More Canadians are getting older and retiring, while their portfolios are now being asked to work harder and for longer. Canadians need new financial products for decumulation, to help increase the longevity of their nest egg. In this whitepaper, we introduce and modernize the Tontine structure.

In late April 2022, Statistics Canada released the results of the most recent Canadian census. Among many other fascinating facts, the study indicated that there were now 9,540 centenarians living in Canada, defined as people above the age of 100. That number works out to 25.8 per 100,000 Canadians, and an increase from a mere 1,065 Centenarians in the year 1971. To put these numbers in historical perspective, these 9,540 centenarians would have been born in the year 1921 or earlier, perhaps during World War I or the Spanish Flu. Additionally, if members of this extraordinary group of centenarians retired at the traditional age of 65, that would imply they lived through 35 years of retirement and possibly as many as 40 or 45 years. That is simply unprecedented and should cause everyone to wonder, will my money last as long as me?

Of course, not everyone born in the year that Lyon Mackenzie King was Prime Minister and the Ottawa Senators won the Stanley Cup by beating the Vancouver Millionaires (yes, that was their name), aka 1921, survived to the end of the year 2021. Of the 264,879 who are estimated to have been born in 1921, less than 9,540 were still alive in early 2022, which is less than 3.6%. So, not everyone needs to

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1 Moshe Arie Milevsky, Ph.D. is the Chief Retirement Architect in collaboration with Guardian Capital LP, while Adam Murl, CFA, is Portfolio Manager and Vice President, Retail Research & Lead Solutions Architect, at Guardian Capital LP. Both authors would like to acknowledge the input and research of Humaira Omari, Investment Product Analyst, also at Guardian Capital LP.


4 Zimonjic, Peter. “Number of Canadians Living to 100 Hit a Record High, New Census Figures Show”, CBC News, Politics, May 1, 2022.


6 Statistics Canada, as at June 2022.
worry about three to four decades of retirement, and these centenarians likely had a combination of great genes, healthy habits and a dosage of good luck.\footnote{Zimonjić, Peter. “Number of Canadians Living to 100 Hit a Record High, New Census Figures Show”, CBC News, Politics, May 1, 2022.}

But such centenarian survival odds aren’t unique to 1921, and the 3.6% rate, although relatively stable from year-to-year, appears to be growing. In other words, the fraction of any cohort reaching very advanced ages gets higher and higher for later cohorts, primarily because of the reduction in infant mortality rates during the 20th century, but also due to a myriad of other health factors. In fact, according to estimates from demographers and actuaries, a Canadian born in the year 1950, who is 72 years of age in the year 2022, has a 21.5% probability of surviving to age 100 – that is, living to the year 2050.\footnote{Data collected from the Human Mortality Database (HMD) - Cohort Data - Death Rates table for both 1950 and 1921.} That probability is 1.5 times higher than a 72-year-old Canadian born in the 1921 cohort.\footnote{Calculating survival probability using methodology in Milevsky, “Retirement Income Recipes in R: From Ruin Probabilities to Intelligent Drawdowns”, 127.} Then again, that is only an actuarial estimate. We really don’t know what it will be, and we certainly don’t know whether any one individual will become a centenarian. The demographers and actuaries call this \textit{longevity risk}, which is the topic of this whitepaper.

To be very clear, nobody really knows what fraction of any recent cohort will actually survive to age 100. It depends on many unknown societal factors, including, but not limited to, unexpected pandemics such as COVID-19. All we can do is look to the past and create pictures such as Figure \#1, which illustrates the fraction of the 1921 cohort survivors.

The discerning demographer or cautious actuary is careful to couch projections and estimates with a wide range of uncertainties, also known as confidence intervals. In fact, those confidence intervals

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{The Known History of the 1921 Canadian Cohort (Generated by Humaira Omary, Guardian Capital LP, with methodology based on M.A. Milevsky (2022), How to Build a Modern Tontine) For Illustrative Purposes Only}
\end{figure}
have actually gotten wider in the last few years. The key subtle point here is that, unlike a fair coin toss that falls heads 50% of the time, we don’t really know what your survival odds will be, and you will only be tossing your longevity coin once.\textsuperscript{10} This is another aspect of longevity risk.

Figure \#1, with its very precise number of survivors from a specific cohort, is only possible to plot or graph while looking backward in time. In contrast, Figure \#2 displays an estimate or hypothetical range for what fraction of a 1950 cohort of individuals is likely to survive to future ages. Using the modal age of death of 100 and 80 for upper and lower, respectively, notice the growing wide bands of survival estimates. To be clear – we just don’t know what this will actually look like in the future. That is the dual element of longevity risk. The odds themselves are random.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{longevity_risk_graph.png}
\caption{The Unknown Future of the 1950 Canadian Cohort (Generated by Humaira Omary at Guardian Capital LP, with methodology based on M.A. Milevsky (2022), How to Build a Modern Tontine)}
\end{figure}

