White Paper

In Search of the Numbers.
A Practical Application of Withdrawal Rate Research for Pre-retirees and Its Possible Implications.

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Note: This unpublished paper is an initial thought paper that leads to follow-on papers that explore areas of further research suggested by some of the thoughts explored here. The first of follow-on papers* referred to this paper (*Blanchett, David, and Larry R Frank Sr. “A Dynamic and Adaptive Approach to Distribution Planning and Monitoring,” *Journal of Financial Planning* (April 2009)).

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Executive Summary

- This paper will discuss a methodology that applies Withdrawal Rate Research (WRR) for pre-retirees, years or preferably decades, before retirement.

- Pre-retirees should understand the methods, terminology and practical application of WRR well before reaching retirement when, at that time, they would be more capable to implement their withdrawals.

- The difference between longevity based on birth as a reference age, versus the probability of living to some older age based on their current age is discussed.

- Ages are aligned with research distribution periods using a single, logically defined, Mortality-Base Age paradigm; versus non-alignment of ages, since not everyone retires at the same age, that result from a Retirement-Base Age approach.

- There is an overlap of two withdrawal groups, one planning to retire and the other already retired, which raises questions and implications about the initial withdrawal rates versus current withdrawal rates of these overlapping groups of people.

- Further research is needed to have a more complete understanding about a dynamic application of withdrawals as a retiree ages, which dynamically decreases the distribution period that remains as a result of the aging process.

Introduction

A single retirement savings value, or more simply the singular amount that must be saved in order to fund a successful retirement, is the elusive goal of each prospective retiree. The majority of tools used by advisers today yield a value that is often fixed and one that does not easily adapt to the dynamic situation of the client as they age. The real value must be fluid, it must be able to adjust to dynamically shortening distribution periods (i.e., longevity risk), volatile portfolio performance, inflation, and be dynamic enough to adjust to the clients' needs before retirement.

There is not really a single number, rather a range of potential values, all of which are potentially feasible. The main objective of this paper is to demonstrate how previous withdrawal rate research can be applied in pre-retirement planning as well as the importance of presenting withdrawal rate outcomes as a set of ranges, rather than a single firm number. Interesting questions, observations, and implications result through the application of this methodology.

Past Research: Brief Summary

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The body of research on withdrawal rates is rapidly expanding. Past research provides advisers with a foundation of knowledge on distribution planning, addressing how certain factors, like how varying withdrawal rates and distribution periods affect the probability of retirement success. While past research has approached sustainability in different ways (e.g., Bengen (deterministic), DeMuth (stochastic), Milevsky (calculus), and Blanchet and Spitzer (bootstrap algorithm)), they have each arrived at very similar results.

For this paper, the authors address the issue of how to apply withdrawal rate research (WRR) to *pre*-retirement planning, even decades before a client actually retires. What does a commonly reported 4% initial withdrawal rate mean to someone who is years away from retirement? Is the withdrawal rate simply 4% for everyone? How does the anticipated length of retirement affect the withdrawal rate, e.g., is 30 years an appropriate rule of thumb? How does the client's risk tolerance enter the picture? How do we factor in other unknowns, like inflation or health care costs that may occur before or after retirement?

Using the approach discussed in this paper, using a single initial value such as 4% would provide a single retirement lump sum goal for the client, and not a bad one at that. However, what happens if the client cannot save enough to reach that value prior to retirement? Are there other retirement sums that would still be feasible to support retirement? What are the probabilities of success for these other retirement sums? These are typical retirement planning questions when applying WRR.

The main objective of this paper is to demonstrate how to apply past research to pre-retirement planning. Along the way, the paper will help advisers and clients understand how key factors and influencers in the withdrawal rate equation, like planned retirement age, mortality age, and desired portfolio success rate affect planning results. For example, it will show how it makes more sense to use a Mortality Based-Age (age of death) as a reference point for planning instead of the retirement age. It will show advisers how to – and the importance of – presenting withdrawal rate outcomes as a set of ranges that dynamically change as the client's situation changes.

The Withdrawal Rate: WR%

Long story short, the withdrawal rate serves as a conversion factor that links annual retirement income needs with the lump sum available or required on Retirement Day. This relationship can be derived from Figure 1, Formula 1. Therefore, the withdrawal rate (WR%) = \$Y divided by \$X as defined in Figure 1.

Figure 1

Withdrawal Rate Formulas

1. Solve for annual withdrawal *during retirement*.

Annual withdrawal ($Y) = Liquid Wealth ($X) * Withdrawal Rate (WR%)

- or -

$$\$Y = \$X * WR\%$$

2. Determine required wealth to support an annual withdrawal (“the Number”) -- *prior to* retirement.

$$\text{Liquid Wealth (SX)} = \frac{\text{Annual Withdrawal (\$Y)}}{\text{Withdrawal Rate (WR\%)}}$$

- or -

$$\$X = \frac{\$Y}{WR\%}$$

Determining $Y: Unfunded Retirement Individual Standard of Living (ISL)

The numerator in Figure 1, Formula 2, is $Y, a key value used in this methodology, which represents the *planned* annual income withdrawn from the portfolio for pre-retirees, It’s easy to gloss over the nuances of life that influence distributions by using, for instance, “income replacement ratios” used in some retirement planning calculations.

These income replacement ratios have been generalized from past research on the public at large [1] and subsequently applied as rule of thumbs. They may serve for general application to a broad audience, or as a teaching tool, however most advisers today prefer a more specific analysis of each individual client’s spending patterns.

