

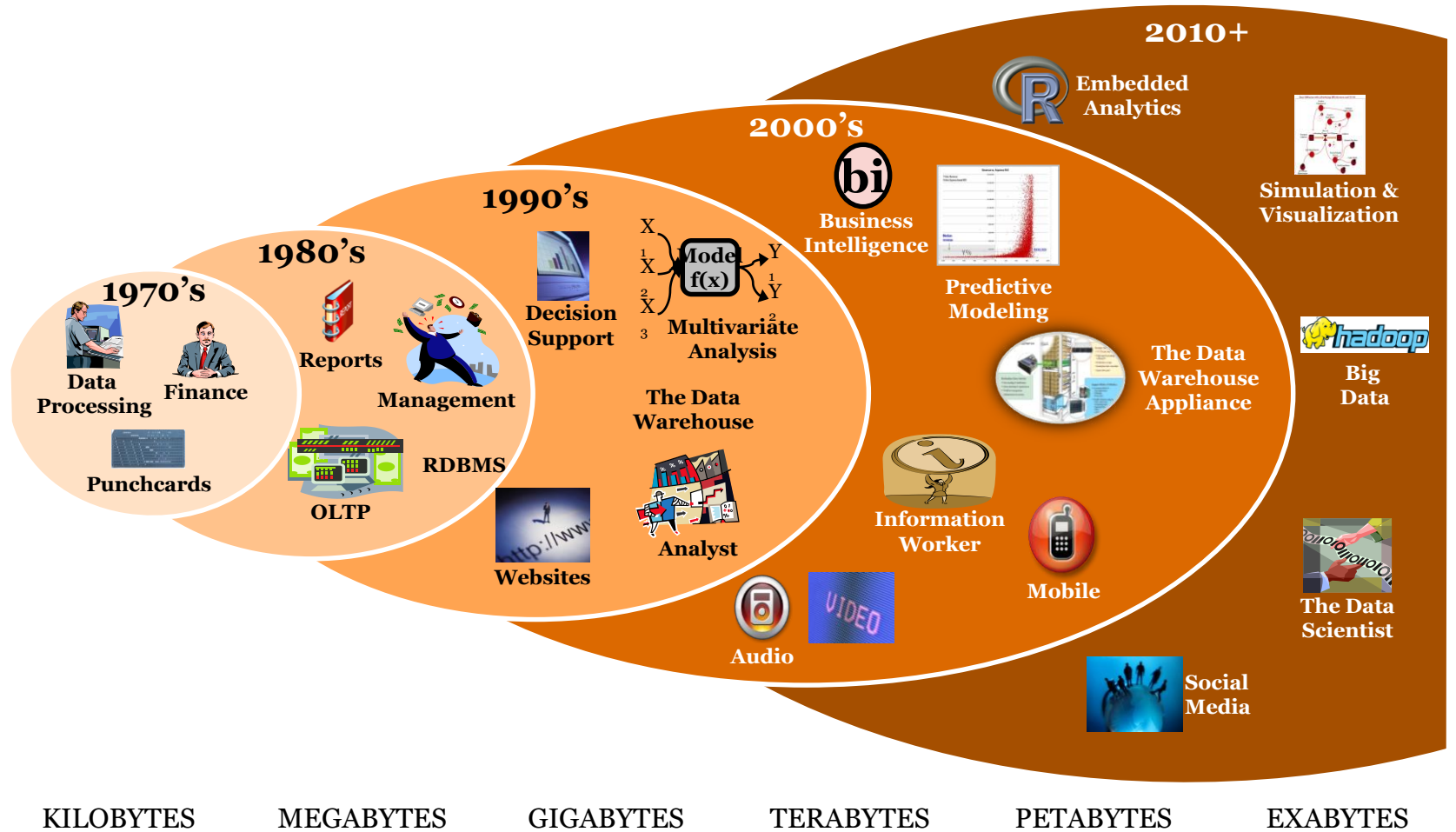
# *Actuarial Innovation*

A discussion of new ways to understand customer behavior

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**February  
2016**

# Explosion of Data and Analytics



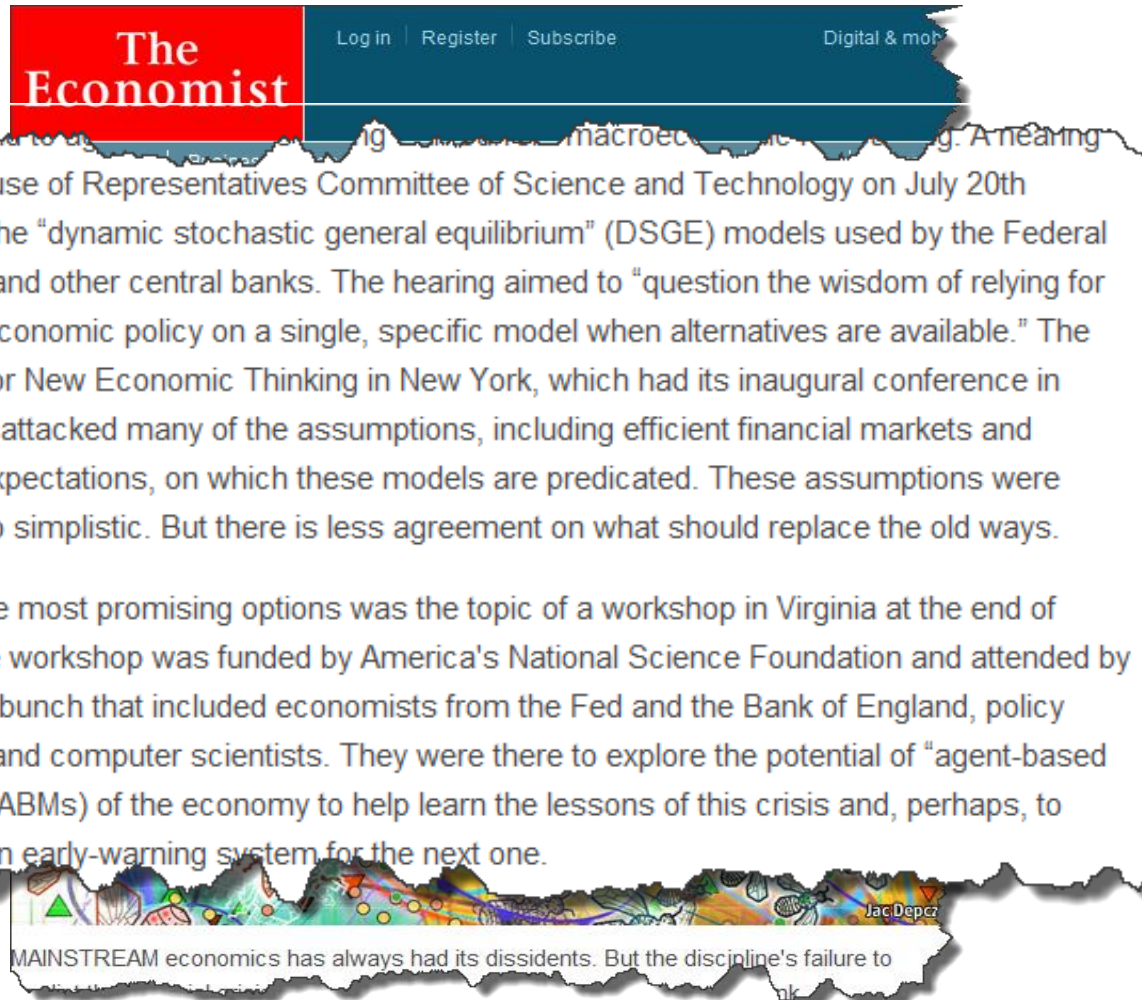
***In every sector, companies that differentiate themselves based on information advantage have shown superior productivity and profitability***

