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Behavioral Drivers of Mortality Experience

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How does **behavior** affect **mortality**?



Direct Effects

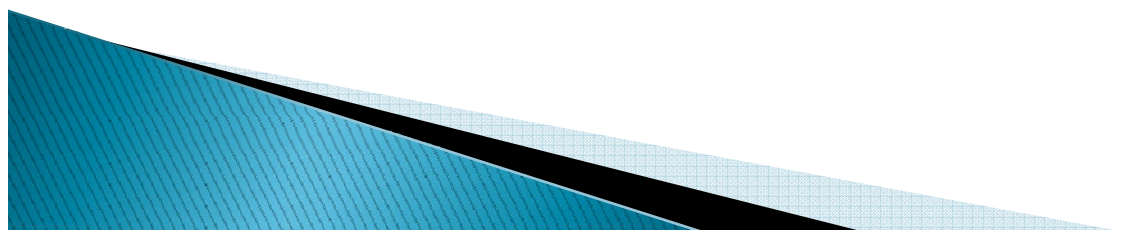
Policyholder behaviour affects directly their own individual risk

- Lifestyle
 - Smoking
 - Alcohol
 - Junk Food
 - Adventures
 - Etc.
- Suicide

Personal behavior is the leading cause of death

- Over one million of the 2.4 million [U.S.] deaths in 2000 (45%) can be attributed to personal decisions and could have been avoided if readily available alternative choices were made
- 46% of deaths due to heart disease and 66% of cancer deaths are attributable to personal decisions
- 55% of all deaths for ages 15–64 are attributable to personal decisions
- Relative to the current 45%, retrospective appraisal suggests that roughly 5% of deaths in 1900 and 20%–25% of deaths in 1950 could be attributed to personal decisions

Ralph L. Keeney, Duke University: Operations Research 56(6), pp. 1335–1347, 2008.

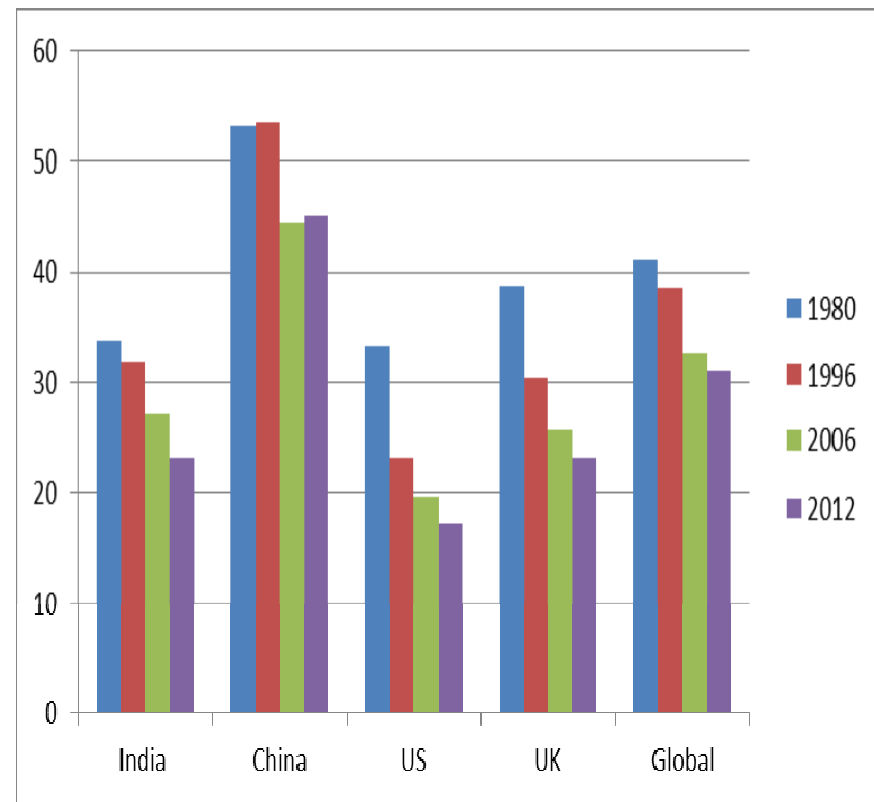


Smoking

Significant extra mortality for smokers

- Mortality among smokers in the US is about three times higher than that among similar people who never smoked
- Major causes of excess mortality include cancer and respiratory and vascular disease
- Smoking increases the risk of dying from coronary heart disease among middle-aged men by almost 4x; women by almost 5x

Male smoking Prevalence (%)



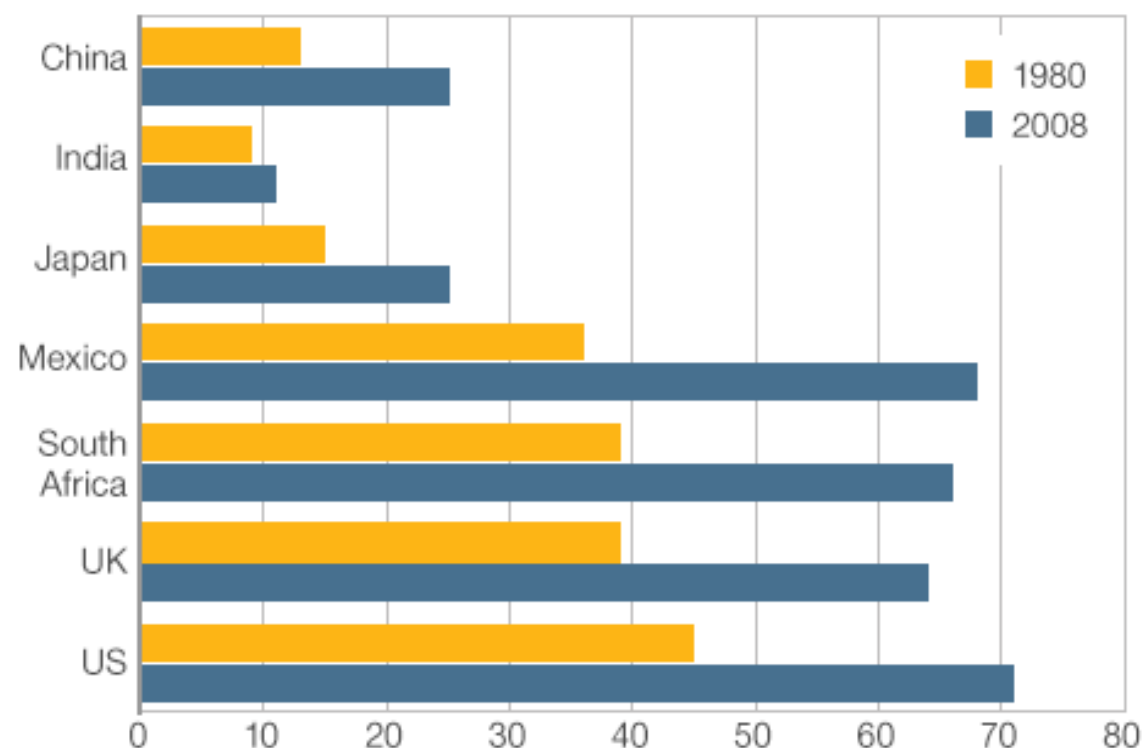
CDC – Centers for disease control and prevention

http://jama.jamanetwork.com/data/JAMA/929635/JOI130117supp1_prod.pdf

Obesity

1 in 3 Adults is obese or overweight

Percentage of overweight and obese adults with BMI greater than 25, by country



Source: Overseas Development Institute

Suicide

One death every 40 seconds



- 2nd leading cause of death among 15-29 year olds
- There are more deaths from suicide than from war and homicide together
- 3/4th of suicide deaths occur in low and middle-income countries
- 11.4 per 100,000 (15.0 for males & 8.0 for females)
- Suicides and economic downturns are correlated

World Health Organization

http://www.cdc.gov/media/releases/2011/p0414_suiciderates.html

How does **behavior** affect **mortality**?

