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GULF ACTUARIAL SOCIETY



Behavioral Drivers of Experience Results

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Direct Effects



How does behavior affect Mortality?

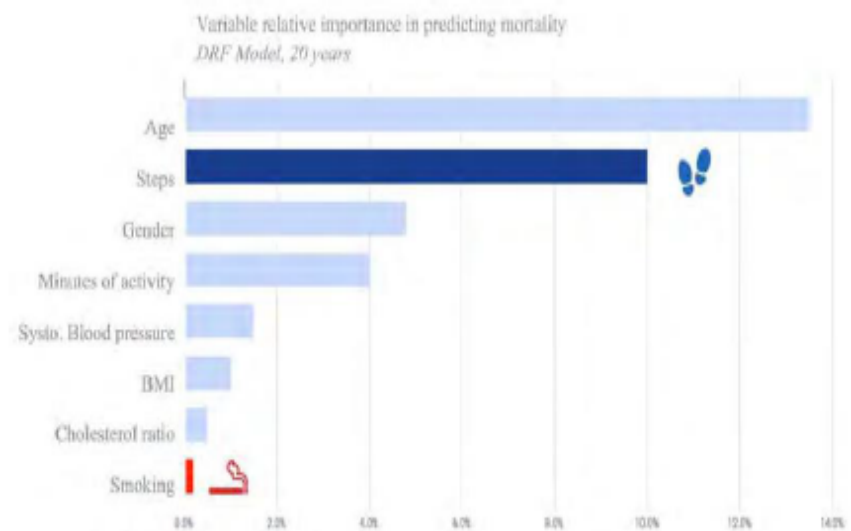
Policyholder behavior affects directly their own individual risk

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



Sitting is the new smoking?

Why **NEW** data matters



Activity metrics

10X

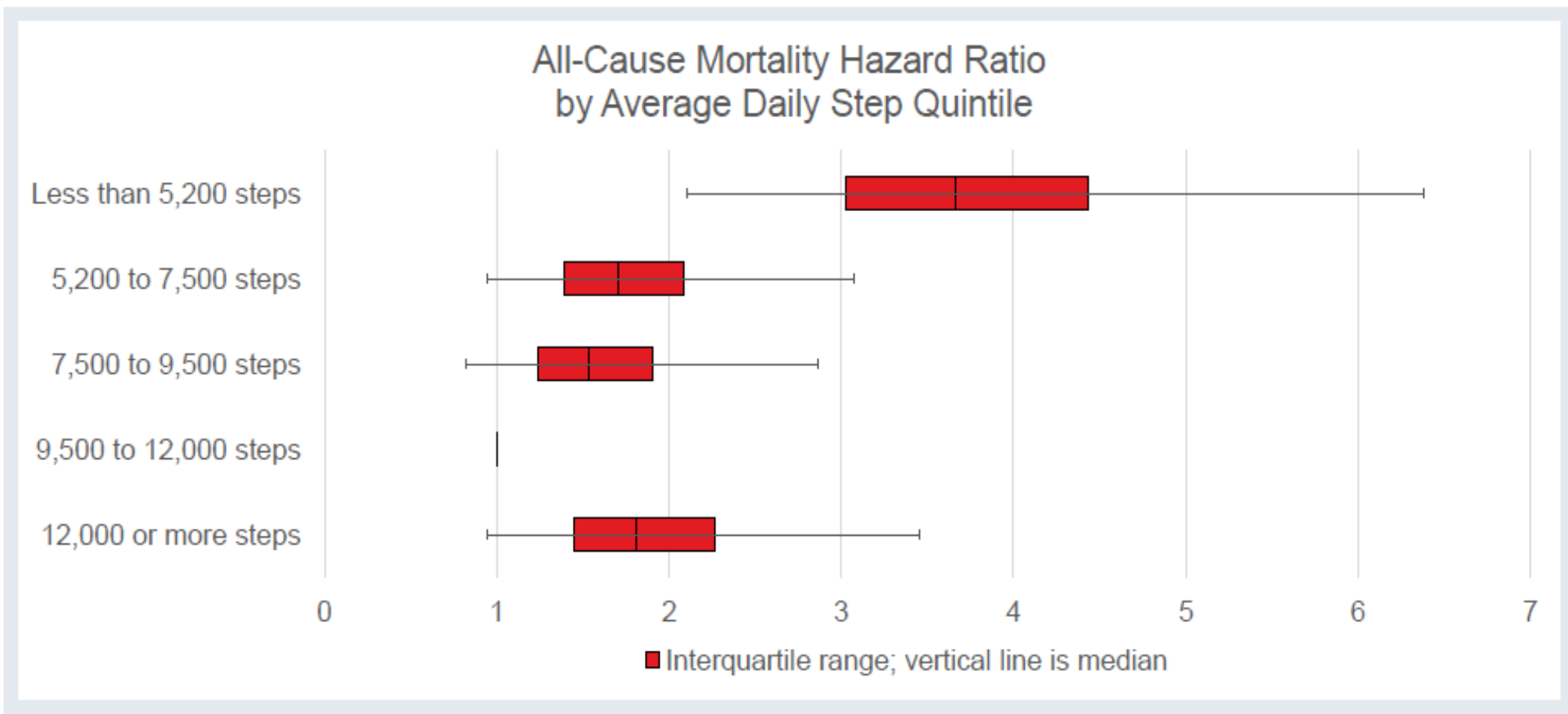
More
Predictive of
Mortality than
Smoking

Sitting really is the new smoking

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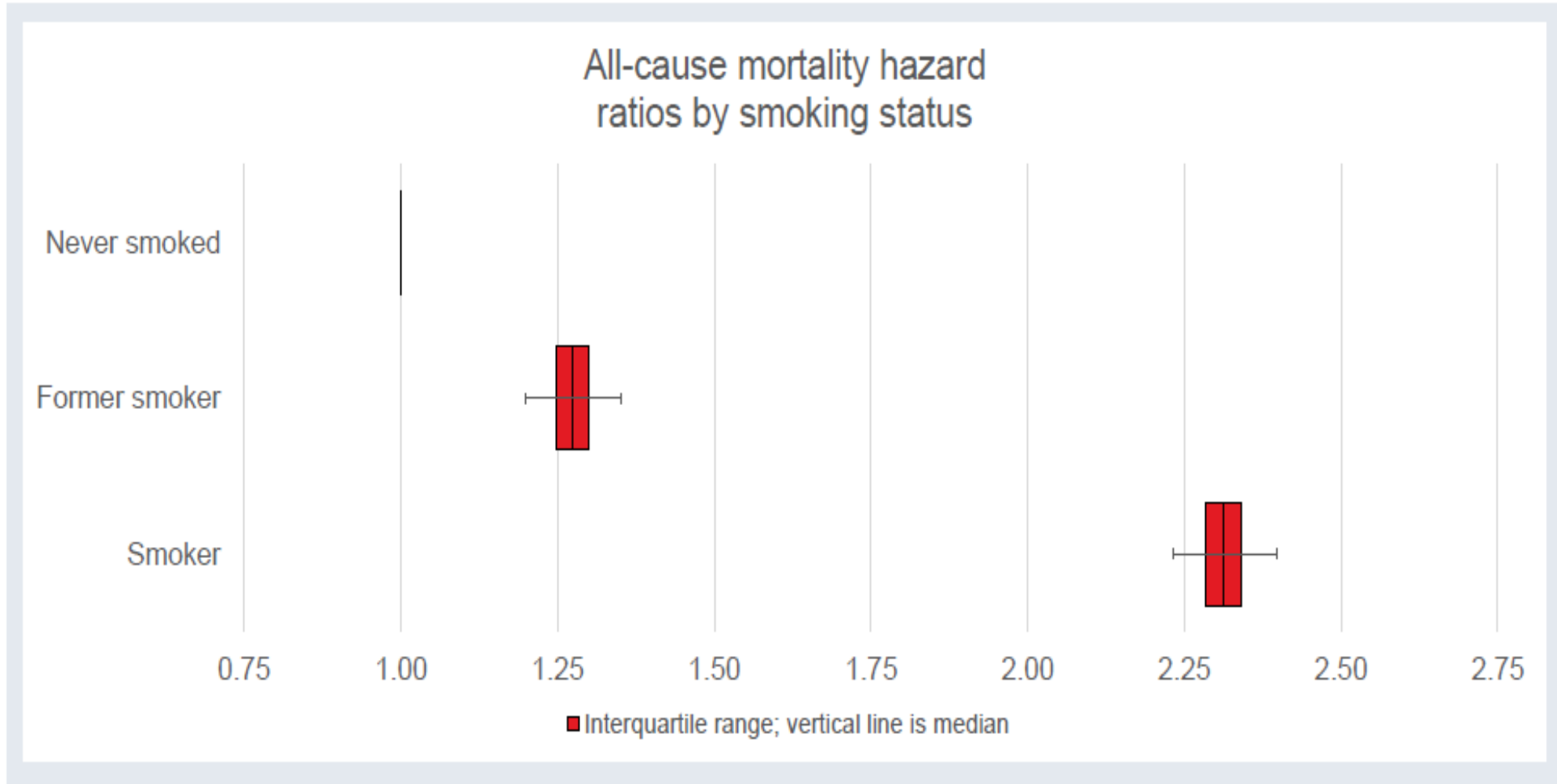
People with lower steps do have high mortality



Multivariate model adjusts for: age, sex, smoking, disease history, health status, income and ability to walk a quarter mile.

