of the high age used for the end of the planning period.

One Monte Carlo program bases its recommended consumption path on the asset level resulting from the estimated mean return. Another program that is deterministic measures success as having sufficient resources to meet the user's target expenditure level that the user specified, up to the age of the user's specified life expectancy. Another program has as the measure of success a 90 percent chance that the desired level of retirement income, based on an 85 percent target replacement rate, can be sustained over a 30-year retirement. Thus, for a person retiring at age 65, that would be a 90 percent chance of success up to age 95. This combination of replacement ratio, planning period, and probability of success all are on the high side, combining to make the required resources high. A different program uses a replacement rate of 70 percent to age 95, with a 70 percent chance of success.

Users undoubtedly differ in their own views as to probability of success, but they are not necessarily paired with a program that shares their views. It thus appears that some of the programs advise higher levels of savings than needed, given the life expectancy and desired level of consumption of some users.

With a stringent measure of success, such as a 90 percent chance of having sufficient income to maintain consumption level up to age 95, most workers will die with more assets left over than they might have wished, having sacrificed consumption opportunities to meet that high standard. Thus, the measure of success should take into account the lost consumption opportunities of persons who die at younger ages. Another consideration is the severity of the consequences of failing to meet income targets. Completely running out of money 10 years into retirement vs. not quite being able to meet the desired replacement ratio in year 35 are two very different outcomes. Also, in situations when

income targets are not met because liquid financial assets are depleted, the outcome may not be as dire if the retiree also has Social Security, pension income, and annuity income.

The desired probability of success among users is the desired probability that their retirement income goal will be met. The desired probability of success doubtlessly varies across people. Presumably less risk averse people, people with higher rates of time preference⁶, and people with greater mortality risk would be more willing to trade off a higher risk of reduced consumption in the future for a higher level of current consumption. One of the free web-based programs and most of the professional programs we examined assess the user's level of risk tolerance. None of the programs attempt to assess the user's rate of time preference, which would be useful for recommending the time pattern of consumption.

One of the professional programs assesses the user's risk preference indirectly through assessing their desire to be conservative, moderate, or aggressive in their consumption during retirement. The higher the user's consumption relative to income and assets, the greater the risk of having to reduce future consumption.

Most programs fund consumption chronologically, providing the date when the user is projected to run out of money, if the user has insufficient resources. One program, however, funds goals according to their priority, rather than to the chronology in which they occur.

Table 3.13. Probability of success					
Program	Deterministic		Stochastic		
	Adequate up to life expectancy	Adequate up to age 95	Have sufficient assets for 70%+ chance of success	Have sufficient assets where 90% of the time the market performs better	Probability of success provided by user
Free consumer software	1	1	1	2	0
Professional	0	0	1 (a)	0	7

Source: Authors' compilation
 Note: In some of the programs, stochastic modeling is an option. Those programs are counted here as stochastic, even though some users may not take advantage of that option.
 Note a: default

Further research is needed on the issue of the appropriate measure of success. One issue is whether the measure of success should be specified by the program or by the user.

⁶ The rate of time preference is a measure of people's willingness to trade current consumption for future consumption.

Arguably, an informed user would be better able to specify the measure of success than a program, which would have a single measure for all persons.

TAKE AWAYS

1. In determining the rate of return, a common problem with many of the programs examined is that they use rates of return that are too high, either due to user or program specifications. The programs examined do not consider interest rate risk. All of the free consumer programs and most of the professional programs examined, do not treat inflation as a risk. The differences in treatment of investment returns and different assumptions have very different impacts depending on the situation of the user. Investment returns have a much larger impact on those with greater assets.
2. Longevity generally is treated as affecting the length of the retirement period and planning horizon, but is not recognized as a risk.
3. One approach to dealing with the length of the planning period would provide information as to the adequacy of resources if death occurs at different ages. For example, in a deterministic framework the output could indicate that a particular individual would have adequate resources if death occurred at age 80 but not if it occurred at age 90 or later. For a couple, the output could indicate that they had adequate resources if death of the surviving spouse occurred at age 90 or earlier but not at age 95 or later. This approach would require deterministic programs to automatically run scenarios with death occurring at ages 80, 90 and 95.
4. None of the programs examined have the capability of analyzing variable rate mortgages, nor do they consider the risk of declining housing values. They generally do not offer the user the ability to analyze a range of options with regard to the use of housing equity to help finance retirement.
5. Some professional programs allow the user to specify whether he is willing to sell his home to meet retirement expenses. Other programs either assume that the house is illiquid or assume that home equity will be used to meet retirement expenses. The differences in the treatment of housing wealth have very different importance depending on the user's situation. They are most important where a large part of a family's assets are in housing, and when they have significant mortgage debt.
6. The consumer software generally are oriented toward dealing with how much to consume and save, and often do not address other related issues. The professional software are able to address more issues. However, users can expand their capacity to improve the scope of information by running alternative scenarios.
7. Neither the consumer nor the professional software dealt with the risk of retiring earlier than expected or the risk of unexpected poor health that results in early retirement.

8. Most programs either require the user to determine their target spending in retirement or set that for the user based on a standard that is applied to all users. Greater work needs to be done on analyzing target replacement rates to determine the appropriate way to measure them and what their level should be.

Chapter 4. RESULTS OF CASE STUDIES

“Will I run out of money in retirement?” is often the most critical question for retirees and people nearing retirement. Given their current circumstances and their plans for the future, how likely are they to be able to maintain their standard of living?

SIX CASES STUDIES

We examined six case studies that were provided by the Project Oversight Group that was created by the Society of Actuaries for this project. These case studies are explained in Appendix A but can be characterized in brief as the following:

Case 1. Sue Singleton, a 60 year-old divorcee, still working. This case involves issues of working past age 65; changes in SS benefits with postponed retirement, using the home as a primary retirement asset, no employer retirement plan, reverse mortgage for retirement income, and Social Security benefits based on divorce and prior marriage.

Case 2. Hal and Karen Middleton, ages 64 and 60, recently retired. This case involves issues of being too conservatively invested through retirement, spending a sizable part of assets early in retirement, annuity income stream reduced upon death of husband, and change in health coverage at Medicare eligibility.

Case 3. Gary and Sandra Alterman, ages 74 and 74, retired. This case involves issues of long-term care needs, 40 percent of retirement income does not have a COLA, liquidating home value through move in retirement; increasing medical, assisted living and transportation costs over time; and elimination of spousal pension benefit upon death of primary wage earner.

Case 4. Leslie Gonzalez, a 58 year-old widow, still working, dependent mother. This case involves issues of increasing dependent costs, long life, does not own home, the majority of her retirement assets being in a taxable, low-earning account, different annuitization versus asset investment/withdrawal strategies, and health benefits from former husband’s employment.

Case 5. John and Judy Richman, ages 56 and 50, higher income, still working. This case involves issues of high credit card debt and mortgage going into retirement, college costs at the same time as the need to save for retirement, employer stock options, lack of long-term care insurance, not being able to afford retiring at age 65, and Social Security spouse benefits where spouse is a government employee not covered by Social Security.

Case 6. Jim and Linda Goldin, ages 72 and 69, higher income, retired. This case involves people at older ages and with fairly high income.

RESULTS OF THE CASE STUDIES

The issues raised by these cases are explored throughout the report. To explore particular issues we developed additional cases, beyond those provided by the Project Oversight

Group. These additional cases were not designed to be realistic depictions of a possible scenario but were designed to explore the working of the programs.

As noted in the previous study (Sondergeld et al. 2003): “It is important to note that the differences across programs preclude a direct comparison of most kinds of output. We strove to enter each case on a consistent basis across programs, but inputs varied so widely that only the most basic outcomes could be compared directly.” We found that situation to be unchanged. Because of differences in the capabilities of the programs to handle the situations in the cases, direct comparisons of results across the programs were generally not meaningful because it was often not possible to enter the inputs in a directly comparable way. The differences in permitted inputs are a source of differences in results between programs.

To better understand the differences in results across programs, we compared pair-wise studies with different results to determine why the results differed. This section summarizes some results where for a particular case, one program finds the individual or couple to have adequate savings, while another program finds the savings to be inadequate. As well as differing in this regard, the stochastic programs differed as to the numeric target they used for determining the probability of success and the date at which the user would run out of money.

For case one of a 60-year-old divorcee who is still working, one program assesses that when retirement occurs at age 70 the person has adequate retirement income, while another program finds the income to be insufficient. The differences are explained at least in part because the first program allows the user to set life expectancy, and uses life expectancy to determine the planning period, while the second program sets the planning period to end at age 95, eight years later, or 47 percent longer, than in the first study.

For case two of a recently retired couple ages 60 and 64, one program finds the couple’s savings to be inadequate, while another finds it to be adequate. The program that finds it to be adequate recognizes the value of the home equity as a source of retirement income, while the other program does not.

For case three of a couple both aged 74, the hypothetical people in this case are the oldest of any of the cases. Because of the relatively short planning period for this case, the different programs produced similar results.

For case four of a 58-year-old widow who is still working, one program finds that the person runs out of money because it does not permit taking into account income from sources other than savings, such as from inheritances, while other programs that permit the inclusion of other income indicate that total sources of income are adequate.

For case five of a couple ages 56 and 50 who were still working, one program finds the couple’s savings to be inadequate, while another finds it to be adequate. The one that finds it to be inadequate sets a maximum rate of return of 7 percent, while the other allows the 8 percent specified in the case. Differences in assumed rates of return are more important the younger are the users and the more financial assets they have.

To better understand the workings of the programs, we created another case. The person is age 55, plans to retire at age 65, has a life expectancy of 95, salary of \$100,000, retirement savings of \$500,000, annual contributions of \$18,000 and an assumed rate of return of 7 percent. When comparing two programs that were similar except that one was deterministic and the other was stochastic, the deterministic program showed adequate retirement income while the stochastic program indicated a shortfall in retirement income of over \$200 a month.

To further explore the difference in results between deterministic and stochastic programs, in an additional case, which we created, the person is age 55, plans to retire at age 62, has a life expectancy of 95, has a salary of \$100,000, and annual savings of \$12,000. Again, a deterministic and a stochastic program were compared. The deterministic program indicated that the person would be able to retire if he had already accumulated \$740,000 while the stochastic program indicated that he would need to have already accumulated \$690,000. Thus, it cannot be concluded that the stochastic programs always indicate that people need greater savings than do the deterministic programs.

Some of the programs allow the users to run either deterministic or stochastic projections. We compared the two for case five because it involves substantial assets for users who are relatively young, and thus have a relatively long planning horizon. The deterministic case indicated that the couple has 94 percent of the assets they needed to accumulate, based on their current accumulations and projected savings. The stochastic case showed that in a small percent of the 500 simulations they had 90 percent or more of the assets they needed, but in the large majority of simulations they had less than 65 percent of the assets they need.

WHY RESULTS DIFFER

The different programs provide different results in terms of retirement income adequacy in some circumstances, while in other circumstances they provide similar results. Various reasons may explain why the results differ and under what circumstances that occurs.⁷

1. The input or parameter values differ. This explanation is probably the most obvious explanation, but the reasons behind it are not necessarily obvious. For example, one program uses a rate of return of 10 percent on equities, while another program has a default rate of return of 5 percent on equities, and a maximum allowable rate of 7 percent. Some programs ignore the sizable effect of investment fees on accumulated account balances. One of the factors identified in the previous study as causing differences in results is that some programs

⁷ A further question, not addressed in this study, is why do the programs differ in the ways described above? Are the differences purely the result of the different backgrounds of the programmers, company preferences or expertise, or are there other explanations that cause the programs to differ in their results?

recognize that the price of medical care is rising faster than other prices. For that reason, in those programs, expenses rise more quickly during retirement. The default inflation rate varies across programs from 2.3 percent to 4.6 percent. Some programs set the default increase in Social Security benefits in retirement at less than the inflation rate, causing the benefits to decline in real value over the period of retirement.

2. The capabilities of dealing with special situations differ. For example, some programs are not capable of handling expenses that last only a few years, such as college expenses (case 5). Some programs are not capable of dealing with cost-of-living adjustments on pensions.
3. The measures of retirement resources differ. For example, some professional programs ask the user to indicate expected inheritances or other one-time receipts, while other programs do not include expected inheritances. One program incorporates the value of housing as a source of retirement income, while other programs do not. Programs differ in their treatment of taxes, so that consumer programs that basically ignore taxes indicate that the user has more retirement resources. Programs that request more detail in the inputs for sources of income may tend to yield a higher probability of success because users end up specifying a higher level of expected income in retirement.
4. The measures of retirement needs differ. One program specifies a replacement rate of 85 percent, while another program allows the user to specify the amount of income needed in retirement.
5. Programs differ in how they treat the retirement income needs of a surviving spouse. Some programs set as a default that the surviving spouse needs half the income of a couple, while one program takes into account economies of scale in consumption, assuming that a couple needs 1.6 times as much as a single person.
6. The replacement rate definition differs. One program specifies a replacement rate relative to current income for people still working, while another specifies it relative to lifetime average income.
7. The retirement planning period differs. One program specifies a retirement planning period of 30 years, while another specifies the period that ends at age 95, and yet another bases the retirement planning period on the user's specification of life expectancy.
8. Some programs are deterministic, while some are stochastic. Stochastic programs recognize the possibility of worst case scenarios, while deterministic programs do not explicitly incorporate that possibility in their methodology.

9. For stochastic programs, the standard for the minimum probability of success differs. For example, one program requires that the user be successful in 90 percent of the scenarios, while other programs use lower standards.
10. Longevity generally is treated as affecting the length of the retirement period and planning horizon, but is not recognized as a risk.
11. None of the programs examined have the capability of analyzing variable rate mortgages, nor do they consider the risk of declining housing values. They generally do not offer the user the ability to analyze a range of options with regard to the use of housing equity to help finance retirement.

TAKE AWAYS

1. The results differ across programs for some situations.
2. For people age 70 and older, the results differ less because the planning period is shorter.
3. One important difference in results across programs is how housing is treated. Some programs treat it as a retirement asset and other programs do not treat it as a potential source of retirement income.
4. Programs differ as to how they treat Social Security benefits. Some don't recognize that those benefits are fully price-indexed, so that over time their real value is eroding because of inflation.