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"On the Internet, nobody knows you're a dog."

Indirect Effects

Policyholder behaviour changes the relative risk of the insured pool

- Pre-issue adverse selection
- Anti-selective discontinuance
- Fraud

Information asymmetry

What is common between used-car market and Insurance?

researchonIndia



Used Car Market - India

April 2010

Information Asymmetry

- One party has access to more/better information than the other

Anti-Selection

- Attributes on one side is unfavorable to the other due to asymmetric information advantage

A Simple Illustration

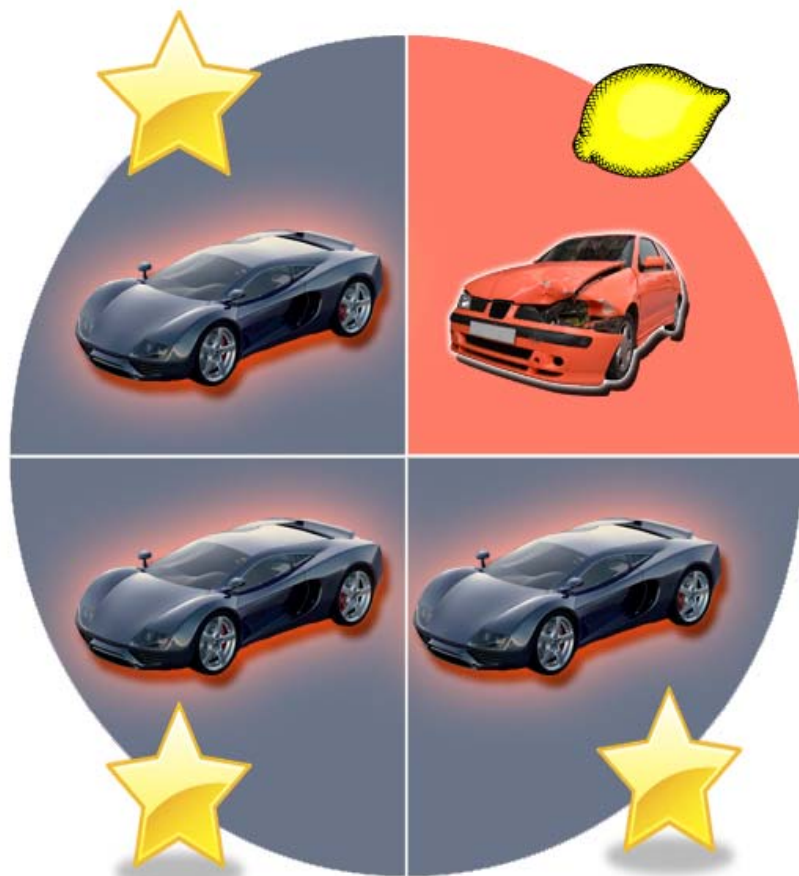


You are looking for good quality used car and willing to pay up to **\$10,000**



I have a car that I am willing to sell for **\$9,000**.
Trust me it is in good condition!

The Market for used cars



- 75% of all used cars are in **good working order** and are worth \$10,000
- 25% of all used cars are “**lemons**” and are worth \$2,000.
- There is **no way to tell** a good car from a lemon.

So, What happens next? The Market for “Lemons”



- Without any **verifiable information** about my car or my personal trustworthiness, you have to factor in the **risk** of getting a lemon; Therefore, your expected value of my car is

$$= (0.75 * \$10,000) + (0.25 * \$2,000)$$

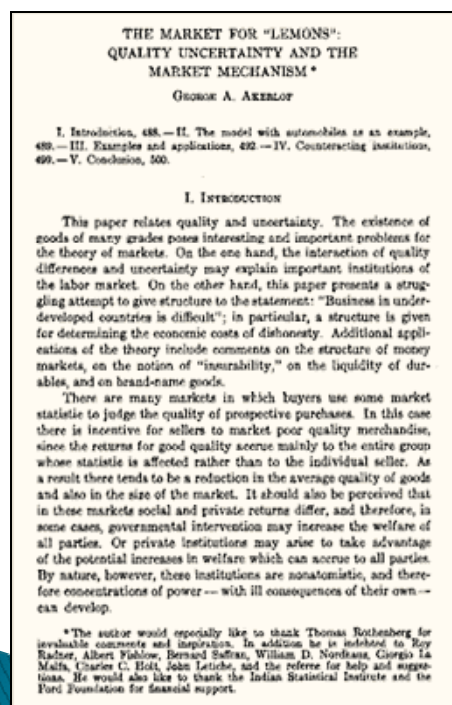
$$= \mathbf{\$8,000}$$
- You aren't willing to pay more than \$8,000 but I won't sell for less than \$9,000 (unless I know my car is a lemon!)

The Market for “Lemons”



George Akerlof’s “Lemons” model (Nobel Prize, 2001) predicts the break-down in markets with asymmetric information.

The basic problem: **Buyers and sellers often don’t have access to the same information**



- Rational buyers are worried that they might be buying a lemon, so sellers of good cars can’t get fair value.
- This creates an **unraveling market** on both sides:
 - Sellers with perfectly good cars can’t sell them for a fair price
 - Buyers looking for good cars are increasingly likely to get stuck with a lemon.
- Mechanisms may evolve in asymmetric markets to help minimize the information gap.

Information Asymmetry and Insurance

Applicant



- ▶ Knows detailed information about her medical history
- ▶ Voluntarily enters insurance market
- ▶ Demand is correlated to riskiness

Insurer



- Has access to less information than applicant
- Must determine risk-appropriate rate for all applicants

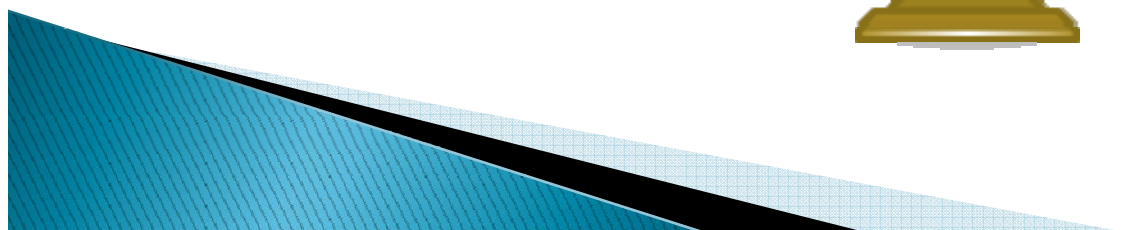
Goals of the Insurance Underwriting Process

