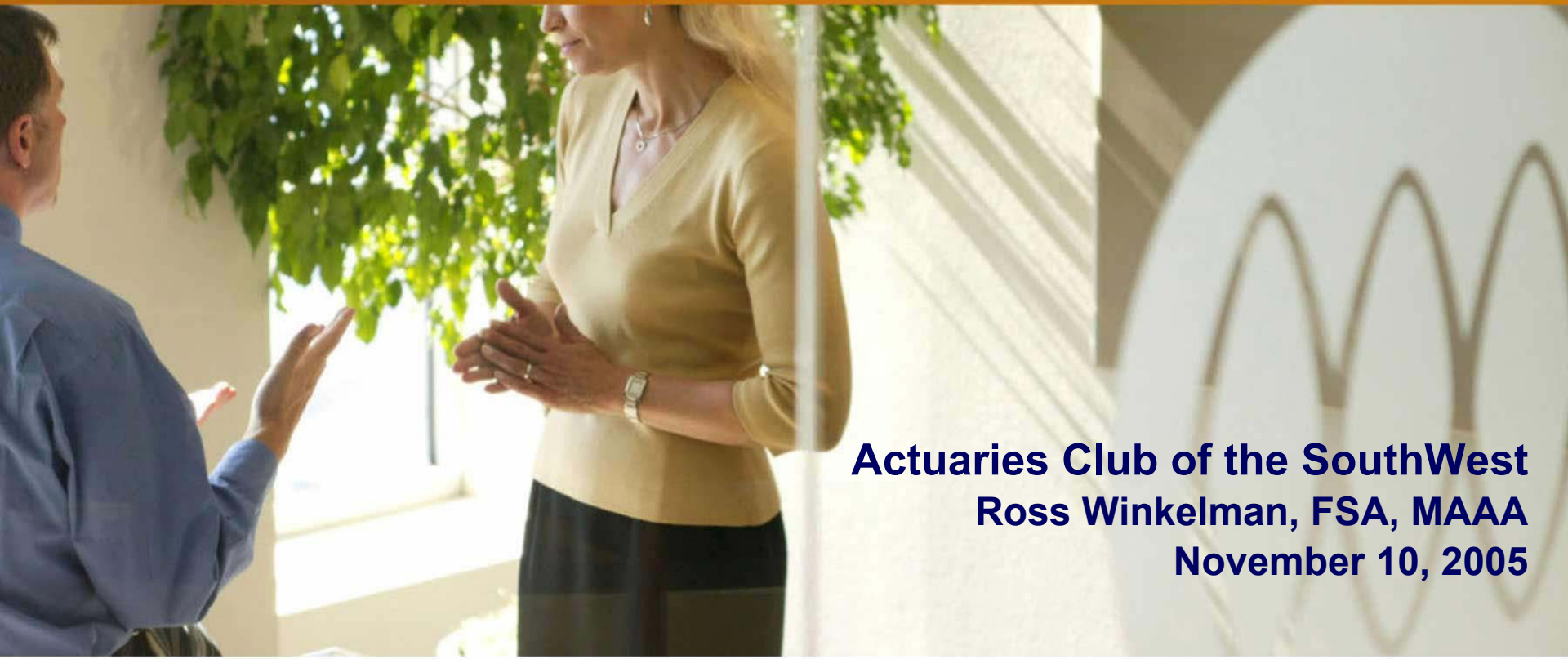
Optimal Methods for Rating Small Groups & Using Consumer Data in Underwriting



Actuaries Club of the SouthWest

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Consultants and Actuaries

Presentation Overview

Optimal Renewal Project

- Introduction
- Risk Adjusters
- Models & Results
- Conclusions & Recommendations

Use of Consumer Data in Underwriting

- Overview
- Example

Optimal Renewal Guidelines:

Identify Optimal Methods for Rating Small Groups at Renewal…under real world conditions.