*“Companies in the top third of their industry in the use of data-driven decision making were, on average, 5% more productive and 6% more profitable than their competitors”*



<sup>1</sup>Big Data: The Management Revolution, HBR, Andrew McAfee and Erik Brynjolfsson, October 2012. Erik Brynjolfsson (MIT), Lorin Hitt (University of Pennsylvania), Heekyung Hellen Kim (MIT), *Strength in Numbers: How Does Data-Driven Decision-Making Affect Firm Performance?*, Working Paper April 22, 2011

# Agents of change



Source: <http://www.economist.com/node/16636121>

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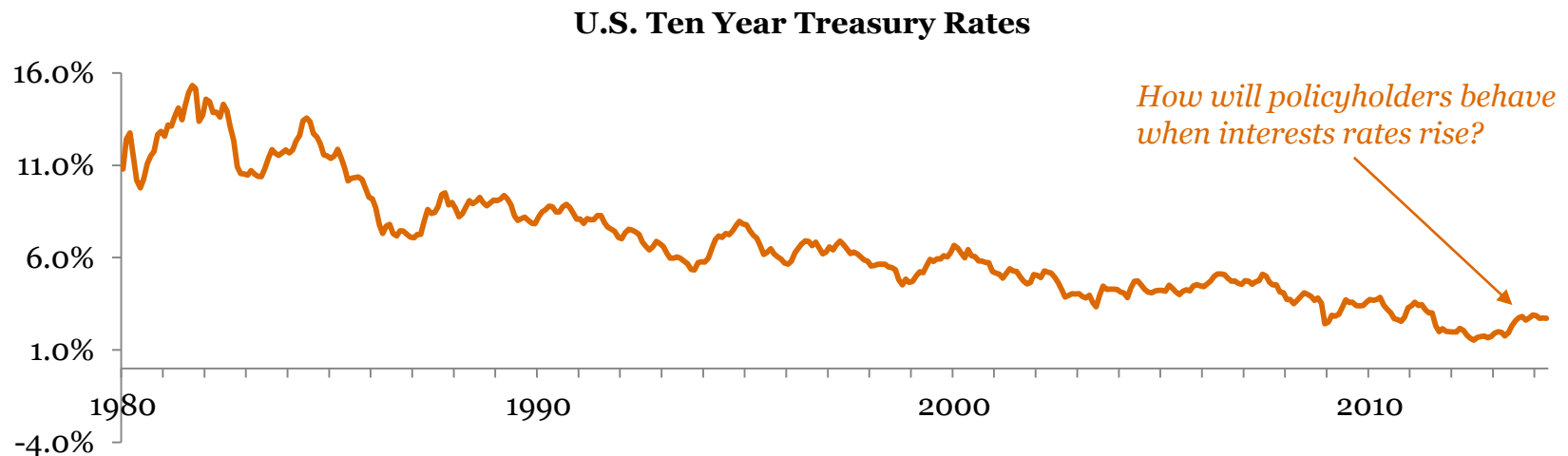
# *Behavioral simulations*

In this section, we will introduce behavioral simulations as a new way of understanding your customers.

## Addressing a challenge

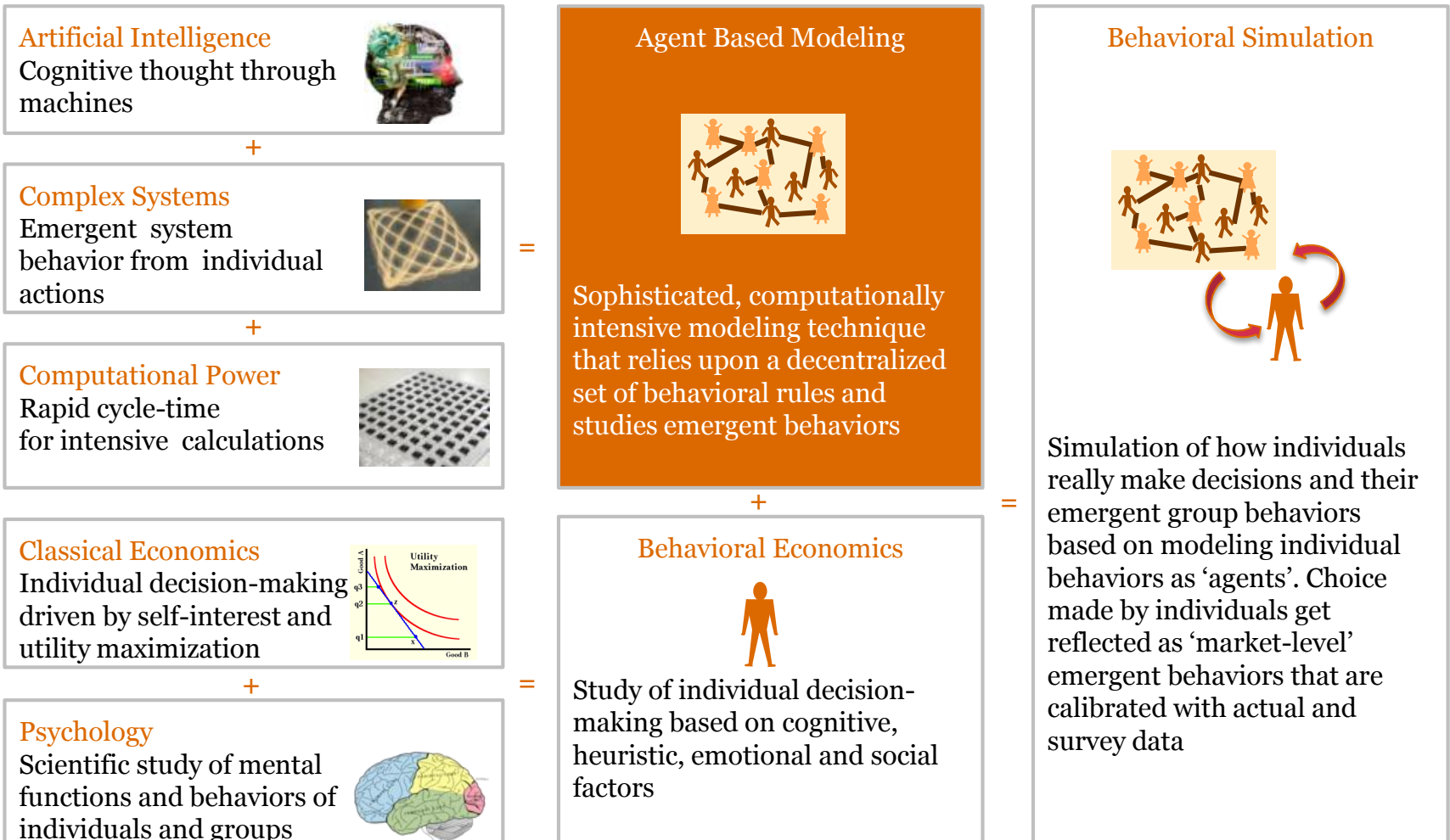
*A significant challenge confronting the actuarial profession is how policyholders will behave under different environments.*