Primary Goals

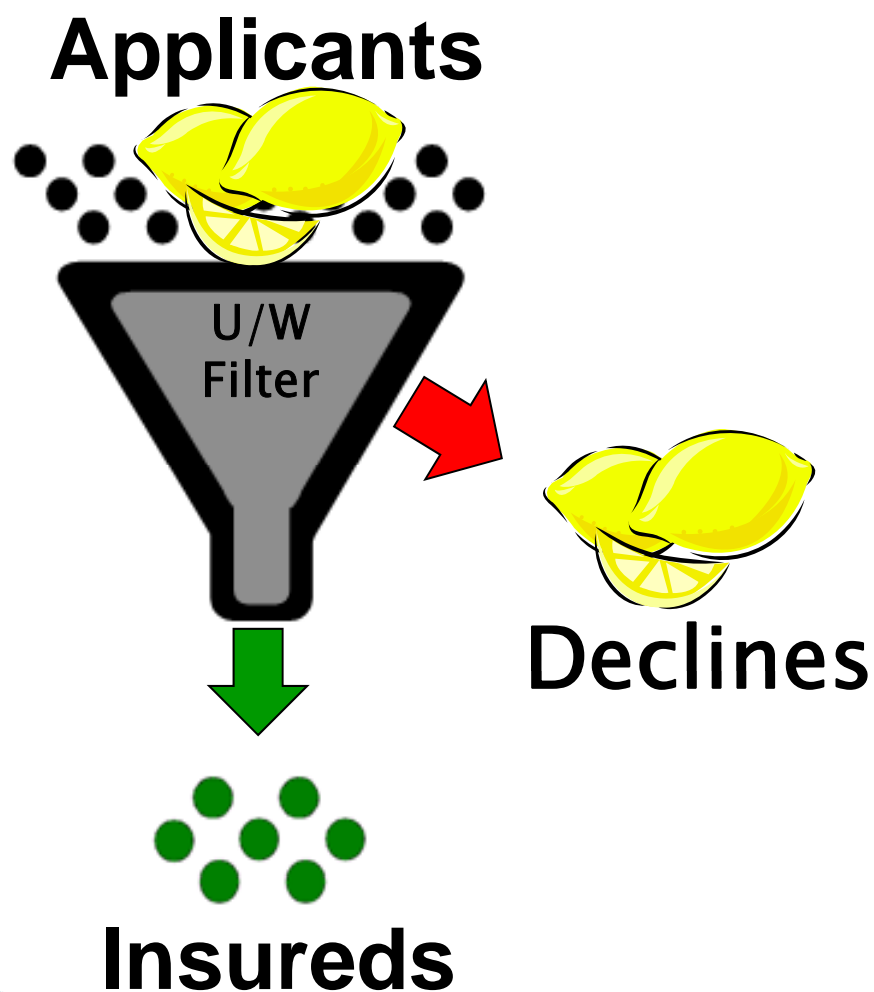
- Minimize adverse selection by reducing information asymmetry
- Accurately assess risk profile
- Uncover existence and severity of medical impairments
- Provide sentinel to discourage agent/applicant anti-selection

Secondary Goals

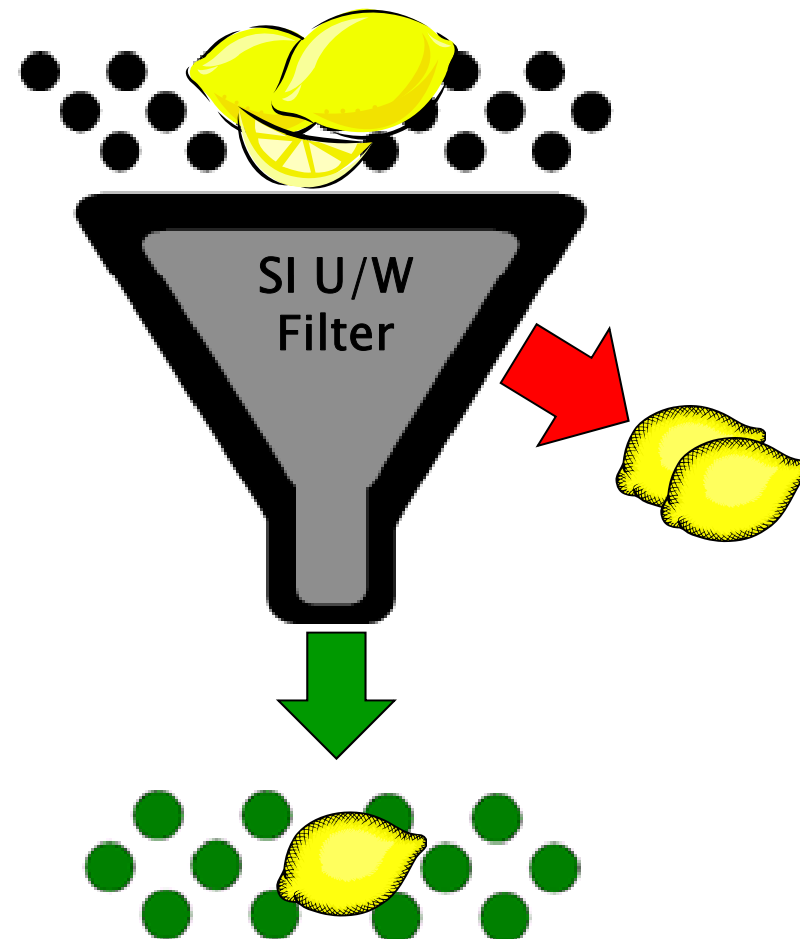
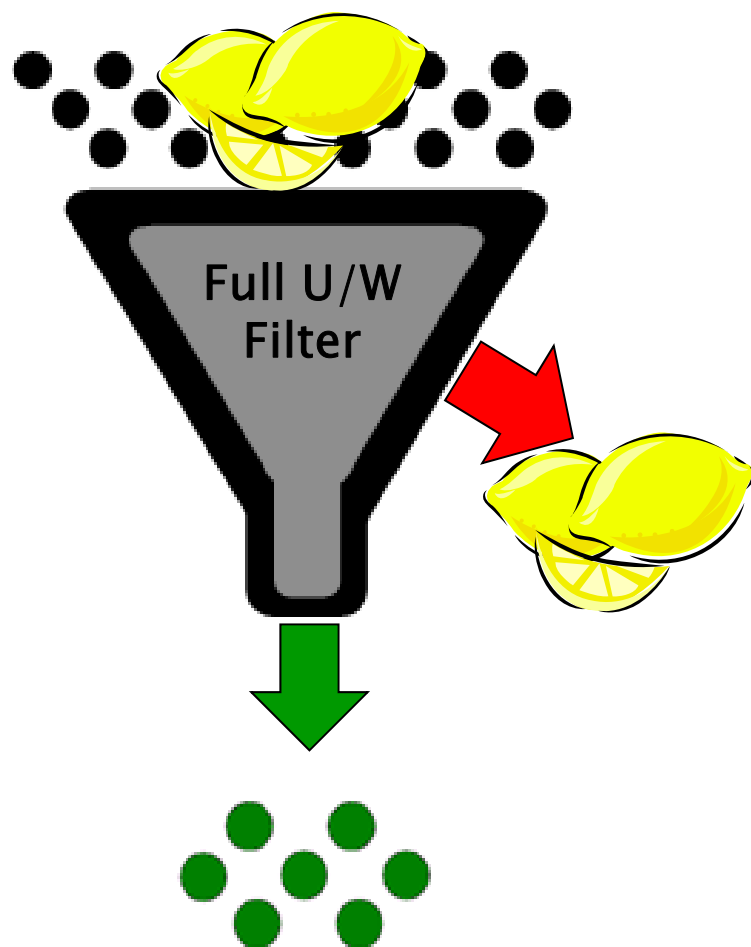
- Make decisions as quickly as possible
- Minimize intrusiveness to applicant and agent
- Minimize underwriting costs
- Maximize case placement rates



