

# Pricing Health and Life Insurance Products – A Practical Tool

International Conference on Inclusive Insurance 2024

Pre-conference – Workshop 2

21 OCTOBER 2024





# Today's presenters



**Enock Sing'oei**  
**Facilitator**

Agricultural Insurance  
Specialist UNDP –  
Insurance & Risk  
Finance Facility  
(IRFF), Kenya



**Josh Collins**  
**Speaker**

Consulting Actuary,  
Milliman, USA



**Brian Merkey**  
**Speaker**

Manager,  
Data Science,  
Milliman, USA



**Romain de Harlez**  
**Speaker**

Consulting Actuary,  
Milliman, Belgium



**Amir Hassan**  
**Speaker**

Actuarial Associate,  
Milliman, Malaysia



# Agenda

1. Introducing IRFF (10 mins)
2. Introducing GAIN (10 mins)
3. Actuaries in Microinsurance (10 mins)
4. Tool Demonstration – Hospital Cash (60 mins)
5. Break (10 mins)
6. Tool Demonstration – Life (60 mins)
7. Q&A (20 mins)



# Introducing GAIN

# Milliman-UNDP Partnership: Global Actuarial Insurance Initiative (GAIN)

Program Launch – 18<sup>th</sup> September 2022



“Protection from risks is **the only way out** of a world of deepening inequalities and compounding crises.”

“**Our collaboration with Milliman** should generate the **expertise** necessary to support insurers and regulators as they look to effectively address these risks.”

**UNDP Administrator Achim Steiner**



# Insurance contribution to the Sustainable Development Goals (SDGs)

Insurance as a risk protection mechanism critical and directly supports 6 SDGs:

<p><b>1</b> NO POVERTY</p> 	<p><b>2</b> ZERO HUNGER</p> 	<p><b>3</b> GOOD HEALTH AND WELL-BEING</p> 	<p><b>5</b> GENDER EQUALITY</p> 	<p><b>8</b> DECENT WORK AND ECONOMIC GROWTH</p> 	<p><b>13</b> CLIMATE ACTION</p> 
<p>Insurance helps to end poverty in all its forms everywhere</p>	<p>Insurance helps to end hunger, achieve food security, improved nutrition and promote sustainable agriculture</p>	<p>Insurance helps to ensure healthy lives and promote well-being for all at all ages</p>	<p>Insurance helps to achieve gender equality and empower all women and girls</p>	<p>Insurance helps to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all</p>	<p>Insurance helps to take urgent action to combat climate change and its impacts</p>

...and is important to the completion of five others:

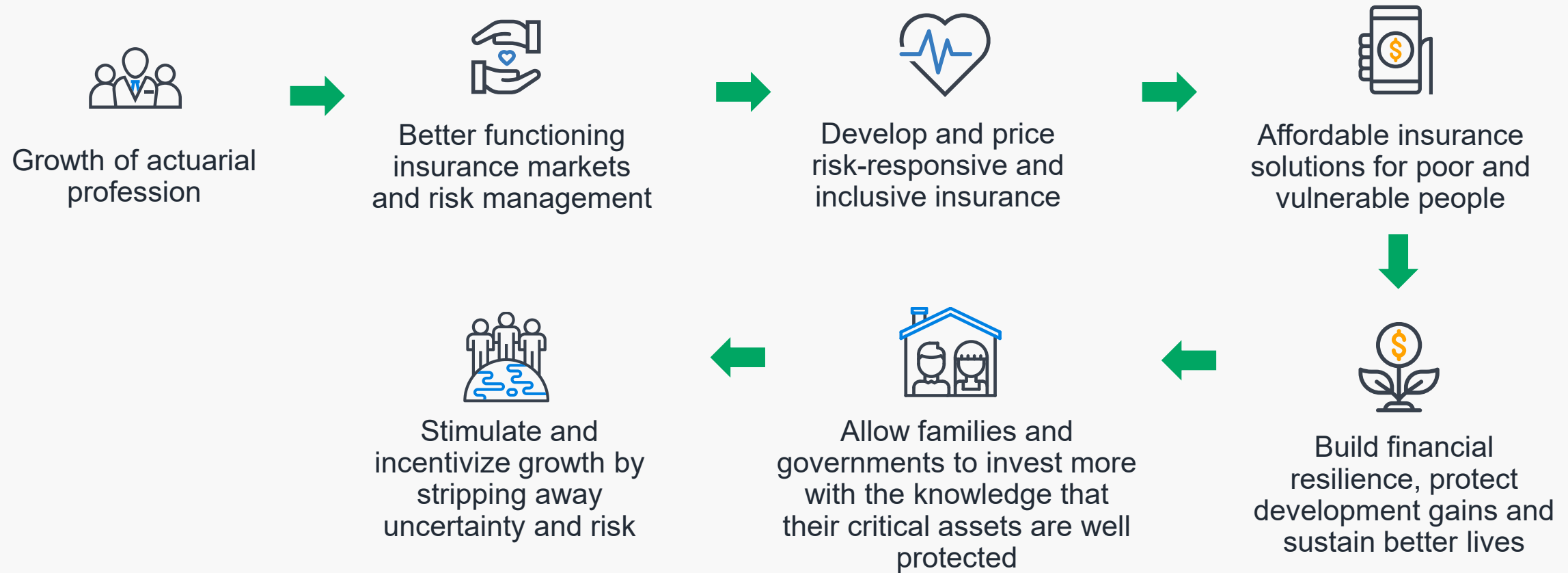
<p><b>4</b> QUALITY EDUCATION</p> 	<p><b>9</b> INDUSTRY, INNOVATION AND INFRASTRUCTURE</p> 	<p><b>10</b> REDUCED INEQUALITIES</p> 	<p><b>11</b> SUSTAINABLE CITIES AND COMMUNITIES</p> 	<p><b>17</b> PARTNERSHIPS FOR THE GOALS</p> 
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# Actuarial contribution to the Sustainable Development Goals (SDGs)



# Overarching goals of GAIN

## Program Goal



Enhance global sustainable development through enhancement of the actuarial profession in the developing world.

## Partnership Goal



Milliman will work within the UNDP **target countries**, and with **other stakeholders**, to advance the program goal as part of a **full spectrum of interventions in eradicating poverty**.



# Milliman / UNDP coordination

## UNDP

- Advocacy for public policy change
- Hosting of meetings
- Linkages to local stakeholders
- Interpretation support
- On-going partnership relationship management



U N  
D P



## Milliman

- Actuarial capacity and expertise
- Actuarial Situation Assessment
- Intervention Roadmap
- Program assessment tool
- Implementation with local partners
- Linkages with international associations and more

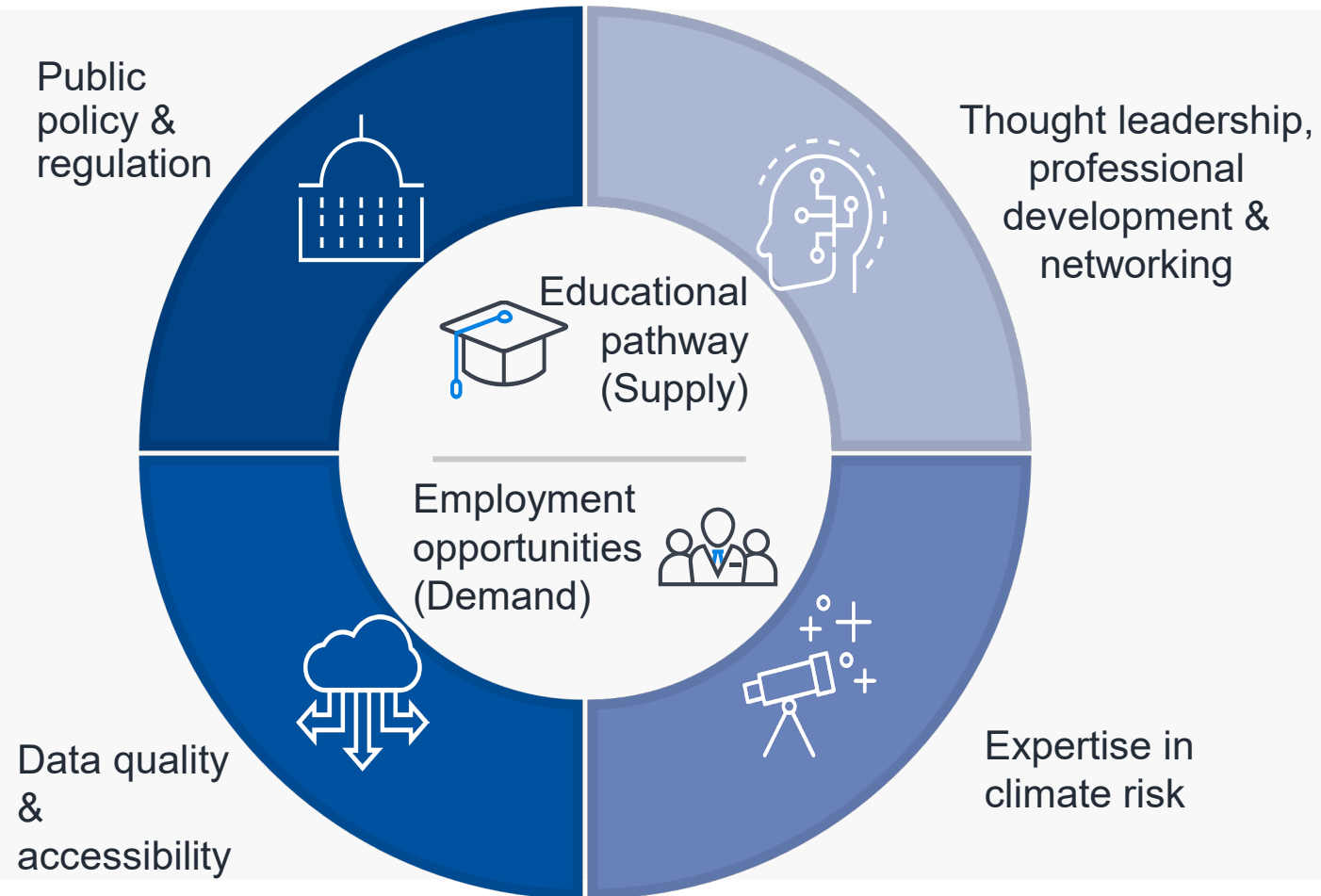


# Implementation across 27 countries



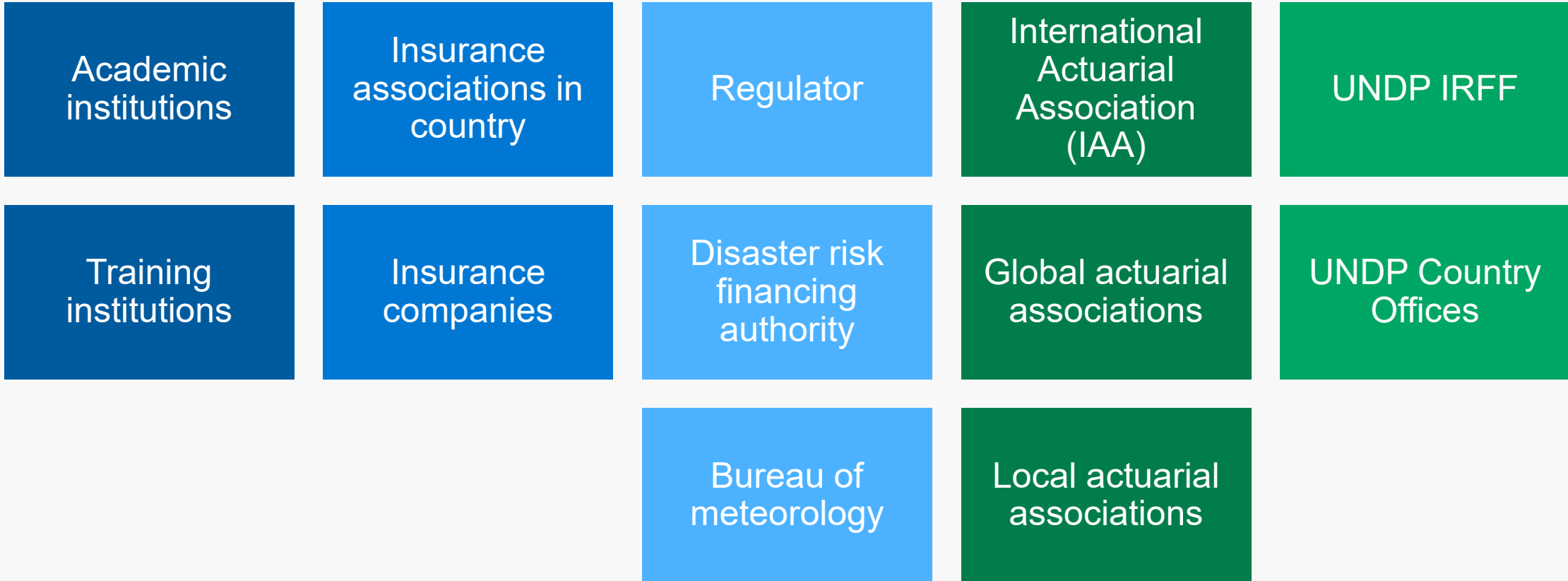


# Actuarial situation assessment





# Key stakeholders





# Program activities



## Capacity

Enhancing the actuarial profession in the target countries

**How:** By working with the **supply side** - associations, universities, actuaries – and the **demand side** - supervisory authorities, insurance industry and public sector players



## Data

Enhancing data availability and effective utilization

**How:** Through regulators and the insurance industry and well as data “owners” like meteorological agencies and statistics offices



## Climate risks

Supporting countries in adapting with more resilient risk management to help mitigate financial impacts of climate change


**How:** By improving the meteorological risk modelling and associated liability valuation.




## Advocacy

Supporting advocacy to governments, insurers and others in achieving the goal of an enhanced actuarial profession.


# Key GAIN interventions and activities




**Webinar on actuarial skillsets and value of actuaries**



**Training on actuarial technical topics and panel of experts**




**Exam tutorials**




**Mentorship program**


**Short-term capacity building:** requested by local stakeholders, low structural impact, easy to deliver, engages ambassadors and good to build trust with local stakeholders




**Best practice guidelines for setting up actuarial teams**



**Microinsurance Pricing Toolkit**




**Actuarial Profession Awareness Toolkit**




**Develop climate map of risks**


**Tools:** Challenging to develop, tools to remain for use for long-term, yet to disseminate



**Advisory on regulatory definition of actuaries in guidelines and bills**



**Exam accreditation**



**Peer review of mortality table**

**Structural change:** Rely heavily on local stakeholders, beyond control of GAIN team, long-term impact



**Actuarial Capacity Development Program**



**Capacity building at regulator's office**



**Faculty Development Program**

**Medium-term capacity building:** welcomed by local stakeholders, medium structural impact, training-of-trainers and authorities



**Regulatory roundtable**

**Advocacy:** Involvement of influential stakeholders

# Actuaries in Microinsurance

# What is an actuary

**Definition<sup>1</sup>:** a person who calculates insurance and annuity premiums, reserves, and dividends



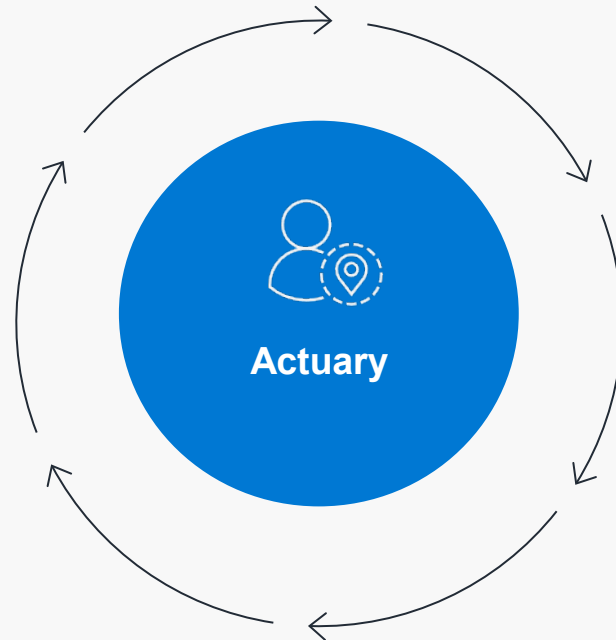
## Competencies

Risk management  
Mathematical statistics  
Financial theory



## Employment

Insurance Companies  
Consulting Firms  
Government  
Non-traditional



## Disciplines

Life and Annuities  
Pensions Property & Casualty  
Health  
Financial and Enterprise Risk