- The complex products we have sold give policyholders a variety of choices for which we have a limited amount of experience.
- To complicate the situation further, these products have been sold during a prolong period of steadily declining interest rates and inflation rates.
- Thus, a significant challenge confronting the actuarial profession is how policyholders will behave under different environments.



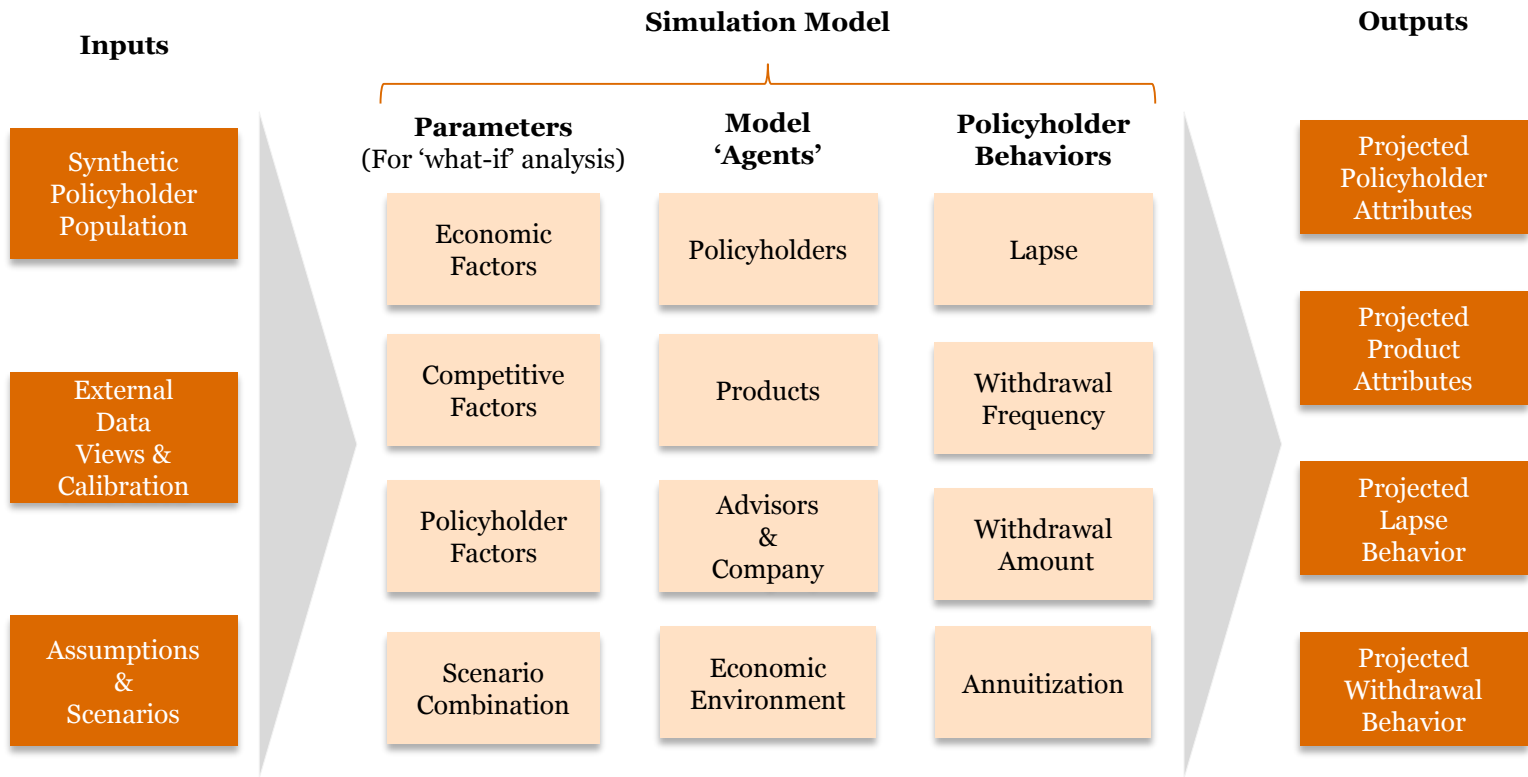
# Behavioral simulations

The data and our understanding of behaviors is brought together through agent-based modeling to model individual decision-making and emergent behaviors.



# Simulation model structure

The model includes a range of components that simulate important factors relevant to policyholder decision-making.





