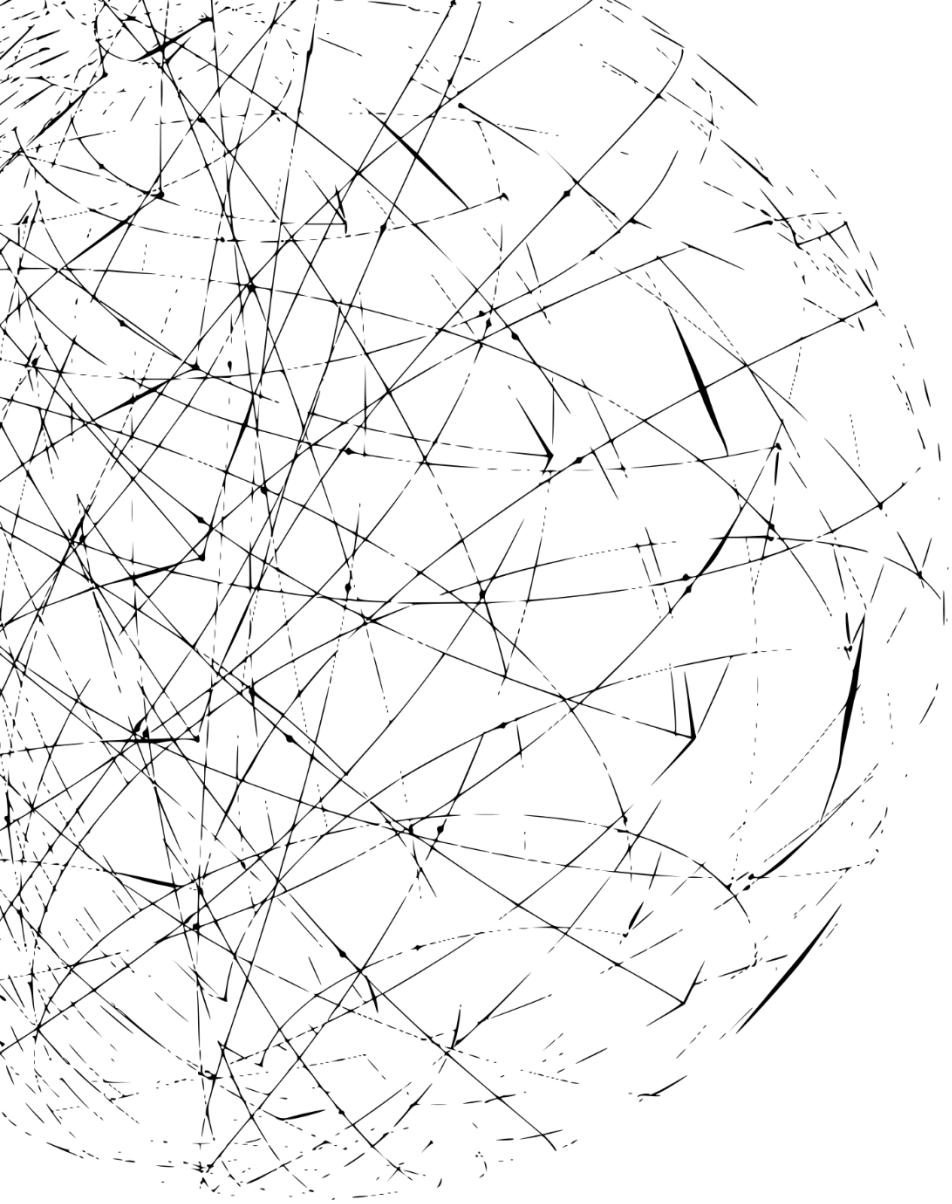


Mortality Monitor Viability Study

May, 2021

MORTALITY MONITOR

A RiskStream Collaborative Solution

The Institutes
RiskStream Collaborative™

The RiskStream Collaborative's Mortality Monitor

An Overview and Viability Study

By Patrick Schmid, PhD

**Special Thanks to Sandy Hampel for the detailed background of the Mortality Monitor use case, as well as leadership and assistance throughout this project.*

This report, The RiskStream Collaborative's Morality Monitor – An Overview and Viability Study, is available from:

The Institutes RiskStream Collaborative™
720 Providence Road, Suite 100, Malvern, Pennsylvania, 19355-3402
(610) 644-2100

https://Web.TheInstitutes.org/RiskStream-Collaborative

Contents

Executive Summary

In the U.S., nearly as many life insurance policies are in force as people are in residence. Specifically, as of 2018, 267 million life insurance policies were in force[1] among a population of roughly 330 million.[2]

In addition, Americans leverage a substantial number of retirement plans and annuities. For example, some 100 million Americans[3] are now covered by defined contribution accounts, mostly 401(k) plans, and an estimated 30 million individual annuity contracts are in force.[4] Overall, a large percent of the population is involved in life insurance contracts (both individual and group) and other financial products (like annuities and retirement plans). Therefore, an individual who passes away, is likely listed in numerous databases that span across organizations.

For example, John Doe may have an individual life insurance policy, a group life insurance policy and annuity, and a retirement account all with different carriers Today, the process of notifying carriers of a deceased policyholder's death can be inconsistent across carriers and take time for the beneficiary.

The carrier first must learn that the policyholder died. Then it must collect and assemble the pertinent information and documents from multiple sources, which means duplication of data, high rework and potential for errors. Meanwhile, beneficiaries experience difficulty gathering and completing all the documentation so that they can start the process of notification and eventually receive death benefits. The challenge is in the lack of a single source of truth for processing death benefits and claims.

To fill this need, The Institutes RiskStream Collaborative has developed a Mortality Monitor application using blockchain technology. This application aims to mitigate data-sharing challenges during the death claims process and help participants on the RiskStream Collaborative network identify potential deaths more quickly by incentivizing secure, permissioned data sharing. This, in turn, can improve the beneficiary experience while reducing time, cost, and risk to the carrier or organization.

The corresponding study sought to test the viability of this Mortality Monitor concept with a confined scope and a small network of participants. Three carriers provided five years of claims data around two key questions: First, within the three datasets, were there deceased policyholder matches? And second, if such matches existed, how much time elapsed between

1 Statista, "Total Number of Life Insurance Policies in Force in the United States From 2008 to 2018", https://www.statista.com/statistics/207651/us-life-insurance-policies-in-force/

2 Worldometer, "United States Population", https://srv1.worldometers.info/world-population/us-population/

3 CNBC, "America's Retirement Accounts Are Growing, but Not Fast Enough," June 12, 2019, https://www.cnbc.com/2019/06/12/americas-retirement-accounts-are-growing-but-not-fast-enough.html

4 Insured Retirement Institute (IRI), "IRI Retirement Fact Book 2020" (IRI, 2020)

the first payment from the first carrier and the first payment from the last carrier? The findings were further inspected by company and type of product.

The results show that about 4% of deceased policyholders of one of the carriers also had policies (life or individual policies) or other financial instruments (annuities or retirement plans) with one of the two other carriers. This number is much larger than expected and would undoubtedly grow if a larger network of organizations participated in a future study.

The findings also show that when a policyholder has policies with more than one carrier, there is a median 55-day gap between the first and last carrier's paid claim date. The average is even larger.

Nonetheless, both the average and median highlight the value and viability of a network that shares decedent profile information. Such a resource would undoubtedly lead to greater efficiency and reduced beneficiary frustration during the death registration and claims initiation process.

Introduction

Introduction

The life and annuities (L&A) industry is changing. The pandemic and associated economic downturn are expediting the need to incorporate and adopt technological change, as industry players seek to maximize operational efficiency in a new world.[5]

As the L&A industry moves further into the 2020s, it is faced with an increasingly fast moving, innovative, and data-driven environment—with large-scale changes to traditional industry products, processes, distribution, and employment sure to follow. New risks are emerging. New forms of data and analytics are changing the way the industry operates and analyzes risk. New tools are helping to create innovative efficiencies.

The industry is embracing a variety of new technologies, including blockchain and broader distributed ledger technology (DLT), all at once.

Meanwhile, today's economic climate presents many challenges for organizations within the L&A industry.

In an extended period of weak income growth, volatile consumer prices, greater access to information, ever-evolving technology and increasing globalization, consumers demand more from suppliers, including life and annuities organizations. Yet, investment yields and profits have been constrained by low interest rates[6], concerns about economic stability and associated volatile regulatory scrutiny.

Insurance-related organizations have increasingly begun focusing on cost minimization to drive profitability. Much of this focus has been on leveraging technology to lower the costs of shared recordkeeping, easing data retrieval for multiparty workflows, simplifying shared business processes, combating fraud, and finding an efficient path within a stringent regulatory environment.