Introduction
Small Group Rating

Overview

- Health insurance
- Small group = 2 to 50 employees
- Guaranteed Issue
- Limits on rate adjustments due to health status

Introduction
Survey Results

What methods are currently practiced to rate small groups at renewal?

- Surveyed 21 carriers on SG methods
- 30% of carriers used risk adjusters
- 60% of groups

Introduction
Real World Conditions

- Delay between when rates are developed and the rating period
- Incomplete data (IBNR)
- Rating limits (total HSF and changes)
- Turnover
- Competing against carrier's new business methods, not their renewal methods

Introduction
Questions

1. What is the most accurate method to rate small groups at renewal?

2. Should risk adjusters be used in conjunction with traditional approaches? If so, how should they be combined?

3. What factors affect credibility?

4. What competitive strategies should be employed?

Introduction
Prior Studies

Society of Actuaries Report (May, 2002 Cummings et al)

Society of Actuaries Health Section Council Article (Aug, 2003 Ellis - DxCGs)

Introduction
Main Components

Individualized Data Analysis

Carrier Analysis

Competitive Simulation

Introduction
Individualized Data

Advantages

- Large database
- Good geographical representation

Disadvantages

- No group identifiers
- Manual rate unavailable

Introduction
Carrier Data

Advantages

- Actual Group Data
- Group Manual Rates Available

Disadvantages

- Medium sized data set
- Geographical concentration
- Biased

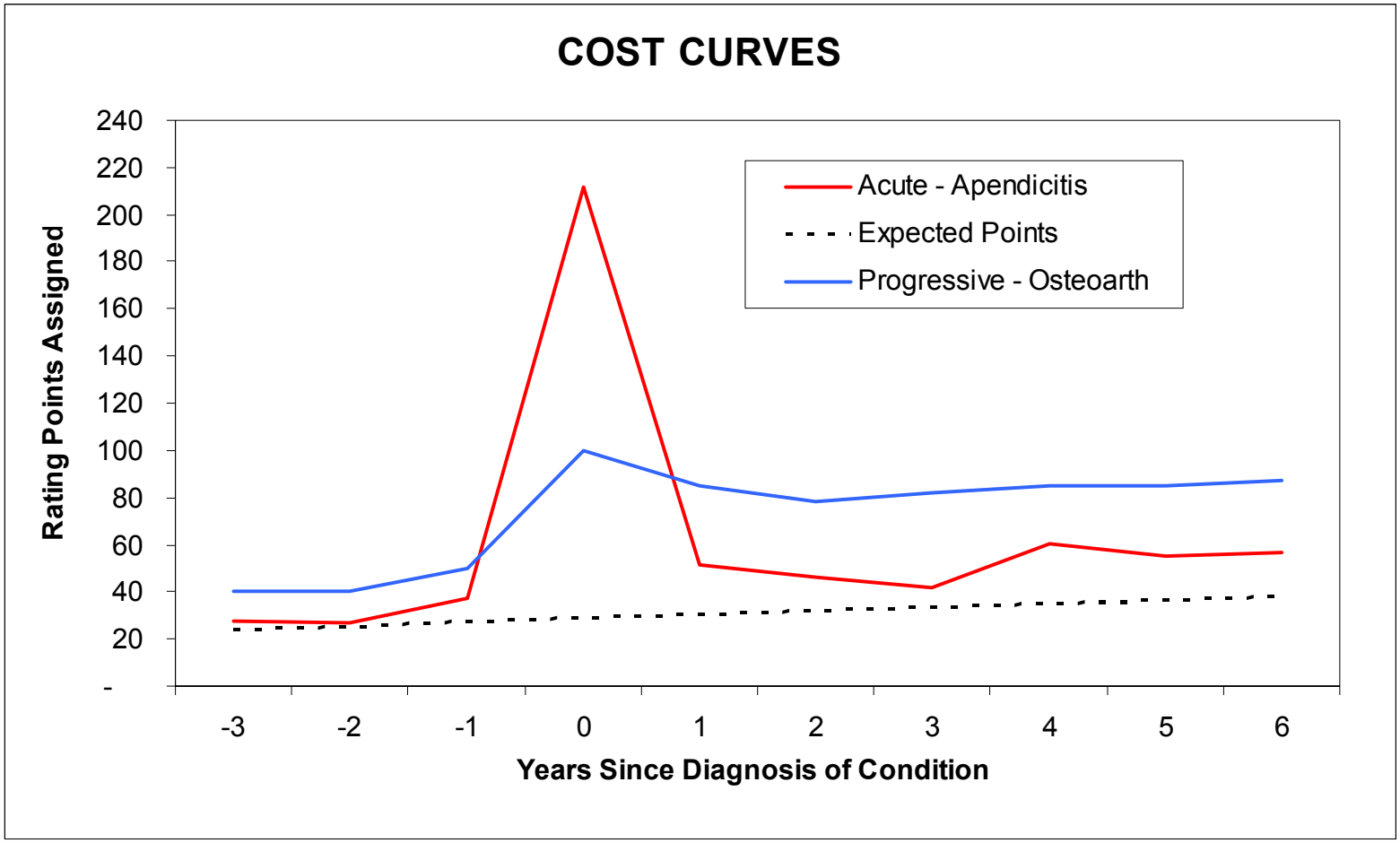
Risk Adjusters
Overview

- Risk adjusters measure morbidity
- Used for adjusting payments (Medicare), predictive modeling (SG rating), and medical management (DM).
- Function of age, gender, and claim history (diagnoses and services - medical and/or Rx)
- ERG, ACG, DxCG, etc.

Risk Adjusters
Overview

- Claim detail is sorted and formatted.
- Software assigns members to relatively broad diagnosis categories (e.g. Symmetry has 120 categories called Episode Risk Groups (ERGs)).