\textit{For Illustrative Purposes Only}

\section*{Financing Modern Decumulation}

Managing decumulation in the face of longevity risk is the \textit{raison d’etre} of pensions. In any pension system, whether it is a guaranteed corporate defined benefit (DB) plan, the Canadian Pension Plan (CPP) or Old Age Security (OAS) and the Guaranteed Income Supplement (GIS), those who live longer than expected – i.e. benefit from the human longevity blessing – are implicitly subsidized by those who do not reach the longevity averages. Intuitively, someone who retired and draws a pension for a mere few years and then, unfortunately, dies early, even if the spouse or children receive continuation payments for a while, ends up losing in the longevity pooling arrangement. By losing, we mean that they have obviously paid into a system in which \textbf{after the fact}, their internal rate of return (IRR) turns out to be much lower than the above noted centenarians who survive. Nevertheless, the insurance element in these social programs is extremely important and also benefits those who don’t “make a

\textsuperscript{10} The Covid-19 pandemic has not only reduced period life expectancy around the world, but it has also increased awareness of the volatility or stochasticity of mortality rates themselves. This new challenge further increases the statistical uncertainty when making long-term predictions for individual survival rates. For a recent survey and discussion of this, see Regis, L., Jectić, P. (2022).

\textbf{Guardian Capital LP: Modern Accumulation Tontines for Retirement Decumulation}
claim.” After all, car, home and health insurance are valuable – even if you have never made a claim in your life. It gives piece of mind, or what economists would call “utility.”

The question facing Canadians in 2022, especially in light of the latest census results, is whether these guaranteed sources of income will be enough for the next generation of retirees, and whether their current nest egg will be able to sustain the growing number and the increasing odds of becoming a centenarian.

To this point, a recent editorial in the The Globe & Mail\(^1\) noted that there are 7 million Canadians above the age of 65, according to the census, and another 5.2 million between the ages of 55 and 64. This latter, younger group of soon-to-retire Canadians, who are within sight of eligibility for CPP as well as OAS and GIS, outnumber – by over a million people – those who are entering the workforce. The editors at the The Globe & Mail noted the challenges that this demographic wave poses for Canada’s finances and concluded by asking:

“...Given that people are living and working longer, is 65 still the right age for OAS? Should the income level at which claw-backs starts be lower? And, should a senior couple with a combined income of $150,000 get full OAS payments? Their cheques are, after all, being paid by taxpayers – nearly all of whom are younger and have lower incomes...”

Such musings, in a leading Canadian newspaper, raise the very serious possibility that the current level of OAS and GIS support simply can’t be taken for granted. In other words, the above-noted longevity-guaranteed retirement income embedded within these social programs, and currently available to all retirees, may not be there in the future. Canadians and their financial advisors will be forced to think differently and innovatively on how to decumulate assets and consider the need to harvest the benefits of pooling. Just as importantly, what are the options available to Canadians for whom CPP, OAS and GIS simply aren’t available? Is there any way to participate in this type of asset pooling arrangement, but without buying an irrevocable and irreversible life annuity? This brings us to tontines.

**Tontine History, Thinking and Future**

Before we explain the origins and history of tontine funds and how they can be modernized for the 21\(^{\text{st}}\) century, it’s important to emphasize that traditionally there have been two different types of tontine arrangements; one focused on decumulation and the other on accumulation. We start by describing the historical (17\(^{\text{th}}\) and 18\(^{\text{th}}\) century) decumulation tontine, then move on to explain the (19\(^{\text{th}}\) and 20\(^{\text{th}}\) century) accumulation tontine and finally conclude with Guardian’s innovation, which is to merge an accumulation tontine with a decumulation fund.

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\(^1\) The Globe and Mail, “‘Sorry, Grandma, We’re Cutting Your Benefits.’ No Politician Will Ever Say That. but Maybe They Should.” The Editorial Board, May 2, 2022.
In the year 1693, England was struggling with the cost of an expensive and unpopular war against France and was looking for an innovative way to borrow money at the lowest possible interest rate. The 17th century was a time before long-term bonds or central banks. So, the English decided to try a rather innovative strategy using a **tontine scheme**. Thus, an act of parliament was passed that approved the borrowing of £1,000,000 using this method which we will now describe.

For this tontine scheme, the English offered a syndicate of wealthy lenders 10% interest for seven years and then 7% interest in perpetuity, as compensation for the £1,000,000 loan. But the principal would never be returned. Think of this like a mortgage. You borrow a lump sum from the bank and pay it back in installments over time. In this case, the parliamentary Exchequer slowly paid back the £1,000,000 loan over time.

Thus, for example, after one year, the Exchequer would make £100,000 in total interest payments to the syndicate of lenders in 1694. The same process would be repeated in 1695, 1696 and so on. Then, in the year 1700, the annual interest payments to the syndicate would be reduced from 10% to 7%, for a total outflow of £70,000 per year, until the entire syndicate of lenders was effectively gone.

Gone?

