A Demographic Approach to Forecasting Health Insurance Benefits Costs

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ABSTRACT

Introduction and Objective: In the U.S., many employers provide health insurance benefits to their employees (and retirees) as well as their dependent spouses and children. The dramatic rise in health care costs has elevated interest in the demographics of insured groups, and the uninsured. Employers need annual and long-term forecasts for financial statements and financial reporting. One approach is to tie health care costs (per person or an age-sex profile) to a projection of the employer health benefits population.

Much remains to be learned about projecting employer health benefits populations because data are scarce. Previous studies have found that employer groups can be as large as U.S. states and grow much faster than the U.S. population.

The objective to this study was to evaluate various methods for projecting health benefit populations. Do simple methods work as well as complex techniques?

Methods: We evaluate extrapolative, headship, and cohort-component methods for forecasting population size and age-sex composition using data about the General Motors salaried health benefits population from 1983 to 1993. Data exclude COBRA participants and sponsored dependents, who belong by choice. We use 1988 as a jump-off year, forecast the population 1989 to 1993, and compare forecasts to actual annual data.

Results: Extrapolation procedures predict total population size well, as has been found elsewhere. Cohort-component methods forecast the age-sex composition better than other procedures. Unlike prior studies, we find that accuracy levels vary dramatically across both techniques and years, and that errors do not increase with the length of the forecast horizon.

Conclusions: These findings suggest that population dynamics in health benefits populations differs markedly from that in geographically-defined populations.

DATA

- Annual counts from General Motors salaried payroll and insurance administration databases.
- Both databases have a master record for each enrollee and satellite records for each dependent.
- Only individuals with inforce coverage counted.
- Study excludes sponsored dependents and COBRA participants.

FORECASTING METHODS

We evaluate methods for forecasting population size and age-sex composition.

Extrapolative techniques:
- Linear interpolation.
- Continuous geometric increase.
- Polynomial.

Separate forecasts for
- naïve members
- total enrollees then members (using members per enrollee)
- disaggregated enrollees by type (employee, retiree, laid- off, surviving spouse), then members

Demographic techniques:
- cohort-component -U.S. survivorship
  - GM-U.S. survivorship and GM birth rates.
- naïve age-sex growth rates.
- "Headship" projections.

FORECAST ACCURACY MEASURES

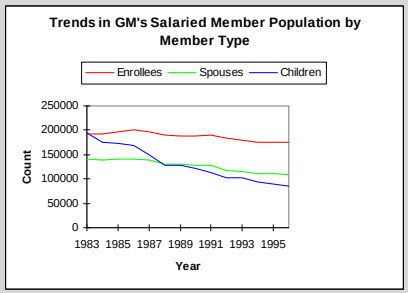
Mean absolute percent error (MAPE) $\frac{\sum_x |\hat{N} - N|}{x} \cdot 100$

Mean algebraic percent error (MALPE) $\frac{\sum_x (\hat{N} - N)}{x} \cdot 100$

Root mean square percent error (RMSPE)

$$100 * \sqrt{\left(\sum (\hat{N} - N)^2 / x\right)}$$

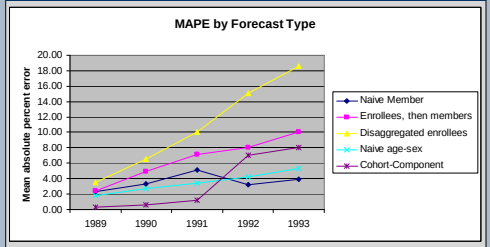
POPULATION

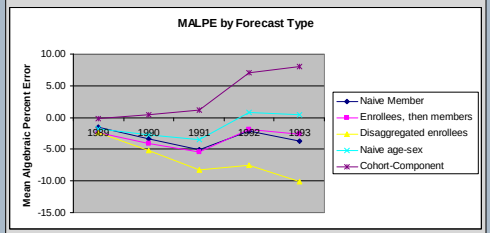


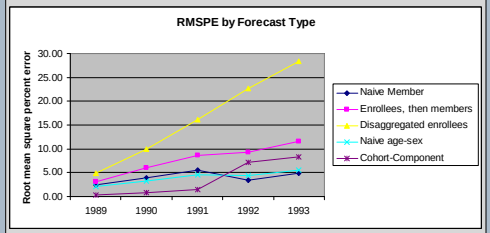
We use 1988 as a jump-off year, forecast the population 1989 to 1993, and compare forecasts to actual annual data.

Total population was 539, 473 in 1983 but fell by one-fourth to 1993. In contrast, U.S. population grew during period. Average age rose dramatically from 36.45 in 1983 to 44.43 in 1993.

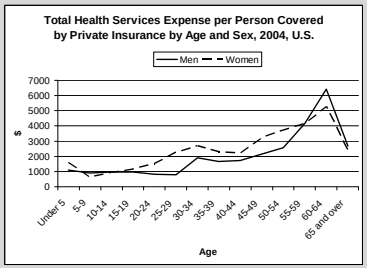
Results - Projecting Total Size (Members)





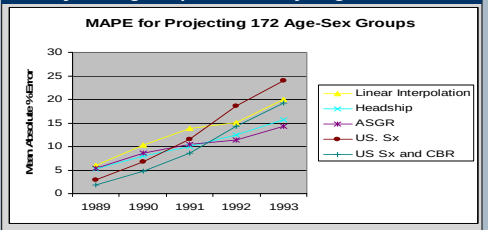


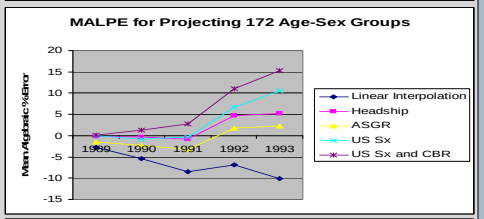
Health Care Costs by Age and Sex

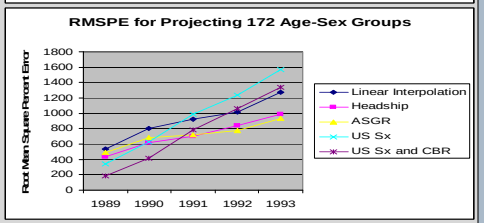


We aim to tie this age-sex profile to projected population by age and sex. We evaluate how well five techniques (linear interpolation, headship, age-sex specific growth rates and two cohort-component) project the size of 172 age groups by sex.

Projecting Population by Age and Sex







FINDINGS

1. For forecasts of total population size, simple extrapolation techniques work well.

Some findings differ from other research on population projections:

2. Accuracy levels vary dramatically across techniques and years.
3. Errors do not necessarily increase with length of forecast horizon.

4. For forecasts of age-sex composition, cohort-component techniques better than simple techniques.

CONCLUSION

Population dynamics in health benefit populations differ from that in geographically defined populations.

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