SUPERLIFE PROGRAM PROPOSAL

2024 SOA Student Research Case Study Challenge

Lifesavers CONSULTANCY

03/2024

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Problem Statement

SuperLife, a major life insurance provider in Lumaria is exploring the integration of targeted health incentives with its longer-term life insurance offerings to maintain its competitive advantage within a data-driven society. The company's internal product team has conducted extensive research on both internal and external data and proposed a possible solution. To ensure the feasibility and unbiased evaluation, SuperLife has requested LifeSavers Consultancy to independently assess the market domain.

Objectives

As claims payments hold the largest contribution toward the cost for insurers, the implementation of health incentives that reduce the mortality rates for policyholders is critically investigated. Thus, our goal is to provide a program that can be deployed simultaneously with SuperLife's insurance policy to reduce the mortality rate by fostering the healthy behaviour of the insured. Thereupon the successful implementation of the program, SuperLife will benefit through an increase in profitability and market exposure.

Program Design

Preliminary Analysis

To better understand the market domain that SuperLife is operating within, we have investigated the contextual background of Lumaria to tailor our solution to meet the customers' needs. Our team began research by analysing the annual income distribution, as well as GDP per capita which translates to 26,806 USD as of the 2023 estimate. The following figures indicate that their economic status is comparable to countries such as Argentina with similar GDP per capita which will serve as a benchmark.

Furthermore, employment distribution data with 12% in agriculture, 35% in industry, and 53% in service shares a similar proportion with emerging countries such as China, Turkey, and Indonesia, which served as a critical indicator for our solution. Based on the comparison, our team has rejected the implementation of health incentives which solely rely on high upfront costs for policyholders, leading to more robust program design.

From the inforce dataset, we found the following key facts:

- SuperLife issues whole life insurance to people aged 35-65 (left-skewed).
- SuperLife issues 20-year term insurance to people aged 26-55 (left-skewed).
- The cause of death between smokers and non-smokers has huge discrepancies, as seen in Appendix A, and thus must be considered separately.
- The distribution channel has no effect on the underwriting class, as seen in Appendix B, thus does not need to be considered in our investigations.

Program Description

SuperLife's main concern is regarding the improved mortality rate of their policyholders after purchasing the whole and term life insurance products. Recognising that a healthier lifestyle directly correlates with longevity, our team has devised an innovative approach to reward

policyholders for adopting and maintaining healthy habits. Our new program aims to incentivise policyholders to live healthily by offering predetermined discounts through a cashback application that we'd develop for users to utilise whenever they participate in scheduled intervention programs or utilise designated health services through partnered retailers/institutions. Our team is looking to specifically lowering the mortality of smokers, as mortality rates increases significantly as the age group increases.

Intervention Programs

Intervention programs are health initiatives targeted to reducing mortality rates through educating and providing medical assistance for policyholders. To ensure equitable distribution of rewards and encourage continuous improvement in health behaviours, policyholders are first stratified into distinct tiers based on various health-related factors, mainly age group and smoking status. When assessing the possible intervention programs to invest in the proposed system, LifeSavers Consultancy grouped them into 3 categories: high effect (at least a 6% mortality reduction), moderate effect (between 3-6%) and low effect (2-4%). It was decided to select 3 programs in each tier to allow a diverse range of policyholders to participate.

After thoroughly analysing the most frequent death causes of policyholders within the last 20 years (see Appendix A), it was discovered that cancer and heart or circulatory system disease were the top two leading causes of death. Considering this, as well as how different programs would have different effects based on smoking status and age, Lifesavers Consultancy critically selected the 9 intervention programs that the firm recommends that SuperLife focuses on, as shown below:

- High Effect (6%+ mortality reduction):
    - Weight Management Programs
    - Heart Health Screenings
    - Cancer Prevention Initiatives
- Moderate Effect (3-6% mortality reduction):
    - Fitness Tracking Incentives
    - Holistic Stress Reduction
    - Alcohol Moderation Programs
- Low Effect (2-4% mortality reduction):
    - Educational Workshops
    - Driving Safety Courses
    - Incentives for Regular Medication Adherence

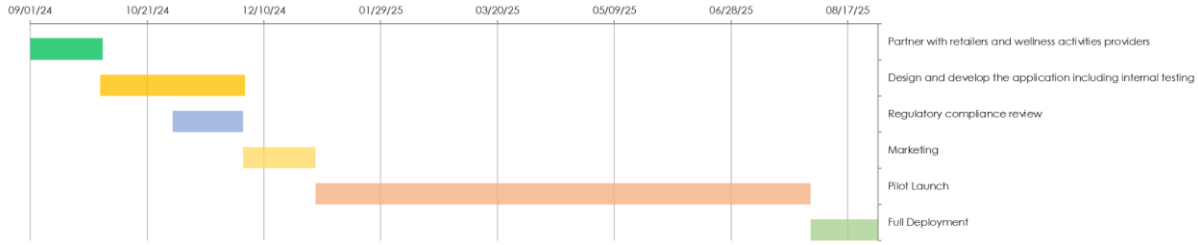
A detailed table explaining the choice of the intervention programs, as well as the mortality reduction effects can be seen in Appendix C.

Cashback Logistics

Each tier is associated with different discount levels based on the estimated reduction in mortality, ensuring that rewards are tailored towards individual circumstances. The following tiered approach encourages policyholders to strive for healthier lifestyles, as those who exhibit positive health behaviours, participate in the high effect intervention program and thus, have the highest reduction in mortality are eligible for more substantial cashback discounts.

Regular annual evaluation, analysis of policyholders' transitions through tiers and monitoring of the program's effectiveness will be conducted to assess its impact on policyholder health outcomes and insurance risks, aiming for long-term improvements in policyholder health and mortality, as well as reduced insurance risks and costs for SuperLife.

Product Timeline



As demonstrated in Lifesavers Consultancy's product timeline, between September and October 2024, efforts will concentrate on forging partnerships with retailers and wellness activity providers, laying the groundwork for collaboration. Following this, from October - December 2024, the focus will shift to the design, development, and internal testing of the application. Additionally, November 2024 will see a regulatory compliance review to ensure adherence to necessary standards.

The initiation of marketing endeavours, utilising TV advertisements and direct email campaigns to inform current policyholders about the pilot launch of the program and providing specialised training to retail partners and wellness activity providers will start a month later. Pilot launch is scheduled from January 2025 to July 2025, targeting a selected 30% of current policyholders.