Source: RGA analysis of NHANES III data, 2005-2006 survey. <https://www.cdc.gov/nchs/nhanes/Default.aspx>

Smoking is still bad

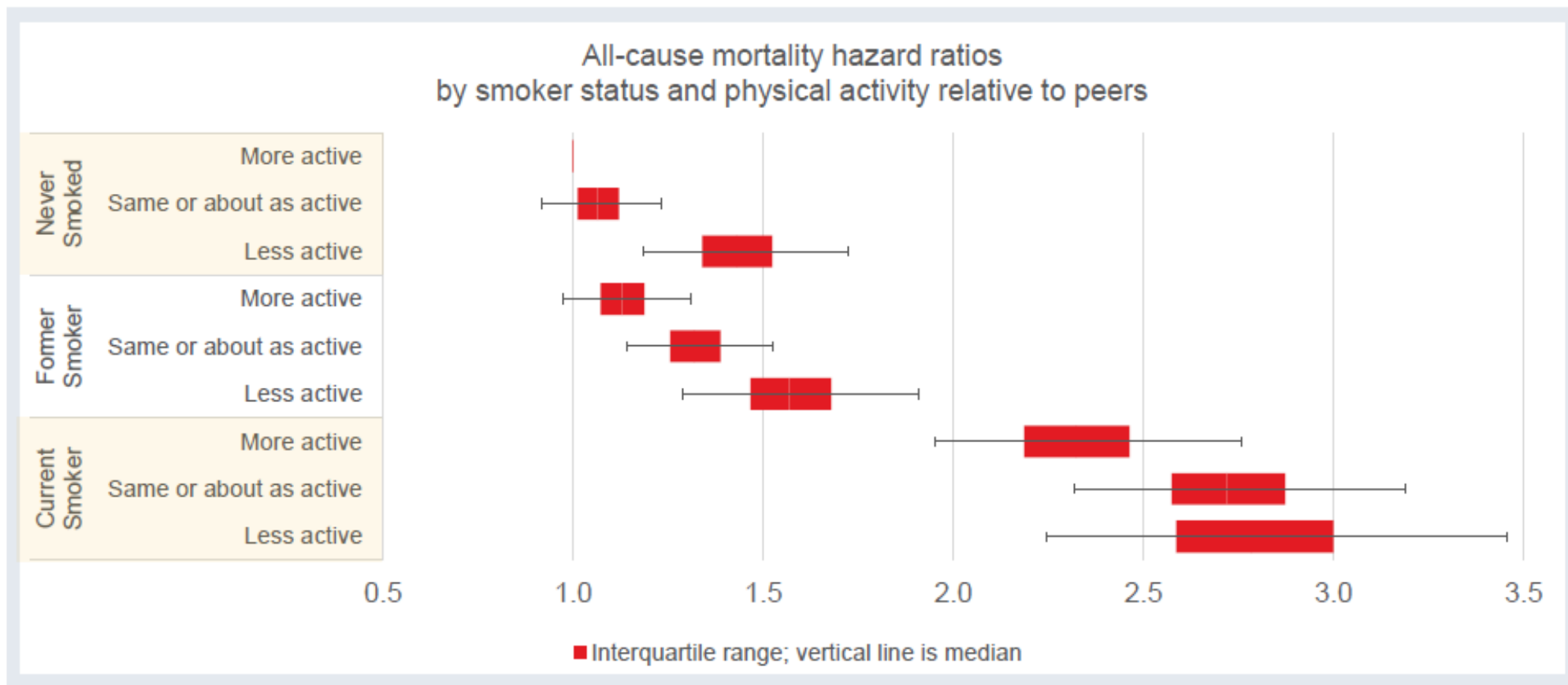


Multivariate model adjusts for: age, sex, smoking, disease history, health status, income and ability to walk a quarter mile.

Source: RGA analysis of NHIS data, 1987-2009, <https://www.cdc.gov/nchs/nhis/index.htm>

Smoking and exercise both impact mortality

No amount of exercise can remove the risk of smoking

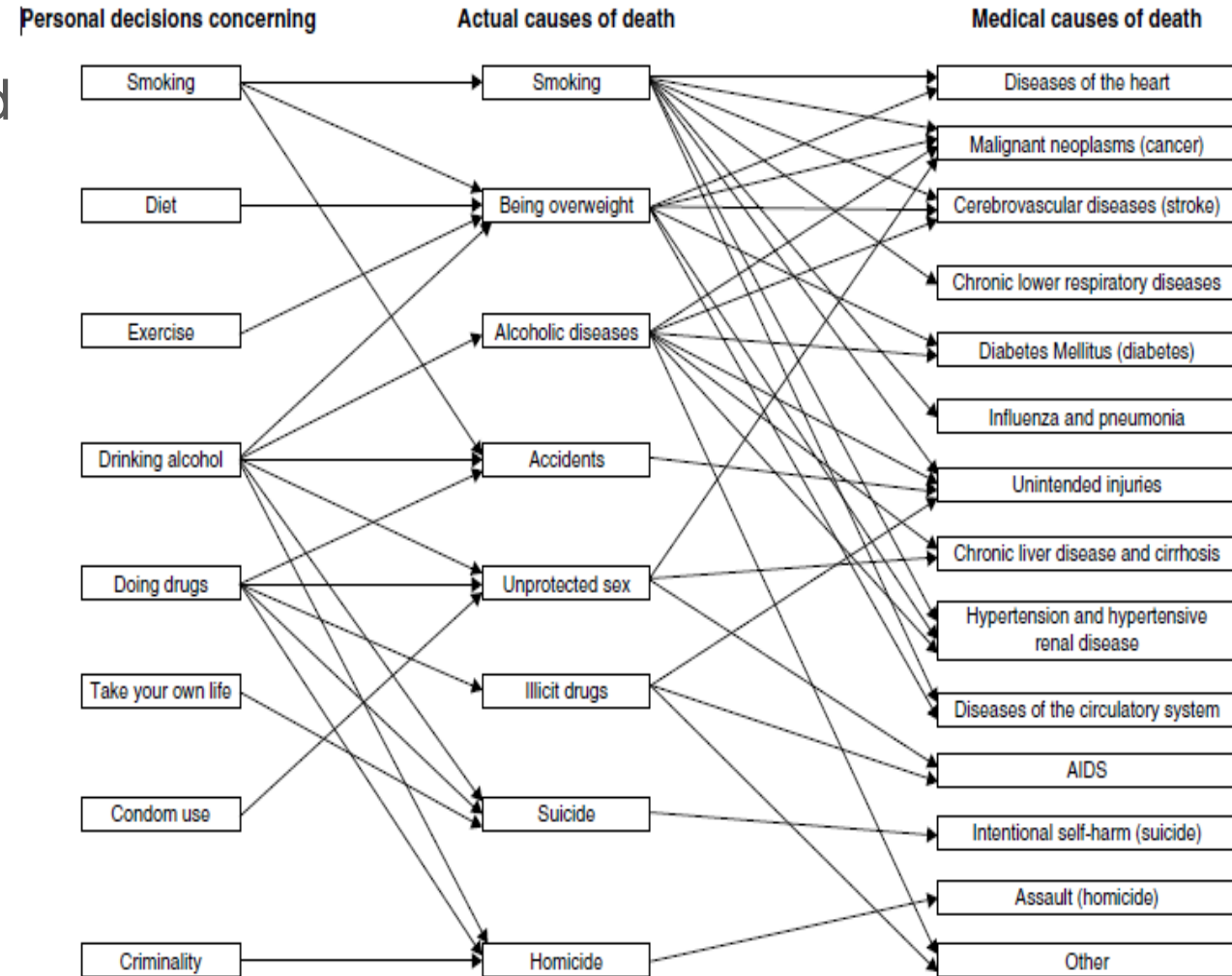


Multivariate model adjusts for: age, sex, smoking, disease history, health status, income and ability to walk a quarter mile.

Source: RGA analysis of NHIS data, 1987-2009, <https://www.cdc.gov/nchs/nhis/index.htm>

Personal behavior is the leading cause of death

- Over one million of the 2.4 million [US] 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



Unnatural Cause of death

Experience Study

Cause	Finding
Motor Vehicle Accidents	After years of significant improvement in all countries, the last few years show that improvement has leveled off or declined in most countries
Accidental Poisoning (incl. drug overdoses)	Significant worsening in the United States (U.S.), United Kingdom (U.K.), Canada, and France. France is notable in that older people contributed more to the decline than younger people.
Suicide	Low rates in the U.K. and Italy. Highest in the U.S. and France. Suicide rates have steadily increased in the U.S. for the last 15 years, while steadily decreasing in France over the past 30 years. Canada has also seen rates increase in recent years.
Homicide	Homicide rates are a problem limited mostly to the U.S. After years of general improvement, rates have begun climbing again in the most recent years. The increase in the U.S. between 2013 and 2016 alone would be larger than the total rate for most countries in the most recent year of data.