Yes, the catch – or the difference between this particular amortizing loan and any other loan – was that the annual interest payments would only be distributed to the investors in the syndicate conditional on their original “nominee” being alive. To clarify here, in the year 1693, when the loan was syndicated, any investor who lent or invested £100 (which was the minimum investment) via this scheme had to select a nominee upon whose life the interest payment would be continued. If and when the nominee died, the payments ceased to the annuitant. As one might expect, the nominees of the 1693 tontine were mostly young healthy children—the average age of the typical nominee was 10—who were expected to live a long life. But of course, not all of them did in reality.

We call this a “decumulation-style tontine”, even though nobody in the 17th or 18th century ever used that term, because the typical investor or annuitant was handing over a lump sum today (at retirement) in exchange for periodic income and cash flow for the rest of their (or their nominee’s) life. It was meant for people who were trying to decumulate their wealth – and this is where the modern term comes from – spend down their assets and generate an income they wouldn’t outlive.

As an example, assume that 10,000 investors each invested £100 in the scheme and selected their distinct nominees. Now imagine that by the year 1697, a total of 500 of the nominees had died during the first four years of the scheme. In that year, the £100,000 of interest would be distributed among the corresponding 9,500 annuitants, which would result in a **tontine payout** of 100,000/9500 = £10.53 per investor. The key here is that the extra £0.53 above and beyond the 10% interest were what are today called mortality credits.

*Mortality had, thus, become an interest rate subsidy. This key insight would then be used in the 19th and 20th century to create “accumulation tontines”, which were packaged and sold by insurance companies all over the world to investors who didn’t necessarily want or need those periodic cash flows and income. We will explain these accumulation tontine structures in just a bit.*

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Guardian Capital LP: Modern Accumulation Tontines for Retirement Decumulation
But back to the decumulation tontine; let’s fast-forward a quarter of a century after the loan was initiated. If, by the year 1720, a hypothetical total of 4,000 nominees had died, then the £70,000 in interest would be distributed to the remaining 6,000 investors, generating a tontine payout of £11.67 to each, which can be further broken down to 4.67% (or £4.67) of mortality credits, plus 7% (or £7.00) of interest.

Recall that by construction and design, in the year 1700 the aggregate interest payment to the syndicate was reduced from 10% to 7%, which leads to a lower numerator. This pattern would continue until the last remaining survivor (nominee) receives a dividend of £70,000 until they die and the tontine was extinguished. That last annuitant received an annuity for the rest of their life.

As a point of fact, the oldest nominee linked to the 1693 tontine was a female who died in 1783 at the age of 100. Yes, she was selected as a nominee at the age of 10. Our point here isn’t to tell the full history of the first English tontine loan, but rather to unearth the source of new ideas for the retirement income strategies in the 21st century.12 The original 1693 design — and what has been named King William’s tontine by historians — inspired future generations of investment funds with what we call “tontine thinking”. The next step in the evolution of the historical tontine was to leverage the central idea of mortality as an interest rate for consumers and investors who weren’t quite ready to retire and/or decumulate. We will call those accumulation tontines.

Tontine Scheme Transparency vs. Annuity Complexity

Anyone who participated in the 1693 decumulation tontine knew exactly why he or she was receiving a particular payout in a particular year. The calculation could be done — and was actually reported — on a single sheet of paper that is still preserved today in the archives of the British Library in London. The cash flow numerator was known in advance, and the denominator of survivors could easily be counted every year at the designated dividend payout date. The division of the two numbers didn’t require any advanced mathematics or actuarial discretion. It’s important to emphasize, once again, that these schemes were quite popular during that time, and for those who are interested in delving into their history (and legality), we recommend the articles listed in the bibliography.

Added and Real Longevity Protection

Participating in the decumulation tontine could protect the investor against the nominees — which could also be the investor — living longer than they had originally planned or anticipated. The longer they lived and the longer they outlived other nominees, the more income the investor received. The last few survivors — who by definition had lived very long lives — would receive larger payments, which then could serve as a hedge or protection against uncertain medical expenses, which may have increased at a rate higher than inflation. In some sense, nominal instruments were being used to generate real returns. This is a subtle point that is worth repeating. Even though all payments are in nominal currency terms, the fact they increase rapidly over time means they might beat inflation.

12 The source for the historical material on tontines is Milevsky (2014, 2015) and the underlying mathematics are fully and carefully explained in Milevsky and Salisbury (2015, 2016). Note that as of spring 2022, over 100 technical articles and newspaper stories have been written about tontines just in the last decade, including features in The Economist Magazine, The New York Times and Financial Times.

Guardian Capital LP: Modern Accumulation Tontines for Retirement Decumulation
**The Accumulation Tontine**

With the history of the 17th and 18th century decumulation tontine out of the way, let’s move forward by a century or two and take a look at the accumulation tontine. The central idea there was to leverage those mortality credits to create an even larger pool of money for those who survived. This could be done by people as young as in their 30s and 40s, investing in an accumulation tontine that matured 20 years later, when they were in their 50s and 60s. Or an accumulation tontine might be entered into by investors in their 50s and 60s, with the maturity date being in their 70s and 80s.