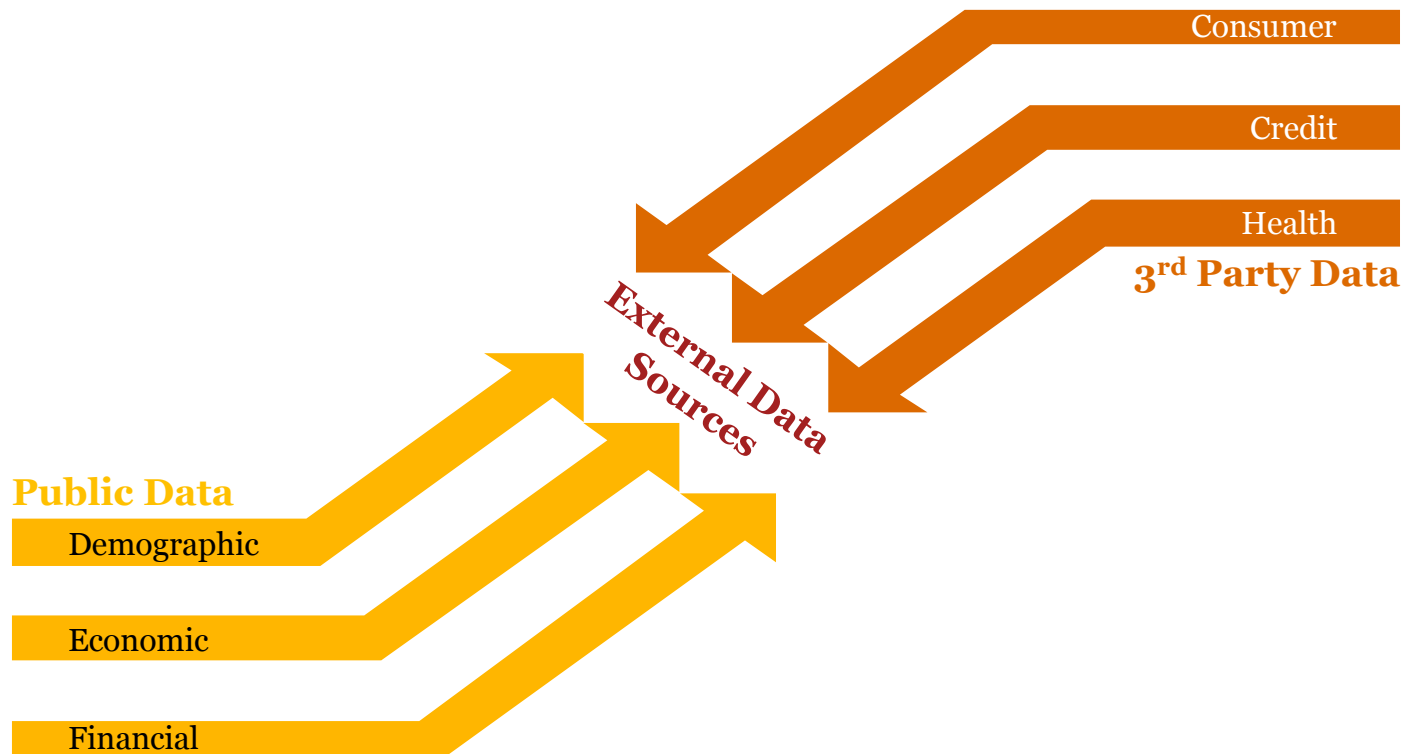
# *Synthetic populations*

In this section, we will discuss how internal data sources can be combined with external data sources to develop a more complete and comprehensive view of your customers.

## External data sources

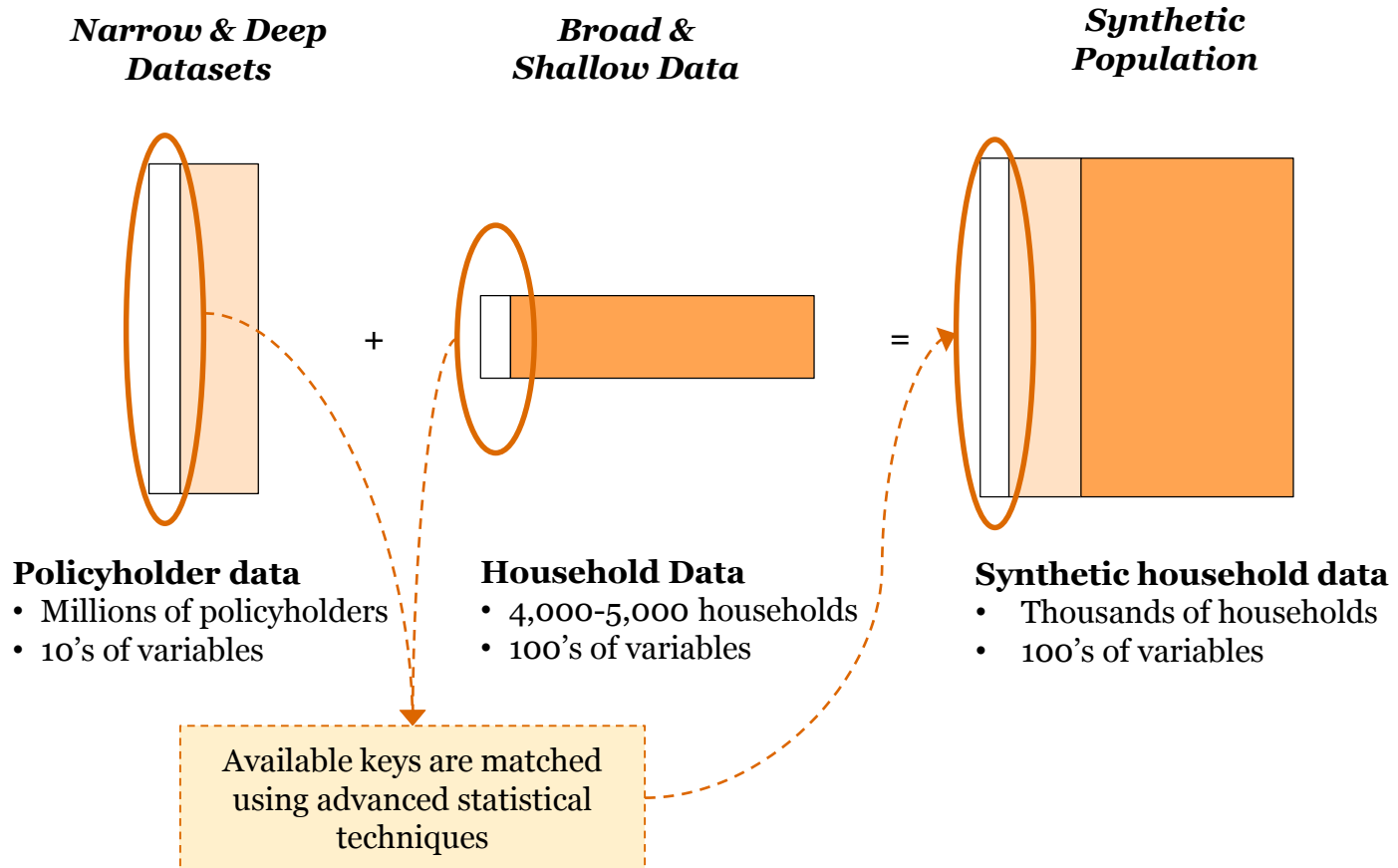
*Augmenting internal policy data with external data sources enriches the depth and level of detail of customer information.*

- There is a large amount of external data from a variety of public and propriety sources.
- The challenge is to develop an understanding of these data sources and how to use them.