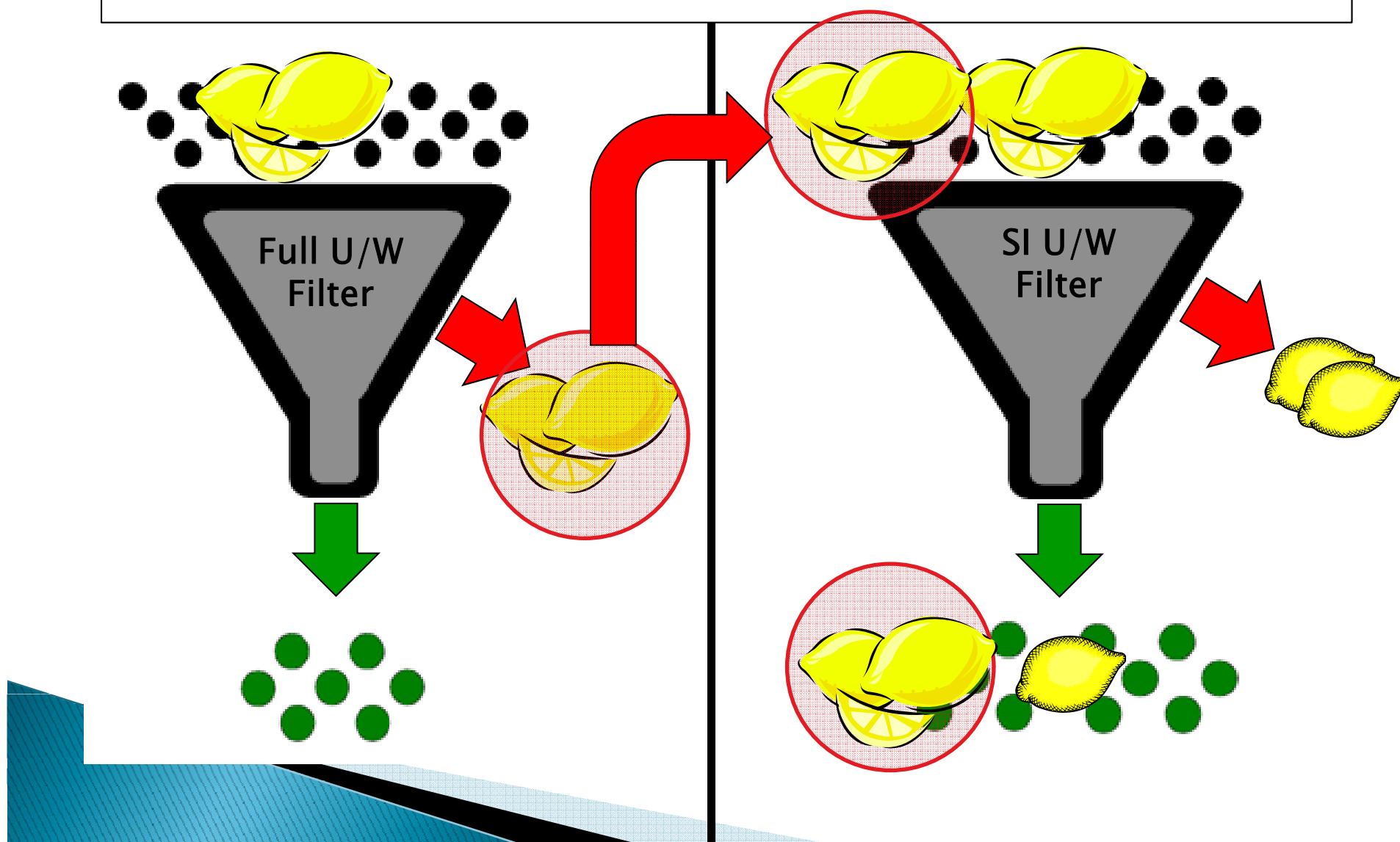
Underwriting reduces the information asymmetry between applicants and insurer



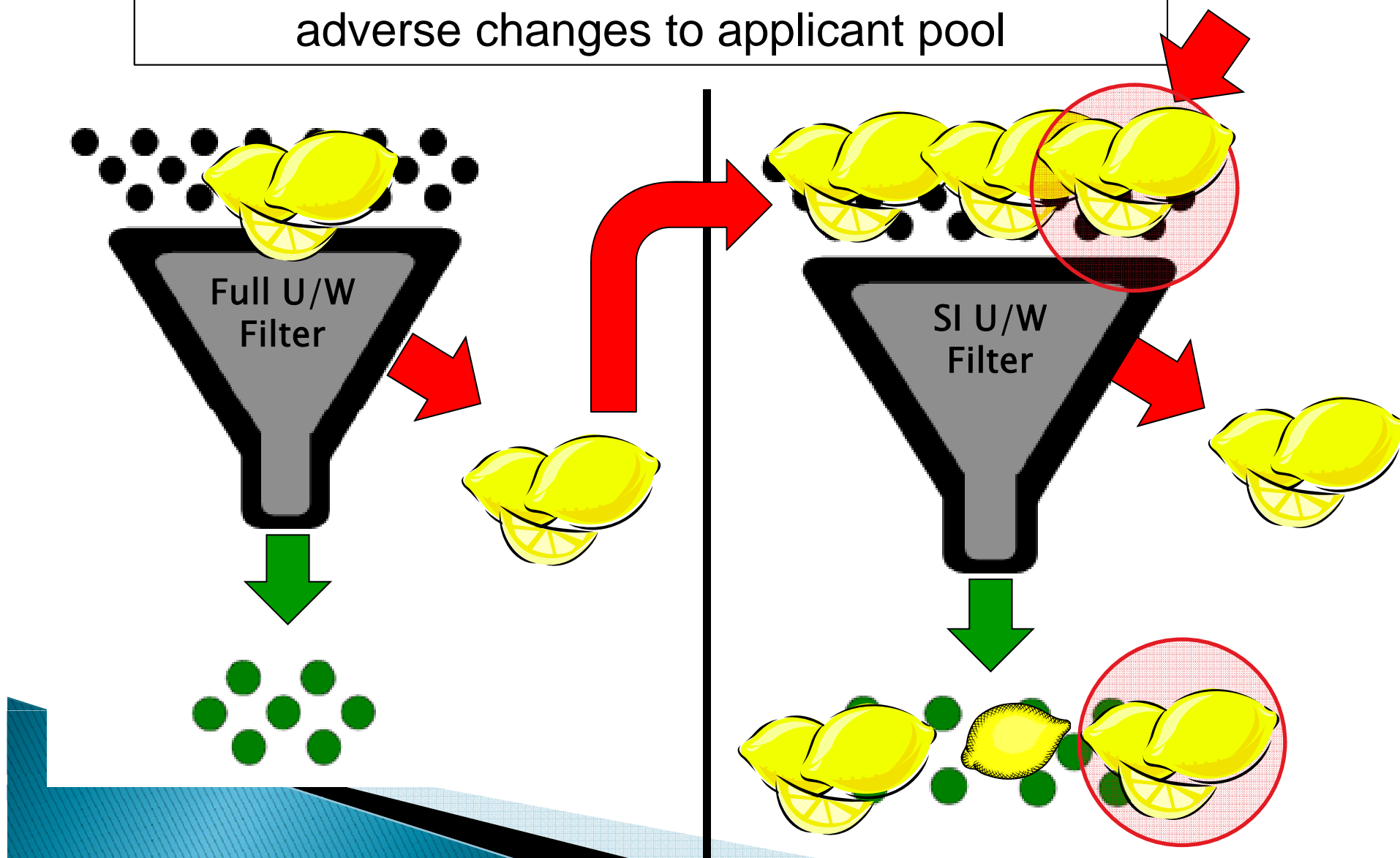
“Simplified Issue” improves **secondary** u/w goals but a few “lemons” may get through