Individual Standard of Living (ISL) is just that – it is individual, or tailored to the needs and spending habits of the individual or family the adviser is working with.

While the ISL calculation appears to be very specific and detailed on a micro level, it must be dynamic on a macro level and recognize that pre-retirees can adapt their spending to their resources and reallocate where necessary as changes occur throughout life. When changes in overall expenditures that impact $Y occur, the simple process described in this paper can quickly revisit its effect on $X. As $Y changes, $X changes accordingly. The overall objective is to accumulate an overall sum ($X) that would sustain a given standard of living, for example $100,000, 300,000, etc. Essentially, the list of expenses for those in their 30’s would be different from those in their 50’s. Over time as the client approaches retirement, the composition of expenditures making up $Y will converge closer and closer to the truer retirement expenditures, when on retirement day they are one and the same.

The goal, from Figure 1, Formula 2, is to develop a method that easily (common calculator) determines the accumulation sum ($X) that would support these annual $Y expenditures on a macro level for pre-retirees expressed in *current, un-inflated dollars.* This generates a corresponding *current, un-inflated* value for $X – the accumulation target value at the present point in time expressed in current dollars – the value towards which the client strives to save that would support those expenditures not already funded through entitlement programs, if any.

Therefore, in this paper, $Y is defined as the result of an evaluation of the client's *current* annual expenditures in *current* dollars – more precisely, the *unfunded retirement* ISL expenditures left over after expected entitlements in *current* dollars (pensions and/or Social Security) are received once they do retire. These entitlements estimates also change each year prior retirement and are revisited and reviewed periodically during the intervening years.

The ISL discussion presents planning points. Inflation is already one of the variables considered in the value WR% (see "The WR% Link" next). Since taxes would be paid from the total accumulated value ($X) during retirement in the future, $Y calculations also include taxes that would be continued to be paid once retired, i.e., $X needs to be tax inclusive in order to support tax expenditures in the future once retired.

What kind of housing will the client choose in retirement? How much will it cost? Property taxes and insurance payments would continue with home ownership. Will there be a mortgage, or will the mortgage be paid off before, or sometime during, retirement? Neidermeyer, et al., find that "changing contract terms for mortgages, mortgage refinancing, and mortgagee demographics jeopardize long-standing rules of thumb regarding the necessary level of retirement income." Neidermeyer continues: "Financial advisers should view the notion that retirees need 70 to 80 percent of pre-retirement income as suspect in today's mortgage environment."

Once the advisor and client agree on a retirement ISL, it's important to distill this down to what is really needed at the end of the day – withdrawn cash flow requirements from $X – to fund the *unfunded* Retirement ISL net of what's covered by Social Security, pensions. The result is an annual $Y, to be employed in the withdrawal rate formulas in Figure 1.

The WR% Link: Withdrawal Rate Research

Withdrawal Rate Research (WRR) has focused on determining a sustainable withdrawal from a given sum that has a high probability of lasting longer than a given *fixed* time period, ideally lasting longer than the retiree does. The research has been exploring the factors that determine what a *sustainable* WR% should or could be with the goal being to provide a probable stream of sustainable withdrawals.

These points are discussed in subsequent sections:

- The WR% – and the assumptions and changes in assumptions contained within – sets an *initial* withdrawal rate.
- Advisers and clients can also use WR% to easily measure accumulation progress *during accumulation* years (and distribution progress during *distribution* years. See hypothesis later).

Much of the current WRR has been published in the *Journal of Financial Planning* and can be accessed online through the journal's Archived Articles. The expression "WR%," used in this paper, has been shortened from a more complete expression

$$\text{WR\%}_{N,\, I,\, i,\, \sigma,\, \mu,\, t}$$

derived by the research variables. Essentially, the factor WR% contains the variables which complicate calculations for most clients where one expression, WR%, simplifies usage of all these variables.

In summary, past research has *fixed* the portfolio withdrawal period (N), in order to evaluate the other variables – inflation (I), market return and deviation probabilities (i, σ), to arrive at WR% with an associated probability of success/failure (μ) at time (t). Milevsky's work, using calculus, integrates another probability factor – longevity (λ) – with those above for the markets. See "About Longevity" for more on applying this factor to retirement planning through this methodology.

A selective body of key WRR is summarized in Figure 2. Research periods and Age bars in the figure will be further discussed in the longevity section. As the reader will see, this graphical overlay provides a framework to align research periods with age ranges of clients.

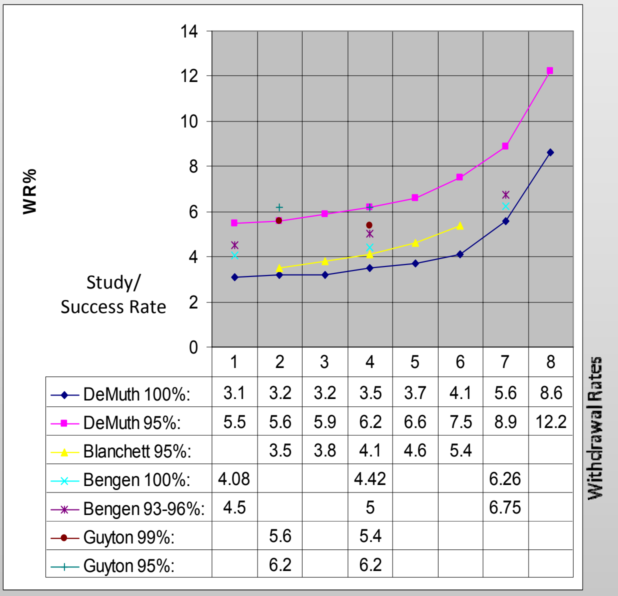
Figure 2

Withdrawal Rate Research (overlaid with Mortality Base-Ages 100 & 95, to Illustrate both uncertainties together)