Also, throughout March and July 2025, quarterly reports will be monitored to gauge profitability based on data obtained from program engagement with retailers and wellness activity providers. Adjustments will then be made in April and August 2025 based on data analysis. During that time, in July 2025, a comprehensive report on the program's performance will be delivered to stakeholders.

Full deployment of the program is set from August 2025 to July 2040 while monitoring of Key Performance Indicators (KPIs) will be conducted quarterly, with annual reports assessing effectiveness and outreach. Marketing strategies will also be adjusted every two years based on relevance, with periodic reviews assessing long-term impact. Lastly, every five years, the program's retention rate will undergo evaluation to withdraw irrelevant programs.

With the above product timeline in mind, the short-term timeframe for the evaluation of this program will be from 2025 to 2040 as the full deployment will allow SupeLife to gather enough data to evaluate the success of the program in reducing mortality. The long-term timeframe will be from 2025-2055 as this will allow SuperLife enough time to optimise the program and re-evaluate objectives.

Assumptions

Contextual assumptions	
Exchange rates	Based on provided exchange rates and assumed to be constant.
Interest rates	Based on 1 year spot rate and ARIMA model.
Mortality reduction and intervention cost	Based on intervention data provided, external research and comparing to similar products.
Transition rates	Initial transition rate is based on external research.
Program Calculation Assumptions	
Age group distribution	Assumed to be constant based on the inforce data for the projection.
Reduction of smokers population per year	1%-7.5% rate of decrease based on studies by the CDC.
Life table	Based on mortality provided, mortality for smokers have a loading factor based on probability of death differences calculated from in force dataset.
Profit margin assumption	Based on the idea profit margin provided by SIAA of 10%.
Program discount	Discount rate for non-smokers is 15% and 10% for smokers to incentivise smokers to quit.
Program cost	Each program based on market research as seen in Appendix D.
Lapse rate	Assumed that policies lapse at the end of year.
Program participation	All policyholders are expected to participate in all 3 intervention programs within the selected tier.
Maintenance Costs	Assumed maintenance costs are 5% of the premium, and include admin fees and claim handling, every 5 years conduct market research, marketing costs.
Commission (Agents/Website Fees)	Term insurance commission is 10% for the first premium and whole life insurance is 7% of the premium.
Termination Costs	Includes claims investigations, and admin fees for closing accounts - 10% of premiums.

Pricing and Costs

Modelling Program Participation

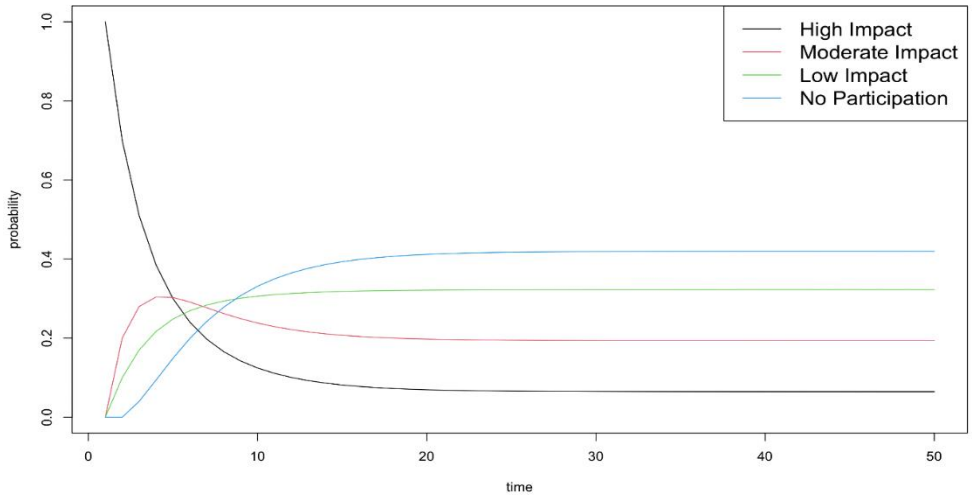
To emulate the policyholder's behaviour and their participation in the program, our team has segmented the population into 4 groups driven by their reduction in mortality due to their participation in health incentives. The four groups are defined as "High Impact", "Moderate Impact", "Low Impact", and "No Participation" groups with assumptions of 7.5%, 5%, 2.5% and 0% reduction in mortality respectively. Furthermore, this group will act as states of the

Markov Chain to simulate both short-term behaviours when the program is deployed as well as long-term distribution amongst the group incorporating diminishing effects as well.

The transition rate amongst the states is initially estimated backed by critical research of literature reviews. Yet, it is a sole assumption in the program development phase and Lifesavers Consultancy aims to continuously modify and update the model during SuperLife's deployment of the program to retrieve relevant data. The transition rates are defined as below:

	High Impact	*Medium Impact*	*Low Impact*	*No Participation*
High Impact	**0.7**	**0.2**	**0.1**	**0**
Medium Impact	**0.1**	**0.6**	**0.2**	**0.1**
Low Impact	**0**	**0.2**	**0.6**	**0.2**
No Participation	**0**	**0**	**0.2**	**0.8**

Based on the initial conjecture provided above, Lifesavers Consultancy will continue investigation into the dynamic participation rate and population distribution amongst different states as the programs are deployed. The visualisation is provided below.



As demonstrated through the visualisation, all policyholders are assumed to begin in the full participation state and the distribution changes as time progresses. It is important to note for the long-term prediction over the 20-30-year period the distribution stabilises, and the corresponding figures are used for our future projections.

Interest Rate Projection

Proven from precedent literature reviews, the Autoregressive Integrated Moving Average (ARIMA) model has shown its effectiveness in forecasting inflation and interest rates in future using past datasets. The modelling can be seen in Appendix E and F. From the model, it can be derived that the long-term interest rate is 4.85% p.a., which will be integrated in Lifesavers Consultancy's pricing model.

Mortality Saving

The mortality savings are calculated through the implementation of Lifesavers Consultancy's intervention program on the already existing inforce dataset with a 20-year interval from the

year 2004 to 2023. Using the inforce data set, the policyholders are grouped into age groups from 21-30, 31-40, 41-50 and onwards, and then further grouped by their smoking status. Smoking status is an important factor due to the mortality of smokers being drastically different from non-smokers (0.39 vs 0.03 for aged 61-70), especially in older age groups as indicated in Appendix G.