# Synthetic households

Using various statistical techniques, internal data can be combined with external data to give a more complete view of a customer within a household setting.



# Implications on behavioral simulations

*Designing behavioral simulations requires gathering data from internal and external sources.*

## Policyholder Household Data

### Demographics

- Age
- Gender
- Family Size
- Geographic Region

### Employment

- Employed
- Unemployed (Searching for job)
- Unemployed (Not searching for job)
- Retired

### Health

- Healthy
- Poor Health
- Severely Ill

### Income Statement

- Income
  - Employment
  - Social Security
  - Other Income
- Expenses
  - Discretionary
  - Fixed
  - Housing
  - Healthcare

### Key Decisions

- Product withdrawal hierarchy
- Social security withdrawal
- Retirement Age
- Retirement Investment
- Discretionary Spending
- Evaluate Advisor Proposal

### Balance Sheet

Liquid Assets

Mutual Funds

Annuities

Retirement Accounts

Home Equity

Mortgage

Other Liabilities

# *Simulation model*

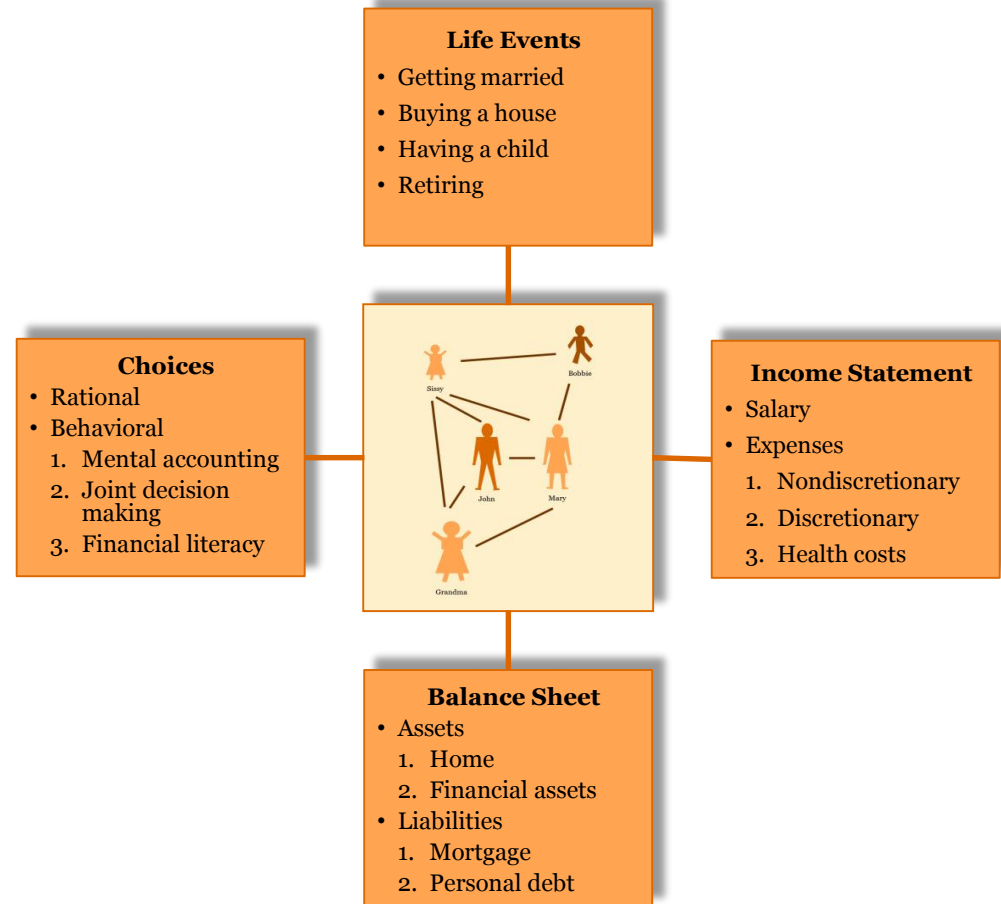
In this sections, we will discuss behavioral simulations in more detail. The important point is to simulate customer behavior as realistically as possible under multiple scenarios to develop a more holistic understanding of the choices policyholders make.

# Understanding the policyholder

*It is important that we view the policyholder not as a male age 40 nonsmoker, but as the member of society and part of a household.*

Viewing the policyholder as the member of society and part of a household switches the focus on:

- The composition of that household and how it changes over time;
- The life events that take place in the household such as having children;
- The household's income, spending, and savings habits;
- The type of assets the household owns and the liabilities the household owes; and
- The choices the household makes, both rational and behavioral.