## Credentialing

Exam pathway  
University education  
Actuarial associations

<sup>1</sup><https://www.merriam-webster.com/dictionary/actuary>



# Actuaries Role in Microinsurance



Product Design

Pricing and  
Premium  
Setting

Claims  
Management  
and Loss  
Reserving

Data Analysis  
and Innovation

Financial  
Reporting

Regulatory  
Compliance

# Challenges for Actuaries in Microinsurance



Data Availability



Regulatory Environment



Expertise



Education/Cultural Barriers

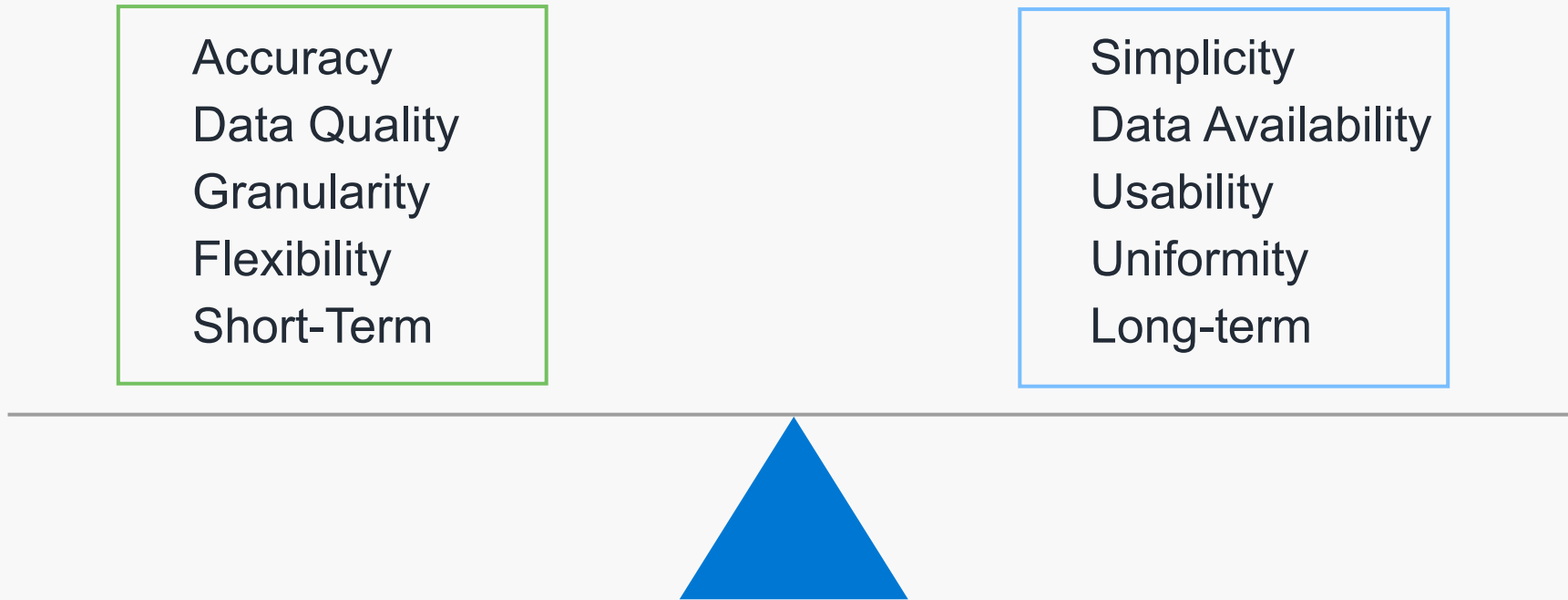


Adverse Selection



Tools and Models

# Actuarial Pricing Tool



# Tool Demonstration – Hospital Cash



# Hospital Cash – Agenda

1. Microinsurance Products for Health
2. Project Goals and Intended Use
3. Model Inputs and Composition
4. Model Demo
5. Scheme Design Considerations
6. Considerations for Model Expansion





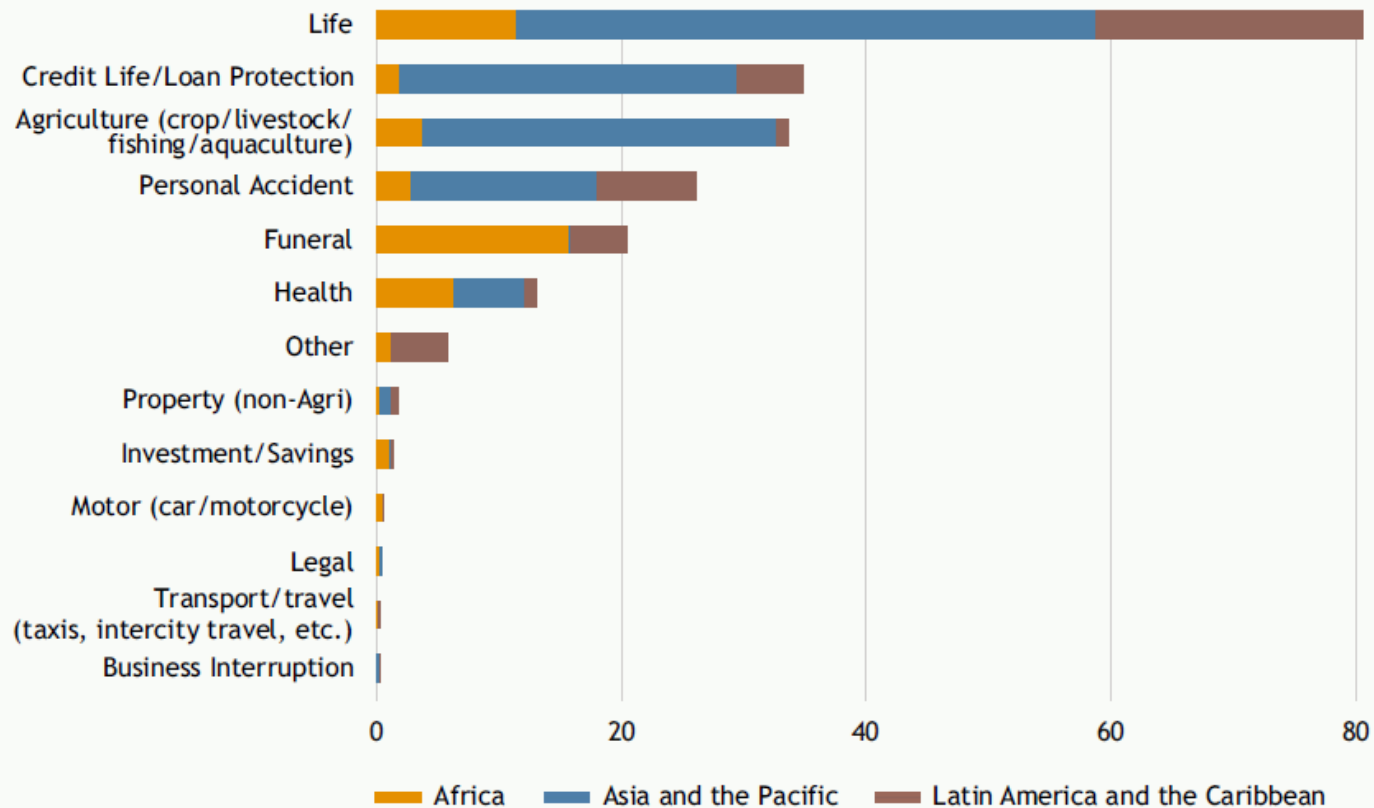
# Introductory Questions

- How Many Years Have You Been Involved With MicroInsurance?
- What Challenges Do You Face When Pricing MicroInsurance Products?
- Where Do You Typically Go to Find Data For Pricing a MicroInsurance Product?
- Which Health MicroInsurance Products are You Familiar With?



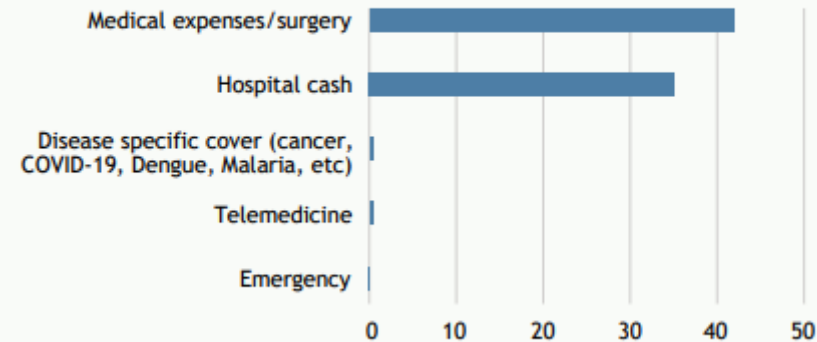
# Health-Related Microinsurance Products

**FIGURE 2**  
PEOPLE COVERED BY PRODUCT LINE (MILLIONS)

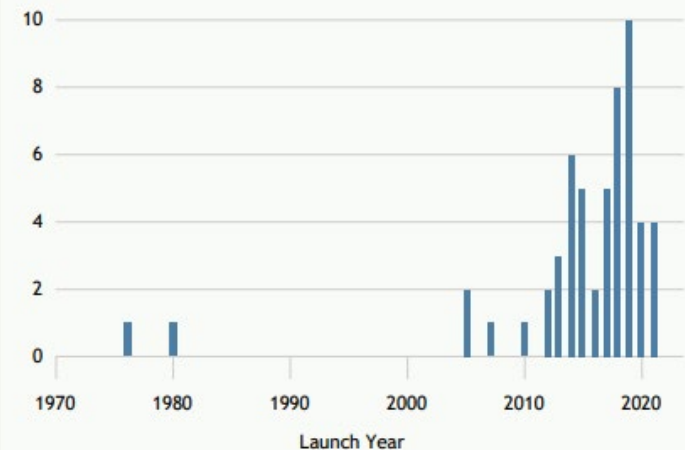


Source: The Landscape of Microinsurance 2023 by Microinsurance Network

**FIGURE 23**  
PEOPLE COVERED BY TYPE OF HEALTH RISK (MILLIONS)



**FIGURE 24**  
THE LAUNCH YEAR OF HEALTH PRODUCTS



# Health-Related Microinsurance Products

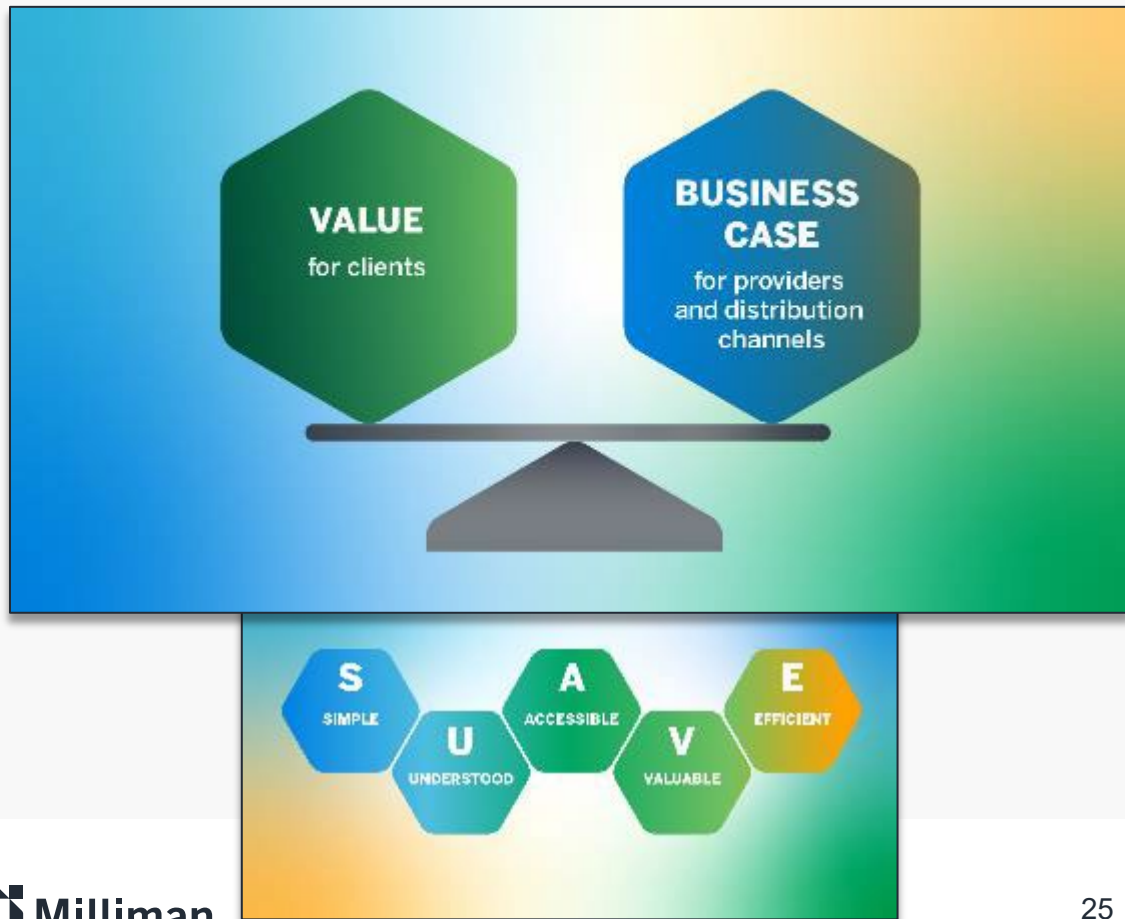


The MicroInsurance Centre at Milliman has developed SUAVE to capture critical characteristics entities should incorporate into each of their microinsurance products:

- Simple
- Understood
- Accessible
- Valuable
- Efficient



# Health-Related Microinsurance Products



A successful microinsurance product will exhibit each of the SUAVE characteristics in a way that balances providing value to both the policyholders and the business.

A successful microinsurance product provides a sound business case for insurance carriers and distribution channels, while providing meaningful insurance coverage to a population without historical access to it.

# Hospital Cash Model Goals



## Develop an available, accessible model that:

- Illustrates an actuarial approach to pricing a hospital cash product
- Demonstrates effective use of a spreadsheet in building a model for a hospital cash product
- Communicates the benefits of modeling the business case of a hospital cash product
- Discusses the various considerations that are part of designing an effective product
- Provides a tangible educational resource for use in a classroom, or for someone learning independently

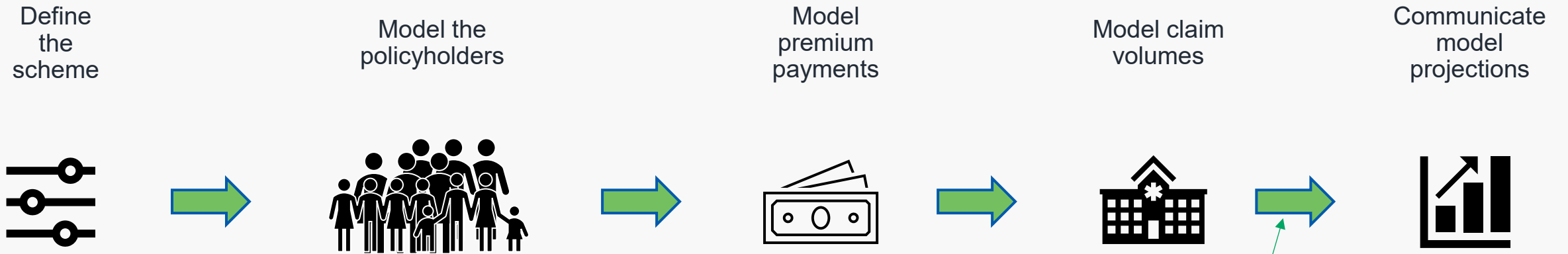
# Hospital Cash Model

Core calculation:

$$\text{Premium} = \frac{\text{Projected Claims} + \text{Fixed Expenses}}{1 - \text{Expenses as \% of Premium}}$$



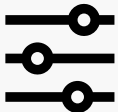

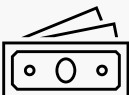


# Overall Model Structure



$$Premium = \frac{Projected\ Claims + Fixed\ Expenses}{1 - Expenses\ as\ \% \ of\ Premium}$$



# Overview Demo of the Model

-  1. Define the scheme
-  2. Model the policyholders
-  3. Model premium payments
-  4. Model claim volumes
-  5. Communicate model projections

The screenshot shows an Excel spreadsheet with the following sections:

### Assumptions for Model Input

The five sections below provide all input parameters for this Hospital Cash Product model. Sample values are given, but should be changed to match the particular circumstance being modeled.