Chapter 5. EVALUATION OF ADVICE PROVIDED

This chapter has three components:

- Discussion of Social Security, focusing on claiming age and on the estimation of Social Security benefits
- Discussion of advice regarding how much to save, including both what programs do and the underlying theory – also includes what to do if not enough saving and some discussion about whether program recommendations lead to undersaving or oversaving
- Briefer discussion about what programs do with regard to post retirement strategies and issues such as purchase of annuities and insurance, what funds to withdraw money from, changing portfolio, and consumption in retirement

People use financial planning software to assist them in making decisions concerning retirement issues. Retirement planning has five major related aspects:

1. Choosing the retirement age,
2. Accumulating adequate financial resources for retirement,
3. Choosing appropriate investments,
4. Choosing appropriate payout mechanisms, and
5. Risk management during retirement

For users already retired, the questions they face include:

1. How much can I consume in retirement?
2. What should I do if I have saved too little?
3. Should I convert some of my savings into an annuity?
4. Which assets should I spend down first?
5. Should I change my portfolio during retirement?
6. Will my surviving spouse have adequate income if I die first?
7. What types of risk protection products will be helpful to me?
8. Can I use my home equity to support retirement? What options do I have?

Depending on their circumstances, people may also have questions concerning their IRA, such as whether they should convert it to a Roth IRA, or how much do they need to withdraw from their IRA to meet the IRS requirements for required minimum distributions. Others may want to know about economic consequences of tapping the equity in their home through a reverse mortgage, refinancing, or moving to a less expensive home.

Table 5.1 summarizes some of the analysis of this chapter. The programs generally are useful for indicating and exploring options. They allow users to consider alternative approaches to preparing for and dealing with retirement risks. Providing advice or suggestions occurs less commonly.

Table 5.1. Advice on post-retirement strategies		
Strategy area	Consumer programs	Professional programs
Which funds to draw down first	Beyond the scope of the programs	Very spotty – programs weak on this point
Annuity purchase	Rarely suggested	Rarely suggested
Use of life, long-term care and health insurance	Beyond the scope in most programs, but some programs suggest user consider long-term care insurance	Covered extensively in professional programs
Changing investment strategies during retirement	Sometimes suggested as a way of dealing with a projected financial shortfall	Frequently suggested as a way of dealing with a projected financial shortfall
Use of housing wealth in retirement	Rarely considered	Frequently considered
Reducing expenses	Sometimes suggested	An option
Working during retirement	Sometimes an option	Generally an option
Postponing retirement	Sometimes suggested	Sometimes suggested as an option
Source: Authors' compilation		

This section evaluates the advice provided by financial planning software. The consumer software generally are oriented toward dealing with how much to consume and save, and often do not address other, though related, issues. The professional software are able to address more issues.

Even when programs do not provide explicit advice, users can gain information in helping them answer the questions addressed here by running scenarios to investigate the effects of alternative decisions.

SUITABILITY OF THE SOFTWARE

The first piece of advice that a program should provide is who it is suitable for. The programs tend to be targeted toward a particular segment of the market, which varies by program, but that generally is not indicated in an explicit statement of suitability. The usefulness of the programs would be enhanced, especially the consumer programs, if a statement of suitability were provided.

The programs also differ in that they provide analysis to aid in answering different questions. It would be helpful for the programs information indicating what questions can be answered by using their analysis.

RETIREMENT AGE AND SOCIAL SECURITY BENEFIT RECEIPT

While issues relating to Social Security are of lesser importance for high-income persons, for most workers Social Security is the most important aspect of their retirement income.

The decision to retire is linked for many people to the age at which they start receiving Social Security benefits. For some people, however, these decisions are distinct. For example, many people retire before the earliest age at which they can receive Social Security benefits, which is age 62. For other people, their best strategy may be to postpone receipt of Social Security benefits past age 62 and possibly to finance the early years of their retirement with other sources of income, or to continue working.

The age at which a person takes Social Security benefits and the decision as to whether to postpone taking the benefits are key financial decisions for most people. Most consumer programs we examined, however, do not address the issue. The user simply specifies the age. However, generally the programs suggest postponing the age at which Social Security benefits are taken if retirement savings are inadequate. A few programs note that benefits are increased if the worker postpones the age at which they are first received.

Social Security benefits are increased when workers postpone benefit receipt, up to age 70. One consumer program provides a side program for calculating the best age to take Social Security benefits based on the user's age and gender. It calculates the break even point if benefit receipt is postponed from age 62 to the Normal Retirement age, which is age 66 for a person born in 1943. It notes that a person with average life expectancy for their age and gender has an X percent chance of living longer than the break even point, with the likelihood of living longer being higher for women than for men because of women's greater life expectancy. The same web site also offers a life expectancy estimation program that allows individual determination of life expectancy. It would be an improvement if the two programs were integrated.

The program does not calculate, or even note, that the optimal age at which to collect Social Security benefits depends on whether the user has a dependent spouse or is a dependent spouse. More detailed information on Social Security claiming age strategies is provided in a separate document, including the option of purchasing a five-year fixed term annuity as a bridge from 62 to 67 in order to postpone receipt of Social Security benefits.

One consumer program suggests that everyone would be better off in terms of lifetime benefits received by postponing receipt of retirement benefits. Presumably, about half of the population has life expectancy less than the mean. Many of these people would not receive higher lifetime benefits by postponing retirement.

Several consumer programs and all professional programs allow the user to specify the level of Social Security benefits, but they often do not note that benefits increase with postponed retirement. At least one consumer program makes no adjustment in benefits for postponed retirement.

The consumer programs examined generally do not consider separate retirement ages or dates for two-earner couples (table 5.2). Given the prevalence of two-earner couples, this is a drawback. Most of the programs are incapable of evaluating more sophisticated strategies for claiming benefits. For example, a two-earner couple may be best off if the

lower earner claims benefits at age 62 while the higher earner postpones benefit claiming. A widow or divorcee may be best off claiming benefits on her own earnings-record at age 62 and then later claiming benefits based on the earnings record of her former spouse (case 1, Appendix A). The possibilities for couples claiming benefits at various ages can be complex, depending on earnings histories, differences in age, and longevity expectations. It's not too surprising that the programs do not directly address these decisions.

One of the professional programs provides detailed information about different strategies for when to take Social Security benefits. The strategies for married couples as to the timing of taking Social Security programs can be complex. One professional program is capable of investigating strategies, for example, of repaying benefits already received and reapplying for future benefits. However, it is not clear how well these options are calculated because the program assumes that people live to an advanced age, considerably past their life expectancy. In the tutorial on this subject, the user is advised to plan on living to their maximum possible age, which it states is 100 for many people. The results presumably would differ if a more reasonable life expectancy were used. One of the professional programs automatically provides the age to which the user would need to postpone retirement in order to have sufficient savings to meet projected needs. An alternative approach would be to show the effect of claiming Social Security benefits at several different ages.

One of the professional programs has as inputs the ages that the user views as ideal and acceptable retirement ages and the degree of willingness to postpone retirement past the ideal age. This type of information about the user's preferences helps provide advice that fits the user's preferences. This approach was not used in the other programs we studied.

When the user's Social Security benefits are based on a prior marriage (case 1, Appendix A), many of the consumer programs cannot deal with this situation. It poses challenges for the professional programs, as well. Programs where the user specifies the level of Social Security benefits have the flexibility to deal with this situation.

Program	Are the earnings and pensions of two-earner couples treated separately?	Separate retirement ages for two-earner couples?	Risk of retiring early	Effect of unexpectedly poor health on early retirement
Free consumer software	3	2	0	0
Professional	7	7	0	0
Source: Authors' compilation				

While the risk of expecting to work longer than is realistic is not considered in the programs evaluated, neither is the risk of retiring earlier than expected (table 5.2). That can be due to unexpectedly poor health while working, which is also not considered.

How much people need to save for retirement depends to a large extent on how much they will receive from Social Security. Nearly 90 percent of persons age 65 and older receive Social Security benefits, which is more than twice as many people as receive pension benefits. They are a far more important source of retirement income than income from investments. For 60 percent of aged units age 65 and older receiving Social Security benefits, those benefits account for 50 percent or more of their retirement income (Social Security Administration 2006).⁸

Despite the importance of Social Security benefits, the retirement planning software we analyzed generally focuses far more on income from investments, and pays relatively little attention to obtaining accurate information concerning people's Social Security benefits or, in many cases, to facilitating the entry of different types of Social Security benefits (for example, spousal benefits). That focus may be appropriate for high-income individuals, for whom Social Security benefits are a small part of their retirement income, but for most people it is not.

Some programs estimate the user's Social Security benefits based on the person's salary in one year, birth year, and age at retirement. The programs could ask the user to refer to his or her annual Social Security statement, but the effectiveness of that approach may be limited due to people not having saved those statements or not being willing to make the effort to locate them. Some programs assume that the worker has received pay raises at a rate equal to the national average each year through the current year and that current earnings stay the same until Normal Retirement Age, which currently is age 66 for workers nearing retirement. That approach is not satisfactory because the user may not realize how inaccurate the results are.

The relationship between salary in a single year and lifetime average wages varies considerably across workers. Administrative records reveal many different pay patterns over the lifetime, with only 14 percent of workers fitting the "classic" humped-shape earnings profile of earnings increasing when young, reaching a peak near retirement, and declining in real value in the few years before retirement (Bosworth, Burtless and Steuerle 1999). About the same fraction had real earnings patterns that sagged during their middle years, another group had flat real earnings profiles, and still another had declining real earnings after some fairly young age. For this reason, a model of pension outcomes that assumes all workers have a common earnings profile is unlikely to capture any employee's pension outcomes (Mitchell and Turner 2009).

One consumer program asks, "Would you like to include an estimated Social Security benefit in your calculations?" This question suggests that Social Security may not be important in planning for retirement. Even though the default is to include Social

⁸ An aged unit, the term used by the Social Security Administration, can be a single person or more than one person in the same family, and can include someone younger than age 65.

security, this treatment of Social Security is misleading because nearly everyone should include Social Security.⁹

One of the free consumer programs is completely useless for a middle- or lower-income person. It assumes that everyone receives \$24,000 in Social Security benefits, which it claims is the approximate average Social Security benefit for a couple. It uses this value even when the user only input information for a single person, and even when the user indicates moderate or low income. Most people using this program would be given a false sense of having more retirement resources than they actually had because their Social Security benefits would be considerably overstated. In 2007, 75 percent of households age 65 and older received less than \$20,000 in Social Security benefits (Purcell 2008).

One program provides the following advice: “For many people, Social Security provides a significant portion of their retirement income. Therefore, it is important to estimate your benefit as accurately as possible. If you have an estimate provided by the Social Security administration or are already receiving benefits, enter that amount. If not, you can let the Program calculate a benefit.”

This advice as to entering Social Security benefits is better than the advice provided by many programs. This program also indicates that the maximum benefit age is age 70, meaning that workers can increase their Social Security benefits by postponing benefit receipt to age 70. However, it neglects to inform the user that the Social Security Administration has an online benefit calculator, where the user can calculate his expected future Social Security benefits based on his own earnings record. Social Security issues are explored further in Appendix C.

HOW MUCH SHOULD I SAVE?

The life cycle model in economics posits that people attempt to smooth their consumption over their life cycle. While the professional programs we examined have the user set the target income in retirement, some consumer programs use replacement rates for determining retirement income adequacy. The replacement rate can be calculated various ways, but it basically is some measure of retirement income divided by some measure of pre-retirement income. It thus does not measure consumption directly. It is a proxy for measuring the adequacy of consumption. It increasingly has come under attack from economists, in part because of factors that arguably would cause it to differ across people.

⁹ A minor offsetting benefit of this approach is that it allows the small percentage of the population not covered by Social Security to use the software. However, that can be achieved by allowing the user to “unclick” Social Security benefits.

Essentially experts have used very different approaches to determine suggested savings amounts:

- Life-time consumption smoothing – levels consumption and makes savings vary year by year. For example, saving will be low when children are in college, and high after they have left home.
- Replacement ratios – formula determines the projected retirement income needed, and the level percentage of pay is calculated as proposed savings amount.
- Target income in retirement set – user specifies projected retirement income needed, and a level percentage of pay is calculated as proposed savings amount.

A fourth approach looks at particular categories of expenses, such as housing, as a percentage of income as a way to think about economic insecurity. The idea is that if a high percentage of income is spent on what might be considered basics, or on fixed commitments, the household is more insecure.

When replacement rates are used, income replacement rates differ from consumption replacement rates in important ways. In retirement, once a person stops working the person no longer pays Social Security payroll taxes and no longer has work expenses. While a person is working, he is saving for retirement, but in retirement presumably that expense ceases. Traditional income replacement rates take this reduction in expenses into account.

Most programs either require the user to determine their target spending in retirement or set that for the user based on a standard that is applied to all users, such as a replacement rate of 85 percent. Kotlikoff (2008) argues that two problems arise with this approach. First, it is difficult to accurately determine a spending target. Current consumption levels may be a poor guide for a future spending target if those levels are too high to be sustainable or if they are lower than the sustainable level. Second, even small errors in spending targets can lead to large errors in savings levels because the savings accumulation period and the spend down period both are lengthy.

Replacement rates should presumably vary across people depending on their personal circumstances, so that programs that use a single replacement rate target may not be well suited for many people. Given the variability in target replacement rates for people in different circumstances, Vanderhei (2006) questions whether a single replacement rate as a rule of thumb is useful.

Target replacement rates arguably should be lower for people retiring at a younger age. The reason is that they would have needed to have saved at a higher rate and consumed at a lower rate than people with the same income who retired later. None of the programs using replacement rates vary the target replacement rate by age at retirement.

Replacement rates may make sense as an analytical tool when peoples' income and expenses are stable over time. However, generally neither is the case. A drawback of replacement rates that consider income at retirement is that retirement income tends to

decline in real value for many people because some sources of income are not indexed for inflation. Also, expenses tend to vary over time due to changes in health care needs, the graduation of a child from college, or paying off a mortgage.

An alternative measure of retirement income adequacy focuses on particular categories of expenses relative to income as a way of measuring economic insecurity (Meschede et al. 2009). For example, a retiree would be considered to be economically insecure if housing consumed 30 percent or more of income; if medical expenses, including health insurance payments, were more than 15 percent of income; or if the person was a renter with no home equity. None of the programs test for these problems. Table 5.3 summarizes the different approaches that could be used to determine how much to save and consume.

Approach	Use by software	Comments
Lifetime consumption smoothing	Used in one program	Leads to wide variations in saving by year Approach favored by many economists
Defining target as a replacement ratio	Common approach in consumer software	Significant variation in application
Defining target based on desired spending level	Common approach in professional software	Prescribes constant savings per year despite changing needs
Use of expenses relative to income to measure to measure economic security	Not used	Approach defined in Meschede et al. (2009)
Source: Authors' compilation		

One program indicates in its technical notes that it assumes people need a replacement rate of 85 percent of final salary (table 5.4). Another program uses a target replacement rate of 75 percent of current salary. Other studies allow the user to input desired income in retirement, which seems to be a superior approach because it allows the user to decide, but it presumes that users are able to adequately perform this task.