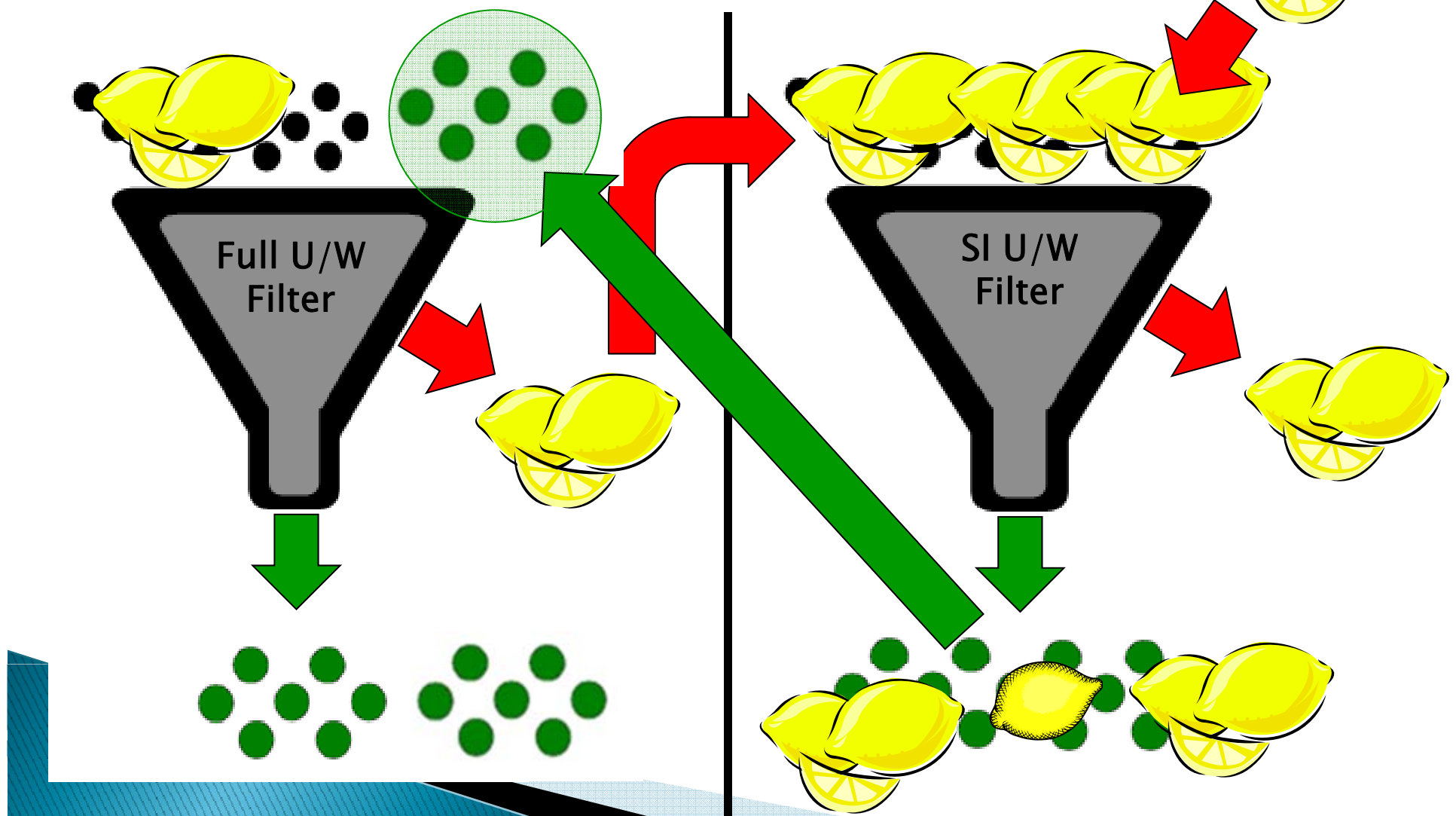
What happens to the **fully underwritten declines**?



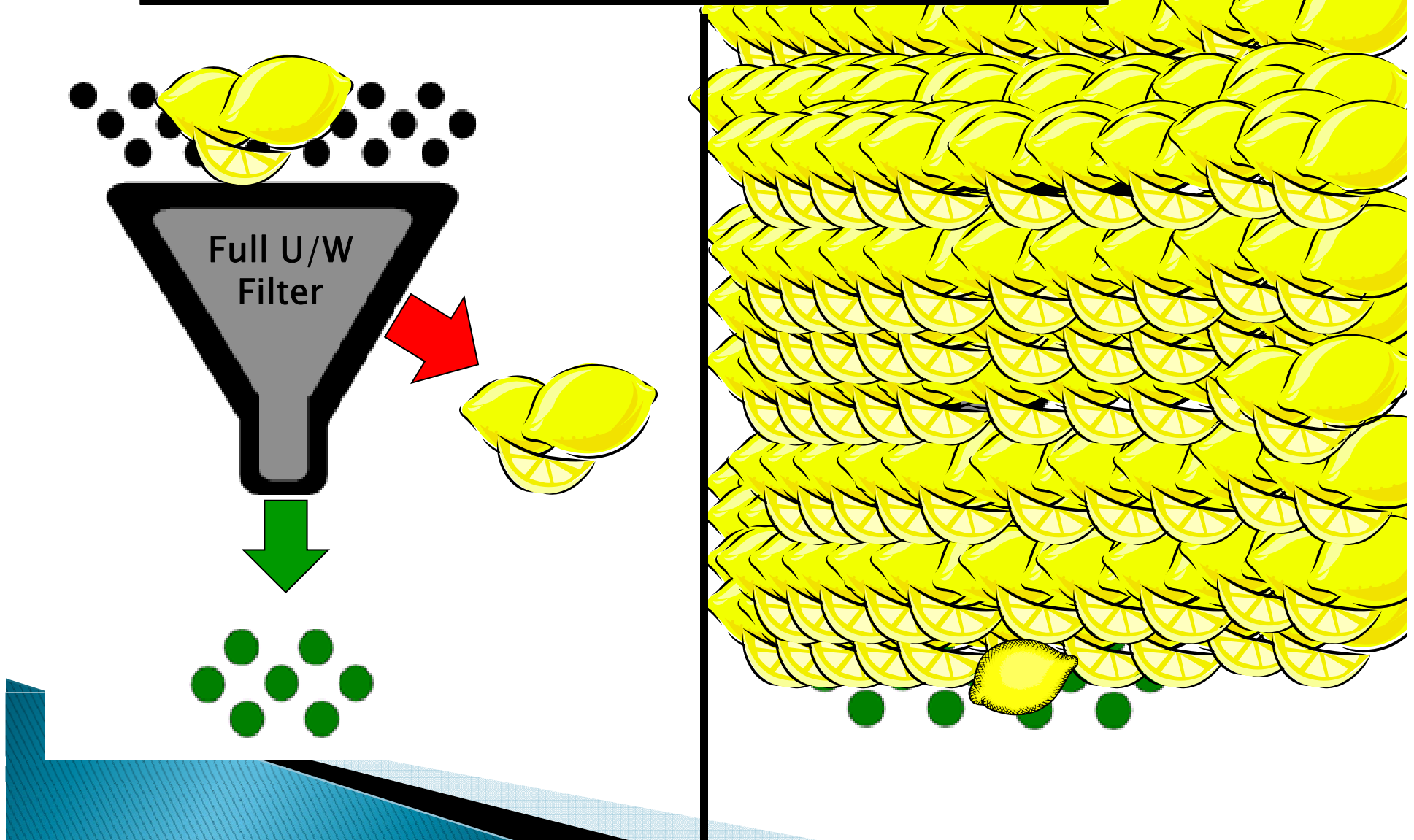
Reduced sentinels may encourage more adverse changes to applicant pool



Anti-selective discontinuance can lead to further deterioration of mortality



The market can **unravel** as information asymmetry and anti-selection increase.



Post-Level Term Experience

Post-level term experience is one of the clearest **observable** demonstrations of anti-selective policyholder behavior.

