

The Everyday Math of Retirement Portfolios

Craig L. Israelsen, Ph.D.

Designer of the *7Twelve*[®] Portfolio

2019

Based on research by Craig L. Israelsen, Ph.D.

Performance as of December 31, 2018

Key Concepts

Retirement Account Multiple (or RAM)

Key Concepts

Retirement Account Multiple (or RAM)

Initial Withdrawal Rate

Key Concepts

Retirement Account Multiple (or RAM)

Initial Withdrawal Rate

% of Income Replaced

The Mathematics of Income Replacement

RAM = Retirement Account Multiple



\$100,000 final salary OR \$100,000 annual expenses

\$1.2 million retirement account

RAM = 12x

The Mathematics of Income Replacement

RAM * % Withdrawal Rate



\$100,000 final salary

4% of account balance

\$1.2 million retirement account

RAM = 12x

The Mathematics of Income Replacement

$$\text{RAM} * \% \text{ Withdrawal Rate} = \% \text{ Income Replacement}$$



\$100,000 final salary

4% of account balance

48% income replacement

\$1.2 million retirement account

RAM = 12x

The Mathematics of Income Replacement

RAM * % Withdrawal Rate = % Income Replacement



12



4



48%

*

=

Various RAM and Withdrawal Rates

Retirement Account Multiple of Pre- Retirement Income (RAM)	Multiplied By	Initial Withdrawal Rate (%)	Equals	% of Pre-Retirement Income Being Replaced in First Year of Retirement
7x	*	3%	=	21%

Various RAM and Withdrawal Rates

Retirement Account Multiple of Pre- Retirement Income (RAM)	Multiplied By	Initial Withdrawal Rate (%)	Equals	% of Pre-Retirement Income Being Replaced in First Year of Retirement
7x	*	3%	=	21%
10x	*	4%	=	40%

Various RAM and Withdrawal Rates

Retirement Account Multiple of Pre- Retirement Income (RAM)	Multiplied By	Initial Withdrawal Rate (%)	Equals	% of Pre-Retirement Income Being Replaced in First Year of Retirement
7x	*	3%	=	21%
10x	*	4%	=	40%
12x	*	4%	=	48%

Various RAM and Withdrawal Rates

Retirement Account Multiple of Pre- Retirement Income (RAM)	Multiplied By	Initial Withdrawal Rate (%)	Equals	% of Pre-Retirement Income Being Replaced in First Year of Retirement
7x	*	3%	=	21%
10x	*	4%	=	40%
12x	*	4%	=	48%
15x	*	5%	=	75%

% Income Replacement in Retirement

Various Combinations of RAM and Withdrawal Rate						
Retirement Account Multiple of Final Salary (RAM)	Initial Withdrawal Rate (%) in Retirement					
	2%	3%	4%	5%	6%	7%
5x						
7x						
10x						
12x			48%			
15x						
20x						
25x						

% Income Replacement in Retirement

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7x			28%			
10x			40%			
12x			48%			
15x			60%			
20x			80%			
25x			100%			

% Income Replacement in Retirement

Various Combinations of RAM and Withdrawal Rate						
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7x	14%	21%	28%	35%	42%	49%
10x	20%	30%	40%	50%	60%	70%
12x	24%	36%	48%	60%	72%	84%
15x	30%	45%	60%	75%	90%	105%
20x	40%	60%	80%	100%	120%	140%
25x	50%	75%	100%	125%	150%	175%

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Other issues...

What kind of retirement portfolio are we building?

How long will our portfolio survive during retirement?

What about the RMD?

Conservative Retirement Model

93-Year Review: 1926-2018 59 Rolling 35-Year Periods

- **Large-cap US equity** represented by the S&P 500 Index from 1926-2018
- **Small-cap US equity** represented by the Ibbotson Small Companies Index from 1926-1978 and the Russell 2000 Index from 1979-2018
- **U.S. Bonds** represented by SBBI US Intermediate Government Bonds from 1926-1975 and the Barclay's Capital Aggregate Bonds Index from 1976-2018
- **Cash** represented by 3-month Treasury Bills from 1926-2018

Conservative Retirement Model

93-Year Review: 1926-2018 59 Rolling 35-Year Periods

25% Stock/75% Fixed Income Portfolio

15% Large Stock, 10% Small Stock, 55% Bonds, 20% Cash

Conservative Retirement Model

93-Year Review: 1926-2018 59 Rolling 35-Year Periods

25% Stock/75% Fixed Income Portfolio 15% Large Stock, 10% Small Stock, 55% Bonds, 20% Cash						
Annual Cost of Living Adjustment (COLA)	Initial Withdrawal Rate (%)					
	2%	3%	4%	5%	6%	7%
	Historical Success Rate of Portfolio Lasting 35 Years					
0%	100%	100%	100%	100%	93%	66%
1%	100%	100%	100%	97%	73%	41%
2%	100%	100%	100%	83%	49%	29%
3%	100%	100%	93%	61%	37%	25%
4%	100%	100%	73%	41%	25%	15%
5%	100%	93%	49%	31%	15%	2%

Moderate Retirement Model

93-Year Review: 1926-2018 59 Rolling 35-Year Periods

65% Stock/35% Fixed Income Portfolio

40% Large Stock, 25% Small Stock, 25% Bonds, 10% Cash

Moderate Retirement Model

93-Year Review: 1926-2018

59 Rolling 35-Year Periods

65% Stock/35% Fixed Income Portfolio 40% Large Stock, 25% Small Stock, 25% Bonds, 10% Cash						
Annual Cost of Living Adjustment (COLA)	Initial Withdrawal Rate (%)					
	2%	3%	4%	5%	6%	7%
	Historical Success Rate of Portfolio Lasting 35 Years					
0%	100%	100%	100%	98%	95%	92%
1%	100%	100%	100%	98%	95%	90%
2%	100%	100%	100%	95%	90%	86%
3%	100%	100%	98%	92%	88%	73%
4%	100%	100%	97%	90%	81%	58%
5%	100%	98%	92%	88%	66%	32%

Let's summarize...

93-Year Analysis from 1926-2018

59 Rolling 35-Year Periods

(3% COLA assumed)

93-Year Analysis from 1926-2018

59 Rolling 35-Year Periods

(3% COLA assumed)

% Income Replacement in Retirement

Based on RAM (RAM = Retirement Account Multiple)

(Green shading indicates 60% or higher income replacement)

5x RAM	10%	15%	20%	25%	30%	35%
7x RAM	14%	21%	28%	35%	42%	49%
10x RAM	20%	30%	40%	50%	60%	70%
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93-Year Analysis from 1926-2018

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(3% COLA assumed)

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15x RAM	30%	45%	60%	75%	90%	105%
20X RAM	40%	60%	80%	100%	120%	140%

Required Withdrawal Rate

(based on RAM)

Required % Withdrawal Rate	2%	3%	4%	5%	6%	7%
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93-Year Analysis from 1926-2018

59 Rolling 35-Year Periods

(3% COLA assumed)

% Income Replacement in Retirement

Based on RAM (RAM = Retirement Account Multiple)

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Required Withdrawal Rate

(based on RAM)

Required % Withdrawal Rate	2%	3%	4%	5%	6%	7%
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Historical Success Rate

% of Time Portfolio Lasted at Least 35 years between 1926-2018

25/75 Portfolio	100%	100%	93%	61%	37%	25%
65/35 Portfolio	100%	100%	98%	92%	88%	73%

93-Year Analysis from 1926-2018

59 Rolling 35-Year Periods

(3% COLA assumed)

% Income Replacement in Retirement

Based on RAM (RAM = Retirement Account Multiple)

(Green shading indicates 60% or higher income replacement)

5x RAM	10%	15%	20%	25%	30%	35%
7x RAM					42%	49%
10x RAM					60%	70%
12x RAM					72%	84%
15x RAM					90%	105%
20x RAM					120%	140%
Required % Withdrawal Rate					6%	7%
<p>Don't take more than risk than is needed.</p> <p>There is no reason to keep up with "the market" if you don't need to.</p> <p>Don't let ego determine your asset allocation.</p>						
<p>% of Time Portfolio Lasted at Least 35 years between 1926-2018</p>						
25/75 Portfolio	100%	100%	93%	61%	37%	25%
65/35 Portfolio	100%	100%	98%	92%	88%	73%

Building a Modern Retirement Portfolio

Building an investment portfolio is like making **salsa**...we add different ingredients together.