#### 1. Scheme Design

Assumption	Value	Projection Year	Payment Date
Policy Term (Months)	5	1	101.00
Premium Payment Frequency	Full Term	2	101.00
Claim Waiting Period (Months)	3	3	101.00
Policy Deductible (Days)	3	4	101.00
Policy Benefit Maximum (Days)	10	5	110.00

#### 2. Enrollment and Retention Assumptions

Enrollment Assumptions		Retention Assumptions	
Projection Year	Enroll. Policies per Month	Enroll. Term	Assumed Retention Rate (At Policy Term)
1	100	1	80.0%
2	110	2	70.0%
3	120	3	80.0%
4	130	4	80.0%
5	140	5	80.0%

Additional Assumptions:

Assumed In-Term Discontinuance (Monthly)	0.20%
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Navigation tabs at the bottom: License, Instructions, Input | Assumptions, Calculations | Premium, Calculations | Claims, Calculations | Summary, Summary | Premium Development, Summary | Financial Statement.



# Model Inputs

Allow the user to specify multiple relevant elements of a premium, claims, and business model.

Sections:

1. Scheme Design
2. Enrollment and Retention Assumptions
3. Claim Utilization Assumptions
4. Non-Benefit Expense Assumptions
5. Premium Rate

**Assumptions for Model Input**

1. Scheme Design

Projection Year	Enrollment	Retention	Benefit
1	100%	100%	100%
2	100%	100%	100%
3	100%	100%	100%
4	100%	100%	100%
5	100%	100%	100%

2. Enrollment and Retention Assumptions

Projection Year	Enrollment	Retention	Benefit
1	100%	100%	100%
2	100%	100%	100%
3	100%	100%	100%
4	100%	100%	100%
5	100%	100%	100%

3. Claim Utilization Assumptions

Projection Year	Male	Female	Child	Total
1	100%	100%	100%	100%
2	100%	100%	100%	100%
3	100%	100%	100%	100%
4	100%	100%	100%	100%
5	100%	100%	100%	100%

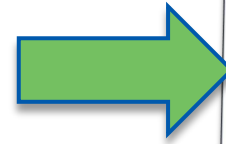
4. Non-Benefit Expense Assumptions

Projection Year	Operating Expenses (% of Total Premium)	Commissions (% of Total Premium)	Premium Taxes (% of Total Premium)
1	30.0%	10.0%	10.0%
2	30.0%	10.0%	10.0%
3	30.0%	10.0%	10.0%
4	30.0%	10.0%	10.0%
5	30.0%	10.0%	10.0%

5. Premium Rate

Projection Year	Annual Operating Expenses	Annual Commissions	Annual Premium Tax
1	5,000	4,000	7,000
2	5,000	4,000	7,000
3	5,000	4,000	7,000
4	5,000	4,000	7,000
5	5,000	4,000	7,000

# Model Inputs



**Assumptions for Model Input**

1. **Scheme Design**

Projection Year	Enrollment	Retention	Benefit Rate
1	100%	100%	100%
2	100%	100%	100%
3	100%	100%	100%
4	100%	100%	100%
5	100%	100%	100%

2. **Enrollment and Retention Assumptions**

Projection Year	Enrollment	Retention
1	100%	100%
2	100%	100%
3	100%	100%
4	100%	100%
5	100%	100%

3. **Claim Utilization Assumptions**

Projection Year	Male	Female	Child	Total
1	33.3%	33.3%	33.3%	100%
2	33.3%	33.3%	33.3%	100%
3	33.3%	33.3%	33.3%	100%
4	33.3%	33.3%	33.3%	100%
5	33.3%	33.3%	33.3%	100%

4. **Non-Benefit Expense Assumptions**

Projection Year	Operating Expenses (% of Total Premium)	Commissions (% of Total Premium)	Premium Taxes (% of Total Premium)
1	30.0%	10.0%	10.0%
2	30.0%	10.0%	10.0%
3	30.0%	10.0%	10.0%
4	30.0%	10.0%	10.0%
5	30.0%	10.0%	10.0%

5. **Premium Rate**

Projection Year	Annual Operating Expenses	Annual Commissions	Annual Premium Tax
1	5,000	4,000	7,000
2	5,000	4,000	7,000
3	5,000	4,000	7,000
4	5,000	4,000	7,000
5	5,000	4,000	7,000

Allow the user to specify multiple relevant elements of a premium, claims, and business model.

Sections:

1. Scheme Design
2. Enrollment and Retention Assumptions
3. Claim Utilization Assumptions
4. Non-Benefit Expense Assumptions
5. Premium Rate

# Scheme Design

1. Scheme Design														
		<table border="1"> <thead> <tr> <th>Projection Year</th> <th>Per Diem Payment Rate</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>100.00</td> </tr> <tr> <td>2</td> <td>105.00</td> </tr> <tr> <td>3</td> <td>105.00</td> </tr> <tr> <td>4</td> <td>105.00</td> </tr> <tr> <td>5</td> <td>110.00</td> </tr> </tbody> </table>	Projection Year	Per Diem Payment Rate	1	100.00	2	105.00	3	105.00	4	105.00	5	110.00
Projection Year	Per Diem Payment Rate													
1	100.00													
2	105.00													
3	105.00													
4	105.00													
5	110.00													
Policy Term (Months)	6													
Premium Payment Frequency	Monthly													
Claim Waiting Period (Months)	3													
Policy Deductible (Days)	3													
Policy Benefit Maximum (Days)	10													

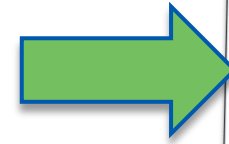
### Enrollment parameters:

- Length of Coverage
- Premium Collection Rate
- Claim Waiting Period

### Claim payment parameters:

- Payment Amount
- Deductible
- Benefit Maximum

# Model Inputs



**Assumptions for Model Input**

1. **Scheme Design**

Projection Year	Enrollment	Retention	Benefit Rate
1	100%	100%	100%
2	100%	100%	100%
3	100%	100%	100%
4	100%	100%	100%
5	100%	100%	100%

2. **Enrollment and Retention Assumptions**

Projection Year	Enrollment	Retention
1	100%	100%
2	100%	100%
3	100%	100%
4	100%	100%
5	100%	100%

3. **Claim Utilization Assumptions**

Projection Year	Male	Female	Child	Total
1	100%	100%	100%	100%
2	100%	100%	100%	100%
3	100%	100%	100%	100%
4	100%	100%	100%	100%
5	100%	100%	100%	100%

4. **Non-Benefit Expense Assumptions**

Projection Year	Operating Expenses (% of Total Premium)	Commissions (% of Total Premium)	Premium Taxes (% of Total Premium)
1	30.0%	10.0%	10.0%
2	30.0%	10.0%	10.0%
3	30.0%	10.0%	10.0%
4	30.0%	10.0%	10.0%
5	30.0%	10.0%	10.0%

5. **Premium Rate**

Projection Year	Annual Operating Expenses	Annual Commissions	Annual Premium Tax
1	5,000	4,000	7,000
2	5,000	4,000	7,000
3	5,000	4,000	7,000
4	5,000	4,000	7,000
5	5,000	4,000	7,000

Allow the user to specify multiple relevant elements of a premium, claims, and business model.

Sections:

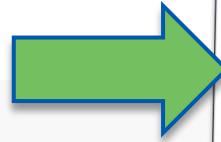
1. Scheme Design
2. Enrollment and Retention Assumptions
3. Claim Utilization Assumptions
4. Non-Benefit Expense Assumptions
5. Premium Rate

# Model Inputs

Allow the user to specify multiple relevant elements of a premium, claims, and business model.

Sections:

1. Scheme Design
- 2. Enrollment and Retention Assumptions**
3. Claim Utilization Assumptions
4. Non-Benefit Expense Assumptions
5. Premium Rate



**Assumptions for Model Input**

1. Scheme Design

Projection Year	Enrollment	Retention	Non-Benefit Expense	Premium Rate
1	100.00%	100.00%	100.00%	100.00%
2	100.00%	100.00%	100.00%	100.00%
3	100.00%	100.00%	100.00%	100.00%
4	100.00%	100.00%	100.00%	100.00%
5	100.00%	100.00%	100.00%	100.00%

2. Enrollment and Retention Assumptions

**Enrollment**

Projection Year	Year	Month
1	2009	1
2	2010	1
3	2011	1
4	2012	1
5	2013	1

**Retention**

Projection Year	Retention Rate
1	100.00%
2	100.00%
3	100.00%
4	100.00%
5	100.00%

3. Claim Utilization Assumptions

Projection Year	Male	Female	Child	Total
1	30.00%	30.00%	30.00%	30.00%
2	30.00%	30.00%	30.00%	30.00%
3	30.00%	30.00%	30.00%	30.00%
4	30.00%	30.00%	30.00%	30.00%
5	30.00%	30.00%	30.00%	30.00%

4. Non-Benefit Expense Assumptions

**Percent-of-Total-Premium Expenses**

Projection Year	Operating Expenses (% of Total Premium)	Commissions (% of Total Premium)	Premium Taxes (% of Total Premium)
1	30.00%	30.00%	30.00%
2	30.00%	30.00%	30.00%
3	30.00%	30.00%	30.00%
4	30.00%	30.00%	30.00%
5	30.00%	30.00%	30.00%

**Fixed Expenses**

Projection Year	Annual Operating Expenses	Annual Commissions	Annual Premium Tax
1	5,000	4,000	7,000
2	5,000	4,000	7,000
3	5,000	4,000	7,000
4	5,000	4,000	7,000
5	5,000	4,000	7,000



# Enrollment Assumptions

2. Enrollment and Retention Assumptions				
Enrollment Assumptions		Retention Assumptions		
Projection Year	New Policies per Month	Cohort Enrollment Term	Assumed Retention Rate (At Policy Term)	Assumed In-Term Disenrollment (Monthly)
1	100	1	60.0%	0.20%
2	110	2	70.0%	
3	120	3	80.0%	
4	130	4+	90.0%	
5	140			

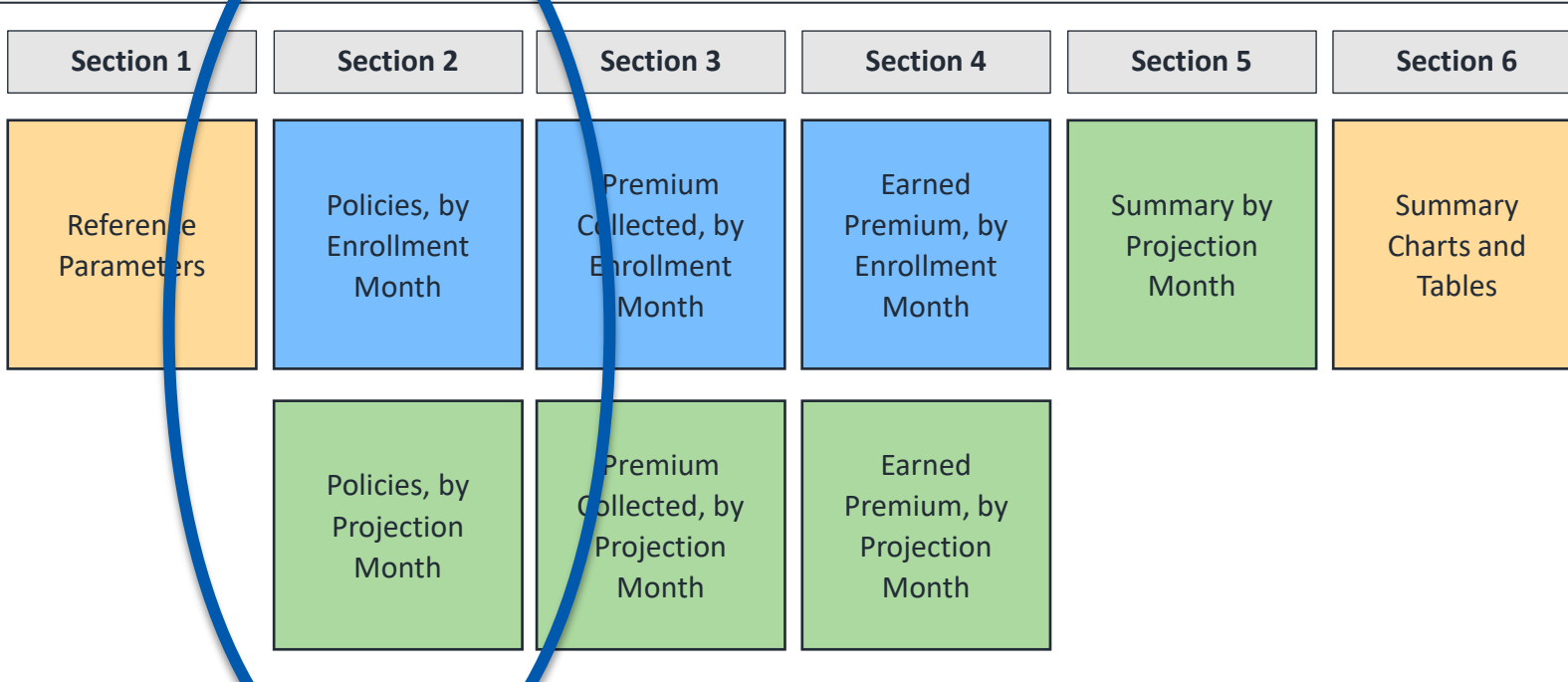
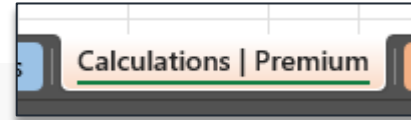
New policyholders are added at a steady rate each month in a projection year.

- User may vary by Projection Year the volume of new policies added each month.

Retention rate, based on when it is applied:

- Retention at policy renewal may depend on policyholder satisfaction.
- Disenrollment (1 – Retention) may occur within a policy due to morbidity or lapsing due to non-payment (for premium amounts paid monthly rather than in full).

# Enrollment Model



The Enrollment calculations in this model are carried out in several sections.

1. Reference
2. Policy Volumes
3. Premium Collected
4. Earned Premium
5. Summary Tables
6. Summary Charts

Several sections distinguish between Enrollment Month and Projection Month.

# Enrollment Model

Section 2											
Policies, by Enrollment Month and Cohort Start Month											
Cohort Start Year Index ->											
1 1 1 1 1 1 1											
Cohort Start Month Index ->											
Cohort Enrollment Month Index	Cohort Enrollment Year Index	Enrollment Policy Term	Policy Term Index	1	2	3	4	5	6	7	
1	1	1	1	100	100	100	100	100	100	100	100
2	1	1	2	100	100	100	100	100	100	100	100
3	1	1	3	100	100	100	100	100	100	100	100
4	1	1	4	99	99	99	99	99	99	99	99
5	1	1	5	99	99	99	99	99	99	99	99
6	1	1	6	99	99	99	99	99	99	99	99
7	1	2	1	59	59	59	59	59	59	59	59
8	1	2	2	59	59	59	59	59	59	59	59
9	1	2	3	59	59	59	59	59	59	59	59
10	1	2	4	59	59	59	59	59	59	59	59
11	1	2	5	59	59	59	59	59	59	59	59
12	1	2	6	59	59	59	59	59	59	59	59
13	2	3	1	41	41	41	41	41	41	41	41
14	2	3	2	41	41	41	41	41	41	41	41
15	2	3	3	41	41	41	41	41	41	41	41
16	2	3	4	41	41	41	41	41	41	41	41
17	2	3	5	41	41	41	41	41	41	41	41
18	2	3	6	41	41	41	41	41	41	41	41
19	2	4	1	32	32	32	32	32	32	32	32
20	2	4	2	32	32	32	32	32	32	32	32
21	2	4	3	32	32	32	32	32	32	32	32
22	2	4	4	32	32	32	32	32	32	32	32
23	2	4	5	32	32	32	32	32	32	32	32
24	2	4	6	32	32	32	32	32	32	32	32
25	3	5	1	29	29	29	29	29	29	29	29
26	3	5	2	29	29	29	29	29	29	29	29

- Enrolled policies are tracked separately by Cohort, based on the month in which a policy is first written.
- Cohort is shown as columns in the table.
- Each Cohort starts with the number of policies specified in the input tab.
- Enrollment Month is shown as rows in the table. Every Cohort starts at Enrollment Month = 1, regardless of the Projection Month.
- As the Enrollment Months progress, the impact of Retention and Disenrollment assumptions reduces the Cohort's size.