For the sake of a pure hypothetical example, and to help understand the accumulation tontine concept, imagine the following: Assume you are currently 65 years old and that it has been estimated that only 80%, that is, four-fifths of your birth cohort, will ever reach the age of 85. Remember, we really have no idea what fraction of a population—and especially among a small group—will reach the age of 85.

For this example, imagine a cohort of (only) 100 investors all chip in with $1.00 today and place that into a zero-interest piggy bank. That $100 will remain $100 for the 20 years, which can then be split among the remaining 80% at its maturity. The pooling bonus multiple—a reward to those who survive—will be 1.25, or a return of $1.25 on the original $1.00 investment. That is just a simple calculation of $100 / 80 = 1.25, even though the piggy bank paid absolutely nothing! Another way to think about and present this is as a 25% total return. It’s all the same, just different ways of explaining the gain.

Now, let’s make this even more interesting and lucrative. If the initial $1.00 is invested at 4.5% per year for 20 years, which is not an unreasonable rate of return from a diversified portfolio over 20 years, then $100 will grow to $241.20. That’s just pure time value of money and financial math. Divide that future value by 80, the number of remaining survivors, and you get about $3.00. That’s a multiple of three. For the original investment of $1.00, the investor would end up with $3.00, if they survived. That conditional return is 5.67%, or 1.17% extra per year. The mathematical equation that governs the multiple, under the most general investment and mortality conditions, is presented and displayed in the Technical Appendix: The Pooling Bonus Multiple, which can be found at the end of this whitepaper.

Figure #3 uses this exact same mathematical calculation, assuming an even smaller fraction survive, thus the pooling bonus of “extra return”, as measured in annual percentage, becomes even greater. Whether reporting the pooling bonus as a multiple (e.g. times your cost basis) or as enhanced investment returns (e.g. annual percentage), the underlying idea is exactly the same.

### Return Depends on Fraction that Survive

<table>
<thead>
<tr>
<th>Fraction that Survive</th>
<th>Extra Return (%)</th>
<th>Multiple of Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>80%</td>
<td>1.17%</td>
<td>3.00</td>
</tr>
<tr>
<td>70%</td>
<td>1.88%</td>
<td>3.45</td>
</tr>
<tr>
<td>60%</td>
<td>2.70%</td>
<td>4.00</td>
</tr>
<tr>
<td>50%</td>
<td>3.69%</td>
<td>4.82</td>
</tr>
</tbody>
</table>

*Table 1: What will be Your Pooling Bonus? (Generated by Humaira Omary at Guardian Capital LP, with methodology based on M.A. Milevsky (2022), How to Build a Modern Tontine)*

*For Illustrative Purposes Only*
Now, to be very clear, that extra return isn’t free and doesn’t come out of thin air. It is earned at the expense of those investors who don’t survive the full 20 years to maturity of the accumulation tontine. However, and this is key, for individuals whose main concern is squeezing the highest and greatest amount of return from their nest egg as they reach an advanced age, an accumulation tontine opens up an entirely new opportunity to potentially stretch savings and increase multiples.

Guardian Capital’s Approach: An Accumulation Tontine

Now that we’ve spent some time delving into the history and theory of tontines, what does an accumulation tontine actually look like in practical and modern terms? Enter the GuardPath™ Modern Tontine. As part of GuardPath™ Longevity Solutions, created and offered by Guardian Capital LP, this modern take on the accumulation tontine has been designed with the aim of delivering the capital appreciation that investors demand, along with the benefit of survivorship credits, which can help to further improve expected returns and extend the longevity of portfolios. Think of it as an accumulation tontine built for a decumulation portfolio.

More specifically, the GuardPath™ Modern Tontine is an investment trust with a 20-year term, and which is only available for purchase by a specific age cohort of investors that are at or near the age of retirement. Similar to the previous example, investors that survive to the termination date will receive the proceeds from both the 20 years of compounded investment returns, as well as any accrued pooling benefits of extra return, which we refer to as ‘survivorship credits’13, from those investors who either pass away or redeem early during the 20-year term, which we estimate could amount to an additional 2% per year of additional return14.

To help illustrate, let’s assume we have two investors, A and B. Investor A takes $100K and invests in a portfolio of global equities, at an assumed annual return of 6.9%, and in turn expects to receive approximately $380K in 20 years. Investor B takes their $100K and invests in the GuardPath™ Modern Tontine, which is also exposed to the same pool of global equities and thus has the same expected investment return. However, because Investor B benefits from both investment returns and survivorship credits, they could expect to receive an estimated $548K at the end of 20 years, for an incremental $165K, or 2% of additional annual return.

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13 Tontine total returns may decline if mortality rates or voluntary redemptions, which contribute to survivorship credits, decline and may increase if mortality rates, or voluntary redemptions increase. Investors who redeem early or pass away prior to year 20 will only receive a percentage of their NAV, as described in the prospectus, as of the date of redemption or death.