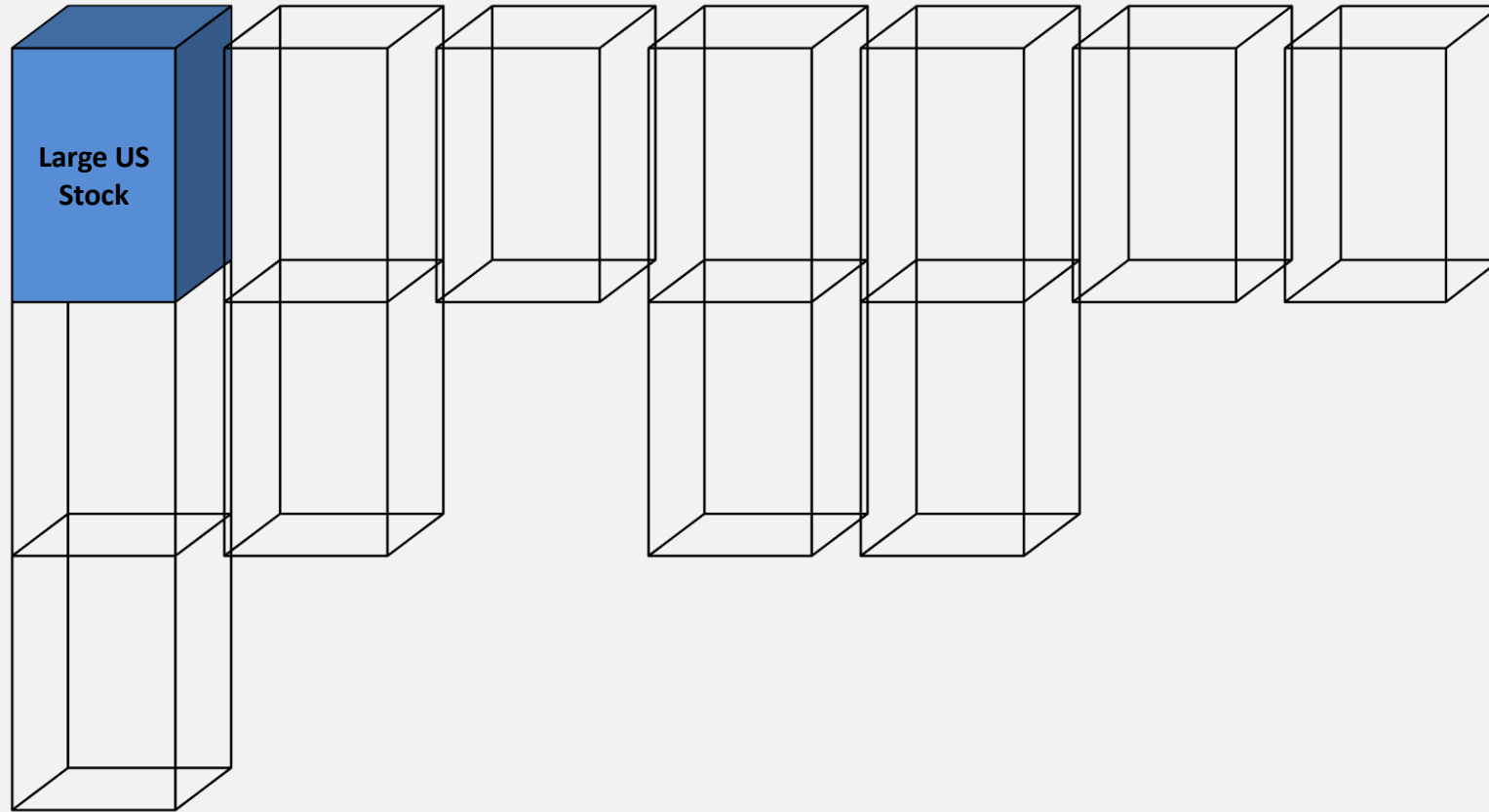
Why do we diversify?

Because we don't know the future.

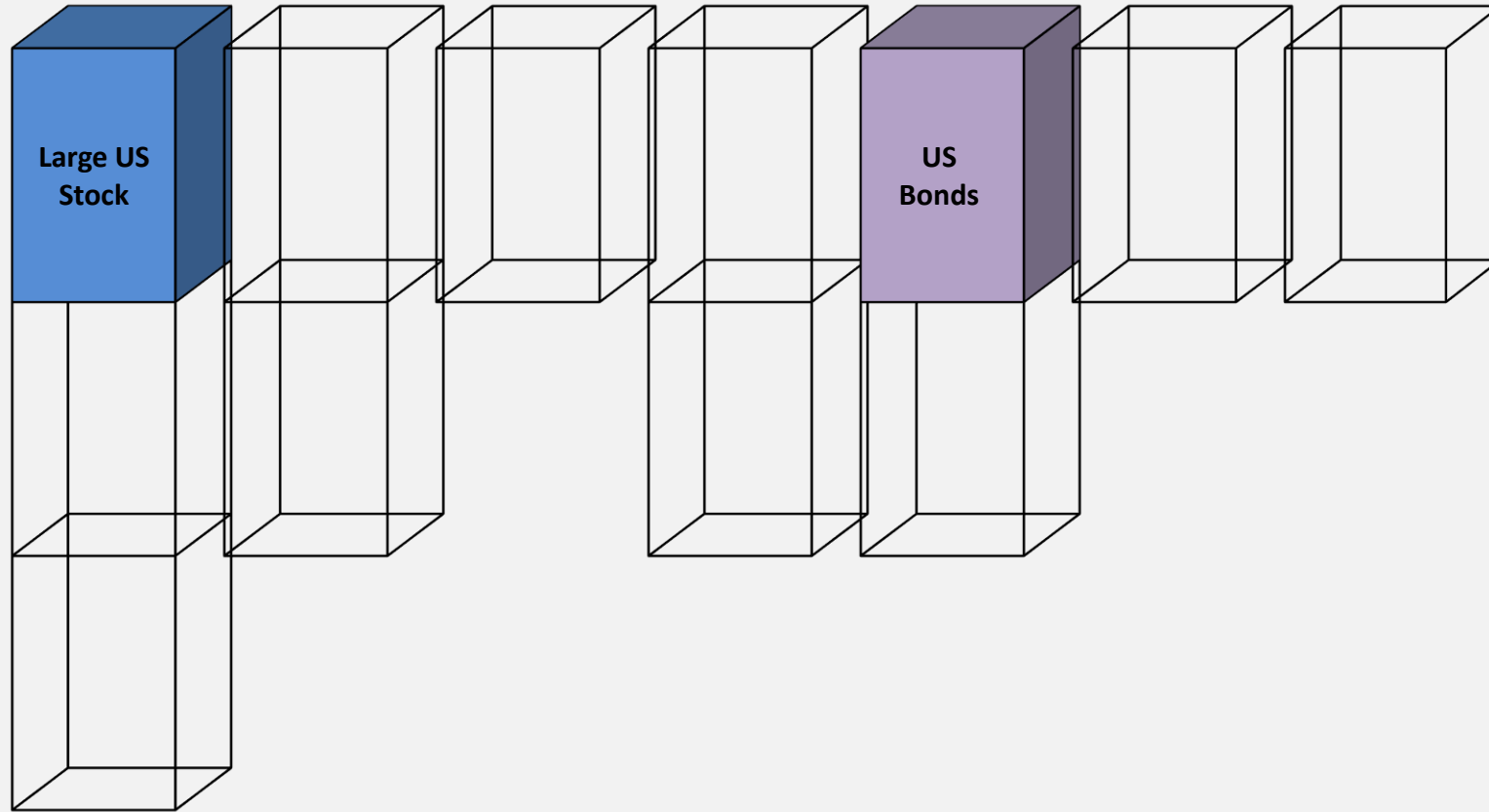
**If we knew the future,
we would never diversify.**