None of the programs using a replacement rate indicate clearly that consumption in retirement is financed not only by retirement income but also the spend down of accumulated assets. One of the deterministic programs for a person retiring at age 66 has 6.4 percent of assets withdrawn annually when the rate of return is 5 percent and 7.9 percent of assets drawn down annually when the rate of return is 7 percent. This program uses an inflation rate of 3.5 percent. Thus, when the rate of return is 5 percent and 6.5 percent of assets are withdrawn, the nominal decline in the retiree's assets per year is 1.5 percent (=6.5-5.0). The real decline, taking into account inflation, is 5 percent (=1.5+3.5). When the rate of return is 7 percent, the nominal decline is 0.9 percent (=7.9-7.0) and the real decline is 4.4 percent (=0.9+3.5). However, the program does not provide this information, which was obtained by calculation, and does not indicate why the rates of nominal and real drawdown differ in the two scenarios.

Table 5.4. Measure of retirement income adequacy					
Program	User specifies retirement income adequacy	Program specifies 85% replacement rate	Program specifies 75% replacement rate	Replacement rate is based on final salary	Replacement rate is based on current salary
Free consumer software	3	1	1	1	1
Professional	7	0	0	0	0
Source: Authors' compilation					
Note: one of the professional programs sets the sustainable level of consumption as an output rather than having a target level as an input					

One professional program takes a much different approach and rejects the replacement rate concept as a planning tool. Instead, it calculates the level of consumption that could be maintained throughout the person's lifetime. This approach translates into different replacement rates for different people. This program argues that people generally do a poor job in trying to determine what their target spending or replacement rate should be. The program calculates the sustainable level of consumption based on the family's economic resources.

One of the professional programs divides target retirement consumption into necessary expenses and desired expenses. Another program divides target consumption into needs, wants, and wishes. Presumably, people would feel differently about a reduction in desired expenses or wishes than they would about a reduction in necessary expenses. This approach may offer promise as a more sophisticated way of measuring people's target consumption in retirement. Such a measure could provide insight as to whether reducing consumption or postponing retirement would be preferable for that person. The supporting material for the program argues that experienced financial planners use this approach in evaluating plans, but that their program incorporates the approach within the program.

Greater work needs to be done on analyzing target replacement rates to determine the appropriate way to measure them and what their level should be. For example, should the target replacement rate be the same for a married couple where one person did not work, a married couple where both worked, and a single person. The amount of household work performed by a two-earner couple versus a single-earner couple, both before and after retirement, may affect the target replacement rates of the two groups.

Generally, programs indicate the amount of additional savings per month or year needed to meet the target replacement rate or level of consumption. Programs that advise a fixed level of savings per month achieve smoothing of savings, while the real goal, according to economics, is to achieve smoothing of consumption. Smoothing of savings will insure

swings in consumption, as nondiscretionary spending on items such as medical care will vary, causing swings in discretionary consumption (Kotlikoff 2008).

While all the consumer programs examined advise saving a constant amount per month, one professional program advises quite different levels of savings at different time periods depending on how the needs of the household change over time. For example, savings would be considerably lower when two children were in college than after they graduated.

The deterministic programs may under some circumstances advise saving less than people need. With one deterministic program, a user can input an expected rate of return of ten percent or higher. While that may at times appear to be a reasonable rate of return, it is high for a long-term assumption in a deterministic model, especially as people tend to move toward more conservative investments as they age. This problem would be exacerbated if people tend to think of living up to their life expectancy, since many people will live longer.

One of the professional programs automatically provides the increase in monthly savings or the one-time lump sum investment needed to have adequate savings to retire with sufficient resources at the user's target retirement age.

HOW MUCH CAN I CONSUME IN RETIREMENT?

Society of Actuaries (2008) research indicates that adjusting the level of consumption is the primary way that many people have for dealing with risks in retirement.

Some of the programs indicate the level of sustainable consumption, given the user's resources. The programs recommend reducing consumption if resources are insufficient and indicate that consumption can be increased if resources are adequate to do so.

While annuities generally are not considered in the programs, one program in the professional group helps users make decisions that could potentially raise their consumption, for example by purchasing an annuity. This program provides advice to smooth, maximize and protect consumption through insurance, and price consumption and work decisions in terms of the sacrifices that must be made or benefits gained. While other programs ask the user to determine the level of consumption desired, or set it by a fixed standard, this program determines the level of sustainable consumption. One of the consumer programs considers a joint and survivor annuity with 10 years certain.

This program also notes the connection between the risk of investments and the level of consumption in retirement. Households that invest aggressively should spend defensively. None of the other programs take that relationship into account. Many also do not take into account that spending needs change during retirement.

ADVICE GIVEN IF THE USER'S SAVINGS ARE INSUFFICIENT

When programs indicate that the person has insufficient savings, they provide a variety of outputs. Some programs indicate the increase in savings needed to meet target expenditures. However, one program indicated that the increase was more than \$10,000 a month in one scenario. Recommending an increase in savings that is greater than income is not helpful advice. Other programs indicate the level of consumption that would probably be sustainable, given the current level of resources.

Society of Actuaries research shows that reducing spending is a popularly chosen risk management method. If the person has adequate assets to self-insure, that approach is a reasonable strategy. When users face a shortfall of resources, some programs advise more aggressive (higher risk) investing

For people who have saved more than enough to meet their retirement consumption target, some programs indicate the higher level of consumption that appears to be sustainable.

If the user of free consumer software is evaluated as having insufficient savings, the software generally provides some advice. At least implicitly, all of the programs, by indicating insufficient savings, advise greater savings. Some of the consumer programs suggest the option of postponing retirement, and some suggest investing in higher risk assets. Reducing expenses, cutting back on the desired estate, and purchasing an annuity are suggested by only a few programs among those we examined (table 5.5).

One consumer program suggests five changes to consider if the user has saved too little:

1. Postpone retirement
2. Take Social Security at a later age
3. Cut expenses
4. Contribute more to your employer-sponsored 401(k) plan
5. Consider hiring a financial adviser to help with your investments, moving them into higher risk, higher expected return investments.

By contrast, one professional program only recommends postponing retirement or saving more. Notably, it does not recommend investing in riskier investments, though that is commonly recommended.

One of the professional programs bases its advice on the user's indicated degree of willingness to make changes in different areas, such as saving more or postponing retirement. If programs distinguished between essential expenses and expenses that users viewed as non-essential to maintaining a satisfactory life style, they could provide better advice as to cutting expenses relative to other changes.

Providing advice arguably is the role of the financial planning professional when one is involved. For this reason, some of the professional programs indicate options but do not

provide advice. The providers of programs may be concerned about legal concerns over fiduciary liability if they provided advice.

Table 5.5. Advice given if the user has insufficient savings						
Program	Save more	Postpone retirement	Reduce expenses	Change investments	Reduce desired estate	Purchase an annuity
Free consumer software	3	3	2	3	1	2
Source: Authors' compilation						
Note: assumed that professional advisers perform this function						

ANNUITIES

With increased reliance on 401(k) plans, an important challenge facing many retirees is how to manage the risk of outliving their assets. Annuities are one way to reduce the impact of longevity risk.

The previous study (Sondergeld et al. 2003) reports that annuitization was rarely mentioned as an option for dealing with risk. That result is also found in this study. The consumer programs examined here generally do not consider annuities, except when they are offered by the institution sponsoring the software. They do not consider alternative withdrawal strategies—they generally do not compare annuities to phased withdrawal of assets. They generally only consider phased withdrawal as the method of spending down assets. The same also holds for the professional programs.

While generally the professional programs allow users to enter the income from an annuity as part of their portfolio, they do not advise as to whether a user without an annuity should purchase one. The consumer programs examined generally do not recognize annuities as an income source in retirement. The programs do not recommend insuring against the risk of outliving assets by purchasing an annuity. They recommend, in essence, self-insurance. Most programs assume that the user will not annuitize and that instead the problem the user faces is having adequate savings to finance retirement through phased withdrawals over a period of uncertain length.

One of the professional programs addresses this issue in a sample scenario it provides online. In that scenario, it finds an advantage to investing in an inflation-indexed annuity.

None of the programs mention longevity insurance annuities as a payout option, but that may be in part because this is a relatively new option. Longevity insurance annuities start payment at an advanced age, such as age 85. Attractive features of these annuities are that they are low cost, and they can be used to eliminate the risk due to uncertainty as to length of life, since they payoff if the person lives longer than they anticipate (Turner 2009).

WHICH ASSETS SHOULD I SPEND DOWN FIRST?

As exemplified by the treatment of annuities, generally the programs are weak on issues relating to distributions during retirement, as were the programs examined in the prior study. Even the programs that bothered to separate taxable assets from tax-qualified assets rarely made use of this information in building recommendations for the order of distributions. People with assets in accounts facing different types of tax treatment encounter the problem of which assets to spend down first. Should they start withdrawing from their pension (401(k) and defined benefit) accounts and save their non-pension assets, or should they do the reverse? None of the free consumer programs examined addresses this issue.

One of the professional programs addresses this issue in one of the scenarios it provides online, comparing a Roth IRA to a regular IRA. It also permits the user to run different scenarios to explore the tax effect of different spend-down strategies. Some programs assume that taxable assets are spent down before tax-preferenced assets.

SHOULD I CHANGE MY PORTFOLIO DURING RETIREMENT?

During retirement it may be advisable for people to make changes in their portfolio. For example, it may be advantageous for some people to continue shifting toward bonds as they get older. One of the free consumer programs addresses this issue by providing a life cycle fund as an option.

Some of the professional programs use a questionnaire on risk tolerance to advise clients as to whether they should change their portfolio holdings based on their current portfolio not being in line with their risk tolerance. Some programs recommend changing portfolios based on the user facing a shortfall of retirement income.

While changing portfolios is often recommended, either because of an asset shortfall or because the portfolio is inconsistent with the user's self-reported risk aversion, none of the programs takes into account the possible tax consequences of doing so with a taxable account, or even mention that as an issue to consider.

FINANCIAL EDUCATION

An important function of retirement planning software, in particular consumer software, is to provide financial education to users. That role is presumably assumed by financial planners in the case of professional software, though the output of the software can play a role.

The use of the consumer software should be an educational experience. This can occur several ways. First, the software can provide links to related educational information. Second, the software can provide help when it appears that user-provided information, for example life expectancy, may be inaccurate. Third, the software can provide information such as historical rates of return on different asset classes, the average level of Social

Security benefits, and the benefits of purchasing an annuity. Fourth, the use of alternative scenarios can be educational, particularly if the user explores the effect of changing one decision at a time, such as the effect of postponing retirement.

Some websites provide access to brochures providing information about planning for retirement and different aspects of financial management. One website provides a Retirement IQ quiz.

One website provides information on the rates of return on various assets over the period 1999-2008. During this time period, bonds performed substantially better than the S & P 500 index. This information is thus misleading because it represents a short and non-representative time period. Information should be provided for a longer time period.

INSURANCE

Individuals can deal with risks by purchasing insurance or annuities, thereby transferring the risk to a financial institution.

As individuals age, they often face increasingly costly medical care expenses. Insurance can reduce the financial effects of these and other risks. The free consumer software programs we examined, however, generally do not consider purchasing insurance as a strategy for dealing with risk, though that is considered in some software sponsored by companies providing such products (table 5.5).

The programs generally do not deal with the change in medical care coverage when the user becomes eligible for Medicare (case 2, Appendix A). They do not deal with spend down strategies to qualify for Medicaid benefits. Generally, purchasing life insurance to protect the living standard of a survivor is not considered.

The free consumer programs often do not consider long-term care expenses as a separate issue. However, two programs provided by organizations that sell long-term care insurance, and thus have a particular interest in that form of insurance, suggest that users consider the need for long-term care insurance.

In this area, the professional programs differ considerably from the consumer programs. The professional programs explore a much wider range of solutions involving insurance than the consumer programs we examined. Thus, for issues involving insurance, users of software should be aware of the differences between the two types of programs. Some professional programs provide as outputs the amount of life insurance that both husband and wife should have. However, it appears that in determining that value the programs only take into account the earnings of the two people and not the value of production that occurs within the home, which is especially important for a spouse who does not work outside the home. Some of the professional programs have special features for analyzing insurance needs (table 5.6).

Program	Is retiree health insurance considered?	Is life insurance considered?	Is long-term care insurance considered?	Is Medicare and the age of its availability considered?	Are annuities considered as an investment option?	Are inflation indexed benefits or products considered?
Free consumer software	1	1	3	2	2	0
Professional	7	7	7	7	7	1

Source: Authors' compilation

HOUSING

Even though housing is the most important asset for many people, it receives relatively little attention in the programs we analyzed. Often, people remain in the house they had when they were raising children, despite their having a much smaller family during their retirement years. People needing more retirement income could consider downsizing their housing, though that option is rarely suggested or considered.

A question that most programs do not address is whether it would be better to pay down a mortgage before retirement or contribute more to a tax-deferred retirement account. One study indicates that many people would be better off not accelerating the pay-down of their mortgage and instead investing more in their retirement account (Amromin et al. 2006). Another study, however, concludes that it would generally be better to pay down an mortgage than to invest in stocks and bonds outside of a retirement account (Webb 2009).

DIFFERENCES IN ADVICE PROVIDED

Different programs are designed to help people answer different questions. The programs tested all look at some subset of financial and life planning for retirement. The goals and focus of the sponsoring organizations are likely to influence the types of issues dealt with in the programs. It would be helpful for users if the programs provided suitability statements to clarify the type of user or type of issues that they were best suited to address.

Some consumer programs are provided by companies that sell financial products. The programs sponsored by some companies, while providing general information, also provide information about the types of products that their companies sell. One mutual fund company provides this advice, “To ensure your money lasts throughout your retirement, our research suggests you should withdraw about 4% of your total assets during the first year of retirement, increasing that amount by 3% each year to account for inflation.” It makes no mention of annuities as an efficient way of ensuring that “your money lasts throughout your retirement.”

DO THE PROGRAMS UNDER- OR OVERSTATE THE AMOUNT OF SAVINGS NEEDED?

Experts disagree as to how much savings a person needs for retirement. For example, Kotlikoff (2006) argues that the financial planning software he examined overstated the amount of savings needed. That occurred by setting the target consumption rate or target replacement rate too high. Using a single target replacement rate for all circumstances clearly is wrong. For example, the target income replacement rate for a couple with three children that they sent to college would be much lower than for a couple with no children and no college expenses.

