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OBJECTIVES

In response to SuperLife's visionary goals, Tiger Insurance Consulting is honored to embark on the development of a robust health incentive program designed to revolutionize the landscape of life insurance offerings. Our collaborative venture aims to transcend conventional industry boundaries by creating a multifaceted initiative that not only incentivizes healthy behaviors but aligns seamlessly with SuperLife's overarching objectives. Our comprehensive strategy revolves around engaging participants through innovative health promotion initiatives, fostering a community that champions well-being. By strategically intertwining this health incentive program with SuperLife's life insurance offerings, our mission is not only to decrease expected mortality rates but also to forge a profound connection between proactive health choices and financial security.

In the following report, we will meticulously outline a detailed roadmap encompassing program design, participant engagement strategies, and metrics for success. Our methodology prioritizes the synthesis of cutting-edge technology, innovative actuarial and econometric methods, behavioral economics and psychology, and industry expertise to not only drive life insurance sales but also to elevate SuperLife's market presence, rendering its offerings highly competitive. Through this collaborative endeavor, we endeavor not only to meet SuperLife's primary goals but to surpass them, propelling the company into a new era of economic value creation and societal well-being.

Measuring the success of a health incentives program necessitates a thorough examination of key metrics that encapsulate its impact on participants and organizational outcomes. Mortality rates, especially when correlated with specific causes of death within the participant pool, offer valuable insights into the program's effectiveness in preventing premature deaths and addressing targeted health concerns. These health-focused metrics provide a nuanced understanding of the program's impact on participants' well-being over time.

Financial metrics, including changes to profit, are equally vital in assessing the program's sustainability and organizational benefits. Evaluating the impact on profit provides a tangible measure of the program's economic feasibility. Monitoring the number of users enrolled in the program is crucial for gauging its reach and popularity, indicating the program's success in engaging the target audience. Lapse indications, such as participant drop-out rates or instances of discontinued healthy behaviors, offer insights into the long-term viability and effectiveness of the program, helping stakeholders refine strategies to enhance participant retention and sustained engagement. Combining these metrics provides a comprehensive overview of the health incentives program's success over suitable time horizons, encompassing both health and financial dimensions.



PROGRAM DESIGN

Participant Motivation Strategies

Implementing a wellness program with a comprehensive array of incentives can significantly contribute to reducing expected mortality rates among participants in the long run. Tiger Insurance Consulting plans to introduce ten wellness activities that are recognized for their significant impact on reducing mortality rates:

- Smoking Cessation Program
- Annual Health Check-ups
- Weight Management Programs
- Heart Health Screenings
- Holistic Stress Reduction
- Cancer Prevention Initiatives
- Chronic Disease Management
- Incentives for Preventative Screenings
- Mental Health Support
- Mindfulness Programs

By combining these incentives, Tiger Insurance Consulting's wellness program creates a comprehensive approach to health promotion and disease prevention, ultimately leading to a significant decrease in expected mortality rates among participants.

Engaging Incentives

Gift Card Raffle

Tapping into the intrinsic motivation of participants, our wellness program offers two compelling incentives to encourage active engagement and sustained participation. Firstly, participants have the chance to win exciting rewards through our bi-weekly gift card raffle, adding an element of anticipation and excitement to their wellness journey. This raffle not only acknowledges their commitment, but also provides tangible incentives that amplify the sense of accomplishment. By incorporating this element of chance and reward, the program not only incentivizes individuals to actively participate but also fosters a sense of excitement and anticipation, which can significantly enhance their overall experience and adherence to healthy behaviors.

Reward Redemption

Secondly, our points-based rewards system empowers participants to earn points for participating in and completing various wellness activities, allowing them to track their progress and work towards personalized goals. These points can then be redeemed for a variety of rewards, ranging from discounted gym memberships to SuperLife merchandise and fitness gear, to gift cards, providing continuous motivation and reinforcement for healthy behaviors. Each participant will have the opportunity to redeem rewards at the end of each calendar year ranging from \$10-\$50, depending on their point accumulation totals.

Key Program Features

Our wellness program integrates three key features to promote holistic well-being, empower participants on their health journey, and reduce overall mortality. These three features include: an initial health risk assessment, including a self-disclosing questionnaire and clinical screening; a referral plan; and a



points-based reward system. Tiger Insurance Consulting plans to uphold data protection regulations by implementing security measures to safeguard all personal health information collected from participants. This includes encryption of data, strict access controls, regular audits, and compliance with the Health Insurance Portability and Accountability (HIPAA), ensuring that individuals' privacy rights are respected, and their data is handled responsibly.

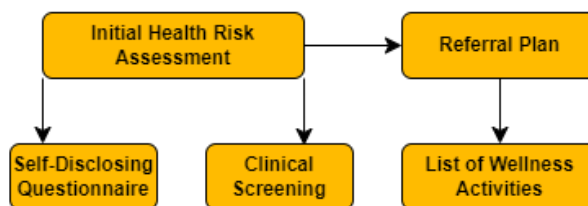
Health Risk Assessment

Participants will complete an initial health risk assessment upon signing up for the program, where they will undergo a comprehensive evaluation to identify potential health risks and establish baseline measures. The assessment will include two key parts: (1) a self-disclosing questionnaire that probes participants to identify health-related behaviors and risk factors, and (2) a clinical screening. The questionnaire is followed by an initial clinical screening, which will collect key biometric data that will assess participants' health status and potential risk factors.

Referral Plan

Based on the results of the health risk assessment, participants with elevated risk factors will receive a referral plan consisting of certain interventions based on their health. This allows for personalized targeting of the needs of each participant. The health risk assessment and referral plan require renewal every year for existing members in the wellness program. Research by Coulter et al. (2009) highlights the importance of personalized feedback in promoting health behavior change, as individuals are more likely to take action when presented with tailored recommendations based on their specific health risks.

Figure 1: Wellness Activity Assignment Process

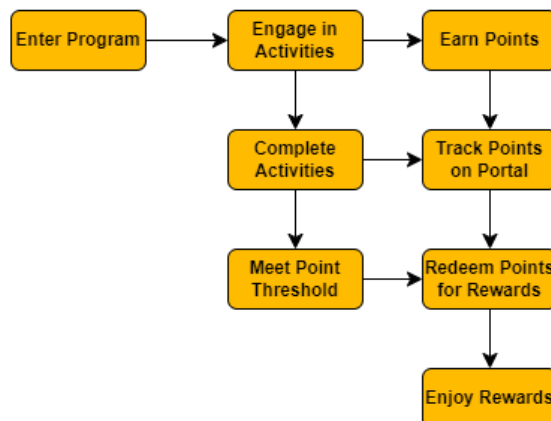


Points-Based Reward System

The most pivotal feature of our program is the points-based reward system that is structured to incentivize and motivate participants to engage in various health-promoting activities and behaviors. Participants will earn points for signing up for and completing interventions, as well as engaging in healthy activities, such as exercise and wellness sessions, tracking nutrition and maintaining a balanced diet, attending health screenings, and completing health challenges set by the program. Participants can track their points through SuperLife's wellness portal or online platform, allowing them to monitor their progress, view upcoming activities or challenges, and stay motivated to earn more points. Participants can redeem their points for prizes once they meet a certain point threshold. Rewards can include gift cards to retailers, restaurants, or online stores; fitness-related items such as workout gear, fitness trackers, or discounted gym memberships; wellness services like massages, spa treatments, or nutrition counseling sessions; and SuperLife themed merchandise.



Figure 2: Points-Based Reward System



Short-Term Evaluations

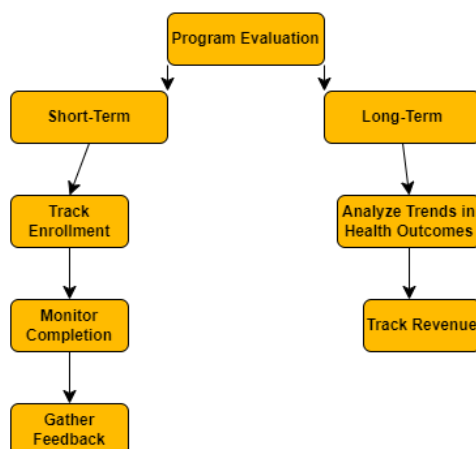
After a minimum of one year following the launch of Tiger Insurance Consulting's wellness program, quarterly short-term evaluations will be implemented to gauge its success and efficacy. These assessments, occurring every three months, will involve several key components. Firstly, they will track the enrollment numbers of participants in the program to ascertain its reach and engagement levels. Additionally, completion rates of participants in various interventions will be monitored to measure the program's effectiveness in promoting sustained engagement. Revenue tracking will also be conducted to assess the financial impact of the program. Furthermore, feedback will be gathered through surveys, focus groups, and informal discussions, allowing participants to share their experiences and provide insights into areas for program enhancement.

Long-Term Evaluations

Long-term evaluations would be conducted every three years, solely focusing on changes to the health outcomes and biometric data of participants. By implementing this periodic evaluation schedule, we ensure that we capture both short-term improvements and sustained changes over time, providing a holistic view of the program's effectiveness. Specifically, tracking biometric indicators such as blood pressure, cholesterol levels, and BMI longitudinally enables us to observe trends and patterns in participants' health profiles. These evaluations are instrumental in identifying any significant shifts in health outcomes, allowing us to tailor interventions and refine program strategies as needed. Importantly, the emphasis on gathering sufficient data over the long term is essential for assessing the program's effectiveness in reducing mortality rates. By analyzing trends in health outcomes and biometric data over multiple evaluation cycles, we can establish correlations between program participation and long-term health outcomes, including mortality rates.