As all of these factors play out and technological change flourishes within the risk management and insurance industry, blockchain and DLT will play a pivotal role. Most new technologies, including the internet of things, artificial intelligence (AI), and machine learning, provide a means to capture and analyze data. Blockchain technology provides something different: a secure and permissioned way for entities to share data without the need for an intermediary, allowing for more seamless shared business processes.

Until recently, competitors within the insurance industry were wary of sharing data because the benefits of setting up centralized intermediaries outweighed the security risks and costs only in certain situations. That calculation changed with the birth of blockchain technology.

5 Deloitte, "Covid-19 impact to life insurance and annuity companies", https://www2.deloitte.com/content/dam/Deloitte/us/Documents/financial-services/us-covid-19-life-and-annuity-considerations.pdf

6 National Association of Insurance Commissioners (NAIC) Low Interest Rates, 9/3/2020, https://content.naic.org/cipr_topics/topic_low_interest_rates.htm

Across the financial services industry, many are looking at blockchain and broader DLT technology as ways to streamline the flow and verification of data, lower operating costs, improve processes, and reduce the need for intermediation. For example, they may provide:

- Privacy with permissioned data sharing
- Lower administrative costs
- Trust and auditability
- Increased automation
- Reduced fraud

In this report, The Institutes RiskStream Collaborative™ demonstrates the potential for DLT technology within the L&A market and focuses on the benefits for a lead use case, the Mortality Monitor.

By providing an overview of blockchain and DLT technology, an explanation of the RiskStream Collaborative, a high-level analysis on blockchain use cases and their stackable benefits, an overview of Mortality Monitor, an explanation of the approach for the viability study, and the results of our analysis, this report proves the viability of the Mortality Monitor use case, setting it on a path to production within the RiskStream Collaborative membership.

The Institutes RiskStream Collaborative

At its core, the technology behind blockchain and DLT is network driven. While it provides a means to work on universal problems that plague the industry and add costs, it also requires a nonpartisan arbiter to test, learn about, and implement it.

The Institutes RiskStream Collaborative emerged from The Institutes, a not-for-profit educational entity formed over 100 years ago out of The Wharton School.

The Institutes educate more than 100,000 learners annually on risk management and insurance topics. Its Board of Directors include chief executive officers who represent a majority of domestic property-casualty (P&C) insurance premium volume and whose organizations have a sizable international presence.

If a private permissioned blockchain requires a network, The Institutes already have an established network within the P&C insurance space. To establish that same arrangement in the L&A space, the RiskStream Collaborative teamed up with LIMRA, a research and professional development trade association for the financial services industry.

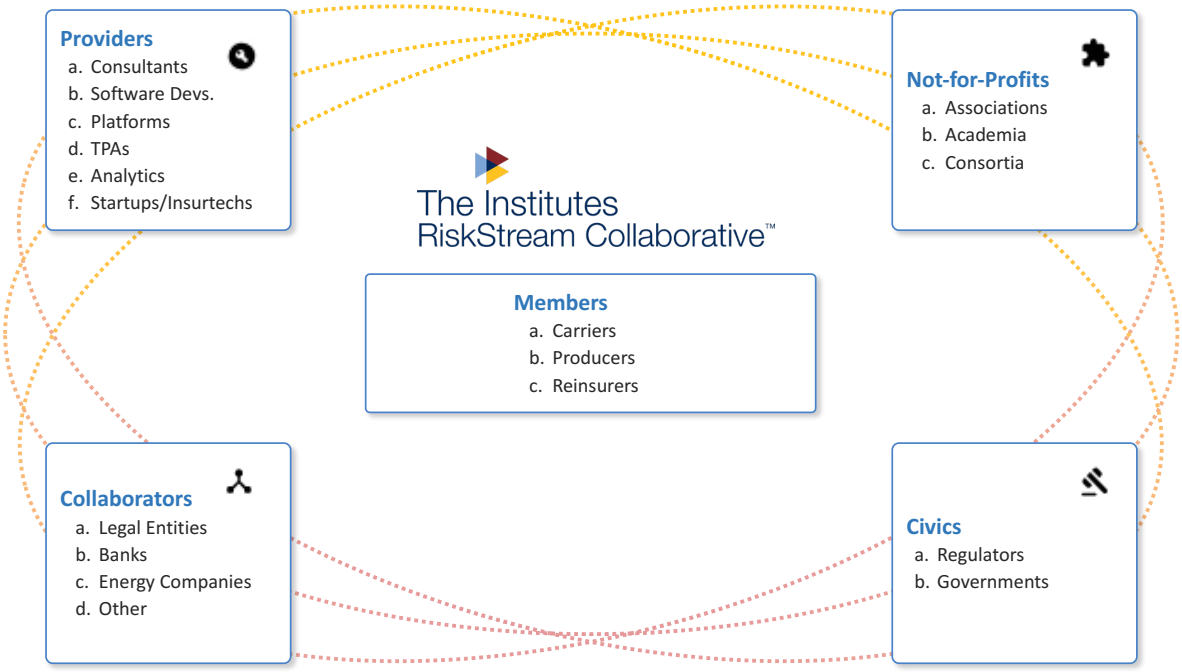
The RiskStream Collaborative is a separate not-for-profit that has been working on blockchain and DLT applications for the last few years. Today, it operates as a consortium that uses its network of member companies to develop industry-specific DLT applications for varied use cases.

While activity for the consortium began in P&C insurance, the L&A industry is quickly catching up. RiskStream Collaborative members (carriers, distributors/brokers, and reinsurers) lead all areas of the consortium's governance and activity. For example, members and leadership work to prioritize use cases and launch working groups. These groups, in turn, design use cases and then work with staff and solution providers to build out the associated applications.

While all of RiskStream Collaborative's efforts center around members, the consortium has started creating a larger ecosystem (see Figure 1). Its goal is to position providers; not-for-profits; collaborators; and regulators and governments, or civics, to help consortium members devise solutions to shared business processes within the risk management and insurance space.

Figure 1

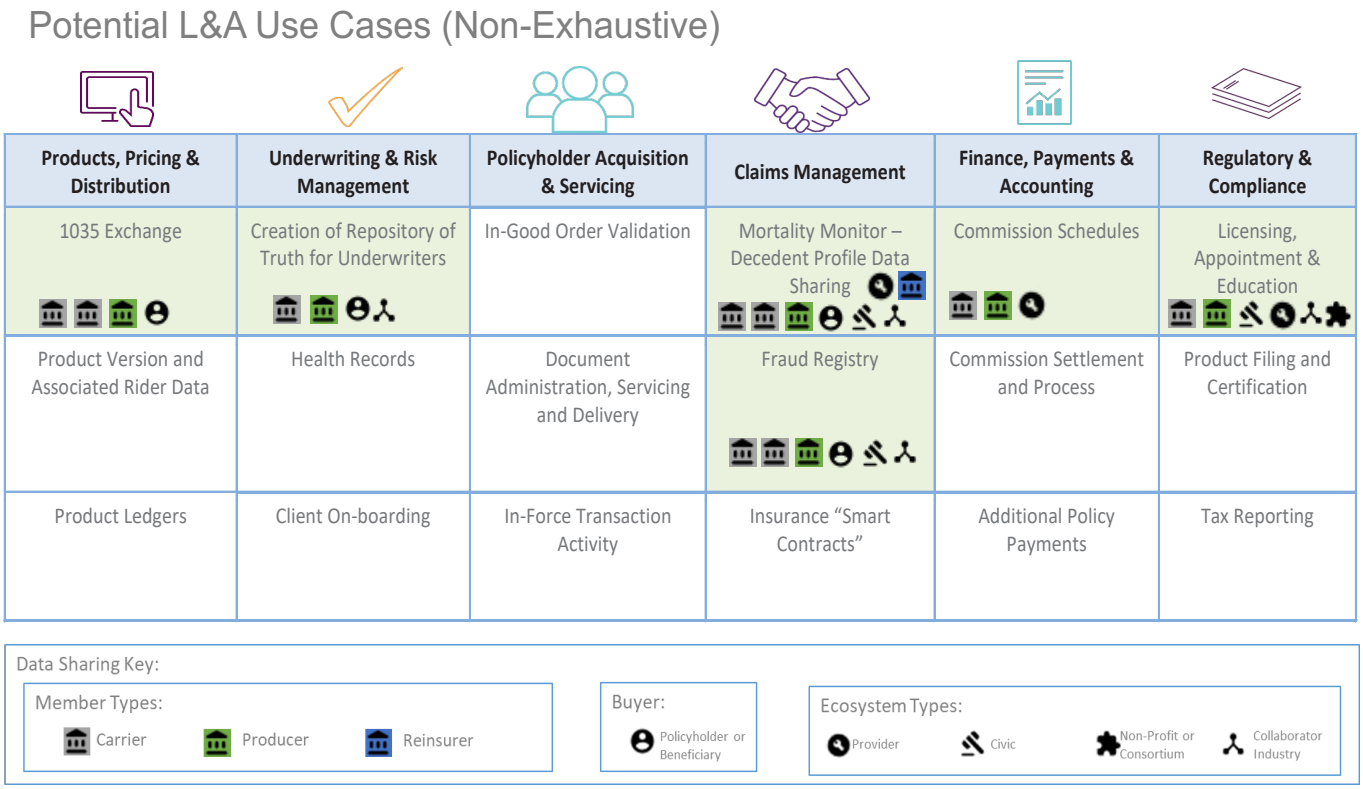
RiskStream Collaborative Participant Categories & Ecosystem