The 2015 report stated that the U.S. is the only country to see periods of unnatural death mortality deterioration. That is no longer the case. Canada, the U.K., and even Hong Kong SAR have experienced deteriorating unnatural death mortality since 2011.

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Indirect Effects



How does behavior affect Mortality?

Information Asymmetry

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

Policyholder behavior changes the relative risk of the insured pool



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

Insurance vs Used-car market

What is common between them?

- 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



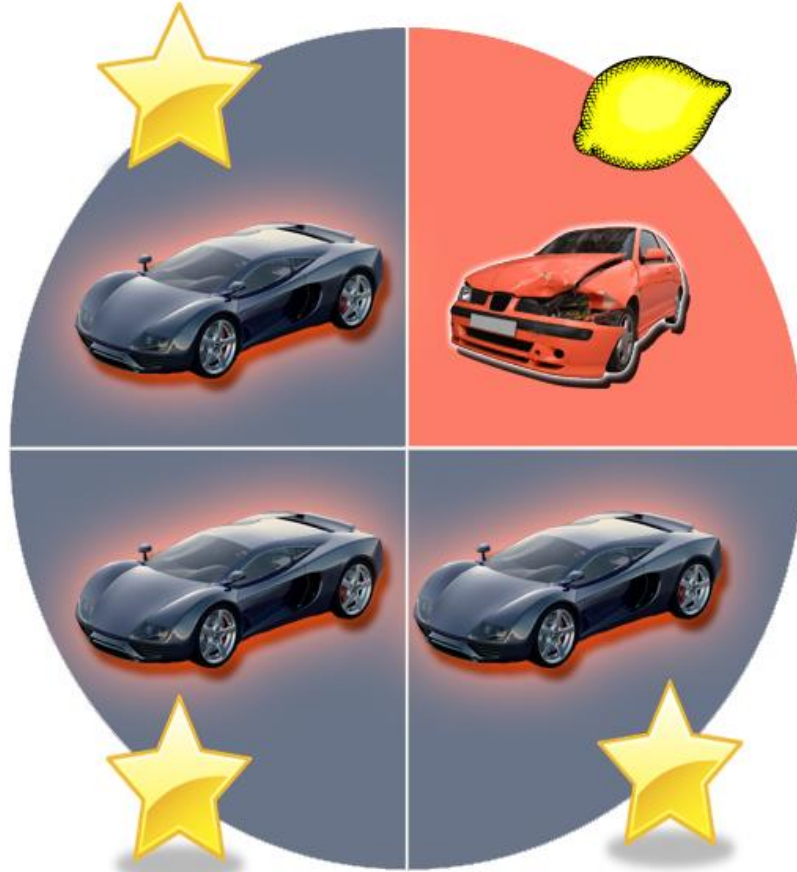
A Simple Illustration

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!

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 Underwriting

The balancing act

Primary Goals

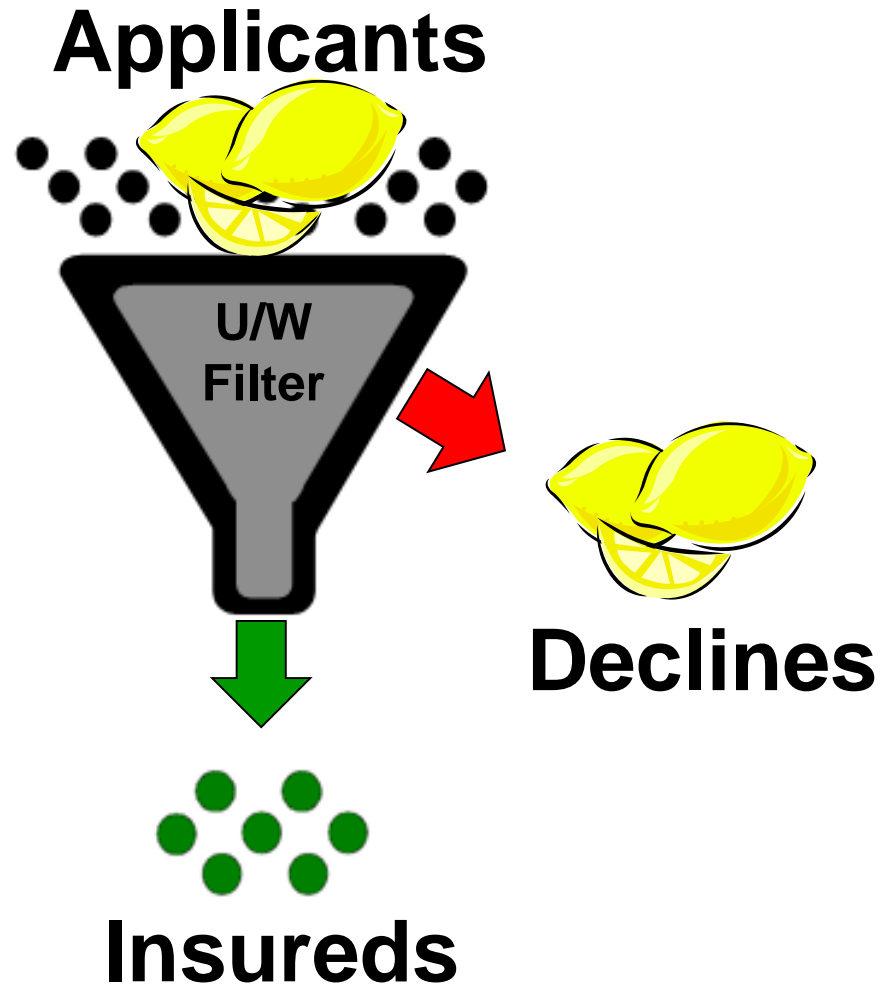
- Minimize adverse selection by reducing information asymmetry
- Accurately assess risk profile
- Uncover existence and severity of medical impairments
- Provide sentinel to discourage agent/applicant anti-selection

Secondary Goals

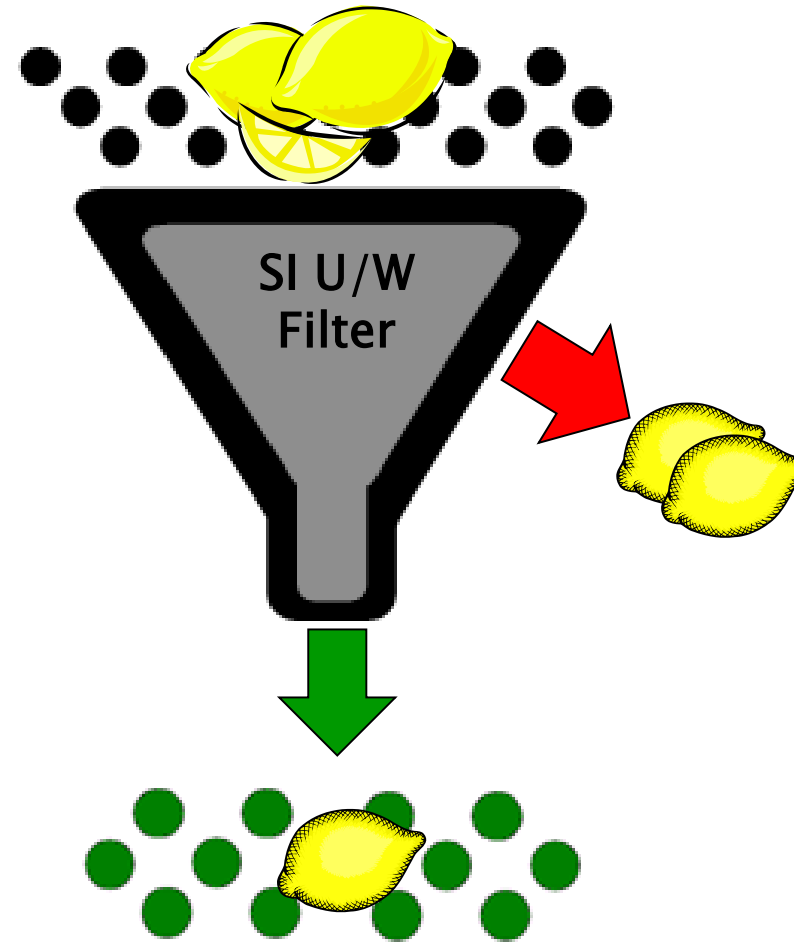
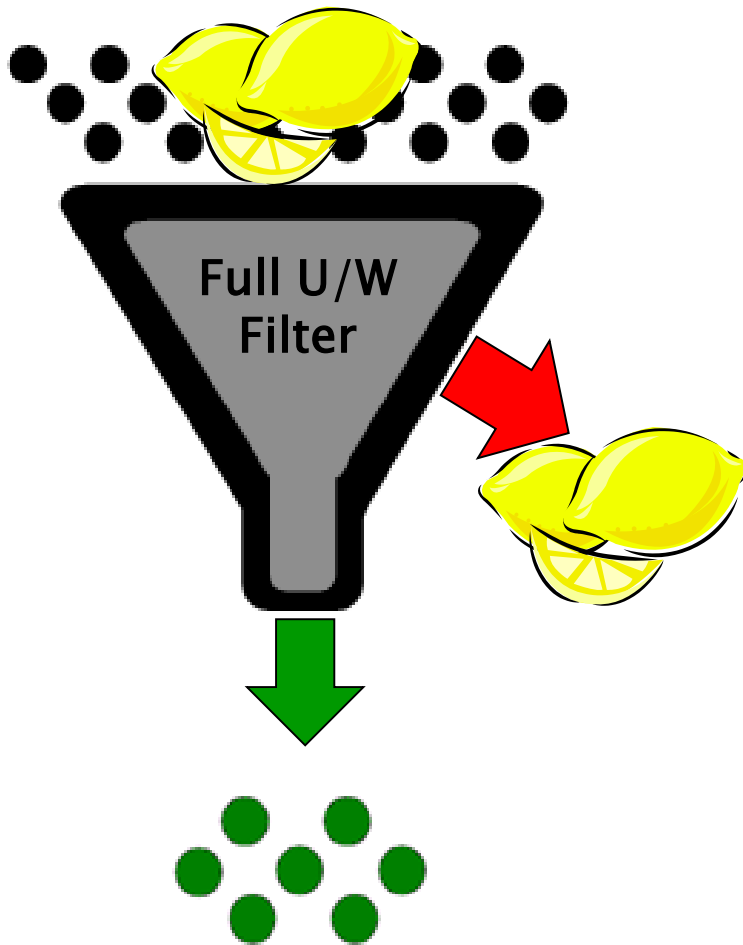
- Make decisions as quickly as possible
- Minimize intrusiveness to applicant and agent
- Minimize underwriting costs
- Maximize case placement rates