Relationship between select Research Period Length, Age, Success Rates and Withdrawal Rates from studies by:

1) DeMuth (2005)
2) Blanchett (60/40, 2007)
3) Bengen (tax deferred, 2006)
4) Guyton & Klinger (80/10/10, 2006)

Mortality Base-Age, either 100 or 95, minus Planned Retirement Age (PRA) of (*N*), equals the corresponding Research Period length.



Study/ Success Rate	1	2	3	4	5	6	7	8
DeMuth 100%:	3.1	3.2	3.2	3.5	3.7	4.1	5.6	8.6
DeMuth 95%:	5.5	5.6	5.9	6.2	6.6	7.5	8.9	12.2
Blanchett 95%:		3.5	3.8	4.1	4.6	5.4		
Bengen 100%:	4.08			4.42			6.26	
Bengen 93-96%:	4.5			5			6.75	
Guyton 99%:		5.6		5.4				
Guyton 95%:		6.2		6.2				

Age (*N*)	55	60	65	70	75	80	85	90
Research Period (100 - *N*)	45	40	35	30	25	20	15	10
Research Period (95 - *N*)	40	35	30	25	20	15	10	5

Figure 2 provides us, from the research of Blanchett, Bengen, Guyton, and DeMuth, [2] a set of numbers we can explicitly use in Figure 1, Formula 2 for WR% in pre-retirement planning with clients. As longevity *increases* – which is in part a function of an *earlier* planned retirement age (Age (N)) – applicable WR% values *decrease*. Stated differently, the older the pre-retiree Age (N) (or the shorter the expected distribution period) the higher the WR% can be achieved for a given probability of failure.

The DeMuth data set is featured since it reflects the largest set of different retirement time spans (see hypothesis later). From DeMuth, a 55-year old retiree can withdraw 3.1 percent of a nest egg to achieve 100 percent success; however that figure increases to 5.5 percent if the retiree is willing to accept a 95 percent chance of success (column 1). That gives the adviser and pre-retiree a wide range of options to choose from.

Pre-retirees would enter Figure 2 at the Age (N) that corresponds to their Planned Retirement Age (PRA) Observe that as the (PRA) *increases*, allowable WR% values increase, and increase more rapidly, as the Age (N) rises. Therefore, the longer a client works the shorter the distribution period.

About Longevity

Life expectancy is different from the probability of those of any given current age living past a given later age. The latter probability is what the National Center for Health Statistics reports as "period (or current) life tables." [3] This data is used to construct Figure 4 through a methodology briefly discussed in their life tables and more extensively discussed by Goodman (see works cited); basically, the number of cohorts still alive at a given later age divided by the number alive at an earlier living age.

To illustrate the point, life expectancy at birth for 2003 for the total population was 77.4 years.[4] This figure represents the average number of years that one may expect to live *from the time of birth*. Clients tend to think in terms of such life expectancy numbers quoted in the popular press, rather than *re-framing the mortality question* in terms of a given *current* age; or for use in this paper, their PRA.

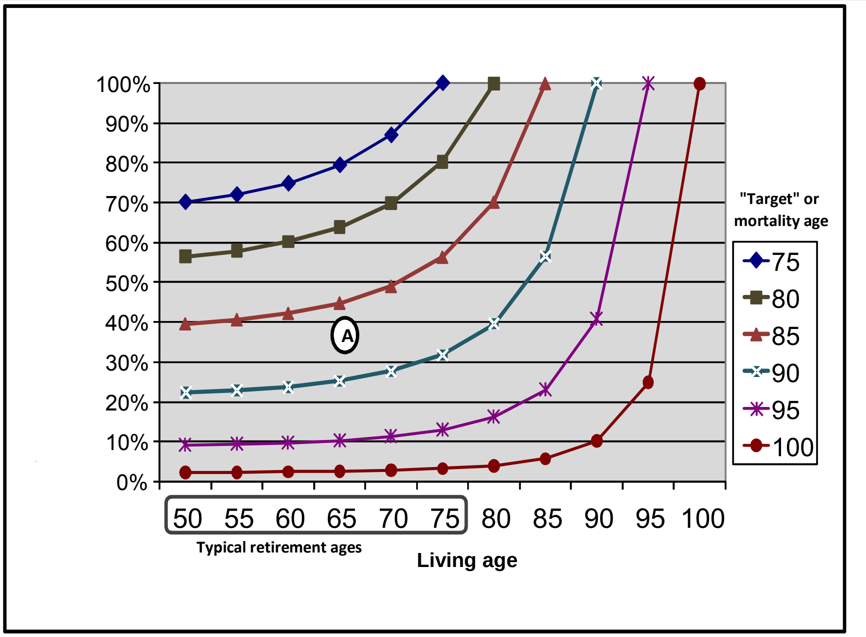
The Figure 3 shows the probability of surviving to a later age from any "living" age – that is, for either a current age or PRA (note: life tables work for either pre- or post-retirement planning). For example, to determine the likelihood of an individual, already aged 65 (or for Planned Retirement Age 65) of surviving to 85; first, find the living age of 65 on the x-axis, then find the intersection with the age 85 "target," or "mortality age" curve with triangle data points in figure 4 (Point A in the figure). Observe where the curve crosses the y-axis; that value indicates that 44.7 percent of people who are alive at 65 survive to live past age 85.