Life & Annuity Use Cases

Blockchain and DLT are poised to have widespread ramifications across the L&A sector's value chain, increasing market reach, removing redundancy, and cutting costs (Figure 2). Figure 2:

Figure 2



The industry could change on a number of exciting fronts as a result:

- **Insurance products, pricing, and distribution may alter considerably.**
  Take for example, 1035 Exchange transfer of funds. A blockchain solution could reduce the manual tracking and wait times, eliminate the paper hassle, and address NIGOs (not-in-good-order paperwork) by providing transparency of information, instant access to information from multiple insurers, and decrease processing time per transfer.

- **Underwriting and risk management may see data-sharing capabilities and risk registries emerge.**
  Underwriting involves significant wait time depending upon the coverage selected. Blockchain makes data accessible via permissioned data sharing so other organizations can securely access the information. Creating the correct incentives for companies to share is critical—and possible through the technology. Also possible is a single

source of truth once a shared system of record is established. This increased transparency will accelerate the underwriting process and could be leveraged for risk management purposes.

- **Policyholder acquisition and servicing may include applications, consent forms, medical information, lab results, and client correspondence.**
  Policy issuance requires the delivery of policy materials and disclosures—and is currently conducted in an inefficient, outdated manner. A blockchain-based solution can simplify, streamline, and enable multiparty sharing of documents across the value chain, allowing companies to share documents and data securely and selectively. Paper reconciliation would become unnecessary because all parties would be linked on the platform, and updates would be instantaneous.

- **Blockchain can streamline the claims process** by optimizing the flow of data, meeting state regulatory requirements, detecting and preventing fraudulent claims, and providing proof that proceeds have reached the intended recipients. The number of parties requiring proof of death increases the expense and paperwork, while contributing to potential fraud and cyber-security.

- **Financial, payment, and accounting processes in insurance could also improve.**
  For instance, commission payment processing involves transfer of funds from a life insurance or annuity carrier to distributors, their agents/advisers, and others. Blockchain can simplify this process and eliminate the complexities by centralizing the validation of commission schedule and hierarchy validations.

- **Insurance regulation and compliance could be transformed.**
  Regulators would be able to monitor all insurance variables in real time and help with verification of certain information, including education, certification, and icensing across states.

L&A Product Roadmap

Prioritizing potential use cases or products is important to using the RiskStream Collaborative's resources effectively.

The consortium's L&A Advisory Board helps it efficiently select use cases for working group launch, proof-of-concept (POC) design and build within RiskStream Labs, and production build. Although subject to change by the Advisory Board, the expected product roadmap is shown in Table 1.

Table 1:

Sector	Use Case	End of 2020	End of 2021	End of 2022	End of 2023	End of 2024	End of 2025
L&A	Mortality Monitor — Data Sharing	Design/ testing	Design/ testing	Production - Year 1	Production - Year 2	Production - Year 3	Production - Year 4
	Licenses & Appointments – Verification	Design/ testing	Design/ testing	Design/ testing	Production - Year 1	Production - Year 2	Production - Year 3
	1035 Exchanges	–	–	Design/ testing	Design/ testing	Production - Year 1	Production - Year 2
	Commission Schedules	–	–	Design/ testing	Design/ testing	Design/ testing	Production - Year 1
	Repository of Truth Underwriting	–	–	–	–	Design/ testing	Design/ testing
	Fraud Registry	–	–	–	Design/ testing	Design/ testing	Production - Year 1

Potential for Stackable Benefits:

The RiskStream Collaborative has released a new calculator tool for its membership. The tool leverages Bureau of Labor Statistics (BLS) data on employment counts across various insurance sectors, including L&A, as well as BLS Occupational Employment Statistics for sector position and salary information.

From the two datasets, the calculator totals employment costs within a sector. It then allocates position-by-position employment cost information across that sector's value chain. This reveals a total employment cost for all areas across the value chain.

From there, the calculator model allows RiskStream staff or members to make assumptions within a specific area of the value chain about the position-by-position potential reduction in expense from onboarding a specific use case (such as the Mortality Monitor). The model also includes assumptions on blockchain network growth.

Table 2:

Sector	Use Case	End of 2020	End of 2021	End of 2022	End of 2023	End of 2024	End of 2025	Total through 2025
L&A	Mortality Monitor — Data Sharing	Design/ testing	Design/ testing	Production - Year 1	Production - Year 2	Production - Year 3	Production - Year 4	
		$ —	$ —	$50,227,450	$130,235,653	$188,643,348	$ 234,632,318	$603,738,768
	Licenses & Appointments – Verification	Design/ testing	Design/ testing	Design/ testing	Production - Year 1	Production - Year 2	Production - Year 3	
		$ —	$ —	$ —	$7,526,944	$19,516,749	$28,269,562	$55,313,255
	1035 Exchanges	–	–	Design/ testing	Design/ testing	Production - Year 1	Production - Year 2	
		–	–	$ —	$ —	$46,603,383	$120,068,649	$166,375,032
	Commission Schedules	–	–	Design/ testing	Design/ testing	Design/ testing	Production - Year 1	
		–	–	$ —	$ —	$ —	$15,169,540	$15,169,540
	Repository of Truth Underwriting	–	–	–	–	Design/ testing	Design/ testing	
				$ —	$ —	$ —	$ —	
	Fraud Registry	–	–	–	Design/ testing	Design/ testing	Production - Year 1	
					$ —	$ —	$ 20,584,707	$20,584,707
Total				$50,227,450	$137,762,597	$254,466,480	$418,724,775	$861,181,302

According to Table 2, it's possible that the L&A industry could save almost a billion dollars by adopting various blockchain-enabled solutions over the course of the next five years. Please note, this only considers employment efficiency savings. It's possible that other areas could add to these benefits.

The purpose here is to simply show there is mounting interest in blockchain technology to help with various shared business processes. For the RiskStream Collaborative, the L&A industry is starting with the Mortality Monitor—which alone could potentially save the consortium's membership up to $603 million dollars by 2025, according to Table 2.

Mortality Monitor

Mortality Monitor

The life insurance industry lacks a single source of truth for processing death benefits and claims. Family members and loved ones often experience difficulty gathering and completing all required documents to receive death payments to cover funeral expenses and their financial needs. Carriers must collect and assemble pertinent information and documents from multiple sources, which means duplication of data and high rework and potential for errors. For all participants the multiple handoffs between systems and people increase time, cost, and risk.

Real-time access to digital data is desperately needed within the insurance industry. The ability to share data across parties is invaluable and could not be put into practice without a secure, private-permissioned blockchain or DLT framework. The RiskStream Collaborative's blockchain network securely shares death data in compliance with regulations, with the goals of reducing time, cost, and risk and delivering an enhanced beneficiary experience. Mortality Monitor is a blockchain-based technology solution that offers a single source of digital decedent information required to process a claim. Instant notification helps carriers proactively identify potential deaths more quickly, reducing the burden on the beneficiary and shortening the claims cycle time.