Underwriting reduces the information asymmetry between applicants and insurer



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



Simplified issuance

Simplified issue business mortality experience is much worse than that for fully underwritten policies sold at similar face amounts.

Why?

Placed case mortality is determined by:

A) Applicant Pool



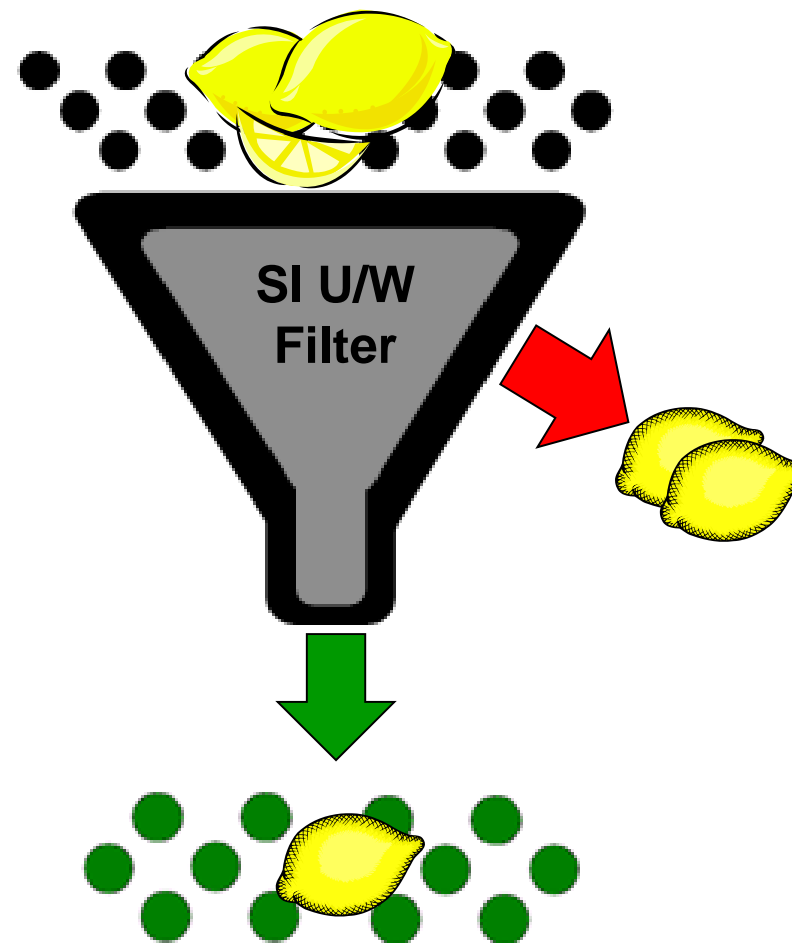
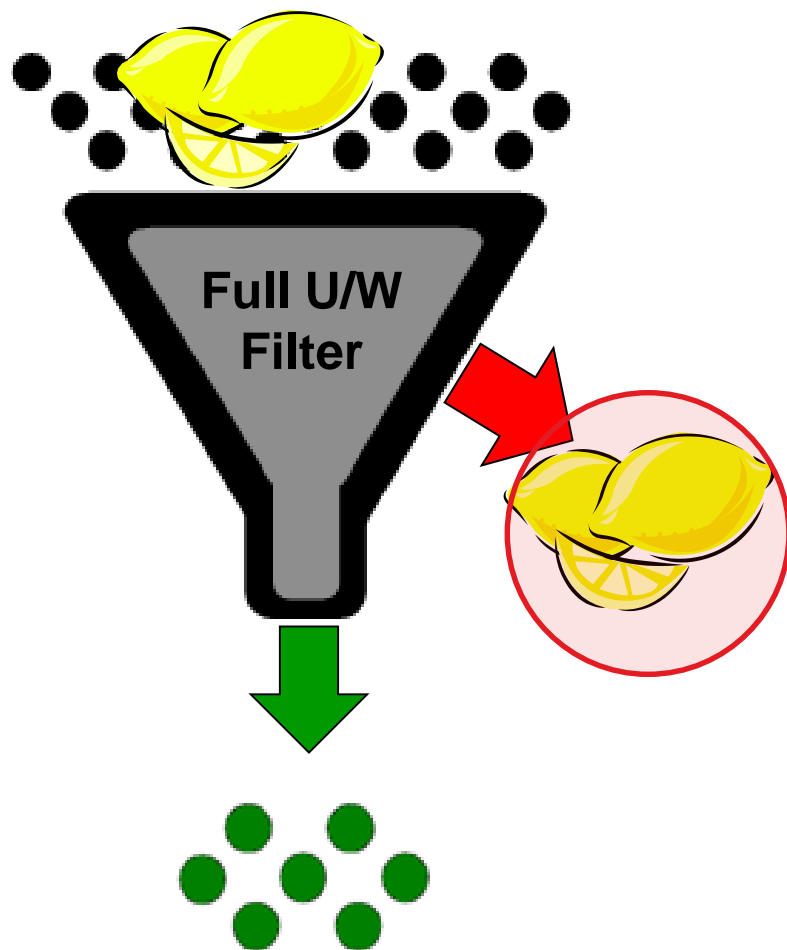
PLUS



