

Modeling Excellence: Quality Patient Segmentation for Targeted Health Care Solutions

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JOHNS HOPKINS
MEDICINE

Brief Definitions

What is population segmentation?

Dividing and conquering: Population segmentation is a data-driven approach that divides a whole — typically large and diverse — population into smaller homogenous and more manageable subgroups based on their characteristics and needs. This helps health care providers, payers and health care analytics companies to better address the unique needs of each subgroup, while improving overall health outcomes and efficient resource allocation.

What is risk stratification?

Where to start: While similar to segmentation, risk stratification is a fundamentally different data-driven approach. Risk stratification involves prioritizing individuals within a population based on their relative health risk or probability of a specific future outcome.

In practice, the two approaches should be used together, so that users can more effectively plan service delivery and prioritize the allocation of resources. For example, a user might segment the population to understand how many people have multiple complex clinical conditions and then further stratify the subgroup to highlight those who are at greatest risk of experiencing a harmful fall within the next twelve months.

Segmentation supports a range of use cases across key decision makers:



From your whole population at a glance...

Population health management strategy: Helps **health care organizations and providers** identify a population's health care needs and plan for resources. This approach allows health systems to **implement strategies based on underlying health risks** to engage and support each segment.



To cohorting/worklists...

Intervention targeting: Segmentation can help **providers and care managers** determine which subset of a patient population will benefit the most from a specific intervention, based on enrollment criteria and likelihood of impact. This helps **ensure a match of the right patient to the right care plan**, with outcomes of each intervention measured over time.



To an individual

Tailoring care delivery: Segmentation shows **providers** the highlighted clinical needs of each patient. This operationalizes **tailored care delivery** based on clinical need, characteristics or behaviors. A segmentation-based approach to population health is often more useful to clinicians than single risk markers, as it considers overall patient health needs.

What does ‘good’ look like?

There are many ways organizations can segment their populations. Some key principles and foundations of an effective segmentation approach are:

Inclusive and comprehensive

- Clinically coherent and simple
- Uses routinely collected standard health care datasets
- Considers a complete set of conditions, problems and risks across primary and secondary care settings

Evidence-based and transparent

- Built on a validated model with transparent methodology
- Backed by evidence, including published studies and customer use cases and outcomes

Flexible and adaptable

- Part of a comprehensive and customizable suite of analytic tools
- Used and understood by multidisciplinary teams of clinicians, analysts and business leaders
- Supports clinical decision-making and intervention planning, including integrated and proactive care management and outreach

Supported and maintained

- Supported and continually improved to meet changing demands and priorities
- Includes training and services that help teams effectively use the analytic tools

“The ultimate test of a good segmentation is whether it is understood, accepted, and used effectively by the organization. A segmentation that is not understood or embraced will fail to drive meaningful action, regardless of its analytical sophistication.”

— David J. Batholomew

What is the Patient Need Groups (PNG) framework and how does it fare against these key points?

Introducing PNGs: The ideal clinical segmentation approach

The Johns Hopkins ACG® System's PNGs offer an innovative and clinically based approach to patient segmentation. PNGs are a powerful population health approach, enabling health care organizations to understand patterns of morbidity and assess health needs over a lifetime. They help providers to identify and monitor rising-risk populations and optimize resource allocation to improve outcomes for individuals at risk.

The Patient Need Groups

PNG01	PNG02	PNG03	PNG04	PNG05	PNG06	PNG07	PNG08	PNG09	PNG10	PNG011
Non User	Low Need Child	Low Need Adult	Multi-Morbidity Low Complexity	Multi-Morbidity Medium Complexity	Pregnancy Low Complexity	Pregnancy High Complexity	Dominant Psychiatric Condition	Dominant Major Chronic Condition	Multi-Morbidity High Complexity	Frailty

Increasing Health Needs

PNGs works on the principle that each individual is unique and, as such, requires a tailored care plan driven by their medical conditions, demographics and social factors. Our PNG methodology assigns individuals of all ages into one of **11 mutually exclusive groups that are easy to understand**, tracking patients as they move into one of various levels of need throughout their life. Exploring impactable risk factors, such as tobacco use and care coordination issues, PNGs help users identify where to concentrate their clinical team's time.

While other population health analytic tools identify patients by disease state, care episode or utilization event, the ACG System has always focused **on a whole-patient approach to care**. Patients, particularly those with complex health needs, cannot be defined simply in terms of their disease (i.e., 'a person with diabetes') or care event, (i.e., 'a readmitted patient').