Figure 3: Evaluation Flowchart



PRICING/COSTS

Mortality Savings

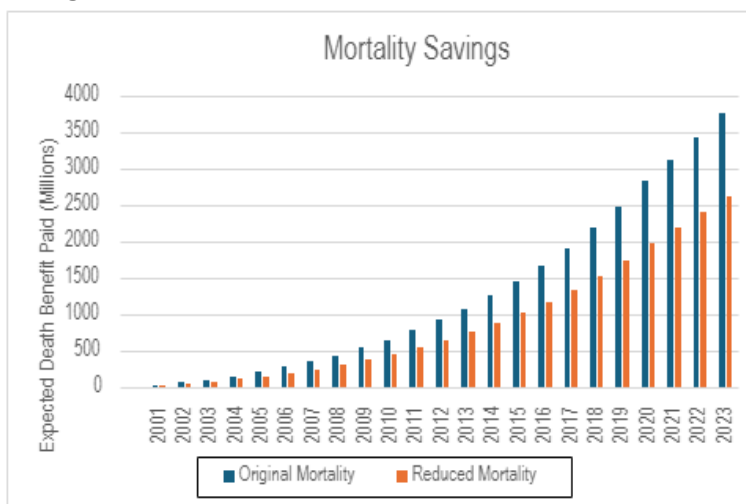
Based on the provided policyholder data and historical mortality rates, we conducted an analysis to assess the potential mortality savings that SuperLife could have realized had our proposed plan been implemented two decades ago. Our methodology involved calculating the annual expected death benefits paid out using both the given mortality rates and the reduced mortality rates anticipated from participation in our health plan's interventions.

To derive the past annual expected benefit, we multiplied the face amount of the policy by the mortality rate corresponding to the policyholder's age in each respective year. It's important to note that our calculation assumes death benefits are disbursed at the end of the year, thereby accounting for deaths and lapsed policies within the calculated period.

Our analysis revealed a consistent reduction of slightly over 30% in total expected death benefits paid out annually when comparing the results obtained under the original mortality rates with those projected under the reduced mortality rates resulting from our health plan interventions.

This reduction signifies the potential mortality savings that SuperLife could have accrued annually over the past 20 years through the implementation of our health plan. These savings not only demonstrate improved health outcomes for policyholders by increasing life expectancy but also suggest significant cost savings for the company, emphasizing the potential value proposition of our proposed plan.



Figure 4: Mortality Savings**Projected Growth and Economic Value**

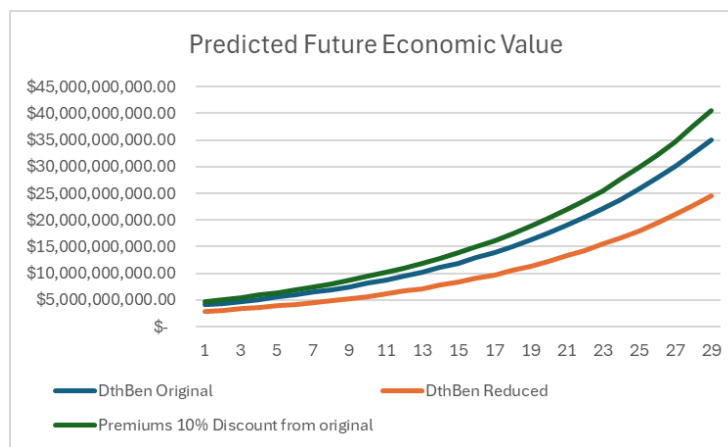
Our analysis forecasts a 30% revenue increase for SuperLife upon implementing our health plan. By analyzing policy data, we predict a 5.48% annual growth in new policy issuance. Post-implementation, this growth is expected to rise due to the enhanced value of our health plan.

Pricing Adjustment for Marketability:

To increase marketability, we recommend offering a 10% discount on annual premiums for policyholders who participate in the health plan's interventions. This pricing change aims to make SuperLife more appealing compared to other insurance providers.

Comparative Economic Value:

Comparisons between SuperLife's economic value with and without the health plan implementation illustrate the program's potential to drive revenue growth and improve financial performance over the long term.

Figure 5: Predicted Future Economic Value

Economic Value

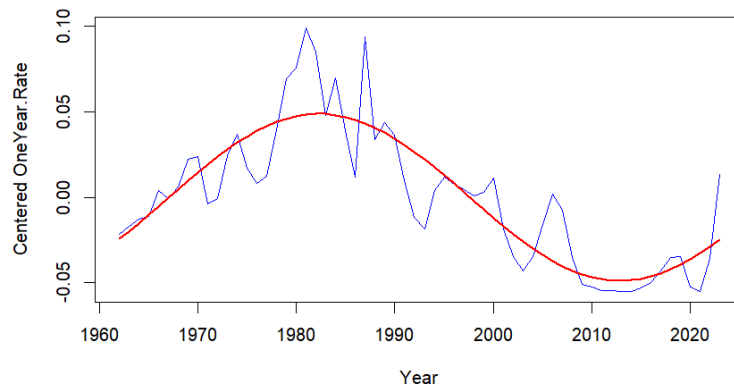
We spent some time creating an analysis of the projected growth and economic value of our health plan for the next 30 years. We estimate that after the implementation of our health plan SuperLife will realize a **30%** gain in revenue. Using the given policy data, we were able to complete trend analysis on the type of new policies being issued as well as the risk level associated with each policyholder. This was important in determining expected future death benefits to be paid out as well as premiums received. After observing the growth of SuperLife, we found that we can expect on average a **5.48%** annual growth of new policies issued each year. After implementation of the new health plan, this number will likely increase as it will be more valuable and enticing for new clients. The figures below show the comparison between Superlife's estimated economic value with and without the health plans implementation.

ASSUMPTIONS

- Our insurance policies are structured around two primary products: whole life and 20-year term plans. We operate under the premise that death benefits are disbursed to beneficiaries after the year in which the insured individual passes away, while premiums are systematically collected at the inception of each month.
- We incorporate the assumption that interest and inflation rates exhibit a cyclical nature, repeating approximately every 60 years. In addition, we leverage sinusoidal curves to model these cyclical patterns, enabling us to visualize and quantify the oscillations in rates with greater precision.
- Our wellness program systematically categorizes new policyholders into one of four distinct risk groups: very low, low, moderate, and high-risk categories, with "very low risk" representing individuals deemed healthy and "high risk" indicating those with less optimal health.
- All smokers are automatically categorized as moderate risk or higher due to the inherent health risk associated with smoking showing a significant difference in risk between moderate and low categories risk.
- In the assessment of Chronic diseases, only individuals categorized as moderate or high risk are considered.
- Under the "Year of Death," we assume that both "NA" and blank entries indicate that the person did not die. Another assumption assumes that the "Year of Lapse" refers to the calendar year in which an insurance policy experiences termination or lapses.
- The first policy year, 2001, was excluded from the trend calculation because the trend was determined based on the percentage change in policy count year over year.
- Sensitivity testing assumes that most individuals, exceeding 90 percent, opt to undergo one of the intervention programs.
- The assessment of the likelihood and severity of impacts relies on a ranking system that evaluates the potential effects on the company's operations, considering variables such as interest rates, mortality rates, and fraudulent claims.
- Sensitivity testing is assumed to be conducted to assess the stability of these rankings across different scenarios.
- The stability or fluctuation of reinsurance costs, which involve sharing risk with other insurers, depends on prevailing market conditions and the risk being reinsured.
- Regulatory changes impacting pricing, product offerings, or capital requirements will be minimal or have a predictable impact on costs.



Figure 5: Inflation Rate



RISK AND RISK MITIGATION CONSIDERATIONS

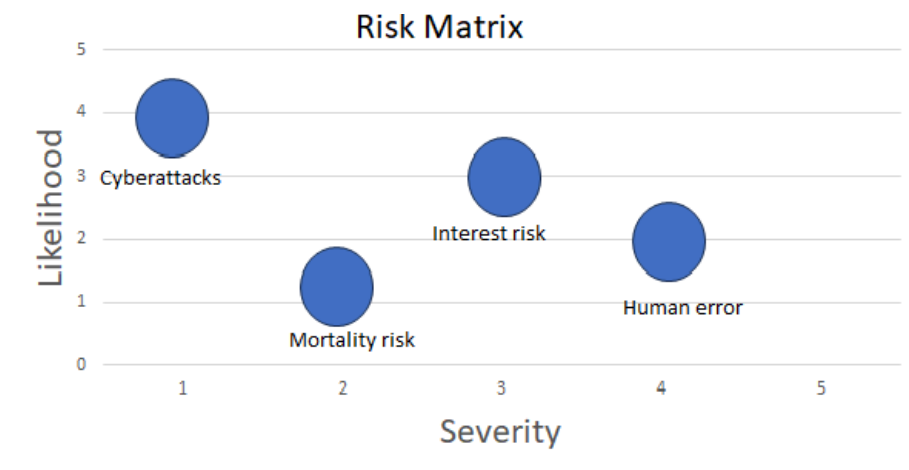
Quantifiable and Qualitative Risks

When introducing new pricing strategies, it is crucial to acknowledge both quantifiable and qualitative risks. Mortality, interest, and human risks fall under the quantifiable category, while cyberattacks represent a qualitative risk.