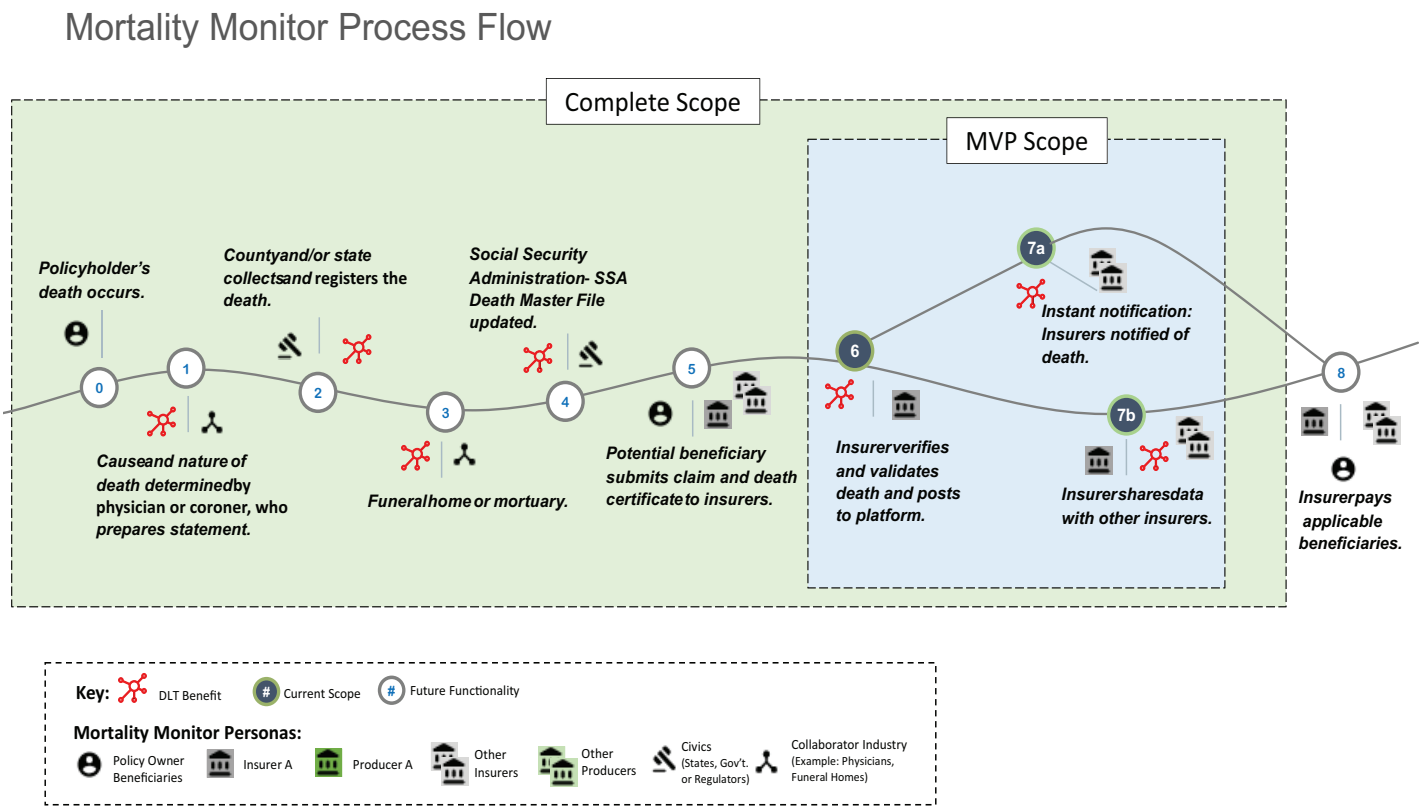
The solution sets the stage for a large-scale decentralized death registry, allowing entities with original sources of death information (such as funeral homes, state Vital Records departments, the Social Security Administration, and government agencies) to share decedent data with L&A carriers in real time. Each entity is bucketed into various ecosystem participation categories (see Figure 3 - Mortality Monitor Process Flow).

The RiskStream Collaborative's Canopy framework and the Mortality Monitor solution enable these entities to simplify the verification process by eliminating paper, to make tamper and fraud schemes obsolete, and to improve accessibility and transparency.

The full scope of the Mortality Monitor business process flow begins with a policyholder's death. The cause and nature of the death are determined by a physician or coroner, who prepares a statement validating the death. This statement will be used as the official recording of the death throughout the downstream process. Eventually, the county and/or state will collect the death statement from the physician or coroner and report it to Social Security. Right around this time, the funeral home or mortuary may prepare a certificate. This may be passed to a life insurance carrier at this point or later in the process by a beneficiary. Once the Social Security Administration receives the physician or coroner's statement, they will process it into the Death Master File, which is used as a death registry (but, unfortunately, there are gaps[7] in this process and the file itself). Downstream, the beneficiary will attempt to obtain the certificate, if they haven't already, and present it to their loved one's insurance carrier to obtain life insurance benefits. Once the insurer is notified, they must

7 Streamline Verify "The New Relevance of the Death Master File", May 19, 2020, https://www.streamlineverify.com/death-master-file-missing-records/

Figure 3



verify and validate that the deceased is a policyholder or had active coverage at the time of death. This is where the Mortality Monitor MVP comes into the process. Provided they are validated, the carrier posts the decedent profile to the Canopy network. All other carriers on the network are notified and the carriers that also have the deceased individual within their policy system can then subscribe and access the decedent profile, streamlining the process. Insurers can proactively contact their beneficiary and service the claim from there. This eliminates that carrier from having to collect this information on their own and expedites the beneficiary experience.

A common platform that provides access to secure, transparent deceased data allows L&A carriers to:

- Proactively service beneficiaries by processing death benefits more quickly
- Reduce the burden, time, and expense of having to provide proof of death on beneficiaries
- Decentralized digital death registry
- Enable timely receipt of death benefits by accurate and shared comprehensive data
- Provide greater cost savings by reducing reliance on data intermediaries and aggregators
- Provide potential reduction in cost per claim by optimizing resources through fewer touchpoints and rework efforts

Ensure the highest standard of data privacy and security through safe, secure, trusted, and transparent permission-based blockchain technology

- Provide greater control of potential fraud by sharing real-time fraud alert notifications between carriers
- Support regulatory guidelines for conducting proactive searches to identify potential unclaimed insurance benefits
- Provide incentives to share information
- Provide the opportunity for standardization of data from states' "Lost Policy Finder" service
- Include downstream participants and other entities other than insurers (banks, states, DMV, regulators, etc.)

Mortality Monitor Minimal Viable Product

Consumers continue to place increased pressure on insurers to improve customer experience and satisfaction. The challenge for the life insurance and financial industry is that the beneficiary is burdened with initiating a claim while dealing with high levels of grief over the loss of a loved one.

Blockchain and DLT can help improve the beneficiary's experience. A network-driven technology designed to proactively share information in a unified, auditable, and secure manner, can help streamline the millions of death claims processed each year.

By focusing on improving the experience of beneficiaries while considering usability for carriers, the Mortality Monitor minimal viable product (MVP) is designed to add value. It uses RiskStream Collaborative's Canopy network and allows carriers to securely publish hashed and encrypted comprehensive death data. The supporting documents, such as a death certificate, are stored and transferred off-chain between authorized carriers while an on-chain registry service hosts hashed unique identifiers and populates encrypted proof-of-transaction activity. Lastly, economic benefits may be realized, which provide the holders of information an incentive to post and share with other carriers. The MVP demonstrates the data exchange between carriers and does not include outside parties.

Ultimately, the Mortality Monitor MVP, sharing decedent information among carriers, could provide the following benefits:

- Identify a potential death more quickly, thereby shortening the response time from the "Date of Death" to "Notification to Beneficiary"
- Enhance the beneficiary's experience
- Provide timelier access to the necessary decedent information required for settling a claim
- Optimize processes that influence and reduce cycle times

- Eliminate or reduce disparate data sources
- Deter, detect, and expose potential fraudulent claims
- Facilitate information sharing with other internal business units
- Provide incentives to share information
- Support regulatory and compliance policies, thus reducing operational costs in mitigating audits and unclaimed property policies

Further, use of the RiskStream Collaborative's network for Mortality Monitor offers the following values and benefits:

- Keeps the initial scope manageable by operating with carriers
- Educates on how to participate on the Canopy network
- Facilitates the secure sharing of sensitive data required to identify and determine an individual is deceased
- Demonstrates the actual exchange of encrypted data in a secure environment
- Illuminates requirements from a security and compliance perspective and lays the groundwork for final review and approval
- Contributes to finalizing the use case requirements based on testing outcomes
- Outlines a post-MVP product roadmap of features and functionality
- Develops a format for collaboration that can also reduce cost and risk
- Provides a common platform that can scale and enable multiple parties to transact data

Mortality Monitor Working Group

The RiskStream Collaborative member-led Mortality Monitor Working Group launched to explore the use of DL technology—specifically, by leveraging the Canopy platform to streamline the claims process and facilitate quicker settlement and payment.

During the working group meetings, industry experts collaborated to define, design, and complete a POC for the Mortality Monitor application. They also identified key issues to help define the framework of the Mortality Monitor use case.

Mortality Monitor was designed to provide beneficiaries with the easiest and best claims-filing experience possible, while also providing benefits to the corresponding carriers.

To achieve an MVP, the team defined functional requirements through which RiskStream Collaborative carrier members will provide and share verified public decedent information on the private and secure Canopy network.

In collaboration with the RiskStream Collaborative and its carrier members, with support with Kaliedo, the Mortality Monitor working group built a POC based on the MVP requirements. The success of the POC accelerates the process for demonstrating the capabilities and value of the MVP.