Another example, where a 30 year distribution period is a common rule of thumb, Figure 3 demonstrates that this would put a 60 year old retiree at risk where 1 out of 4 (23.8%) live past age 90; where that the probability of living past age 90 *increases* as they further age. Alternatively, a 30 year rule of thumb applied to a 70 year old suggests this time frame may be ultra conservative as 2.8% of 70 year olds live beyond age 100. Therefore, the authors suggest aligning and overlapping distribution periods and age by considering mortality risks as discussed next.

Figure 3

Period Life Chart

Probability of survival to a given age from a base "living age"



It should be noted that the Period Life Table shown depicts the population at large to illustrate the concept. For more precision, advisers could examine current, or period, life tables constructed for specific gender, race, joint life, etc. where they can develop a similar figure with more specific data relating to specific client(s) if needed.

Mortality Planning Implications

Milevsky and Goodman discuss mortality considerations for retirement planning. A prudent adviser should consider the stochastic nature of mortality. "Workers may have less of a grasp on the variability of life expectancy. Many may be planning for a retirement that lasts for as long as *they think they will live and failing to consider that they could easily live beyond that anticipated age (emphasis added)."* [5]

At a higher level, the Period Life Table reveals findings important for the planning process as applied to WRR:

- *Average life expectancies don't tell much about an individual*. Mortality varies a lot depending on the *current* age examined. The longer a person lives, the older they are *likely* to live, therefore determining the living age, or PRA for pre-retirement planning, is important. Typical PRAs between ages 50 to 75 are illustrated in Figure 3.

- *The choice of reference point is important*. Most clients retiring at age 75 or less have a fairly consistent and low probability of surviving to Mortality Base-Age 100; 2.3 to 3.2 percent by the 100-year target curve in Figure 4.
  - This Mortality Base-Age 100 corresponds with the Figure 2 bar, "Research Period 100-N," where N is the current living age, or Planned Retirement Age, and age 100 is the Mortality Base age from which to subtract age/PRA to align distribution research periods with corresponding ages.
- Advisers may use a Mortality Base-Age of 95 years where most retirees have approximately a 10 percent chance (9.1 to 12.9%) of achieving while younger than the living age 75.
  - This Mortality Base-Age 95 corresponds with the Figure 2 bar, "Research Period 95-N" to determine how to align the WRR portfolio distribution research time frame.
- *What is an acceptable probability*? Note a Mortality Base-Age of 90 shows a 22.3 to 31.8 percent chance of being outlived for those younger than age 75. These probabilities are, arguably, high to accept since 90-N would result in a shorter distribution period, one with a higher relative probability of outliving.
- Note: Figures 2 and 3 both illustrate 100 year longevity to illustrate a more complete range of the data to facilitate judgment for use of alternative, younger, mortality base ages.

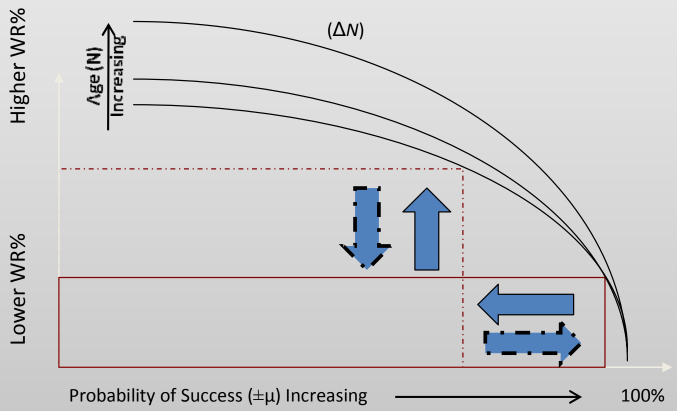
Clearly, the more conservative rate used to start with, the longer lasting the portfolio, *essentially saying that the longer the portfolio needs to last, the lower the withdrawal rate should be,* especially for pre-retiree planning purposes. Conversely, the *shorter the required time horizon, the more the retiree can withdraw.* Figure 2 illustrates these relationships.

From Numbers to a Conceptual Framework

As the probability of portfolio "success" increases towards 100 percent in Figure 2, the indicated WR% drops asymptotically towards 3% (the lowest rate research has supported). Alternatively, to achieve a higher WR% results in a lower probability of success – where PRA, or current age if already retired, remains the same. What is less obvious is the influence of a retiree's age on the relationship. As age increases in Figure 2, the WR% increases because the distribution period of time required decreases. WR% can increase even more if a lower success rate is tolerated. Figure 4 illustrates these inter-relationships. This observation will be discussed more in the hypothesis section.

Figure 4

Withdrawal Rate Research Concept Diagram



As a person ages, their mortality (± λ) decreases and their withdrawal curve shifts upward (Δ*N*) since there are fewer remaining years required for distributions. This results in a higher possible WR% for the same Probability of Success (±μ). Conversely, if they withdraw at a younger age, the withdrawal curve (Δ*N*) shifts downward. A higher WR% reduces the portfolio's probability of longevity, and vice versa.