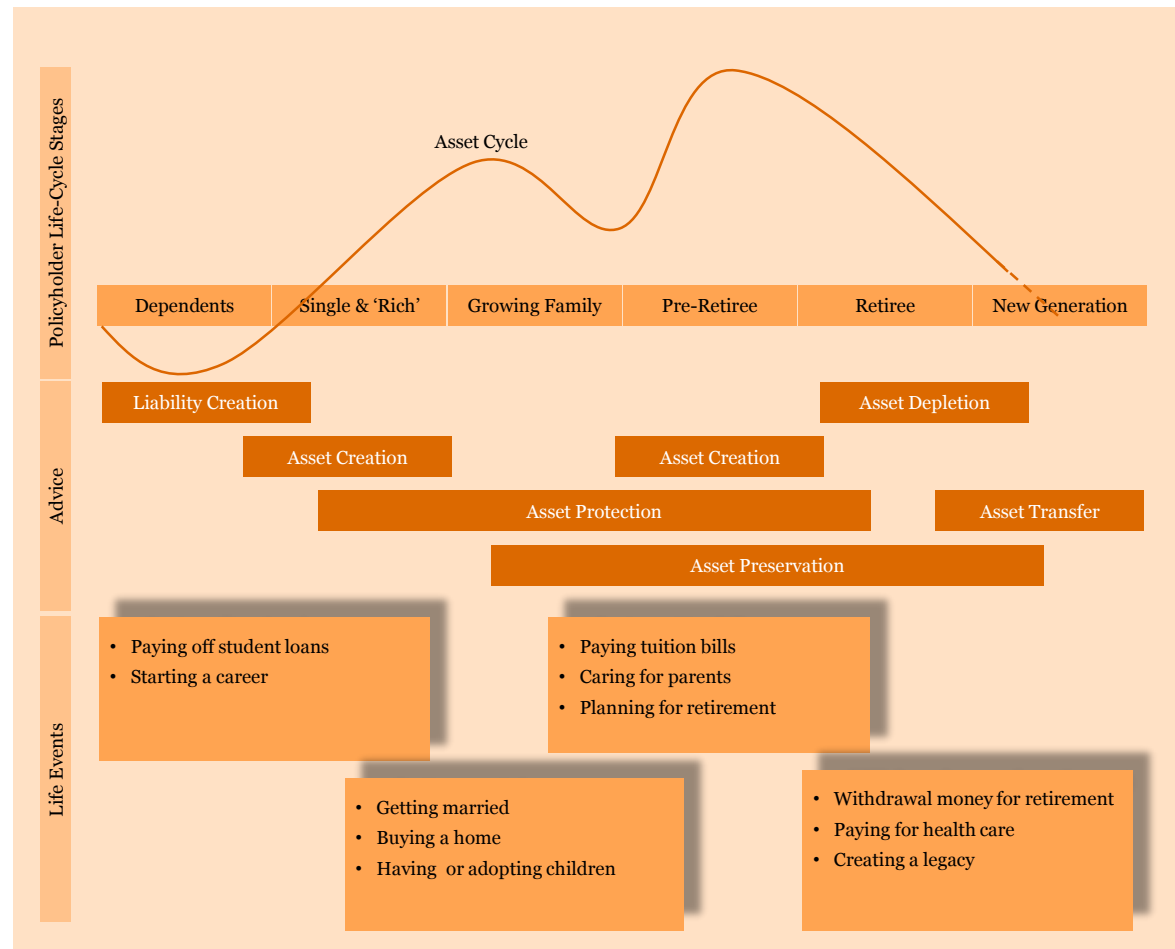


# Understanding life events and choices

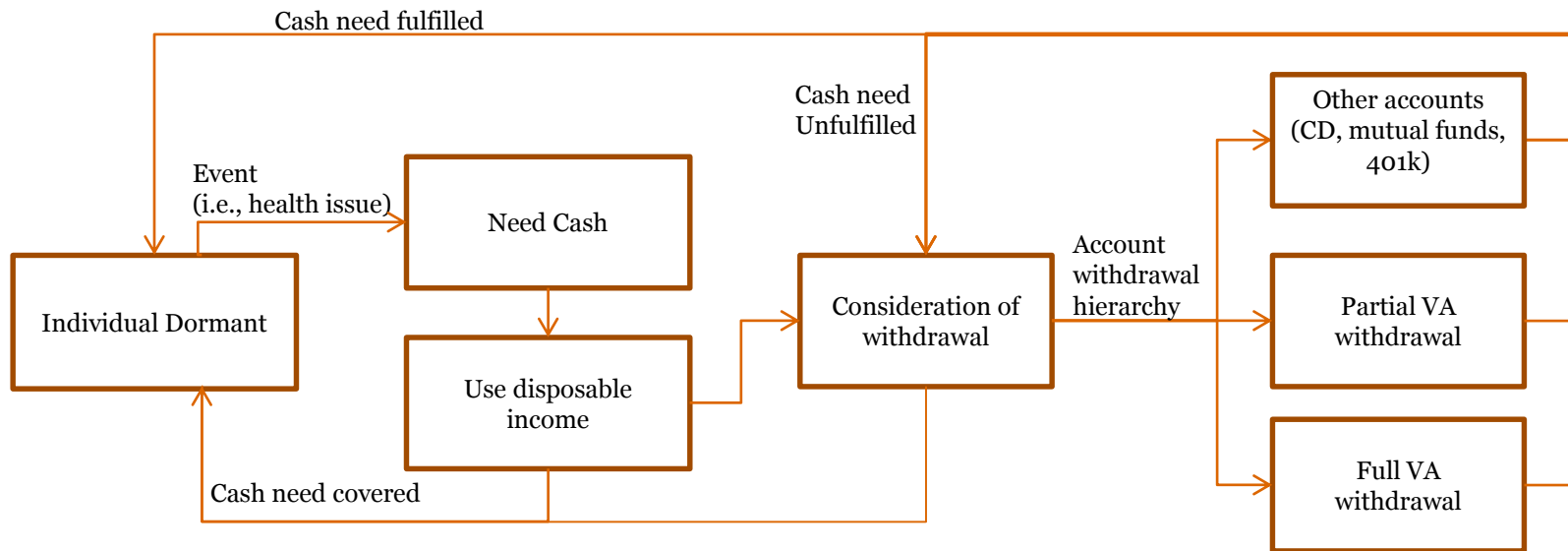
*Life events change the individual's understanding of themselves and their relationship to others and to the environment.*

The goal is to understand how life events and the choices an individual make change over time such as when:

1. He or she graduates from college and gets a job;
2. He or she marries;
3. They buy a home and have children;
4. They become “empty nesters”; and
5. They retire.