In tandem with this work, the RiskStream Collaborative conducted a study on behalf of the participating members to determine potential overlap of death claims across group and individual life, annuity, and retirement business sectors from multiple carriers.

Viability Study and Analysis

Many people have life, annuity, and retirement coverage through multiple companies, resulting in an overlap. To help quantify this overlap, the RiskStream Collaborative conducted a viability study by evaluating participating carriers' claims. The resulting data included five years of claims covering individual life, group life, annuity, and retirement.

The viability study aimed to answer these two questions:

1. Was claims data overlap found, with the same policyholder listed across multiple carriers?

2. Of any overlap claims, what is the average duration of days between the first paid claims date and last paid claims date across carriers?

Problem Statement

Problem Statement

Timely closure of life insurance claims is an industry-wide challenge. A more streamlined process that provides proactive notification and verification of comprehensive death information can enhance the beneficiary's experience while reducing resources and costs for insurance carriers.

Verifying death is a prerequisite to closing death claims, which in turn requires carriers to have detailed data so they can settle and pay claims. Challenges arise, however, from the sensitive nature of the data and lack of a single source of truth on which insurance companies can rely in validating and determining eligibility.

While dealing with a loss, the beneficiary is often tasked with initiating the related claim. This requires notifying every carrier, for every policy, working through the processes, procedures, and necessary information, which may not be straightforward and may vary from carrier to carrier.

Upon receipt of the notification of death, carriers must verify and validate that the deceased individual is the insured before payment is processed for the intended beneficiary. The death certificate is the most comprehensive source of information a carrier requires for claim payment.

However, not all claims are initiated by the beneficiary. State regulations require carriers[8] to proactively "sweep" their active and expired books of business to check for policyholders who may have died while their policy was active. In such instances, carriers are then challenged by triangulating fragmented data[9] from multiple sources to determine whether the deceased individual is an insured.

Validating a death requires a level of subjectivity that increases resource costs and risks. If a claim has not been processed for the insured, the insurance provider takes the necessary steps to locate the beneficiary and then initiate and process the death claim.

This manual intervention, the resulting time-consuming paperwork, and the inevitable delays in claim settlement create a negative experience for the consumer and increase the costs per claim for the carrier.

For the Mortality Monitor MVP to be valuable, policyholders must have life, annuity, and retirement coverage through multiple insurers.

8 National Conference of Insurance Legislators (NCOIL), "Model Unclaimed Life Insurance Benefit Act", November 23, 2014, http://ncoil.org/wp-content/uploads/2016/04/UnclaimedPropertyModel12042014.pdf

9 InformationWeek, "Supplementing the Death Master File for Life Claims Data" September, 19, 2014, https://www.insurancetech.com/claims/supplementing-the-death-master-file-for-life-claims-data/a/d-id/1315914.html

Data and Methods

Data Analyzed

To determine the potential overlap, the Mortality Monitor viability study collected five years of death claims across individual and group life, annuity, and retirement business sectors from multiple carriers.

Participating companies were asked to submit all data in an electronic csv file format. Each line in the data file consisted of an individual claimant record.

Data criteria included:

- Claims paid as a result of the insured deaths for the US sector, for all underwriting companies within a given carrier.
- Claims paid during the time period of January 1, 2014 to January 1, 2018.
- In the event there is more than one instance of an insured, each instance should be an individual record.
- Retirement funds may include any combination of IRAs, defined benefits (such as pensions), and defined contributions (such as 401k, 403b, 457, and Roth accounts).
- The files did not contain a header row.
- The hashing algorithm used was not indicated within the file.
- Company identifiers assigned by the RiskStream Collaborative for every claim record.
- Business identifiers using codes provided by the RiskStream Collaborative for every claim record.

Requested Data Elements

Data Element	Data Format	Data Description
Social Security #	9 digits (no dashes/no spaces) – hash algorithm using SHA256*	SS# of the deceased insured
Carrier Identifier	Numeric	Unique identifier provided by the RiskStream Collaborative
Claim Paid Date	Date as YYYYMMDD	The date the first claim was paid. In the event there is more than one payee and the payments are made at different times, provide the date the first payment is made.
Business Sector Identifier	Code Value (I, G, A, R)	Indicators: I - Individual Life G - Group Life A - Annuity R - Retirement

*Hashing is the process of creating data mapping between a piece of data and a number. A piece of data (for example, a name, date, or even another number) can be inputted into an algorithm to release a large number that uniquely corresponds to the inputted data. This process is irreversible, so the inputted data cannot be determined by looking at the outputted amount.

For example: Given social security number *123456789*, we can use the SHA256 hashing function to produce a hexadecimal number.
While this process is irreversible, the input of *123456789* will always produce the same result when using the SHA256 hashing function. Therefore, if one party hashes the SSN *123456789* and another party hashes the SSN *123456789* using the same hashing function, the two parties will both get the same unique output. Therefore, the two parties only need to share this output to determine if they have the same input SSN.

If all parties hash the SSNs from claims data and share the hashes, the group can determine the percentage of overlap they have—without actually sharing any SSNs. Consider the following example, where two companies share five SSNs:

Company 1 SSNs:	Company 2 SSNs:
b42ec7e338c1f012d22c8c3d47349f775d-dc04a1fab517cb4517948cec0a8c59	d7a09c749c1abfd0c8ceba27a511abf-132b1a2feba0610760995640f351722bf
bc4ef546e7af95f1ea7e88338f-ca4a865a0db737104fb5bdc9ce-166c4bf22df2	2645b3998e565e0d6170418a6901dc-82cb1a0025ada8265743fc5085750e19d3
99b1d48f62eaa88ef-49236ce641177364e33f742d91175850b-376f7aac90dae3	0952f64344b6fa78820fd8f3f8ce9171c-335cc1493c401aaf3fc753f46d307a7
69a71fd483d1efdf67215aad7e85fae84f-da431ec27807ce90cb0b40cc62e6e5	b42ec7e338c1f012d22c-8c3d47349f775ddc04a1fab517cb-4517948cec0a8c59
f0526c2aa78d858a9c654e75341e-a173390af6574c065f8ef993d-117d9eb0407	abb787dc6a944a8f625015dfb8ef-9c6198caa1ba4277e2b15b4e4c1a-f9a6e56d

We can see that Company 1 and Company 2 have one shared SSN highlighted in green. There is no way for us to find out what that SSN actually is.

The **REQUIRED** hashing algorithm for the study was **SHA256**, which is widely used by many internet protocols and cryptocurrencies.

Methodology

The key questions that RiskStream sought to answer were:

1. Is there overlap of claimed policyholders across the participating companies? If so, what's the extent? Does it differ by company or business sector?

2. Assuming there are claimed policyholder overlap, what's the distance between claims paid dates? Does this differ by business sector?

As mentioned above, each social security number was hashed using SHA256 prior to providing to RiskStream. In addition to the SHA246 hash, each observation consisted of a claims paid date, a business sector identifier and a company identifier.

RiskStream organized this data, then matched hashed social security numbers across the participating companies, attempting to see if there were overlap. Once hashes were matched across members, more granular findings were possible on those matches. For example, RiskStream looked into the amount of matches by carrier and the amount of matches by business sector (individual, group, annuity or retirement).

From there, RiskStream further inspected the matched has subset in order to understand the distance between claims paid dates amongst matches. RiskStream looked at the day difference between the first claim paid and the last claim paid for each matched hash.

