

# Risk Stratification, Population Segmentation and Johns Hopkins ACG

FREQUENTLY ASKED QUESTIONS

PHM PROGRAMME TEAM

## Purpose of the document

- To support colleagues in the system with agreed answers for questions regarding the use, caveats/limitations, strengths and interpretation of the Johns Hopkins ACG system.
- Questions and answers documented here have been captured from discussions at various forums including the INT Delivery Group, Health and Wellbeing Partnership (November 2025), and the PHM Delivery Board (July, September, November 2025).

Answers have been provided by colleagues in Public Health, GCC and ICB BI and the PHM team.

## Version Control

This is a live document and outstanding questions will be addressed once answers are known.

Version	Edit	Edited by	Edit date
v.0.1	Added version control table, purpose, update	Jamie Fagg	19.12.2025
v.0.2	Added comments and some responses throughout	Jamie Fagg	08.01.2026
v.0.3	Second draft completed from comments and responses added	Tom Orpin/Joe Blackford	09.01.2026
v.04	Comments added from members of PHM Delivery Working Group	PHM Delivery Working Group	14.01.2026

## Stakeholder engagement

This section outlines the mechanisms through which this document is kept up to date and the forums/groups and stakeholders that it is distributed to and at what frequency to keep them sighted on any updates.

### What questions are arising?

Questions in this document have been collected from key groups and stakeholders where data has been presented.

### How is this document updated?

PHM's Workstream D will have overarching ownership of this document. The PHM Programme Manager will have ownership for all areas outside of the scope of Workstream D. This document will be discussed at each Workstream D meeting to discuss and review any new content. If needed, any new content can be escalated to the PHM Delivery Working Group and, as appropriate, the PHM Delivery Board.

### Who is updated on this document?

Members of the PHM Delivery Board receive an updated copy of this document once every two months, with the option for exception reporting in between this time if needed.

## Frequently Asked Questions

### 1. What is the Johns Hopkins tool?

The Johns Hopkins ACG System is a segmentation and stratification tool that classifies populations into clinically meaningful segments using primary and secondary healthcare data as its source. It applies sophisticated algorithms to identify patterns in health needs, risks, and service utilisation. This segmentation enables commissioners and planners to understand variations across population groups, predict demand, and prioritise interventions.

Its relevance to health lies in supporting integrated needs assessments, long-term planning and resource allocation. By highlighting high-need cohorts and opportunities for prevention, the tool helps design targeted strategies that improve outcomes and reduce inequalities.

It is widely used in ICBs across England. It may also have some relevance to local authorities to strengthen commissioning where health needs in the registered population are particularly important. Key example areas might be for adult social care of older people, where risk of admission, frailty, and /or falls history (for example) might be an important driver predicting loss of independence and need for care. However, as the tool is only derived from acute and primary care data, and not care or community trust data, it might not have as much relevance as a tool which did directly include those to build up segments. Therefore its utility in this space needs to be tested before it can be used in practice to inform planning.

The tool could also inform wider strategic work on need, particularly around multimorbidity and how it impacts demand across different settings in the system. The tool might also be considered as part of the wider ICS Joint Strategic Needs Assessments (JSNA), but it is key to keep in mind that the JSNA usually draws on data relating to the resident, not registered population-level impact so this caveat must be considered and highlighted to users of the JSNA if the Johns Hopkins data is published as a product within the JSNA.

### 2. What is strategic segmentation, how does it differ from generic population segmentation and why is Johns Hopkins good for that?

In general, strategic segmentation is an approach which divides a large and diverse population into distinct, homogenous, mutually exclusive groups or 'segments'. There are many ways to derive these segments, based on characteristics which are quantified and measured consistently across the population. Locally the ICS has at

least two major segmentation tools – the ACORN tool used by GCC which classified segments based on socio-demographic data, and the Johns Hopkins tool, but draws mostly on NHS data.

The Johns Hopkins Strategic Segmentation model uses a Population Health management (PHM) approach that divides a population into distinct groups based on shared health characteristics, risks, and needs. Rather than focusing on individual risk, it examines broader patterns across the population to inform strategic planning and commissioning. Using advanced algorithms applied to primary and acute care data, the approach creates clinically meaningful segments that help commissioners understand variations in health needs, predict demand, and prioritise services.