A common problem with many of the programs examined, in particular deterministic programs, is that they use rates of return that are too high, either due to user or program specifications. Studies have shown that individuals tend to underestimate their life expectancy.

The combination of overestimating rates of return and underestimating life expectancy would cause financial planning programs to underestimate the financial needs of users. Other errors may offset, however, such as those suggested by Kotlikoff (2006), so that it cannot be concluded that underestimation of needs is the net effect.

Other issues that affect over- and underestimation are the accuracy of Social Security benefits and retirement age assumptions. In addition, the programs differ considerably for some situations as to the amount of resources they estimate are necessary.

TAKE AWAYS

1. The Social Security benefits information produced in many of the calculations is inaccurate. A person can obtain information on their Social Security benefits easily and accurately on the U.S. Social Security Administration's website, or from their annual Social Security benefits statement, if they have retained that. The common practice of determining Social Security benefits based on one year's earnings is highly inaccurate.
2. A key retirement decision for many Americans is when to claim Social Security. The software varies in its ability to help users analyze this issue. Some programs suggest that workers postpone retirement if they have insufficient savings. It is important to encourage individuals to evaluate options for claiming Social Security.
3. Most programs either require the user to determine their target spending in retirement or set that for the user based on a standard that is applied to all users. Greater work needs to be done on analyzing target replacement rates to determine the appropriate way to measure them and what their level should be.
4. As in the previous study, annuitization was rarely mentioned as an option for dealing with risk. The consumer programs do not consider annuities, except when they are

offered by the institution sponsoring the software. While generally the professional programs allow users to enter the income from an annuity as part of their portfolio, they do not advise as to whether a user without an annuity should purchase one.

5. The free consumer software programs generally do not consider purchasing insurance as a strategy for dealing with risk, except for software sponsored by companies providing such products, while insurance is a common tool for dealing with risk in professional programs.

6. The programs leave significant gaps in the advice and information provided about the post-retirement period. The user needs to worry about how much to withdraw from savings and from what type of investment, whether to work in retirement, whether and how to consider housing and housing equity, but most of the programs do little to aid in that consideration. Most also do little to help the consumer understand that the complex tax issues to be considered in setting withdrawal strategies.

Chapter 6. CAPABILITIES – INPUTS AND OUTPUTS

Ease of use relates to the capabilities of the programs to analyze different situations. It also relates to the clarity or intuitiveness of the approach taken for inputting the needed information. It is an important issue, especially for the free consumer programs available on the internet. Even for professional financial planners, however, ease of use is a consideration.

This chapter focuses on software functionality issues that software designers should consider when creating or improving financial planning software. We investigate features that make the programs easier or more difficult to use. We examine both the process of providing inputs, including the ease of interpreting instructions, and the ease of interpreting outputs.

In addition, we investigate the capabilities of the programs relating to their ability to analyze different situations that users may face. In considering capabilities, program developers and users must consider the trade-off between the advantages of covering more types of situations versus the costs of added complexity and increased input time for the user and computational time for the program. More detail, depending on the user's situation may not improve functionality and may make the program more cumbersome to use. The more sophisticated programs resolve this conflict by providing numerous options, with the basic program being relatively easy to run.

A fundamental issue in understanding the programs is that their capabilities vary depending on their target market. Some programs are designed for people with middle- or lower-income and without complex finances, while some programs are designed for wealthy people with complex finances.

INPUTS

Financial planning software can be internet based or computer based. All of the consumer programs and most of the professional programs we examined are internet based in that they can be accessed online, without downloading software. While this makes them easy to access, it also raises concerns about the security of the financial information that users are transmitting over the internet, especially for programs that transmit detailed financial and personal information.

The free consumer programs we analyzed are all fairly easy to use. Most of them have relatively few inputs and clear instructions. Some allow the user to obtain results in 10 minutes or less. In others, 20 minutes may be required. In some, serious users who read the explanation of the methodology and other educational material provided by the software, and explore the options can spend an hour or more. Serious financial planning requires time, and users should not expect that in 10 minutes they would get anything more than a “ballpark” estimate, though such estimates can provide useful information.

The professional programs we analyzed require considerably more time for inputs. For one of the professional programs, 18 different categories of inputs are required. Generally, the professional programs give the user much more control over the inputs, with variability in the range of inputs within programs depending on the options chosen.

Change from Previous Report

The previous report (Sondergeld et al. 2003) noted that only one of the six consumer programs they analyzed provided assistance through help buttons located near the questions on the worksheet. This approach to assistance is now common among the programs we analyzed, suggesting an improvement in the assistance the programs provide to users.

One of the professional programs provides data gathering worksheets for collecting the information to be entered in the program.

Input Mechanisms

The programs use a variety of options for assisting the user in inputting information. Some input mechanisms involve no defaults, and the user is required to input all of the data. Some involve a default that is pre-entered, giving the user the option of providing a different number. None of the programs have “dynamic” defaults that build off of previous inputs.

These defaults can be useful in helping to steer users to consider the possibility of living longer than expected, or possibly of retiring later than they might otherwise have done. Defaults can help prevent people from inputting bad data. Use of defaults is a subtle way of providing suggestions. For example, a default of age 65 for retirement or a default of 60/30/10 for portfolio shares in stocks, long-term bonds, and short-term bonds provides an implicit recommendation to users.

Some people, however, may accept the defaults as the easiest and fastest way to use the software, even though the defaults do not apply to them. Defaults on personal characteristics, such as life expectancy, may be considerably off the mark for some people because of the variation in life expectancy across people.

Some input mechanisms involve sliding bars, where the user slides the bar between zero and a maximum to input the amount. While the sliding bar is easy to use, in some cases the maximum amount may be too low, and in other cases it seems too high, for example a maximum salary of \$500,000, giving the impression that the tool is for a high-income person.

Some programs provide a pop up worksheet that could be accessed to assist the user in calculating the amount to be entered. One professional program greatly simplifies inputs by providing drop down choices.

Inputs should be in the units people are most comfortable using. For example, it may be preferable to have income entered as an annual amount rather than as monthly income, or to offer the choice between the two. Some programs allow the user to input monthly or annual amounts. This approach allows the user to provide the inputs for the most convenient time frame. For many people, a monthly time frame makes most sense when considering cash flow and expenses. Some programs require that pension contributions be entered as a percent of salary. A choice between percent of salary and dollar amount would be preferable.

Some professional programs allow the user to integrate the program with other financial software. For example, one allows the user to enter the user's portfolio from the Schwab portfolio center or the Morningstar Advisor Work Station, if the user is a Schwab or Morningstar client. This time- and error-saving feature allows detailed portfolio information to be entered into the financial planning program without the user having to key in the data.

Internal Consistency and Reasonableness of Inputs

Issues of consistency and reasonableness of inputs are relevant for consumer programs, but are less of an issue for professional programs, where the professional adviser is assumed to not make those types of errors. Users of consumer programs should not be required to input information for which they would not be expected to have expert information, such as the future rate of inflation, future rates of return, or possible future changes in Social Security. In actuality, that information about the future is unknowable, but financial planners may consider it conservative to input information that differs from historical averages. However, consumers risk overstating the resources they will have in the future by inputting high rates of return. On the other hand, consumers should be encouraged to run alternative scenarios so that they have a better appreciation of the effects of various options they might choose.

Many consumer programs lack features of internal consistency. Generally, none of the programs check the relationship between the inflation rate and the expected rate of return on stocks and bonds. When users input data, there is the possibility that the data are not internally consistent or are not sensible. For example, a high rate of return and a low inflation rate would yield a high real rate of return. Some programs allow users to input an inflation rate of 2 percent, which is unreasonably low. By contrast, one of the professional programs warns users that if they change the default on the inflation rate they will also be changing the real interest rates, because the nominal interest rates are not adjusted automatically by the program.

Preventing Careless Errors

A key element in obtaining useful information from financial planning software is the quality of the inputs. No matter how sophisticated the program, bad inputs result in bad outputs. The consumer programs we examined often do not reject inputs that are clearly false. For example, one program accepted an input of Social Security benefits of \$60,000

a year. That program accepted monthly expenditures of \$25,000 a month on a yearly income of \$40,000. Errors of this type can occur due to confusion as to whether inputs are for annual amounts or monthly amounts.

A person's preparedness for retirement is much greater if they have saved \$730,000 than if they have saved \$73,000. However, some of the input screens do not space the numbers a user inputs with commas, as in the previous sentence, making it more likely that careless errors occur as to the number of zeros the user has entered.

Some programs in the outputs provide a summary of all the inputs provided by the user, including the defaults. This output provides a good way of checking for errors in inputs.

The inputs instructions need to be clear when inputting dollars for future years as to whether they are to be measured in today's dollars or in future dollars, taking into account inflation. It is preferable to measure them in today's dollars, which can be more readily determined by most users.

The programs differ on the ease with which the user can correct errors. Some programs allow the user to easily go back to a previous screen, while in some programs, particularly some consumer programs, it is more difficult to change inputs once the user has progressed to subsequent input screens.

Running Alternative Scenarios

The programs should be designed to facilitate entering the inputs needed for running alternative scenarios. One consumer program facilitates this ability by allowing the user to change inputs on the same screen that displays the results, without having to navigate to a different screen. By contrast, some consumer programs require the user to start from the beginning and re-input all data.

One professional program facilitates running alternative scenarios by having a package of pre-programmed scenarios, such as postponing retirement, reducing consumption, or facing a bear stock market in five years. One program calculates how much the user would need to postpone retirement or reduce consumption to have sufficient retirement resources.

Program Calculations

Programs differ in the extent that they make calculations for the user. For example, some programs calculate the effect on Social Security benefits of postponed retirement, while others require the user to make that calculation and then enter the resulting value. A couple of professional programs have a feature that allows the user to enter in the benefit formula for his defined benefit plan to calculate expected defined benefit plan benefits.

Transparency

Transparency of the program relates to the ability of an interested user to understand why results are what they are and why they differ under different scenarios. Some programs provide detailed technical notes to help the user, while some consumer programs provide little background information, treating the program as a black box.¹⁰ For example, how Social Security benefits are calculated, in programs that calculate them, is largely a black box.

Details and Precision

One professional program provides three levels of analysis, depending on the complexity and level of detail desired. At the higher level, the user has greater control over the program, with more parameters that he can control.

While it is important to have accurate information about the key assumptions, the importance of detail in other areas may depend on the issues the user wishes to address. One of the professional programs, in its supplemental materials, states that greater detail can be counter-productive because it is impossible to predict over the next 20 to 40 years changes in many of the important parameters, such as the tax system. More data and more assumptions do not necessarily provide a better prediction of the future. It argues that the programs should make as few assumptions as needed, and focus on goals, savings, and overall returns. Life is inherently unpredictable, and in some areas greater detail may not be important because the inherent unpredictability outweighs the benefits of greater precision. The main purpose of the programs is not to precisely predict a person's financial assets thirty-five years from now. Rather, the programs can help to illustrate the possible consequences of certain financial decisions made today, within specified assumptions.

Phases of Retirement

An aspect of detail and precision is the ability of a program to deal with the timing of events. Some of the free consumer programs only allow the user to specify the timing of retirement. By comparison, some professional programs allow the specification of the timing of sale of a home, the end of a mortgage, the expected onset of the need for long-term care insurance, the end of a phased retirement period of work, a bear market, and other possible scenarios.

Some programs allow the user to determine expected phases of retirement, with the first phase, for example, involving expensive travel for people who can afford that. A Society of Actuaries (2008) report discusses issues relating to phases of retirement. One professional program identifies four possible phases of retirement for a married couple: one retired and one working; one deceased and one working; both retired; and one alive. Another divides retirement among 4 periods – early, middle, late retirement and survivor.

¹⁰ Transparency is one of the points stressed by Fortune (2000).

OUTPUTS

Outputs are provided both as graphics and in print form in tables and text. Most programs provide as an output whether the user will have adequate financial resources to meet his retirement goals. One program, however, provides the level of sustainable consumption given financial resources. Most programs have the user's financial market portfolio as an input. Some programs provide a suggested portfolio mix as an output, based in part of the user's risk aversion and sometimes based on the extent to which they have a projected shortfall in resources. As discussed in the chapter on risks, programs differ considerably in the outputs they provide relating to risks. In addition, the chapter on advice discusses outputs relating to advice.

While one of the free consumer programs provides an annual cash flow analysis, that feature is generally provided by the professional programs, at least in graphical form. Some of the professional programs provide annual output for each adult member of the household. That level of detail is helpful for seeing precisely the output of the program. This feature is particularly useful if the user has specific plans for future expenditures or receipts. For example, if a person in retirement plans to sell his house in five years, or to take a major trip in two years, or anticipates college expenses ending in a couple of years, cash flow analysis can be particularly useful. A graph or table indicating the cash flow can also provide a check that the program is functioning as expected. For example, it can provide a check as to how the program is treating life expectancy and survivors benefits. For most important events in the future, such as the receipt of an inheritance, the onset of a health problem, or the death of a spouse, it is prudent to anticipate such events, but the date at which they, and their associated cash flow, will occur is unknown.

TAKE AWAYS

1. In considering capabilities, program developers and users must consider the trade-off between the benefits of covering more types of situations versus the costs of added complexity and increased input time for the user and computational time for the program. The more sophisticated problems resolve this conflict by providing numerous options, with the basic program being relatively easy to run.
2. Inputs should be in the units people are most comfortable using. For example, it may be preferable to have income entered as an annual amount rather than as monthly income, or to offer the choice between the two. The help functions on consumer programs have improved considerably since the 2003 report.
3. Issues of consistency and reasonableness of inputs are relevant for consumer programs, but are less of an issue for professional programs, where the professional adviser is assumed to not make those types of errors. Many consumer programs lack features of internal consistency, such as determining an economically sensible relationship between the inflation rate and other parameters, including the wage growth rate and interest rate on bonds. They also often do not reject inputs that are clearly invalid or provide warning messages.

4. Serious financial planning requires time. Users should not expect that in 10 minutes they would get anything more than a “ballpark” estimate, though such estimates can provide useful information.

5. Programs differ considerably as to program calculations, transparency, and levels of detail and precision. The professional programs generally allow the user far greater control over inputs than do the consumer programs, where more of the inputs are set as program parameters.

6. Programs vary in the ease with which the user can run alternative scenarios. For some of the consumer programs, it is necessary to re-enter data, while the professional programs generally facilitate running alternative scenarios. Consumers should be aware that there is always a way to run alternative scenarios. For example, they could run a scenario checking the effects of postponing retirement by a few years, which would provide an alternative yet realistic view of the options for retiring.