- Output file (array) of 0's and 1's under each demographic category and each condition category for each member.
- Regression to fit actual costs to array of 0's and 1's.

Risk Adjusters
Theoretical Value



Models
Loss Ratio Model

- **1st Renewal**

$$\text{FutureClaims} = \phi_0 \sum_{i=1}^{14} \alpha_i \text{Manual}_i + \phi_1 \text{Experience}(\text{last } 9) + \varepsilon$$

- **2nd Renewal**

$$\text{FutureClaims} = \phi_0 \sum_{i=1}^{14} \alpha_i \text{Manual}_i + \phi_1 \text{Experience}(\text{last } 12) + \phi_2 \text{Experience}(\text{Prior } 9) + \varepsilon$$

Models
Risk Adjuster Model

- **1st Renewal**

$$\text{FutureClaims} = \phi_0 \sum_{i=1}^{14} \alpha_i Manual_i + \phi_1 \text{Experience(last 9)} + \phi_2 \sum_{j=1}^{134} \beta_j \text{ERGArray}_j + \varepsilon$$

- **2nd Renewal**

$$\text{FutureClaims} = \phi_0 \sum_{i=1}^{14} \alpha_i Manual_i + \phi_1 \text{Experience(last 12)} + \phi_2 \text{Experience(Prior 9)} + \phi_3 \sum_{j=1}^{134} \beta_j \text{ERGArray}_j + \varepsilon$$

Models
Service Category Model

- **1st Renewal**

$$\text{FutureClaims} = \phi_0 \sum_{i=1}^{14} \alpha_i \text{M}anual_i + \phi_1 \text{Inpatient} + \phi_2 \text{Outpatient} + \phi_3 \text{Rx} + \varepsilon$$

Results
Error Measures

- R-Squared - % of variance from the mean explained by rating variables

$$R^2 = 1 - \frac{\text{ESS}}{\text{TSS}} = 1 - \frac{\sum \left(Y - \hat{Y}\right)^2}{\sum \left(Y - \bar{Y}\right)^2}$$

- MAPE - Absolute error as % of total costs

$$\text{MAPE} = \frac{1}{n} \sum \left| \frac{Y - \hat{Y}}{Y} \right|$$

Results
Theoretical

For a Single Member, Uncapped		
Method	**R-Square**	**MAPE (%)**
Manual Rate	5.70%	101.00%
Traditional	16.40%	90.70%
Service Category	22.60%	84.10%
Risk Adjuster	24.10%	82.70%

Results
Error Calculation Example

- Small Group ABC
- Traditional Prediction = 150%
- Risk Adjuster Prediction = 125%
- Actual Claims equal 120% of manual
- Which method is better?
- Error / R-squared?