**Since we don't know the future,
let's examine the past...for clues.**

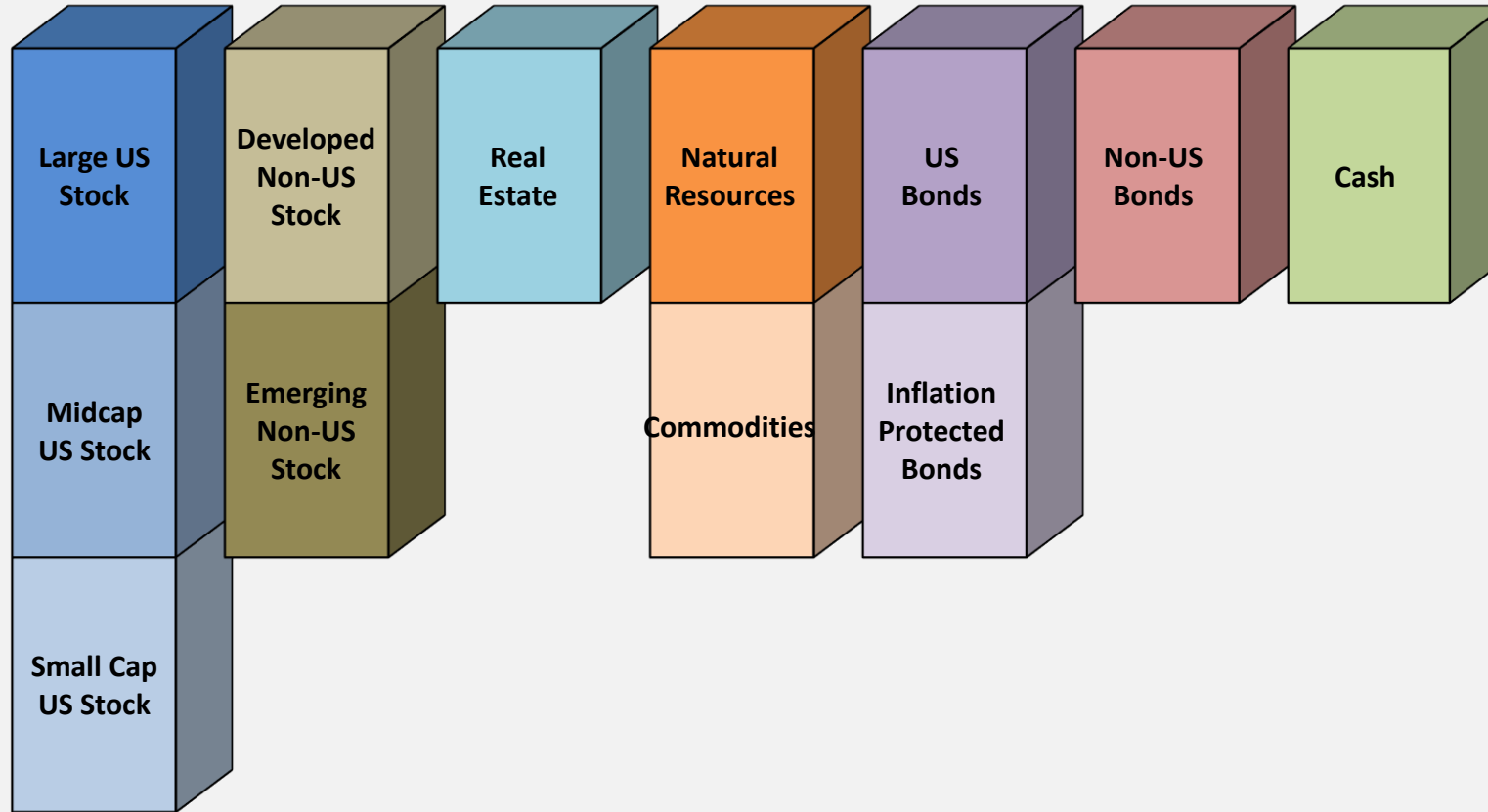
Minimal Diversification



Two-Asset Portfolio

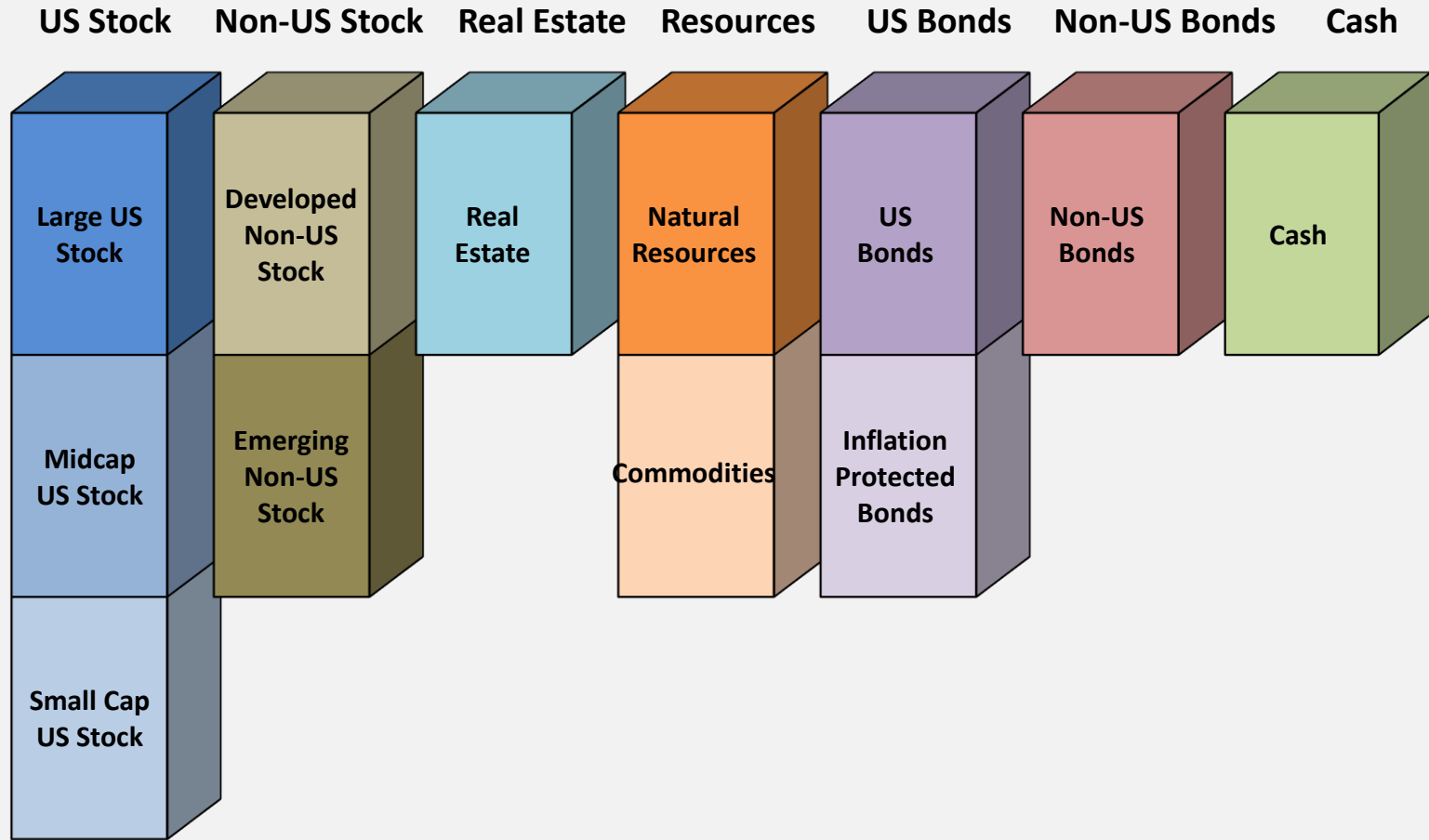


12-Asset Portfolio



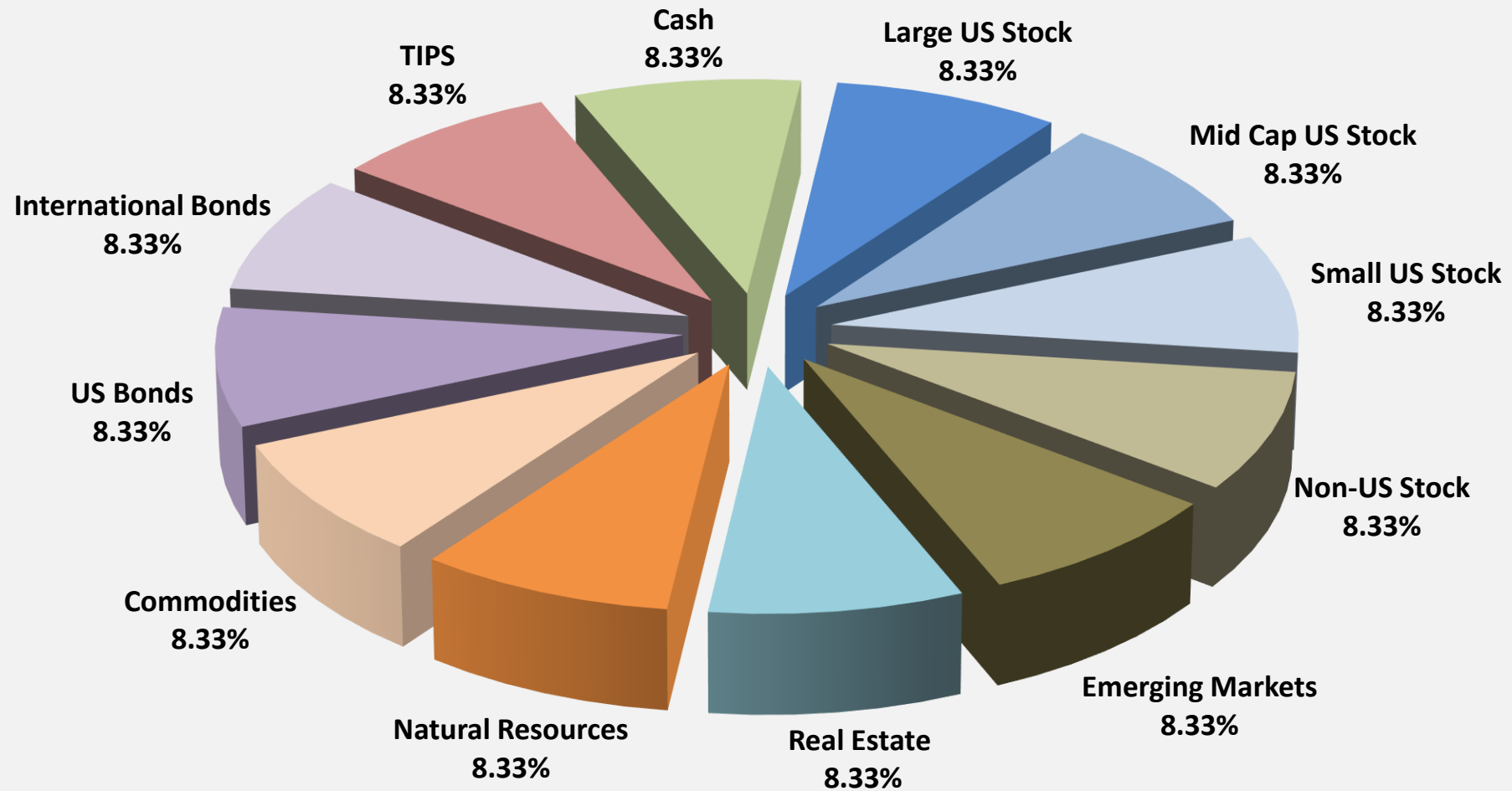
7Twelve[®]

