CHURN, BABY, CHURN: THE EFFECTS OF CHURN, POPULATION SIZE, OUTLIERS, AND RISK ADJUSTMENT ON ANNUAL HEALTH CARE SPENDING CHANGE

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INTRODUCTION

Health status-adjusted, or risk-adjusted, annual spending growth is a key measure of performance employed in numerous private contracts and by government agencies such as the Massachusetts Health Policy Commission (HPC). In previous research, the HPC has found risk scores to be rising roughly 2-3% per year overall. Risk scores are a measure of the average health risk among the population relative to a certain reference population and year that is generally defined as 1.0. These larger increases for risk scores were reported in some instances as being associated with IT system upgrades and investments in coding. Upward trends in risk score growth due to coding behavior (rather than patient health status) artificially depress risk-adjusted spending growth. A plurality of commercial contracts in the 2015-6 year in Massachusetts had unadjusted spending growth >3.6%, the state's spending benchmark, but HSA TME growth below 3.6%.

While increases in coding behavior can add bias to risk-adjusted spending growth measures, high rates of patient churn add significant noise. According to the Massachusetts Attorney General's Office (2019), "during a two-year period, 43% of two payer members moved either out of their health plan or their product. Another payer had 56% churn during this two-year period."

Understanding risk adjustment and churn is important to better understand and limit true spending growth.

Notes: POPV analysis looked at members attributed using POPV methodology and not just HMO/POS participants

Sources: Office of the Attorney General of the Commonwealth of Massachusetts.(2019). Barnett M, et al. (2017). HPC analysis of Massachusetts All-Payer Claims Database, 2016-2017

OBJECTIVES

- The primary objective of this research is to assess and improve the accuracy of health status-adjusted spending growth of privately-insured populations as a performance measure.
- To assess trends in spending growth more comprehensively, health status-adjusted spending will be modeled and the results analyzed in the context of external factors. These factors include churn rate, population size, and the presence of high spending outliers.
- Churn is established in this research as the rate at which patients leave and enter a patient population from one year to the next. For example, in a patient population with 1,000 members, if 200 members left the population in one year and 200 new members came in, that would be a churn rate of 20%.
- This research seeks to establish what relationship or effect, if any, churn, population size, and high spending outliers have on average spending changes for a patient population and any potential interactions with health status-adjusted spending growth analysis.

STUDY DESIGN

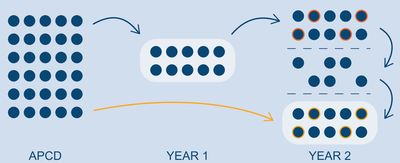
A population of 10,000 commercially-insured individuals less than 65 years old with 12 months of health and prescription insurance coverage was randomly drawn from the 2017 Center for Health Information & Analysis' (CHIA) Massachusetts All-Payer Claims Database (APCD) to create a reference ("Year 1") population. Part of the Year 1 population was removed (to simulate being "churned out") and a new equivalent number of patients was added (to simulate being "churned in") to form a "Year 2" population.

Retained members that were present in both Year 1 and Year 2 were assumed to have no spending change between the two years. Then, the difference in average spending due solely to churn between the Year 1 and Year 2 populations was recorded in 1,000 simulations to test the impact of churn rates of 10%, 20%, and 40%. Simulations were also run with a fixed churn rate of 20%, but considered varying patient population sizes of 5,000, 10,000, and 20,000 to assess the impact of population size on average spending.

To study the impact of outliers, simulations were also run in which high spenders were "capped" where average individual spending above $75,000 was replaced with $75,000. Risk adjustment (using The Johns Hopkins ACG® System) as well as risk adjustment from a constructed age-sex risk adjuster were also modeled in simulations to assess the impact of risk adjustment and coding intensity on average spending.

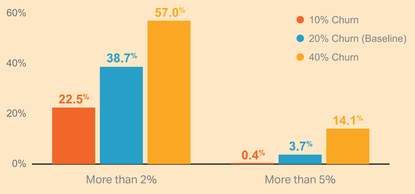
Notes: The information in the risk score analyses herein has been processed by software called The Johns Hopkins ACG® System © 1990, 2017, Johns Hopkins University. All Rights Reserved.