The chart below clearly sets out the association between key system metrics and the different needs of each segment in the PNG hierarchy.

			% of population	Mean Age	Mean Number of Chronic Conditions	Mean Number of Generalist Appointments	Mean No. of Active Ingredients (Distinct Drugs)	Emergency Admissions per 1,000	Mean Emergency (LOS) days	Mean Risk of Emergency Admission
High Complexity; Multi-Morbidity	11	Frailty	1.2%	85	8.1	16.5	8.1	751	7.5	55.6%
	10	Multi-Morbidity, High Complexity	3.5%	71	7.9	15.9	8.2	714	3.9	51.3%
Dominant Chronic	09	Dominant Major Chronic Condition	6.5%	58	4.4	9.6	5.0	146	0.5	16.4%
	08	Dominant Psychiatric/ Behavioral Condition	3.3%	46	3.6	7.8	3.5	114	0.5	5.4%
Pregnant	07	Pregnancy, High Complexity	0.2%	32	2.7	11.4	3.1	338	0.3	3.6%
	06	Pregnancy, Low Complexity	0.8%	31	1.0	6.8	1.6	80	0.1	0.2%
Moderate Needs	05	Multi-Morbidity, Medium Complexity	15.7%	62	4.2	9.4	4.6	132	0.3	7.9%
	04	Multi-Morbidity, Low Complexity	23.6%	47	1.7	4.9	2.0	47	0.1	0.2%
Healthy	03	Low Need Adult	30.2%	42	0.3	1.9	0.6	8	0.0	0.0%
	02	Low Need Child	14.4%	9	0.2	2.4	0.6	37	0.0	0.0%
	01	Non-User	0.6%	23	0.0	0.0	0.0	0	0.0	0.0%

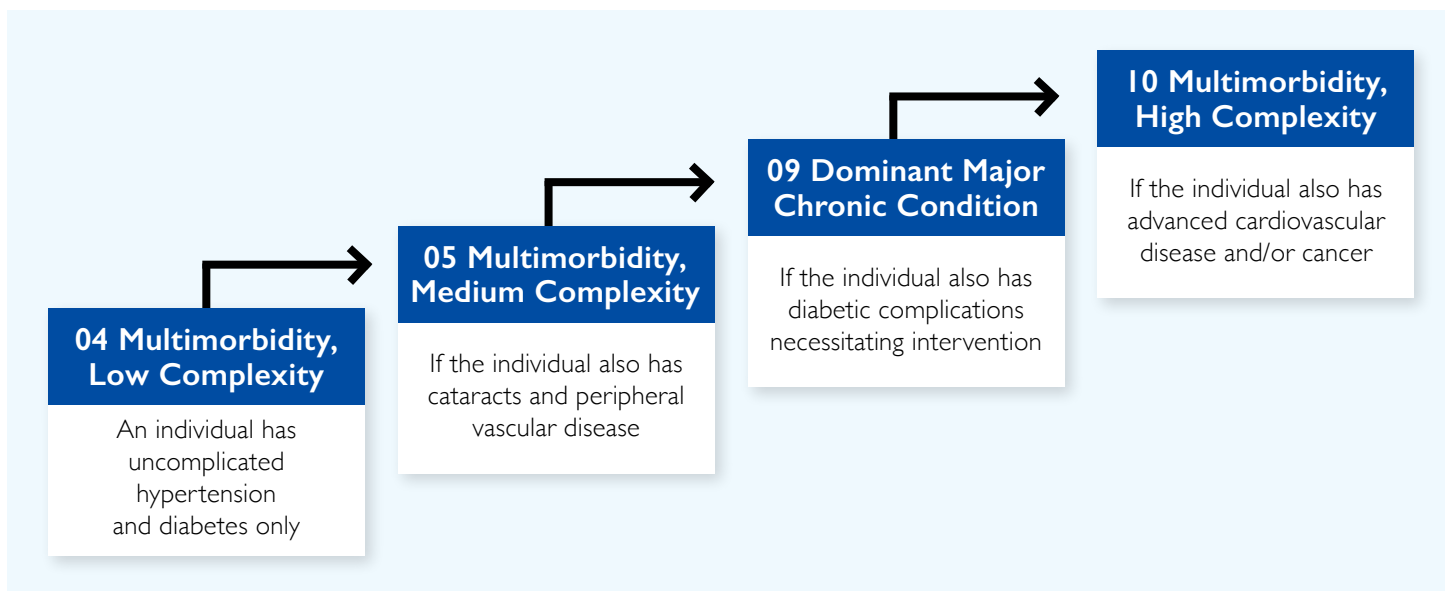
Based on a sample size of approximately 800,000 patients from UK National Health System

Understanding your population and selecting subgroups

The PNG toolkit has three components. This model acts as a lens to zoom in on your population — starting with segmentation, then moving to care modifiers and predicted risk.