Likelihood and Severity Estimates for Quantifiable Risks

Upon evaluating these risks and ranking their likelihoods from one to four, it became apparent that mortality risk takes precedence, followed by human error and interest risk, with cyberattacks being deemed the least probable. Similarly, when assessing the severity of these risks and assigning rankings from 1 to 4, cyberattacks emerged as the most severe, followed by mortality risk, interest risk, and finally, human error.

Figure 6: Risk Matrix



Risk Mitigation Strategies

To mitigate these risks, we can take the following measures:

For mortality risk, we can implement stringent underwriting practices to thoroughly evaluate the health, lifestyle, and other risk factors of applicants. This approach ensures that premiums charged accurately reflect the mortality risk associated with each policyholder.

For interest rate risk mitigation, we can opt for Stress Testing and Scenario Analysis. This involves conducting thorough stress tests and scenario analyses to gauge the effects of different interest rate scenarios on the company's financial standing. By identifying potential vulnerabilities, we can develop contingency plans to mitigate adverse outcomes. Alternatively, Liquidity Management offers another approach. By ensuring adequate liquidity and cash reserves, the company can meet short-term obligations and seize investment opportunities, especially during periods of interest rate volatility.

To address human error, we can implement Training and Education initiatives. This involves offering comprehensive training programs to employees aimed at enhancing their knowledge, skills, and awareness of potential risks and best practices. This training encompasses company policies, procedures, compliance requirements, and error prevention techniques.

To mitigate the risk of cyber attacks, we can adopt several strategies. Firstly, regular Risk Assessment and Management procedures can be conducted to identify vulnerabilities and develop a prioritized risk management plan. Secondly, comprehensive Employee Training and Awareness programs can educate staff on cybersecurity threats and best practices. Lastly, implementing Network Segmentation and Firewall Protection can control traffic flow and prevent unauthorized access.

Degree of Certainty for Lowered Mortality

With a 90 percent confidence level, we are certain that individuals will eagerly participate in the program. This confidence primarily stems from the enticing incentives we provide, which serve as a significant motivator for their engagement. Additionally, individuals' inherent desire for longevity and improved health naturally propels them to join the program. When combined with the appealing incentives, participation becomes an undeniable and compelling choice for them. Consequently, more people will be keen to join, surpassing the value of benefits derived from policies sold without incentives. This justification underscores the rationale behind leveraging incentives to enhance program participation and effectiveness.



DATA AND DATA LIMITATIONS

- In conducting our analysis of SuperLife's current block of business, we extensively utilized diverse datasets and resources, including an online encyclopedia entry, the Super Life Enforce data set, the Key to SuperLife Enforce Dataset, the Lumaria mortality table, Lumaria economic data, and most impactful selected interventions implemented by SuperLife.
- Our analysis included cross-referencing Excel formulas for premium calculation and mortality rates with the SOA Standard Ultimate Life Table to validate the accuracy.
- The lack of sufficient enforced data for each age at each risk level posed a major limitation, impeding the creation of the most accurate life table based on risk level.
- The data set solely comprised information on individuals identifying as Male or Female, with no representation of those identifying as non-binary or another gender.
- Policyholder age data was limited to individuals between 26 and 65 years old, omitting important information for those younger than 26 and older than 65.
- The analysis did not incorporate the year of death data for lapsed policies due to incomplete information regarding policy status.
- The available death data extends only up to age 87, reflecting individuals who initiated policies at age 65 in 2001 and passed away by the year 2023 at age 87.



APPENDICES

Appendix A: Wellness Activity Descriptions

Smoking Cessation Programs

A smoking cessation program is a structured and comprehensive approach designed to help policyholders quit smoking and achieve long-term abstinence from tobacco use. These programs typically offer a range of support services and resources tailored to the needs of participants. This may include counseling sessions with trained professionals to address both the physical and psychological aspects of nicotine addiction, as well as strategies to cope with cravings and withdrawal symptoms. Many programs also provide educational materials and information about the health risks associated with smoking, as well as the benefits of quitting. Additionally, some programs offer pharmacological interventions such as nicotine replacement therapy or prescription medications to aid in the quitting process. Support groups, either in-person or online, may also be part of a smoking cessation program, providing participants with a sense of community and encouragement from others who are also on the journey to quitting. Overall, smoking cessation programs offer a structured and supportive environment to help individuals break free from tobacco addiction and improve their overall health and well-being.

Annual Health Check-Ups

Annual health check-ups are comprehensive assessments conducted on a yearly basis to monitor and maintain overall health and well-being. These check-ups typically involve a series of medical evaluations, tests, and screenings tailored to an individual's age, gender, medical history, and lifestyle factors. During these appointments, healthcare professionals may conduct physical examinations, assess vital signs such as blood pressure and heart rate, and review medical history and current medications. Additionally, various screenings may be performed to detect early signs of chronic conditions such as diabetes, high cholesterol, hypertension, and cancer. Depending on individual risk factors, other assessments like blood tests, mammograms, Pap smears, colonoscopies, and bone density scans may also be recommended. Annual health check-ups play a crucial role in preventive care by identifying health issues early, promoting healthy lifestyle behaviors, and facilitating timely interventions to reduce the risk of serious health complications. Regular participation in these screenings can lead to improved health outcomes and a better quality of life.

Heart Health Screenings

Heart health screenings are specialized assessments aimed at evaluating the cardiovascular system's function and identifying potential risk factors for heart disease. These screenings typically involve a combination of medical evaluations, tests, and assessments designed to assess various aspects of heart health. Common components of heart health screenings include blood pressure measurement, cholesterol level testing, and evaluation of other risk factors such as smoking status, family history of heart disease, and lifestyle factors like diet and physical activity. Additional tests such as electrocardiograms (ECGs or EKGs), stress tests, and imaging studies like echocardiograms may be recommended based on individual risk profiles. The goal of heart health screenings is to detect early signs of heart disease, such as hypertension, high cholesterol, or abnormal heart rhythms, and to implement preventive measures and interventions to reduce the risk of heart attacks, strokes, and other cardiovascular events. Regular participation in heart health screenings is essential for maintaining optimal cardiovascular health and reducing the burden of heart disease.



Weight Management Programs

Weight management programs are essential components of any health incentive program, aiming to promote and support individuals in achieving and maintaining a healthy weight. These programs typically offer a comprehensive approach that encompasses personalized diet plans, regular physical activity guidance, behavioral counseling, and educational resources. By focusing on sustainable lifestyle changes rather than short-term fixes, these programs empower participants to adopt healthier habits for the long term. Moreover, they often incorporate motivational strategies and incentives to encourage adherence and success. Whether through group sessions, one-on-one coaching, online platforms, or mobile apps, weight management programs within health incentive initiatives provide individuals with the tools, support, and accountability needed to reach their weight-related goals and improve overall health and well-being.

Holistic Stress Reduction

Holistic stress reduction approaches encompass a comprehensive set of strategies and practices aimed at addressing stress from multiple dimensions—physical, emotional, mental, and spiritual. These approaches recognize that stress is not solely a result of external factors but also influenced by internal factors such as beliefs, thought patterns, lifestyle choices, and overall well-being. Holistic stress reduction may involve a combination of techniques including mindfulness meditation, deep breathing exercises, progressive muscle relaxation, yoga, tai chi, qigong, aromatherapy, biofeedback, and guided imagery. Additionally, dietary modifications, regular physical activity, adequate sleep, social support, and meaningful connections with others are often emphasized to promote overall wellness and resilience to stress. By addressing stress holistically, individuals are empowered to cultivate a greater sense of balance, harmony, and vitality in their lives, leading to improved mental and physical health outcomes.

Cancer Prevention Initiatives

Cancer prevention initiatives encompass a range of strategies aimed at reducing the incidence of cancer and minimizing its impact on individuals and communities. These initiatives typically include public health campaigns, educational programs, and policy interventions focused on raising awareness of cancer risk factors, promoting healthy behaviors, and facilitating early detection and screening. Key components of cancer prevention initiatives may include tobacco control efforts to reduce smoking rates, promotion of healthy diets and physical activity to reduce obesity and related cancers, vaccination programs to prevent infection-related cancers such as HPV-associated cervical cancer and liver cancer caused by hepatitis B, and campaigns encouraging regular cancer screenings such as mammograms, Pap smears, colonoscopies, and skin examinations. Additionally, initiatives may involve environmental interventions to minimize exposure to carcinogens in the workplace, air, water, and food supply. By implementing comprehensive cancer prevention initiatives, communities can empower individuals to adopt healthier lifestyles, increase awareness of cancer risk factors, and ultimately reduce the burden of cancer on society.