# Enrollment Model

Section 2									
Policies, by Enrollment Month and Cohort Start Month									
Cohort Start Year Index ->									
1 1 1 1 1 1 1									
Cohort Start Month Index ->									
Cohort Enrollment Month Index	Cohort Enrollment Year Index	Enrollment Policy Term	Policy Term Index	1	2	3	4	5	
1	1	1	1	100	100	100	100	100	
2	1	1	2	100	100	100	100	100	
3	1	1	3	100	100	100	100	100	
4	1	1	4	99	99	99	99	99	
5	1	1	5	99	99	99	99	99	
6	1	1	6	99	99	99	99	99	
7	1	2	1	59	59	59	59	59	
8	1	2	2	59	59	59	59	59	
9	1	2	3	59	59	59	59	59	
10	1	2	4	59	59	59	59	59	
11	1	2	5	59	59	59	59	59	
12	1	2	6	59	59	59	59	59	
13	2	3	1	41	41	41	41	41	
14	2	3	2	41	41	41	41	41	
15	2	3	3	41	41	41	41	41	
16	2	3	4	41	41	41	41	41	
17	2	3	5	41	41	41	41	41	
18	2	3	6	41	41	41	41	41	
19	2	4	1	32	32	32	32	32	
20	2	4	2	32	32	32	32	32	
21	2	4	3	32	32	32	32	32	
22	2	4	4	32	32	32	32	32	
23	2	4	5	32	32	32	32	32	
24	2	4	6	32	32	32	32	32	
25	3	5	1	29	29	29	29	29	
26	3	5	2	29	29	29	29	29	

Counts of policies are shifted to Projection Month to feed into the overall business summary.

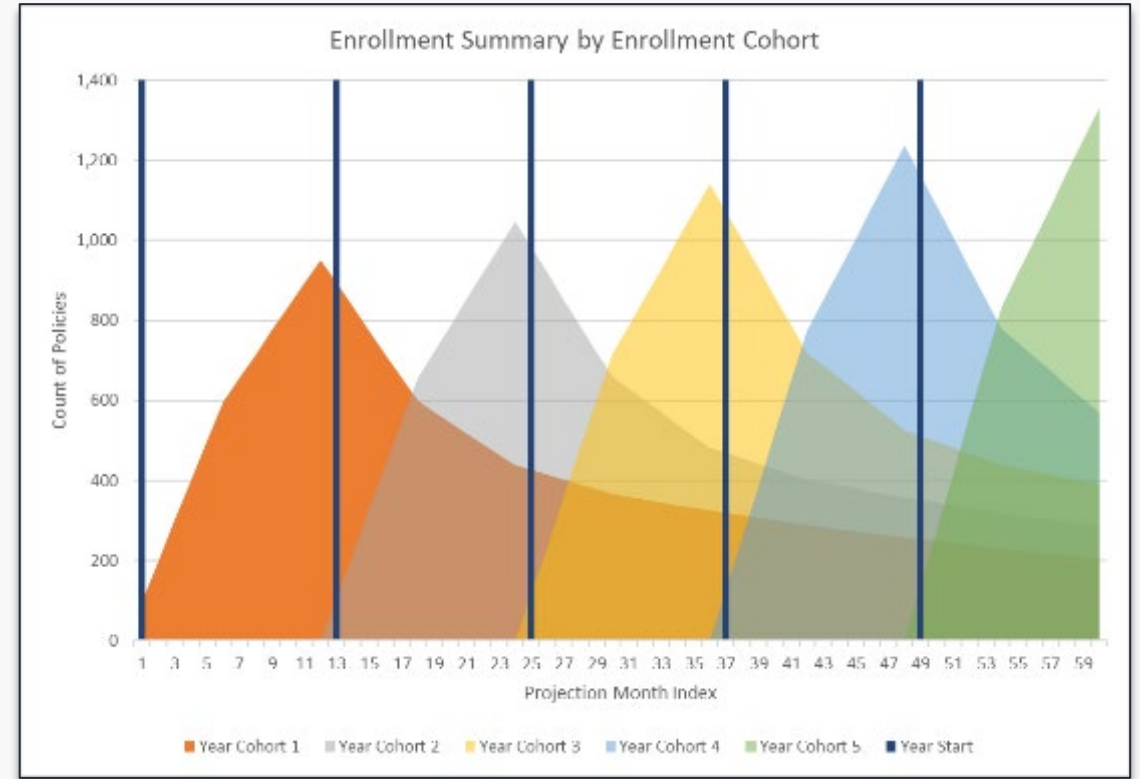
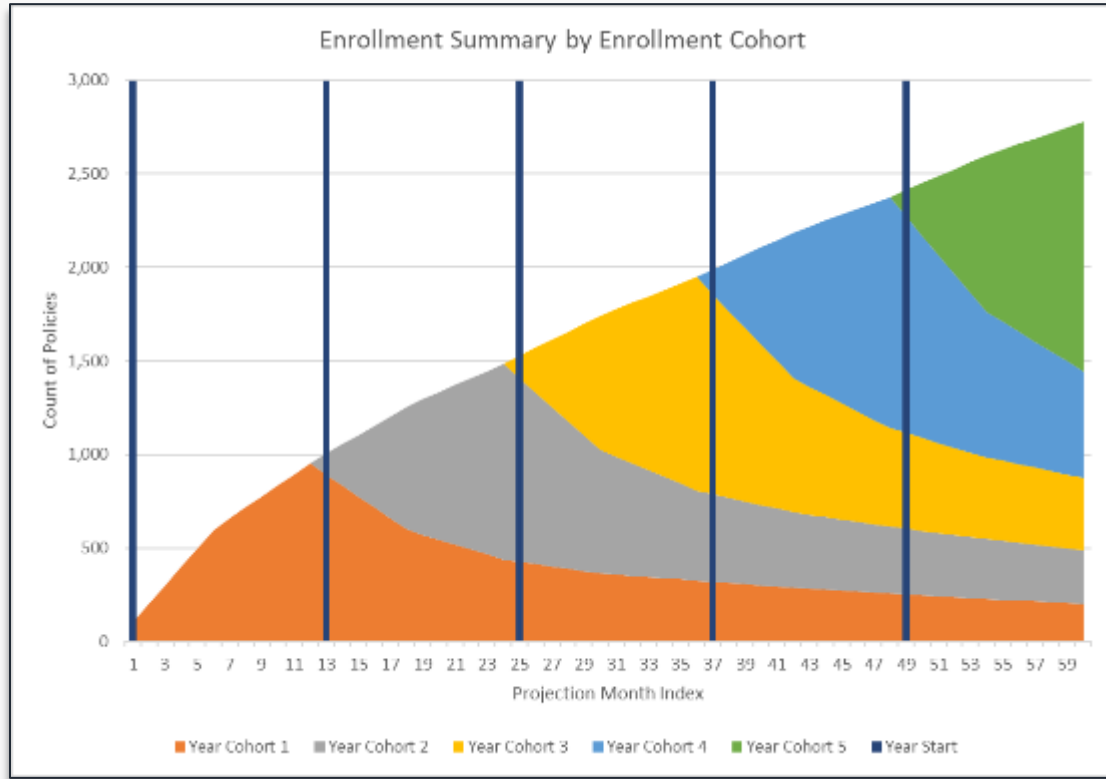
(The overall summaries are presented by Projection Month.)

Policies, by Projection Month and Cohort Start Month									
Waiting Period (Months)									
3									
Cohort Start Month Index ->									
Projection Month Index	1	2	3	4	5	6	7	8	
1	100								
2	100	100							
3	100	100	100						
4	99	100	100	100					
5	99	99	100	100	100				
6	99	99	99	100	100	100			
7	59	99	99	99	100	100	100		
8	59	59	99	99	99	100	100	100	
9	59	59	59	99	99	99	100	100	100
10	59	59	59	59	99	99	99	100	100
11	59	59	59	59	59	99	99	99	100
12	59	59	59	59	59	59	99	99	99
13	41	59	59	59	59	59	59	99	99
14	41	41	59	59	59	59	59	59	99
15	41	41	41	59	59	59	59	59	59
16	41	41	41	41	59	59	59	59	59
17	41	41	41	41	41	59	59	59	59
18	41	41	41	41	41	41	59	59	59
19	41	41	41	41	41	41	41	59	59
20	41	41	41	41	41	41	41	41	59
21	41	41	41	41	41	41	41	41	41
22	41	41	41	41	41	41	41	41	41
23	41	41	41	41	41	41	41	41	41
24	41	41	41	41	41	41	41	41	41
25	41	41	41	41	41	41	41	41	41
26	41	41	41	41	41	41	41	41	41

Total Policies	New Policies	Policies in Waiting Period
100	100	100
200	100	200
299	100	299
399	100	299
498	100	299
597	100	299
656	100	299

# Enrollment Model

Example policy volumes across all 60 Projection Months, separated by Year Cohort.



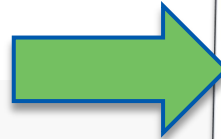


# Model Inputs

Allow the user to specify multiple relevant elements of a premium, claims, and business model.

Sections:

1. Scheme Design
- 2. Enrollment and Retention Assumptions**
3. Claim Utilization Assumptions
4. Non-Benefit Expense Assumptions
5. Premium Rate



**Assumptions for Model Input**

1. Scheme Design

Year	Enrollment	Retention	Dropouts
1	100%	95%	5%
2	100%	95%	5%
3	100%	95%	5%
4	100%	95%	5%
5	100%	95%	5%

2. Enrollment and Retention Assumptions

Enrollment

Year	Enrollment
1	100%
2	100%
3	100%
4	100%
5	100%

Retention

Year	Retention
1	95%
2	95%
3	95%
4	95%
5	95%

Dropouts

Year	Dropouts
1	5%
2	5%
3	5%
4	5%
5	5%

3. Claim Utilization Assumptions

Category	Male	Female	Child	Total
Population Distribution	40.0%	55.0%	5.0%	100.0%
Hospital Admissions Rate	50%	50%	5%	2%

4. Non-Benefit Expense Assumptions

Projection Year	Operating Expenses (% of Total Premium)	Commissions (% of Total Premium)	Premium Taxes (% of Total Premium)
1	30.0%	10.0%	10.0%
2	30.0%	10.0%	10.0%
3	30.0%	10.0%	10.0%
4	30.0%	10.0%	10.0%
5	30.0%	10.0%	10.0%

5. Premium Rate

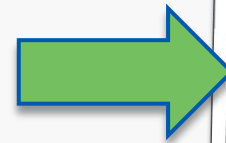
Projection Year	Annual Operating Expenses	Annual Commissions	Annual Premium Tax
1	5,000	4,000	7,000
2	5,000	4,000	7,000
3	5,000	4,000	7,000
4	5,000	4,000	7,000
5	5,000	4,000	7,000

# Model Inputs

Allow the user to specify multiple relevant elements of a premium, claims, and business model.

Sections:

1. Scheme Design
2. Enrollment and Retention Assumptions
3. **Claim Utilization Assumptions**
4. Non-Benefit Expense Assumptions
5. Premium Rate



**Assumptions for Model Input**

1. Scheme Design

Projection Year	Enrollment	Retention	Assumed Annual Discount Rate
1	100%	100%	5.00%
2	100%	100%	5.00%
3	100%	100%	5.00%
4	100%	100%	5.00%
5	100%	100%	5.00%

2. Enrollment and Retention Assumptions

3. **Claim Utilization Assumptions**

Projection Year	Male	Female	Child	Total
1	10.00%	15.00%	25.00%	50.00%
2	10.00%	15.00%	25.00%	50.00%
3	10.00%	15.00%	25.00%	50.00%
4	10.00%	15.00%	25.00%	50.00%
5	10.00%	15.00%	25.00%	50.00%

4. Non-Benefit Expense Assumptions

Projection Year	Operating Expenses (% of Total Premium)	Commissions (% of Total Premium)	Premium Taxes (% of Total Premium)
1	30.00%	10.00%	10.00%
2	30.00%	10.00%	10.00%
3	30.00%	10.00%	10.00%
4	30.00%	10.00%	10.00%
5	30.00%	10.00%	10.00%

5. Premium Rate

Projection Year	Annual Operating Expenses	Annual Commissions	Annual Premium Tax
1	5,000	4,000	7,000
2	5,000	4,000	7,000
3	5,000	4,000	7,000
4	5,000	4,000	7,000
5	5,000	4,000	7,000

# Claim Utilization Assumptions

3. Claim Utilization Assumptions					
	Male	Female	Child	Total	
Population Distribution	40.0%	55.0%	5.0%	100.0%	OK
Hospital Admission Rate <i>(per 1,000 individuals per Month)</i>	20.0	30.0	5.0	24.8	

Projection Year	Admit Rate Adjustment Factor
1	1.0000
2	0.9900
3	0.9800
4	0.9700
5	0.9600

Overall claim utilization volumes are based on two primary elements:

1. Number of hospital admissions
2. Length of hospital stays (number of days)

These elements are further based on demographics, and may change over time.

May be difficult to measure in practice.

Assumed Length of Stay Distribution				
Hospital Day	Male	Female	Child	Overall
1	18.0%	8.0%	25.0%	12.9%
2	25.0%	15.0%	22.0%	19.4%
3	20.0%	37.0%	20.0%	29.4%
4	15.0%	18.0%	12.0%	16.5%
5	10.0%	10.0%	8.0%	9.9%
6	5.0%	5.0%	6.0%	5.1%
7	3.0%	3.0%	3.0%	3.0%
8	2.0%	2.0%	2.0%	2.0%
9	1.0%	1.0%	1.0%	1.0%
10	0.5%	0.5%	0.5%	0.5%
11	0.3%	0.3%	0.3%	0.3%
12	0.2%	0.2%	0.2%	0.2%
13	0.1%	0.1%	0.1%	0.1%
14	0.1%	0.1%	0.1%	0.1%
15	0.0%	0.0%	0.0%	0.0%
16	0.0%	0.0%	0.0%	0.0%
17	0.0%	0.0%	0.0%	0.0%
18	0.0%	0.0%	0.0%	0.0%
19	0.0%	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%	0.0%
21	0.0%	0.0%	0.0%	0.0%

# Claim Utilization Model

The scheme design is combined with the assumed distribution of hospital lengths of stay to arrive at a windowed distribution for the expected number of claim payment days per covered admission, as well as the overall expected volume of covered admissions.