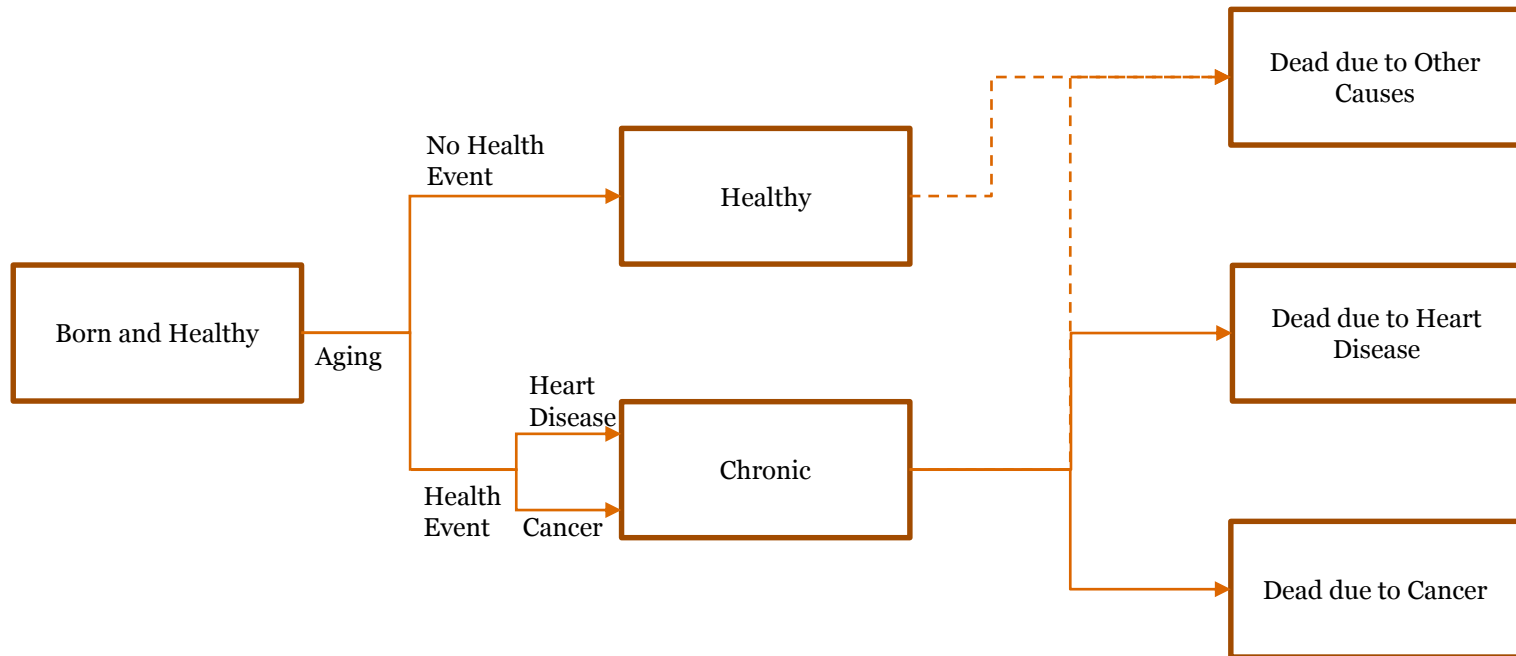


# *Advanced studies: modeling decision process around fulfilling a cash need*





# Advanced studies: modeling calibration process around health state



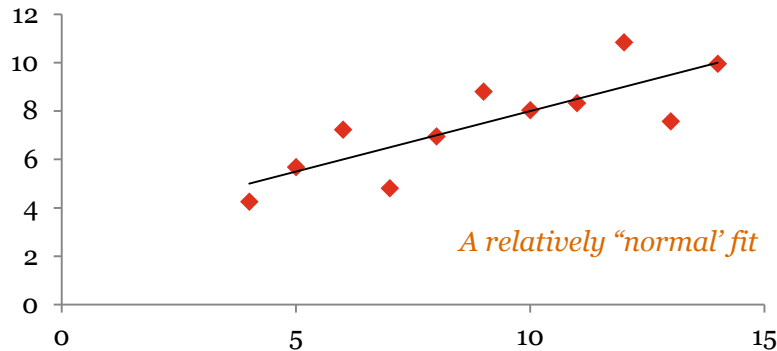
# *Visualization*

In this section, we will discuss how visualization can help in important ways.

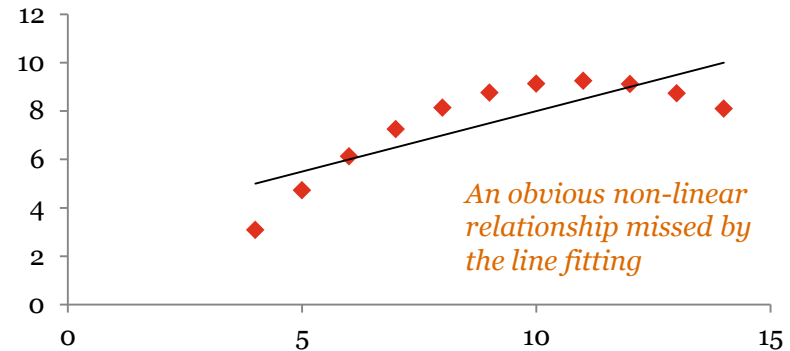
# Importance of visualization

*Our brain processes data in a visual format more easily and faster than tables of numbers.*