Results

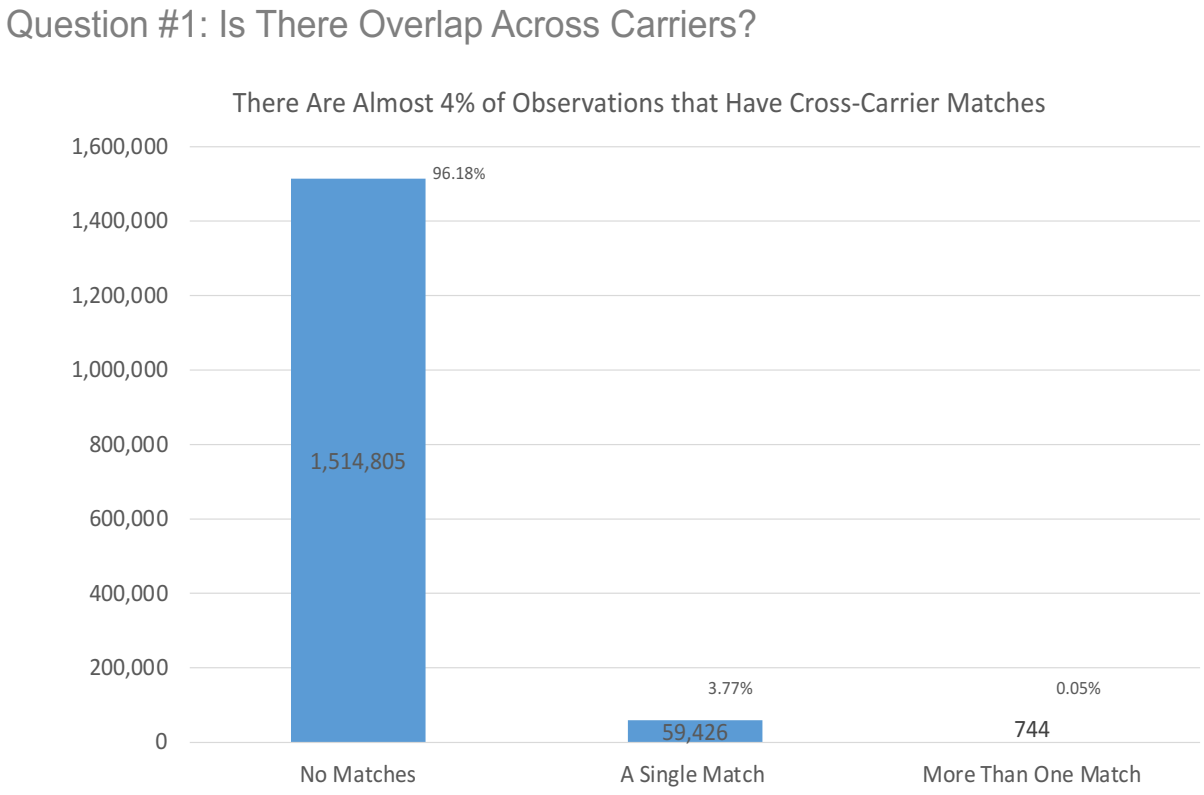
Results

This section examines the results of the claims data provided by participating Life & Annuity RiskStream carrier members.

It's worth noting three Life & Annuity carriers participated in this study, each providing 5 years of paid claims across individual & group life, annuity and retirement business sectors. While the total market share is about 10%, RiskStream hypothesizes match or overlap rates would grow with larger network of participants. With the three carriers involved sharing 5 years of data, the total number of 1,574,975 claims records were analyzed for this study.

Percentage of Overlap

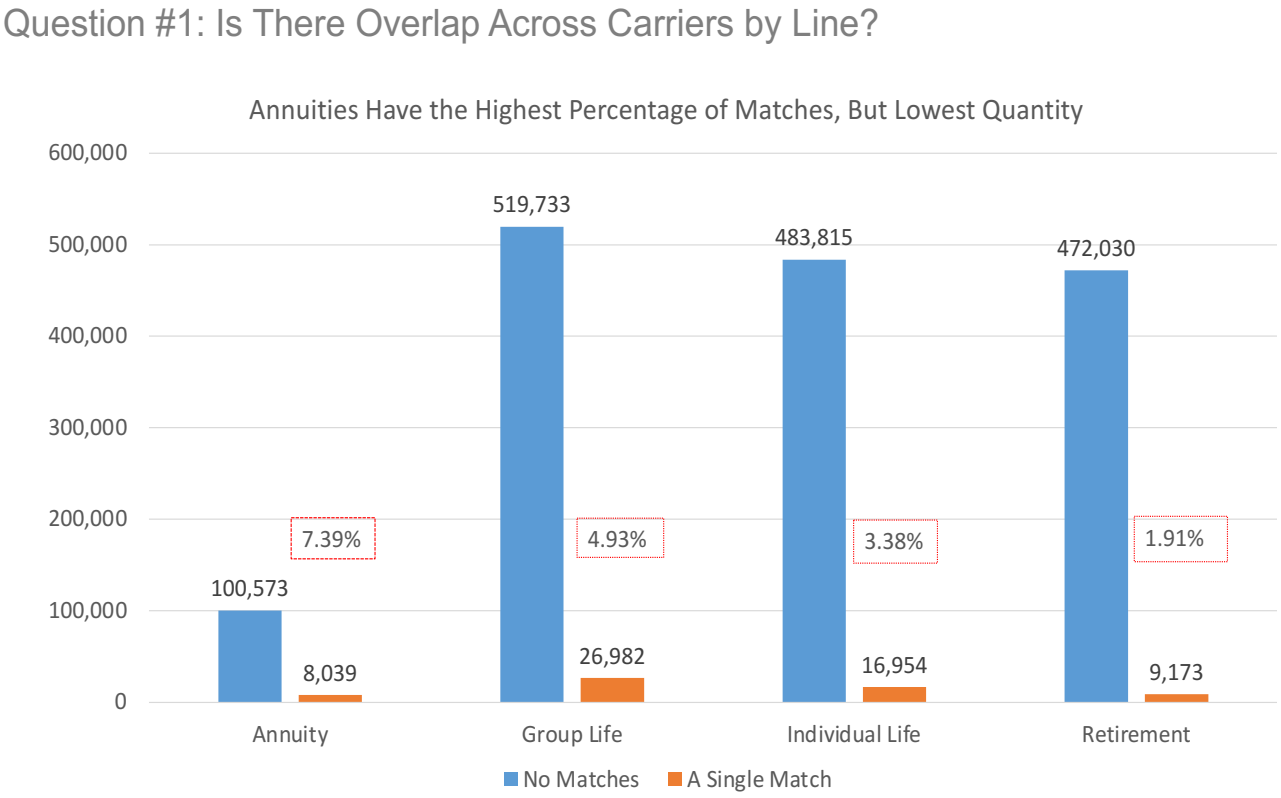
Figure 4



- Out of the 1,574,975 total observations, 59,426 had an overlap and 744 and multiple overlaps. Thus, 3.77% had an overlap and 0.05% had multiple overlaps.
- This indicates that about 4% of the deceased policyholder are on multiple carrier's databases. While we'd anticipate this rate to grow with a larger network, this was a surprisingly larger percentage than anticipated

Percentage of Overlap Across Carriers by Line

Figure 5

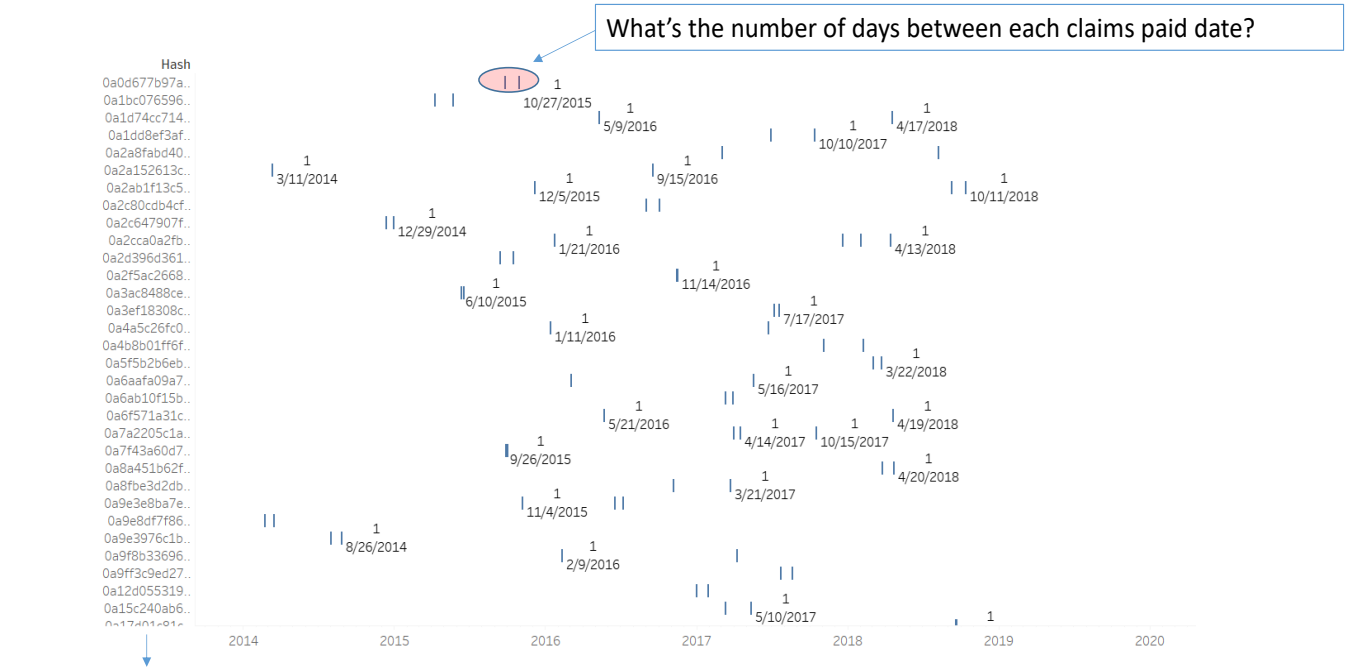


- Although Annuity made up the lowest number of quantity, it made up the highest percentage of matches with 7.39% , followed by Group Life with 4.93%, Individual Life 3.38% then Retirement 1.91%
- It is worth noting Retirement was not provided by all the participating carriers and we expect this percentage to be higher with a higher volume of claims or higher volume of market participation.