Claim Waiting Period (Months)	3
Policy Deductible (Days)	3
Policy Benefit Maximum (Days)	10



Assumed Length of Stay Distribution				
Hospital Day	Male	Female	Child	Overall
1	18.0%	8.0%	25.0%	12.9%
2	25.0%	15.0%	22.0%	19.4%
3	20.0%	37.0%	20.0%	29.4%
4	15.0%	18.0%	12.0%	16.5%
5	10.0%	10.0%	8.0%	9.9%
6	5.0%	5.0%	6.0%	5.1%
7	3.0%	3.0%	3.0%	3.0%
8	2.0%	2.0%	2.0%	2.0%
9	1.0%	1.0%	1.0%	1.0%
10	0.5%	0.5%	0.5%	0.5%
11	0.3%	0.3%	0.3%	0.3%
12	0.2%	0.2%	0.2%	0.2%
13	0.1%	0.1%	0.1%	0.1%
14	0.1%	0.1%	0.1%	0.1%
15	0.0%	0.0%	0.0%	0.0%
16	0.0%	0.0%	0.0%	0.0%
17	0.0%	0.0%	0.0%	0.0%
18	0.0%	0.0%	0.0%	0.0%



Windowed Distribution				
Payment Day Index	Male	Female	Child	Total
0	0.0%	0.0%	0.0%	0.0%
0	0.0%	0.0%	0.0%	0.0%
0	0.0%	0.0%	0.0%	0.0%
1	15.0%	18.0%	12.0%	16.5%
2	10.0%	10.0%	8.0%	9.9%
3	5.0%	5.0%	6.0%	5.1%
4	3.0%	3.0%	3.0%	3.0%
5	2.0%	2.0%	2.0%	2.0%
6	1.0%	1.0%	1.0%	1.0%
7	0.5%	0.5%	0.5%	0.5%
8	0.3%	0.3%	0.3%	0.3%
9	0.2%	0.2%	0.2%	0.2%
10	0.1%	0.1%	0.1%	0.1%
10	0.1%	0.1%	0.1%	0.1%
10	0.0%	0.0%	0.0%	0.0%
10	0.0%	0.0%	0.0%	0.0%
10	0.0%	0.0%	0.0%	0.0%



Average Payment Days			
Male	Female	Child	Total
2.32	2.22	2.48	2.27

Average Covered Admits/1000 per Month			
Male	Female	Child	Total
7.40	12.00	1.65	9.52

# Claim Utilization Model

3. Claim Utilization Assumptions				
	Male	Female	Child	Total
Population Distribution	40.0%	55.0%	5.0%	100.0%
Hospital Admission Rate <i>(per 1,000 individuals per Month)</i>	20.0	30.0	5.0	24.8

OK



Average Covered Admits/1000 per Month			
Male	Female	Child	Total
7.40	12.00	1.65	9.52



Average Payment Days			
Male	Female	Child	Total
2.32	2.22	2.48	2.27



Projection Year	Admit Rate Adjustment Factor
1	1.0000
2	0.9900
3	0.9800
4	0.9700
5	0.9600

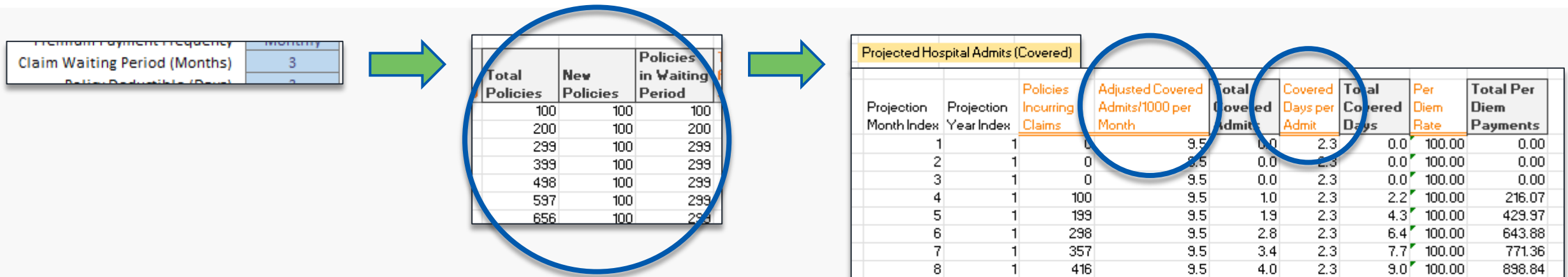


Model Outputs		
Year	Adjusted Covered Admits/1000 per Month	Covered Days per Admit
1	9.5	2.3
2	9.4	2.3
3	9.3	2.3
4	9.2	2.3
5	9.1	2.3

The assumed volume of hospital admissions is combined with the average payment days and adjustment factor to arrive at the net projection of covered admissions and covered days per admission.



# Claim Utilization Model



The waiting period also plays into the projected volume of claim payments, linking enrollment and claim assumptions.

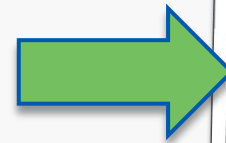
Projection		Policies Incurring Claims	Adjusted Covered Admits/1000 per Month	Total Covered Admits	Covered Days per Admit	Total Covered Days	Per Diem Rate	Total Per Diem Payments
Month Index	Year Index							
1	1	0	9.5	0.0	2.3	0.0	100.00	0.00
2	1	0	9.5	0.0	2.3	0.0	100.00	0.00
3	1	0	9.5	0.0	2.3	0.0	100.00	0.00
4	1	100	9.5	1.0	2.3	2.2	100.00	216.07
5	1	199	9.5	1.9	2.3	4.3	100.00	429.97
6	1	298	9.5	2.8	2.3	6.4	100.00	643.88
7	1	357	9.5	3.4	2.3	7.7	100.00	771.36
8	1	416	9.5	4.0	2.3	9.0	100.00	898.84
9	1	476	9.5	4.5	2.3	10.3	100.00	1,028.48
10	1	534	9.5	5.1	2.3	11.5	100.00	1,153.80
11	1	593	9.5	5.6	2.3	12.8	100.00	1,281.28
12	1	652	9.5	6.2	2.3	14.1	100.00	1,408.76
13	2	693	9.4	6.5	2.3	14.8	105.00	1,556.49
14	2	734	9.4	6.9	2.3	15.7	105.00	1,648.58
15	2	775	9.4	7.3	2.3	16.6	105.00	1,740.67
16	2	825	9.4	7.8	2.3	17.6	105.00	1,852.97
17	2	876	9.4	8.3	2.3	18.7	105.00	1,967.51
18	2	926	9.4	8.7	2.3	19.8	105.00	2,079.82
19	2	965	9.4	9.1	2.3	20.6	105.00	2,167.41
20	2	1,003	9.4	9.4	2.3	21.5	105.00	2,252.76
21	2	1,041	9.4	9.8	2.3	22.3	105.00	2,338.11
22	2	1,079	9.4	10.2	2.3	23.1	105.00	2,423.46
23	2	1,117	9.4	10.5	2.3	23.9	105.00	2,508.81
24	2	1,155	9.4	10.9	2.3	24.7	105.00	2,594.16
25	3	1,188	9.3	11.1	2.3	25.2	105.00	2,641.32

# Model Inputs

Allow the user to specify multiple relevant elements of a premium, claims, and business model.

Sections:

1. Scheme Design
2. Enrollment and Retention Assumptions
3. **Claim Utilization Assumptions**
4. Non-Benefit Expense Assumptions
5. Premium Rate



**Assumptions for Model Input**

1. Scheme Design

Projection Year	Enrollment	Retention	Assumed Annual Discount Rate
1	100.00%	100.00%	5.00%
2	100.00%	100.00%	5.00%
3	100.00%	100.00%	5.00%
4	100.00%	100.00%	5.00%
5	100.00%	100.00%	5.00%

2. Enrollment and Retention Assumptions

3. **Claim Utilization Assumptions**

Projection Year	Male	Female	Child	Total
1	10.00%	15.00%	25.00%	50.00%
2	10.00%	15.00%	25.00%	50.00%
3	10.00%	15.00%	25.00%	50.00%
4	10.00%	15.00%	25.00%	50.00%
5	10.00%	15.00%	25.00%	50.00%

4. Non-Benefit Expense Assumptions

Projection Year	Operating Expenses (% of Total Premium)	Commissions (% of Total Premium)	Premium Taxes (% of Total Premium)
1	30.00%	10.00%	10.00%
2	30.00%	10.00%	10.00%
3	30.00%	10.00%	10.00%
4	30.00%	10.00%	10.00%
5	30.00%	10.00%	10.00%

5. Premium Rate

Projection Year	Annual Operating Expenses	Annual Commissions	Annual Premium Tax
1	5,000	4,000	7,000
2	5,000	4,000	7,000
3	5,000	4,000	7,000
4	5,000	4,000	7,000
5	5,000	4,000	7,000

# Model Inputs

Allow the user to specify multiple relevant elements of a premium, claims, and business model.

Sections:

1. Scheme Design
2. Enrollment and Retention Assumptions
3. Claim Utilization Assumptions
4. **Non-Benefit Expense Assumptions**
5. Premium Rate

**Assumptions for Model Input**

1. Scheme Design

Projection Year	Enrollment	Retention	Assumed Annual Discount Rate
1	100%	95%	5.0%
2	100%	95%	5.0%
3	100%	95%	5.0%
4	100%	95%	5.0%
5	100%	95%	5.0%

2. Enrollment and Retention Assumptions

3. Claim Utilization Assumptions

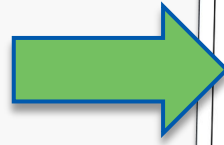
Projection Year	Male	Female	Child	Total
1	100%	100%	100%	100%
2	100%	100%	100%	100%
3	100%	100%	100%	100%
4	100%	100%	100%	100%
5	100%	100%	100%	100%

4. Non-Benefit Expense Assumptions

Projection Year	Operating Expenses (% of Total Premium)	Commissions (% of Total Premium)	Premium Taxes (% of Total Premium)
1	30.0%	10.0%	10.0%
2	30.0%	10.0%	10.0%
3	30.0%	10.0%	10.0%
4	30.0%	10.0%	10.0%
5	30.0%	10.0%	10.0%

5. Premium Rate

Projection Year	Annual Operating Expenses	Annual Commissions	Annual Premium Tax
1	5,000	4,000	7,000
2	5,000	4,000	7,000
3	5,000	4,000	7,000
4	5,000	4,000	7,000
5	5,000	4,000	7,000



# Non-Benefit Expense Assumptions

This input section captures assumptions related to running the business, including expenses of various types.

- Expenses may be percent of premium, fixed amounts, or both.
- Income tax is applied as a simple percent of net income, and is reported in the summary exhibits.
- The discount rate is used to report future revenues and expenses based on their Net Present Value.

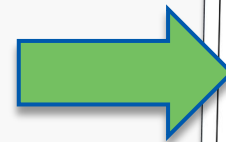
4. Non-Benefit Expense Assumptions							
<b>Percent-of-Total-Premium Expenses</b>				<b>Fixed Expenses</b>			
Projection Year	Operating Expenses (% of Total Premium)	Commissions (% of Total Premium)	Premium Taxes (% of Total Premium)	Projection Year	Annual Operating Expenses	Annual Commissions	Annual Premium Tax
1	30.0%	10.0%	10.0%	1	5,000	4,000	7,000
2	25.0%	10.0%	10.0%	2	6,000	5,000	7,000
3	25.0%	10.0%	10.0%	3	7,000	6,000	7,000
4	20.0%	10.0%	10.0%	4	8,000	7,000	7,000
5	20.0%	10.0%	10.0%	5	9,000	8,000	7,000
Assumed Income Tax Rate <input type="text" value="25.0%"/>							
(Percent of Net Income)							
Assumed Annual Discount Rate <input type="text" value="5.0%"/>							
(For Net Present Value (NPV) Calculations)							

# Model Inputs

Allow the user to specify multiple relevant elements of a premium, claims, and business model.

Sections:

1. Scheme Design
2. Enrollment and Retention Assumptions
3. Claim Utilization Assumptions
4. **Non-Benefit Expense Assumptions**
5. Premium Rate



**Assumptions for Model Input**

1. Scheme Design

Projection Year	Enrollment	Retention	Assumed Annual Discount Rate
1	100%	100%	5.00%
2	100%	100%	5.00%
3	100%	100%	5.00%
4	100%	100%	5.00%
5	100%	100%	5.00%

2. Enrollment and Retention Assumptions

3. Claim Utilization Assumptions

Projection Year	Male	Female	Child	Total
1	100%	100%	100%	100%
2	100%	100%	100%	100%
3	100%	100%	100%	100%
4	100%	100%	100%	100%
5	100%	100%	100%	100%

4. Non-Benefit Expense Assumptions

Projection Year	Operating Expenses (% of Total Premium)	Commissions (% of Total Premium)	Premium Taxes (% of Total Premium)
1	30.00%	10.00%	10.00%
2	30.00%	10.00%	10.00%
3	30.00%	10.00%	10.00%
4	30.00%	10.00%	10.00%
5	30.00%	10.00%	10.00%

5. Premium Rate

Projection Year	Annual Operating Expenses	Annual Commissions	Annual Premium Tax
1	5,000	4,000	7,000
2	5,000	4,000	7,000
3	5,000	4,000	7,000
4	5,000	4,000	7,000
5	5,000	4,000	7,000



# Model Inputs

Allow the user to specify multiple relevant elements of a premium, claims, and business model.

Sections:

1. Scheme Design
2. Enrollment and Retention Assumptions
3. Claim Utilization Assumptions
4. Non-Benefit Expense Assumptions
5. Premium Rate

**Assumptions for Model Input**

1. Scheme Design

Projection Year	Enrollment	Retention	Assumed Annual Discount Rate
1	100%	100%	5.00%
2	100%	100%	5.00%
3	100%	100%	5.00%
4	100%	100%	5.00%
5	100%	100%	5.00%

2. Enrollment and Retention Assumptions

Enrollment

Projection Year	Enrollment
1	100%
2	100%
3	100%
4	100%
5	100%

Retention

Projection Year	Retention
1	100%
2	100%
3	100%
4	100%
5	100%

3. Claim Utilization Assumptions

Projection Year	Male	Female	Child	Total
1	100%	100%	100%	100%
2	100%	100%	100%	100%
3	100%	100%	100%	100%
4	100%	100%	100%	100%
5	100%	100%	100%	100%

4. Non-Benefit Expense Assumptions

Percent-of-Total-Premium Expenses

Projection Year	Operating Expenses (% of Total Premium)	Commissions (% of Total Premium)	Premium Taxes (% of Total Premium)
1	30.00%	10.00%	10.00%
2	30.00%	10.00%	10.00%
3	30.00%	10.00%	10.00%
4	30.00%	10.00%	10.00%
5	30.00%	10.00%	10.00%

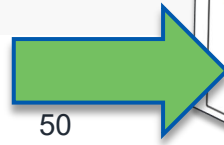
Fixed Expenses

Projection Year	Annual Operating Expenses	Annual Commissions	Annual Premium Tax
1	5,000	4,000	7,000
2	5,000	4,000	7,000
3	5,000	4,000	7,000
4	5,000	4,000	7,000
5	5,000	4,000	7,000

5. Premium Rate

Full Year Premium Rate

Projection Year	Full Year Premium Rate
1	100%
2	100%
3	100%
4	100%
5	100%



# Premium Rate

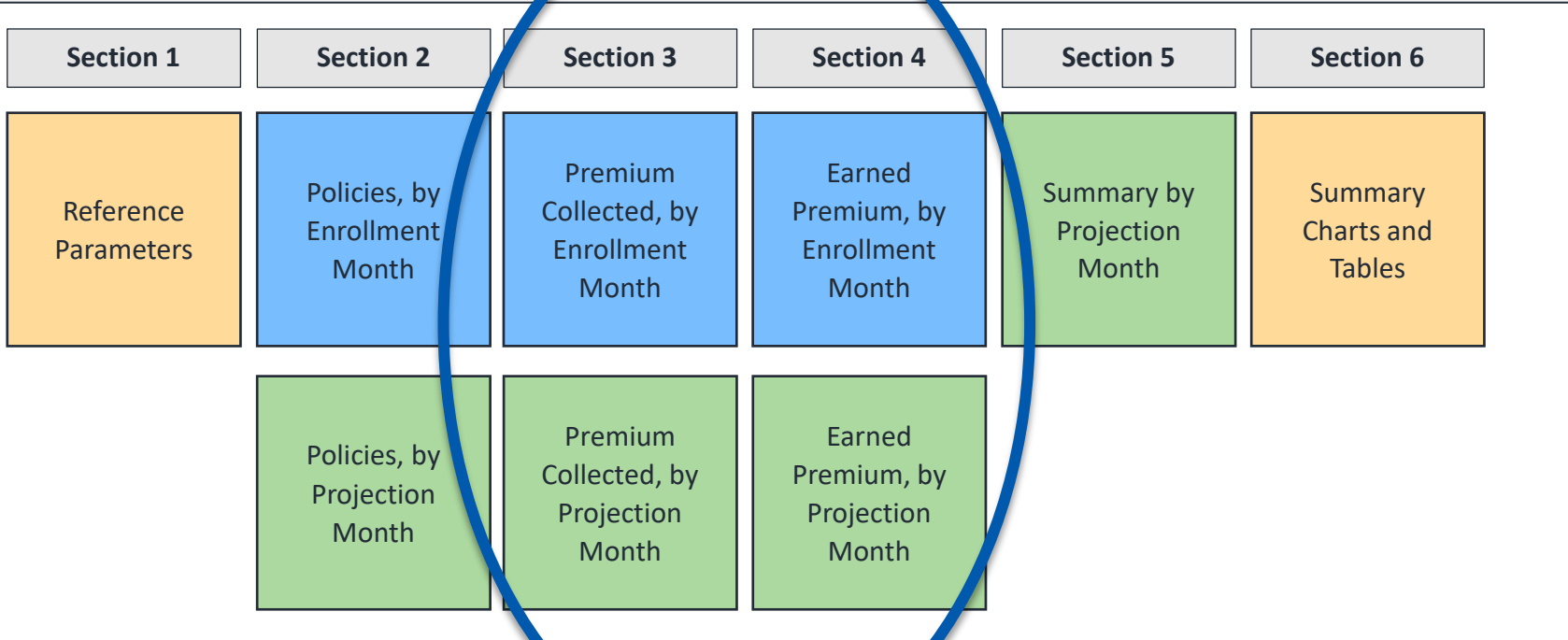
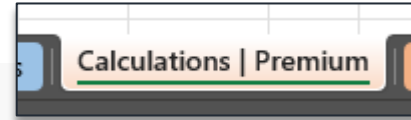
5. Premium Rate					
Full Term Premium Rate		Margin			
Projection Year	Input Term Premium Rate	Projection Year	Calculated Term Premium (Excluding Margin)	Margin as % of Input Total Premium	Full Term Per-Policy Margin
1	45.00	1	41.13	8.6%	3.87
2	50.00	2	30.84	38.3%	19.16
3	55.00	3	29.39	46.6%	25.61
4	60.00	4	26.19	56.4%	33.81
5	65.00	5	26.53	59.2%	38.47

The user inputs a term premium rate, with the payment frequency set in the Scheme Design section.