7 Core Asset Classes **Twelve** Actual Holdings



7Twelve®

Equally-weighted exposure to 12 asset classes



Retirement Portfolio Survival Test 1999-2018

*The Withdrawal Phase
During Retirement*

Assumptions

5% initial withdrawal rate

3% annual cost of living (COLA) increase in withdrawal






Analysis

Ending Balance After 20 Years as of Dec 31, 2018

7Twelve® Portfolio cannot be evaluated prior to 1998 as some ingredients do not have performance history prior to that.






Retirement Portfolio Survival Analysis

20-Year Period from 1999-2018

Risk Level	Asset Allocation Models		20-Year Annualized IRR (%)
Very Conservative	100% Cash		2.09
Conservative	50% Cash 50% Bonds		3.37
Moderate	60% US Stock 40% Bonds		4.76
Moderate	Diversified ETF-Based <i>7Twelve</i> [®] Portfolio		7.29
Aggressive	100% US Stock		2.69






Retirement Portfolio Survival Analysis

20-Year Period from 1999-2018

Risk Level	Asset Allocation Models		20-Year Annualized IRR (%)	Remaining Balance After 20-Years Starting balance of \$250,000 Total Withdrawal of \$335,880
Very Conservative	100% Cash		2.09	-3,538
Conservative	50% Cash 50% Bonds		3.37	53,562
Moderate	60% US Stock 40% Bonds		4.76	137,933
Moderate	Diversified ETF-Based <i>7Twelve</i> [®] Portfolio		7.29	379,494
Aggressive	100% US Stock		2.69	20,778






Retirement Portfolio Survival Analysis

20-Year Period from 1999-2018

Risk Level	Asset Allocation Models		20-Year Annualized IRR (%)	Remaining Balance After 20-Years Starting balance of \$250,000 Total Withdrawal of \$335,880	Remaining Balance After 20-Years Starting balance of \$500,000 Total Withdrawal of \$671,760
Very Conservative	100% Cash		2.09	-3,538	-7,077
Conservative	50% Cash 50% Bonds		3.37	53,562	107,124
Moderate	60% US Stock 40% Bonds		4.76	137,933	275,867
Moderate	Diversified ETF-Based <i>7Twelve</i> [®] Portfolio		7.29	379,494	758,987
Aggressive	100% US Stock		2.69	20,778	41,556






Retirement Portfolio Survival Analysis

20-Year Period from 1999-2018

Risk Level	Asset Allocation Models		20-Year Annualized IRR (%)	Remaining Balance After 20-Years Starting balance of \$250,000 Total Withdrawal of \$335,880	Remaining Balance After 20-Years Starting balance of \$500,000 Total Withdrawal of \$671,760	Remaining Balance After 20-Years Starting balance of \$1,000,000 Total Withdrawal of \$1,343,520
Very Conservative	100% Cash		2.09	-3,538	-7,077	-14,154
Conservative	50% Cash 50% Bonds		3.37	53,562	107,124	214,248
Moderate	60% US Stock 40% Bonds		4.76	137,933	275,867	551,734
Moderate	Diversified ETF-Based <i>7Twelve</i> ® Portfolio		7.29	379,494	758,987	1,517,974
Aggressive	100% US Stock		2.69	20,778	41,556	83,113

Retirement Portfolio Survival Analysis

20-Year Period from 1999-2018

Risk Level	Asset Allocation Models	20-Year Annualized IRR (%)	Remaining Balance After 20-Years Starting balance of \$250,000 Total Withdrawal of \$335,880	Remaining Balance After 20-Years Starting balance of \$500,000 Total Withdrawal of \$671,760	Remaining Balance After 20-Years Starting balance of \$1,000,000 Total Withdrawal of \$1,343,520
Very Conservative	100% Cash 	2.09	-3,538	-7,077	-14,154
Conservative	50% Cash 50% Bonds 	3.37	53,562	107,124	214,248
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Disclosures

Performance in the past is not a guarantee of performance in the future.

Raw data source: Steele Mutual Fund Expert

Calculations: Craig Israelsen, Ph.D.

Performance of the individual ETFs and the Passive ETF 7Twelve Portfolio in the prior slides generally reflects the performance of the following indexes.

US Large cap	S&P 500 Index (TR)
US Mid Cap	S&P MidCap 400 Index (TR)
US Small Cap	S&P Small Cap 600 Index (TR)
Non-US Developed	MSCI EAFE Index NR USD
Emerging	MSCI EM Index GR USD
Real Estate	S&P Global REIT Index TR USD
Natural Resources	S&P North American Natural Resources Index TR
Commodities	Deutsche Bank Liquid Commodity Optimum Yield Diversified Commodity Index Total Return
US Bonds	Barclays US Aggregate Bond Index TR USD
TIPS	Barclays U.S. Treasury US TIPS Index TR USD
Non-US Bonds	Barclays Global Treasury Index TR
Cash	USTREAS Stat US T-Bill 90 Day TR

Low-Cost *7Twelve*[®] Models

12-Asset Class <i>7Twelve</i>[®] Portfolio	<i>12 Actively Managed Mutual Funds (Active <i>7Twelve</i>)</i>	<i>12 ETFs from various fund families (Passive <i>7Twelve</i>)</i>	<i>12 Vanguard Mutual Funds</i>	<i>12 Vanguard ETFs</i>	<i>12 Fidelity Mutual funds</i>	<i>12 ETFs available at Schwab</i>
Portfolio Aggregate Annual Expense Ratio in 2019	0.60	0.17	0.16	0.09	0.29	0.21

Low-Cost *7Twelve*[®] Models

12-Asset Class <i>7Twelve</i> [®] Portfolio	12 Actively Managed Mutual Funds <i>(Active 7Twelve)</i>	12 ETFs from various fund families <i>(Passive 7Twelve)</i>	12 Vanguard Mutual Funds	12 Vanguard ETFs	12 Fidelity Mutual funds	12 ETFs available at Schwab
Portfolio Aggregate Annual Expense Ratio in 2019	0.60	0.17	0.16	0.09	0.29	0.21
20-Year Average Annualized Return (1999-2018)	7.54	6.87	7.09	7.18	7.73	6.94

Research reports available that outline the funds used to build each of these *7Twelve* models

7Twelve[®] Age-Based Models

Portfolio Allocations

	7Twelve Core Model	7Twelve Age-Based 50-60	7Twelve Age-Based 60-70	7Twelve Age-Based 70+
Large US Stock	8.33%	6.67%	5.00%	3.33%
Mid Cap US Stock	8.33%	6.67%	5.00%	3.33%
Small US Stock	8.33%	6.67%	5.00%	3.33%
Non-US Stock	8.33%	6.67%	5.00%	3.33%
Emerging Markets	8.33%	6.67%	5.00%	3.33%
Real Estate	8.33%	6.67%	5.00%	3.33%
Natural Resources	8.33%	6.67%	5.00%	3.33%
Commodities	8.33%	6.67%	5.00%	3.33%
US Bonds	8.33%	6.67%	5.00%	3.33%
Inflation Protected Bonds	8.33%	6.67%	5.00%	3.33%
International Bonds	8.33%	6.67%	5.00%	3.33%
Cash	8.33%	26.67%	45.00%	63.33%