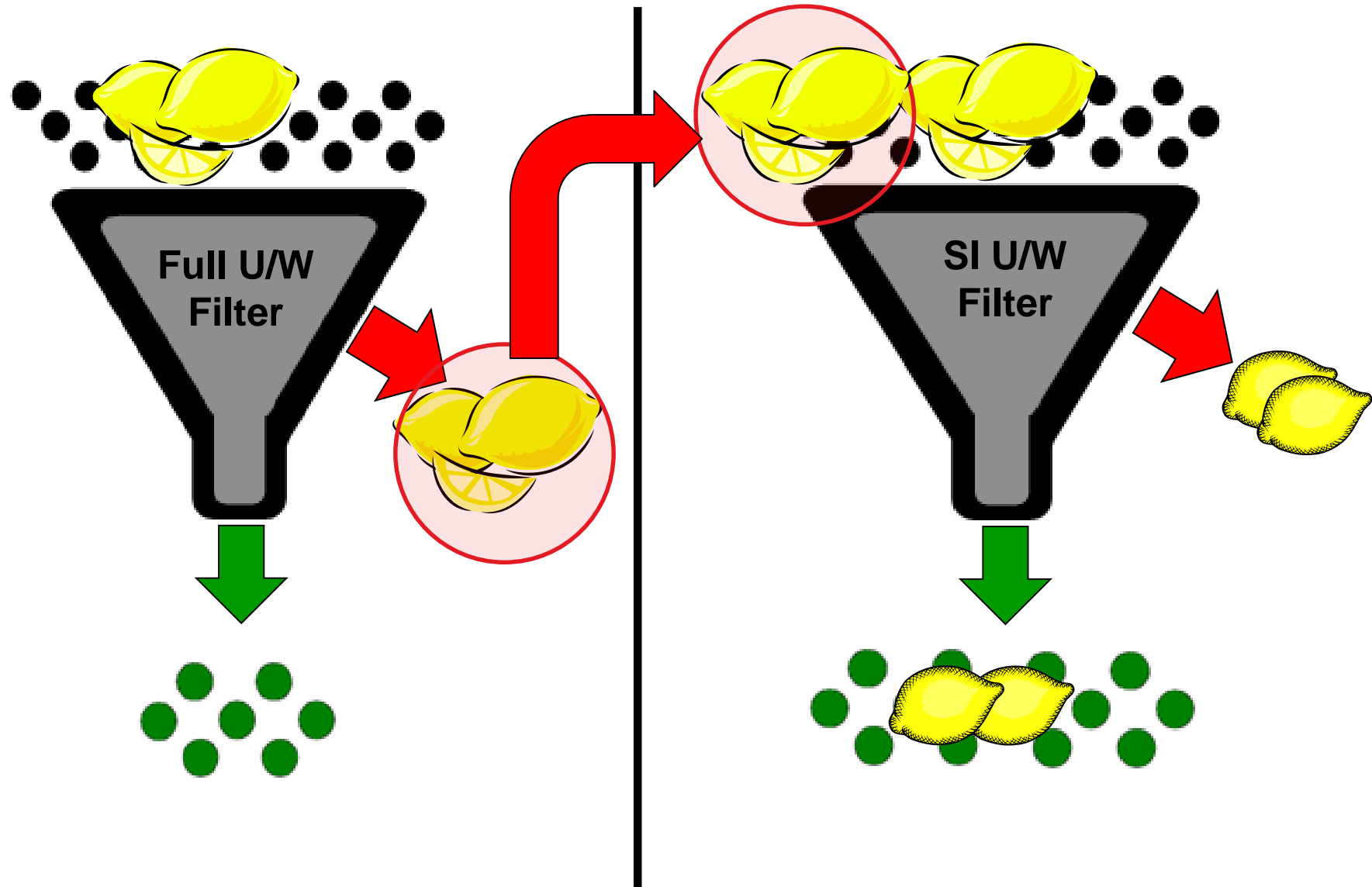
B) Underwriting Filter



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

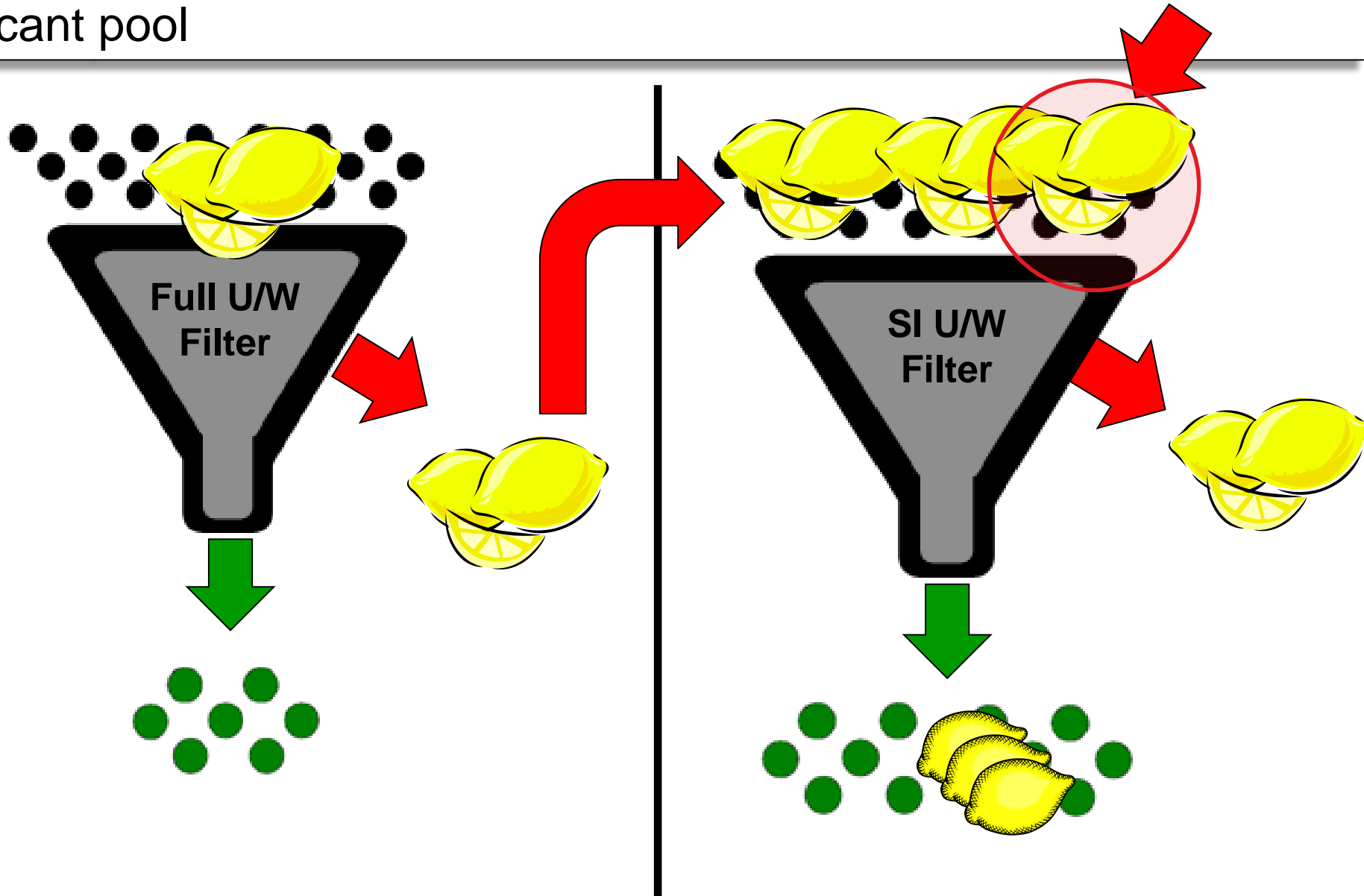


The **applicant pool** begins to change when Fully U/W declines become SI applicants

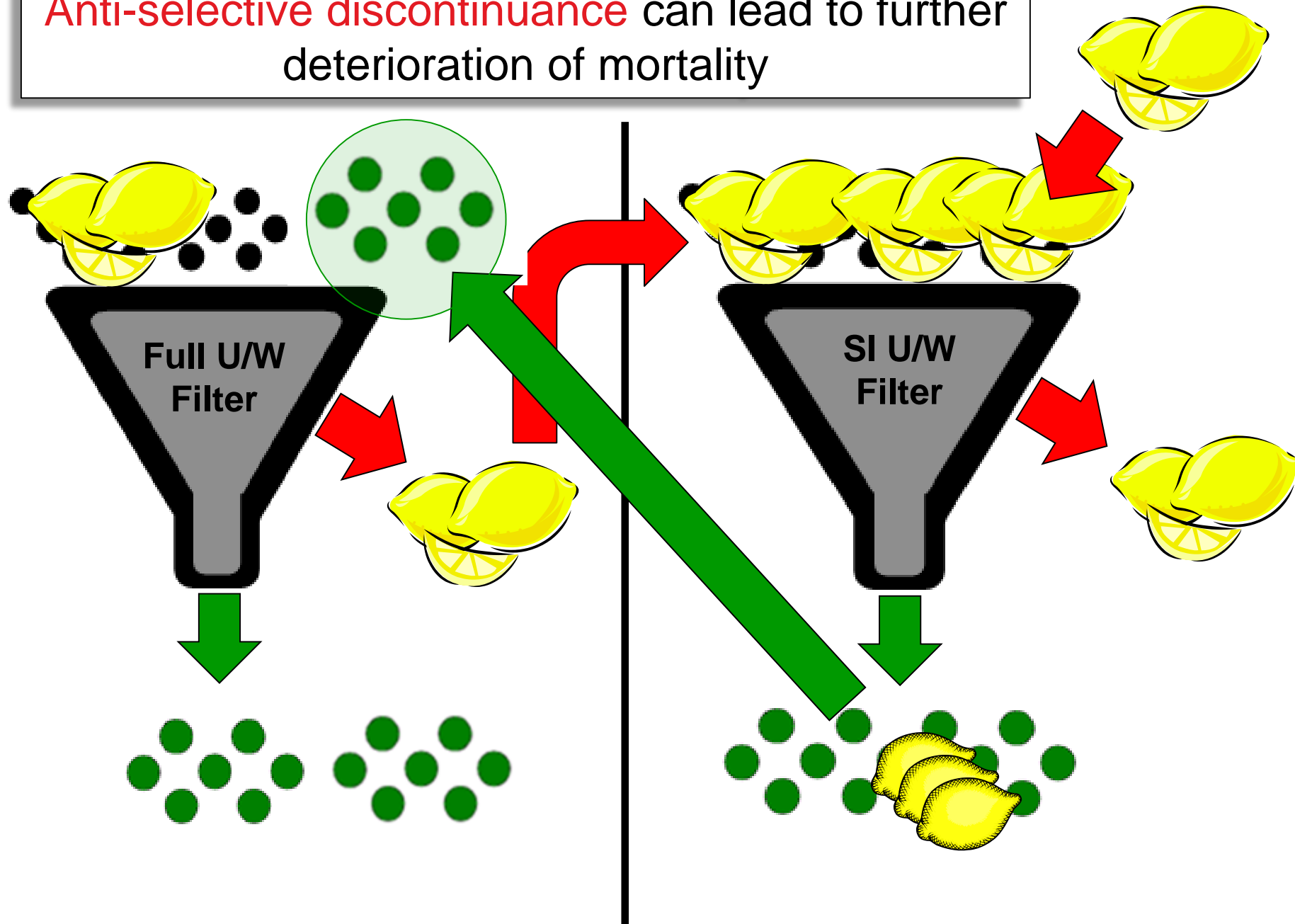


What About Those Who Don't Bother Applying for Fully U/W?