Results
Credibility Weights

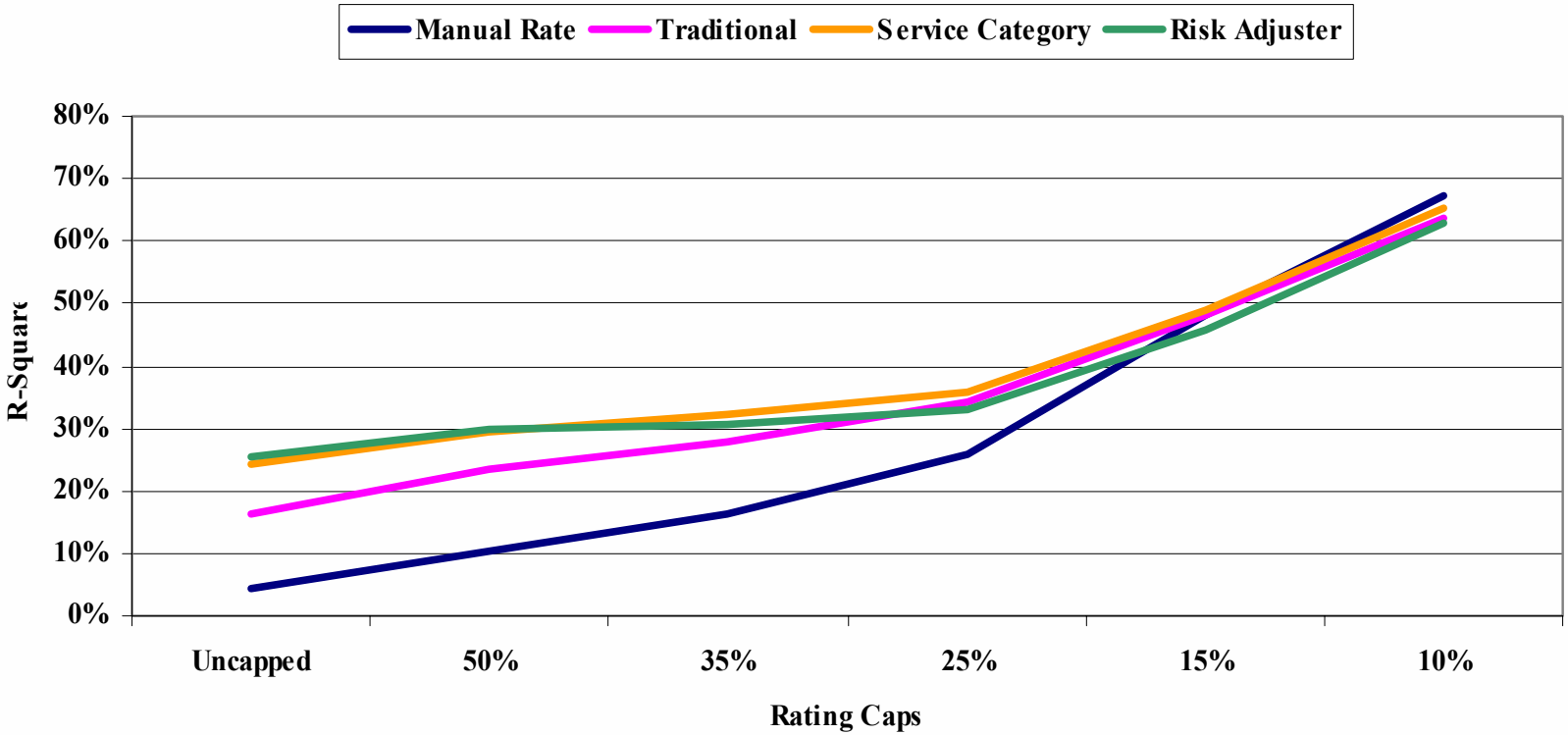
- 1st Renewal, Individual Analysis

	Predictors		
Methodology	**Manual Rate**	**Loss Ratio**	**Risk Adjuster**
Loss Ratio	73%	27%	N/A