20-Year Retirement Portfolio Analysis: 1999-2018

\$250,000 Initial Account Value on Jan 1, 1999 in Passive ETF 7Twelve Models

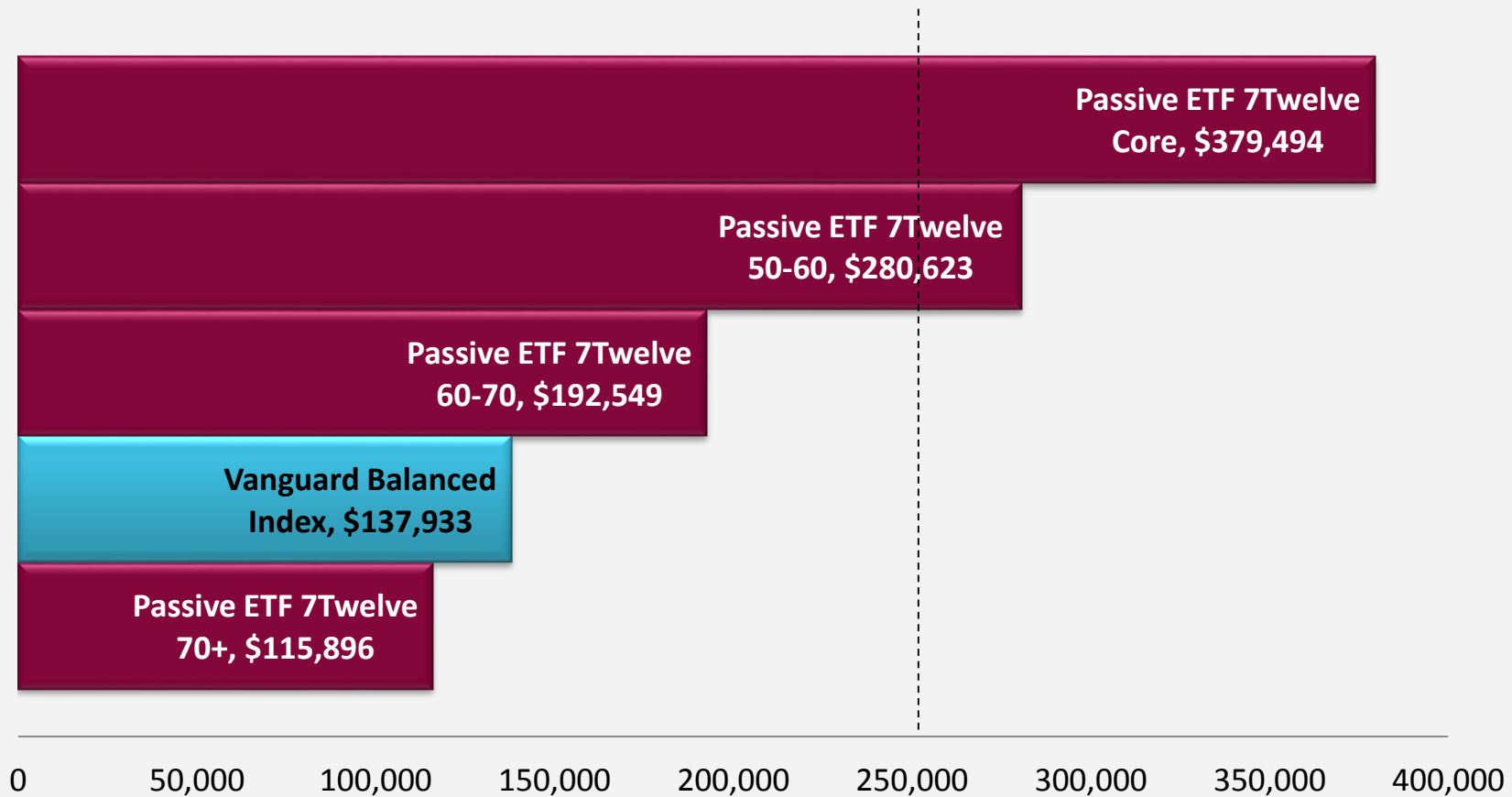
5% Initial Withdrawal

3% Annual Increase in Annual Withdrawal

Total Withdrawal of \$335,880

20-Year Period

Ending Account Balance on December 31, 2018



Key points

Key points

Worry less, live more.

Key points

Worry less, live more.

Stay appropriately diversified in retirement.

Key points

Worry less, live more.

Stay appropriately diversified in retirement.

Don't make investing a competitive sport.



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7Twelve[®] Portfolio

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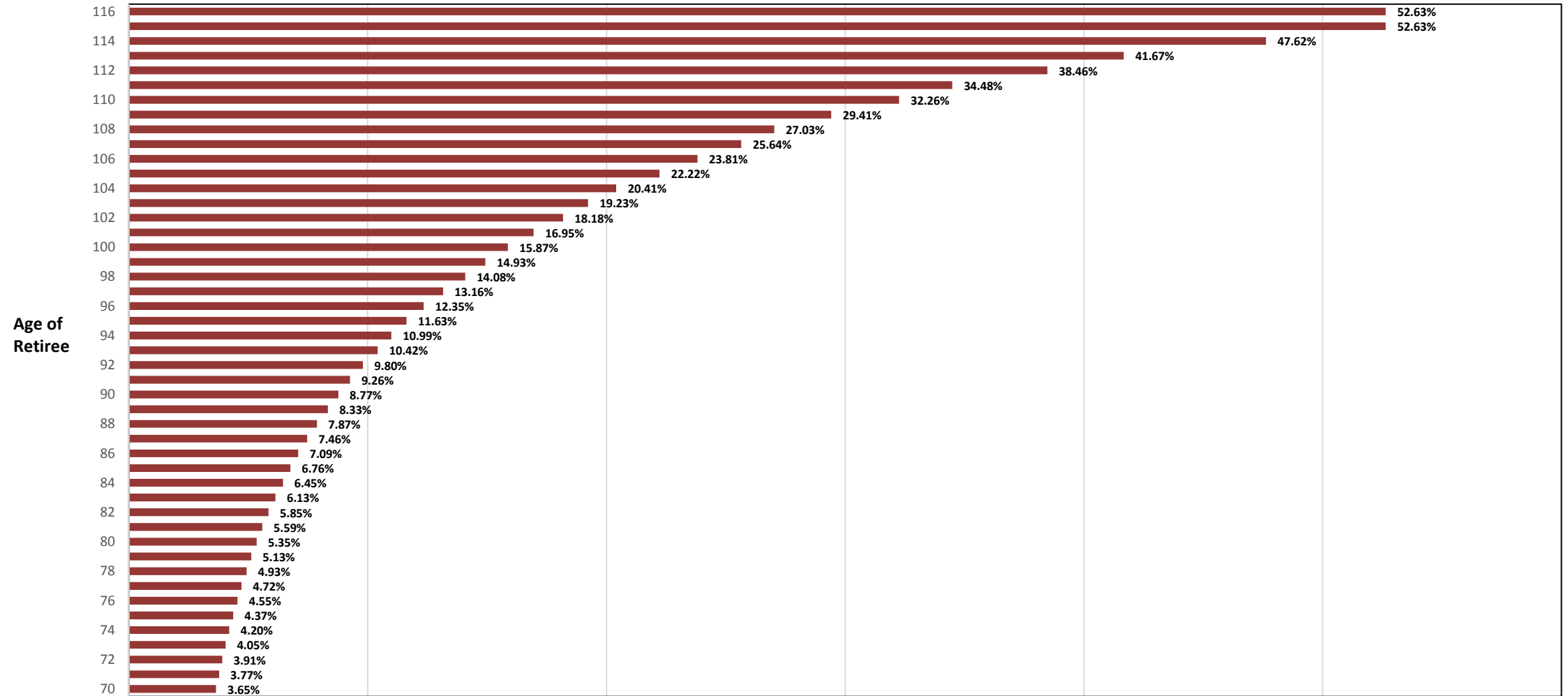
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**Analyzing retirement portfolio survival
as affected by the RMD
(required minimum distribution)**