Simulated Example – For Illustrative Purposes Only

The graph above shows the estimated potential redemption value up to and at the Termination Date of the GuardPath™ Modern Tontine based on the assumptions outlined in the prospectus. This illustration is not representative of any particular investor’s experience, please referred to the Risk and Assumptions at the end of this white paper.

Contrary to many retirement products in the market today, which seek to conservatively provide income, the GuardPath™ Modern Tontine has a sole investment objective of capital appreciation and as such, will aim to maintain a very high equity allocation throughout the majority of the life of the Trust, which seeks to help maximize investor value over time. Additionally, as the GuardPath™ Modern Tontine is an accumulation vehicle, with no planned distributions, it does not suffer from sequence of returns risk, which, in our view, is one of the most critical challenges facing retirees today (please refer to our whitepaper on sequence of returns and related risk titled “Retirement’s Hidden Risk: Sequence of Returns” from April 2021 here).

As mentioned previously, investors in the GuardPath™ Modern Tontine are expected to benefit in two ways: first, from investment returns and second, from the “survivorship credits” captured through investor redemptions or deaths over the life of the investment. Investors in the qualified age cohort are able to purchase or redeem daily at NAV throughout the term of the trust; however, any redemption prior to the termination, whether voluntary or upon death, is subject to a discount to current NAV that varies over that term. What this means is that the GuardPath™ Modern Tontine is not an appropriate investment solution for any investor that is seriously ill, does not reasonably expect to live for another 20 years or who does not anticipate remaining invested for the entire term. This investment solution is a provision for the distant future – a new type of nest egg.

However, as individual mortality increases with age, and as it is highly uncertain, the GuardPath™ Modern Tontine aims to serve as an effective tool for the majority of investors who would like to hedge their personal human longevity risk. And if the investor lives a long time – which can be costly in economic terms – they are expected to receive lump-sum payouts at the end of the 20-year term.
Translating this into numbers, let’s assume Investor A is 65 years of age and contributes $100,000 into the GuardPath™ Modern Tontine. Based on our assumptions, Investor A could expect to receive approximately $548,000 at the termination of the trust, which in turn could be used to fund years of additional retirement spending or medical expenses, or any other purposes. This equates to over 5x the initial investment for an annualized return of approximately 9%, conditional on survival, which is in excess of the underlying net investment returns of 6.9% alone, thanks to survivorship credits estimated to be 2% per year.

Although the economic value of the GuardPath™ Modern Tontine largely lies in the termination payout, investors are generally expected to benefit from the capital appreciation of the portfolio during the life of the trust, such that our models estimate that investors could receive at least their initial investment amount in year 10 with a potential rise thereafter. In other words, even though the GuardPath™ Modern Tontine was built with the expectation that investors would not intentionally redeem during the 20-year period, even if they do so – whether for liquidity, due to mortality or other reasons – those who do should be able to at least recover their original investment, with increasing benefit over time, despite the redemption fee.

By aiming to provide high and consistent returns and reduced risk, the GuardPath™ Modern Tontine could be an option for advisors and their clients to better optimize retirement plans in a way that has not historically been possible through the use of traditional investment funds. The key insight is that by having more efficient portfolios that aim to provide higher returns and lower longevity risk, investors have an opportunity to overcome the many challenges of investing and decumulating assets during retirement and increase the chances of achieving their retirement goals.

However, we understand that advisors and their clients have different financial situations, preferences and timelines, which is why the GuardPath™ Longevity Solutions provide a variety of options. Guardian Capital LP has created another investment solution designed to optimize the utility of invested capital during retirement. The GuardPath™ Managed Decumulation solution offers two distinct options:

1. The Decumulation series, with an annual 8% initial cash distribution, paid monthly, over 20 years that aims to provide a steady cash flow and help manage the decumulation experience for investors.

2. The Hybrid Tontine series, which combines the decumulation series that pays a high, consistent and tax-efficient annual 6.5% initial cash distribution, along with an annual 1.5% allocation contributed to the GuardPath™ Modern Tontine. In this way, investors in the Hybrid Tontine series can gradually and easily acquire units of the GuardPath™ Modern Tontine over time and directly from the distributions of their existing investment, rather than cash on hand.

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15 This example describes the potential payout value at the Termination Date of the GuardPath™ Modern Tontine based on certain assumptions, which come with inherent risks. This illustration is not representative of any particular investor’s experience and is not complete without referring to the Risks and Assumptions at the end of this white paper.

16 Reflects initial target distribution rate. This distribution may be subject to change over time. Please refer to the Assumptions and Risks for more information on the risks associated with this distribution.