Chronic Disease Management

Chronic disease management refers to the coordinated efforts and strategies aimed at preventing, controlling, and mitigating the effects of long-term health conditions. Chronic diseases, such as diabetes, hypertension, asthma, heart disease, and arthritis, often require ongoing medical care, lifestyle modifications, and self-management strategies to effectively control symptoms, prevent complications, and improve overall quality of life. Chronic disease management typically involves a multidisciplinary approach that may include healthcare providers, specialists, nurses, pharmacists, dietitians, and other



allied health professionals working collaboratively with patients. Key components of chronic disease management may include regular medical assessments and monitoring, personalized treatment plans tailored to individual needs and preferences, medication management, patient education and empowerment, lifestyle modifications such as diet and exercise counseling, and support services to address psychosocial and emotional aspects of living with a chronic condition. By implementing comprehensive chronic disease management strategies, healthcare systems can optimize health outcomes, reduce healthcare costs, and enhance the well-being of individuals living with chronic diseases.

Initiatives for Preventative Screenings

Initiatives for preventative screenings encompass organized efforts aimed at promoting early detection and prevention of various health conditions through routine screenings and tests. These initiatives often involve public health campaigns, community outreach programs, and healthcare provider collaborations to increase awareness of the importance of preventative screenings and encourage individuals to undergo recommended tests based on their age, gender, and risk factors. Key components of initiatives for preventative screenings include education about the benefits of early detection, providing information on available screening tests, and addressing barriers to access such as cost, transportation, and lack of awareness. Additionally, initiatives may involve policy advocacy to ensure that preventative screenings are covered by health insurance plans and integrated into routine healthcare services. By promoting preventative screenings, these initiatives aim to identify health conditions in their early stages when treatment is most effective, reduce disease burden, and improve overall health outcomes for individuals and communities.

Mental Health Support

Mental health support encompasses a range of services and resources designed to promote emotional well-being, provide assistance during times of distress, and facilitate recovery for individuals experiencing mental health challenges. These supports can include access to licensed mental health professionals such as therapists, counselors, psychiatrists, and psychologists who offer counseling, psychotherapy, medication management, and other evidence-based interventions tailored to the individual's needs. Additionally, mental health support may involve peer support groups, helplines, online forums, and community-based organizations that offer empathy, understanding, and practical guidance for navigating mental health issues. Psychoeducation, skill-building workshops, and self-help materials may also be provided to empower individuals to develop coping strategies, enhance resilience, and improve self-care practices. Overall, mental health support aims to reduce stigma, increase access to care, and foster a supportive environment where individuals can seek help, find hope, and achieve optimal mental well-being.

Mindfulness Programs

Mindfulness programs offer structured interventions and practices aimed at cultivating present-moment awareness, nonjudgmental acceptance, and a greater sense of mental clarity and well-being. These programs typically incorporate mindfulness meditation techniques, breathing exercises, and gentle movement practices such as yoga or tai chi to help individuals develop a deeper connection with their thoughts, emotions, and bodily sensations. Participants are encouraged to observe their experiences with curiosity and compassion, learning to respond to life's challenges with greater resilience and equanimity. Mindfulness programs may be offered in various settings, including healthcare facilities, workplaces,



schools, and community centers, and can be delivered through in-person classes, workshops, online courses, or mobile apps. Research has shown that regular mindfulness practice can lead to numerous benefits, including reduced stress, improved emotional regulation, enhanced cognitive function, and greater overall well-being. By teaching individuals to cultivate mindfulness in their daily lives, these programs empower participants to develop healthier relationships with themselves and others, leading to greater satisfaction and fulfillment.



Appendix B: Health Risk Assessment – Self-Disclosing Questionnaire**Introduction:**

Thank you for taking the time to complete this health self-questionnaire. Your responses will help Tiger Insurance better understand your health needs and provide appropriate support and resources if needed. Please answer the following questions honestly and to the best of your ability. Your responses will be kept confidential.

Section 1: General Information

1. Age: _____
2. Gender:
 - ☐ Male
 - ☐ Female
 - ☐ Non-binary / Other
 - ☐ Prefer not to say
3. Do you have any chronic health conditions? If yes, please list them:
 - ☐ Yes: _____
 - ☐ No

Section 2: Lifestyle and Habits

4. Do you smoke cigarettes or use tobacco products?
 - ☐ Yes, regularly
 - ☐ Occasionally
 - ☐ No, I've never smoked
 - ☐ No, I quit smoking
5. On average, how many alcoholic drinks do you consume per week?
 - ☐ None
 - ☐ 1-7 drinks
 - ☐ 8-14 drinks
 - ☐ 15 or more drinks
6. How many hours of sleep do you typically get per night?
 - ☐ Less than 5 hours
 - ☐ 5-7 hours
 - ☐ 7-9 hours
 - ☐ More than 9 hours
7. Rate your stress level on a scale of 1 to 10 (1 being low, 10 being high): _____

Section 3: Medical History

8. Have you been diagnosed with any mental health conditions such as depression, anxiety, or bipolar disorder?
 - ☐ Yes
 - ☐ No
9. Are you currently taking any prescription medications?
 - ☐ Yes
 - ☐ No
10. Have you ever been hospitalized for a medical condition?



-
- ☐ Yes
 - ☐ No
11. Do you have any allergies (e.g., food, medication, environmental)?
- ☐ Yes
 - ☐ No
12. Have you ever been diagnosed with cancer?
- ☐ Yes
 - ☐ No
13. Do you have any family history of chronic diseases or medical conditions? If yes, please specify:
- _____

Section 4: Physical Activity

14. How often do you engage in low to moderate-intensity exercise (e.g., brisk walking, cycling)?
- ☐ Less than once a week
 - ☐ 1-2 times a week
 - ☐ 3-5 times a week
 - ☐ Daily
15. How often do you engage in vigorous-intensity exercise (e.g., running, swimming)?
- ☐ Less than once a week
 - ☐ 1-2 times a week
 - ☐ 3-5 times a week
 - ☐ Daily

Section 5: Diet and Nutrition

16. On average, how many servings of fruits and vegetables do you consume per day?
- ☐ Less than 2 servings
 - ☐ 2-4 servings
 - ☐ 5-7 servings
 - ☐ More than 7 servings
17. How often do you consume processed or fast foods?
- ☐ Rarely or never
 - ☐ Occasionally
 - ☐ 1-2 times a week
 - ☐ 3 or more times a week
18. How would you describe your typical diet? (e.g., balanced, high in processed foods, vegetarian/vegan, etc.): _____

Section 6: Preventive Health Measures

19. Do you receive regular check-ups and screenings, such as annual physical exams, dental check-ups, and vaccinations?
- ☐ Yes
 - ☐ No
20. How often do you practice self-care activities, such as meditation, mindfulness, or relaxation techniques?



-
- Rarely or never
 - Occasionally
 - 1-2 times a week
 - 3 or more times a week

Section 7: Additional Comments

21. Please share anything else you would like to indicate about your health, lifestyle, or medical history:

Conclusion:

Thank you for completing this health survey. Your participation is greatly appreciated and will assist us in providing you with the best possible care. If you have any questions or concerns, please feel free to contact us.



Appendix C: Health Risk Assessment – Clinical Screening

A clinical screening is a systematic assessment of an individual's overall health and well-being, involving various components aimed at evaluating different aspects of their physiology and anatomy. The examination typically begins with vital signs assessment, which includes measurements such as blood pressure, heart rate, respiratory rate, and body temperature, providing essential baseline information about the individual's cardiovascular and respiratory health.

Next, the inspection phase involves visually assessing the individual's general appearance, skin color, hydration status, and any visible abnormalities or signs of illness. Palpation follows, where the examiner uses their hands to feel for abnormalities in different body areas, checking for tenderness, swelling, masses, or abnormalities in organs and tissues. Percussion may also be employed, tapping on body surfaces to assess the density and resonance of underlying structures, aiding in the detection of abnormalities such as fluid accumulation or organ enlargement. Auscultation involves listening to sounds produced by internal organs using a stethoscope, such as heart sounds, lung sounds, and abdominal sounds, to identify any irregularities or abnormalities indicative of underlying medical conditions. Additionally, specific maneuvers and tests may be performed to assess joint mobility, muscle strength, neurological function, and sensory perception, providing further insights into the individual's musculoskeletal and neurological health.

Overall, a clinical screening combines these components to comprehensively evaluate an individual's health status, aiding in the diagnosis, monitoring, and management of various medical conditions.



Appendix D: Program Design Justifications

Gift Raffle

Several key justifications support the integration of such a raffle system. One study conducted by the National Library of Medicine found that incentives with a monetary reward were associated with higher odds of health promotion programs, measured by an odds ratio of 2.78 and confidence interval of 95% (Michaud et al., 2022). According to behavioral economics research conducted by the National Institute of Health, people tend to place more weight on the present than the future, preferring immediate benefits over delayed benefits (Volpp et al., 2011). By introducing a bi-weekly gift raffle, the health incentives program taps into this innate human desire for immediate achievement and reward, ultimately helping to motivate participants to actively engage in activities conducive to better health.

Reward Redemption

According to a study published in the Journal of Medical Internet Research, gamified incentives, such as certain rewards, have demonstrated positive effects on various health-related behaviors, positively impacting the behavior of roughly 10% of participants in a study conducted (Cugelman, 2013). Together, both the gift card raffle and reward redemption create a dynamic and engaging environment that inspires individuals to prioritize their well-being and actively participate in our wellness program.