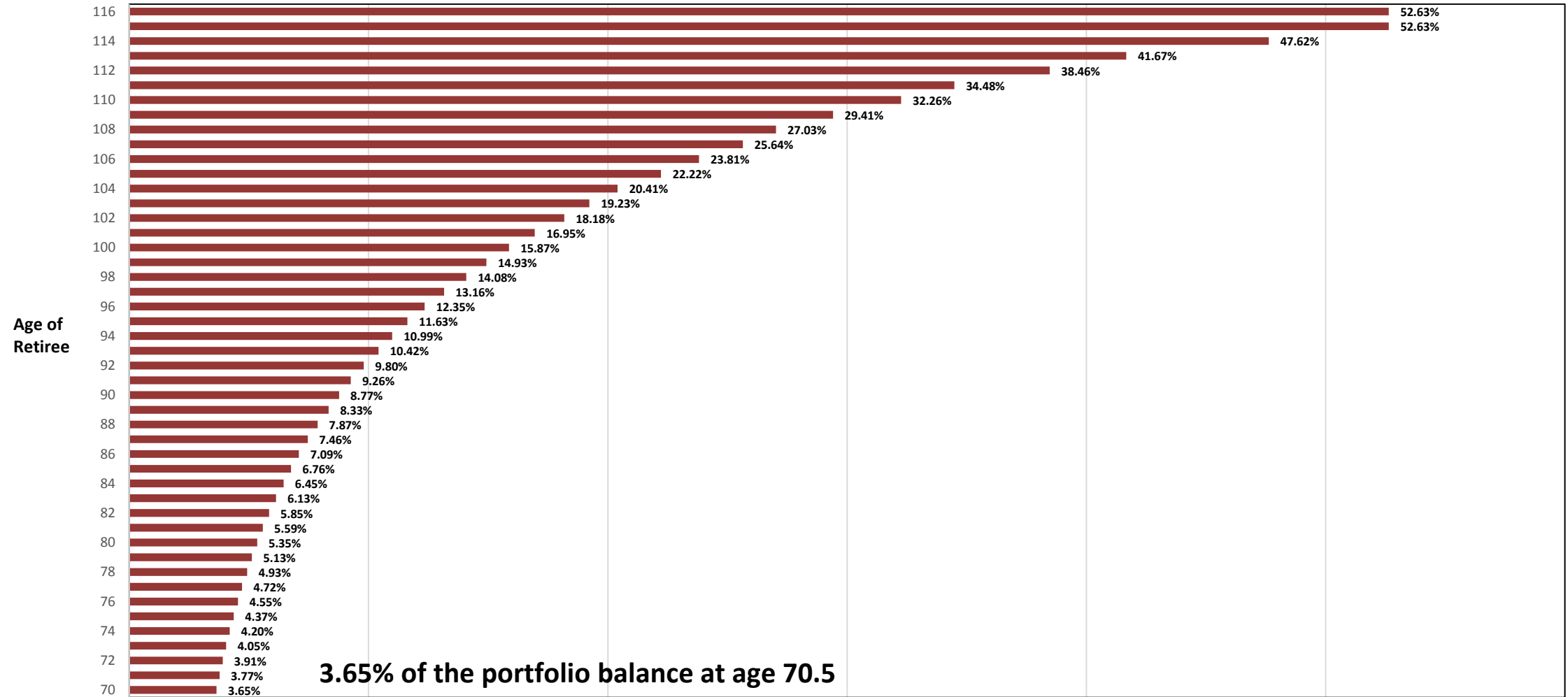
Quick facts about RMD

- RMD stands for **Required Minimum Distribution**.
- You generally have to start taking withdrawals from your IRA, SEP IRA, SIMPLE IRA, or retirement plan account when you reach age **70½**.
- Roth IRAs do not require withdrawals until after the death of the owner.

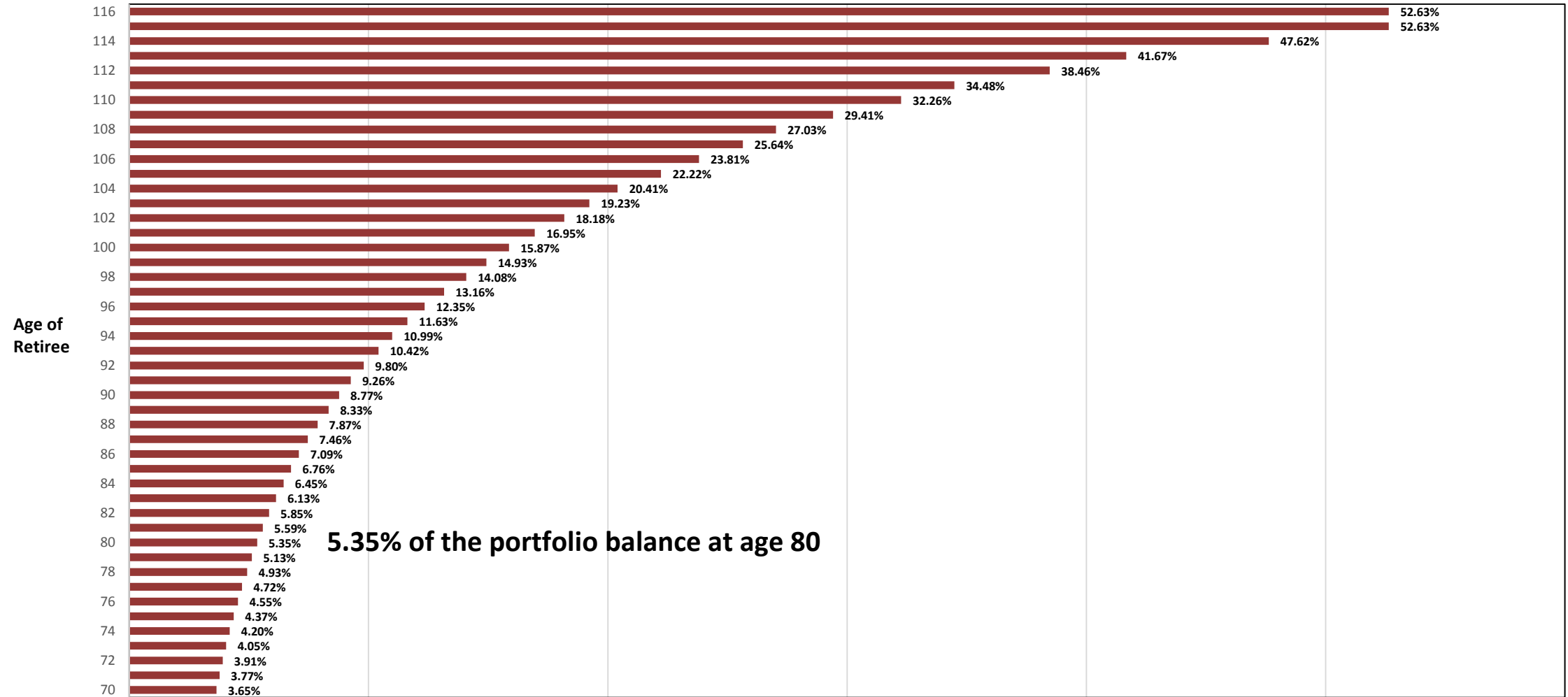
RMD Annual Withdrawal Percentages from age 70-116