The tool supports integrated needs assessments and long-term planning by identifying high-need cohorts and informing strategies for prevention and resource allocation. It is currently influencing ICB commissioning in Gloucestershire and could potentially be adapted for use by wider ICS partners in primary care, acute and community providers, and local authority (conditional on testing within those settings) to strengthen needs assessment and strategic decision-making.

### **3. What is risk stratification in Johns Hopkins?**

Although it is often discussed alongside segmentation, risk stratification is a distinct data-driven approach. Risk stratification focuses on ranking individuals within a population according to their relative health risk or likelihood of experiencing a specific future outcome.

Demonstrating best practice, segmentation and risk stratification should be used in combination to support effective service planning and resource prioritisation. For example, a population may first be segmented to identify people living with multiple complex clinical conditions, and this group can then be further stratified to highlight those at highest risk of a harmful fall within the next twelve months. Segmentation and stratification occur at the same time and are not reliant on each other.

The Johns Hopkins ACG tool has a variety of risk algorithms for ICB's to use. These run on the population each month and provide a likelihood of experiencing each outcome in the next 6-12 months (depending on the outcome).

The following algorithms are accessible through the tool:

- Probability of high total cost
- Probability of high pharmacy cost
- Probability of unexpected pharmacy cost
- Probability of persistent high service use
- Probability of inpatient hospital admission in the next 12 months
- Probability of inpatient hospital admission in the next 6 months
- Probability of hospital admission linked to injury

- Probability of extended hospital admission
- Probability of unplanned 30-day readmission

#### **4. Can I use the Johns Hopkins segmentation or risk stratification algorithms to inform direct care of patients as a provider in primary care, GHFT, GHC or the VCSE?**

It is technically possible to flow data from Central BI systems to inform direct care (see for example Greater Manchester and Lincolnshire ICB flows) so theoretically this would be possible.

Currently Gloucestershire ICB do not have an agreed technical mechanism to flow the risk stratification algorithm (or segmentation) data at the patient level to provider clinical systems. Therefore at the moment these risk stratification algorithms cannot be used to support the targeting of individual interventions.

Resource would be required to build this requirement (i.e. to flow Johns Hopkins data to clinical systems) along with a stakeholder engagement exercise to ensure it is used for clinical benefit.

The ICB Digital Transformation and BI teams are actively assessing technical and business options to deliver segmentation and risk stratification data to practitioners and will initiate a project to do so once an option has been ratified and approved,

#### **5. How might ACG support risk stratification in General Practice?**

Contractually, GPs will be required to use PHM risk stratification and segmentation tools in their planning by the end of March 2026. Existing guidance does not specify a specific tool or approach.

Using a standardised tool and associated risk stratification interventions and practice, would mitigate against general practice risk stratifying in an inconsistent way. This standardisation would also therefore ensure that inequalities in access and healthcare practice across the Counties were minimised as they are for other contractual responsibilities.

A key PHM Programme deliverable under the ICB Commissioning Plan is to support the development of a county-wide risk stratification approach, in conjunction with key stakeholders including the GP Collaborative. In this work we are working with our primary care clinical lead (Dr Alan Gwynn) to understand the contractual perspective, to draw on the examples of good practice at the PCN level in risk stratification (for example in respiratory, frailty and end of life work).

As noted above in question 4, the ICB Digital Transformation and Business Intelligence teams are also exploring whether the ICB can identify a mechanism to push out ACG risk stratification algorithms and segmentation data to primary care clinical systems such as EMIS and SystemOne in the future to support a standardised set of general risk stratification tools which relate to key population health outcomes such as risk of hospital admission, high pharmacy cost, or persistent high service use (i.e. algorithms listed in FAQ 3).

**6. The Johns Hopkins system (and other ICB Healthcare data analysis) relates to the registered population, but the Local Authority draws on the resident population, what is the implication of this.**

High level response: the 'registered' and 'resident' are two common 'population estimates' used in local planning by the NHS and Local Authority respectively.