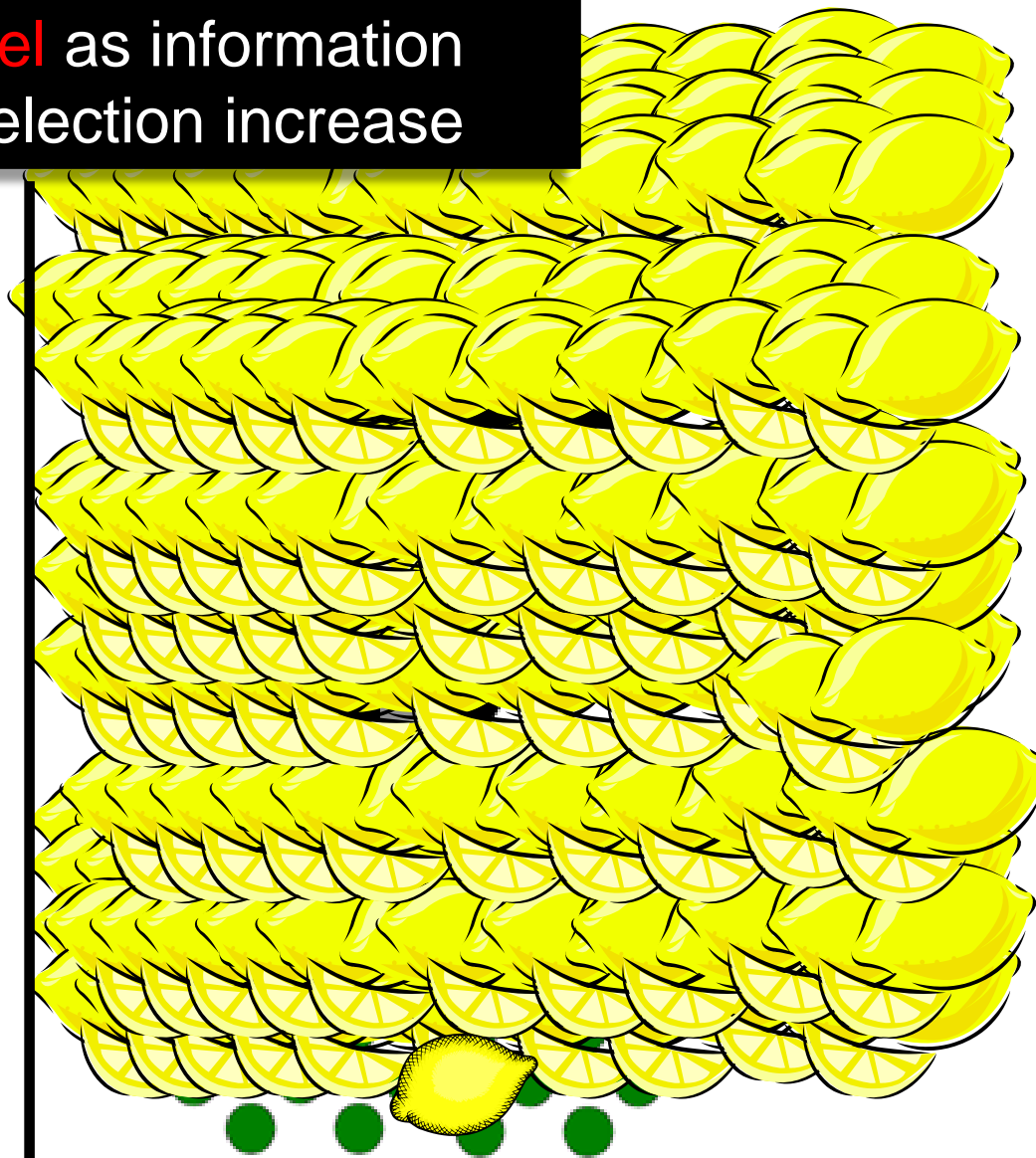
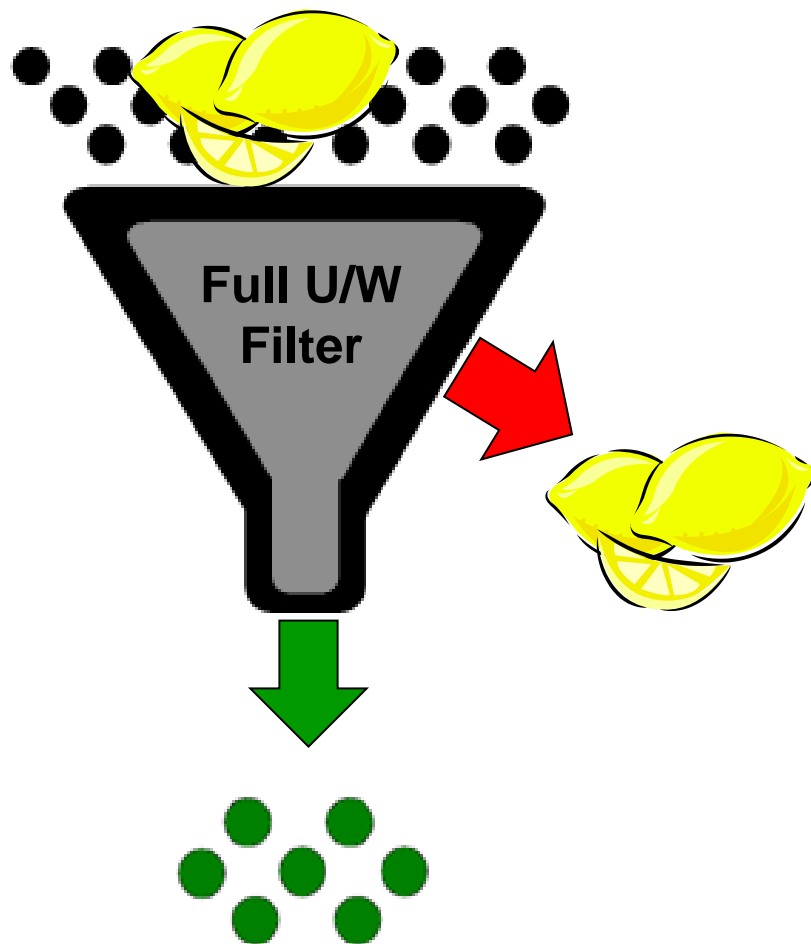
Reduced sentinels may encourage more adverse changes to applicant pool



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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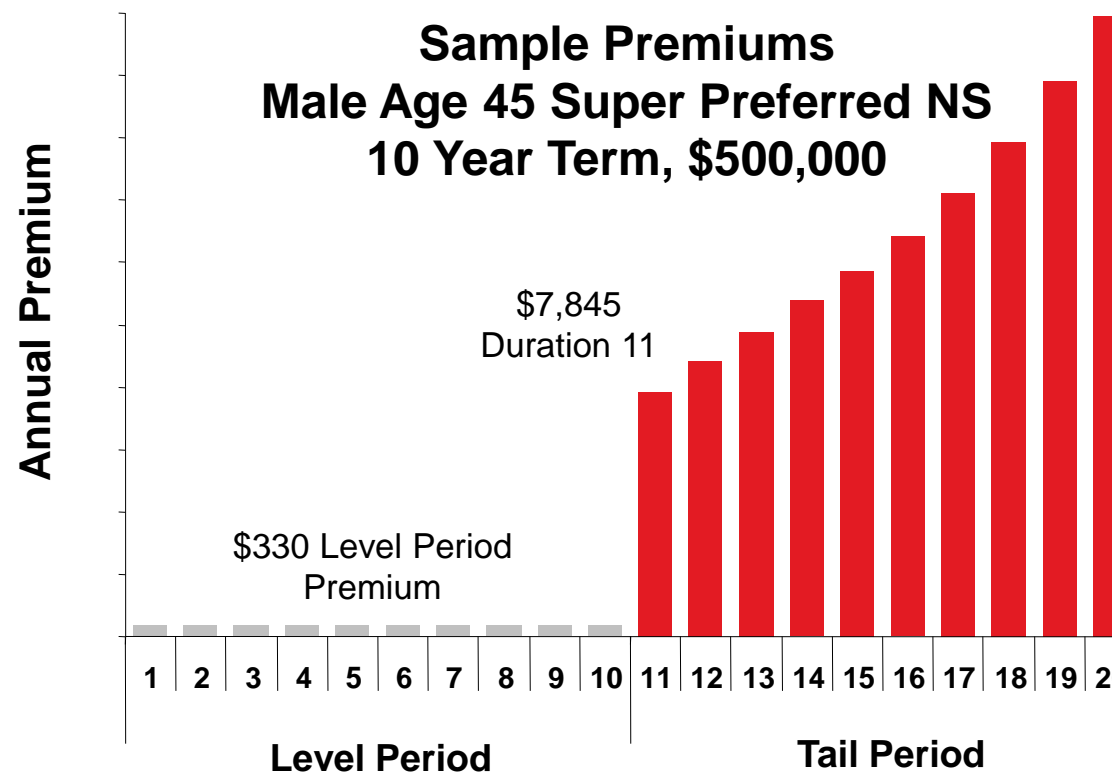
RGA Reinsurance Company

July 2010



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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!