Claims with Overlap, Distance Between Payment

This section examines of the overlap claims, what is the average duration of days between the first paid claims date across carriers.

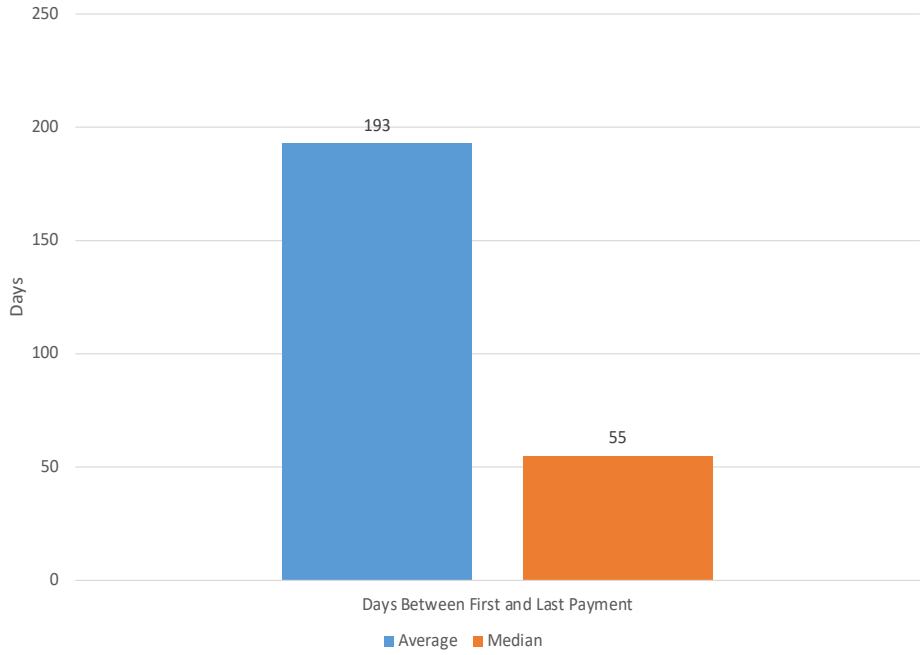
Figure 6



- Hashed matches (of policyholders) were organized into a subset. The dates between the first and last payments were inspected across the different carriers.
- Of the 60,170 duplicate hashed identifiers, the difference in the number of days between the claims paid date was calculated and inspected for this study. The gaps between the payments, highlighted in Figure 6 above, that were measured in days.

Figure 7

Question #2: What's the Difference in Claims Paid Dates? Average vs. Median

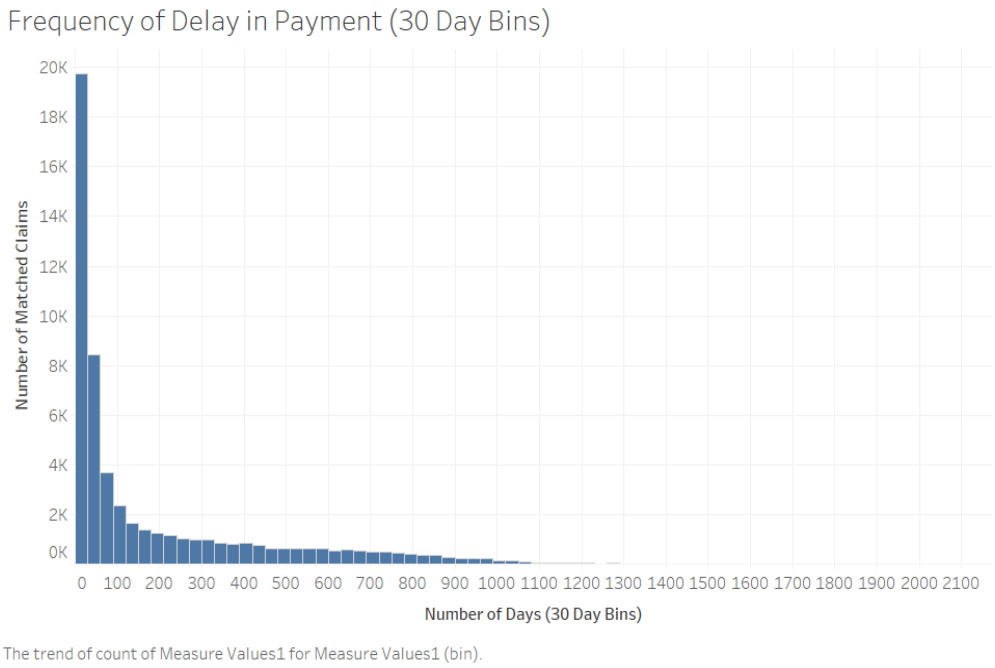


- Across the matched subset, the average time between the first payment and the last payment was 193 days.
- This average was skewed because many of the observations had significant delays. This is shown in the 'maximum', which was 2,065 days.
- The median, may be the preferred over the average to analyze the midpoint. It reveals a 55 day delay between first and last payments amongst matches.

Figure 8

Question #2: What's the Difference in Claims Paid Dates? Monthly Bins

Roughly 58% of matched claims fall within the 3 months

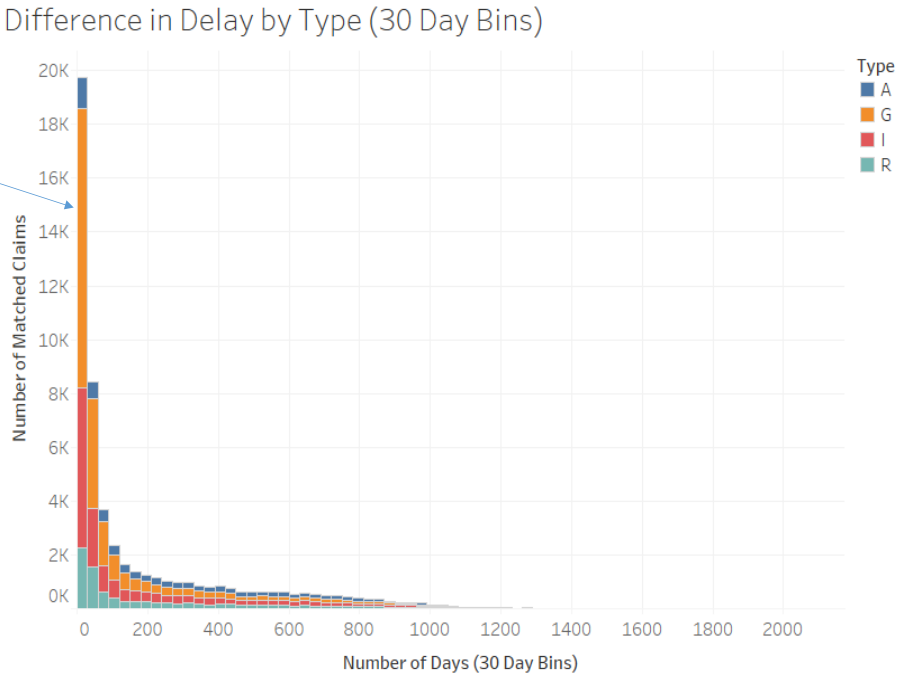


- RiskStream's analysis also organized data into 30 day bins, which allowed for measurement of frequency or count of matches by payment gap. Almost 20,000 matches had a delay between first and last payments of 30 days or less. Roughly 8,000 had a delay between first and last payments between 30 and 60 days. Almost 4,000 matches had a day delay between 60 and 90 days.
- Therefore, over 58% of matched claims (or roughly 32,000 matches) had the first and last payment occur within 90 days (the first three 30 day bins).