7. Programs also differ in the presentation of outputs. For example, some provide a cash flow analysis over time, while others only provide a summary as to adequacy of resources.

Chapter 7. ISSUE CAPABILITIES – What Issues Can be Analyzed?

The consumer programs vary in their complexity and sophistication, with some dealing with a variety of issues while others are quite simple. The programs vary greatly in their number of inputs, ranging from six to more than 100 for the free consumer programs, and even more for the professional programs. As a result, the features also vary. Some of the professional programs can be used with relatively few inputs required but with a large number of inputs possible, depending on the features of the program the user wants to access.

Even the more complex consumer programs generally have limited capabilities. They cannot analyze nonstandard family arrangements such as a dependent parent (case 4, Appendix A) or grandparents raising grandchildren. They generally cannot deal with more common family arrangements, such as dependent children. The programs generally do a poor job concerning the income received by a surviving spouse (case 2, Appendix A). They generally do not consider issues of health insurance or long-term care insurance (case 3, Appendix A). By contrast, most of the professional programs are capable of dealing with these issues. Both types of programs generally do not recognize that health care expenses tend to increase with age, though some take a step in that direction by having a higher inflation rate for health care than for other expenditures.

Some programs have associated programs for analyzing special issues, such as whether to convert a regular IRA to a Roth IRA. One life insurance company website has programs for choosing employee benefits, disability insurance, life insurance, long-term care insurance, and for providing for children with special needs.

The professional programs generally allow the user far greater control over inputs than do the consumer programs, where more of the inputs are set as program parameters (table 7.1).

Program	Rates of return	Salary increase rate	Inflation	Tax rates	Retirement income needs or target replacement rate	Life expectancy
Free consumer software	2	0	2	0	3	2
Professional	7	6	7	6	7	7

Source: Authors' compilation

CONSUMPTION AND EXPENSES CATEGORIES

Some of the programs differentiate between different types of consumer expenditures at a detailed level, while others differentiate at a higher, conceptual level. For example, at the

conceptual level, one consumer program allows the user to differentiate between essential and discretionary expenses. One professional program separates expenditures into two categories: consumption and other expenses. Other expenses refer to housing expenses, special expenditures, contributions to a reserve fund, taxes, contributions to retirement accounts, and life insurance premium payments. One professional program separates expenses into ideal and acceptable, and has the user rate his willingness to reduce expenditures below the ideal level.

The consumer programs differ considerably in the level of detail they request concerning expenses. They generally do not have the capability to deal with foreseen, one-time expenses, such as an expensive trip shortly after retirement (case 2, Appendix A). Users need to adjust their asset level to take such expenses into account. Some programs assume everyone has the same needs relative to income, not taking into account the circumstances of people with high credit card or mortgage debt, or persons paying for the college education of their adult children.

One of the professional programs considers the issue of borrowing constraints that impede consumption smoothing during high expense periods in the pre-retirement years, but that is not a consideration presumably during the retirement years.

PHASED RETIREMENT

Some consumer programs and all of the professional programs consider phased retirement by allowing for earnings from work as one source of income during retirement. While phased retirement with a career employer is uncommon, phasing into retirement by continuing in employment after leaving the main career job is more common. Programs differ in their flexibility as to specifying income flows that last for specific periods.

TAXES

The professional programs pay much more attention to tax issues than the consumer programs. This result is not surprising, given the fact that financial professionals are more likely to be working with relatively affluent consumers, to whom taxes are a major concern. One consumer program instructs the user to input information after tax, which would be a reasonable approach for people who had that information. Other consumer programs generally ignore taxes.

One of the professional programs has detailed information about taxes, including the tax systems in each of the states. The program provider updates the software to take into account changes in taxes, including changes in all of the states. This program allows users to specify different tax rates in the future than in the present, though most users would presumably not be qualified to make an informed specification. Many people apparently believe that tax rates will be higher in the future than in the present, but the accuracy of that prediction is unknown.

One professional program taxes all income pre-retirement at the marginal rate, which is higher than the average rate due to the progressivity of the income tax structure. It does so arguing that this approach is more conservative. It thus provides an overestimate of taxes paid and an underestimate of after-tax income.

The more sophisticated professional programs keep track of both the market value of a taxable asset and its tax basis so that the amount of tax paid can be determined when the asset is liquidated. They also keep track of the pre-tax and after tax contributions to pension plans. The professional programs do a better job than the consumer programs in dealing with the tax treatment of tax-preferenced assets.

ESTATE PLANNING

Estate planning involves leaving assets to heirs in a tax-efficient manner so as to minimize the amount of estate tax paid. Most people are not subject to estate taxes, however, because their estates are too small. This is important for higher-income and higher-asset persons. Only one of the free consumer programs takes into account the user's desired estate. That is done in some of the professional software programs, but some of the professional programs do not request the user to specify a desired estate.

The estate tax law has sunset provisions, so that without further legislation, the current law will revert to the law in effect in 2001 for most aspects of the law. The professional programs generally recognize this situation.

MARITAL AND FAMILY ISSUES

While three of the consumer programs we examined ask for information on spouses, including their income and their savings, only one identifies the gender of the spouse, which may be important in determining the planning horizon for the different spouses. However, two ask for the life expectancy of the spouses, so that gender information is not needed to determine life expectancy. Two ask for the expected retirement age of the spouse. Separate retirement ages or retiring at different times cannot be handled in other programs, which is a problem given that many people do not retire at the same time as their spouse (table 7.2).

Because some of the consumer programs have no option for separately entering information for spouses, they are incapable of assessing whether the survivor has adequate income. While not asking about spouses may be less important in one-earner households and may be irrelevant in single households, given the prevalence of two-earner couples, these programs need to improve their treatment of two-earner couples.

For one professional program, the default on consumption expenses is that the survivor will have expenses at half the level of when the couple was alive. This default does not take into consideration economies of scale in consumption, which would indicate that the survivor would need more than half the amount of the couple. One professional program scales consumption needs by the number of people in the household, taking into account

economies of scale in consumption (two can live more cheaply per person than one) and taking into account that the cost of children differs from the cost of adults and varies by their age. The default scale is that two adults can live as cheaply as 1.6, or alternatively that it costs one person 62.5 percent as much to live as it does two people. By comparison, another program assumes that it costs one person 80 percent as much to live as it does two people. Thus, one program assumes that the living expenses of the survivor will be nearly 30 percent higher than the other program. This wide range suggests that this is an area where further work is needed to determine a reasonable value. Consumer programs we analyzed that set a target replacement rate generally do not take into account that two people can live more cheaply per person than one.

The consumer programs generally do not deal with non-spouse dependents, while the professional programs do have the ability to include them in the calculations.

Program	Spousal information	Information about spouse provided				
		Gender	Retirement age	Income	Savings	Life expectancy
Free consumer software	3	1	2	3	3	2
Professional	7	7	7	7	7	7

Source: Authors' compilation

Women generally outlive their husbands, and they are less likely than widowed men to remarry. Many free consumer programs do not do a good job of dealing with planning issues relating to surviving spouses. One program allows entering separate information for both spouses but assumes both retire at the same date. Some programs do not adjust target spending or the replacement rate for the death of a spouse.

The free consumer programs we analyzed generally do not deal with the problem of providing adequate retirement income for a surviving spouse. For example, none of them recommend purchasing an annuity with a survivor's benefit, but none of the professional programs we examined recommend that either.

Program	Husband and wife treated separately?	Number of dependent children	Dependent status of parents	Grandparents taking care of grandchildren
Free consumer software	3	0	0	0
Professional	7	7	7	7

Source: Authors' compilation

IRAs

One consumer website provides three programs for managing an IRA: a program for how much a person can contribute to a traditional and Roth IRA, a program for comparison between the two types of IRAs, and a program for whether it makes sense to convert a traditional IRA to a Roth IRA.

One professional program allows the user to calculate whether a traditional or Roth IRA would be more favorable. If taxes rise significantly in the decades to come, and if post-retirement income levels are not much lower than pre-retirement income levels (i.e., replacement ratios are high), then conceivably some retirees could face higher post-retirement tax rates than pre-retirement tax rates. If so, then the Roth IRA would be especially attractive. The choice between a Roth IRA and an IRA depends in part on expectations as to future tax rates. All the professional programs we examined distinguish between a Roth and a traditional IRA, while some of the consumer programs do.

REQUIRED MINIMUM DISTRIBUTIONS (RMD)

While required minimum distributions (RMDs) from pension accounts are generally ignored by consumer programs, some of the professional programs incorporate them. If the RMD causes the income flow to exceed the projected expenses, the excess is reinvested in one program (case 6, Appendix A).

STOCK OPTIONS

None of the consumer programs we examined, but some of the professional programs, have capability for dealing with stock options, which is not an issue for most lower- and middle-income users. One program designed for high-income users has a detailed structure for incorporating and analyzing stock options, with the analysis based on the historical performance of the actual stock (case 5, Appendix A). A related issue is stock shares, such as company stock issued within profit-sharing and 401(k) plans. There are special rules for the distribution of stock from qualified retirement plans. If the stock has appreciated in value, owners have the option of taking the stock out of the plan, paying income taxes on the initial cost basis of the stock, and then paying capital gains when the stock is eventually sold. Generally, the programs are not capable of dealing with these issues.

TAKE AWAYS

1. Users of these programs should be aware that they differ considerably in their capability to handle certain issues, such as taxes.
2. Stock options and required minimum distributions from 401(k) plans are examples of issues that the professional programs handle, but none of the consumer programs examined do.

3. The consumer programs examined generally could do a better job of dealing with two-earner couples.

CHAPTER 8. PRINCIPLES OF THE RETIREMENT INCOME INDUSTRY ASSOCIATION

The Retirement Income Industry Association (RIIA) has established principles for statements of advice concerning retirement income planning. Many of these principles relate to aspects of risk.¹¹

Because these principles propose industry standards, we comment on how each of these principles applies for the programs we examined. Table 8.1 summarizes the results by counting the number of programs we examined that meet the criteria.

RIIA PRINCIPLES

1. Uncertainty should be recognized by phrasing outcomes in terms of probabilities.

Uncertainty is recognized in programs using the Monte Carlo approach. In deterministic models it can be recognized by running alternative scenarios. Alternative scenarios can allow the user to focus on changing different variables, one at a time or in combination. For example, what is the impact of retiring five years later or earning one percent more on investments?

2. The assumptions used should be disclosed so that differences in outcomes can be understood as being due to differences in assumptions.

Often basic assumptions appear only in technical notes, and some issues are not explained. For example, it is often unclear what happens to expenses and income after the death of a spouse.

3. The mortality table used should be stated, with different mortality tables being suitable for different parts of the population.

Some consumer programs do not use mortality tables but instead assume that people will live to a set age, such as 95 or 100. Some consumer programs use the same mortality tables for men and women. Two programs we examined allow the user to estimate his or her own life expectancy based on risk factors. None differentiate by race, ethnicity, or education and income levels. Users may implicitly do so in programs where they can set their own life expectancy, which is generally the case in the professional programs.

4. Different inflation rates would be applicable to people of different ages because of the differences in what they consume.

None of the consumer or professional programs we examined use different inflation rates for people of different ages, though two consumer programs have a different inflation rate

¹¹ RIIA is a national, not-for-profit association focused on post-retirement income and risk. As far as we know, these are the only principles that have been proposed for statements of advice regarding retirement income.

for health care expenditures than for other expenditures. It is not clear what the source of the data would be for different inflation rates by age. The Bureau of Labor Statistics has an experimental inflation rate series for people age 65 and older, but it does not produce age-specific breakdowns in inflation rates by smaller age groupings. None of the programs use different inflation rates based on stage of retirement.

5. Monte Carlo techniques are more reliable when a large number of trials are run. The results should indicate the standard errors.¹²

In the programs we examined, the number of trials run varies from 150 to 10,000. We interpret this standard as requiring at least 1,000 runs. The standard errors are inputs to the process, and are provided in most of the professional programs. However, the standard errors for the outputs generally are not provided.

6. The results should indicate the various components of risk. The probability of failure is only one component of risk. The magnitude of failure is another.

The Monte Carlo programs indicate the probability of failure and generally indicate the shortfall in terms of annual consumption. The deterministic models indicate the shortfall but not the probability of experiencing the shortfall.

7. It is not reasonable to model a single interest rate over time. The yield curve (or term structure of interest rates) generally suggests that interest rates will vary over time.

None of the programs we examined use a yield curve but some allow the user to vary the interest rate over time.

8. The precision with which outputs are shown should avoid giving a misleading impression as to the degree of accuracy.

Generally, the smallest unit of dollar values for financial flow variables is \$10 per month, so that, for example, consumption might be measured as \$3,320 per month. One program highlights that it produces results that are precise to the dollar, which may provide a misleading impression of the degree of accuracy since future outcomes for many aspects of financial planning are unknown.

9. Use of terminology should be consistent across models and terminology used should be at a level that is understandable by the general public of users.

The models generally do well by this measure of understandability.

¹² The standard error is the standard deviation divided by the square root of the number of observations.

Table 8.1. RIIA criteria									
Program	Criteria								
	1	2	3	4	5	6	7	8	9
Free consumer software	3	5	0	0	0	5	0	5	5
Professional Programs	7	7	0	0	2	7	0	6	7
Source: Authors' compilation.									

TAKE AWAYS

1. Some of the RIIA Principles are not met by any of the programs we analyzed. For example, none of the programs use a yield curve for interest rates, but some allow the user to set different interest rates for different time periods.
2. Some of the programs do not recognize uncertainty by phrasing results in terms of probabilities.
3. The RIIA proposes using different inflation rates for people at different ages, but it is not clear how this proposal would be implemented because the official inflation statistics do not recognize that distinction.
4. The models generally meet the RIAs measure of understandability.

Chapter 9. RECOMMENDATIONS, RESEARCH QUESTIONS, AND CONCLUSIONS

There are a variety of stakeholders to be considered in successful retirement planning. Our recommendations are provided as general overall recommendations and specific recommendations to different stakeholder groups: consumers, manufacturers, financial planners/advisors, financial service companies, and actuaries. This structure was used in the 2003 study.

Our recommendations suggest improvements that the manufacturers of these types of programs might make if they are compatible with the goals of the organization and the goals for the specific software program. Some programs have these features, but we suggest that for those who do not, that the manufacturers might consider them.

Many of the findings of the 2003 study still hold. Therefore, we first list recommendations from the previous study that are still valid, followed by our recommendations.