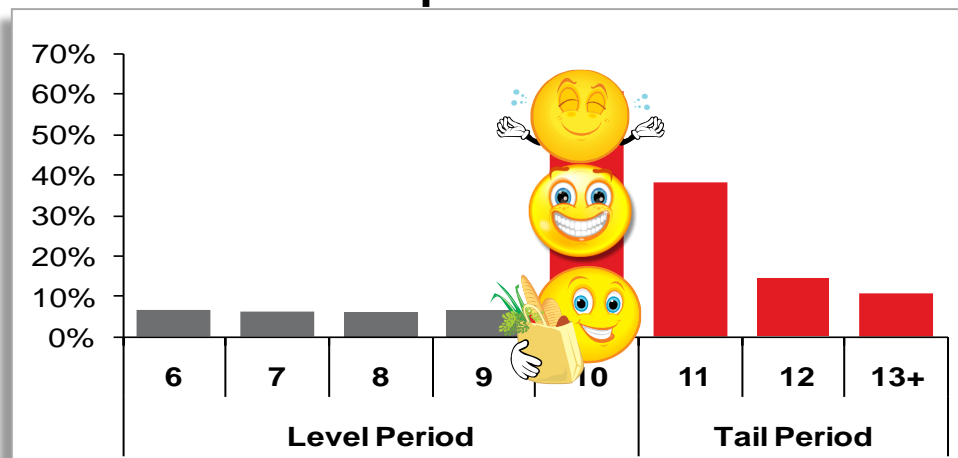
- The Unaware...



Post-Level Term Experience

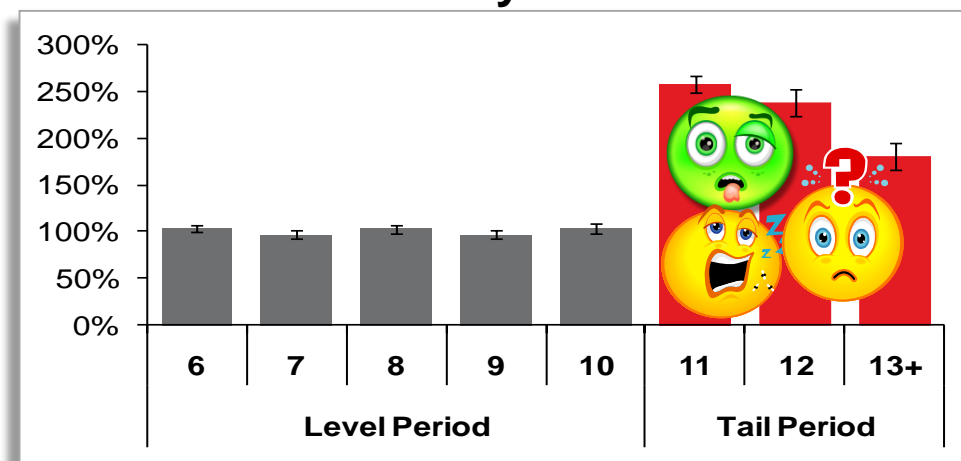
- Sharp increase in premium after level period leads to large anti-selective shock lapse.

Lapse Rate



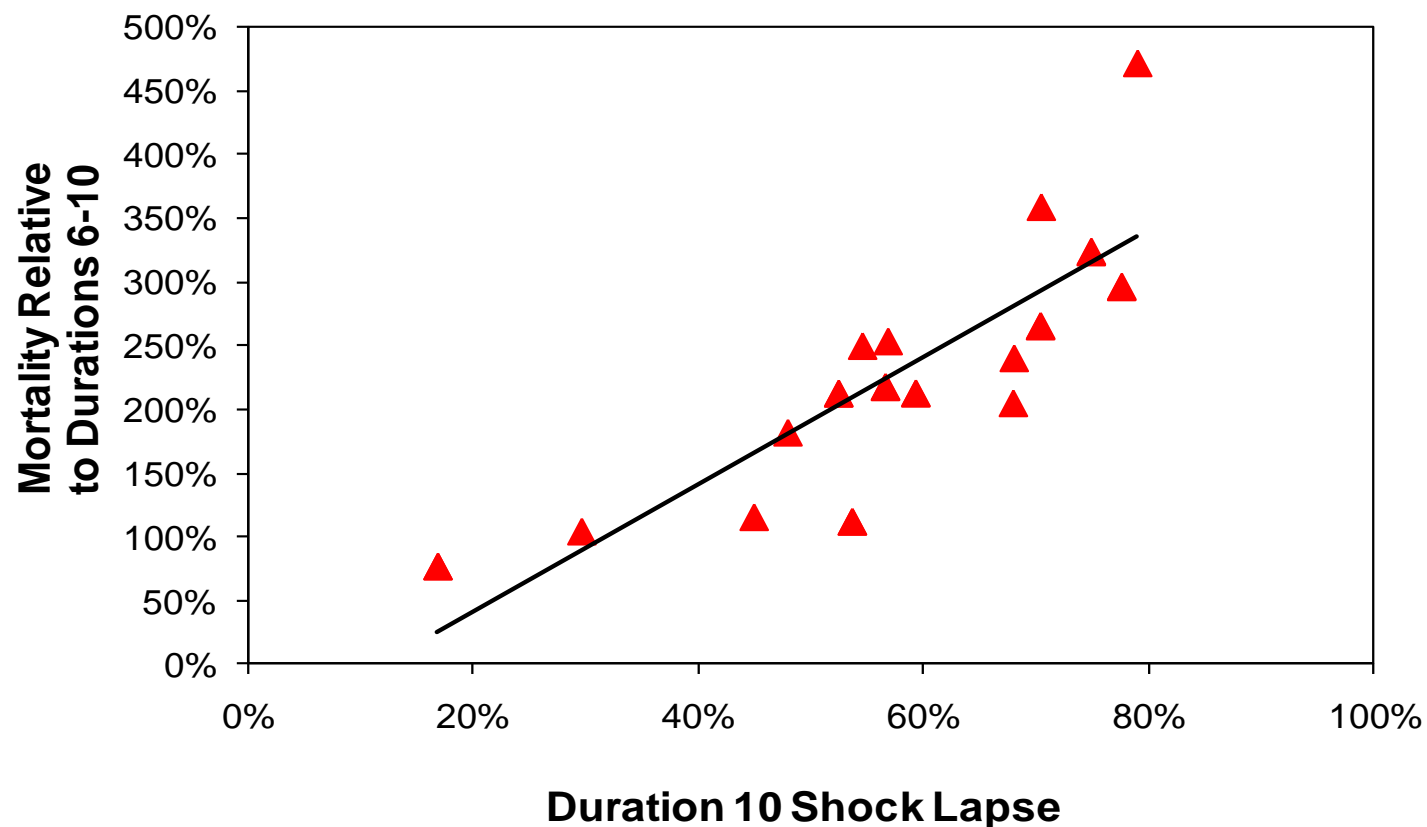
- Mortality on persisting policyholders is substantially worse in the post-level period.

Mortality Ratio



Lapse vs Mortality

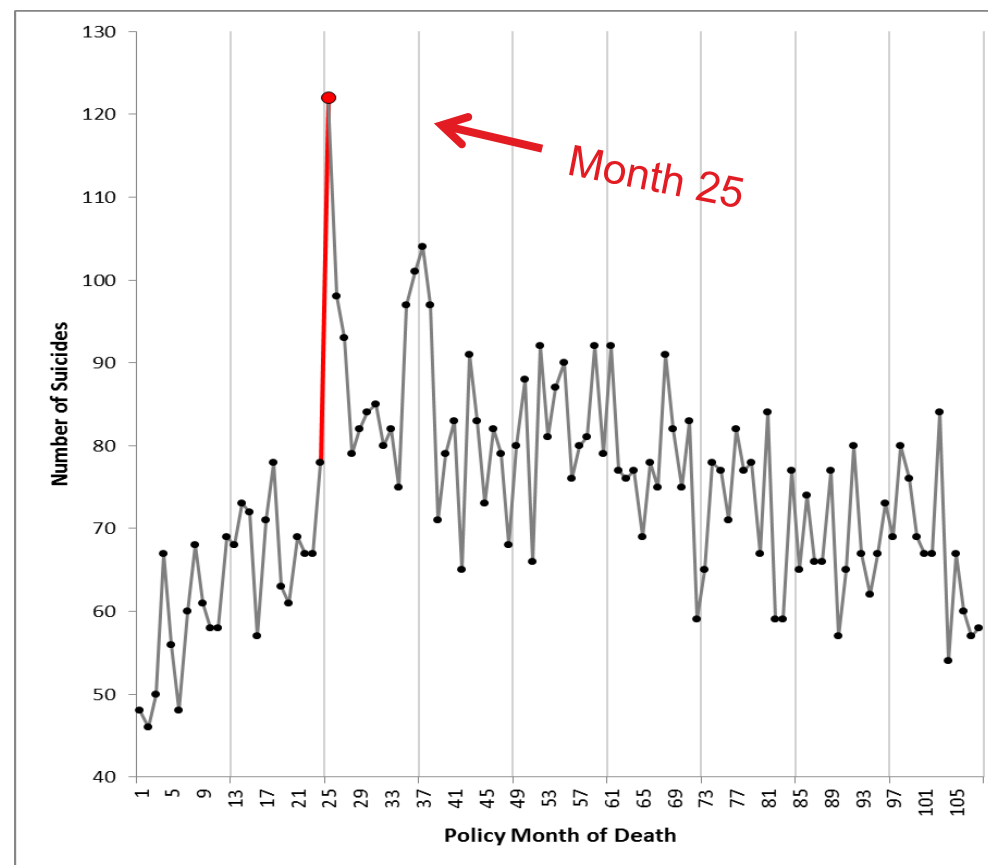
Strong correlation between the size of a company's shock lapse and the amount of post-level period mortality deterioration – the larger the shock lapse, the worse the post-level period mortality.