At the end of the day, a client can "pick their poison" – their PRA, longevity assumption and the success rate they are comfortable with. As a result, they can choose WR% values which can be far different from the rules of thumb – for example, 4 percent and 30 years – often used.

Practical Application of Withdrawal Rate Research to Pre Retirement Planning

Now the individually tailored ISL, or more precisely, *unfunded* Retirement ISL ($Y), can be combined with the chosen WR% from Figure 2 to produce a pre-retirement savings goal ($X) using Figure 1, Formula 2. Additionally, the applicable research distribution period has now also been logically aligned with a selected Mortality Base-Age (where the authors suggest age 95).

Figure 5 shows these calculations for *unfunded* annual Retirement ISLs of $50,000 and $75,000, however it's easy for an adviser to use a simple calculator and work the figures for any u*nfunded* Retirement ISL ($Y) the adviser and client may work up.[6] The adviser and client together can see ranges of lump sum ($X) required to achieve goals as a function of PRA and Probability of Success for the portfolio distribution period associated with that PRA from Figure 2.

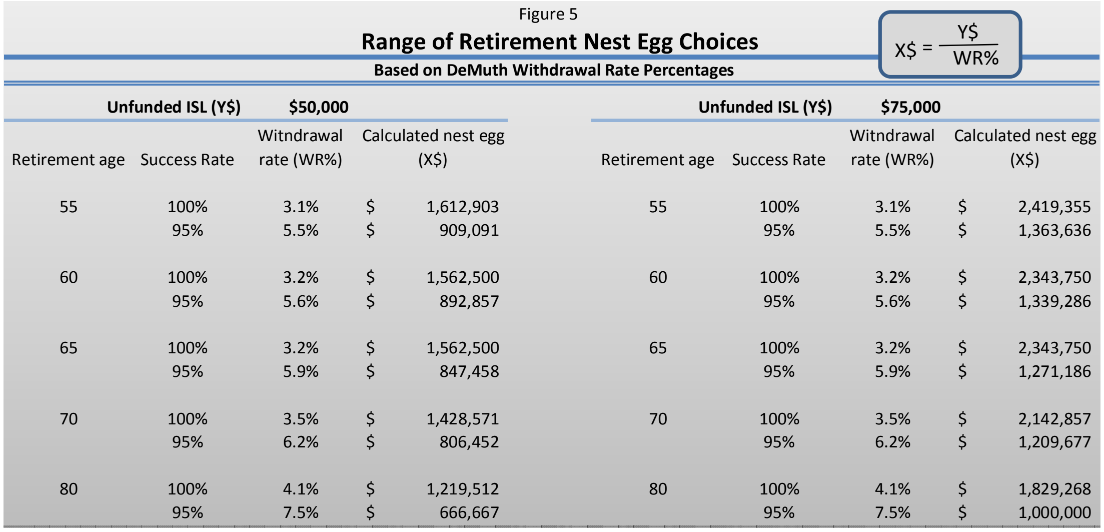


Figure 5

Range of Retirement Nest Egg Choices

Based on DeMuth Withdrawal Rate Percentages

$$X\$ = \frac{Y\$}{WR\%}$$

Unfunded ISL (Y$)		**$50,000**			**Unfunded ISL (Y$)**		**$75,000**	
Retirement age	Success Rate	Witndrawal rate (WR%)	Calculated nest egg (X$)		Retirement age	Success Rate	Witndrawal rate (WR%)	Calculated nest egg (X$)
55	100%	3.1%	$ 1,612,903		55	100%	3.1%	$ 2,419,355
	95%	5.5%	$ 909,091			95%	5.5%	$ 1,363,636
60	100%	3.2%	$ 1,562,500		60	100%	3.2%	$ 2,343,750
	95%	5.6%	$ 892,857			95%	5.6%	$ 1,339,286
65	100%	3.2%	$ 1,562,500		65	100%	3.2%	$ 2,343,750
	95%	5.9%	$ 847,458			95%	5.9%	$ 1,271,186
70	100%	3.5%	$ 1,428,571		70	100%	3.5%	$ 2,142,857
	95%	6.2%	$ 806,452			95%	6.2%	$ 1,209,677
80	100%	4.1%	$ 1,219,512		80	100%	4.1%	$ 1,829,268
	95%	7.5%	$ 666,667			95%	7.5%	$ 1,000,000

A 3%, 4%, 5% or 6% Solution?

Observing the range of results from Figure 6, an adviser may ask, "why not save towards the lower dollar amounts suggested?" Indeed those lesser accumulation values are easier to save. That would mean saving using a 5% or even 6% WR% referring to Figures 2 and 5.There may be the temptation to take a higher WR%, or alternatively, to start retirement with lesser savings. Due to mortality, either temptation may be disastrous for those predestined for high longevity, where a high proportion would be women. What are some implications of such a conclusion and recommendation to the client?

Recall that this is for *pre*-retirement *planning* and, as much is the case, assumptions tend to be best case. What can go wrong during this time between current age and PRA? Here are four possible scenarios that alone present consequences, or combined in a perfect storm, potential disaster for the client. All of the following reasons argue for *plans* built on a *lower* WR% (for those PRA younger than 75), rather than higher rates. Of course, if the client can not save the required amount to support a lower WR% through a higher accumulated value; than they need to understand the additional risks (lower probability of success) they face by *planning to* use a higher relative WR% from a lower accumulated value (see Figure 4).