Figure 9

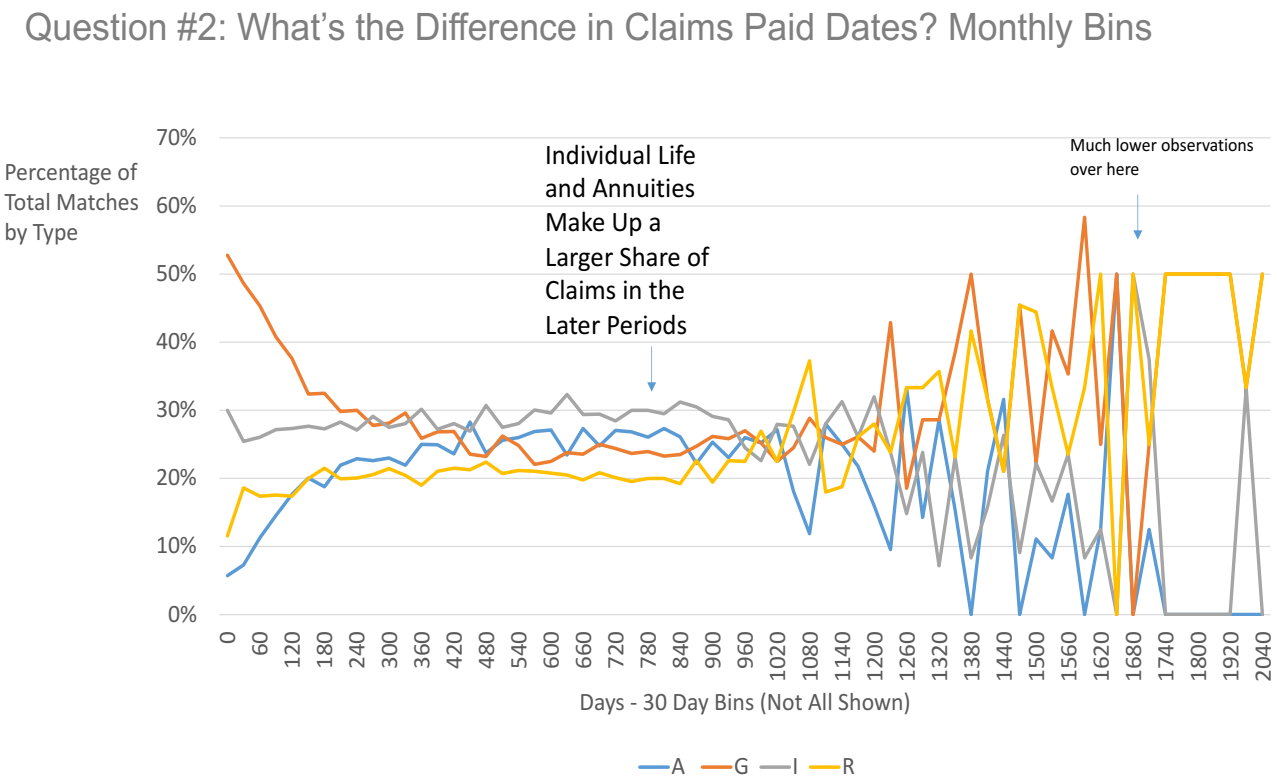
Question #2: What's the Difference in Claims Paid Dates? Monthly Bins

Group life makes up 40% or more of claims within the first three 30 day bins



- The analysis took the same 30 day frequency bins and added a color coding on the type (Annuity, Group Life, Individual Life and Retirement).
- Of the matched claims with a first and last payment within the first three months, 40% or more of the matches had a Group Life component.

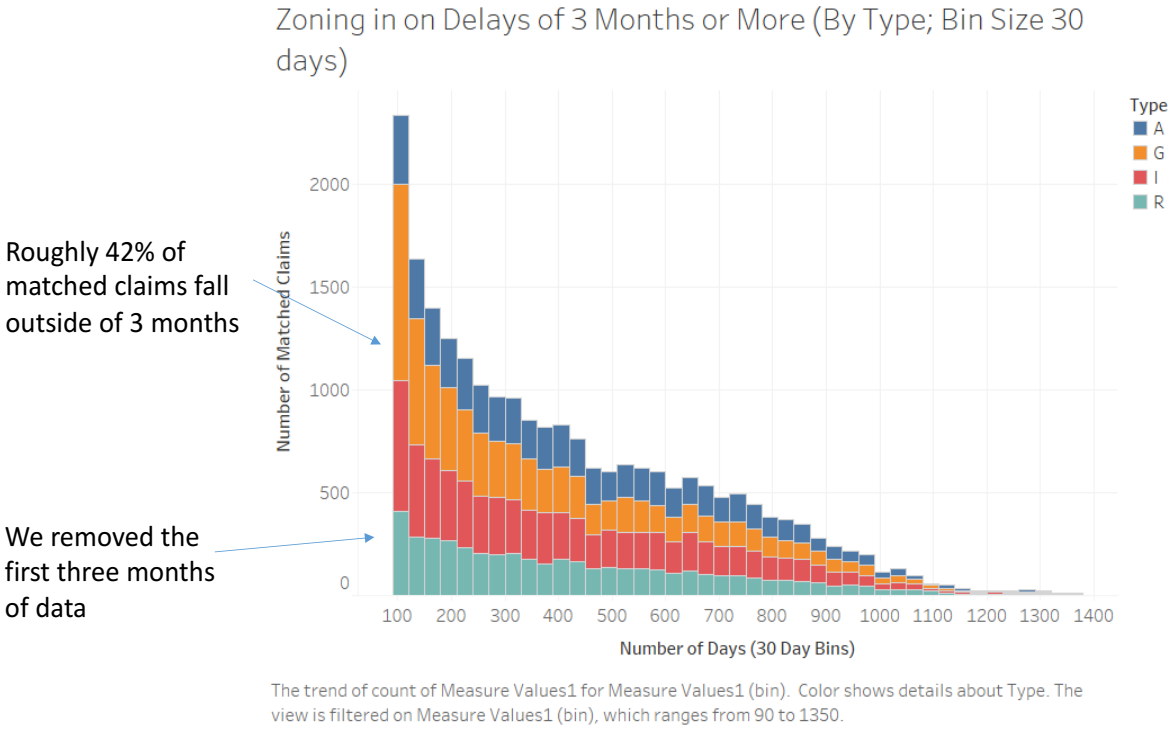
Figure 10



- The line chart above views the frequency bins in a slightly different way, focusing on the share of the type over time.
- While Group Life had the highest proportion of matches with first and last payments made within 90 days,that percentage shrinks over time.
- By about 300 days, Individual life has the largest share of matches with first and last payments. Annuities also surpasses Group life by about 400 days. Therefore, it appears Individual Life and Annuities make up a larger share of the matched claims in later periods.
- The volatility increases substantially after 1,020 days because the amount of observations is so low after that point.

Figure 11

Question #2: The Use Case Appears Viable As Many of the Cases Fall Outside Three Months



- Removing the matches where first and last payment occurs within the first three months, indicates a still large amount of matches.
- In fact, 42% of all matches have the difference between first and last payment spanning over 90 days (or 3 months).
- Combining the fact that 4% of all policyholders found matches in a study with only three companies, with the fact that the delays in payments amongst those matches are quite significant demonstrates the value of the Mortality Monitor solution. This application would streamline the notification process, reducing cycle times and contributing to processing death benefits more quickly.

Conclusion

Conclusion

The death notification process within financial services has potential for improvement. Today's process involves multiple handoffs between systems and people, increasing time, cost, and risk. Family members and loved ones may experience difficulty in gathering and completing documents, resulting in a less-than-optimal experience. Carriers must collect and assemble pertinent information and documents from multiple sources, which means duplication of data, high rework and potential for errors. The challenge is in the lack of a single source of truth for processing death benefits and claims.

The Institutes RiskStream Collaborative's Mortality Monitor is a blockchain application that aims to:

- Provide a single source of truth to eliminate or reduce data-sharing challenges within the death notification space
- Help participants on the RiskStream Collaborative network identify potential deaths more quickly by incentivizing secure, permissioned data sharing, thereby refining the death notification and claims process

The ultimate goal is to improve the experience for beneficiaries while reducing time, cost, and risk for carriers.

This report documents findings from our viability study of the Mortality Monitor concept, with a confined scope and small network of participants. Three carriers provided five years of claims data around whether deceased policyholder matches cross carrier datasets. Where deceased policyholder matches appeared, the study also examined the amount of time between the first payment from the first carrier and the last payment from the last carrier.

The results from the three companies show that about 4% of deceased policyholders of one of the carriers also had policies (life or individual policies) or other financial instruments (annuities or retirement plans) with one of the two other carriers. This number varies by financial instrument, but is much larger than expected and would undoubtedly grow if a larger network of organizations participated in a future study.

The findings also show that when a policyholder has more than one carrier, a delay in payment exists between the first and last carrier. The median shows a 55-day delay and the average is even larger.

The median delay statistic highlights the value and viability of a network that shares decedent profile information. The Mortality Monitor blockchain solution offers a viable path forward in achieving greater efficiency and reduced beneficiary frustration during the death registration and claims initiation process.