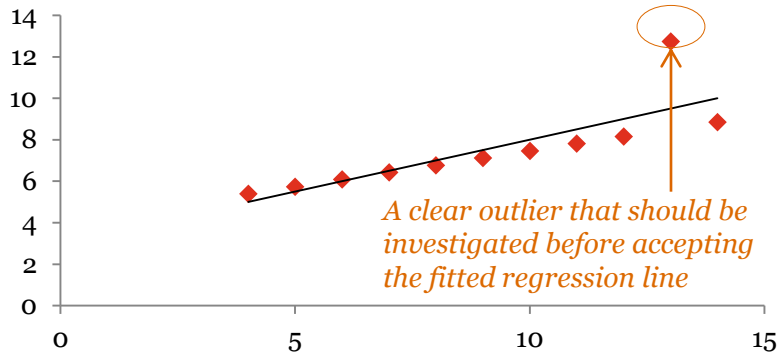
### Set A



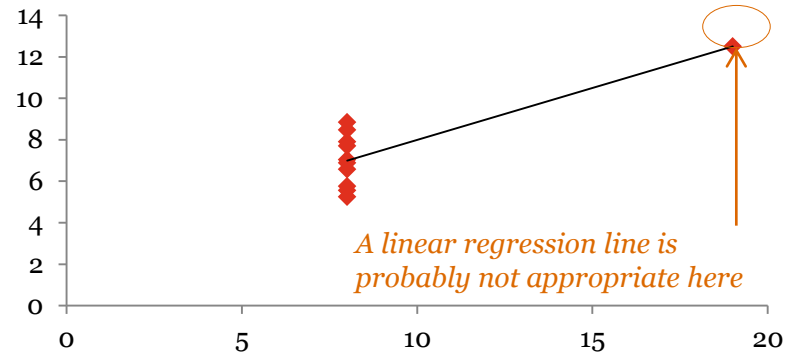
### Set B



### Set C

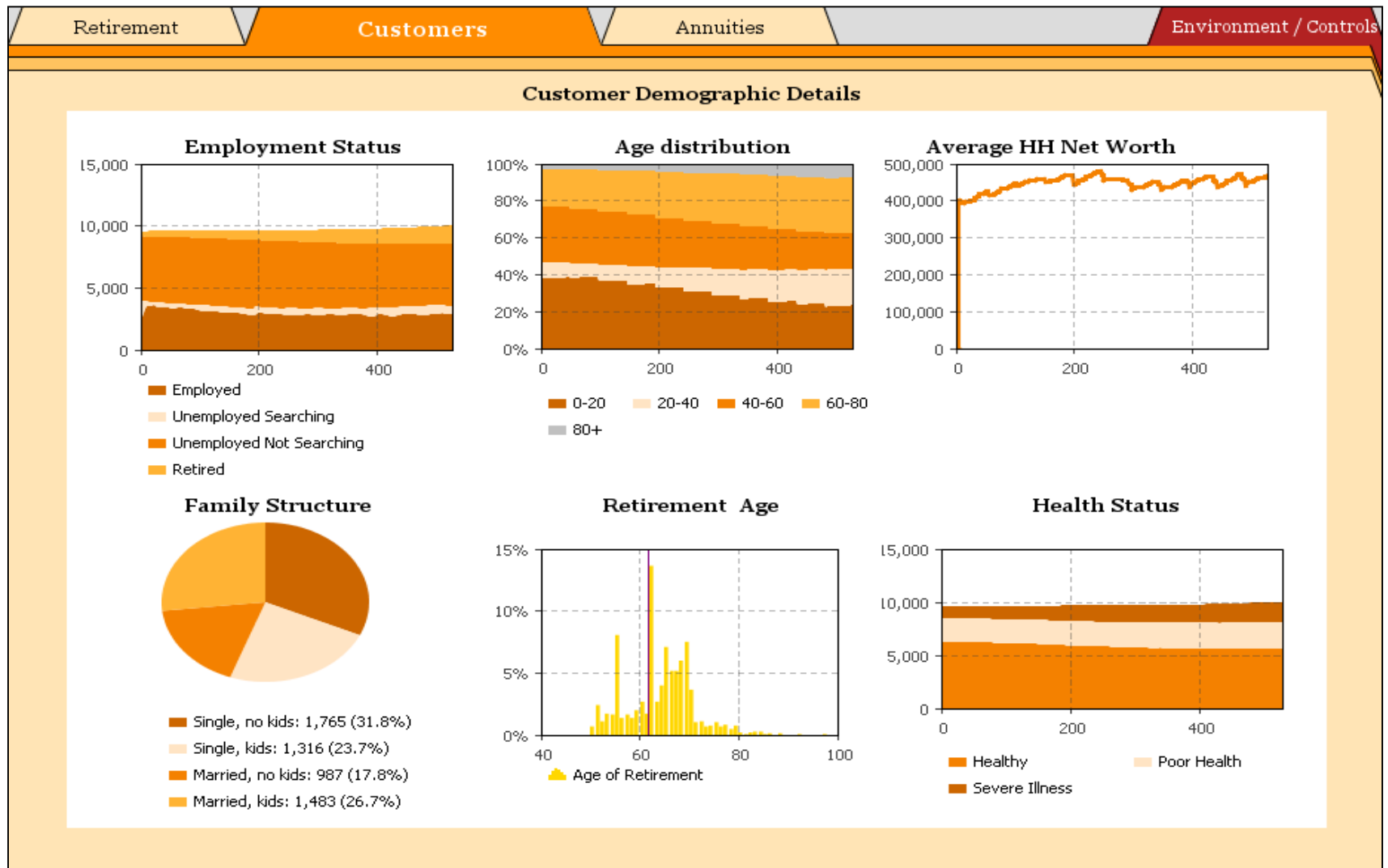


### Set D

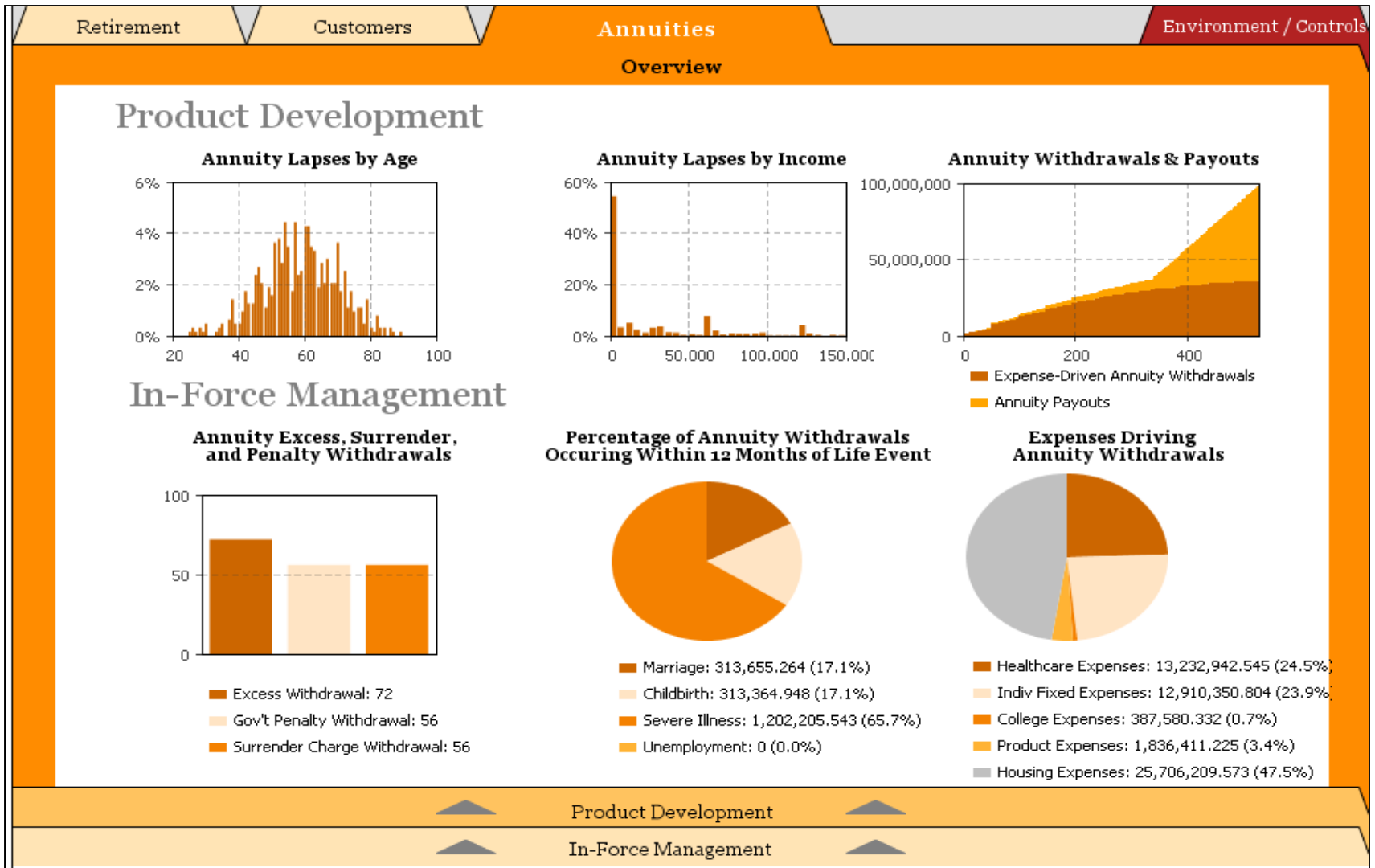


Source: Anscombe, F. J., *Graphs in Statistical Analysis*, American Statistician (1973)

# Customer demographic simulation



# Annuities simulation



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# *Questions?*

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