This chapter includes recommendations for specific stakeholder groups, general recommendations and questions for future research. It concludes with some general conclusions.

RECOMMENDATIONS

Consumers¹³

Recommendations from the previous study:

- Consumers should identify the issues that are important to them personally. For example, if their home is a large part of their assets, they need to understand how it is treated in the programs they choose to use.
- If an individual is part of a dual-income couple, be sure the program handles both spouses' incomes.
- Run several scenarios if using a deterministic program. In addition to incorporating assumptions that demonstrate consumer expectations (e.g., rate of return on assets, inflation, longevity), they should also run best and worst case scenarios.
- Understand that risks can be inter-related. For example, some people may have high acute care and long-term care expenses.
- Setting assumptions requires expertise. Attempt to ensure consistency across assumptions. In some cases, consumers may be better off seeking professional advice.

¹³ This list of recommendations for consumers is taken from the previous report.

□ Consumers must understand the qualifications of advisors and have advisers explain the assumptions used. They must also understand the purposes the program was designed for and that their situation fits into those purposes. Precision of outputs should not be conflated with accuracy.

In addition, we make the following recommendations.

- Because of the importance of Social Security benefits for the majority of people's finances, users should make an attempt to provide accurate information about their likely future benefits, or for programs that provide the benefit level, make sure that the estimated benefits are accurate for their situation. The best approach is to use the benefit calculator at the Social Security Administration's website, which calculates benefits based on the person's actual earnings history.
- Households that invest aggressively should spend defensively. None of the consumer programs take that relationship into account.

Software Manufacturers

Experience Using the Software

Recommendations from the previous study:

Links

□ Programs should improve user friendliness with help screen links next to corresponding inputs. This would greatly reduce the difficulty and frustration involved in finding appropriate information. More important, this reduces the likelihood that a user will overlook something important.

Data manipulation

□ Programs should reduce the amount of data manipulation that is needed by users by including more fields and worksheets. Having to perform data manipulation makes the process much more tedious and reduces the value of the program. Allowing for itemization of expenses, income sources, and assets can help to reduce the possibility of miscalculation.

□ Programs should provide more expense breakdowns because it is difficult to determine overall expense figures. In particular, programs need to separate expenses related to specific post-retirement risks such as medical or long-term care expenses. Some of these costs may also be tax deductible. They may also have different inflation rates.

Periodic update capability

□ Programs should suggest that users rerun their analysis from time to time since people's circumstances almost certainly will evolve over time. Rather than redoing the analysis entirely, programs could offer an "update" module that allows users to easily adjust inputs periodically.

Capabilities

Income/expense adjustments

- Programs should allow income and expense needs to vary over time because these needs can change. Expenses do not usually increase at a steady, linear rate throughout retirement — they vary depending upon various factors, including health status, spousal mortality, statutory age of distribution requirements, and the overall economic environment.

- Consider having programs solve for expenses. Often income is pre-determined in retirement whereas expenses are not. Aside from withdrawals from financial assets, typical income sources such as defined benefit pensions and Social Security are generally set by the time an individual retires. Expenses, on the other hand, can be modified within certain limits. For example, once basic living expenses are covered, a retiree might make ends meet by cutting back on travel or entertainment costs. Retirement programs might focus on helping individuals to manage their expenses, given their income constraints.

- Programs should categorize income sources as guaranteed or not. A pie chart showing Social Security benefits, pensions, and lifetime payout annuities in one color, and work income, asset distributions, and other sources in a different color might be effective, if shown in combination with recommended percentage.

Home equity

- Programs should include specific input and processing for home equity. Retirees can access their home equity through loans, reverse-mortgage annuities, or by selling their home and moving into a less expensive residence. To be useful to individuals who intend to use their home values to finance their retirement, programs must be able to accommodate these situations.

Client specific

- Programs need to include more client-specific goals in their analysis. Doing so will make the analysis more relevant to the individual's particular needs.

- Programs should ask specific questions about current and expected health status in order to assess the need for long-term care. If individuals need it, LTCI (Long-term Care Insurance) should be recommended to insure against long-term care costs. The cost of uninsured long-term care could be directly compared to LTCI premiums over time.

Nonstandard characteristics

- Nonstandard characteristics or circumstances (e.g., immigrants who had not worked enough years in the U.S. to qualify for full Social Security benefits, an elderly mother sharing living expenses with her daughter) posed a challenge to the software. The individuals in these scenarios are not typical, and are difficult to anticipate when creating the programs; however, they are often the very people who require the most guidance.

Dependents

□ Programs need to allow for inputs other than clients and spouse. For instance, children and grandchildren can be important considerations in post-retirement planning. Some individuals also care for brothers and sisters, other family members, or friends.

Social Security adjustments

□ Social Security will likely remain an important source of retirement income. Therefore, programs must be able to provide useful processing for users facing a variety of situations, including the death of one's spouse, taking early Social Security benefits, and working while receiving benefits.

□ The relative importance of Social Security adjustments varies by market segment. For roughly 40 percent of the retired population this is nearly all of their retirement income, but this group is unlikely to be using professional planners. For the roughly 50 percent in the middle, this is very important. For planners geared toward high-net-worth individuals (the top 5 percent or 10 percent of the population), this is less important since Social Security is a smaller portion of their income.

Updates

□ Programs should provide periodic tax law and 401(k) limit updates. This feature will keep the programs from becoming obsolete. This feature would be useful because retirement analysis should be updated periodically. Alternatively, programs could allow users to manually adjust these limits in the program itself. For instance, one of the consumer programs allows users to adjust 401(k) and IRA limits.

Risks

□ If the client is not comfortable with the risk as demonstrated, then solutions for managing that risk should be explored. Programs should be able to incorporate these solutions so the client can see the magnitude of the risk decline when the solution is illustrated or implemented. For example, if longevity risk is at a level the client is uncomfortable with, then the program should be able to demonstrate the impact of annuity income on the scenario.

□ If a deterministic approach to mortality is employed, care should be taken to guide users in selecting a sufficiently long time horizon. Programs should educate users regarding the likelihood of survival to specified ages for both individuals and couples.

□ Programs should be able to handle the consequences and resultant impact on cash flow because of the death of either or both spouses.

□ For consumer programs, the output should explain non-deterministic analyses (e.g., Monte Carlo procedures) using straightforward language and real-world examples.

□ Consider including inputs for needs that could be addressed through risk-transfer products such as long-term care insurance, health insurance, or life insurance.

In addition, we make the following recommendations for organizations that do not already have these features in their programs.

Social Security

- Because of the importance of Social Security benefits to most people, the programs should place special emphasis on obtaining or providing an accurate estimate of people's expected Social Security benefits. Programs should integrate with the Social Security website, allowing users to calculate their Social Security benefits based on their actual earnings histories. This issue is not important for very wealthy individuals and families.
- Programs should note that delaying claiming of Social Security benefits (up to age 70) will raise Social Security benefits.
- Because of the importance of Social Security, it is desirable for programs to provide guidance as to the best age at which to claim Social Security benefits.

Inputs

- To give programs greater flexibility for dealing with special circumstances, users should be able to enter the amount of income they need in retirement. This feature is available in all the professional programs but not in all of the consumer programs. This one feature would greatly expand the capabilities of the software to deal with the needs of users who have dependents or who have health issues that cause them to have greater needs.
- To reduce data input errors that can occur when a number of zeroes are entered for dollar amounts, the software should automatically add commas to facilitate the user checking the amount.
- To reduce data input errors due to miscalculations, the user should be able to choose between monthly or annual values for most dollar amounts, and between dollar amounts and percentages when inputting pension contributions.
- To avoid “money illusion” arising from the large dollar amounts associated with future dollars at future price levels, all dollar amounts should be entered, analyzed, and output in current dollars. Alternatively, the choice should be offered between current dollars and future dollars. In either case, the program should provide an explanation of the difference.
- Programs should have reasonable limits on user-provided inputs. For example, one deterministic consumer program limits rates of return to between 3 percent and 7 percent.
- Deterministic programs should advise users to input conservative (low) rate of return assumptions and conservative (high) life expectancy assumptions as a way of dealing with risk.

- An error can be made by entering annual values where monthly values are required because the user thinks of that amount in annual terms and assumes that is the way the information would logically be input. Thus, programs need to check to make sure that users are not making this mistake.
- Programs should provide short cuts for users who do not want to enter a lot of detail. For example, users should have the option of entering total expenses if they do not want to fill out a detailed expense worksheet.
- Programs should provide basic information on which users would not be expected to have expert knowledge. For example, consumer programs should provide the future inflation rate, rather than having that as a user input.
- Programs should facilitate the user running alternative scenarios. They should allow the user to rerun the program with the data already input, but providing the ability to easily modify some of the inputs. One program allows the user to do this on the same screen that the results appear.
- Programs should check for consistency between assumptions if the user inputs the inflation rate. For example, the relationship between the inflation rate and the wage growth rate, the interest rate, and rates of return should be checked.

Issues Relating to Married Couples

- Programs should take into account economies of scale in consumption, so that the target consumption rate for two people would be less than twice that for a single person.
- Programs should allow the user to enter separate retirement ages for the husband and wife.
- Because of the importance of providing adequate retirement income for surviving spouses, programs should allow entry of separate data for each spouse, and should clearly indicate the amount of income that continues following the death of the first spouse. Alternatively, programs should include a statement on limitations of what questions they can answer.

Life Expectancy and Planning Period

- Programs should allow users to input their own life expectancy because of the large differences in life expectancy across people. Programs should also provide information assisting people in doing so and noting that many people underestimate their life expectancy, which would cause them to underestimate their retirement income needs.
- Some consumer programs set the end of the planning period at age 95 and do not allow the user to override that assumption. That feature greatly overstates the amount of required resources for persons with relatively short life expectancy. Programs should permit this assumption to be overridden.

- Users should be able to specify their planning period, acceptable probability of success, and target income level. Guidance should be available on these issues, limits should be set on allowable assumptions, and queries should be raised on questionable (but allowable) assumptions.
- An alternative approach to dealing with the length of the planning period would provide information as to the adequacy of resources if death occurs at different ages. For example, in a deterministic framework the output could indicate that a particular individual would have adequate resources if death occurred at age 80 but not if it occurred at age 90 or later. For a couple, the output could indicate that they had adequate resources if death of the surviving spouse occurred at age 90 or earlier but not at age 95 or later. This approach would require deterministic programs to automatically run scenarios with death occurring at ages 80, 90 and 95.

Monte Carlo Programs

- Monte Carlo approaches should consider whether they are giving adequate weight to large increases or declines in the stock market. There is some evidence that approaches using bell curve distributions underweight extreme events.

- The descriptions of the Monte Carlo simulations would be improved if they clearly disclosed:

1. The length of the planning period
2. The probability standard for success
3. The measure of retirement income adequacy; and if that is a replacement rate the income measure in the numerator and the denominator.
4. A clear statement of which variables are stochastic.
5. A statement on the limitations of the stochastic approach.

Outputs

- When users have insufficient savings, programs should always include as one of the recommendations postponing retirement. They should include how much more the person would need to save per month, up to a reasonable maximum. If the total amount needed to be saved per month exceeds some maximum, the advice should indicate that and strongly recommend that the person consider working longer. There should also be standard language regarding the risks associated with assuming that one can continue to work until the desired retirement age.

- Programs should consider improving the extent to which they provide financial education, given the documented low level of financial sophistication of many users.

- Programs should have as a feature the purchase of an annuity, so that users can see the effect on risk of outliving one's resources by doing so.

Financial Planners/Advisors

The following recommendations from the previous study are still valid.

- Some financial advisors specialize in a particular aspect of retirement, and often the area of specialization is product based (e.g., annuities, long-term care insurance). They will likely focus on programs that emphasize their specialty. In order to provide retirees with comprehensive retirement planning advice, planners should consider an approach that involves referrals to specialists in other aspects of retirement or collaborate/partner with others to provide this comprehensive service.

- Advisors who provide financial planning for individuals in their accumulation years should be cautious about applying the same tools (or programs that use the same approach) to post-retirement planning. Pre-retirement planning generally involves developing a savings strategy and using appropriate asset allocation and investment vehicles over the course of a known time period. Postretirement planning needs to address a complex set of risks over the course of an unknown time period. Programs that treat post-retirement the same as pre-retirement could frame the postretirement strategy inadequately. This recommendation does not discount the definite link between post-retirement and pre-retirement goals and considerations. It also does not account for drawing the line in phased retirement or situations where there is no clear cut point of switching from pre- to post-retirement.

- Retirement planning programs, particularly when designed for professionals, require additional interpretation by a financial planner or advisor. Sometimes many of the recommendations are left to the professional. Planners who are relatively new to the business might benefit from a program that contains more built-in guidance and structure.

- Planners need to be in frequent contact with clients to know of any changes that could adversely affect the plan they have provided. A regularly scheduled follow-up with clients to examine how the plan is proceeding and any changes that need to be made is a good idea.

- Since capabilities and results vary widely across programs, professionals should purchase multiple programs to help validate results before making recommendations to their clients.

In addition to the recommendations provided by the previous study, we recommend the following.

- Given the importance of Social Security benefits to most persons, financial planners should make a special effort to obtain accurate information for estimating future Social Security benefits. The best approach is to use the benefit calculator at the Social Security Administration's website.

- Financial planners should be careful to use rates of return that take into account fees, and that take into account the tendency for consumers to have lower rates of return than the market because of the timing of their investments.
- Financial planners should take into account taxes on capital gains when recommending changes in portfolios for taxable accounts.

Financial Service Providers

The following recommendations were made by the previous study, all of which still are valid.

- Providers should be selective in which programs they advocate for use in retirement planning. Priority should be given to those programs where multiple retirement risks are examined, particularly those risks that are interdependent. Programs that focus on risks will not only benefit the retiree, they will also naturally frame the analysis in terms of insurable events, which will benefit insurers.
- In order to illustrate the benefits of a provider's products and services, programs could be customized. For example, a long-term care insurance provider's retirement planning program might show the impact of long-term care costs without insurance, compared to a policy possessing the costs and features of one sold by the company.
- Customers who are educated about post-retirement risks will be more likely to appreciate their impact. Consumer-driven programs should therefore contain abundant information about market performance, inflation rates, health care costs and long-term care costs. They must also contain guidance and recommendations specific to the customer's needs.
- Providers need to examine whether developing their own proprietary software is feasible. They should analyze whether they have enough financial advisors to justify the cost, if they have the technical assets to develop and support the software, and whether they can improve on existing software.

Actuaries

The following recommendations were made by the previous study for actuaries, all of which are still valid.