The total death benefit payouts before the implementation of Lifesavers Consultancy's program are calculated (see more details in Appendix H) using:

$$\begin{aligned} &total\ payout\ per\ year \\ &\quad = probability\ of\ death\ of\ smokers \times percentage\ of\ age\ group \\ &\quad \times policyholders\ each\ year \times percentage\ of\ smokers \times mean\ face\ amount \end{aligned}$$

The calculation of total death benefit payouts with the implementation of the intervention program requires the probability transition matrix presented above, with the long-run proportions (approximated to 1dp) being 6.5%, 19.3%, 32.3% and 41.9% in the high, moderate, low and no effect tiers respectively.

The reduction in mortality from the intervention program will be very effective at the start of the program, and as the lifestyle improves for the policyholders, the reduction in mortality will taper off to the long-run reduction calculated using the proportions above and short-run reduction as shown in Appendix I. Furthermore, since data for the yearly reduction of smokers are not given, we decided to conservatively assume a 1% decrease in the number of smokers annually under our program (CDC, 2022). With the above information, we can then repeat the same process and incorporate the reduction in mortality.

The results show that with the implementation of the program, the mortality will have a 7.1% reduction in the long-term (15+ years) and a short-term reduction (1-15 years) of 10-22% for non-smokers, and 7.6% long-term and 8-23.5% short-term reduction for smokers. The reduction in mortality subsequently results in mortality savings of an average of 15.2% annually shown in Figure 1 The comparison of the costs can be seen in the diagram in appendix K.

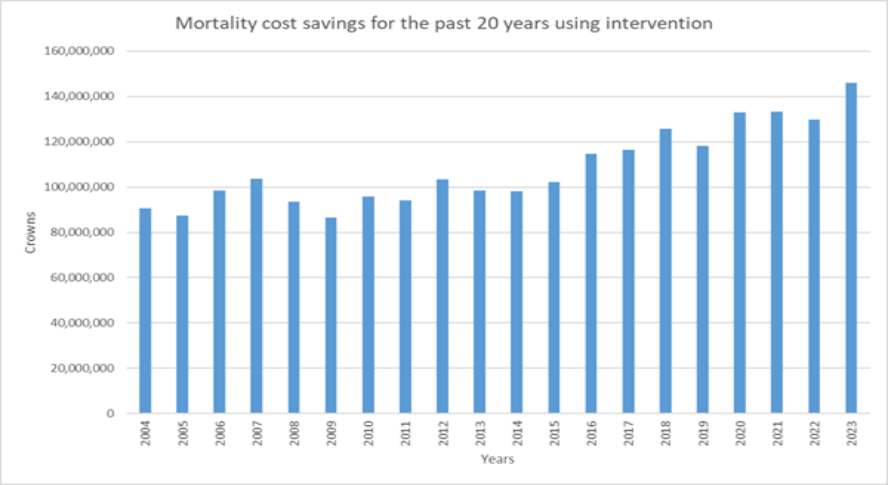


Figure 1

This mortality saving can be projected into the future (20-year projection), using linear regression to project new policyholders and mortality projections given in the mortality table. As shown in Appendix L, SuperLife, using our intervention program will still maintain a positive mortality saving to an even greater extent, due to higher numbers of policyholders resulting in more savings from intervention reducing mortality costs by 17.4% average annually.

Premium Pricing

To calculate the economic benefits of the proposed product, the policyholders were split into four groups, which were:

1. Non-smokers, whole life
2. Non-smokers, 20-year term
3. Smokers, whole life
4. Smokers, 20-year term

First, the cost of the policies without the program were calculated. Life tables of non-smokers and smokers were first constructed respectively. To produce the life table for non-smokers, the mortality data provided was used, while for smokers, a loading factor, as can be seen in Appendix M, was added to the mortality data, and the age limit was set to 100. To get the cost of each policy, assumptions around the cost per policy were used. Also, the modelled interest rate of 4.85% p.a. was used, as well as a 1% lapse rate, gathered from the inforce dataset (see Appendix N).

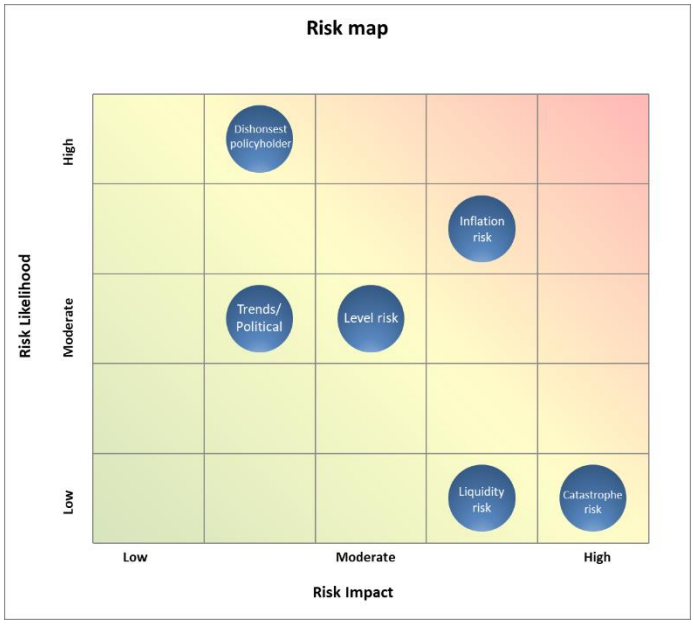
Then, the cost of the policies with the program were calculated. This was done by estimating the costs of the intervention programs as part of the product, and then calculating the cost of a reasonable cashback. This was then multiplied by the long-term transition probabilities, to predict the proportion of people we would be giving cashback to. The cost of the cashback was split evenly between each policyholder, despite the policy conditions, as any policyholder would be given the same amount of cashback. This cashback would be funded by a reduction in mortality, and this factor was predicted to be, using the long-term transition probabilities, ~93% for non-smokers, and ~92.5% for smokers.