Example: Creating a custom cohort using PNGs



How can this information help users improve their population health strategy?

Together with contextual and personal self-reported information about an individual, health care providers and decision makers can **design and direct care plans tailored to each patient's needs**. Less-complex PNG patient groups may be encouraged to sign up for health improvement programs to focus on appropriate lifestyle management and prevention of worsening disease. Highly complex patients may receive additional specialist clinical services focused on cardiovascular disease management and medication management to prevent future hospitalizations.

Where are PNGs being currently applied and what benefits are they driving?

Case Study: Payer Organization Uses PNGs to Proactively Manage Rising-Risk Population

Advancements in predictive analytics have changed the way that payers can implement early, targeted care interventions for their rising-risk members. One health plan using the ACG System applied PNGs to identify and support rising-risk individuals *before* they exhibited high-risk PNG profiles and to understand how their members transition through different risk stages.

Problem:

Without early intervention, rising-risk populations are at risk for poor health outcomes, disease progression, higher cost, higher ED and inpatient utilization, as well as higher readmission rates.

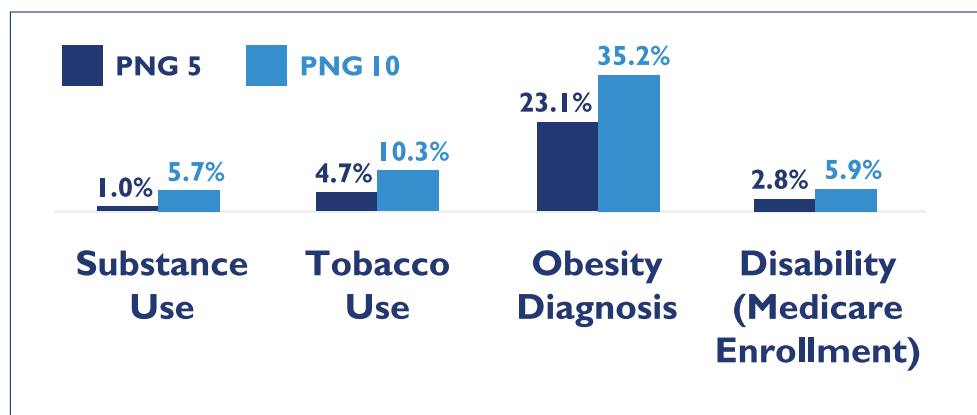
This organization needed help in identifying their rising-risk members who may not yet be displaying high-risk profiles, so that they could better understand how a patient moves through different stages of risk and develop appropriate care interventions — based on each member's unique needs — to slow disease progression.

Solution:

Using PNGs, the team followed two cohorts of elderly individuals, comparing members in PNG05 who stayed in this segment over a two-year period with members who transitioned from PNG05 to the higher complexity PNG10.

The analysis revealed that members who progressed to higher complexity (PNG 10) had:

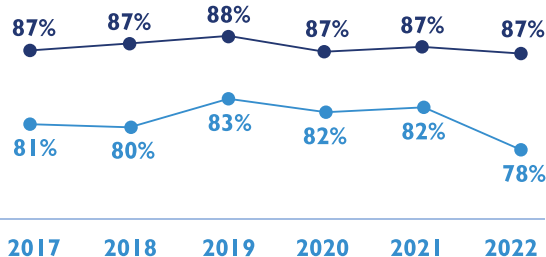
- 4X higher substance use disorder prevalence
- 2X higher tobacco use
- 50% higher obesity diagnosis
- Increased Medicare enrollment due to disability



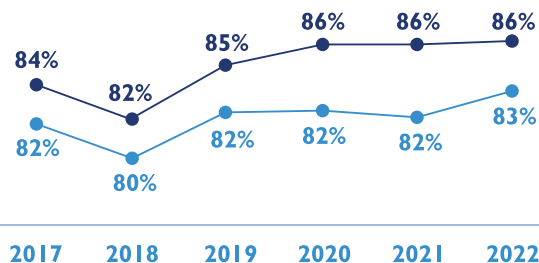
The exercise also showed that members progressing to PNG 10 were less likely to be up to date on cancer screenings, while members stable in PNG 05 that were diagnosed with cancer were more likely to have timely screening, facilitating an earlier diagnosis with more treatment options.