First, a gap remains between worker expectations (where 62% *plan* to retire age 65 or older) and the actual experience of current retirees (where 67% actually retired *prior to* age 65).[7] Downsizing or poor health may contribute to this gap. Saving towards a lower WR% value, e.g., 3%, results in a higher accumulation value *at any point in time* due to the higher savings rate. This results in having more resources to fall back on should premature distributions be required prior to the PRA.

Second, what is the effect on $X, when markets value decline, on a plan? From the withdrawal rate formula in Figure 3, WR% = $Y / $X. Since the numerator, $Y, is consciously adjusted periodically for inflation, this is a relatively stable value. Therefore, the effect of market *declines* in the accumulation value $X (the denominator) would increase WR%. The question is – to what lower probability of success does this higher WR% represent to the client? The dynamics of the choices for the client in a declining market are illustrated in Figures 2 and 4 where higher WR%s push the distributions into a lower probability of success range, or shortens the portfolios distribution lifetime. Client choices are either to decrease their distributions $Y to reduce the WR% (through Guyton decision rules for example) or accept the portfolio's potential to exhaust itself earlier than expected. Klinger’s paper conceptually addressed these dynamics and trade offs. Note, hoping for markets to rise again enough to make up for the decline is another possibility, although not one most advisers would suggest to clients unless they are more than a few years from retirement.

Third, what if tax rates go up and the plan is based on a higher WR%? Rather than a fixed budget, the client has a "fixed" accumulation value; where fixed here means that once retired, they are not adding further contributions, and hence only market forces can increase the accumulation value to support future increased expenditures. In order for the client to pay a higher tax rate they would need to plan to either, reduce expenses elsewhere to maintain their WR% or, they'd have to increase their withdrawals, thus resulting in the same client choice dynamics as discussed in point 2 above.

Fourth, what if medical expenses go up, or the cost of energy, food, or any other expense category? Basically these are the unknowns of inflation's effects. A higher savings figure provides for such contingencies. EBRI finds that a couple both age 65 today living to average life expectancy could need as much as $295,000 to cover premiums for health insurance coverage and out-of-pocket expenses during retirement. A couple who lives to age 95 could need as a much as $550,000. [8] Once again, the same client choice dynamics discussed above come into play.

All of the above reasons argue for *plans* built on a lower WR%, towards the 3% solution, rather than *planning for* higher rates such as 4, 5, or 6% in order to accumulate the values ahead of time to weather these uncertainties. Of course, these factors could happen in combination. Therefore, while WRR gives us withdrawal rate ranges tested against normal market variations, and higher savings figures obviously provide the ability to cover extreme and unexpected changes in a client’s future individual situation, both pre- and post-retirement.

Pre-retiree conversations

The paper, to this point, has illustrated how to easily incorporate WRR concepts and terminology to demonstrate the dynamics between supportable probability of success rates and withdrawal rates based on a logical alignment between research distribution periods using a single Mortality-Base Age. The purpose is to educate clients on these dynamics *before* they retire and to show how WRR can be applied years, even decades, before retirement day. Refinements from further research would not change the fundamental application of this methodology for pre-retirees.

Other Applications

This WR% methodology can be used to answer other questions besides retirement. Note that this methodology is scalable to any income amount. WR% essentially serves as a conversion factor between income lost and assets required to replace that lost income (e.g., for retirement, or for death, etc).

Determining life insurance coverage is a good example. Take a couple, where each partner 35 years old is concerned about providing for their family. One spouse earns $30,000, the other $40,000 annually. They would like to provide for lost income for 30 years (until age 65). What amount of life insurance would each need?

The insurance need effectively replaces the “lump sum $X” in the analysis. Instead of “saving” the lump sum, the clients are using an insurance benefit to fund the asset requirement. Using Figure 1, Formula 2 and solving for $X for each spouse: $30,000 income coverage for the first spouse as $Y, and the WR% ranges from Figure 2 (3.5% to 6.2% for 30 years, Column 4) results in a range of $483,871 ($30,000/0.062) to $857,143 ($30,000/0.035) as a policy size to fund the amount to replace the income from the first spouse. Similarly, insurance coverage somewhere between $645,161 and $1,142,857 should be purchased by Spouse 2 to replace the lost $40,000 income.

The dynamics and implications of the client choices between the values within the ranges were discussed above in the 3, 4, 5, or 6% solution segment. The client may choose the desired degree of certainty. Just as WRR helps simply and understand the choices for retirement, WRR can also determine insurance needs, or any other situation where loss of income looks for an asset value to replace that loss.

Towards A Withdrawal Rate Hypothesis

Up to this point, the discussion has centered on the application of WRR to pre-retirement planning where Planned Retirement Ages commonly fall within 50 to 75. That is results from common retirement periods of, from the focus of past research, 20 years in length or longer and have now been aligned with specific ages using a Mortality Base-Age concept previously discussed.

The current application of WRR at retirement is primarily “static” in that an *initial* WR% is applied to $X and in subsequent years the $Y value is adjusted for inflation. A person aging is actually a dynamic process. However, current applications of research are based on initial parameters and WR% is not specifically adjusted for the aging dynamics of continually decreasing time as discussed next.