- Many actuarial risks are not included in these programs. Therefore, actuaries are best suited to help develop methods for demonstrating retirement risks and the impact of various management techniques on those risks. This would include how to analyze multiple risks simultaneously and the impact of utilizing different methods for different risks.
- In developing ways to treat retirement risks, actuaries should consider the interaction of

various risks.

- Actuaries should assist in improving programs to help users understand the tradeoffs of risk transfer approaches.
- Actuaries could also identify and communicate specific risks for the financial and retirement planning professions to incorporate when planning.

RESEARCH QUESTIONS

In the course of preparing this report, we have identified a number of unanswered research questions.

1. How should retirement adequacy be measured?
2. If replacement rates are used, what values should they take?
3. Should target replacement rates differ across people, and if so on what basis?
4. Should single-person households, single-earner couples, and dual-earner couples all have the same target replacement rate?
5. Should target replacement rates differ by age of retirement?
6. Should widows have the same target replacement rate as they did while their spouse was alive?
7. What should be the length of the planning period, and how does that vary across people?
8. For stochastic models, what probability of success should be used in determining whether the user has saved adequately?
9. What rates of return should be used in deterministic models?
10. What parameters should the program provide values for? Inflation rate? Rates of return?
11. What parameters should the user provide values for? Life expectancy? Standard of living in retirement?
12. Why do the programs differ in ways that lead to different outcomes? Are the differences purely the result of the different backgrounds of the programmers, or are there other explanations relating to the financial interests of the providers that cause the programs to differ in their results?
13. How do people interpret Monte Carlo results, and on how is their interpretation affected by different formats in which it is presented?

CONCLUSIONS

Financial planning should be understood as not providing precise answers because the future is unpredictable. Given the inherent uncertainties of life, it is generally not possible for people to establish a retirement plan and then rigidly follow it. Rather, as life unfolds, with unexpected positive and negative events, people need to adjust their retirement plans as to expected date of retirement, expected length of retirement, needed amount of savings, and sustainable level of consumption. Nonetheless, a major benefit of financial planning software is that it makes it easier for people to plan for the future.

Two major shortcomings of the consumer programs analyzed are their treatment of Social Security benefits and their treatment of future rates of return. Social Security benefits are a major source of retirement income for most people, but most programs could do a better job on obtaining better estimates. Concerning investments, studies have documented that workers tend to earn less than stock market averages. In addition, rates of return in the future may be lower than in the past. It appears that many programs or users may use overly optimistic assumptions on rates of return.

Most of the free, web-based programs could do a better job of limiting the range of inputs on rates of return. They could do a better job of dealing with spouses and the resources available to a survivor. They could incorporate economies of scale in consumption and express all monetary values in current prices.

Some areas clearly need further research to provide guidance to software developers. Research needs to focus on what should be the target criteria – the length of the planning period, the measure of adequate retirement income, and the minimum standard for probability of success.

The main conclusions of the previous study (Sondergeld et al. 2003) are still valid. The following conclusions are taken from the previous study:

- Combined, the tools analyzed have an extensive list of features and capabilities. Their value is in helping people estimate income, retirement needs, and spending.
- The programs varied greatly on their inputs and how to treat various situations. For example, the handling of home equity ranged from no treatment to programs that automatically withdrew income from the home each year. It was difficult to accurately portray each case study in any program or to do so consistently across programs.
- Because of the variety in the programs' inputs, capabilities, and results, direct comparisons of a wide range of results was impossible. However, there is tremendous variability across programs regarding when the assets ran out, if at all.
- These programs are merely tools to help facilitate the retirement planning process and there is no right answer. Nor is there any general agreement on the right answer or how to arrive at it. The results from any program should not be used as the sole input for decision making for retirees or prospective retirees. It is very likely that professionals using these programs consider many of the issues raised in this report and may also do so out of recognition of the limitations of the program(s) they have chosen to use. (End of conclusions from the previous study.)

Comparing our study with the previous study, for the programs we analyzed we found improvements in several areas: a greater use of Monte Carlo techniques and a greater amount of help provided the users by the programs.

Chapter 10. WHAT CONSUMERS SHOULD KNOW WHEN USING RETIREMENT PLANNING SOFTWARE

1. Programs are designed for different target markets, and they are focused on answering different questions. Depending on the individual's situation, some programs will offer a good match to needs and others will not. The individual needs to find a program that matches their personal situation.
2. Different programs (that look similar to the user and ask for similar input) may give very different results. If you talk to multiple experts, often they do not agree on the best strategies or the underlying methods that are used as the basis for programs.
3. Many people retire earlier than they had planned because they were laid off, their health declined, or they needed to retire to take care of a family member. In retirement planning, allow for an extra cushion of savings in case this might happen.
4. Many people underestimate their life expectancy. When using financial planning software, it is generally a good idea to use an age higher than your life expectancy because of the probability of living longer than your life expectancy. Alternatively, plan to have enough guaranteed life income to meet your minimum expense needs, or plan to have an extra cushion of assets. Life expectancies for a 65 year old male and female are approximately 17 and 20 years, but differ by race and income level. .
5. Many people overestimate future rates of return in financial markets. When using financial planning software, it is a good idea to use a conservative estimate for future rates of return. It is recommended that you test alternative scenarios to understand the difference based on different rates of return. Negative returns in early years can have a devastating effect on a retirement plan.
6. Social Security benefits are a major part of most middle income American's retirement income. You can get an estimate of your Social Security benefits from the Social Security Administration at the following website: <http://www.ssa.gov/estimator/> . Some of the programs set the rate of increase for Social Security benefits in payment at less than the rate of inflation. By law, they are indexed in line with consumer prices. If you have worked at several jobs or were not in the labor force for some years, it is important to use the government estimator to get a good estimate.
7. Financial planning software differs in how it handles housing as a retirement resource. If you are not planning on selling your house, you should check to make sure the software does not assume that you will use your housing equity to finance retirement consumption. Financial planning software often does a poor job of dealing with housing market risks. If you have a variable rate mortgage and are at risk of housing market declines, the software generally is not capable of handling these risk factors or understanding the implications of these risks.
8. Some financial planning software does not do a good job of dealing with two-earner couples. Couples in that situation should check to make sure the software handles that issue adequately.

9. Financial planning software generally does not recommend some of the options that are available for dealing with risks. These include purchasing an annuity that has an immediate start at the beginning of the payout period, purchasing an annuity that starts at an advanced age (called a longevity insurance annuity), and purchasing inflation indexed Treasury bonds (called TIPS).
10. Some of the programs have a bias toward investing in risky assets. They recommend investing in riskier assets if the person has inadequate resources saved for retirement. They do not take into account the taxes generated by selling assets in non-pension accounts.
11. When using retirement planning software, you should try different “what if” scenarios, such as what if I postponed retirement, got a different rate of return, was forced to retire early, etc.
12. Serious financial planning requires time, and users should not expect that in 10 minutes they would get anything more than a “ballpark” estimate, though such estimates can provide useful information.
13. Finally, it is important to note that the value provided by these programs is very much dependent on accurate input and on careful review of all the output. A sophisticated output is of little value unless carefully reviewed and understood. A presentation to a financial planner that is not conveyed to the ultimate consumer does nothing to educate the consumer.

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Appendix A. Six Cases

These six cases were developed for this project by the Program Oversight Group.

Case 1. Sue Singleton

Sue Singleton is a recent divorcee, age 60, after 35 years of marriage. She just went back to work as a receptionist in a dental office. She makes \$30,000 a year. Her general health is fine. Her family has a history of heart problems that emerge during their late 60's and early 70's; however, she expects to live to age 87. She has health insurance now through her employer, but will need to pay for her own when she retires at age 65 at a cost of \$300/mo. for a Medicare supplement. She will also need to pay Part B and Part D premiums.

Her ex-spouse was a truck driver for a fast food company, who averaged \$45,000 per year when he recently retired at age 65. His company only had a 401(k) for retirement savings. Sue receives a \$350 per month alimony from the divorce until she reaches age 65, when she wants to begin collecting Social Security based on his earnings. As a divorced spouse who was married for more than ten years, she can collect 50% of her former husband's benefit while he is alive and that increases to 100% of his benefit if he should become deceased. Sue's former husband dies when she is age 75. From the divorce, Sue got their primary residence (it is fully paid for, and currently worth \$90,000) and her share of her ex's 401(k) (which she rolled over into a Roth IRA because she was told it was a good thing to do; invested half in conservative equity mutual funds and half in treasury bonds), currently worth \$60,000. Her ex got the cottage up north, the fishing boat, the pontoon boat, the all-terrain vehicle, the two jet-skis and the two ski-doods.

Her three children are grown, but not in a position to help out Sue if she needed help in a major way, either financially or physically, since they all live in other states. She also doesn't want to be a burden to them. Because of this, she would like to get LTC insurance, but doesn't feel she can afford the \$150 a month it would cost now for a policy with a 3 month waiting period.

Sue was a stay-at-home mom until her children all left, and then had to take care of her ailing mother full time for almost ten years. Because of her mother's extended illness, there are no other assets left for a possible inheritance to help Sue out during her retirement years.

Sue wants to stay in her house as long as possible. The house is 20 years old; they purchased it for \$50,000 when it was 5 years old and it is now worth \$85,000. The taxes are \$1500 per year.

Even though it leaves her little leeway, out of her \$30,000 earned annual income she is diligently setting aside 10% a year in an IRA (that earns 5% at the credit union), knowing she will eventually need to sell her house to pay expenses during retirement (which she doesn't want to do). She has accumulated about \$4,000 in her IRA to date. She hopes

that the extra money in the IRA will allow her to put off selling the house for as long as possible. Her annual living expenses are \$20,000.

Sue also wonders what the benefits would be if she were to continue working until age 70, since her health is currently good. How much more Social Security might she get? Would she be that much better off and maybe not have to sell her house if she were to work 10 more years, versus five more years?

Testing for:

1. Working past age 65; changes in SS benefit
2. Using home as a primary retirement asset
3. No employer retirement plan
4. Reverse mortgage for retirement
5. Social Security benefits based on divorce and prior marriage

Case 2. Hal and Karen Middleman

Hal Middleman, age 64, has recently retired from his job as a manager of a local grocery store where he averaged \$50,000 per year income. His wife, Karen, is age 60 and recently retired from a supervisory position she held at a local craft store for over 15 years where she was making \$20,000 per year. Karen decided to retire early since she and Hal are currently in good health so they could take some time to travel. Her employer has invited her to come back to work part-time if she wants to/is ready to.

Hal and Karen have always been good savers (but not good investors). They never splurged on expensive vacations or cars. They always lived within their means, and paid cash for everything (cars included). They both have contributed \$2000 per year to separate IRAs at the local credit union that earned 6% per year in certificates of deposit over the last 20 years now worth \$73,000 each. (Neither worked for a company that had a retirement plan.) Their \$200,000 house is paid off; their \$70,000 vacation home is paid for; and they purchased an annuity years ago that will pay them a fixed \$5,000 per year while Hal lives, with half of that to Karen once Hal dies. He expects to live until 75 due to family history; Karen until age 90 (good genes).

They always thought they would only need about \$100,000 in retirement assets once they retired. Social Security is to pay around \$17,000 per year until Karen is age 62, and then will increase to \$23,000 a year when Karen will collect her spousal benefits. Because they have \$146,000 (and they only thought they needed \$100,000) in retirement assets, they thought they would celebrate their years of hard work and saving by taking a total of \$12,500 out of each IRA during their first two years of retirement to travel and make ends meet until Karen's Social Security kicks in. They also figure they will need around \$8,000 per year from their IRAs after the first two years to take care of the rest of their income needs.

Hal and Karen also plan that when either should die, the remaining spouse would use the money from the sale of the vacation home to pay for living expenses.

They expect their health costs (insurance coverage and out-of-pocket) to average \$8,000 per year during retirement in year 2008 dollars until Karen is eligible for Medicare, and then they will drop to \$5,000 per year in 2008 dollars when both are eligible for Medicare.

Testing for:

1. Too conservatively invested through retirement
2. Taking a chunk out of principal early on in retirement
3. Annuity income stream reduced upon death of Hal
4. Change in health coverage at Medicare eligibility

Case 3. Gary and Sandra Alterman

Older couple both age 74. Gary and Sandra Alterman. They have been married 50 years. He is a retired machinist from a company where he had worked for 36 years. She was a school cafeteria hostess.

They both receive Social Security; Sandra receives benefits based on Gary's earnings. They both retired at age 62.

Gary made around \$35,000 and has a current pension benefit of \$14,000 (40% of final pay) with no COLA associated with it. Sandra will get none of Gary's pension benefit when Gary passes away since they choose a single life annuity option to maximize their income when they retired and since Gary believed he wouldn't live past the age of 77 due to family and personal health past history. They also collect \$1,500 a month from Social Security.

Sandra has a \$5,000 pension from the school system which does have a 2% COLA associated with it. She did not work the full 25 years and therefore has a greatly reduced pension.

They have a combined \$100,000 in rollover IRAs - \$80k from Gary's profit sharing plan and \$20k from Sandra's 403(b).

They have purchased a Supplemental Medicare Plan, but at one of the lower benefit levels due to the cost.

The house is paid off. They are being encouraged by their children to move to Florida where it is a milder climate and two of their five children now reside. They have a home valued at \$185,000 in Minnesota. They will use all the funds to buy a condo in Florida when (if) they move there; they are concerned about a higher cost of living there (though no state tax and no living costs associated with the colder climate.)

Gary has rheumatoid arthritis that is getting worse each year. It is a hereditary condition and is to be assumed that it will continue to affect his life style. The cold weather is

certainly a contributing factor. There is concern that Sandra will need help in taking care of Gary, since Sandra is very petite. Since Sandra does not want to be dependent on the children, and Sandra is in much better health than Gary, stripping assets is not idealthus, obtaining Long Term Care insurance is a priority. The cost of Long Term Care at age 75 for a couple is estimated to cost \$13,000 a year with a 3 month waiting period.

They do not spend a lot of money on hobbies; their big expense has been an annual trip to Vegas. They hope to continue to go for a few more years. Gary tends to fish in the Minnesota lakes and hang out with his buddies....they are looking for an environment in Florida where they can meet other older couples and possibly consider a Senior citizen community at which Gary could move into assisted living and stay on site as his condition worsens. At that time, they were told that assisted living facilities in Florida average \$2,700 per month for one person in 2008 dollars.

Testing for:

1. LTC needs
2. 40% of retirement income does not have a COLA
3. Liquidating home value through physical move in retirement
4. Increasing medical, assisted living and transportation costs as time goes on.
5. Elimination of spousal pension benefit upon death of primary wage earner.