Health Risk Assessment Justification

Implementing a health risk assessment (HRA) as part of a wellness program is justified by its potential to provide valuable insights into employees' health status, facilitate targeted interventions, and ultimately improve overall well-being. Behavioral economics literature suggests that individuals often underestimate their own health risks and may lack awareness of preventive measures, leading to suboptimal health behaviors. According to the certainty effect in utility theory, people tend to underweight outcomes that are merely probable and overweight outcomes that are obtained with certainty (Kahneman and Tversky, 1979). Moreover, research conducted by Harrison, Mullen, & Green (1992) found that the degree to which people perceive themselves to be vulnerable to health problems predicts the likelihood that they will engage in health-promoting behaviors. By conducting a health risk assessment, employees are pushed to reflect on their current health status and identify potential areas for improvement. Overall, by leveraging insights from behavioral economics and empirical evidence on the effectiveness of personalized assessments, implementing a health risk assessment represents a valuable investment in promoting employee health and well-being within the organization.

Referral Plan

A study conducted by Steinberg et al. (2015) demonstrate that personalized interventions yield superior outcomes compared to one-size-fits-all approaches, leading to greater improvements in health metrics such as BMI, blood pressure, and cholesterol levels. A study conducted by Dzau et al. (2015) found that the implementation of personalized health solutions reduced “incidence of six diseases in the US by 10% and 50%”, and depending on the disease, a reduction “as little as 10% generates anywhere from \$44 to \$114 billion in the form of longer, healthier lives enjoyed by the US population”. Additionally, a tailored assignment of interventions can result in cost savings by optimizing the allocation of resources to interventions that are most effective for specific participant groups.

Point System Justification



By assigning points for various wellness activities and behaviors, the program creates a clear and tangible incentive structure. Research by Ariely et al. (2009) demonstrates the effectiveness of immediate rewards in reinforcing desired behaviors, as individuals are more likely to repeat actions that result in immediate gratification, with a statistical significance of < 0.05 . Additionally, the concept of mental accounting, proposed by Thaler (1999), suggests that individuals mentally segregate rewards into different categories or accounts based on their source and purpose. Thus, by earmarking points specifically for wellness-related activities, participants are more likely to perceive them as valuable rewards and allocate them towards further engagement in the program. Furthermore, the points-based system introduces an element of gamification, tapping into individuals' intrinsic motivation to achieve goals and earn rewards, as highlighted by Deci et al. (1999). Overall, by integrating insights from behavioral economics, a points-based reward system offers a compelling mechanism to incentivize and sustain healthy behaviors within the wellness program, ultimately driving positive outcomes for participants and the organization alike.



Appendix E: Linear Interpolation Method

New mortality tables by risk category were computed by segmenting mortality data from the inforce dataset and computing new mortality rates based on ages of the participants from the existing data. In assessing the impact of wellness activities on mortality rates across the four risk categories, an interpolation technique was employed to assess values for the "Low" and "Moderate" categories, falling between the given maximum and minimum reduction rates, which were respectively assigned to the "Very Low" and "High" categories. The approximation suggested that "Low" typically resides around one-third of the distance between these benchmarks, while "Moderate" lies approximately two-thirds of the way. Applying these fractions, the interpolated values for "Low" and "Moderate" were computed.

The reduced mortality rates for each wellness activity were subsequently applied to the existing mortality tables for each risk category. This method was also used to assess the approximate impact of mortality reduction for each intervention by risk category. The linear interpolation method allows for a more nuanced understanding of the impact of wellness activities across a spectrum of risk levels, enhancing the precision of mortality rate assessments.



Appendix F: Insurance Benefit VBA Functions

Figure 7: 20 Year Term Insurance Benefit Function Code

```
Function AxTwenty(x As Integer, i As Double, d As Double)

Dim a1 As Integer, a2 As Integer, lim As Integer
Dim k As Integer, n As Integer, pvf As Double
Dim kpx As Double, kbarqx As Double, epv As Double
Dim qx As Double, v As Double
lim = 20
v = 1 / (1 + i)
epv = 0
For k = 0 To lim
    a2 = x + k
    pvf = (Exp((k + 1) * (Log(v))))
    kpx = 1
    For n = 0 To k - 1
        a1 = x + n
        qx = Application.WorksheetFunction.VLookup(a1, Sheets("Mortality").Range("A2:B121"), 2, False)
        kpx = kpx * (1 - qx)
    Next n
    qx = Application.WorksheetFunction.VLookup(a2, Sheets("Mortality").Range("A2:B121"), 2, False)
    kbarqx = kpx * qx
    epv = epv + (pvf * kbarqx)
Next k
AxTwenty = Round(epv, d)
End Function
```

Figure 8: Whole Time Insurance Benefit Function Code

```
Function Ax(x As Integer, i As Double, d As Double)

Dim a1 As Integer, a2 As Integer, lim As Integer
Dim k As Integer, n As Integer, pvf As Double
Dim kpx As Double, kbarqx As Double, epv As Double
Dim qx As Double, v As Double
lim = 120 - x
v = 1 / (1 + i)
epv = 0
For k = 0 To lim
    a2 = x + k
    pvf = (Exp((k + 1) * (Log(v))))
    kpx = 1
    For n = 0 To k - 1
        a1 = x + n
        qx = Application.WorksheetFunction.VLookup(a1, Sheets("Mortality").Range("A2:B121"), 2, False)
        kpx = kpx * (1 - qx)
    Next n
    qx = Application.WorksheetFunction.VLookup(a2, Sheets("Mortality").Range("A2:B121"), 2, False)
    kbarqx = kpx * qx
    epv = epv + (pvf * kbarqx)
Next k
Ax = Round(epv, d)
End Function
```



Appendix G: R-Studio Code for Interest Rate Model

```
summary(economic_data)

model <- lm(`OneYear.Rate` ~ Year, data = economic_data)
summary(model)

#centered the data by subtracting the mean
economic_data$Centered_Rate <- economic_data$OneYear.Rate - mean(economic_data$OneYear.Rate)

#centered data to check the pattern
plot(economic_data$Year, economic_data$Centered_Rate, type = "l", col = "blue", xlab = "Year", ylab =
"Centered OneYear.Rate")

model_sinusoidal <- nls(Centered_Rate ~ A * sin(2*pi*Year/Period) + B * cos(2*pi*Year/Period),
                        data = economic_data,
                        start = list(A = 1, B = 1, Period = 60))
plot(economic_data$Year, economic_data$Centered_Rate, type = "l", col = "blue", xlab = "Year", ylab =
"Centered OneYear.Rate")
lines(economic_data$Year, predict(model_sinusoidal), col = "red", lwd = 2)

future_years <- data.frame(Year = 1962:2100)

predicted_values <- predict(model_sinusoidal, newdata = future_years)

print(predicted_values)

predicted_original_scale <- predict(model_sinusoidal, newdata = future_years) +
mean(economic_data$OneYear.Rate)

plot(economic_data$Year, economic_data$OneYear.Rate, type = "l", col = "blue", xlab = "Year", ylab =
"Original OneYear.Rate", xlim = c(min(economic_data$Year), 2100))

lines(c(economic_data$Year, future_years$Year), c(economic_data$OneYear.Rate,
predicted_original_scale), col = "red", lwd = 2)
```



Appendix H: Trend Analysis

From reviewing the number of policies issued each year and the risk level associated with each policyholder, we can see a steady trend for each population group.

The four risk level groups are Very Low, Low, Moderate, High. We noticed that the percentage of policies from each group stayed consistent from 2001-2023 regardless of how many new policies were issued. This led to our assumption that these percentages also reflected the population of Lumaria and could be used going forward when estimating growth.

While there was consistency each year, we noticed a general trend from the groups. Very Low and Low risk populations were rising while Moderate and High risk populations were declining. These trends were calculated by first finding the annual 5-year average of each yearly percentage of the past 5 years of that respective year. We then calculated the annual increase/decrease of the 5-year average. Taking the total average of those values is how we determined the annual growth rate of new policies for each risk level.