Anti-selection

Suicide

- Suicide claims are typically contestable for first 2 years after policy issue in US
- Noticeable spike in suicides in policy month 25
- Indicates that the suicide decision is often either made prior to policy issue or is delayed until after contestable period ended



Source: RGA Internal Studies

Anti-Selection

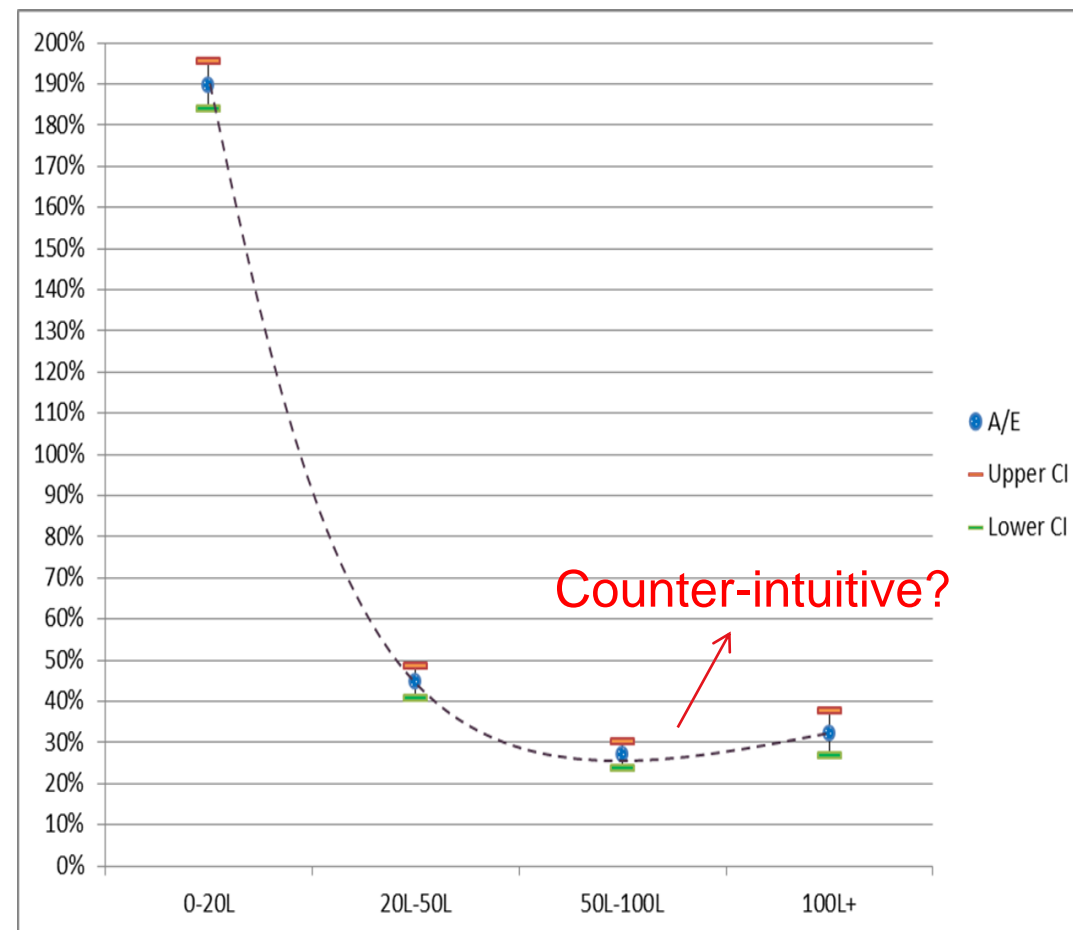
Large face amounts

Intuition suggests large face amount policies should have better mortality than any other policies:

- Higher socio-economic class
- More rigorous underwriting requirements

However, industry experience beginning to suggest that mortality is actually worse at higher face amounts:

- 1) An applicant's demand for insurance is positively correlated with their risk
- 2) Higher suicide and other accident mortality at larger face amounts



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Surviving in the face of info asymmetry

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



1. Pre-issue

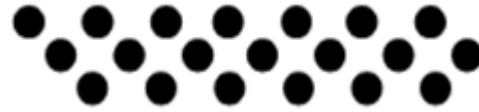


2. Underwriting



3. Inforce management

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
- 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



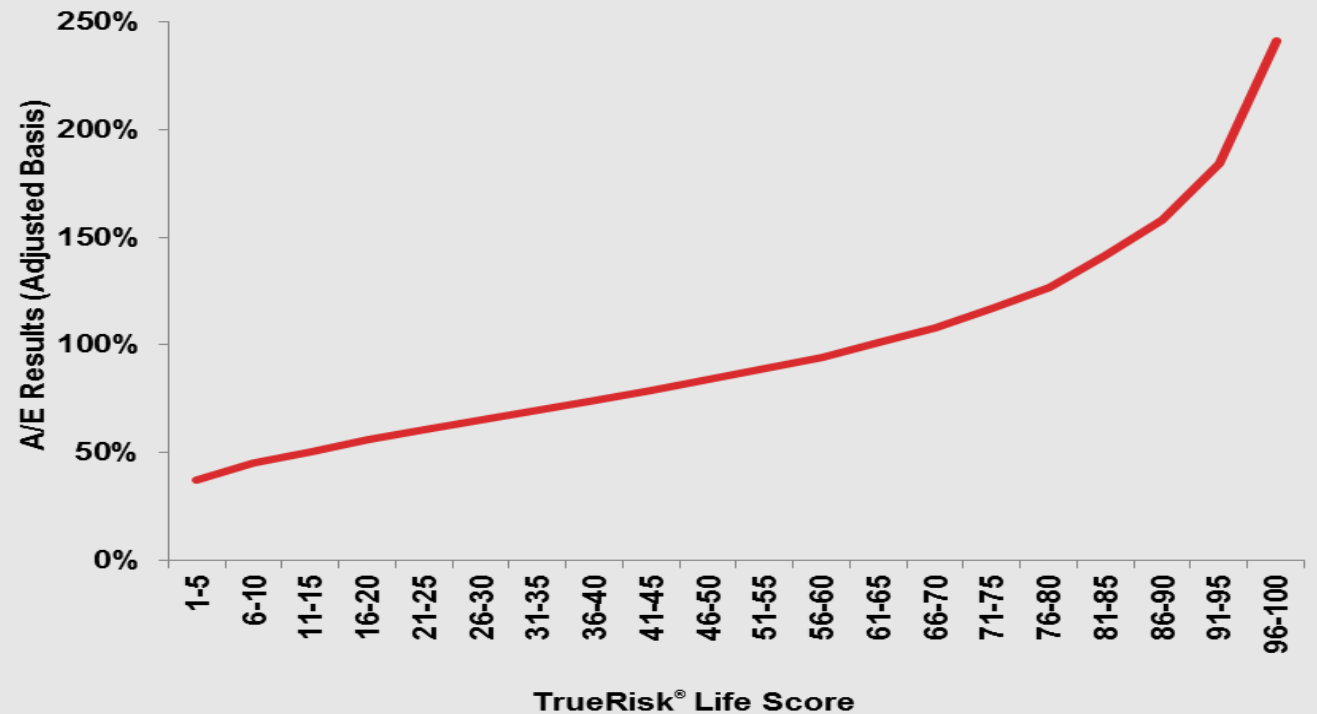
- Maintain sound underwriting practices
 - Don't forget about "primary" underwriting goals
 - Gather the evidence required to assess risk appropriately
 - Reflexive interviews may bring more clarity to application disclosures
- Improve vigilance on financial underwriting
 - Coverage amount should be 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, credit history etc.

Behavior is the missing link..

Correlation between credit behavior and mortality

- Credit-based insurance score that gives carriers a multidimensional view of an applicant's risk.
- Enables companies accelerate the underwriting process and make more (and more competitive) offers to qualified applicants
- Improved risk selection
- Enabled segmented pricing

TrueRisk® Life Overall Mortality



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-sell opportunities
- Encourage favorable policyholder behavior
 - Wellness credits for health maintenance

Take away

Some concluding thoughts...

- **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.