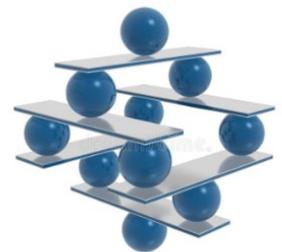


Analytics in Support of Population Health Management:

Accounting for Health Risk and Disease Prevalence

Articles in this series will explore various aspects of Analytics in Support of Population Health Management. This article is the third in this series [Analytics for Population Health Management](#) and [Advancing Analytics for Population Health Management - Article 2](#)

Population Health Management requires providers and program managers to maintain a delicate balance between taking a longer-term view of a target population (patient) experience and outcomes versus a short-term focus on individuals participating in a health management program and their near-term cost, utilization and outcomes. It is often difficult to see the forest for the trees, when too much of the analytic focus is centered around short-term experience, particularly when measured by cost and utilization results. (Prior article [Advancing Analytics for Population Health Management - Article 2](#) discusses limits of cost/utilization measures.)



While the two evaluation perspectives (short versus long term) may seem at odds, they are in fact closely related, with the more global perspective helping to inform, guide and predict the outcome of patient care in the near term. Regardless of which evaluation perspective one considers, there is general concurrence across different stakeholders that health risk is relevant and important to understand from a cost, outcomes, and quality perspective. By using population-based data longitudinally to better understand patterns of what is likely to happen, providers can develop insights into how each unique patient is progressing along common pathways and plan their interventions accordingly.

Likewise, population-based data can be leveraged as the basis for determining and setting expectations about the efficacy and effectiveness of population health management programs more broadly. This type of evaluation not only benefits from a longer-term perspective, but also requires a deeper understanding of not just what the levers of cost, utilization and health outcomes are for a target population overall, but also how demographic, clinical and other socio-economic differences within that population drive a range of results.

The Case for Health Risk and Disease Prevalence Stratification

Risk scoring and risk stratification are foundational for any successful population health management program and is the subject for this next article in our series on the population health management evaluation lifecycle. Accounting for

health risk characteristics is becoming even more critical with the aging population for whom the presence of co-morbid conditions is much more prevalent, and the differential impacts of level and quality of health management will be more pronounced.



Improving the health of populations requires the ability to stratify patients by health risk, and broader populations according to disease and condition prevalence. This is true in the clinical setting in order to identify and address high-priority issues but is also true when using population-based data to evaluate health management programs. Population health managers need to avoid siloing populations according to individual diseases or conditions and take into account how individuals within a given cohort may have multiple factors that can be combined into a risk score that is more predictive of likely outcomes.

It is difficult to ascertain or “tease out” potential levers of cost, utilization, and health outcomes without considering the distinct population characteristics that are expected to influence how individuals will proceed along their journey toward better health. Individuals within a population that present with different health risk and disease and/or medical conditions will likely start out looking very different from one another according to whatever measures are being used and will likely respond differently to program interventions (such that when viewed in the aggregated, may mask or distort results).

Providers can greatly improve the usefulness of population-based analytics by breaking down and examining patients with similar characteristics according to key clinical (disease and/or condition prevalence) and other health risk indicators and then analyzing and identifying how those factors influence ultimate outcomes.

What are some of the considerations for developing health risk and disease prevalence measures?

“Risk scoring” and “risk stratification” or the act of dividing patients into buckets of risk based on their clinical and health risk characteristics, are often used interchangeably, although the two terms have different applications. A “risk score” may indicate the likelihood of a single event (such as a hospital readmission within the next six months), while risk stratification refers to a framework that may combine several indicators of health risk and disease prevalence to profile a patient population in terms of how these characteristics are likely to drive program results and outcomes.

Taking the specific health risk and disease prevalence characteristics for a target population into account is a critical step, to avoid the pitfalls of simply looking at population level cost, utilization and outcomes in the aggregate and drawing conclusions accordingly.

The capability to profile populations along these dimensions is important because both demographic and clinical characteristics drive differences in observed cost within (and across) populations.

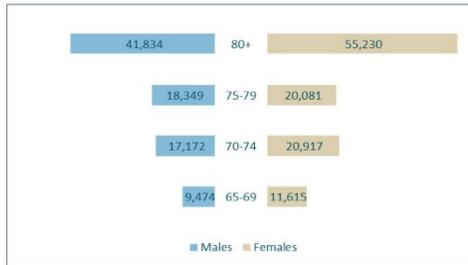
Analytic Building Blocks – Stratify Data by Health Risk Characteristics

	Categorize Claims for Clinical Conditions	Associate Clinical Conditions with Members	Stratify Data by Demographic Characteristics	Create Cost & Utilization Measures	Analyze Cohort Trends & Trend Drivers
Maturity ↑	Maintain & manage clinical cohort definitions and data				
	Match up members to their historical claims data	Count continuously-enrolled member months			
	Define the cohort of members	Track member retroactive changes	Assess areas of opportunity		
	Create clinical cohort definitions in claims data; consider co-morbidities and risk factors of interest	Associate patients with eligibility over time	Analyze statistical differences between the cohort and total population	Calculate utilization rates that are cohort-specific	Analyze utilization drivers
	Determine clinical conditions and areas of focus	Associate patients with eligibility to track 'active' status	Stratify claims by demographic groupings	Count different kinds of services (header & detail) that are cohort-specific	Analyze cost drivers
	Review the prevalence of disease	Count unique patients, Unique patients w/ claims	Create demographic groupings	Calculate cost measures that are cohort-specific	Calculate trend measures
	Cumulative work effort →				

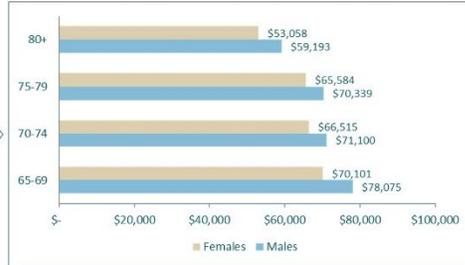
Define & Profile Populations to Analyze Demographic Impacts

The work to profile populations requires an association between patient demographic characteristics from eligibility data and medical coding from claim data. In this illustration, a target population of seniors with pneumonia was defined using select diagnostic codes found in claim data.