Figure 9: 5-Year Avg. Growth by Risk Category

%VL 5 Year Avg Growth			%L 5 Year Avg Growth			%M 5 Year Avg Growth			%H 5 Year Avg Growth		
34.46%			26.73%			26.70%			12.11%		
34.38%			26.86%			26.41%			12.36%		
35.11%			26.77%			25.80%			12.33%		
34.53%			26.81%			26.18%			12.48%		
34.84%	34.66%		26.78%	26.79%		26.30%	26.28%		12.08%	12.27%	
35.80%	34.93%	0.27%	26.85%	26.81%	0.03%	25.35%	26.01%	-0.27%	12.00%	12.25%	-0.02%
35.63%	35.18%	0.25%	27.32%	26.91%	0.09%	25.00%	25.72%	-0.28%	12.06%	12.19%	-0.06%
35.80%	35.32%	0.14%	27.15%	26.98%	0.08%	25.14%	25.59%	-0.13%	11.91%	12.11%	-0.08%
35.90%	35.59%	0.27%	27.39%	27.10%	0.11%	24.91%	25.34%	-0.25%	11.81%	11.97%	-0.13%
35.98%	35.82%	0.23%	27.91%	27.32%	0.23%	24.67%	25.01%	-0.33%	11.45%	11.84%	-0.13%
35.95%	35.85%	0.03%	27.99%	27.55%	0.23%	24.42%	24.83%	-0.19%	11.64%	11.77%	-0.07%
35.92%	35.91%	0.06%	28.43%	27.77%	0.22%	24.15%	24.66%	-0.17%	11.50%	11.66%	-0.11%
36.47%	36.04%	0.14%	28.22%	27.98%	0.21%	23.72%	24.37%	-0.28%	11.59%	11.60%	-0.06%
36.45%	36.15%	0.11%	28.35%	28.18%	0.19%	23.76%	24.14%	-0.23%	11.45%	11.53%	-0.07%
36.73%	36.31%	0.15%	28.17%	28.23%	0.05%	23.67%	23.94%	-0.20%	11.44%	11.52%	0.00%
37.00%	36.52%	0.21%	28.37%	28.30%	0.08%	23.21%	23.70%	-0.24%	11.42%	11.48%	-0.04%
37.26%	36.78%	0.27%	28.46%	28.31%	0.01%	23.14%	23.50%	-0.20%	11.14%	11.41%	-0.07%
37.36%	36.96%	0.18%	28.58%	28.38%	0.07%	22.94%	23.34%	-0.16%	11.12%	11.31%	-0.09%
37.34%	37.14%	0.18%	28.76%	28.47%	0.08%	22.90%	23.17%	-0.17%	11.01%	11.22%	-0.09%
37.37%	37.27%	0.13%	28.88%	28.61%	0.14%	22.72%	22.98%	-0.19%	11.03%	11.14%	-0.08%
37.59%	37.38%	0.12%	29.19%	28.77%	0.17%	22.34%	22.81%	-0.17%	10.88%	11.03%	-0.11%
37.68%	37.47%	0.08%	28.82%	28.85%	0.07%	22.51%	22.68%	-0.13%	10.99%	11.01%	-0.03%
37.75%	37.54%	0.08%	29.10%	28.95%	0.10%	22.10%	22.51%	-0.17%	11.05%	10.99%	-0.01%
AVG			0.16%			0.12%			-0.21%		
									-0.07%		



Figure 10: Historical Trend Analysis

Year	New Policies	Growth	5 Year Avg
2001	16904		
2002	22394	32.48%	
2003	24755	10.54%	
2004	25688	3.77%	
2005	26274	2.28%	
2006	31164	18.61%	
2007	34274	9.98%	9.04%
2008	33247	-3.00%	6.33%
2009	36761	10.57%	7.69%
2010	38889	5.79%	8.39%
2011	40704	4.67%	5.60%
2012	44271	8.76%	5.36%
2013	46038	3.99%	6.76%
2014	46387	0.76%	4.79%
2015	45314	-2.31%	3.17%
2016	51606	13.89%	5.02%
2017	48948	-5.15%	2.23%
2018	53972	10.26%	3.49%
2019	59492	10.23%	5.38%
2020	64256	8.01%	7.45%
2021	63706	-0.86%	4.50%
2022	59646	-6.37%	4.25%
2023	63892	7.12%	3.63%
			5.48%

Following these trends, we can predict the population percentages for the next 30 years while staying consistent with the total growth of new policies.



Figure 11: Prospective 30-Year Trend Analysis

Prediction	Total New Policies	VL%	VL Policies	L%	L Policies	M%	M Policies	H%	H Policies
2024	67,390	37.70%	25,409	29.07%	19,590	22.30%	15,031	10.92%	7,359
2025	71,080	37.86%	26,914	29.19%	20,748	22.10%	15,705	10.85%	7,712
2026	74,971	38.03%	28,508	29.31%	21,974	21.89%	16,409	10.78%	8,080
2027	79,076	38.19%	30,195	29.43%	23,272	21.68%	17,142	10.71%	8,467
2028	83,405	38.35%	31,982	29.55%	24,647	21.47%	17,906	10.64%	8,871
2029	87,972	38.51%	33,874	29.67%	26,102	21.26%	18,702	10.56%	9,294
2030	92,788	38.67%	35,877	29.79%	27,642	21.05%	19,532	10.49%	9,737
2031	97,869	38.83%	37,998	29.91%	29,273	20.84%	20,397	10.42%	10,200
2032	103,227	38.99%	40,244	30.03%	31,000	20.63%	21,298	10.35%	10,686
2033	108,879	39.15%	42,621	30.15%	32,828	20.42%	22,236	10.28%	11,193
2034	114,840	39.31%	45,139	30.27%	34,763	20.21%	23,214	10.21%	11,724
2035	121,127	39.47%	47,804	30.39%	36,812	20.00%	24,231	10.14%	12,280
2036	127,759	39.63%	50,626	30.51%	38,981	19.80%	25,291	10.07%	12,862
2037	134,754	39.79%	53,613	30.63%	41,277	19.59%	26,394	10.00%	13,470
2038	142,132	39.95%	56,776	30.75%	43,707	19.38%	27,542	9.92%	14,106
2039	149,913	40.11%	60,124	30.87%	46,280	19.17%	28,736	9.85%	14,772
2040	158,121	40.27%	63,669	30.99%	49,004	18.96%	29,979	9.78%	15,469
2041	166,778	40.43%	67,422	31.11%	51,887	18.75%	31,272	9.71%	16,197
2042	175,910	40.59%	71,395	31.23%	54,940	18.54%	32,616	9.64%	16,959
2043	185,541	40.75%	75,601	31.35%	58,170	18.33%	34,014	9.57%	17,755
2044	195,699	40.91%	80,054	31.47%	61,590	18.12%	35,467	9.50%	18,588
2045	206,414	41.07%	84,767	31.59%	65,210	17.91%	36,977	9.43%	19,459
2046	217,715	41.23%	89,756	31.71%	69,042	17.71%	38,547	9.36%	20,370
2047	229,635	41.39%	95,038	31.83%	73,098	17.50%	40,177	9.29%	21,322
2048	242,207	41.55%	100,629	31.95%	77,391	17.29%	41,870	9.21%	22,317
2049	255,468	41.71%	106,548	32.07%	81,935	17.08%	43,629	9.14%	23,357
2050	269,455	41.87%	112,813	32.19%	86,744	16.87%	45,454	9.07%	24,444
2051	284,208	42.03%	119,444	32.31%	91,835	16.66%	47,348	9.00%	25,581
2052	299,768	42.19%	126,464	32.43%	97,222	16.45%	49,314	8.93%	26,768
2053	316,181	42.35%	133,894	32.55%	102,925	16.24%	51,353	8.86%	28,009



Figure 12: Historical Trend Analysis – Annual Premiums

Year	Premiums Paid - Original	5 year avg	growth
2001	\$ 54,749,225.46		
2002	\$ 128,889,351.73		
2003	\$ 217,383,962.10		
2004	\$ 309,792,718.66		
2005	\$ 406,354,658.29	\$ 223,433,983.25	
2006	\$ 526,350,848.74	\$ 317,754,307.91	30%
2007	\$ 664,153,545.35	\$ 424,807,146.63	25%
2008	\$ 801,060,584.33	\$ 541,542,471.07	22%
2009	\$ 962,202,172.99	\$ 672,024,361.94	19%
2010	\$ 1,140,845,502.80	\$ 818,922,530.84	18%
2011	\$ 1,334,466,436.97	\$ 980,545,648.49	16%
2012	\$ 1,550,925,488.78	\$ 1,157,900,037.17	15%
2013	\$ 1,781,882,873.36	\$ 1,354,064,494.98	14%
2014	\$ 2,026,698,205.93	\$ 1,566,963,701.57	14%
2015	\$ 2,257,870,393.61	\$ 1,790,368,679.73	12%
2016	\$ 2,529,116,691.23	\$ 2,029,298,730.58	12%
2017	\$ 2,791,164,096.80	\$ 2,277,346,452.19	11%
2018	\$ 3,085,915,587.40	\$ 2,538,152,994.99	10%
2019	\$ 3,418,211,209.87	\$ 2,816,455,595.78	10%
2020	\$ 3,785,125,731.05	\$ 3,121,906,663.27	10%
2021	\$ 4,133,991,178.06	\$ 3,442,881,560.64	9%
2022	\$ 4,467,578,581.42	\$ 3,778,164,457.56	9%
2023	\$ 4,831,499,800.69	\$ 4,127,281,300.22	8%