Now, using the demographic of policyholders given in the dataset, it was calculated that the average savings SuperLife would have made per policy would have been 2.5% with the proposed product, if it had been implemented 20 years ago. This would have allowed SuperLife to either reduce premiums, or maintain the same level of premiums, and have 2.5% more margin per policy. Projecting into the future for 20 years, there is a trend in the proportion of sum insured, seen in Appendix O, and it was calculated that if this trend continues, that SuperLife will save up to 3-4% per policy on average.

Risk and Risk Mitigation

The program risk map displays the most likely and impactful risk we identified for this project. Since these risks can greatly affect mortality savings, profitability and longevity of

policyholders, they must be identified and mitigated so that benefits of our product are not diminished.



1. Catastrophe risk (quantifiable): unexpected natural disasters or a deadly pandemic will dramatically increase the mortality of all policyholders, which increases the potential payout and cost of our product. This risk can be mitigated either through transferring it to a disaster reinsurance pool or through exclusions of catastrophe related claims

2. Liquidity risk (quantifiable): life insurance claims require adequate reserves to cover potential claims. This risk can be mitigated by frequent reviewing of cash flow projections, mortality rates etc. This is included in the maintenance cost of the products and is transferred as a premium expense loading to further mitigate this risk. Furthermore, consistent scenario testing can also reduce this risk.

3. Level risk (quantifiable): if the actual mortality rate is lower than expected, it will affect the total death benefit paid out which reduces the savings created by our program. Risk is mitigated by carefully considering the policyholder's health and lifestyle conditions such as their age and smoking status. Furthermore, the design of our program is targeted at reducing mortality, which will reduce the level risk.

4. Inflation Risk (quantifiable): consistent high inflation will increase the cost of our intervention programs which will affect the financial benefits our product will bring to Superlife. To mitigate this risk, inflation rate and related macroeconomic factors must be closely monitored and if there is an upward trend of inflation, pricing of the premiums needs to be reassessed.

5. Dishonest policyholders (qualitative): smokers may lie about their smoking status to enjoy high discounts and lower premiums which may result in higher-than-expected mortality payout. To combat individuals falsely identifying as non-smokers, we would run an investigation when a claim is made and void the payout if they have committed fraud.

6. Behavioural trends/policy changes (qualitative): increased popularity in harmful trends such as vaping and changes in taxation on harmful products such as alcohol cigarettes can result in deviations from projected mortality rates. To mitigate this risk, it is important to constantly update risk profiles and review policy changes. Our product design also mitigates this risk as we incentivise a healthy lifestyle which can lower the risk of policyholders developing harmful behaviour trends.

Scenario Testing

Smoker Quit Rate

According to external studies (CDC, 2022) on the annual quit rate of smokers, the average annual rate of reduction for smokers is 1% to 7.5%. Therefore, we used a conservative assumption of using the worst-case scenario which yields a mortality cost saving in the pricing/cost section.

Mortality Reduction

We calculated the mortality using the median of the range from the intervention data and increased the reduction of certain programs as we believed they would be more effective in reducing smokers' mortality. By scenario testing with the low-end mortality reduction (5% reduction for high tier, 3% reduction for moderate tier and 2% for low tier), our intervention program still yields a 10% average annual mortality saving which is equal to the ideal profit margin. For the projected mortality saving, the program, in the worst-case scenario will produce a 12.4% annual savings in mortality payments. An example of the effects of lowered reduction is indicated in Appendix L. Therefore, to be conservative, the financial viability range for program mortality reduction is 6-10% for high tier, 3-8% for moderate tier, and 2-4% for low tier. Overall, due to the accuracy of our mortality reduction simulation, combined with the conservative assumptions, there is a 90% certainty that the mortality will decrease and create mortality savings as a result of our program.

In addition, the SuperLife consultancy has incorporated the multiplicative effects of the intervention programs by using:

$$(1 - reduction\ in\ mortality)^{number\ of\ interventions}$$

Considering the conjunction effect of interventions rather than simple addition which is not an accurate demonstration of real-life scenarios.

Transition Probability

The long-run transitional probabilities to each tier of our product are contingent on external studies and research, if the rate of participation is lower than expected, then it will negatively impact SuperLife's mortality saving. By scenario testing lower participation rates, we found that the viable range for scenario tests are 30%-100% to achieve a significant amount of mortality saving (10%). However, the Monte Carlo simulation used during calculating mortality savings produces reliable results through 50 repetitions so participation rate falling below 30% is unlikely.

Interest Rate

By modifying the interest rate assumption, Lifesavers Consultancy found that there was little impact on the total profits. It can be said that with 95% certainty, SuperLife will make at least an additional 2% of profit by implementing this program.

Data and Data Limitations

Mortality data	No data to base whole life insurance pricing accurately for the 21–30-year-old age group, therefore they will be priced the same as 31-40 age group.
	Mortality loading factor on smoker's mortality for premium calculation is not provided, thus we compared the probability of death of smokers and non-smokers to produce an estimate of smoker's mortality.
Sample space of data	The in-force data used in the calculations might not reflect the mortality of the entire economy including proportion of smokers, age distribution etc.
Population data	Projections can only be accurately performed until 20 years due to limitation of number of years of data in inforce data and only provided data for year of issue after 2001

Further Recommendations

Lifesavers consultancy has illustrated several scenarios and projections for SuperLife with a cashback program design and assumptions table that are both heavily grounded in rational actuarial judgement.

Data Gathering

Even though the assumptions and modelling may have a slight margin of error due to the lack of historical data provided, our simulations established that we've constructed a program that contains a high-level of certainty to increase future savings for SuperLife insurance whilst simultaneously being able to decrease expected mortality in policyholders. However, this requires regular monitoring, feedback and reviewing for the program to be truly successful and in turn, future data can be utilised to fulfil the margin of error, increasing accuracy.

Application Implementations

A key future concern for SuperLife is retaining policyholders to continue participating and demonstrating these healthier lifestyle habits. Gamifying through objectives and adding the ability to interact with peers through the application would enhance policyholders' user experience, making it more enjoyable, competitive and sociable to participate in. An app demo is seen in Figure 2. Ultimately, our team's goal transcends just mortality reduction and cost saving; it also encompasses the holistic well-being of SuperLife's policyholders.

Data Protection

As the program expand out into a digital space and SuperLife is collecting more of policyholder's information, it is integral to protect the policyholder's data safely and securely. As such, we aim to implement cloud computing system and utilise VPN and segregation of access theory to SuperLife organisation, protecting trust and maintaining integrity of the firm.