Report on the
Lapse and Mortality Experience
of Post-Level Premium Period
Term Plans

Sponsored by
The Product Development Section and
The Committee on Life Insurance Research
of the Society of Actuaries

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RGA Reinsurance Company

July 2010



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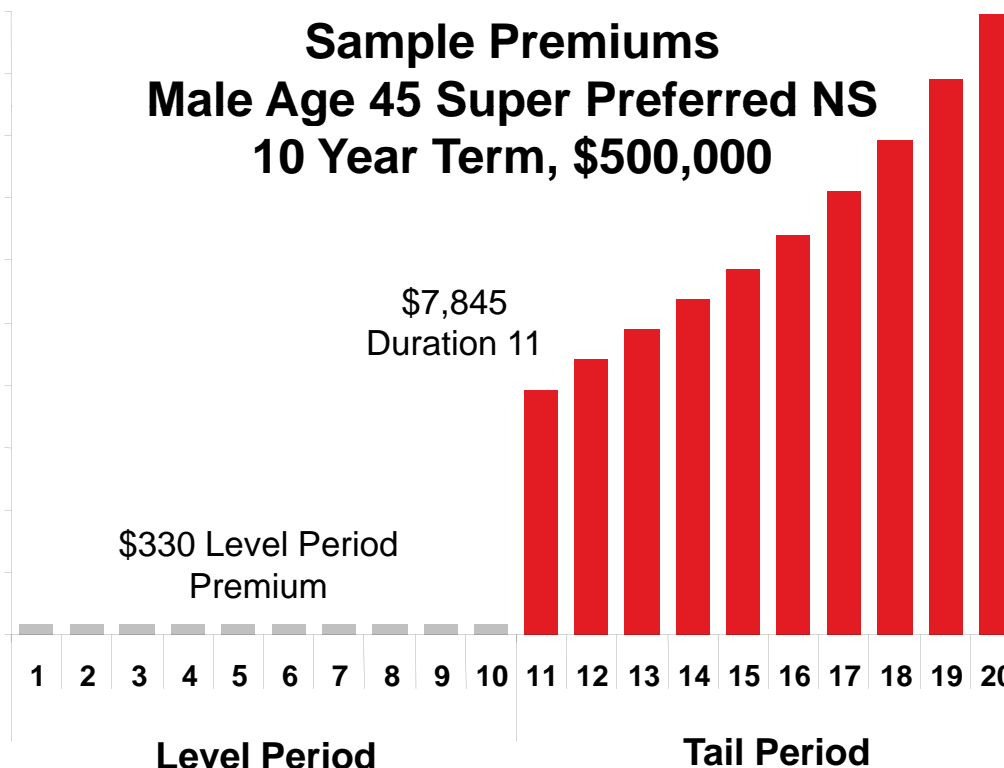
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Annual Premium

Sample Premiums
Male Age 45 Super Preferred NS
10 Year Term, \$500,000

\$7,845
Duration 11

\$330 Level Period
Premium



Who Pays the \$7,845 Rather Than Dropping Coverage or Getting a New Policy?

- The Sick...



- The Lazy...



...and ALL 3 have extra mortality risk!

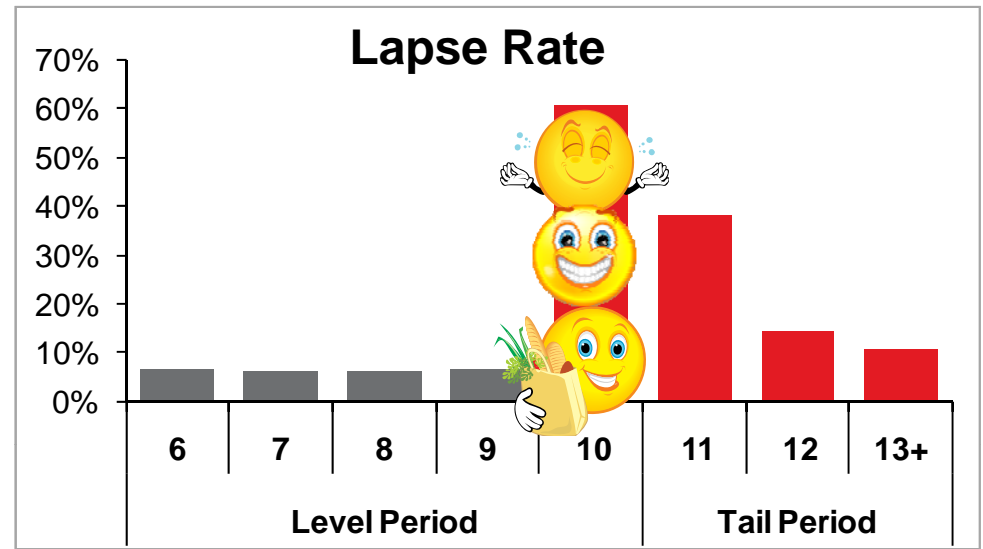
- The Unaware...