Figure 13: Historical Trend Analysis – Expected Death Benefits Paid

	Expected	5 Year Avg	Growth	Decreased Mortality	5 Year Avg	Growth
2001	\$ 25,455,087.08			\$ 17,800,938.50		
2002	\$ 61,140,062.88			\$ 42,754,967.31		
2003	\$ 104,908,949.52			\$ 73,362,053.97		
2004	\$ 153,754,821.26			\$ 107,519,352.93		
2005	\$ 208,001,535.40	\$ 110,652,091.23		\$ 145,453,502.74	\$ 77,378,163.09	
2006	\$ 275,643,451.29	\$ 160,689,764.07	31%	\$ 192,754,733.67	\$ 112,368,922.12	31%
2007	\$ 355,405,717.95	\$ 219,542,895.08	27%	\$ 248,531,548.67	\$ 153,524,238.40	27%
2008	\$ 439,703,005.66	\$ 286,501,706.31	23%	\$ 307,479,790.01	\$ 200,347,785.60	23%
2009	\$ 539,155,063.82	\$ 363,581,754.82	21%	\$ 377,025,629.29	\$ 254,249,040.88	21%
2010	\$ 651,653,498.66	\$ 452,312,147.48	20%	\$ 455,694,736.47	\$ 316,297,287.62	20%
2011	\$ 777,994,727.17	\$ 552,782,402.65	18%	\$ 544,044,362.01	\$ 386,555,213.29	18%
2012	\$ 922,900,682.10	\$ 666,281,395.48	17%	\$ 645,375,993.81	\$ 465,924,102.32	17%
2013	\$ 1,083,592,059.03	\$ 795,059,206.16	16%	\$ 757,746,457.10	\$ 555,977,435.74	16%
2014	\$ 1,262,388,194.41	\$ 939,705,832.27	15%	\$ 882,776,797.12	\$ 657,127,669.30	15%
2015	\$ 1,454,351,089.55	\$ 1,100,245,350.45	15%	\$ 1,017,015,037.06	\$ 769,391,729.42	15%
2016	\$ 1,677,589,170.66	\$ 1,280,164,239.15	14%	\$ 1,173,123,887.26	\$ 895,207,634.47	14%
2017	\$ 1,916,809,075.00	\$ 1,478,945,917.73	13%	\$ 1,340,407,965.59	\$ 1,034,214,028.83	13%
2018	\$ 2,187,387,108.55	\$ 1,699,704,927.63	13%	\$ 1,529,620,890.13	\$ 1,188,588,915.43	13%
2019	\$ 2,492,502,994.79	\$ 1,945,727,887.71	13%	\$ 1,742,985,942.65	\$ 1,360,630,744.54	13%
2020	\$ 2,838,470,153.44	\$ 2,222,551,700.49	12%	\$ 1,984,917,933.77	\$ 1,554,211,323.88	12%
2021	\$ 3,133,835,737.38	\$ 2,513,801,013.83	12%	\$ 2,191,464,478.40	\$ 1,757,879,442.11	12%
2022	\$ 3,431,706,104.85	\$ 2,816,780,419.80	11%	\$ 2,399,762,593.92	\$ 1,969,750,367.77	11%
2023	\$ 3,761,301,909.31	\$ 3,131,563,379.95	10%	\$ 2,630,246,343.29	\$ 2,189,875,458.41	10%



Figure 14: Prospective 30-Year Economic Value Analysis

	2024 Premiums Original	DthBen Original	DthBen Reduced	Discounted Premiums
2025	\$ 5,218,019,784.74	\$ 4,062,206,062.05	\$ 2,840,666,050.76	\$ 4,696,217,806.27
2026	\$ 5,635,461,367.52	\$ 4,387,182,547.02	\$ 3,067,919,334.82	\$ 5,071,915,230.77
2027	\$ 6,086,298,276.92	\$ 4,738,157,150.78	\$ 3,313,352,881.60	\$ 5,477,668,449.23
2028	\$ 6,573,202,139.07	\$ 5,117,209,722.84	\$ 3,578,421,112.13	\$ 5,915,881,925.17
2029	\$ 7,099,058,310.20	\$ 5,526,586,500.67	\$ 3,864,694,801.10	\$ 6,389,152,479.18
2030	\$ 7,666,982,975.02	\$ 5,968,713,420.72	\$ 4,173,870,385.19	\$ 6,900,284,677.51
2031	\$ 8,280,341,613.02	\$ 6,446,210,494.38	\$ 4,507,780,016.01	\$ 7,452,307,451.72
2032	\$ 8,942,768,942.06	\$ 6,961,907,333.93	\$ 4,868,402,417.29	\$ 8,048,492,047.85
2033	\$ 9,658,190,457.42	\$ 7,518,859,920.64	\$ 5,257,874,610.67	\$ 8,692,371,411.68
2034	\$ 10,430,845,694.02	\$ 8,120,368,714.30	\$ 5,678,504,579.52	\$ 9,387,761,124.62
2035	\$ 11,265,313,349.54	\$ 8,769,998,211.44	\$ 6,132,784,945.88	\$ 10,138,782,014.59
2036	\$ 12,166,538,417.50	\$ 9,471,598,068.35	\$ 6,623,407,741.55	\$ 10,949,884,575.75
2037	\$ 13,139,861,490.90	\$ 10,229,325,913.82	\$ 7,153,280,360.88	\$ 11,825,875,341.81
2038	\$ 14,191,050,410.17	\$ 11,047,671,986.93	\$ 7,725,542,789.75	\$ 12,771,945,369.16
2039	\$ 15,326,334,442.99	\$ 11,931,485,745.88	\$ 8,343,586,212.93	\$ 13,793,700,998.69
2040	\$ 16,552,441,198.43	\$ 12,886,004,605.55	\$ 9,011,073,109.96	\$ 14,897,197,078.58
2041	\$ 17,876,636,494.30	\$ 13,916,884,974.00	\$ 9,731,958,958.76	\$ 16,088,972,844.87
2042	\$ 19,306,767,413.85	\$ 15,030,235,771.92	\$ 10,510,515,675.46	\$ 17,376,090,672.46
2043	\$ 20,851,308,806.95	\$ 16,232,654,633.67	\$ 11,351,356,929.50	\$ 18,766,177,926.26
2044	\$ 22,519,413,511.51	\$ 17,531,267,004.37	\$ 12,259,465,483.86	\$ 20,267,472,160.36
2045	\$ 24,320,966,592.43	\$ 18,933,768,364.71	\$ 13,240,222,722.57	\$ 21,888,869,933.19
2046	\$ 26,266,643,919.83	\$ 20,448,469,833.89	\$ 14,299,440,540.37	\$ 23,639,979,527.84
2047	\$ 28,367,975,433.41	\$ 22,084,347,420.60	\$ 15,443,395,783.60	\$ 25,531,177,890.07
2048	\$ 30,637,413,468.08	\$ 23,851,095,214.25	\$ 16,678,867,446.29	\$ 27,573,672,121.28
2049	\$ 33,088,406,545.53	\$ 25,759,182,831.39	\$ 18,013,176,841.99	\$ 29,779,565,890.98
2050	\$ 35,735,479,069.17	\$ 27,819,917,457.90	\$ 19,454,230,989.35	\$ 32,161,931,162.26
2051	\$ 38,594,317,394.71	\$ 30,045,510,854.54	\$ 21,010,569,468.50	\$ 34,734,885,655.24
2052	\$ 41,681,862,786.28	\$ 32,449,151,722.90	\$ 22,691,415,025.98	\$ 37,513,676,507.66
2053	\$ 45,016,411,809.19	\$ 35,045,083,860.73	\$ 24,506,728,228.06	\$ 40,514,770,628.27

Premiums Original: Future calculated premiums with a projected annual growth of 8%

DthBen Original: Future expected death benefits paid, based off original mortality table given, with a projected annual growth of 8%

DthBen Reduced: Future expected death benefits paid, based off new reduced mortality table, with a projected annual growth of 8%

Discounted Premiums: 10% discount of the Premiums Original – Total premiums recieved if all policyholders participate in the interventions.



Appendix I: Additional Risk Considerations

Quantifiable Risk

1. **Mortality Risk:** Associated with each policyholder, as premature death increases claims payouts for life insurance policies.
2. **Interest Rate Risk:** The impact of interest rates on investment returns and liabilities must be considered, as it relates to the potential adverse effects of fluctuations in interest rates on the financial performance of insurance companies.
3. **Inflation Risk:** One of the major risks that erode the value of premiums collected over time. It has a direct impact leading to increased claims cost and investment devaluation.
4. **Natural Disaster and Environmental Risks:** The consequences of rapid climate change with the increased frequency and severity of extreme weather events pose a significant financial threat through higher claims, reinsurance costs, and risk assessment challenges.
5. **Health and Pandemic Risks:** Recent COVID-19 emphasized pandemic risk for insurers, assessing the likelihood of widespread diseases and estimating financial impacts.
6. **Cost Overruns:** The budget allocated for the health incentive program may exceed initial estimates due to unforeseen expenses such as technology implementation, administrative costs, or unexpected participant uptake.
7. **Participant Engagement:** Low participation rates can undermine the effectiveness of the program and its ability to achieve desired health outcomes.
8. **Human Error:** The risk of human error, which entails the potential for mistakes or oversights by employees that could detrimentally affect the effectiveness or integrity of the health incentives program, necessitates the implementation of robust training and education initiatives to mitigate this risk.

Qualitative Risk

1. **Cyberattacks & Data Security Breach:** Cyber-attacks and data breaches pose a multi-faceted threat, including financial losses, regulatory fines, reputational damage, and potential lawsuits.
2. **Regulatory Compliance Risk:** Rapidly evolving regulatory compliance, new legislation, or legal actions increasingly scrutinize insurance products and services.
3. **Moral Hazard/Fraudulent Claims:** Fraudulent activities such as identity theft, forgery, and falsification disrupt the accuracy of actuarial models making it difficult to predict and manage future claims.
4. **Operational Risk:** Operational risks can stem from internal breakdown across several areas, including system failures, employee actions, inadequate procedures, or weak control mechanisms.
5. **Cultural Resistance:** Some employees may be resistant to change or skeptical about the motives behind the health incentive program, leading to low morale or even active opposition.
6. **Equity Concerns:** There is a risk that the health incentive program may inadvertently exacerbate existing health disparities or inequities among participants based on factors such as socioeconomic status, access to healthcare, or disability.