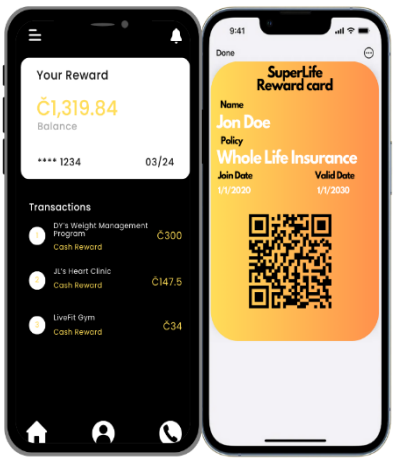
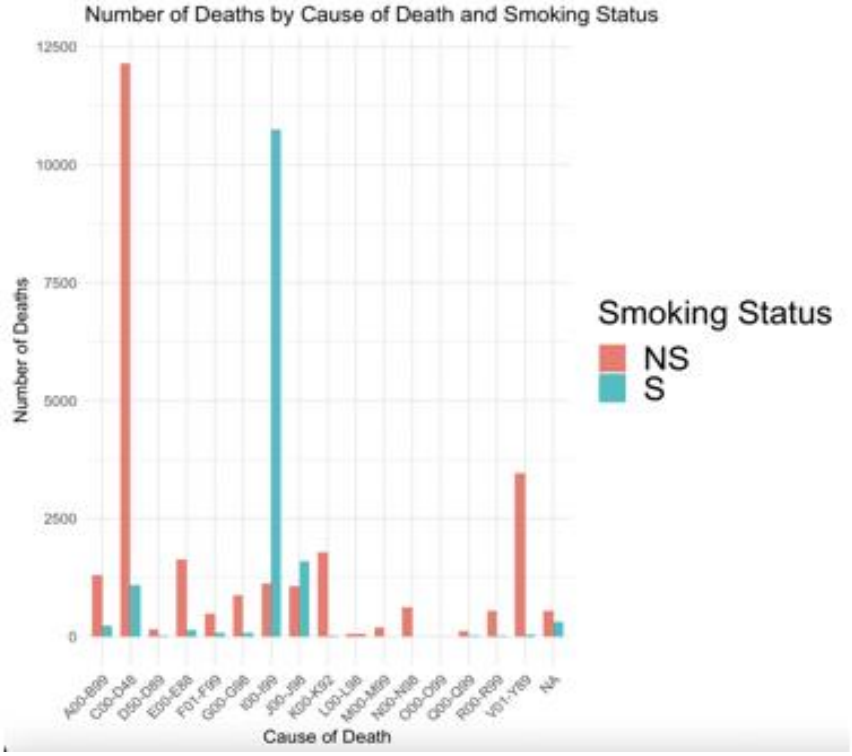


Figure 2

Appendices

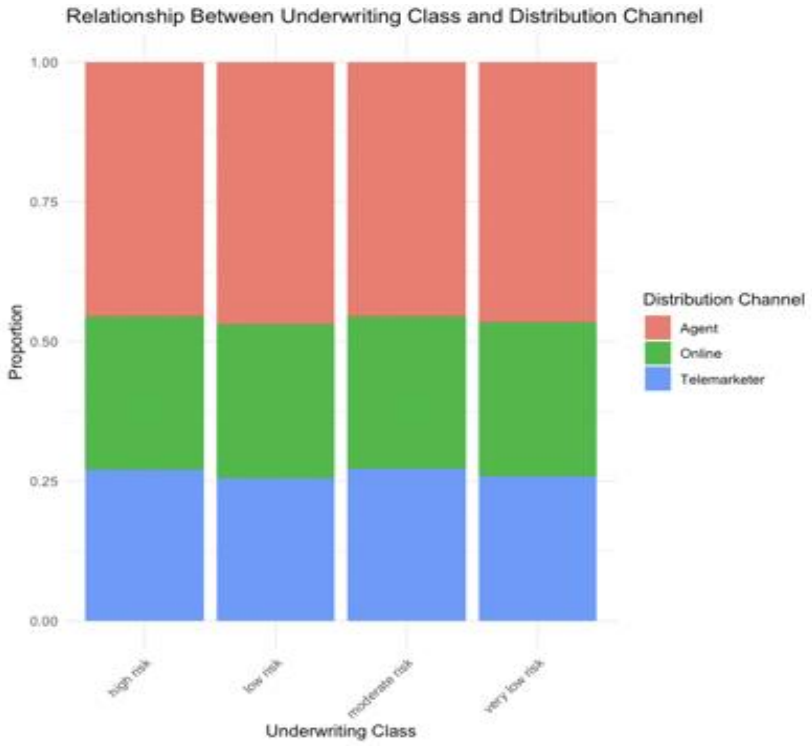
Appendix A

Number of deaths grouped by causes.



Appendix B

Distribution channel plotted with underwriting classes.



Appendix C

Justification of the selected intervention programs

Tier	Program Name	Mortality Reduction	Reason
High Effect:	Weight Management Programs	7.5%	Circulatory and digestive system related deaths are one of the most common causes of policyholder death
	Heart Health Screenings	7.5% for non-smokers 9% for smokers	Early detection of circulatory systems and heart diseases is essential as they accounted for the second most deaths from policyholders at 29.4%.
	Cancer Prevention Initiatives	9%	Cancer is the number one cause of death within policyholders (32.78%) and one of the factors we considered in our program (smokers vs no smokers).
Moderat e Effect:	Fitness Tracking Incentives	5%	When policyholders purchase a tracker, we provide a discount. This intervention program targets heart disease related deaths. Additionally, the effects of smoking outweigh the benefits from fitness to the heart.
	Holistic Stress Reduction	5% for non-smokers 6% for smokers	Stress causes bad lifestyle habits, mainly affecting policyholders between ages 20-50. Many people suffering from stress also utilise methods such as drinking alcohol, smoking and self-harm to combat it.
	Alcohol Moderation Programs	5%	Alcohol is a key factor for a wide variety of death causes including drink driving and liver cancer. This program also doesn't take into consideration whether a policyholder is a smoker or not.
Low Effect:	Educational Workshops	3%	Covers all the death causes known through educating clients on prevention of illnesses such as knowledge on vaping and sunscreen as well as the management of current health conditions.
	Driving Safety Courses	3%	Accounted for third highest cause of death at 8.61%. Since driving safety courses should've been taught during learning. This intervention program is thus classified as low effect but is key to reinforcing the knowledge to drivers.
	Incentives for Regular Medication Adherence	3% for non-smokers 4% for smokers	Valid knowledge on medication adherence is always vital for all policyholders, regardless of any of their factors to learn and understand for safety concerns.