Number of Seniors Diagnosed with Pneumonia By Age and Gender



Seniors Diagnosed with Pneumonia Average Cost Per Patient per Year (All Costs)



Then taking this illustration a step further, the analysis considers clinical research that suggests when people with chronic respiratory disease become ill with pneumonia, individuals are at much greater risk. This is accomplished by adjusting the data (creating sub-categories) for co-morbid conditions that identify those at higher risk.

Define and Profile Populations to Identify Opportunities

Prevalence of Disease for Seniors in Selected Cohorts

	Number in Cohort	Prevalence Rate Per 1,000 Population
Pneumonia Cohort	194,672	56.4
Asthma Cohort	234,355	67.9
Chronic Lower Respiratory Disease Cohort	592,119	171.4

All Costs Observed for the Seniors in Selected Cohorts

	Average Cost per Patient Per Year
Pneumonia	\$62,569
Asthma	\$34,939
Chronic Lower Respiratory Disease	\$35,969

	Average Cost per Patient Per Year	Ratio of Costs for Combined Cohorts vs. Selected Cohorts
Combination of Pneumonia and Asthma In Cohort	\$75,308	2.155
Combination of Pneumonia and Chronic Lower Respiratory Disease in Cohort	\$71,9873	2.001

In this example, initial analysis showed that when a population cohort is defined based on a combination of diagnosis codes for pneumonia and asthma or chronic lower respiratory disease (COPD), costs double.

Using an example from wound care further illustrates this point. A chronic nonhealing wound (CNHW) is typically associated with comorbidities such as diabetes, vascular deficits, hypertension, and chronic kidney disease. A recent National Institute of Health (NIH) article highlights the clinical relationships between healing, wound care, and the presence of clinical conditions. (Beyene Aug 2020)

Consequence of Another Condition

- In essence, a non-healing wound can be the direct consequence of another clinical condition, the cause of that condition, or the result of a clinical intervention (e.g., surgery) intended to treat said clinical condition.

Analyzing the Cost

- Analyzing the cost and utilization experience of a population receiving wound care would be very difficult to interpret and draw useful conclusions about without somehow adjusting for co-morbidities that exist within that population of interest, including the underlying circumstances associated with the wound itself.

Presence of Conditions

- The presence or absence of significant co-morbid conditions, as well as the cause of the wound, will naturally drive different patterns of utilization, cost, and outcomes that are important to understand.

The Role of Disease Prevalence in Risk Adjustment

Chronic diseases forecast risk because they tend to require continued use of medical care in a more or less expected or consistent manner. Acute or transitory diseases and/or medical conditions may also be useful for forecasting risk if they carry higher likelihood of complications that will require care.

To develop useful risk assessment models, it is important to know which diseases (whether chronic or acute) occur with sufficient frequency and/or recurrence to be related to future health care needs. It is also helpful to understand which diseases are similar and can be clustered, and how many classes or categories are needed to adequately account for risk differences within a target population.

Within any disease or disease cluster created for this purpose, medical care utilization patterns should be expected to vary systematically. Straight forward disease prevalence data is not always sufficient for effective risk adjustment modeling. For one thing, diseases vary in severity and stage of progression, and further may fail to account for emerging trends derived from other indicators (combination of demographic and other predisposing factors) at play within a population.

Additional data sources that help define health risk and disease prevalence within a target population

Claim data is often not enough to establish a robust health risk classification built using disease prevalence indicators. Where information about disease severity and/or staging is not available, it can be useful to develop and include self-reported measures of relative functional and health status, given that disease and its effect on activities of daily living and perceived well-being are known to predispose individuals to seek care. Moreover, future utilization may be related to self-reported impaired functioning because it is closely tied to severity. For example, it is not simply that someone has diabetes, but whether the disease interferes with day-to-day activities that generates certain expected use patterns within a population.

Functional and perceived health status can be measured using a self-reported survey information. The RAND-36 Health Survey, for example, measures several dimensions of functional and perceived health status, including social, mental, physical, and perceived health.

As a lead into our next article in the series on the population health management evaluation life cycle, we will expand upon the use and source(s) of various assessment tools (both patient self-reported and provider reported), particularly as it relates to determination for timing and application of clinical interventions to improve outcomes. As a case in point, applying the right intervention to address pain management benefits from an understanding of a patient's experience of pain, beyond that which can be gleaned from claim data alone. Assessments about level of pain can be better obtained via patient and/or provider reported information and the advent of electronic medical records and other home monitoring devices opens up new possibilities for incorporating that data into the health program evaluation framework.

Works Cited

Beyene, R.T., Derryberry, S.L., Barbul, A. Aug 2020. *The Effect of Comorbidities on Wound Healing*. Review, North America: Elsevier Inc. <https://pubmed.ncbi.nlm.nih.gov/32681870/>.