The model-calculated term premium is also shown, and the net margin is calculated by comparing to the user-input premium rate.

1. Scheme Design	
Policy Term (Months)	6
Premium Payment Frequency	Monthly
Claim Waiting Period (Months)	3
Policy Deductible (Days)	3
Policy Benefit Maximum (Days)	10

# Premium Model



- Premium revenue calculations are carried out alongside the Enrollment projections.
- In this part of the model, premium calculations pertain to collection and reporting of premium revenue. (This is not the premium development calculation!)
- Premium revenues calculated here are based on the user-specified input premium.

# Earned vs Unearned Premium

Setting the Premium Payment Frequency parameter to “Full Term” leads to the model making Earned and Unearned Premium calculations.

**1. Scheme Design**

Policy Term (Months)	6
Premium Payment Frequency	Full Term
Claim Waiting Period (Months)	3
Policy Deductible (Days)	3
Policy Benefit Maximum (Days)	10

Month	Collected Premium Payment	Earned Premium	Change in Unearned Premium	Unearned Premium Balance at End of Month
1	60.00	10.00	50.00	50.00
2	0.0	10.00	-10.00	40.00
3	0.0	10.00	-10.00	30.00
4	0.0	10.00	-10.00	20.00
5	0.0	10.00	-10.00	10.00
6	0.0	10.00	-10.00	0.00
Total Across Term	60.00	60.00	0.00	N/A

When the collected premium is intended to cover future time periods' claims expenses, it is sometimes necessary to allocate the premium across time.

- **Earned Premium:** the portion of collected premium that has been accrued.
  - Reported as earned revenue.
  
- **Unearned Premium:** the portion of collected premium that is not yet accrued.
  - Reported as a financial balance.

# Premium Model

Monthly Summary											
Projection Month Index	Projection Year Index	Total Policies	Total Premium	Earned Premium	Change in Unearned Premium	Cumulative Total Premium	Cumulative Earned Premium	Cumulative Change in Unearned Premium	In-Year Cumulative Total Premium	In-Year Cumulative Earned Premium	In-Year Cumulative Change in Unearned Premium
1	1	100	4,500.00	750.00	3,750.00	4,500.00	750.00	3,750.00	4,500.00	750.00	3,750.00
2	1	200	4,500.00	1,500.00	3,000.00	9,000.00	2,250.00	6,750.00	9,000.00	2,250.00	6,750.00
3	1	299	4,500.00	2,250.00	2,250.00	13,500.00	4,500.00	9,000.00	13,500.00	4,500.00	9,000.00
4	1	399	4,500.00	3,000.00	1,500.00	18,000.00	7,500.00	10,500.00	18,000.00	7,500.00	10,500.00
5	1	498	4,500.00	3,750.00	750.00	22,500.00	11,250.00	11,250.00	22,500.00	11,250.00	11,250.00
6	1	597	4,500.00	4,500.00	0.00	27,000.00	15,750.00	11,250.00	27,000.00	15,750.00	11,250.00
7	1	656	7,167.76	4,944.63	2,223.13	34,167.76	20,694.63	13,473.13	34,167.76	20,694.63	13,473.13
8	1	715	7,167.76	5,389.25	1,778.51	41,335.52	26,083.88	15,251.64	41,335.52	26,083.88	15,251.64
9	1	775	7,167.76	5,833.88	1,333.88	48,503.28	31,917.76	16,585.52	48,503.28	31,917.76	16,585.52
10	1	833	7,167.76	6,278.51	889.25	55,671.05	38,196.27	17,474.78	55,671.05	38,196.27	17,474.78
11	1	892	7,167.76	6,723.13	444.63	62,838.81	44,919.40	17,919.40	62,838.81	44,919.40	17,919.40
12	1	951	7,167.76	7,167.76	0.00	70,006.57	52,087.17	17,919.40	70,006.57	52,087.17	17,919.40
13	2	1,002	10,514.33	7,725.52	2,788.81	80,520.90	59,812.69	20,708.21	10,514.33	7,725.52	2,788.81
14	2	1,053	10,514.33	8,283.28	2,231.05	91,035.23	68,095.97	22,939.26	21,028.66	16,008.81	5,019.85
15	2	1,104	10,514.33	8,841.05	1,673.28	101,549.56	76,937.02	24,612.54	31,542.99	24,849.85	6,693.14
16	2	1,154	10,514.33	9,398.81	1,115.52	112,063.89	86,335.83	25,728.06	42,057.32	34,248.66	7,808.66
17	2	1,205	10,514.33	9,956.57	557.76	122,578.22	96,292.40	26,285.83	52,571.65	44,205.23	8,366.42
18	2	1,255	10,514.33	10,514.33	0.00	133,092.55	106,806.73	26,285.83	63,085.98	54,719.56	8,366.42
19	2	1,294	12,431.29	10,833.82	1,597.46	145,523.84	117,640.55	27,883.29	75,517.27	65,553.38	9,963.88
20	2	1,332	12,431.29	11,153.32	1,277.97	157,955.12	128,793.86	29,161.26	87,948.55	76,706.70	11,241.85
21	2	1,370	12,431.29	11,472.81	958.48	170,386.41	140,266.67	30,119.74	100,379.84	88,179.51	12,200.33
22	2	1,408	12,431.29	11,792.30	638.99	182,817.69	152,058.97	30,758.72	112,811.12	99,971.81	12,839.32
23	2	1,446	12,431.29	12,111.79	319.49	195,248.98	164,170.76	31,078.21	125,242.41	112,083.60	13,158.81
24	2	1,484	12,431.29	12,431.29	0.00	207,680.26	176,602.05	31,078.21	137,673.69	124,514.88	13,158.81

The model captures these distinct premium components in its projections.



# Model Inputs

Allow the user to specify multiple relevant elements of a premium, claims, and business model.

Sections:

1. Scheme Design
2. Enrollment and Retention Assumptions
3. Claim Utilization Assumptions
4. Non-Benefit Expense Assumptions
5. Premium Rate

**Assumptions for Model Input**

1. Scheme Design

Projection Year	Enrollment	Retention	Assumed Annual Discount Rate
1	100%	100%	5.00%
2	100%	100%	5.00%
3	100%	100%	5.00%
4	100%	100%	5.00%
5	100%	100%	5.00%

2. Enrollment and Retention Assumptions

Enrollment

Projection Year	Enrollment
1	100%
2	100%
3	100%
4	100%
5	100%

Retention

Projection Year	Retention
1	100%
2	100%
3	100%
4	100%
5	100%

3. Claim Utilization Assumptions

Projection Year	Male	Female	Child	Total
1	30.00%	30.00%	30.00%	30.00%
2	30.00%	30.00%	30.00%	30.00%
3	30.00%	30.00%	30.00%	30.00%
4	30.00%	30.00%	30.00%	30.00%
5	30.00%	30.00%	30.00%	30.00%

4. Non-Benefit Expense Assumptions

Percent-of-Total-Premium Expenses

Projection Year	Operating Expenses (% of Total Premium)	Commissions (% of Total Premium)	Premium Taxes (% of Total Premium)
1	30.00%	10.00%	10.00%
2	30.00%	10.00%	10.00%
3	30.00%	10.00%	10.00%
4	30.00%	10.00%	10.00%
5	30.00%	10.00%	10.00%

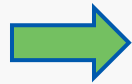
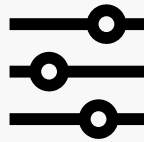
Fixed Expenses

Projection Year	Annual Operating Expenses	Annual Commissions	Annual Premium Tax
1	5,000	4,000	7,000
2	5,000	4,000	7,000
3	5,000	4,000	7,000
4	5,000	4,000	7,000
5	5,000	4,000	7,000



# Overall Model Structure

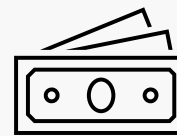
Define the scheme



Model the policyholders



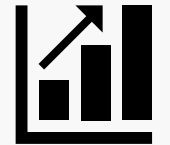
Model premium payments



Model claim volumes



Communicate model projections



$$Premium = \frac{Projected\ Claims + Fixed\ Expenses}{1 - Expenses\ as\ \%\ of\ Premium}$$

# Model Summaries: Premium Development

$$Premium = \frac{Projected\ Claims + Fixed\ Expenses}{1 - Expenses\ as\ \%\ of\ Premium}$$



Premium Rate Development Summary							9/25/2024	
Description	Year 1	Year 2	Year 3	Year 4	Year 5	Item	Source	
<b>1. Insured Portfolio: Policies</b>								
Average Enrollment	576	1,259	1,748	2,192	2,605	(1)	Projected by Model	
Average Policies Eligible for Claims	302	932	1,391	1,806	2,188	(2)	Projected by Model	
<b>2. Insured Portfolio: Admission and Claim Volumes</b>								
Total Hospital Admits	171.1	370.2	508.7	631.6	742.7	(3)	Projected by Model	
Total Hospital Days	585.8	1,267.1	1,741.4	2,161.8	2,542.3	(4)	Projected by Model	
Total Covered Hospital Admits	34.5	105.4	155.7	200.0	239.9	(5)	Projected by Model	
Total Covered Hospital Days	78.3	239.3	353.6	454.2	544.7	(6)	Projected by Model	
Per Diem Payment Rate	100.00	105.00	105.00	105.00	110.00	(7)	User Input: Business Assumptions	
Total Claims Expense	7,832	25,131	37,123	47,686	59,919	(8)	= (6)*(7)	
<b>3. Non-Benefit Expense</b>								
Projected Operating Expense, % of Total Premium	30%	25%	25%	20%	20%	(9)	User Input: Business Assumptions	
Projected Commissions, % of Total Premium	10%	10%	10%	10%	10%	(10)	User Input: Business Assumptions	
Projected Tax, % of Total Premium	10%	10%	10%	10%	10%	(11)	User Input: Business Assumptions	
Total Non-Claim Percent-of-Total-Premium Components	50%	45%	45%	40%	40%	(12)	= (9) + (10) + (11)	
Projected Operating Expense, Annual Fixed	5,000.00	6,000.00	7,000.00	8,000.00	9,000.00	(13)	User Input: Business Assumptions	
Projected Commissions, Annual Fixed	4,000.00	5,000.00	6,000.00	7,000.00	8,000.00	(14)	User Input: Business Assumptions	
Projected Tax, Annual Fixed	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00	(15)	User Input: Business Assumptions	

# Model Summaries

	Year 1	Year 2	Year 3	Year 4	Year 5	Item	Source
<b>Premium Rate Development Summary</b>							
Description	1,576	1,259	1,748	2,192	2,605		
1. In...	802	932	1,391	1,806	2,188		
<b>Insured Portfolio: Admission and Claim Volumes</b>							
Total Hospital Admits		370.2	508.7	631.6		(1)	Projected by Model
Total Hospital Days		1,267.1	1,741.4	2,161.8		(2)	Projected by Model
Total Covered Hospital Admits			155.7			(7)	User Input: Business Assu...
Total Covered Hospital Days		78.3	239.3	353.6	454.2	(8)	= (6)*(7)
Per Diem Payment Rate		100.00	105.00	105.00	105.00		
Total Claims Expense		7,832	25,131	37,123	47,686		
Benefit Expense		30%	25%	25%	20%	(9)	User Input: Business Assump...
		10%	10%	10%	10%	(10)	User Input: Business Assump...
		10%	10%	10%	10%	(11)	User Input: Business Assu...
Total Non-Claim Percent of Total Premium Components		50%	45%	45%	40%	(12)	= (9) + (10) + (11)
Projected Operating Expense, Annual Fixed	5,000.00	6,000.00	7,000.00	8,000.00	9,000.00		
Projected Commissions, Annual Fixed	4,000.00	5,000.00	6,000.00	7,000.00	8,000.00		
Projected Tax, Annual Fixed	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00		

## Summary exhibits include:

- Thematic sections
- Summary amounts across multiple years
- Descriptive and numbered lines
- Notes on calculation source
- Sparklines for visual representation

# Model Summaries: Premium Development

## Summary Sections:

1. Insured Portfolio: Policies
2. Insured Portfolio: Admission and Claim Volumes
3. Non-Benefit Expense
4. Premium Rate Development
5. Premium Sufficiency Calculation

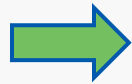
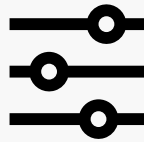
Premium Rate Development Summary							9/25/2024		
Description	Year 1	Year 2	Year 3	Year 4	Year 5	Item	Source		
<b>1. Insured Portfolio: Policies</b>									
Average Enrollment	576	1,259	1,748	2,192	2,605	█ █ █ █ █	(1)	Projected by Model	
Average Policies Eligible for Claims	302	932	1,391	1,806	2,188	█ █ █ █ █	(2)	Projected by Model	
<b>2. Insured Portfolio: Admission and Claim Volumes</b>									
Total Hospital Admits	171.1	370.2	508.7	631.6	742.7	█ █ █ █ █	(3)	Projected by Model	
Total Hospital Days	585.8	1,267.1	1,741.4	2,161.8	2,542.3	█ █ █ █ █	(4)	Projected by Model	
Total Covered Hospital Admits	34.5	105.4	155.7	200.0	239.9	█ █ █ █ █	(5)	Projected by Model	
Total Covered Hospital Days	78.3	239.3	353.6	454.2	544.7	█ █ █ █ █	(6)	Projected by Model	
Per Diem Payment Rate	100.00	105.00	105.00	105.00	110.00	█ █ █ █ █	(7)	User Input: Business Assumptions	
Total Claims Expense	7,832	25,131	37,123	47,686	59,919	█ █ █ █ █	(8)	= (6)*(7)	
<b>3. Non-Benefit Expense</b>									
Projected Operating Expense, % of Total Premium	30%	25%	25%	20%	20%		(9)	User Input: Business Assumptions	
Projected Commissions, % of Total Premium	10%	10%	10%	10%	10%		(10)	User Input: Business Assumptions	
Projected Tax, % of Total Premium	10%	10%	10%	10%	10%		(11)	User Input: Business Assumptions	
Total Non-Claim Percent-of-Total-Premium Components	50%	45%	45%	40%	40%		(12)	= (9) + (10) + (11)	
Projected Operating Expense, Annual Fixed	5,000.00	6,000.00	7,000.00	8,000.00	9,000.00		(13)	User Input: Business Assumptions	
Projected Commissions, Annual Fixed	4,000.00	5,000.00	6,000.00	7,000.00	8,000.00		(14)	User Input: Business Assumptions	
Projected Tax, Annual Fixed	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00		(15)	User Input: Business Assumptions	





# Overall Model Structure

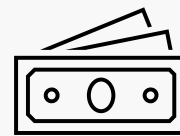
Define the scheme



Model the policyholders



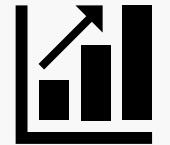
Model premium payments



Model claim volumes



Communicate model projections



$$Premium = \frac{Projected\ Claims + Fixed\ Expenses}{1 - Expenses\ as\ \% \ of\ Premium}$$