Depiction of random sampling process to simulate patient churn and create two distinct patient populations as two different years



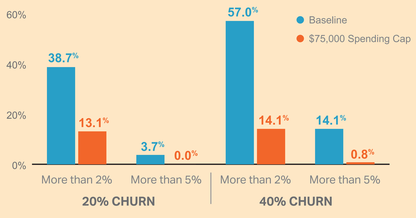
RESULTS

What percent of the time does churn result in a spending change (in either direction) of more than 2% and 5%?



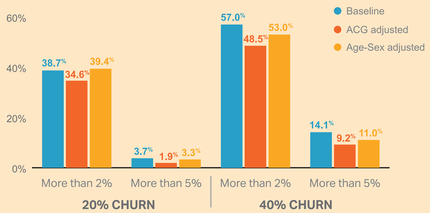
Notes: 10,000 population, 1,000 simulations
Sources: HPC analysis of Massachusetts All-Payer Claims Database, 2017

What percent of the time does churn result in a spending change (in either direction) of more than 2% and 5% with capped outliers?



Notes: 10,000 population, 1,000 simulations
Sources: HPC analysis of Massachusetts All-Payer Claims Database, 2017

What percent of the time does churn result in a spending change (in either direction) of more than 2% and 5% with risk adjustment?



Notes: Spending totals were risk-adjusted using the Johns Hopkins Adjusted Clinical Groups (ACG®) 10,000 population, 1,000 simulations
Sources: HPC analysis of Massachusetts All-Payer Claims Database, 2017

Higher rates of churn and smaller population sizes led to large apparent spending changes even when none truly occurred. For example, with a 10% churn rate and population size of 10,000, the likelihood that a patient population has an annual spending change of greater than 2% in either direction is 22.5%; but if the churn rate is 40%, that likelihood increases to 57.0%. Similarly, with a churn rate of 20% and a patient population size of 5,000, this likelihood is 53.0%, yet it drops to 24.2% if the patient size increases to 20,000.

"Capping" high spenders has a much larger impact in the likelihood of annual spending being greater than 2% in either direction. In a population with 10,000 members and 20% churn, if high spending outliers are excluded, this likelihood drops to 13.1%.

Typical diagnosis-based risk adjustment and age-sex risk adjustment had very little effect in mitigating spending changes due only to population churn. In a patient population of 10,000 individuals, with a 40% churn rate, the Johns Hopkins ACG® System risk score-adjusted annual change was only 8.5 percentage points less likely than the unadjusted change to have an average spending growth of greater than 2% in either direction. Using an age-sex risk adjustment method, the adjusted annual change was only 4.0 percentage points less likely than the unadjusted change to have an average spending growth of greater than 2% in either direction.

In contrast, traditional risk adjustment produced significant downward bias in health status-adjusted spending growth measures due to changes in coding practices. When we model a Johns Hopkins ACG® System risk score adjuster with an assumed 2% increase in risk scores due to coding intensity, the bias induced by coding intensity far outweighs the gains in accuracy from the risk adjustment itself.

CONCLUSIONS

- Churn, population size, and the presence of high spending outliers have a substantial impact on the average annual spending change for a patient population.
- Higher rates of churn lead to a higher volatility in the range of expected average spending growth from one year to the next. As churn increases, the likelihood of having an average population spending change of greater than 2% in either direction increases. The same phenomenon is observed for population sizes, but in an inverse pattern: as the population size increases, this likelihood of having an average population spending change of greater than 2% in either direction decreases, yet, when population size decreases this likelihood increases.
- When the presentation of high-spending outliers' spending average is capped at a threshold ($75,000 in this analysis) the likelihood of having an average population spending change of greater than 2% in either direction decreases dramatically.
- Risk adjustment does not have a large mitigating impact on measured spending growth due to population churn. The impact of both traditional risk adjustment methods and non-traditional methods through the use of an age-sex risk adjuster only slightly decreased the likelihood of having a spending change of greater than 2% in either direction. However, if coding intensity is accounted for, the reported risk-adjusted spending change from one year to the next can be substantially and significantly lower than the true spending change.

POLICY IMPLICATIONS

Spending growth for provider and payer populations is increasingly used in benchmarking and performance measurement, often with financial or other consequences. The results of this analysis suggest that use of larger populations, exclusion of outliers, assessments of spending for the same patients from year to year, understanding of the impact of churn, careful use of risk adjustment, and consideration of unadjusted spending may all help improve the accuracy of spending growth measures.

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