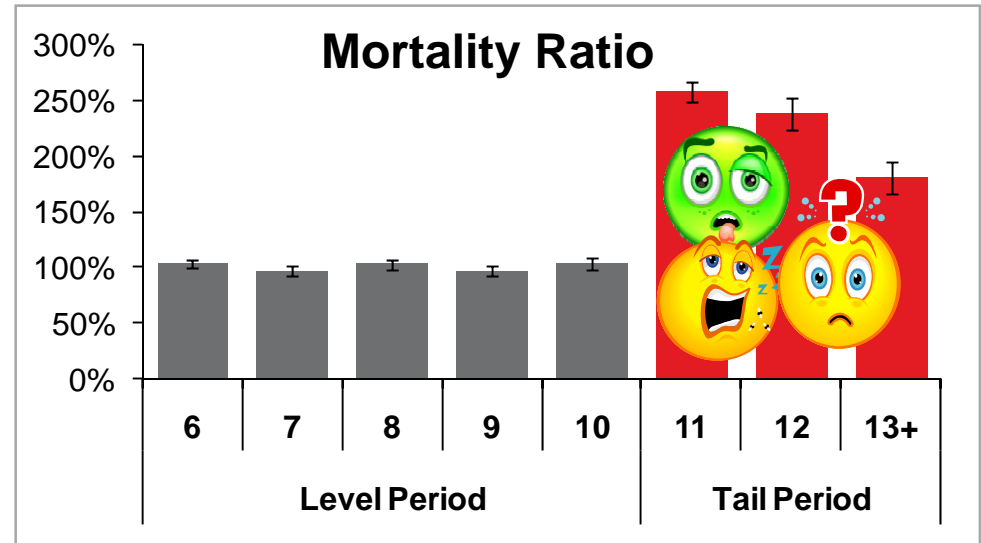
Post-Level Term Experience



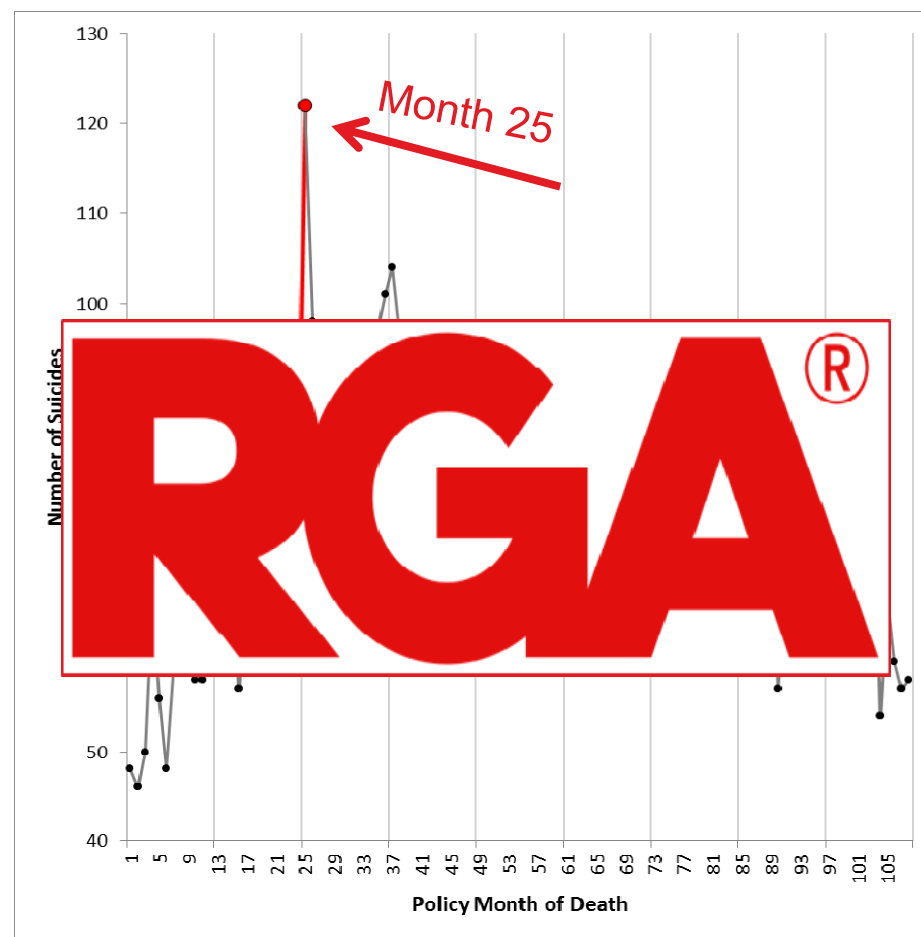
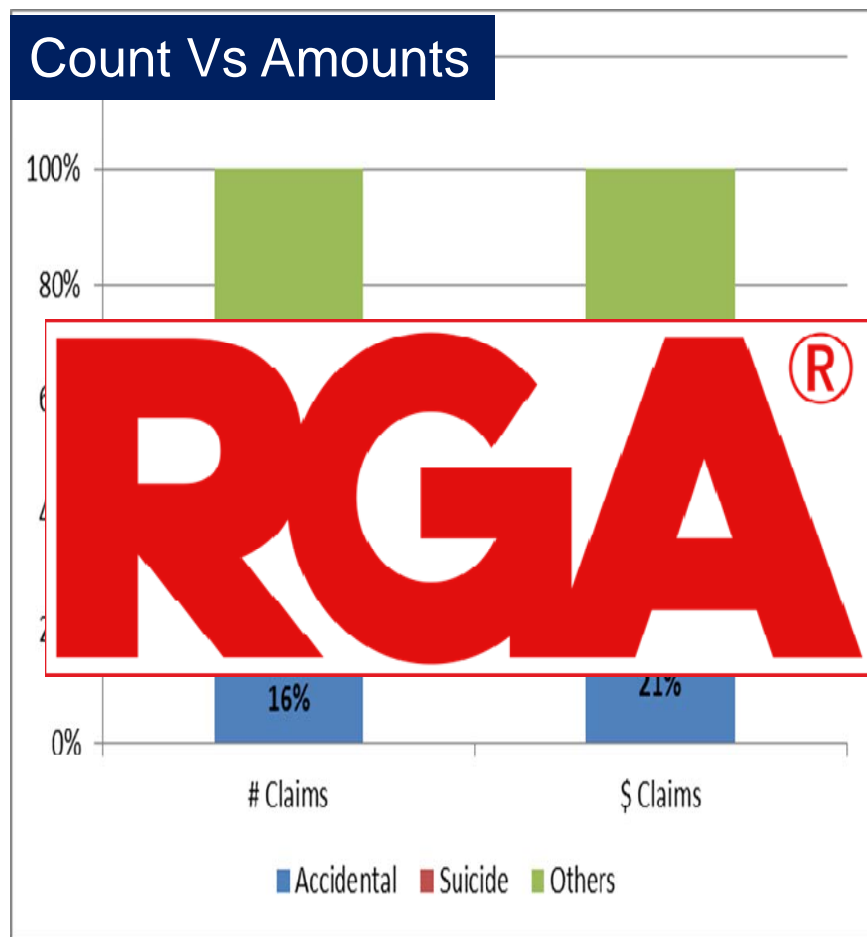
- Sharp increase in premium after level period leads to large anti-selective shock lapse.



- Mortality on persisting policyholders is substantially worse in the post-level period.

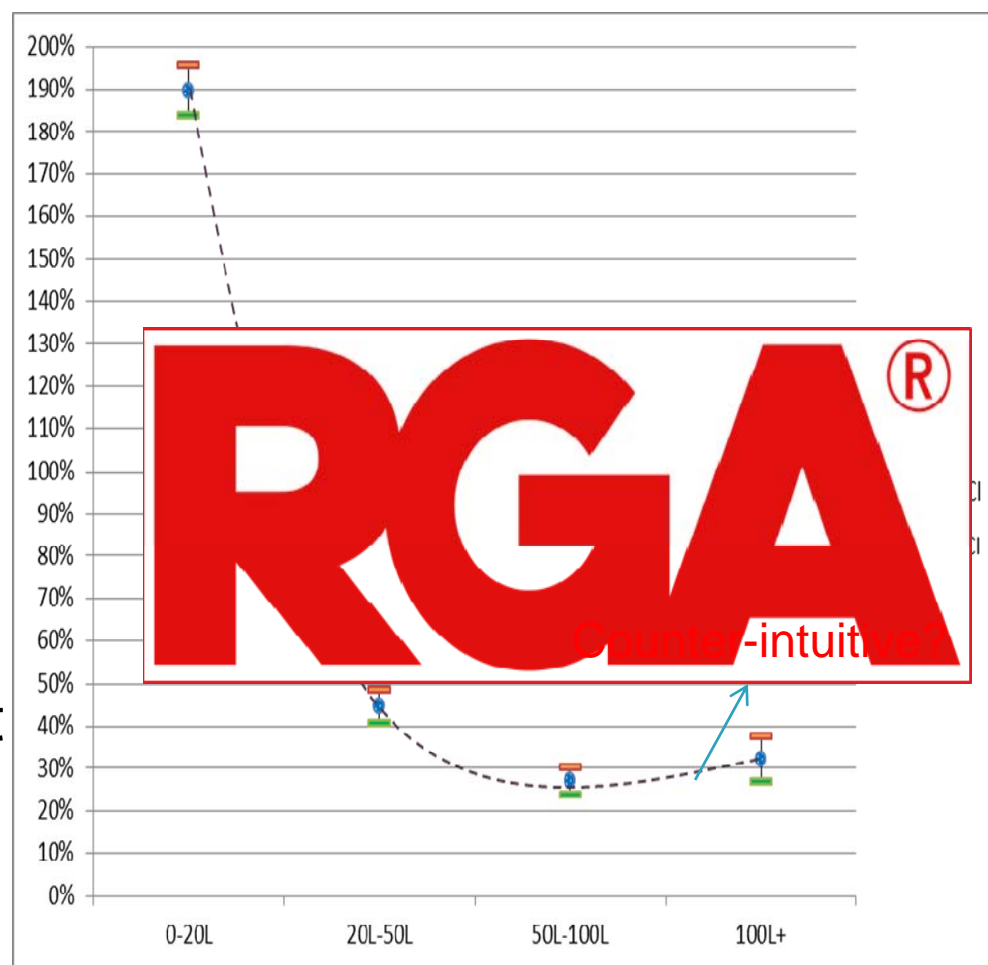


Suicide



Large Size Term Mortality

- Mortality gets heavier beyond a size
- Anti-selection: An applicant's demand for insurance is positively correlated with their risk
- Moral Hazard: Higher suicide and other accident mortality at larger face amounts?