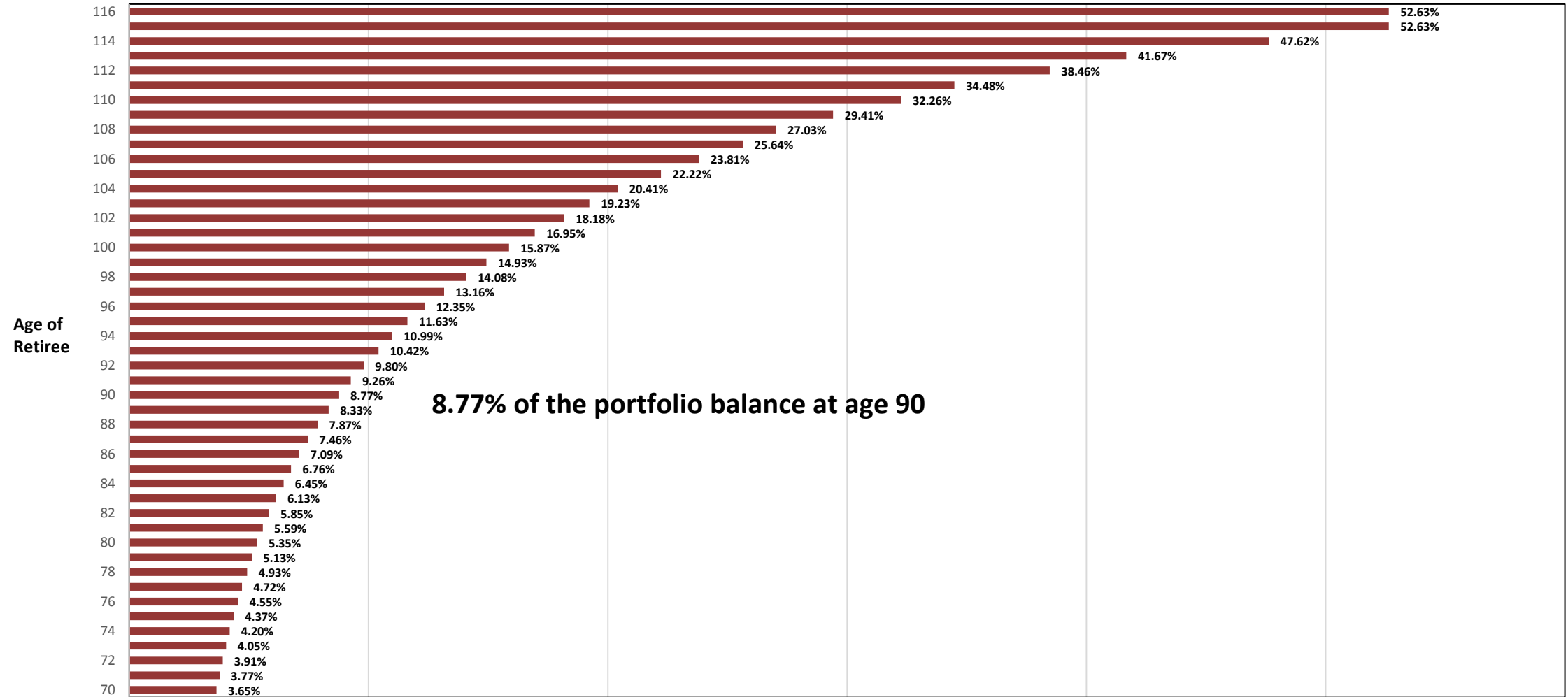
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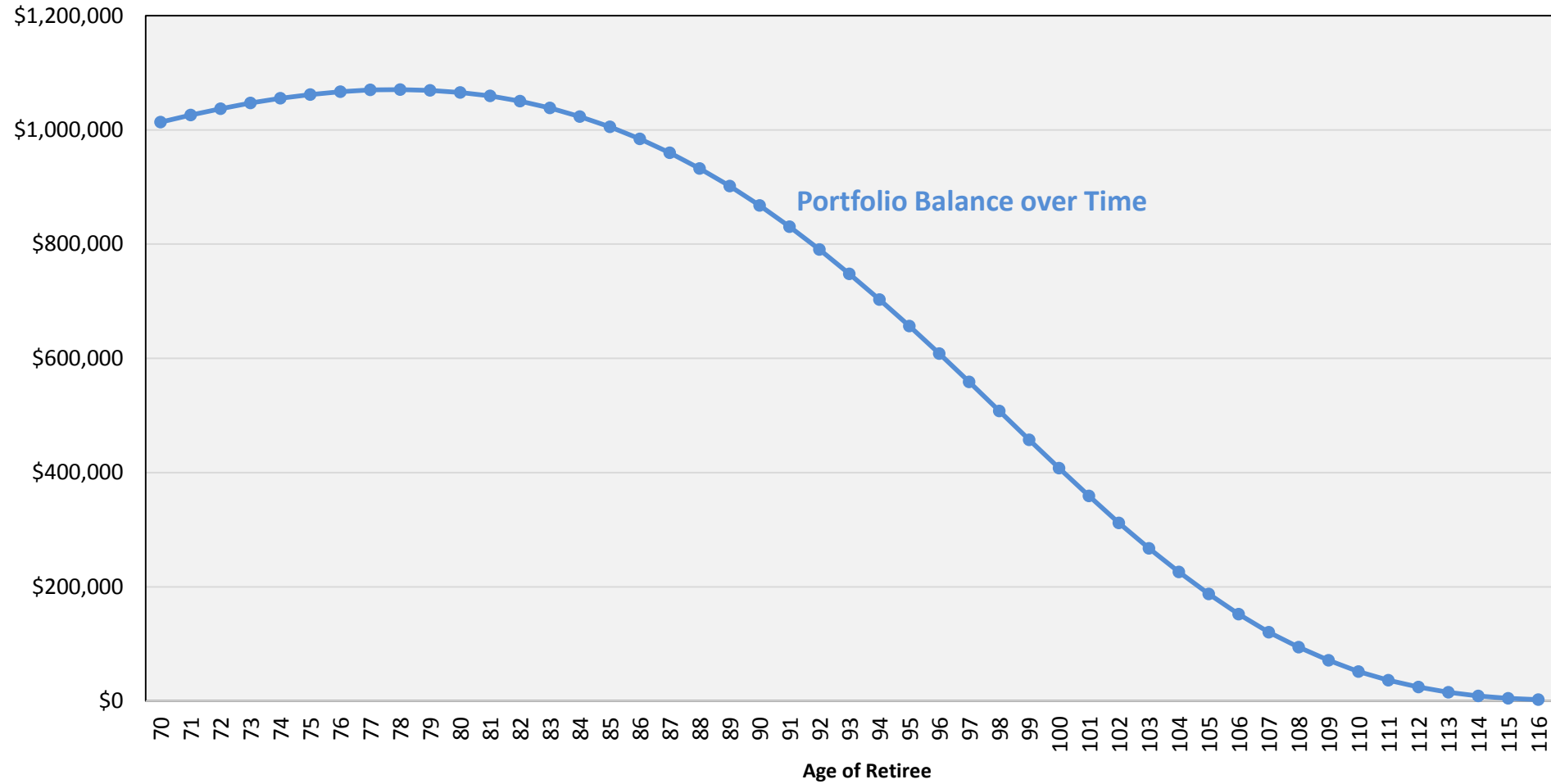
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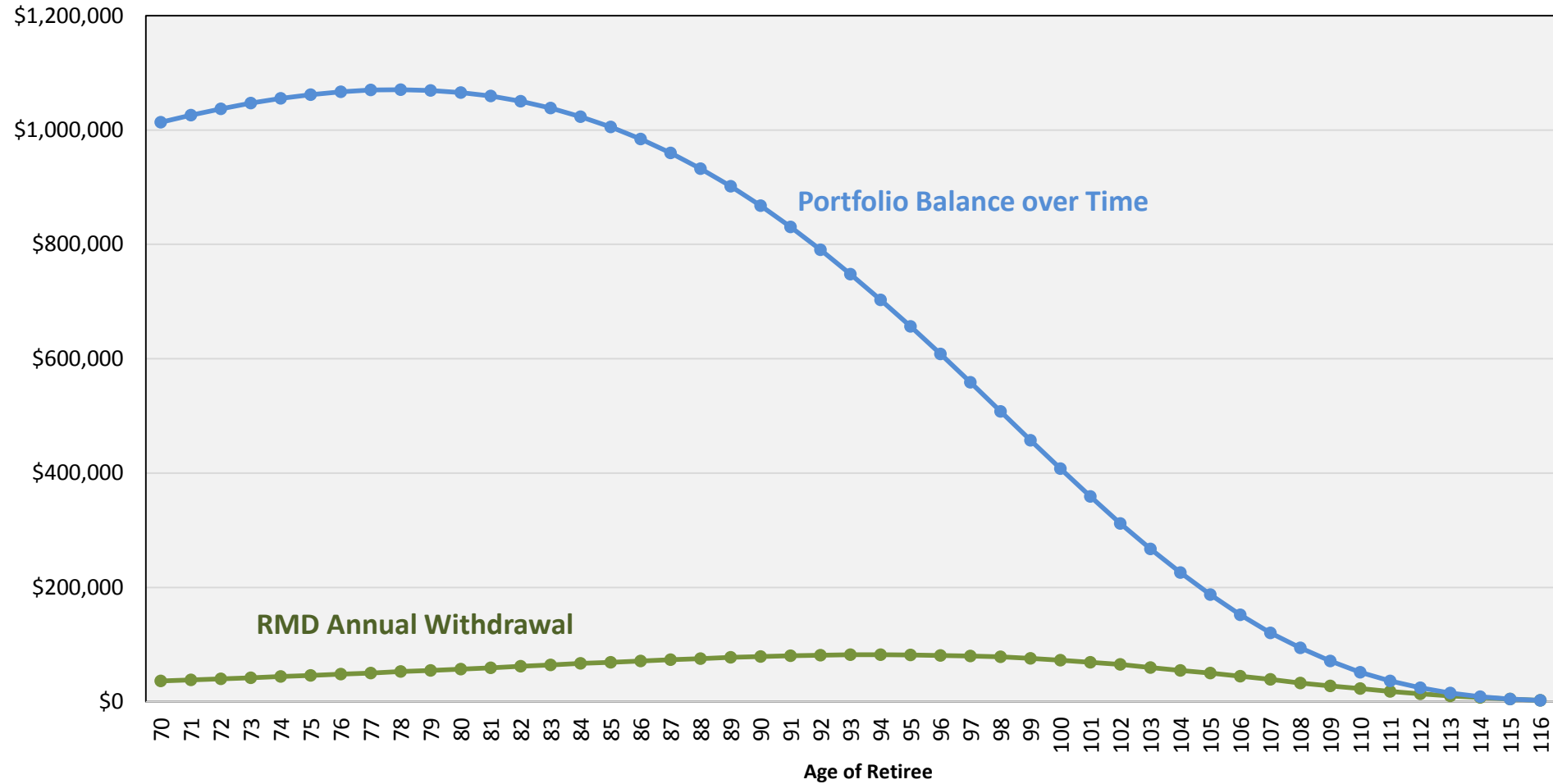
RMD Annual Withdrawal Percentages from age 70-116