Members who stayed in PNG 5 had higher rates of cancers screenings in past years.

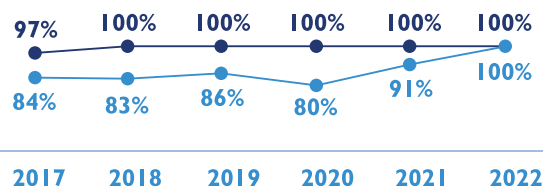
Breast Cancer Screening in past 3 years



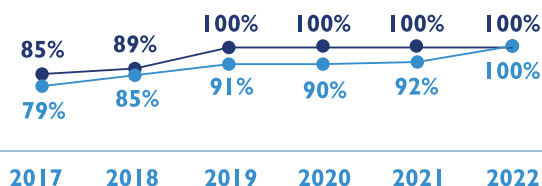
Colorectal Cancer Screening



Breast Cancer (BC) Screening, Members with BC



Colorectal Cancer (CC) Screening, Members with CC



● PNG 5 ● PNG 5 to 10

The ability to segment patients into clinically relevant cohorts using PNGs highlighted to the payer the clear need for early intervention and enabled them to address risk factors and implement individualized, data-driven care strategies.

The team was then able to:

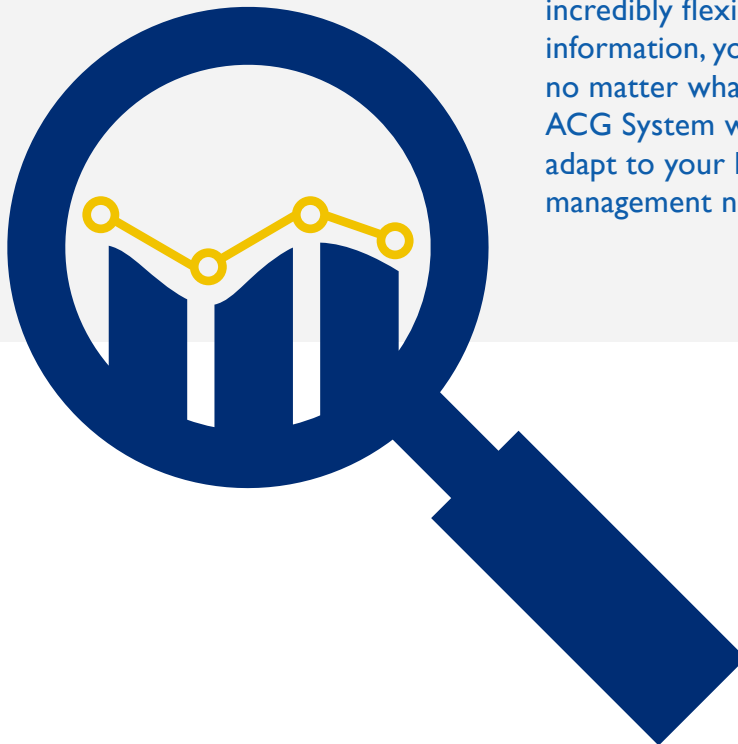
- Implement targeted outreach to address lifestyle factors such as obesity, tobacco use and substance use
- Ensure timely preventive care and screenings
- Focus care management interventions to support chronic condition and substance use management

This case study demonstrates how predictive analytics can drive targeted interventions that can improve patient outcomes while optimizing resource allocation. By tracking patient movement between risk categories, the health plan gained critical insights into key health indicators that contribute to disease progression and higher health care utilization.

ABOUT THE JOHNS HOPKINS ACG SYSTEM:

The Johns Hopkins ACG System is the world's leading population health analytics software. The system continues to evolve, providing ever-more refined tools used in the US and across the globe for over 30 years, from commercial health plans and governments to health systems and large employers. The beauty of the ACG System is its ability to combine data from an array of sources to reveal powerful insights that go beyond just medical records.

By identifying risk and tracking patients over time, the ACG System can help you plan ahead and reduce health care costs — especially valuable to risk-bearing health systems and provider organizations. Most importantly, the ACG System allows you to be proactive rather than reactive when it comes to your population's unique health care needs. The system helps you combine a population-level perspective with patient-level behaviors and conditions. And because the system is incredibly flexible and responsive to new information, you can rest assured that no matter what comes next, the ACG System will continuously adapt to your health care management needs.



To learn more about Patient Need Groups and the ACG System, contact our team at acginfo@jh.edu or visit hopkinsacg.org.