17 Distributions are expected to be primarily return of capital or capital gains generated from option premiums and securities transactions, which are taxed more favourably than income.
Here is an illustration to help provide some more context. Let’s return to Investor A. Let’s say she is looking for additional cash flow to complement her existing sources of income but would also like an option to hedge the risk of possibly outliving her assets. That same $100,000 investment could instead be invested in the Hybrid Tontine Series of the GuardPath™ Managed Decumulation solution. This would entitle her to an initial $6,500 of annual distributions from GuardPath™ Managed Decumulation, while also steadily increasing her longevity hedge investment in the GuardPath™ Modern Tontine. In terms of total value, based on our assumptions, Investor A could expect to receive approximately $130,000 of cumulative distributions and further benefit from the GuardPath™ Modern Tontine termination payout value of approximately $82,000, for an estimated total accumulated value of approximately $213,000. By providing different ways of accessing the GuardPath™ Modern Tontine, advisors and their clients can better toggle exposures to best suit their cash flow needs and risk tolerances.

**GUARDPATH™ MANAGED DECUMULATION – HYBRID TONTINE SERIES: THE EXPERIENCE**

**Simulated Example – For Illustrative Purposes Only**

The graph above shows the estimated potential distribution cash flow and tontine redemption value up to and at the Termination Date of the Hybrid Tontine Series of the GuardPath™ Managed Decumulation Fund based on the assumptions outlined in the prospectus. This illustration is not representative of any particular investor’s experience, please refer to the Risk and Assumptions at the end of this white paper.

As King Solomon wrote in Ecclesiastes 1(9): “What has been will be again, what has been done will be done again; there is nothing new under the sun.” With so many investors entering retirement with less money saved and with the expectation they will live longer lives, it seemed an appropriate time for a reinvention of the tontine, built on the back of several hundred years of history.

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18 This example describes the potential distributions from the GuardPath™ Managed Decumulation and the potential payout value at the Termination Date of the GuardPath™ Modern Tontine based on certain assumptions, which come with inherent risks. This illustration is not representative of any particular investor’s experience and is not complete without referring to the Assumptions and Risks associated at the end of this white paper.

In Conclusion

In this article, we have described a novel investment product – which, to our knowledge, doesn’t exist anywhere in the world and would be a first for Canada – targeted exclusively at retiring and healthier investors who want to decumulate their retirement nest egg in the most efficient manner possible. The underlying philosophy or rationale for this financial novelty is built on the statistical logic of longevity risk pooling, which is a concept that has been around and implemented for centuries. In fact, longevity risk pooling is actually at the core of modern pension plans and annuity funds. In some sense, our core idea is older than mutual funds themselves, but oddly enough hasn’t been implemented within a regulated fund structure.

We conclude by arguing that there is no economic reason why access to longevity risk pooling should only be made available to consumers within a guaranteed insurance- or pension-based policy. Rather, we believe retirees should be given the choice; do they want to pool longevity risk with a guarantee – and receive less income on average? Or are they willing to pool longevity risk without any financial guarantees, but with the potential to enhance their expected investment returns accordingly? That’s the essence of the decumulation trade-off, and we believe Adam Smith’s unconstrained invisible hand and, more specifically, market forces, should determine the answer to this question.
Appendix: Internal Rate of Return

It is important to understand that the IRR is “random” and depends on both investment returns and mortality realizations.

Figure # 4 illustrates the internal rate of return conditional on survival for the GuardPath™ Modern Tontine based on our base case assumptions. The average or expected IRR is about 9% - however, the point of this illustration is mainly to demonstrate the range of the expected IRR. The green indicates a more likely occurrence whereas the red indicates rare occurrences.

![Histogram of IRR Values](image)

Figure 3: Internal Rate of Return (IRR) on the GuardPath™ Modern Tontine, Conditional on Survival (Generated by Humaira Omari at Guardian Capital LP, with methodology based on M.A. Milevsky (2022), How to Build a Modern Tontine)

For Illustrative Purposes Only
Technical Appendix: The Pooling Bonus Multiple

The following expression is a mathematical representation of what we have called, in the body of this white paper, the expected “pooling bonus multiple” that accrues to and is shared among those who participate in an accumulation tontine scheme.

\[
M_T := E \left[ \frac{1}{T} \int_0^T e^{(\lambda_t + r_t) t} \, dt \right]
\]

On the left-hand side, the letter M with the subscript T, which is meant to denote a time horizon, is defined as equal to the path expectation of the random future value.

More specifically the modeling assumption here is that the investor commits to allocate \((1/T)\) dollars every single year for \(T\) years, until the end of the \(T\)-year horizon. For example, if \(T=20\) years, then the right-hand side of the equation would represent someone who invests \$0.05 per year for 20 years \((1/20)\), or a total cost basis of \$1.00 in the accumulation tontine. The other two key variables on the right-hand side of the equation are the mortality hazard rate at time \(t\), denoted by the Greek letter lambda \((\lambda_t)\), and the underlying investment return denoted by \((r_t)\), both of which could be stochastic, or randomly determined.

Here is an extremely simple example to help make sense of the calculus and the expectations. Assume that \(T=20\) years, but that the mortality rate over the entire 20 years is zero, and the investment return is deterministic at: \(r=6.28\%\) per year. These assumptions are both ridiculous, since obviously some investors will die over the 20 years, and the tontine will never earn 6.28% every single year. But, in this case — since there is nothing random over which to take the mathematical expectations on the right side — the inner integral can be evaluated analytically, and the entire expression is \(M_{20}=2\).