The transition between *planning* to retire and applying a *planned* initial WR% *at a Planned Retirement Age* and applying an *actual* initial WR% *at retirement* raises a question: Why would the *initial* withdrawal rate for Client A *retiring, or planning to* retire, today at age 70 be significantly different from the *current* withdrawal rate for Client B who is currently age 70, but had already retired 5 to 10 years ago (whose initial WR% and initial $Y were established years earlier and $Y has been subsequently increased for inflation)? In other words, why would the *initial* WR% for Client A be different from the *current* WR% for Client B when they are using the same age and therefore have the probability of having the same time *remaining*?

This question generates a hypothesis which will be discussed below. The hypothesis is derived from the dynamic interaction between withdrawals and decreasing time due to aging.

- Research data can serve as the benchmark, background data to which the Current WR% (derived from Current $Y / Current $X) can be compared and where the guardrails are measured by Probability of Success associated with the corresponding WRR WR% which serves as a benchmark to compare the current WR%.
- Withdrawals are part of a dynamic and ongoing process. As the person ages, the remaining distribution period is dynamically shortened.
- This dynamic, aging-revisiting concept using guardrails and benchmarks is illustrated in Figure 6. As WR% changes, the Probability of Success is what is assessed.

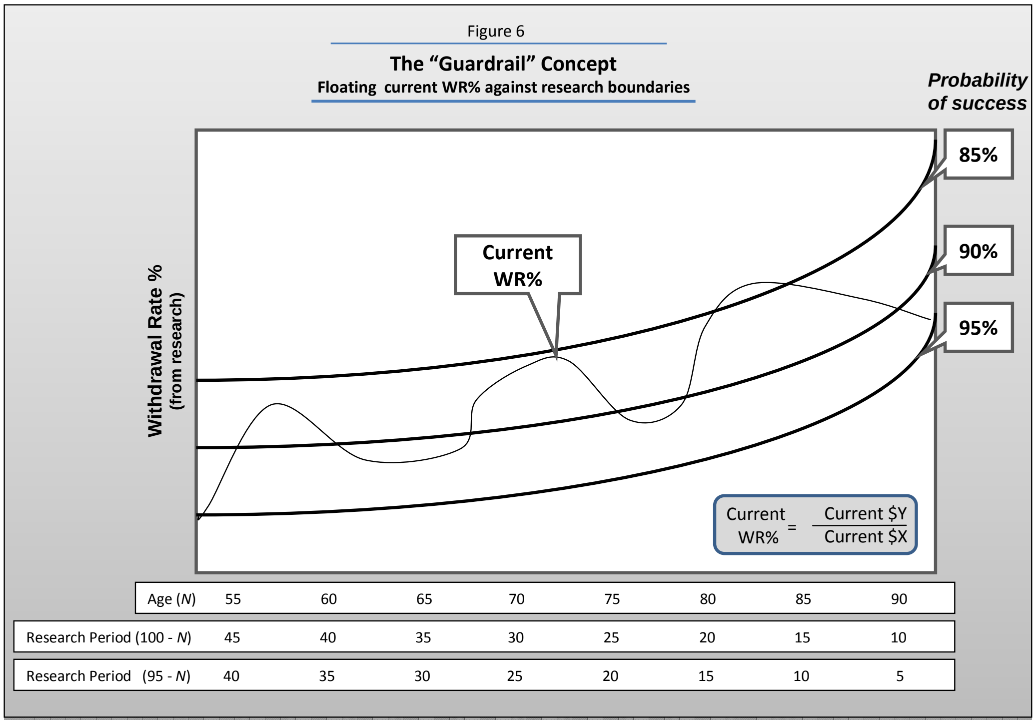


Figure 6

The "Guardrail" Concept

Floating current WR% against research boundaries

Age (*N*)	55	60	65	70	75	80	85	90
Research Period (100 - *N*)	45	40	35	30	25	20	15	10
Research Period (95 - *N*)	40	35	30	25	20	15	10	5

As a person ages, they might progress through Figure 6 and "revisit" their withdrawal rate periodically and make adjustments to their *current* WR% as the *remaining* distribution period decreases due to age; the same effect as a pre-retiree changing their PRA from 60 to age 70 for example. Whereas both Clients A and B have the same mortality from Figure 3, both clients would periodically enter Figure 2 and 6 at the same planned or current age to determine their WR% for the distribution period *remaining*.

Research has been conducted on time frames of 20 years or more; which, when aligned by the common Mortality Base-Age 95, cover the typical ages *younger* than 75 (when people tend to retire) in order to establish the *initial* WR%. Guyton decision rules apply to this age group. However, what of those over age 75 where distributions are not linear, but parabolic?

As Age (N) increases, the remaining time period decreases (by formula 95-N). Their withdrawal rates can be higher in later years, relative to what they started with in their early years; conceptually illustrated in Figure 4 by the curved lines labeled Δ*N* which is the change in Age.

Blanchett's data is the first to show *annual* differences in WR% between the various simulation lengths. Initial observations indicate the annual change between rates is very similar to an inflation rate adjustment to $Y; e.g., the change between 3.1 and 3.0 percent is 3.3% (0.1 / 3.0) which is close to inflation rates used in simulations.