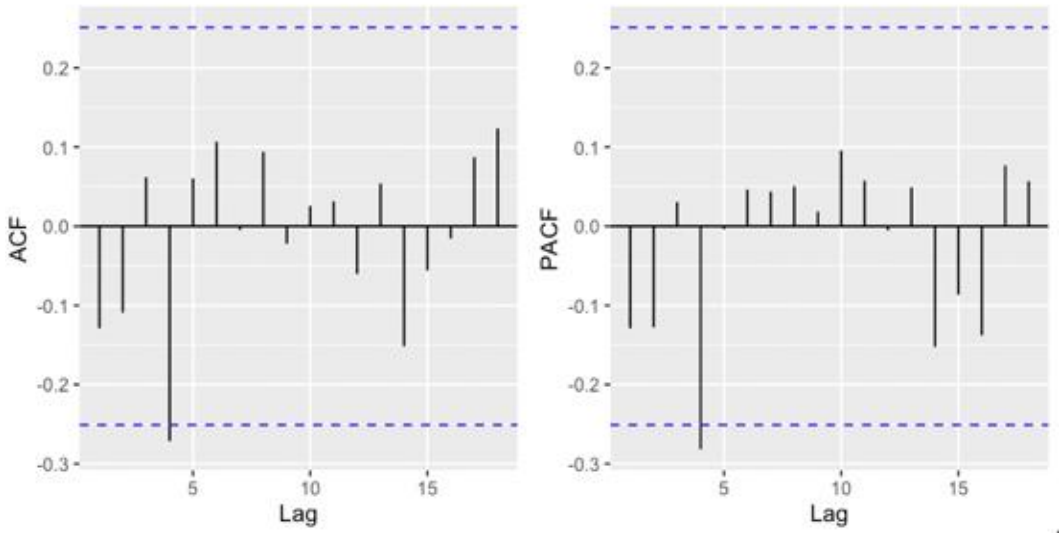
Appendix D

Cost of selected intervention programs

Tier	Program Name	Cost
High Effect:	Weight Management Programs	• $90-190 per week for 12-month plan • $2280/year • At 15% discount: AU$342/customer/year • 393.43Č for 1 year
	Heart Health Screenings	• 122.34Č-162.38Č • *15% discount*: 18.35Č-24.36Č • *10% discount*: 12.23Č-16.23Č
	Cancer Prevention Initiatives	• Č20-Č85 per initiative • About 4 initiatives • Average of 250č
Moderate Effect:	Fitness Tracking Incentives	• US$330 per apple watch • At 15% discount: $49.5/tracker • 86.2785Č • At 20% discount (AIA): 115.038Č
	Alcohol Moderation Programs	• 400 AUD per session • 455 Č • *15% discount:* • 68Č • 45Č
Low Effect:	Educational Workshops	• 810 AUD per session • Equivalent of 923 Č • Low effect, thereby apply 10% deduction = 90Č • For smokers apply 5% = 45Č
	Driving Safety Courses	• 140 AUD for 20 hours. • Equivalent of 159 Č • Low effect, thereby apply 10% deduction = 15-16Č • For smokers apply 5% = 8Č
	Incentives for Regular Medication Adherence	• 60.67Č for non-smokers per session for 6 months • 30.33Č for smokers per session for 6 months