ERG	11%	14%	75%
Svc Category *	56%	44%	N/A

* Svc category = 2% IP, 24% OP, & 18% Rx

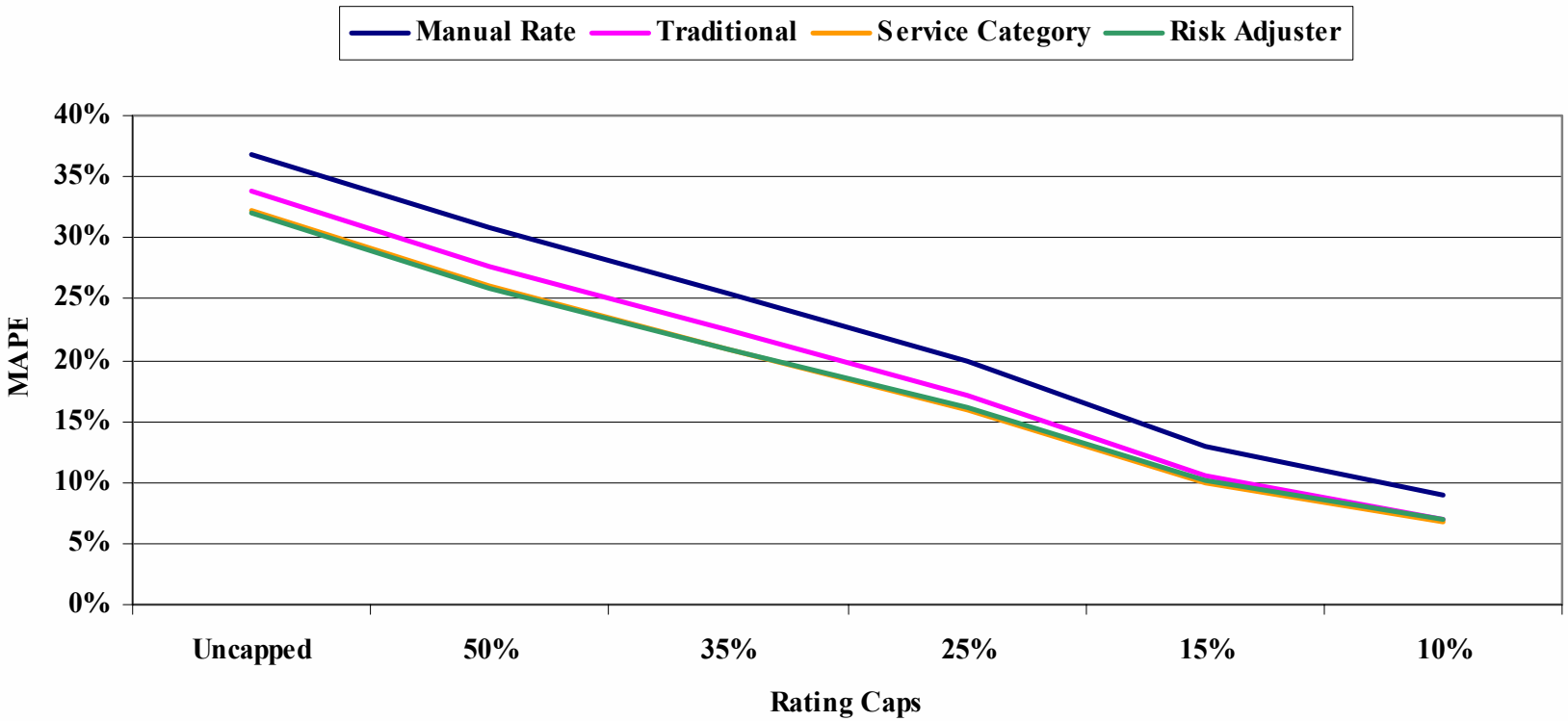
Results
R-Square

- R-Square vs. Rating Caps (Group Size = 10)