# Model Summaries: Financial Statement Summary

Financial Statement Summary										9/25/2024
Description	Year 1	Year 2	Year 3	Year 4	Year 5		Total	NPV	Item	Source
<b>1. Insured Portfolio Overview</b>										
Enrollment at Year End	951	1,484	1,948	2,377	2,777	█	2,777		(1)	User Input
Trend		56.0%	31.3%	22.0%	16.8%					
Average Enrollment	576	1,259	1,748	2,192	2,605	█	1,676		(2)	Projected by Model
Average New Policies per Month	100	110	120	130	140	█	120		(3)	User Input
Average Disenrolled per Month	21	66	81	94	107	█	74		(4)	User Input
Average Policies Eligible for Claims	302	932	1,391	1,806	2,188	█	1,324		(5)	Projected by Model
Percent of Total	31.8%	62.8%	71.4%	76.0%	78.8%	█	47.7%		(6)	= (5)/(1)
Average Policy Retention From 12 Months and Prior		42.7%	50.9%	56.8%	59.8%	█	0.0%		(7)	Projected by Model
<b>2. Premium</b>										
Total Premium	51,869	123,925	189,195	259,017	333,720	█	957,726	816,734	(8)	Projected by Model
Average Monthly Premium per Policy	7.50	8.20	9.02	9.85	10.68	█	47.62		(9)	= (8)/(2)/12
Trend		9.4%	10.0%	9.2%	8.4%					
Total Earned Premium	51,869	123,925	189,195	259,017	333,720	█	957,726	816,734	(10)	Projected by Model
Change in Unearned Premium	0	0	0	0	0		0	0	(11)	= (8) - (10)
<b>3. Claims Expenses</b>										
Total Hospital Admits	171.1	370.2	508.7	631.6	742.7	█	2,424.3		(12)	Projected by Model
Total Hospital Days	585.8	1,267.1	1,741.4	2,161.8	2,542.3	█	8,298.5		(13)	Projected by Model

## Additional Columns:

1. Total
2. Net Present Value

## Summary Sections:

1. Insured Portfolio Overview
2. Premium
3. Claims Expenses
4. Non-Benefit Expenses
5. Net Income
6. Key Performance Indicators

# Summary Metrics: Net Present Value

Financial Statement Summary										9/25/2024	
Description	Year 1	Year 2	Year 3	Year 4	Year 5	Total	NPV	Item	Source		
<b>2. Premium</b>											
Total Premium	51,869	123,925	189,195	259,017	333,720	957,726	816,734	(8)	Projected by Model		
Average Monthly Premium per Policy	7.50	8.20	9.02	9.85	10.68	47.62		(9)	= (8)/(2)/12		
Trend		9.4%	10.0%	9.2%	8.4%						
Total Earned Premium	51,869	123,925	189,195	259,017	333,720	957,726	816,734	(10)	Projected by Model		

Net Present Value calculation leverages the user-input Annual Discount Rate, applied monthly.

$$PV = \frac{V}{(1 + r_m)^n}$$

Projection Month Index	Projection Year Index	Ending Enrollment	Total Premium	Earned Premium	Change in Unearned Premium	Claim Counts	Total Claim Payments	Net Present Value of Total Premium	Net Present Value of Earned Premium	Net Present Value of Change in Unearned Premium	Net Present Value of Claim Payments
1	1	100	4,500.00	750.00	3,750.00	0.0	0.00	4,481.74	746.96	3,734.78	0.00
2	1	200	4,500.00	1,500.00	3,000.00	0.0	0.00	4,463.56	1,487.85	2,975.70	0.00
3	1	299	4,500.00	2,250.00	2,250.00	0.0	0.00	4,445.44	2,222.72	2,222.72	0.00
4	1	399	4,500.00	3,000.00	1,500.00	2.2	216.07	4,427.41	2,951.60	1,475.80	212.58
5	1	498	4,500.00	3,750.00	750.00	4.3	429.97	4,409.44	3,674.54	734.91	421.32
6	1	597	4,500.00	4,500.00	0.00	6.4	643.88	4,391.55	4,391.55	0.00	628.36
7	1	656	7,167.76	4,944.63	2,223.13	7.7	771.36	6,966.64	4,805.88	2,160.75	749.72
8	1	715	7,167.76	5,389.25	1,778.51	9.0	898.84	6,938.37	5,216.78	1,721.59	870.07
9	1	775	7,167.76	5,833.88	1,333.88	10.3	1,028.48	6,910.22	5,624.26	1,285.95	991.53
10	1	833	7,167.76	6,278.51	889.25	11.5	1,153.80	6,882.18	6,028.35	853.82	1,107.83
11	1	892	7,167.76	6,723.13	444.63	12.8	1,281.28	6,854.25	6,429.07	425.18	1,225.24
12	1	951	7,167.76	7,167.76	0.00	14.1	1,408.76	6,826.44	6,826.44	0.00	1,341.68
13	2	1,002	10,514.33	7,725.52	2,788.81	14.8	1,556.40	6,873.02	7,327.70	2,645.23	1,476.36

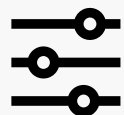
Assumed Annual Discount Rate	5.0%
Monthly Discount Rate	0.4%

# Summary Metrics: Key Performance Indicators

Financial Statement Summary							
Description	Year 1	Year 2	Year 3	Year 4	Year 5		Total
<b>6. Key Performance Indicators</b>							
Incurred Non-Benefit Expense Ratio	80.8%	59.5%	55.6%	48.5%	47.2%	■■■■■	52.6%
Incurred Claims Ratio	15.1%	20.3%	19.6%	18.4%	18.0%	■■■■■	18.6%
Net Income Ratio	4.1%	20.2%	24.8%	33.1%	34.9%	■■■■■	28.8%
Average Enrollment Growth Rate		118.5%	38.8%	25.4%	18.8%	■- - -	-35.7%

- Incurred Non-Benefit Expense Ratio:** Calculated as the total expenses as a percentage of total Earned Premium.
- Incurred Claims Ratio:** Calculated as the total claims expenses as a percentage of total Earned Premium.
- Net Income Ratio:** Calculated as the net income, or profit, as a percentage of total Earned Premium, calculated for the business as a whole.
- Average Enrollment Growth Rate:** Calculated as annual change in the average policies per month across each projection year.

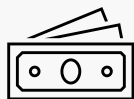
# Follow-Up Demo of the Model



1. Define the scheme



2. Model the policyholders



3. Model premium payments



4. Model claim volumes



5. Communicate model projections

**Assumptions for Model Input**

The five sections below provide all input parameters for this Hospital Cash Product model. Sample values are given, but should be changed to match the particular circumstance being modeled.

**1. Scheme Design**

Assumption	Value	Projection Year	Payment Date
Policy Term (Months)	5	1	101.00
Premium Payment Frequency	Full Term	2	101.00
Claim Waiting Period (Months)	3	3	101.00
Policy Deductible (Days)	3	4	101.00
Policy Benefit Maximum (Days)	10	5	110.00

**2. Enrollment and Retention Assumptions**

Enrollment Assumptions		Retention Assumptions	
Projection Year	Enroll. Policies per Month	Enroll. Retention Rate (At Policy Term)	Assumed In-Term Discontinuance (Monthly)
1	100	80.0%	0.20%
2	110	70.0%	
3	120	80.0%	
4	130	80.0%	
5	140	80.0%	

Navigation tabs at the bottom: License, Instructions, Input | Assumptions, Calculations | Premium, Calculations | Claims, Calculations | Summary, Summary | Premium Development, Summary | Financial Statement.





# Overall Model Structure

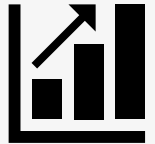
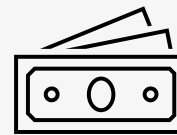
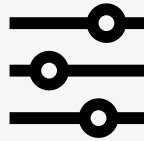
Define the scheme

Model the policyholders

Model premium payments

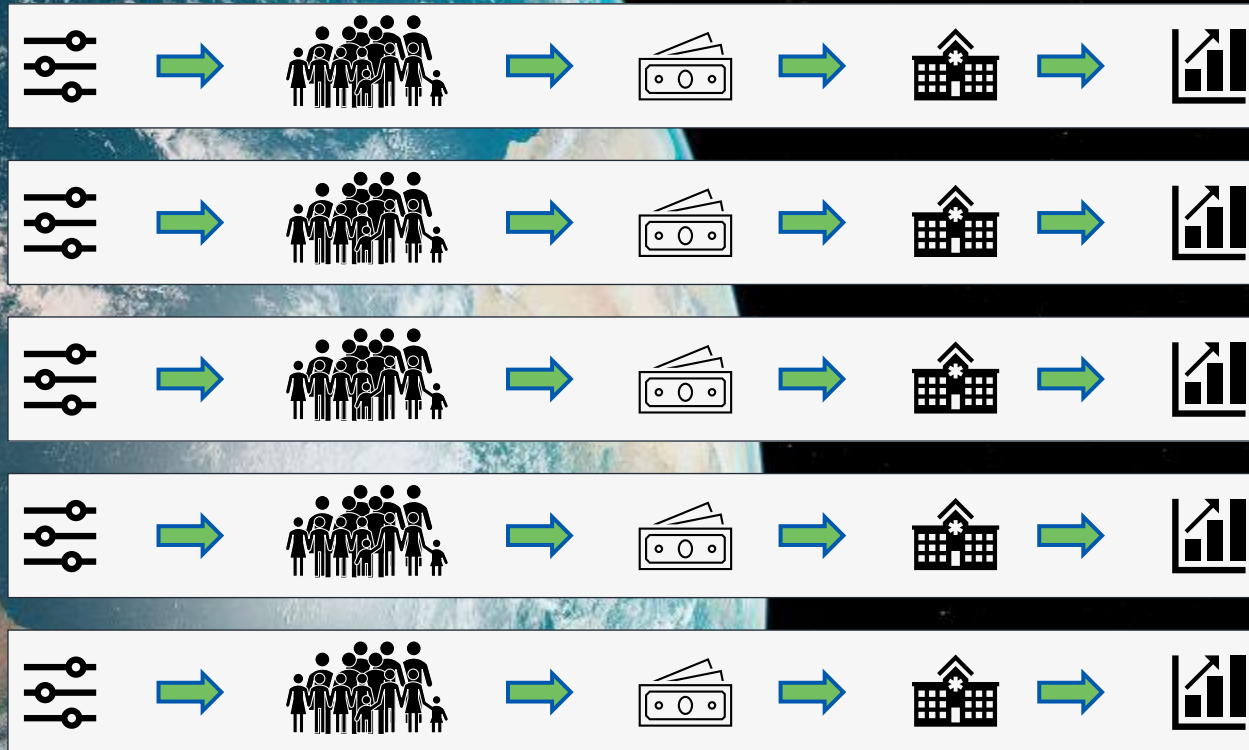
Model claim volumes

Communicate model projections





# Overall Model Structure





# Considerations for Scheme Design

## Additional Scheme Parameters

- Maximum Age
- Maximum Policy Benefit
- Policy Type
- Eligible Facilities

## Setting Premium Rates

- Market Competitor Rates
- Price Sensitivity of Target Market
- Business Profitability (i.e., Premium Adequacy)

## Non-Benefit Expenses

- Distribution Network
- Enrollment Processing
- Payment Processing
- Claims Administration

## Other Considerations

- Family Coverage Policies
- Premium Subsidies
- Product Viability



# Considerations for Model Expansion

## Data Sources

- Product Experience
- Public Data
- Field Research
- Market Summaries

## Expanding the Model

- Distinct Files by Subgroup
- Refined Projections
- Reproducibility

## Data Validation and Quality

- Source Considerations
- Timeliness
- Appropriateness for This Use

## Model Adjustments

- Impact of External Factors (e.g., new hospital facility)

## Model Fine-Tuning

- Sensitivity Testing
- Scenario Testing

## Summary Considerations

- Cohort-Specific Summaries
- Monthly or Quarterly Summaries



## Wrap-Up Q&A

- What Other Considerations Matter?
- How Would You Extend This Work?
- What Remaining Questions Do You Have?





# Hospital Cash Model

Develop an available, accessible model that:

- Illustrates an actuarial approach to pricing a hospital cash product
- Demonstrates effective use of a spreadsheet in building a model for a hospital cash product
- Communicates the benefits of modeling the business case of a hospital cash product
- Discusses the various considerations that are part of designing an effective product
- Provides a tangible educational resource for use in a classroom, or for someone learning independently



# Tool Demonstration – Life

A woman wearing a grey hijab and a patterned blue and white long-sleeved top is standing in a market stall. She is holding a clear plastic bag filled with various fruits and vegetables. The stall is filled with fresh produce, including green leafy vegetables, red chili peppers, and other items. The background shows more market stalls and a tiled floor.

# Life Microinsurance – Agenda

1. Project goal
2. Overview of the life microinsurance market
3. Model construction
4. Live demonstration
5. Pricing Model Considerations





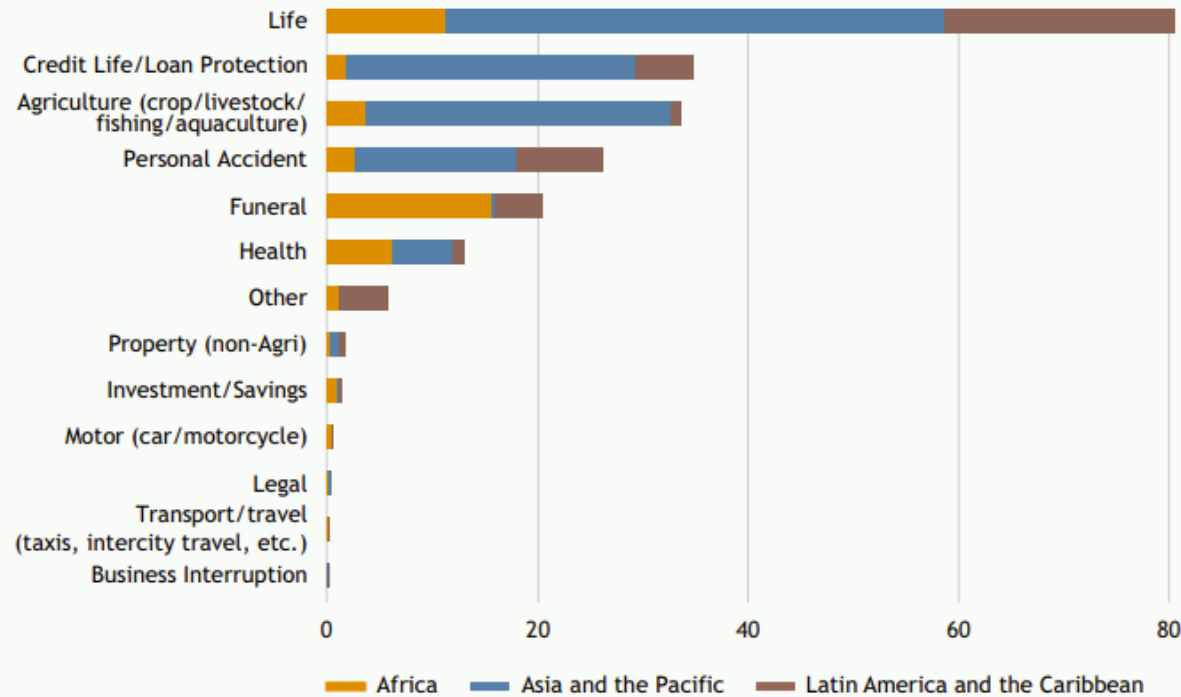
# Life Microinsurance Model Development



Project Goals: Provide an available, accessible model for:

- Actuarial pricing approach for a credit life and funeral benefit product
- High level business planning projection tool based on credit life & funeral benefit product
- Capturing some of the considerations that are part of designing an effective product
- Educational tool for use in a classroom, or for someone learning independently

# Overview of the life microinsurance market



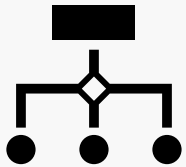
- The graph shows the number of people covered by different microinsurance product lines in 2022.
- Microinsurance products cover a wide range of benefits from life, agriculture, health / medical, personal accident, etc.
- The top two important products are life and credit life / loan protection products with funeral benefit product making up the top five products for 2022.
- Funeral benefits product is more prominent in Africa whereas in Asia the credit life products are more popular amongst the policyholders.
- Our toolkit has been designed to cater for credit life and funeral benefit product pricing.
- The process and calculation method for pricing a life microinsurance product would be largely similar to that of a funeral benefit product. Hence, the toolkit can be further extended to cover life microinsurance products.