The resident population of Gloucestershire captures those people who live within Gloucestershire boundaries. The registered population is those people that are registered with GP practices within the county boundary. The two overlap considerably, but also differ: some Gloucestershire residents will be registered in GP practices outside of the county and will not be captured in the registered population, conversely some people who are registered with GP practices within the county will live elsewhere.

The NHS tend to use the population registered with GPs (the 'registered') and Local Authorities and the Joint Strategic Needs Assessment tend to use estimates provided by the Office for National Statistics (the 'resident'). The registered population is generally higher, and is live, whilst the ONS estimate is static and calculated as a mid-year estimate every year. The ONS estimate is lower as the ONS remove temporary residents such as students and the registered population can contain patients who have moved out of County but have not updated their records.

The implications for Johns Hopkins is that it uses the registered population for the 'numerator' of rates (e.g. number of people in a segment) but the resident population as the denominator for some rates in the Population Dynamic Model (and other current rates or not?). Ideally, it would use the same base population for both but projections of the registered population are not available so this is not possible. This limitation is consistent across other ICBs and the same workaround is used by them in their projection of healthcare; importantly BNSSG also use this workaround. Without data on projections of resident population we cannot explore the implications of this assumption directly.

Johns Hopkins ACG tool is fed by Gloucestershire Primary and Secondary care data. As such data is only available for registered patients and some patients who may reside in Gloucestershire but are registered elsewhere, will not be segmented or stratified by the tool. One piece of work the ICB is undertaking is an effort to project the growth of the ACG patient needs groups, based on the ONS projections. As ONS

uses resident population, this tool will estimate the proportional growth of each age band in Gloucestershire and apply that proportional increase to the registered population.

Another challenge is that the profile of the population means it is skewed, for county council services which are delivered to residents a reliance on the John Hopkins Model could mean we are overlooking the needs of residents.

**7. With regards to proportional increase in frailty, what are the raw numbers? What do those numbers do to expected costs?**

The dynamic population model shows that the frailty segment will increase by 45.6% by 2040 (based on 2025 values). This equates to an increase of 4,809 patients from a base of 10,526. The model estimates total spend (based on certain activity types) to increase year on year, reaching a 34.55% increase by 2040 equating to cost growth in excess of £31 Million for this PNG. Work is ongoing to further refine the costs associated with community and mental health activity as well as incorporate 111 and out of hours costs.

(Activity data included in costings; Emergency Admissions, Elective Admissions, Emergency Department, Mental Health, MIU, Outpatient Appointment, Outpatient Procedure, Primary Care)

**8. Could we easily see the locality and PCN (and IMD?) breakdown for the segments? Of particular interest is the low risk groups for ILPs to help enhance data informed decision making.**

There is an ICB dashboard currently published that contains this information. PDF's can be shared with system partners on request.

**9. When we talk to stakeholders we'll need to understand the algorithms generating the numbers within the cohorts (e.g. the number of those with frailty in the county on JH is 8000 and that's very different to the figures that we get using EFI or Rockwood.**

A frailty briefing which analyses and describes how the different tools (Johns Hopkins, EFI) measure frailty in Gloucestershire has been put together and has been shared for feedback with frailty and PHM leads. Once refined as per feedback this will be shared with the system. And added as a link to this document.

There is extensive documentation provided for the ACG outlining exactly how each algorithm is derived. This is only available to analysts and is technical. However, as use cases are developed and taken forward, BI teams will expand on the underlying

algorithms with commissioners as appropriate to ensure that they understand what is and isn't included.

### **10. What is the frequency of the data refresh?**

Monthly from Primary Care and NHS England. Those two data feeds are what informs the algorithm and that is processed monthly.

ACG data is refreshed monthly using ICB primary and secondary care data as the source.

### **11. How far back does the ACG data go?**

Currently we are also running an historic data process to enable us to have up to 3 years of historic data. Therefore each month, the current month is populated as well as the same month last year and 2 years prior. We will have a full 3 years of data by November 2026.

Having retrospective data dating back to November 2023 will allow us to model transitions between segments, to calculate the local sensitivity and specificity of risk stratification algorithms (e.g. how accurately did they predict hospital admissions data against observed data), and to calculate 3 year averaged rates of more rare conditions/activity.