Case 4. Leslie Gonzalez

Leslie Gonzalez is 58 and approaching retirement. Her mother is a dependent. Her husband was a police officer killed in the line of duty 20 years ago. Her two children are now grown and independent. Leslie has never remarried. Leslie gets 100% of her husband's salary for life (as long as she does not remarry). She currently is receiving \$35,000 based on her husband's salary, and there has been a 3% COLA on the salary.

She continues to pay into the group health care policy with the Police...at the rate of \$200 per month, increasing 10% each year. She intends to stay with this policy until age 65 when there is the option to purchase a Medicare supplemental policy through the department. She lives in Illinois where teachers do not participate in Social Security nor do police, so she will not be eligible for Social Security benefits. However, she gets Medicare as a deceased spouse of a police officer and needs to pay premiums for Medicare buy-in as well as Part B and D premiums.

She also has \$250,000 proceeds from the sale of her home three years ago invested in various certificates of deposit at three different banks. It was too much for her to keep up by herself and take care of her mother at the same time. She realized a \$150,000 gain on the house upon sale.

Leslie currently makes \$25,000 a year working part-time as a substitute high school English teacher and is eligible for full retirement now, but since she is in relatively good health and enjoys working, she plans to continue working until 65 for sure....but would

like to know that she can stop at that time if her health declines, etc. She expects to collect \$5,000 per year pension benefit (with COLA) and live until age 92.

She contributes 10% of her salary to a 403(b) plan that currently has a balance of \$20,000; there is no match. Leslie has a mutual fund account valued at around \$100,000 after recent losses in the market...the 5% interest helps her pay some of her expenses now. The money is what has accumulated from investing the remaining balance of the \$75,000 life insurance policy from her husband.

She now rents a condo at \$1,500 a month. Her mom (Julia Stevens, now age 83) moved in with them when her husband died to help with the kids, so she wants to take care of her now. Leslie claims her mother as a dependent, who is in the early stages of Alzheimer's, as she pays at least half of her upkeep. Mom gets about \$10,000 a year from Social Security, has a \$10,000 life insurance policy and about \$20,000 in treasury bonds. Leslie would like to keep Mom at home as long as possible. She currently spends \$300 a week on home health care and knows that that cost will increase as Mom's health declines and is expected to increase to increase by \$100/week over the next 4 years then increase with general health inflation. She does not want her Mom put her in a Medicaid paid facility; she hopes she can manage taking care of her and paying for paid help as needed.

She wants to stay in her condo for the "foreseeable" future...it is in an upper middle class area that is near where the kids/grandkids live and has an elevator in the building. She chose it for these reasons. She does not want to be a burden to her children (though does not consider Mom a burden, but states that "life is different" now.)

Testing for:

1. Increasing dependent costs
2. Long life
3. Does not own home
4. The majority of her retirement assets being in a taxable, low-earning account.
5. Test different annuitization versus asset investment/withdrawal strategies
6. Health benefits from former husband's employment

Case 5. John and Judy Richman

John and Judy Richman are ages 56 and 50 (respectively) and are in good health. They want to retire in 10 years. At that time, John will have 28 years seniority with the newspaper publisher where he currently earns \$200,000 a year as the senior editor of one of their largest publications. Judy is a high school English teacher currently earning \$55,000 a year at a school where she has taught for 5 years.

Their two children are ages 17 and 19. The 17 year old is now a senior at the public high school, but plans to attend the same private college as his sibling next year that costs \$26,000 a year. John and Judy pay the full college costs.

John and Judy have always lived the high life: a new car every other year for each, expensive vacations, lots of entertaining, and the latest in fashions. They have constantly struggled with debt over the course of their marriage. They currently owe over \$20,000 in credit card debt. They expect their living expenses, currently at \$150,000 per year, to be the same in retirement.

Both John and Judy participate in their employer-sponsored retirement plans, though not as much as they should be. Their current assets and expected benefits are as follows:

John

- 55% of final pay as a DB benefit with a 3% COLA
- \$150,000 in a 401(k) earning 8%, where he contributes the maximum \$20,500 per year (\$15,500 plus \$5,000 over-50 catch-up contribution) and his employer matches 100% on the first 3% contributed.
- \$200,000 price in unexercised employer stock options — current market value if options exercised immediately is \$350,000; there are more three more years in the ten year period for the exercise of the options
- Social security

Judy

- \$28,000 in her 403(b) where she currently contributes \$4000 a year
- A DB benefit of \$5,000 per year (since she will not have worked long enough to get the full benefit); she will get a COLA
- Judy will not get Social Security on her own earnings since teachers in her system do not participate in the program (however, she will get spouse's benefit, but subject to some offset since she will be receiving a government pension)

They will get health coverage during retirement through her retired teacher benefits; however, no COLA. They do not have LTC coverage . . . however both sides of family live into late 80s. The employer pays 80% of the full cost of health insurance in the year of retirement, and retiree contribution increase more rapidly than the total cost as the employer is willing to increase their share by only 2% a year. Both are eligible for Medicare through John's employment, and the teacher benefits convert to a Medicare carve-out at Medicare eligibility.

They live in New England. Their house will not be fully paid off at retirement due to the three refinancings they did during the 1980's and 1990's to consolidate credit card debt. Their home is currently worth \$900,000; their mortgage is \$300,000.

Testing for:

1. High credit card debt and mortgage going into retirement (i.e., will need 100% of pre-retirement income)

2. College costs at same time as need to save for retirement
3. Employer stock options
4. Lack of long-term care insurance
5. Not being able to afford retiring at age 65
6. Testing Social Security spouse benefits where spouse is a government employee not covered by Social Security

Case 6. Jim and Linda Goldin

Jim and Linda Goldin are seeking help managing their money. Mr. Goldin wants to make sure that Mrs. Goldin has the help she needs if he dies before she does.

They want to maintain the lifestyle to which they are accustomed during the remaining years of their retirement. To do this, they expect they will need \$85,500 in real income per year for at least the next ten years, which includes \$54,300 in essential expenses. They have a strong need for guaranteed income to cover their essential expenses, and have a moderate investing risk tolerance for their managed assets. Due to the market events in the early 2000s, they want to keep 20 percent of their assets in cash and short-term securities. When possible, they do not want to give up entire control of their assets.

Mr. Goldin is 72 and Mrs. Goldin is 69. She will turn 70 1/2 in 2008. Mr. Goldin has a required benefit distribution date of April 1, 2006 and Mrs. Goldin's required benefit distribution date is April 1, 2009. They receive a total of \$28,000 per year in combined Social Security benefits:

- his benefit is \$21,000 per year
- her benefit is \$7,000

They live in a \$500,000 home with no mortgage. They do not want to consider their home as a retirement resource at this time. Neither is currently working nor expects to in the future. They do not have any long-term care or employer-provided retiree medical insurance. Their only health insurance coverage is Medicare and a Medigap F policy.

Mr. Goldin also has a pension. It is from a struggling steel manufacturing company. It pays him \$10,000 a year. The pension ceases when he dies. There is no survivor benefit. Mr. Goldin has a rollover IRA worth \$400,000 with a required minimum distribution of \$15,624 (based on a RMD factor of 25.6). Mrs. Goldin has a rollover IRA worth \$300,000, but she is not required to take an annual distribution since she is not yet 70 1/2. On a combined basis, the IRAs are split 30/70 between stocks and bonds. Each IRA lists the spouse as the only beneficiary. There are no contingent beneficiaries.

They have \$35,000 in a checking account, which is earmarked for emergencies and is not intended to be used for retirement consumption. It earns 1 percent a year. They have \$300,000 in a stock portfolio invested in growth stocks, earning 0.9 percent per year in dividends, and in which there are \$125,000 in unrealized long-term capital gains. They have \$100,000 in tax exempt bonds (AA grade) earning 3 percent per year. Mr. Goldin

has \$65,000 in a defined contribution plan from a long-ago private employer, invested completely in cash. It has a required minimum distribution of \$2,539 this year. They are in the 25 percent marginal federal income tax bracket. The Goldins pay all their taxes out of their \$85,500 annual income.

Mr. Goldin's father and two older brothers all passed away before age 78 due to heart trouble. Mrs. Goldin is in relatively good health. They have two adult children (ages 38 and 35) and four grandchildren (ages 13, 12, 10, and 9).

Appendix B. Software Analyzed

Free Consumer Programs

1. **Fidelity's Retirement Income Planner**
<http://personal.fidelity.com/planning/retirement/retiree/content/ripover.shtml>
2. **AARP retirement planning calculator**
http://sites.stockpoint.com/aarp_rc/wm/Retirement/Retirement.asp?act=LOGIN
3. **MetLife calculator**
<http://www.metlife.com/Applications/Corporate/WPS/CDA/PageGenerator/0,4773,P18280,00.html>
4. **EBSA: Taking The Mystery Out Of Retirement Planning**
<http://askebsa.dol.gov/retirementcalculator/UI/general.aspx>
5. **T. Rowe Price Retirement Income Calculator**
<http://www3.troweprice.com/ric/ric/public/ric.do>

Fee-Based Consumer Program (included with professional programs)

1. **ESPlanner**
<http://www.esplanner.com/>

Professional Programs

1. **NaviPlan Standard**
http://www.eisi.com/products/us/standard/product_features.htm
2. **NaviPlan Extended**
<http://www.eisi.com/products/us/extended/index.htm>
3. **Profiles Professional**
<http://www.eisi.com/products/us/professional/index.htm>
4. **PIE's MoneyGuidePro**
<http://www.moneyguidepro.com/Default.aspx?page=products>
5. **AdviceAmerica—AdvisorVision Retirement Income Edition**
<http://www.adviceamerica.com/AAweb/RIE.htm>
6. **Money Tree**
<http://www.moneytree.com/>

Appendix C. Social Security and Financial Planning

One approach for dealing with Social Security benefits is to ask the user to provide the amount of future benefits they expect to receive. However, Mitchell (1988) and Gustman and Steinmeier (2003) document that most individuals have a low level of knowledge about their future Social Security benefits. Rohwedder and Kleinjans (2004) find that among people less than two years from the date at which they took Social Security benefits, about 30 percent responded that they did not know what their Social Security benefits would be. Among those who say they know how much their benefits will be, about 50 percent are accurate to within 10 percent of their actual benefits. However, 25 percent overestimate their future benefits by 10 percent or more.

People do a poor job of estimating their future Social Security benefits both because of their low level of knowledge and because of intervening unforeseen events—poor health and loss of job—that result in lower future earnings than they expected. Some people have an unrealistic expectation about how long they will continue working. Thus, relying on asking people their expected Social Security benefits, with no information provided by the program to assist them, likely leads to a poor estimate for many people. Some programs provide a link to the Social Security Administration’s online benefits calculator, which if people use it, would be a good resolution. It would be better, however, if the programs were able to allow the user to use the Social Security Administration’s calculator more easily as an integrated part of the program, rather than requiring the user to go to a separate website, which many users probably would not bother to do.

One of the programs asks the user to input the percentage of his Social Security benefits that will be taxable. It sets a default rate of 85 percent. Most people probably do not know the answer to this question, but in fact most people do not pay taxes on their Social Security benefits. The default assumes that the users are high earners.

One of the professional programs makes highly detailed calculations of Social Security benefits. It considers the following issues: early retirement reduction in benefits, delayed retirement credit, earnings test, re-computation of benefits with continued work, windfall elimination for spousal benefits for spouses who have worked in non-covered employment, repaying and reapplying for benefits, family benefit maximums, average wage indexation in calculation of initial benefits, inflation indexation of benefits in payment and the offset for non-covered employment. Nonetheless, a superior approach is to link to the Social Security website and have the user calculate his Social Security benefits there. Most of the programs examined cannot easily deal with the Social Security offset for non-covered employment (case 5, Appendix A).

Several of the professional programs inexplicably set the default inflation rate higher than the cost-of-living adjustment for Social Security benefits. This assumption causes a retiree’s real value of Social Security benefits in payment to decline during retirement. In fact, Social Security benefits are price indexed, so the real value of benefits in payment is

constant for each beneficiary over the retirement period.¹⁴ Some programs allow users to set a different inflation rate for the increase in Social Security benefits in payment than for the general inflation rate. Again, this assumption is generally invalid, given the legal requirement that Social Security benefits in payment be inflated at the rate of increase of the Consumer Price Index. None of these programs note in their instructions or help that Social Security benefits are set to increase at the rate of the Consumer Price Index. A possible justification is that the user believes the inflation rate that he faces is different from the general inflation rate, but few people would have the economic sophistication to accurately make such an assessment.

People who have worked in the government sector in jobs not covered by Social Security but who have a spouse who has worked in Social Security covered employment, or who have themselves worked in Social Security covered employment on another job, have a particular set of issues with respect to the determination of their Social Security benefits. Most programs allow the user to specify their anticipated level of Social Security benefits. However, the users in these unusual situations may in particular be uninformed about their expected level of Social Security benefits, because generally those benefits are relatively unimportant compared to benefits they receive from their government-sector employment.

Some of the professional programs have difficulty dealing with Social Security spousal and survivor benefits (case 2, Appendix A). In one program, the program automatically calculates the Social Security benefit of the husband and wife, based on one year of earnings. It then determines whether the wife would receive Social Security benefits based solely on her own earnings record or as a spouse, and at her husband's death it automatically determines if she would receive survivor benefits, and the amount of those benefits. The problem with this approach is that calculating Social Security benefits based on a single year of earnings can provide a poor estimate of those benefits. If the user realizes that and provides his own estimate of benefits, then the program does not make any automatic calculations, and it is not possible to set different levels for the spousal and survivor benefits.

In one of the professional programs, the program did not automatically adjust the spouse's benefit at the death of the husband. That adjustment had to be entered manually. The program did not allow as an option for the spouse to receive Social Security benefits based on the earnings of the spouse.

One professional program allows the user to determine the level of generosity of future Social Security benefits relative to the current system. The example in the tutorial associated with the program is for a 20 percent benefit cut. Thus, if the user thinks that in 2030 Social Security will be reformed and solvency will be restored by a 20 percent cut in benefits, the user can specify that. Few users would be able to make a realistic

¹⁴ The price indexing does not perfectly track the prices of the expenditures of older people. Because of technical problems in the index relating to people switching to lower-priced goods, it may overstate inflation for some people. For other people, whose consumption is dissimilar to that assumed in constructing the index, it may understate inflation.

assessment in determining values for this option. Further, Congress has been reluctant in the past to make benefit cuts affecting retirees or workers near retirement (Society of Actuaries 2008).