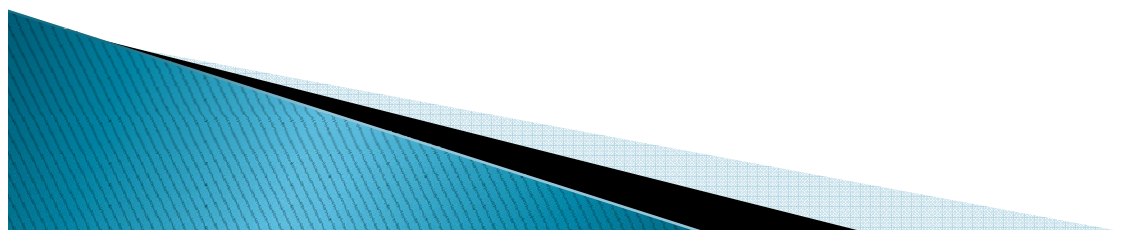
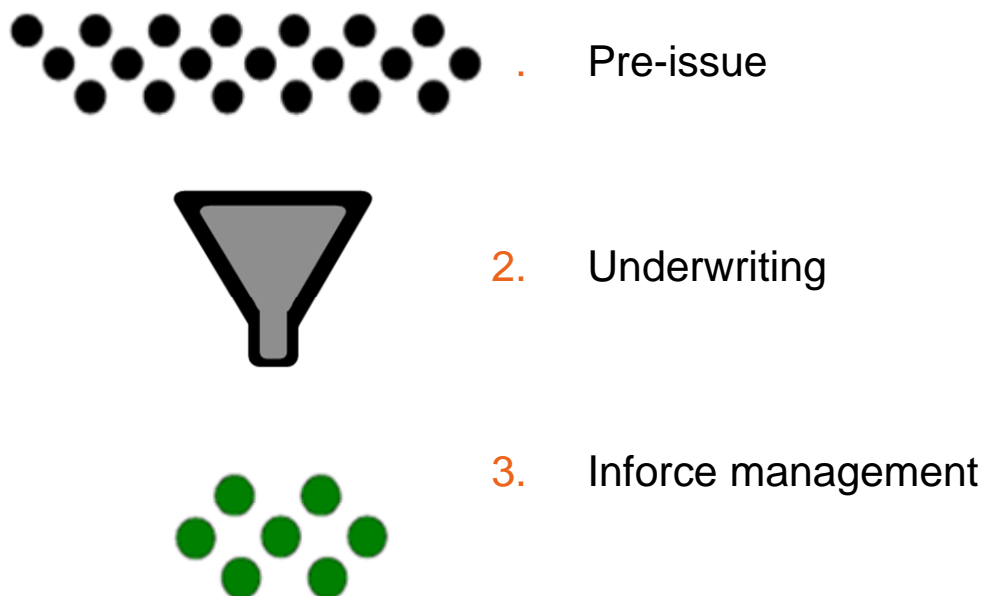
10L = 1million

Source: RGA Internal Studies

Solutions

Surviving in the face of info asymmetry

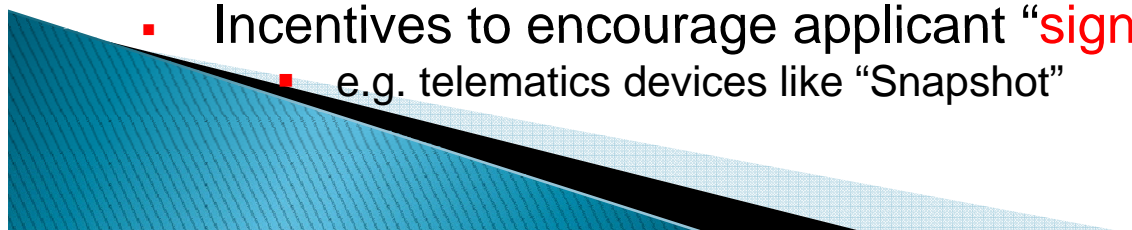
Three opportunities to mitigate or manage the impact of behavior on mortality:



Applicant Pool



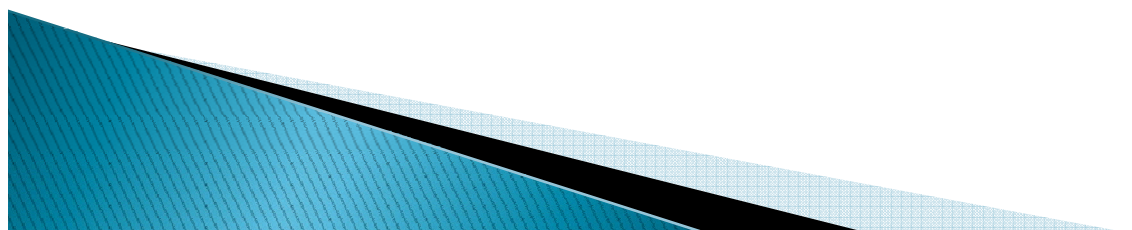
- Improve **sentinels**
 - What applicants think you know might be as valuable as what you actually know.
- Broaden exposure base
 - Higher participation rates lead to reduced anti-selection (e.g. COLI, car insurance, non-contributory group coverage, single payer systems)
- Link insurance sale to **need** or life event
 - Financial planning, education savings, home mortgage
- Price competitively
 - Don't discourage good risks from applying (price increases can lead to death spiral)
- Target marketing/pre-screening
 - Predictive modeling and analytics
- Incentives to encourage applicant "**signaling**"
 - e.g. telematics devices like "Snapshot"



Underwriting Filter



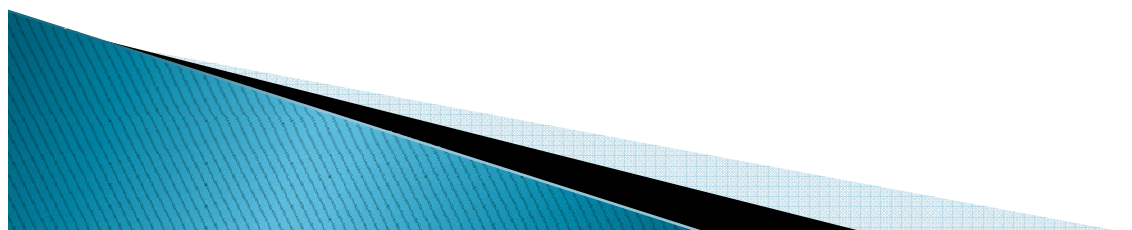
- Maintain sound underwriting practices
 - Don't forget about "primary" underwriting goals
 - Gather the evidence required to assess risk appropriately
 - Reflexive interviews may bring more clarity to application disclosures
- Improve vigilance on **financial underwriting**
 - Coverage amount should be proportional to need, not risk
- Increase insurers' **access** to verifiable information on applicants to reduce information asymmetry
 - Health and prescription drug histories, prior underwriting disclosures, motor vehicle records, criminal history, cognitive screening, etc.



Inforce Management

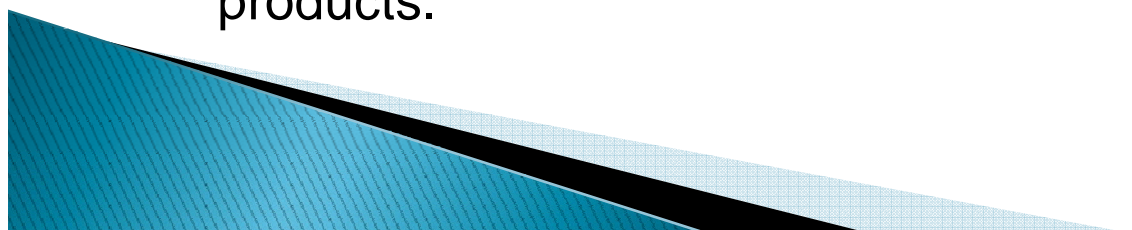


- Maintain sound **claims management** practices
- Enact **smart** policyholder retention/conversion programs
- Avoid abnormally rich benefits or policy wording that may encourage moral hazard (or malingering).
- Identify targeted cross-marketing opportunities
- Encourage **favorable** policyholder behavior
 - Wellness credits for health maintenance



Conclusions

- **Personal decisions** have a major influence on most causes of death and disease
- **Behavioral dynamics** should play a big role in how actuaries think about setting actuarial assumptions
- **Changes in general population lifestyle factors** could have a profound impact on forward-looking mortality expectations
- **Sound underwriting** will focus on analyzing all reasonable information to identify applicant behaviors that could impact mortality risk
- Do not ignore the “lemons” problem created by increased **information asymmetry** between buyers and sellers of insurance products.



Thank you for your attention.