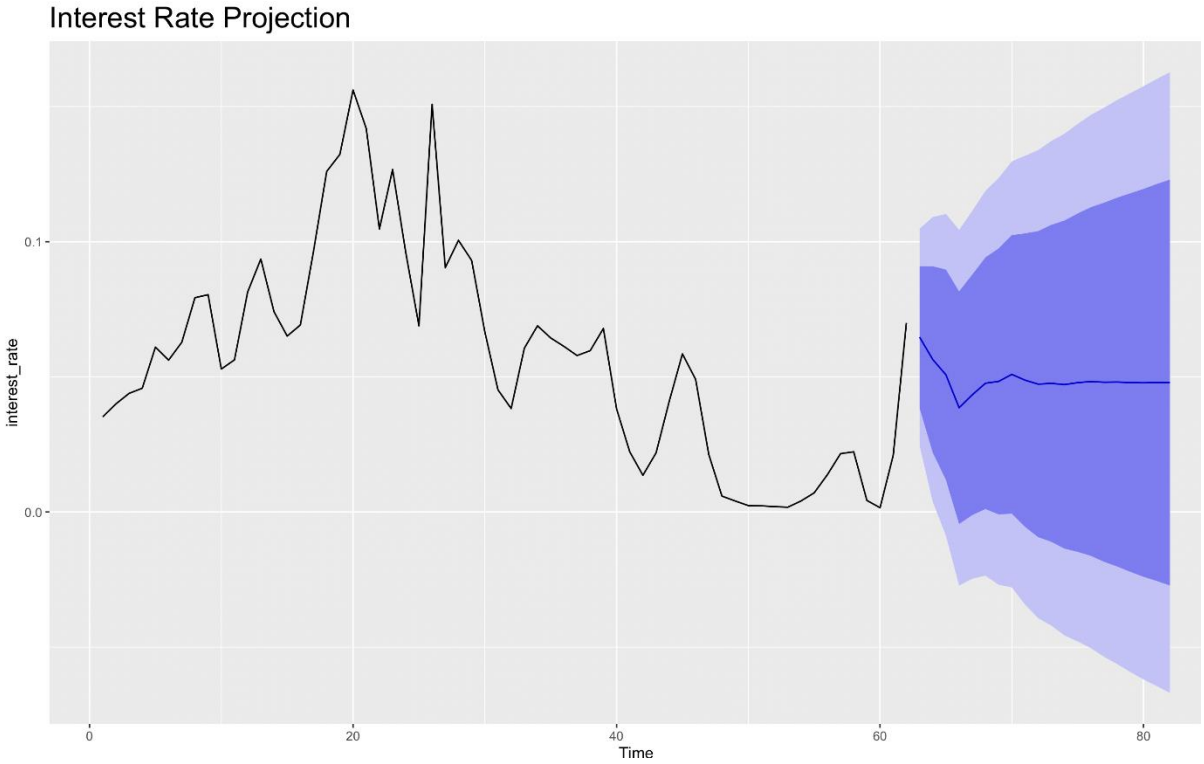
Appendix E

PACF and ACF plot of one year spot rate



Appendix F

Plot of projected interest rate including 85 and 95 confidence intervals



Appendix G

Mortality grouped by age group and smoking status

Age group	*Mortality smokers*	*Mortality non-smokers*
21-30	0.000777454	0.0001407
31-40	0.005254173	0.001682889
41-50	0.0245113	0.005686318
51-60	0.138004316	0.015549655
61-70	0.396577434	0.030374724
71-80	0.706787579	0.044958694
81-100	1	0.064205817

Appendix H

Below is the data needed to calculate the total payout.

a. Smokers in each age group

	age.groups	CountSmokers	deaths	probability.of.death
1	21-30	1407	48	0.0007774538
2	31-40	11172	317	0.0052541727
3	41-50	18575	1205	0.0245112996
4	51-60	16503	4221	0.1380043157
5	61-70	10444	5585	0.3965774338
6	71-80	3281	2572	0.7067875790
7	81-100	358	358	1.0000000000

b. Non-smokers in each age group

	age.groups	CountSmokers	deaths	probability.of.death
1	21-30	9474	129	0.0001407004
2	31-40	102981	1527	0.0016828894
3	41-50	245082	4574	0.0056863177
4	51-60	294710	8697	0.0155496554
5	61-70	201893	8037	0.0303747236
6	71-80	58232	2819	0.0449586935
7	81-100	4470	287	0.0642058166

c. Number of new policyholders the company get each year and projected number of policyholders

	Year	number insured
1	2001	16904
2	2002	22394
3	2003	24755
4	2004	25688
5	2005	26274
6	2006	31164
7	2007	34274
8	2008	33247
9	2009	36761
10	2010	38889
11	2011	40704
12	2012	44271
13	2013	46038
14	2014	46387
15	2015	45314
16	2016	51606
17	2017	48948
18	2018	53972
19	2019	59492
20	2020	64256
21	2021	63706
22	2022	59646
23	2023	63892

	future_years	predicted_number_of_insured
1	2024	67574.63
2	2025	69660.26
3	2026	71745.90
4	2027	73831.53
5	2028	75917.16
6	2029	78002.79
7	2030	80088.43
8	2031	82174.06
9	2032	84259.69
10	2033	86345.32
11	2034	88430.96
12	2035	90516.59
13	2036	92602.22
14	2037	94687.85
15	2038	96773.49
16	2039	98859.12
17	2040	100944.75
18	2041	103030.38
19	2042	105116.02
20	2043	107201.65

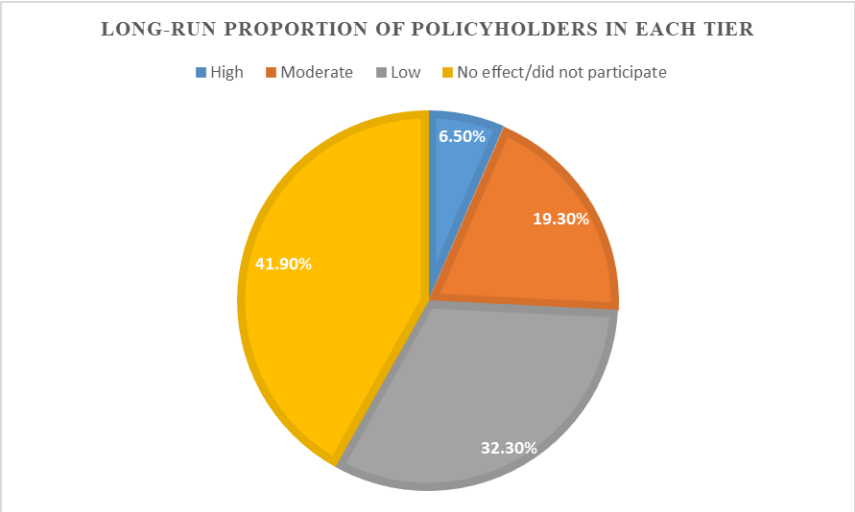
Appendix I

Mortality reduction after implementing intervention programs.

Years	Reduction for non-smakers	Reduction for smokers
1	0.2213812	0.2340075
2	0.2107557	0.2038088
3	0.1944667	0.1782509
4	0.1775229	0.1571862
5	0.1620256	0.140118
6	0.1486947	0.1264435
7	0.1376126	0.1155714
8	0.1285889	0.1069725
9	0.1213378	0.1001962
10	0.1155619	0.0948697
11	0.110988	0.0906902
12	0.1073806	0.0874147
13	0.1045433	0.08485
14	0.1023162	0.0828431
15	0.1005704	0.0812733
16	0.0705401	0.0761495
17	0.0705401	0.0761495
18	0.0705401	0.0761495
19	0.0705401	0.0761495
20	0.0705401	0.0761495

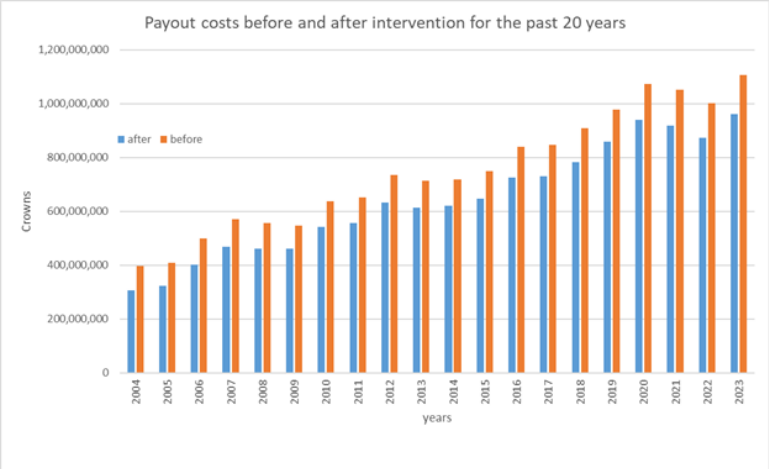
Appendix J

Percentages of policyholders in each tier according to the long-run transition probability.