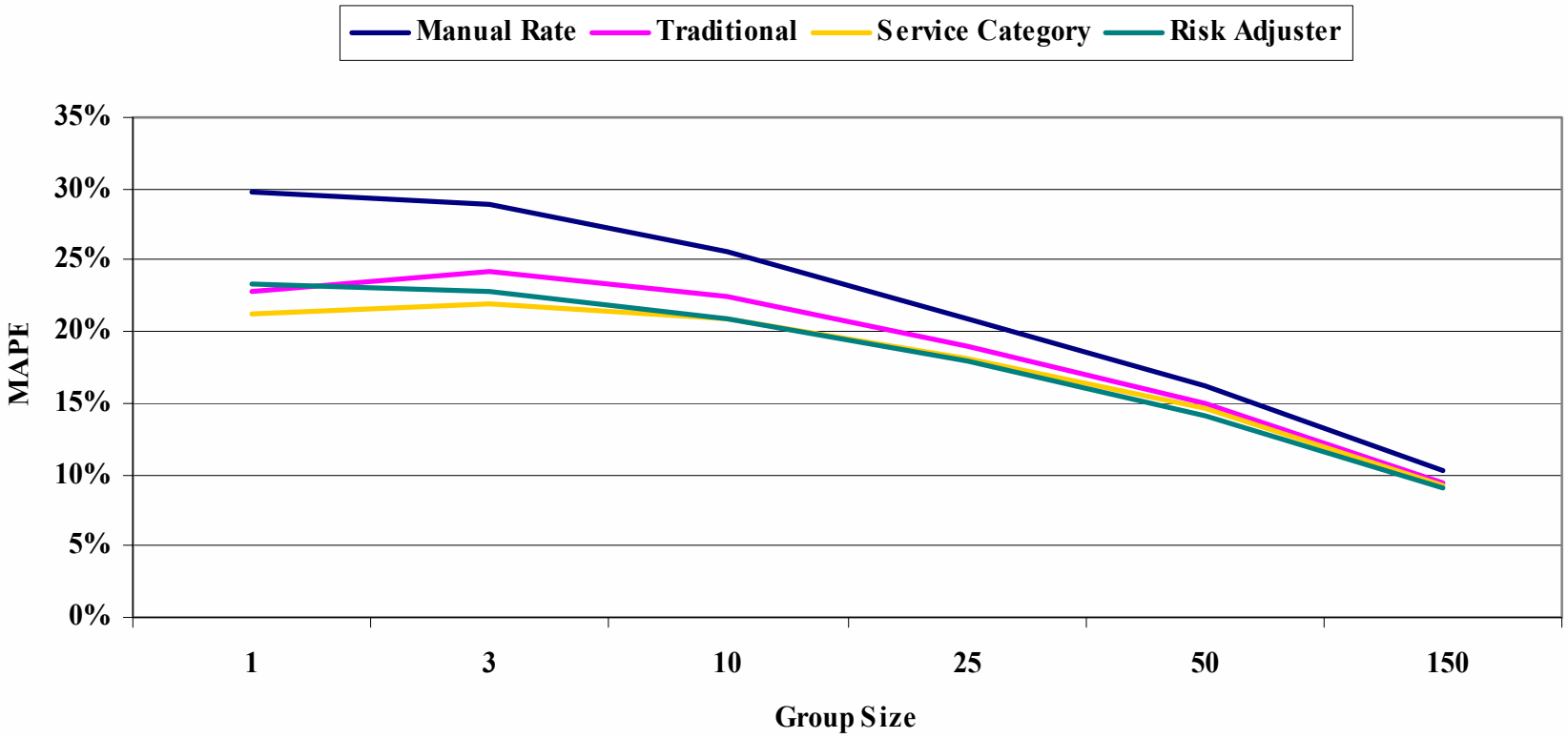
Results
Mean Absolute Prediction Error (as %)