In plain English, this translates to investing \$0.05 per year for 20 years, for a total of \$1, and ending up with \$2, or a multiple of two. Likewise, if you assume or use a value of \(r=0\%\), the multiple itself collapses to the cost basis of \$1. That result should be (even more) obvious.

Note that to achieve a (deterministic) multiple of \(M_{20}=3\), over the 20-year horizon, one would require an interest rate of 9.5%, which could be 6.5% of investment returns and 3.0% of mortality credits, or vice versa. The point is, they are added together within the integral, where death is just an interest rate.

However, when the mortality hazard rate and the investment return are both random — for example assuming a Gompertz law of mortality for the mortality hazard rate and a Geometric Brownian Motion for the investment return — the integral itself and future value is a random variable; its expectation is defined as our multiple.\(^{20}\)

Sources and Bibliography


Assumptions and Risks related to the Distribution and Payout Modelling

These forecast models have been prepared for illustrative purposes only, to help show the potential total amount of distributions for investors. These models are created based on various assumptions, and there is no guarantee that these same results will be achieved by investors. The use of hypothetical, simulated returns comes with inherent risks and limitations. Simulated returns are not the returns of any particular investor, account or portfolio; they are produced with the benefit of hindsight through the application of a model. There are numerous other factors related to the markets in general, and the implementation of any specific investment strategy, which cannot be fully accounted for in the presentation of hypothetical results; all of which can adversely affect actual results. Please consider these and other factors carefully and do not place undue reliance on forward-looking information. This illustration is not intended to represent the distribution experience of any particular investor, and is based on the following assumptions:

- All models assume an initial investment of $100,000 in Series F, which are held from inception through to the Termination Date.
- Illustrative examples shown are modelled based on Series F units, which do not pay a trailing commission, and assume an estimated Management Expense Ratio of 0.79% (management fee of 0.60%, administration fee of 0.10% and an HST rate of 13%).
- The capital market assumptions used for the equity and fixed income return assumptions herein are based on long-term projections from internal models. References to future expected returns are not promises of actual returns that may be realized and should not be relied upon in that regard. Actual returns may vary significantly.

What assumptions were used when modelling GuardPath™ Modern Tontine Trust

Series F: Assumes 6.92% continuously compounded net asset returns; mortality related redemptions as set out within the CPM-14B Mortality Tables*; an investor with an average initial age of 64; as well as 2% of Unitholders voluntarily redeeming per annum.

* A mortality table is a table prepared by actuaries that shows the rate of deaths occurring in a defined population over a particular time period. Based on a mortality table, it is possible to calculate the probability of a person’s death based on their age. CPM-14B, used by the Tontine Trust to prepare the graphs below, is a mortality table issued in 2014 by the Canadian Society of Actuaries based on Canadian pensioner mortality experience. The CPM-14B table is widely used by pension plans in Canada to estimate the financial exposure that is associated with their obligations or assumed under the products they market and sell. As it relies on the experience of pensioners, who tend to outlive non-pensioners, the CPM-14B table is generally viewed as a more conservative presentation of life expectancies than the standard Canadian mortality table. References: 2014 Canadian Pensioners’ Mortality tables. Canadian Institute of Actuaries. Retrieved April 29, 2022, from https://www.cia-ica.ca/docs/default-source/2014/214013e.pdf.

In addition to investment risks, the long-term total return of the Tontine Trust is impacted by actual redemption rates (either voluntary or upon death) by Unitholders of the Tontine Trust. Total returns may decline if mortality rates or voluntary redemptions decline and may increase if mortality rates or voluntary redemptions increase. To the extent Unitholders live longer than predicted by the mortality table, the rate of growth of a series’ NAV per Unit and the amount of distributions that would otherwise have been paid on the Units will be reduced. No assurance can be given that the mortality experience of the Tontine Trust will conform to that reflected in the CPM-14B mortality table underlying the modelled return information.

What assumptions were used when modelling GuardPath™ Managed Decumulation Fund

Series F: Assumes 4.8% continuously compounded net asset returns each year; and $0.80 distribution per Unit per year, each year, until the Termination Date.

In addition to standard investment risks, the long-term total return and the sustainability of the rate of distributions of the Decumulation Fund are impacted by sequence of returns risk and the volatility experienced within the sequence of returns. Sequence of returns risk is the risk that comes from the order in which investment returns occur. Market declines in the early years of operation of the Decumulation Fund paired with high levels of distribution increases the risks to the durability of the portfolio of the Decumulation Fund. Significant declines in asset value in the early years of the Decumulation Fund increase the likelihood that the initial distribution rate is unsustainable, while significant increases in asset value in the early years of the Decumulation Fund increase the likelihood that the initial distribution rate can be sustained. **Unitholders who redeem early or pass away prior to year 20 will only receive a percentage of their NAV, as described in the prospectus, as of the date of redemption or death.**
What assumptions were used when modelling Hybrid Tontine Series of the GuardPath™ Managed Decumulation Fund

Series F: Assumes $0.65 distribution per Unit per year until the end of year 19 (one year prior to the Termination Date) followed by an $0.80 distribution per Unit in year 20; $0.15 per annum switched from the Decumulation Fund to the Modern Tontine Trust until the end of year 19 (one year prior to the Termination Date) with no switches occurring in year 20; 6.92% continuously compounded net asset returns for the Tontine Trust; mortality related redemptions as set out within the CPM-14B Mortality Tables**; an investor with an average initial age of 64; and 2% of Unitholders of the Tontine Trust voluntarily redeeming per annum.