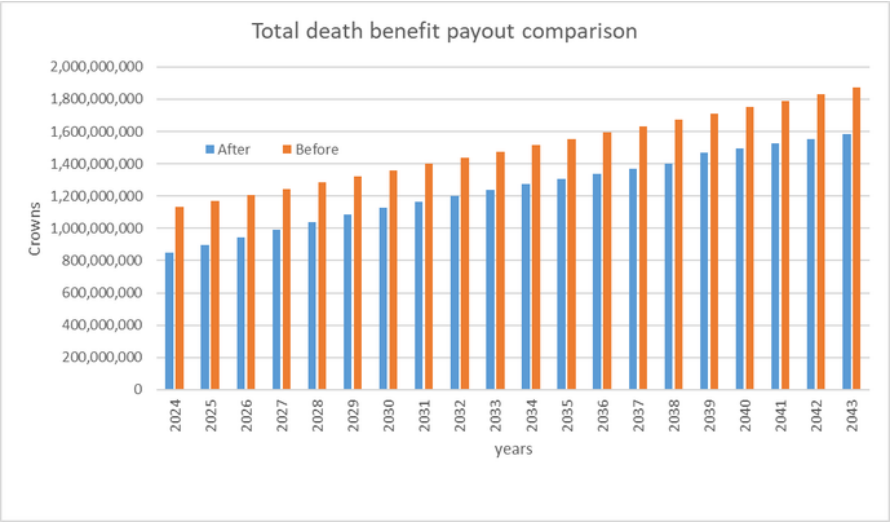
Appendix K

i. Comparison between total mortality payouts with and without the program in the past.



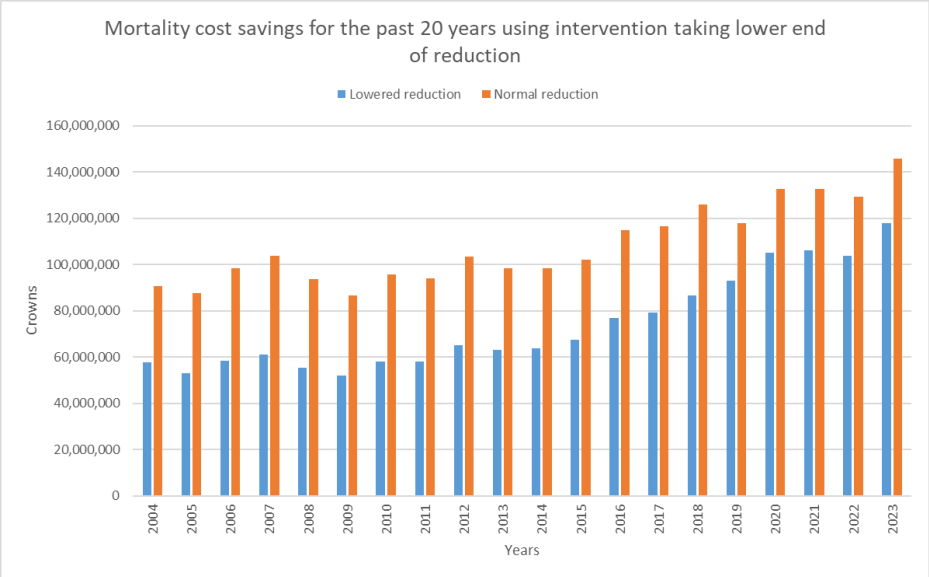
ii. Projected mortality savings using our program.

iii. Comparison between total mortality payouts with and without the program in the future.



Appendix L

Effects of lowered mortality reduction of all tiers of intervention programs.



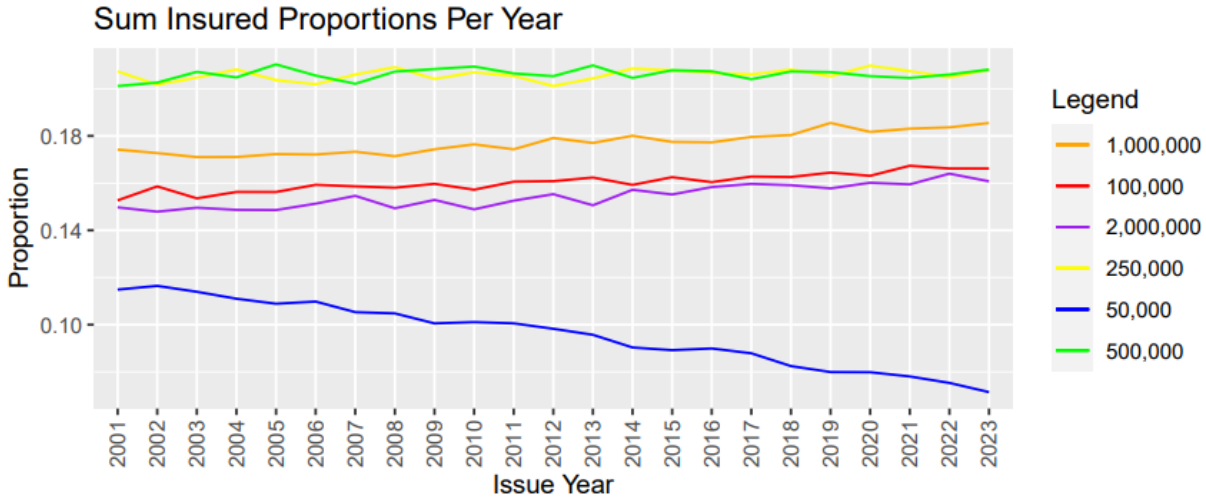
Appendix M

Age	*Loading Factor*
0-30	100%
31-40	120%
41-50	170%
51-60	200%
61-100	250%

Appendix N

Length of Policy	*Lapse Rate*
0	0.99%
1	0.99%
2	0.99%
3	1.00%
4	0.98%
5	0.98%
6	1.03%
7	1.00%
8	1.00%
9	1.02%
10	1.00%
11	1.00%
12	0.99%
13	1.00%
14	1.01%
15	1.00%
16	0.99%
17	0.98%
18	0.98%
19	98.99%

Appendix O



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