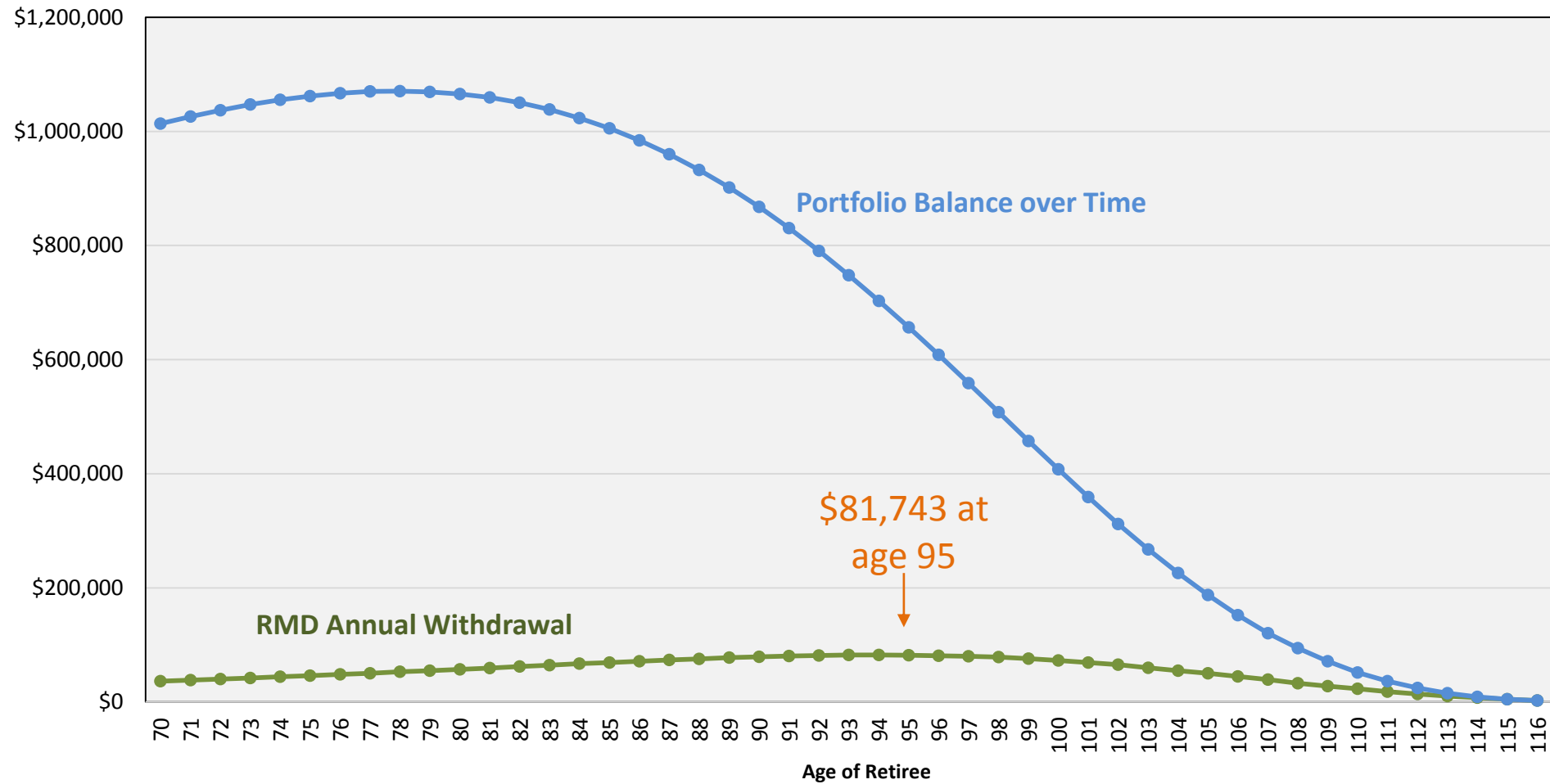
\$1,000,000 portfolio earning 5% annually with RMD-based annual withdrawal



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The RMD Guarantee

- **If you only withdraw the RMD (nothing beyond that) you cannot liquidate your retirement portfolio prior to age 116—no matter what your portfolio is invested in.**

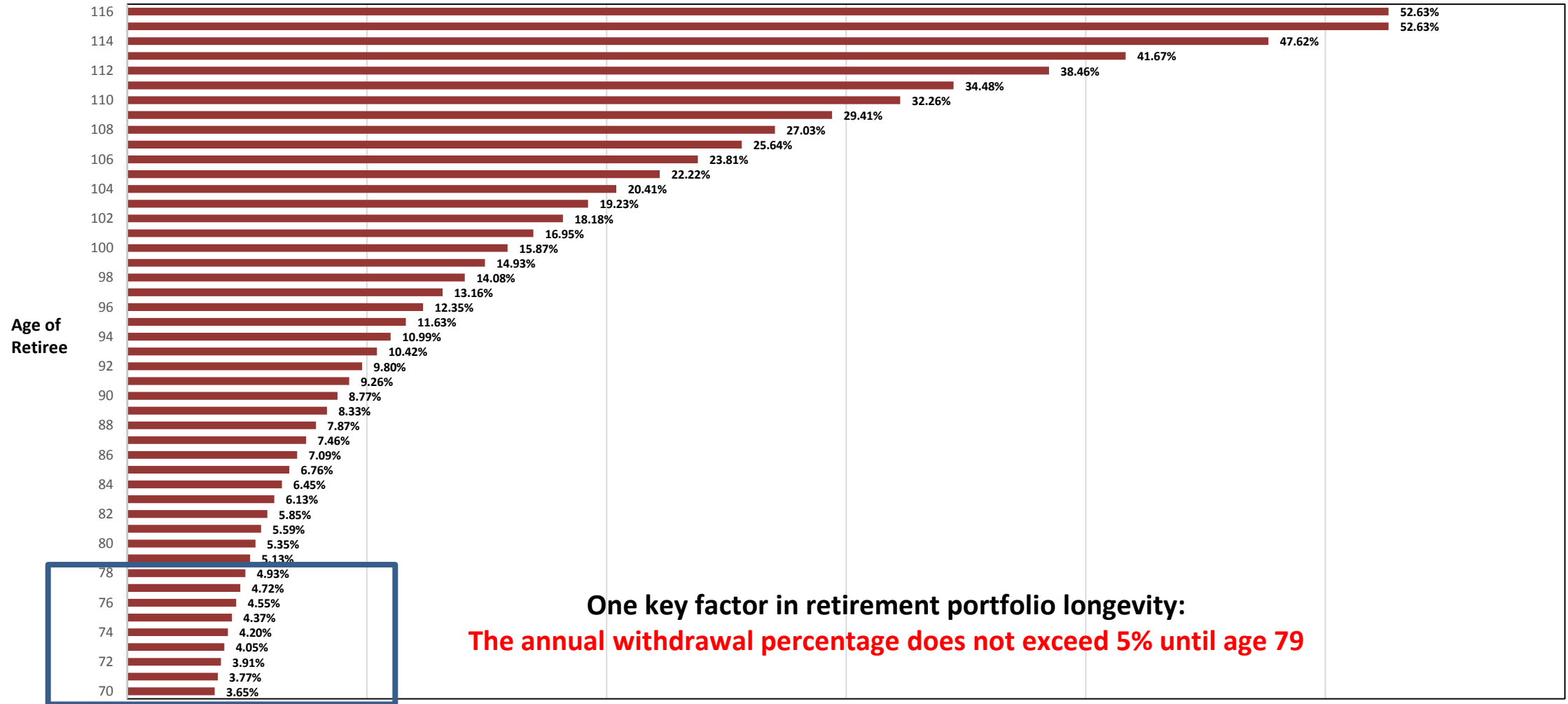
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- **Whether or not the RMD is sufficient to meet your retirement income needs entirely depends upon your starting balance, your retirement portfolio performance, and your spending pattern in retirement.**

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- Whether or not the RMD is sufficient to meet your retirement income needs entirely depends upon your starting balance, your retirement portfolio performance, and your spending pattern in retirement.
- **The RMD is not your enemy. Rather, it provides some sound guidelines regarding sustainable withdrawal rates (aided by not beginning annual withdrawals until age 70).**

RMD Annual Withdrawal Percentages from age 70-116



The RMD Guarantee

- **Because the RMD is based on a percentage of the portfolio's value at the end of the prior year, the amount required to be withdrawn each year will fluctuate and can go down in some years.**

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- **This is in contrast to a fixed initial withdrawal rate (say, 5%) and an annual COLA of 3%. This approach sets in motion an annual withdrawal that increases each and every year and does NOT take into account the portfolio's performance in the prior year.**