Source: The Landscape of Microinsurance 2023 by Microinsurance Network



# Overall Model Structure

## Product Parameters



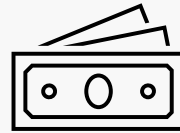
- What benefit to include?
- Single life or Joint life?
- Amount of sum assured?

## Assumptions Setting



- Economic assumptions
- Non-economic assumptions
- Pricing assumptions
- Business planning assumptions

## Premium Pricing



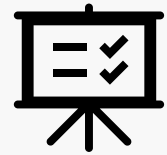
- Determining the amount of premium to charge to policyholder
- Based on assumptions setting
- Using excel spreadsheet

## Financial Projections



- Financial projection based on newly priced product
- To assess feasibility and analyse pricing metrics
- On monthly basis or yearly basis?

## Communicate Findings & Continuous Monitoring



- Present findings and observations to management
- Continuous monitoring of actual experience

# Model Construction – Product Parameters

## 2. Product Parameters

Products duration  months Please update the duration in months of the products, it needs to be an integer between 1 and 12

### 1. Credit Life product

Loan size 

	Selection	SA	Joint Life?
100,000	1	100,000	Yes

 Please select if credit life is based on single life or joint life and update sum assured if product has credit life benefit.

### 2. Funeral product

Sum assured - member 

	Selection	SA
4,000	1	4,000

 Please select and update sum assured if product has funeral benefit for main life

Sum assured - spouse 

	Selection	SA
0	0	4,000

 Please select and update sum assured if product has funeral benefit for spouse

Sum assured - children 

	Selection	SA
4,000	1	4,000

 Please select and update sum assured if product has funeral benefit for children

### Things to consider:

- Determine which type of benefits should the product be offering. This could be a combination of credit life and funeral benefit or separately.
- Should the credit life product be sold as single life or joint life (i.e. benefit payment on first death)?
- Option to include other family members (e.g. spouse and / or children) under funeral benefit
- Sum assured (i.e. benefit payment upon death) information is required for pricing purposes
- For credit life benefit, the duration of the benefit is set to 12 months (i.e. one full year). However, user can adjust this to less than 12 months should they want to know the derived premium for shorter duration.
- We would advise to use 12 months as the credit life duration as this simplifies the premium calculation and subsequently the financial projection for pricing metrics analysis and business planning projections.

# Model Construction – Assumptions Setting (Pricing)

- In general, assumption settings are split into:
  - Economic assumptions
  - Non-economic assumptions
- It is important that users rely on all available data (i.e. both internal and external) to arrive at a suitable assumption for the model.
- This toolkit allows users to price a microinsurance product and produce financial projection for business planning purposes. The assumption settings will also be split for pricing and business planning purposes.

## Economic assumptions

### 1. Economic Assumptions

#### Pricing

Loan interest rate (for credit life benefit)	10%	per annum
Discount rate	2%	per annum

- Assumptions include loan interest rates for credit life benefit and investment return per annum

## Non-economic assumptions

	By entry age	By demographic	Manual Input		
<b>1. Claim frequencies &amp; margins</b>					
Credit life - member	12.00	15.00	8.00	12.00	The expected number of claims per 1,000 lives per year.
Credit life - joint	18.00	27.00	13.00	18.00	The expected number of claims per 1,000 lives per year.
Funeral - member	12.00	15.00	7.00	12.00	The expected number of claims per 1,000 lives per year.
Funeral - spouse	7.00	12.00	6.00	7.00	The expected number of spouse claims per 1,000 members per year.
Funeral - children	4.00	0.71	1.00	4.00	The expected number of child claims per 1,000 members per year.
<b>2. Expense and other loadings</b>					
Profit margin loading	3.0%	Loading in the premium to generate a profit which in turn provides a return on capital supporting the business			
Commission loading	20.0%	The part of an insurance premium paid by the insured to an agent for his or her services in procuring and servicing the insurance contract.			
Variable expenses loading (%)	20.0%	Percentage of gross premiums that is allocated to cover variable expenses			
Budgeted expenses for the year	1,000	The amount budgeted for fixed expenses. Must cover a full year's expenses (e.g. rent and salaries).			
Mortality Buffer	3%	A mortality buffer added to the claims frequency as a buffer against uncertainty (expressed as a percentage of the expected claim frequency).			
<b>3. Business volumes</b>					
Total number of policies	1,000	Average number of policyholders over a full year. Must be the same year for which expenses were budgeted above.			
Lapse Rate	3%	Assumed % of policyholders lapse on a yearly basis			

- Key assumptions include
  - Claims rate / frequency based on selected product parameters
  - Expense and commission assumptions
  - Lapse rates
  - Business volumes
  - Any security margins
- The toolkit allows user to select the method for determining the claims rate i.e. manual input, by entry age or by demographic. The entry age and demographic options will rely on a mortality rate table that is required to be updated by the user

# Model Construction – Assumptions Setting (Business Planning)

## 5. Projection Assumptions

### Projection

Premium payment every x month	12	12	In months. Please ensure that premium frequency is suitable with product duration (i.e. ensure $\text{MOD}(\text{Dur}, \text{C100}) = 0$ ).			
	Year 1	Year 2	Year 3	Year 4	Year 5	
Sales	1,000	1,000	1,000	1,000	1,000	Projected sales for the next 5 years
Investment return	3.0%	Assumed investment return per year				
Tax	10.0%	Assumed tax rate for profits				
Expense inflation	0.0%	Assumed fixed expense increases by % on a yearly basis				
Fixed Expense	1,000	Assumed fixed expense cost				
	Year 1					
Premium increase	0.0%	Assumed increase in gross premium by % per year				
Claims rate increase	0.0%	Assumed increase in claims rate each year (multiplicative)				

- Additional assumptions for business planning include:
  - Sales projection
  - Allowance for tax
  - Expense inflation
  - Allowance for increases in premiums and / or claims rates
- Do note that pricing assumptions will also be used in the financial projection and business planning section e.g. claims rates, lapse rates and variable expenses

# Model Construction – Assumptions Setting (Business Planning)

## 6. Stress Testing. Note: Only impacts Projections, not Premium Calculation

	Year 1	Year 2	Year 3	Year 4	Year 5	
Claims stress	0.0%	0.0%	0.0%	0.0%	0.0%	Stressed increase in claims amount per year
Lapse stress	0.0%	0.0%	0.0%	0.0%	0.0%	Stressed increase in lapse rate per year
Expense stress	0.0%	0.0%	0.0%	0.0%	0.0%	Stressed increase in expense per year
Commission stress	0.0%	0.0%	0.0%	0.0%	0.0%	Stressed increase in commission per year

- The toolkit also provides the possibility of conducting stress testing on several cashflows i.e. claims, expenses, commissions and lapse rates.
- The toolkit allows users to apply different stress factors on different projection years (for flexibility).
- Users may use this to test how sensitive the financial projections are in relation to changes in cashflows.
- The stress factors can be extended to include other cashflows that are deemed important e.g. due to insufficient data when calibrating the assumptions.



# Model Construction – Premium Pricing

Premium Components Breakdown	Amount	%
<b>Annual risk premium for all lives covered</b>	<b>932.93</b>	<b>52.3%</b>
Credit Life	870.70	48.8%
Funeral (Member)	46.40	2.6%
Funeral (Spouse)	-	0.0%
Funeral (Children)	15.83	0.9%
<b>Total loadings</b>	<b>850.23</b>	<b>47.7%</b>
Mortality buffer	46.81	2.6%
Fixed expenses	1.00	0.1%
Variable expenses	356.63	20.0%
Commissions	356.63	20.0%
Profit margin	89.16	5.0%
<b>Annual gross premium</b>	<b>1,783.15</b>	<b>100.0%</b>

Check

0.0%

Pricing Metrics	
Internal rate of return (IRR) (p.a.)	<b>2.05%</b>
Payback Period (months)	<b>12</b>
Profit Margin (p.a.)	<b>5.83%</b>

- The toolkit contains a tab (i.e. “Premium Calculation”) that calculates the appropriate premium based on the parameters and assumptions set by the user.
- The approach used to price the product is based on simplified short term cashflow projection (i.e. up to 12 months) allowing for loadings (if required).
- The derived premium can be broken down to the annual risk premiums and separate loading sections.
- The pricing metrics (e.g. IRR, payback period and profit margin) is extracted for the user to compare against any internal benchmark / requirement by the Company / Group.

# Model Construction – Financial Projection

## Total Projection

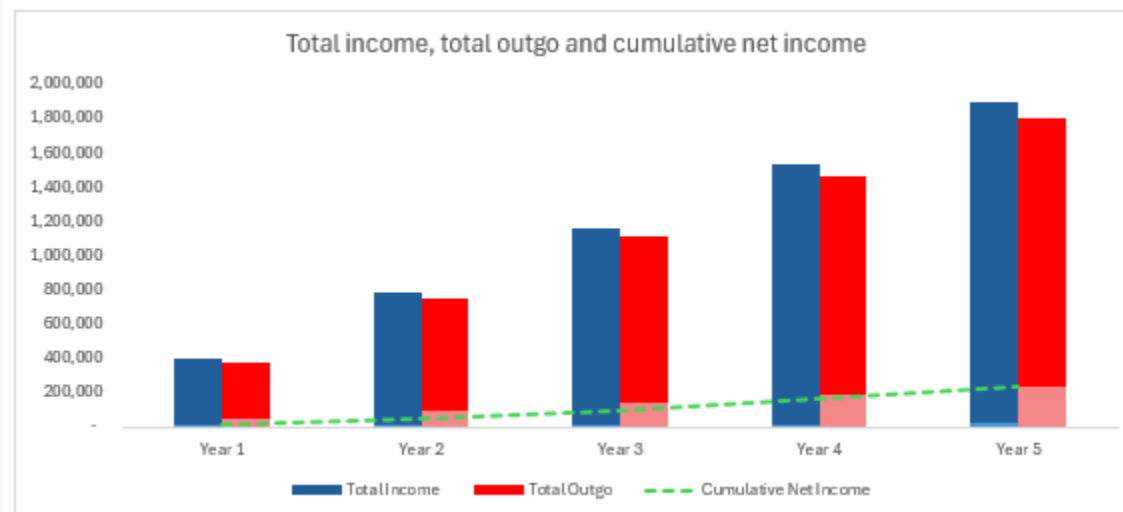
Year	NOP	Premium	Claims		Expense		Commission	Investment Income	Increase in Reserves	Profit Before Tax	Tax	Profit After Tax
			Credit Life Benefit	Funeral Benefit	Variable Expense	Fixed Expense						
1	1,000.00	394,233.49	(328,009.96)	(4,000.00)	(39,423.35)	(985.39)	(9,855.84)	5,338.92	-	17,297.88	(1,037.87)	16,260.00
2	1,973.14	777,877.78	(647,209.50)	(7,996.00)	(77,787.78)	(958.92)	(19,446.94)	10,562.44	-	35,041.08	(2,102.46)	32,938.61
3	2,920.14	1,151,217.16	(957,835.16)	(11,988.00)	(115,121.72)	(933.17)	(28,780.43)	15,644.11	-	52,202.79	(3,132.17)	49,070.62
4	3,841.70	1,514,528.32	(1,260,117.17)	(15,976.02)	(151,452.83)	(908.10)	(37,863.21)	20,587.73	-	68,798.73	(4,127.92)	64,670.80
5	4,738.51	1,868,080.54	(1,554,279.54)	(19,960.04)	(186,808.05)	(883.71)	(46,702.01)	25,397.01	-	84,844.19	(5,090.65)	79,753.54

	1	2	3	4	5
Gross Income	399,572.41	788,440.22	1,166,861.26	1,535,116.05	1,893,477.55
Total Claims	(332,009.96)	(655,205.50)	(969,823.17)	(1,276,093.18)	(1,574,239.58)
Total Expenses	(40,408.74)	(78,746.70)	(116,054.88)	(152,360.93)	(187,691.76)
Total Commissions	(9,855.84)	(19,446.94)	(28,780.43)	(37,863.21)	(46,702.01)
Average Premium	394.23	394.23	394.23	394.23	394.23
Average Credit Life Claims	(328.01)	(328.01)	(328.01)	(328.01)	(328.01)
Average Funeral Claims	(4.00)	(4.05)	(4.11)	(4.16)	(4.21)
Average Expense	(40.41)	(39.91)	(39.74)	(39.66)	(39.61)
Average Commission	(9.86)	(9.86)	(9.86)	(9.86)	(9.86)

- Based on the calculated premiums, the model will project a 5-year financial projection that covers the main cashflows e.g. premiums, claims, expenses, investment returns, profits, etc.
- The projection are based on the assumptions set in the [Input] tab which also considers the amount of new business that the company is planning to sell in the next five years.

# Model Construction – Results Communication & Monitoring

Description	Year 1	Year 2	Year 3	Year 4	Year 5
<b>1. Insured portfolio overview</b>					
Number of Policyholders (Beginning of period)	1,000	1,973	2,920	3,842	4,739
Increase %		97.3%	48.0%	31.6%	23.3%
<b>2. Financials - revenues</b>					
Total Premiums Paid	394,233	777,878	1,151,217	1,514,528	1,868,081
Increase %		97.3%	48.0%	31.6%	23.3%
Investment Income	5,339	10,562	15,644	20,588	25,397
Total Income	399,572	788,440	1,166,861	1,535,116	1,893,478
<b>3. Financials - disbursements</b>					
Total Expenses	(40,409)	(78,747)	(116,055)	(152,361)	(187,692)
Total Commissions	(9,856)	(19,447)	(28,780)	(37,863)	(46,702)
Total Claims	(332,010)	(655,205)	(969,823)	(1,276,093)	(1,574,240)
Total Outgo	(382,275)	(753,399)	(1,114,658)	(1,466,317)	(1,808,633)
<b>4. Net Income Before Tax</b>					
	17,298	35,041	52,203	68,799	84,844
Check	TRUE	TRUE	TRUE	TRUE	TRUE
<b>5. Net Income</b>					
Tax	(1,038)	(2,102)	(3,132)	(4,128)	(5,091)
Net Income	16,260	32,939	49,071	64,671	79,754
Cumulative Net Income	16,260	49,199	98,269	162,940	242,694
Check	TRUE	TRUE	TRUE	TRUE	TRUE
<b>Overview per policyholder</b>					
Average Premium	394	394	394	394	394
Average investment income	5	5	5	5	5
Average Expense	(40)	(40)	(40)	(40)	(40)
Average Commission	(10)	(10)	(10)	(10)	(10)
Average Claim	(332)	(332)	(332)	(332)	(332)
<b>Average net income</b>					
	17	18	18	18	18
Check	TRUE	TRUE	TRUE	TRUE	TRUE



- In tab [Summary], users will be able to find the results of the financial projection presented in a cleaner format.
- This can be used to present to management the case for selling the microinsurance product or as part of business planning.

# Model Construction – Results Communication & Monitoring

Current Year	2024					
<b>Credit life</b>	<b>Member</b>					
Year	Inforce SA	Inforce NOP	Claims Amount	Claims Count	% SA	% NOP
2023						
2022						
2021						
2020						
2019						
2018						
2017						
2016						
2015						
2014						
Average 5 Years						
Average 10 Years						

- An important part of the actuarial control cycle is to monitor experience (i.e. claims and expense) and to feed it back to the valuation and pricing departments so that the reserves and pricing reflects the company’s actual experience.
- The toolkit provides a template for users to produce an experience analysis based on internal historical experience for claims (i.e. credit life and funeral benefit).
- This can be used to set a benchmark for claims rate assumption for product pricing.

# Live demo



# Pricing Model Considerations

Outlined below are some items that users should consider when conducting pricing for microinsurance products:

- Consider **S.U.A.V.E** when developing microinsurance products
  - Simple
  - Understood
  - Accessible
  - Valuable
  - Efficient
- **Assumptions** play important part in pricing (i.e. rubbish in, rubbish out)
  - Use internal data if credible and available to better reflect company experience
  - External data can also be used as benchmark (e.g. standard mortality tables, WHO mortality database)
  - Incorporate experience monitoring to assist in setting assumptions
- There are many **different approaches** to pricing and financial projection. Consider accuracy and practicality when conducting pricing.



# Questions & Answers

**Thank you**