A Demographic Approach to Forecasting Health Insurance Benefits Costs

Hallie J. Kintner, Ph.D., Population Studies Center, University of Michigan, Ann Arbor, MI
David A. Swanson, Ph.D., Department of Sociology, University of California, Riverside, CA

ABSTRACT

We evaluate methods for forecasting population size and age-sex composition. Extrapolative techniques: linear interpolation, continuous geometric increase, polynomial. Separate forecasts for native members, total enrollees then members (using members per enrollee), disaggregated enrollees by type (employees, retirees, laid-off, surviving spouses), then members. Demographic techniques: cohort-component (U.S. survivorship rates and birth rates). "Headship" projections. Mean absolute percent error (MAPE), mean algebraic percent error (MALPE), root mean square percent error (RMSPE). Results: Extrapolation procedures predict total population size well. Cohort-component methods predict 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 length of forecast horizon. Conclusions: These findings suggest that population dynamics in health benefits populations differ 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 in-force coverage counted.
- Study excludes sponsored dependents and COBRA participants.

POPULATION

Trends in GM’s Salaried Member Population by Member Type

Health Care Costs by Age and Sex

Health Care Costs Expense Per Person Covered by Private Insurance by Age and Sex, 2004, U.S.

RESULTS - Projecting Total Size

FORECASTING METHODS

We evaluate methods for forecasting population size and age-sex composition. Extrapolative techniques: linear interpolation, continuous geometric increase, polynomial. Separate forecasts for native members, total enrollees then members (using members per enrollee), disaggregated enrollees by type (employees, retirees, laid-off, surviving spouses), then members.

MAPE by Forecast Type

MALPE by Forecast Type

RMSPE by Forecast Type

FINDINGS

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

REFERENCES