This suggests that the dynamic process of people aging, which shortens the remaining distribution time period required, allows for the WR% to be slowly increased. This increase is problematic unless a revisit and reset method is used to account for this parabolic effect on WR%. What data is currently available for such a revisit and reset method? What is the dynamic process to make such adjustments between the earlier "flatter years" (younger than 75) and the later "parabolic years" (older than 75)? This benchmark data needs to be developed, through further research, especially for periods shorter than 20 years, as well as research on a dynamic resetting process across all the distribution years. For example, what is the benchmark WR% for an 85 year old? From Figure 2, Column 7 the range suggested from current research, far from 4%, is 5.6% to 8.9%.

Figures 2 and 6 show how the WR% can be increased as the retiree ages. Combining the ramifications of the above hypotheses would result in a method, as yet hypothetical, to manage withdrawals for the dynamically changing conditions post-retirees will face especially when they are older than 75. Baby boomers are not that old yet, but they will be. In other words, benchmark withdrawal rates could be used throughout the distribution years for comparison to the current withdrawal rate for use in decisions retirees would continually need to make as the dynamics of their situation evolve.

Recommended Further Research

Further research is needed in order to establish the mechanism(s) to apply WRR data in a dynamic manner – to date hypothetical – so the actual dynamic nature of distributions can be modeled and monitored. Also, the parabolic tendency of the data currently comes from one set of research where distribution periods shorter than 20 years have not been studied in detail. However, data from Blanchett and Bengen tend to initially confirm DeMuth's parabolic tendency. Further research is needed to develop more complete data for shorter distribution periods and over multiple Probability of Successes in order to build out a more complete Figures 2 and 6 for such benchmarking purposes. Each year a person ages, dynamically reduces the distribution period by a year. Therefore, further research is needed to answer the question "What are the effects and findings of a revisit and reset process for a dynamically and continuously shortening distribution period; where a person ages from left to right in Figures 2 and 6?"

Initial research by the author and colleague David Blanchett, published in the April 2009 edition of the *Journal of Financial Planning,* suggest that a dynamic model does exist for withdrawal rates over periods that continually decrease which coincides with the aging process. Establishing a target end date standardizes the withdrawal period for both pre and post-retirees. Evaluation of mortality tables using Goodman's process described above assists in a logical definition of that target end date age. The goal is to devise, monitor and manage withdrawals with a high probability of success over a lifetime with a low probability of exceeding; in other words, a low probability of outliving your money.

Implications and Summary

The paper began by application of current WRR which provides an excellent foundation to support pre-retirement planning. This pre-retirement understanding lays the ground work and perspective for observation of the transition area, around age 75, between typical retirement age band and the late retirement age segments. This generates a set of questions as to whether WR% would be significantly different for one group *planning*, or just retiring, at a given age and another group who are retired and established their initial WR% years before, however who are at the same age as the first group.

This observation and question has led to a hypothesis to suggest the answer to this question is that people may move along the "distribution curves" from left to right in Figures 2 and 6 which dynamically allows for the adjustment of WR% due to the shorter time remaining for distributions. Probability of Success may be used as guardrails while research WR% may provide benchmark data to which current WR% may be compared. Further research on revisiting, linked, and dynamically decreasing distribution periods is required to confirm Blanchett and my preliminary findings.

The result is a spectrum of current withdrawal rates sustainable over a given remaining period of time that, in itself, also continually decreases to mirror the aging process. Coming full circle for pre-retirees, the initial emphasis of this white paper, the Planned Retirement Age becomes essentially picking the age along the distribution spectrum they plan to retire at for planning purposes. Once retired, they continue along the same withdrawal spectrum.

Endnotes

1. The Aon Consulting/Georgia State University 2004 Retirement Income Replacement Ratio Study. "Building on the *Interim Report of thePresident's Commission on Pension Policy* published in 1980, this booklet presents the results of the 2004 analysis, the sixth update to the study."
2. Spitzer, et al, results are not displayed since a single 30 year period was evaluated – their portfolio construction findings are informative. Similarly, results of Milevsky's calculus are not displayed – his integration of mortality and standard deviation findings are informative., Unadjusted values from Blanchett's Figure 1 are used, since other researcher's did not have a similar adjustment in their research; his portfolio construction findings are informative. Probability of success less than 90% were rarely published and therefore not displayed.
3. Current mortality tables can be found at The National Center for Health Statistics at http://www.cdc.gov/nchs/about.htm, search term "Life Tables."
4. United States Life Tables, 2004. NVSR Volume 56, Number 9. 40 pp. (PHS) 2008-1120 (http://www.cdc.gov/nchs/products/pubs/pubd/lftbls/life/1966.htm).
5. Helman, Ruth Mathew Greenwald & Associates; Jack VanDerhei, Temple University and EBRI Fellow; and Craig Copeland, "The Retirement System in Transition: The 2007 Retirement Confidence Survey" *EBRI Issue Brief No. 304* (April 2007), page 13.

6. Dividing by a percentage or multiplying by its multiple is an equivalent math concept: example, 1/.04 is the same as the multiple of 25. These would appear to be high multiples to some; however, this concept is a logical conclusion of current withdrawal rate research. The question is what withdrawal rate or multiple does an adviser use? The suggestion in this paper is that the rate should be based on *both* stochastic *markets* and stochastic *longevities*. Research establishing the use of multiples is not as extensive as that establishing WR%.
7. Helman, op. cit.
8. Fronstin, Paul, "Savings Needed to Fund Health Insurance and Health Care Expenses in Retirement" *Issue Brief,* Employee Benefit Research Institute, EBRI (Jul 2006).

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