- MAPE vs. Rating Caps (Group Size = 10)



Results
Mean Absolute Prediction Error (as %)

- MAPE vs. Group Size (Rating Cap = 35%)



Results
Carrier Analysis Summary

- Real groups
- Turnover
- Biased sample
- Traditional / Risk Adjuster very similar!
- Health status correlation

Competitive Simulation
Introduction

- Based on carrier data.
- Excel model - stochastic.
- First renewal with 9 months of historic claims.
- New business method accuracy simulated relative to renewal method accuracy (less accurate).
- New business quotes generated stochastically (Bayesian from renewal quote distribution) with some correlation among different carriers.

Competitive Simulation
Results

- Small improvements in new business methods significantly increase profitability for new business and hurt profitability for renewal
- Very sensitive to point at which group seeks new business quotes (try to keep your groups from getting quotes!)
- Number of competing quotes is important
- Accuracy and results are sensitive to credibility of risk adjuster and/or historic experience components

Final Conclusions

- A combination of risk adjuster and traditional methods is the most accurate, but optimized traditional methods come close.
- Marginal value of improvements decrease as allowable rate variation decreases, and as group size increases.
- New business is less profitable than renewal business. Don't chase the wrong groups away (credibility too high, etc).
- Competitive results are very sensitive to accuracy of new business methods.
- Credibility is affected by accuracy / explanatory power of manual rate and level of health status correlation.

Recommendations

- Fundamentals (Blocking & Tackling)
- Objectively analyze what prediction method is right for you. It may be that multiple methods are most appropriate (state, group size, costs, etc.).
- Get as much information as possible on what your competitors are doing with new business (prescription histories?).
- Assign credibility explicitly and carefully.
- Use a rigorous, systematic method to develop renewal quotes, with appropriate, efficient manual intervention.
- Capture all information on each renewal quote and what happens with group. Analyze data and modify your approach.

USE OF CONSUMER DATA IN UNDERWRITING

Consumer Data – Where?

- Government – public records
- Census
- Financial services
- Surveys
- Warranties
- Loyalty programs
- Internet purchases
- Subscriptions

Consumer Data – How much?

- Consumer data measured in Disk Storage per Person (DSPS)
  - 1985 – 0.02 Mbytes/yr
  - 1995 – 26 Mbytes/yr
  - 2005 – 3,500 Mbytes/yr

Consumer Data – Why?

- Primarily used for marketing, customer service & fraud purposes
- Graham-Leach-Bliley Act of 1999

Consumer Data – What?

- Traditional Demographics
  - Age, sex, race, etc.
- Financial
  - Homeowner, credit score, mortgage/auto/credit card balances, etc.
- Household
  - Marriage status, number and ages of children, etc.

Consumer Data – What?

- Lifestyle-Based Elements
  - Physical activeness
    - Running, walking, cycling, aerobics, golf, tennis, etc.
  - Physical inactiveness
    - Television time, computer time, board games, stamp and coin collecting, etc.
  - Food purchases
    - Fast food, diet food, gourmet, vegetarian, etc.
    - Wine and alcohol
  - Self improvement
    - Health/fitness, dieting/weight loss, etc.
    - Mental wellness, personal improvement, etc.