* A mortality table is a table prepared by actuaries that shows the rate of deaths occurring in a defined population over a particular time period. Based on a mortality table, it is possible to calculate the probability of a person’s death based on their age. CPM-14B, used by the Tontine Trust to prepare the graphs below, is a mortality table issued in 2014 by the Canadian Society of Actuaries based on Canadian pensioner mortality experience. The CPM-14B table is widely used by pension plans in Canada to estimate the financial exposure that is associated with their obligations or assumed under the products they market and sell. As it relies on the experience of pensioners, who tend to outlive non-pensioners, the CPM-14B table is generally viewed as a more conservative presentation of life expectancies than the standard Canadian mortality table. References: 2014 Canadian Pensioners’ Mortality tables. Canadian Institute of Actuaries. Retrieved April 29, 2022, from https://www.cia-ica.ca/docs/default-source/2014/214013e.pdf.

In addition to standard investment risks, the long-term total return and the sustainability of the rate of distributions of the Decumulation Fund are impacted by sequence of returns risk and the volatility experienced within the sequence of returns. Sequence of returns risk is the risk that comes from the order in which investment returns occur. Market declines in the early years of operation of the Decumulation Fund paired with high levels of distribution increases the risks to the durability of the portfolio of the Decumulation Fund. Significant declines in asset value in the early years of the Decumulation Fund increase the likelihood that the initial distribution rate is unsustainable, while significant increases in asset value in the early years of the Decumulation Fund increase the likelihood that the initial distribution rate can be sustained.

In addition to investment risks which may impact the amount of distributions paid to Unitholders of the Hybrid Tontine Series F Units of the Decumulation Fund, the long-term total return of the Tontine Trust is impacted by actual redemption rates (either voluntary or upon death) by Unitholders of the Tontine Trust. Accordingly, the value of Units of the Tontine Trust acquired pursuant to the automatic switch mechanism may decline if mortality rates or voluntary redemptions decline and may increase if mortality rates or voluntary redemptions increase. Unitholders who redeem early or pass away prior to year 20 will only receive a percentage of their NAV, as described in the prospectus, as of the date of redemption or death.

Series A units of the GuardPath™ Modern Tontine Trust, GuardPath™ Managed Decumulation Fund and Hybrid Tontine Series are also available but have different management fees and distribution rates due to the trailer fee commission, and performance may be lower as a result. Please read the prospectus for complete details.
Disclaimers

Unlike traditional mutual funds or exchange traded funds ("ETFs"), the GuardPath™ Longevity Solutions are unique investment fund structures. As such, investors should carefully consider whether his or her financial condition and investment objectives are aligned with these retirement-focused investments that are meant to be utilized as components of a broader retirement portfolio. The Units may be suitable for an investor primarily concerned about having sufficient income in retirement, especially in the later years of their life. The Units may not be suitable for an investor whose primary objective is to leave capital behind for their estate. The GuardPath™ Longevity Solutions are not insurance companies, the units are not insurance or annuity contracts and unitholders will not have the protections of insurance laws. Distributions provided by the GuardPath™ Longevity Solutions are not guaranteed or backed by an insurance company or any third party. The long-term total return and the sustainability of the rate of distributions of the Managed Decumulation Fund may be impacted by volatility and sequence of returns risk. Payments from the Modern Tontine Trust are tied to the life of the unitholder and, accordingly, people with serious or life-threatening health issues should not invest in the Modern Tontine Trust, as the amount that a unitholder will receive upon redemption (either voluntary or upon death) prior to the lump-sum payout in year 20, will be lower than the then current NAV per unit, as detailed in the prospectus. The long-term total return of the Modern Tontine Trust will be impacted by actual redemption rates and may increase or decline as mortality rates or voluntary redemptions increase or decline. This is not a complete list of the risks associated with an investment in these GuardPath™ Longevity Solutions.

Please read the prospectus before investing. Important information about these Guardian Capital mutual funds and ETFs is contained in their respective prospectus. Commissions, trailings commissions, management fees and expenses all may be associated with investments in mutual funds and ETFs. You will usually pay brokerage fees to your dealer if you purchase or sell units of an ETF on the Toronto Stock Exchange ("TSX"). If the units are purchased or sold on the TSX, investors may pay more than the current net asset value when buying units of the ETF and may receive less than the current net asset value when selling them. Mutual funds and ETFs are not guaranteed, their values change frequently and past performance may not be repeated.

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