Likelihood and Severity Estimates for Quantifiable Risks

1. Mortality Risk:
 - a. Likelihood: Medium to High (depending on demographic factors and health trends)
 - b. Severity: High (significant financial impact on life insurance payouts)
2. Interest Rate Risk:
 - a. Likelihood: Medium (fluctuations are common but can be managed)
 - b. Severity: High (adverse effects on investment returns and liabilities)
3. Inflation Risk:
 - a. Likelihood: Medium (inflation occurs regularly but can vary)
 - b. Severity: Medium to High (erodes the value of premiums and investments over time)
4. Natural Disaster and Environmental Risks:
 - a. Likelihood: Low to Medium (depends on geographic location and climate trends)
 - b. Severity: High (significant financial impact from extreme weather events)
5. Health and Pandemic Risks
 - a. Likelihood: High (Recent events like the COVID-19 pandemic highlight the significant risk posed by health crises, making them highly probable occurrences)
 - b. Severity: High (Health crises can have catastrophic consequences, including loss of life, economic downturns, and widespread societal disruption)
6. Cost Overruns:
 - a. Likelihood: Medium (common in project management)
 - b. Severity: Medium (can impact budget and financial performance)
7. Participant Engagement:
 - a. Likelihood: Medium (depends on program design and communication)
 - b. Severity: Medium (low engagement can undermine program effectiveness)
9. Human Error:
 - a. Likelihood: High (humans are prone to mistakes)
 - b. Severity: Medium (depends on the nature of the error and its impact)

Ranking these risks based on both likelihood and severity, we could prioritize them from most to least significant as follows:

1. Health and Pandemic Risks
2. Mortality Risk
3. Natural Disaster and Environmental Risks
4. Interest Rate Risk
5. Inflation Risk
6. Cost Overruns
7. Participant Engagement
8. Human Error

This ranking allows for focusing mitigation efforts on risks with the highest potential impact on the health incentives program.



Risk Mitigation - Quantitative Risk

1. Mortality Risk
 - a. Reinsurance strategically transfers some of the risk associated with increased claim payouts due to inflation. By sharing the risk with reinsurers, the insurance company can mitigate the financial impact of rising costs.
2. Interest Rate and Inflation Risk:
 - a. Diversify the investment portfolio with inflation-protected securities, real assets, and diverse market instruments.
 - b. Conducting Stress Testing and Scenario Analysis involves conducting thorough stress tests and scenario analyses to gauge the effects of different interest rate scenarios on the company's financial standing. By identifying potential vulnerabilities, we can develop contingency plans to mitigate adverse outcomes.
 - c. Liquidity Management offers another approach. By ensuring adequate liquidity and cash reserves, the company can meet short-term obligations and seize investment opportunities, especially during periods of interest rate volatility.
3. Data Security Breach
 - a. Data security risks can be addressed by implementing strong cybersecurity measures, including encryption and multi-factor authentication. Ensure regular software updates, conduct employee training on secure data handling, and establish a rapid incident response plan to minimize the impact of potential breaches.
4. Natural Disaster and Environmental Risks
 - a. Mitigating natural disaster and pandemic risks involves advanced modeling, strict underwriting, and pricing adjustments. Utilizing reinsurance, promoting customer education, and engaging with communities contribute to comprehensive risk management.
5. Health and Pandemic Risks
 - a. Implement comprehensive vaccination campaigns and hygiene protocols, while incentivizing participants to adopt healthy lifestyle behaviors such as regular exercise and nutritious eating habits
 - b. Additionally, provide access to telemedicine services and promote awareness campaigns to educate participants about preventive measures and early symptom recognition.
6. Cost Overruns
 - a. Regular monitoring and tracking of expenses against the budget, setting aside contingency funds and conducting thorough cost-benefit analyses before implementing any new features or expansions.
7. Participant Engagement
 - a. To mitigate adverse selection, implementation of wellness programs, flexible plans, and rewards for staying healthy can have a significant impact on policyholders. Engaging with communities, giving discounts to non-smokers, and explaining coverage benefits are important too.
8. Human Error
 - a. To address human error, we can implement training and education initiatives. This involves offering comprehensive training programs to employees aimed at enhancing their knowledge, skills, and awareness of potential risks and best practices. This training



encompasses company policies, procedures, compliance requirements, and error prevention techniques.

Risk Mitigation - Qualitative Risk

1. Cyberattacks & Data Security Breach
 - a. Data security risks can be addressed by implementing strong cybersecurity measures, including encryption and multi-factor authentication. Ensure regular software updates, conduct employee training on secure data handling, and establish a rapid incident response plan to minimize the impact of potential breaches.
2. Regulatory Compliance Risk
 - a. Ensure strict adherence to relevant healthcare regulations by implementing robust compliance monitoring systems, conducting regular audits, and staying updated with evolving regulatory requirements through continuous staff training and engagement with legal advisors.
3. Moral Hazard/Fraudulent Claims
 - a. Implement stringent eligibility criteria, employing advanced fraud detection technologies, conducting thorough claim verifications, and fostering a culture of integrity and ethical behavior through transparent communication and accountability measures.
4. Operational Risk
 - a. Minimize operational risk by implementing robust operational processes, leveraging technology for streamlined workflows, conducting regular risk assessments, and establishing contingency plans to address potential disruptions. Additionally, invest in staff training and development to ensure competency and adaptability in handling operational challenges effectively.
5. Cultural Resistance
 - a. Address cultural resistance by fostering a supportive and inclusive organizational culture that values diversity and respects individual beliefs and practices. Engage stakeholders through open communication channels, actively listen to concerns, and tailor program initiatives to align with cultural norms and preferences, thereby promoting acceptance and participation in the health incentive program.
6. Equity Concerns
 - a. Prioritize accessibility by ensuring diverse representation in program planning and implementation. Additionally, employing culturally sensitive approaches, providing language interpretation services, and offering tailored interventions can help address disparities and promote inclusivity within the target communities.



BIBLIOGRAPHY

- Ariely, D., Bracha, A., & Meier, S. (2009). Doing Good or Doing Well? Image Motivation and Monetary Incentives in Behaving Prosocially. *The American Economic Review*, 99(1), 544–555. <http://www.jstor.org/stable/29730196>
- Coulter, A., Fitzpatrick, R., & Cornwell, J. (2009). The Point of Care. Measures of Patients' Experience in Hospital: Purpose, Methods and Uses. *The King's Fund*. https://archive.kingsfund.org.uk/concern/published_works/000042021
- Cugelman, B. (2013). Gamification: What It Is and Why It Matters to Digital Health Behavior Change Developers. *Journal of Medical Internet Research Serious Games*, 3(11): e17. <https://www.jmir.org/2011/1/e17/>
- Deci, E., Koestner, R., & Ryan, R. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, 125(6), 627–668. <https://doi.org/10.1037/0033-2909.125.6.627>
- Dzau, V., Ginsburg, G., Van Nuys, K., Agus, D., & Goldman, D. (2015). Aligning incentives to fulfill the promise of personalised medicine. *Lancet*, 385(9982):2118-9. doi: 10.1016/S0140-6736(15)60722-X
- Harrison, J. A., Mullen, P. D., & Green, L. W. (1992). A meta-analysis of studies of the health belief model with adults. *Health Education Research*, 7(1), 107–116. <https://doi.org/10.1093/her/7.1.107>
- Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47(2), 263–291. <https://doi.org/10.2307/1914185>
- Michaud, T., Estabrooks, P., You, W., Scoggins, D., Gonzales, K., King, K., Dai, H., & Su, D. (2022). Effectiveness of incentives to improve the reach of health promotion programs- a systematic review and meta-analysis. *Preventive Medicine*, 162: 107141. <https://doi.org/10.1016/j.ypmed.2022.107141>.
- Mooney, A. (2024) How Much Does Custom Enterprise Software Cost? Key Factors That Influence Price. *Soltech*. <https://soltech.net/enterprise-software-cost/>
- Patel, M., Volpp, K., Rosin, R., Bellamy, S., Small, D., Heuer, J., Sproat, S., Hyson, C., Haff, N., Lee, S., Wesby, L., Hoffer, K., Shuttleworth, D., Taylor, D., Hilbert, V., Zhu, J., Yang, L., Wang, X., Asch, D. (2018). A Randomized, Controlled Trial of Lottery-Based Financial Incentives to Increase Physical Activity Among Overweight and Obese Adults. *Journal of General Internal Medicine*, 32(7):1568-1575. Doi: 10.1177/0890117118758932.



Society of Actuaries (2018). LTAM Standard Ultimate Life Table.

<https://www.soa.org/globalassets/assets/Files/Edu/2018/ltam-standard-ultimate-life-table.pdf>

Steinberg, G., Scott A., Honcz J., Spettell, C., Pradhan, S. (2015). Reducing Metabolic Syndrome Risk Using a Personalized Wellness Program. *Journal of Occupational and Environmental Medicine*, 57(12):1269-74. doi: 10.1097/JOM.0000000000000582.

Thaler, R. (2015). Mental Accounting Matters. *Journal of Behavioral Decision Making*, 12: 183-206. <https://people.bath.ac.uk/mnsrf/Teaching%202011/Thaler-99.pdf>

Volpp, K., Asch, D., Galvin, R., & Loewenstein, G. (2011). Redesigning employee health incentives: Lessons from behavioral economics. *The New England Journal of Medicine*, 365(5), 388-390. <https://doi.org/10.1056/NEJMp1105966>