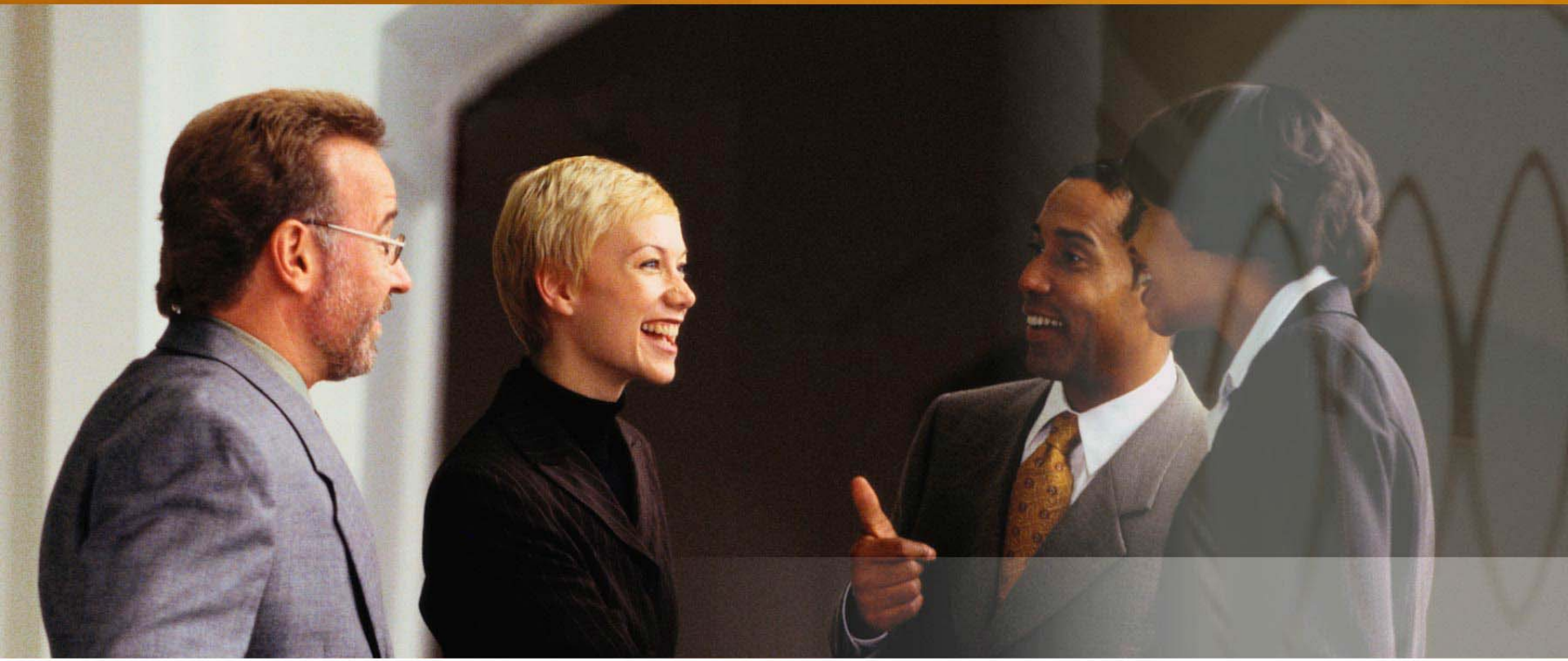
Consumer Data Modeling Example

Diabetes Profiling Example			
Data Element	Employee A	Employee B	Diabetes Ratio A to B
Age	40	40	1 to 1
Vehicle Type	MiniVan	MiniVan	1 to 1
# of Children	2	0	1 to 10
Outdoor Rec	4 plus	No	1 to 25
Education	College	Below HS	1 to 40
Lifestyle Ind	MI7	RE3	1 to 60
Hobbies	Active Outdoor	Reading	1 to 80
…..	…..	…..	…..
…..	…..	…..	…..
Online Purchasing	Sporting Goods	Clothes	1 to 110

Consumer Data Emerging Applications

- Underwriting (health, life, LTC)
  - Preferred
  - Further investigation
  - Jet Issue
- Disease Management
- Wellness

Questions / Discussion



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