### **12. How can we identify if an individual is at risk of transitioning from one segment to another? Can we use clinical markers?**

It is important to understand how the registered population is transitioning between segments as their needs and the activity and costs associated with needs will also change. Some segments (such as pregnancy) are inherently an episode, and people in that segment will then move back to their original segment (e.g. moderate multimorbidity). However, for others, movement from, for example a single chronic condition to a more complex multimorbidity segments represents a 'rising risk'. Understanding early and systematically who these people are, gives a focus to the system from preventative work to reduce or delay the proportion making that change. Currently we are lacking a longitudinal dataset for ACG which makes building models to investigate risk of segment drift more difficult however (see question 5) by the end of 2026 we will have 3 years of data to work with.

However, once that longitudinal data is in place, ACG data is linkable via a common pseudonym across all NHS datasets. This enables us to cross reference the data as well as add condition flags or clinical markers alongside their segments. The ACG data also includes a wide variety of further segmentation methods such as Aggregated Diagnostic Groups (ADGs) and Care modifiers. This will help us to investigate risk of further segment drift and rising risk.

As part of our analytical planning, we will work with commissioners to understand the segment transitions with the most potential for preventing increased burden of morbidity (and therefore system costs) so that when we have the longitudinal dataset in place we can identify who in the populations is most likely to be making those transitions in the next twelve months, and which, if any of those transitions might be delayed or prevented through intervention.

## Questions that are on-going and evolving

### **1. How do we integrate strategic segmentation using the Johns Hopkins tool into the PHM approach?**

Strategic segmentation is a core part of a PHM approach. The ACG tool was commissioned in March 2025. We carried out quality assurance in May 2025 and adapted and deployed the DPM in November 2025. Basic and prioritised analysis was conducted in September and October 2025 with deep dive analysis on frailty running concurrently from September – December 2025. Next steps are for a deep dive into children and young people. A first Johns Hopkins workshop, scheduled for 4 February 2026 with ICB commissioners, will inform future deep dives. The ICB data management team continue to refine the outputs of the tool alongside analytical input to improve analysis. The ACG outputs have been made available to PHM workstream D analysts who will assist in scoping requirements from the Johns Hopkins workshop and assist in the delivery of analytical products.

### **2. How can it support strategic commissioning?**

We will be seeking to integrate the tool into BAU dashboards for governance groups such as portfolios and ILPs. The analytical plan will include details on this once fully scoped out.

### **3. What questions do we want to ask of the data?**

We will use this as a basis for a proposed workplan of deep dives on the data to ensure we translate the data into impact in the most important areas of the business. Our initial focus has been on recognised priorities of needing to inform the strategic commissioning plan and the rollout of the frailty model.

#### **4. What insights will we gain?**

The system has already provided helpful insights to inform the medium-term plan of the ICB. We are also understanding more about how it captures frailty and multimorbidity relative to other tools such as the EFI.

As per the analytical plan, the BI team in the ICB are currently working on an analysis of children and young people.

We are putting in place workshops with system partners to inform our analytical plan.

#### **5. How accessible is the product? Does it need a central team to manage or has it a user interface that can be accessed by INTs?**

Currently it requires a central BI team in the ICB. We anticipate building user interfaces in the future using existing dashboards and, if necessary, new dashboards where required in Power BI. The analytical plan will be circulated in March 2026 with a timetable for the dashboards that will be updated and when

#### **6. Who will be doing the analysis and the support of this in the future state when the ICB has moved to its new operating model?**

The model is still being worked through and therefore in January 2026 we do not know the answer to this as this. We are working with colleagues in BNSSG to align the two PHM programmes in anticipation of clustering and then a merger. This may lead to a fundamental review of how segmentation is done in the new ICB.

We will update this answer when we have more clarity on the future state of the supporting functions for PHM within the new ICB model.

#### **7. How should we approach the challenge around doing something different to BNSSG? (BNSSG use Cambridge Multi Morbidity)**

As above, we have started discussing alignment between the PHM programmes of BNSSG and Gloucestershire.

An evaluation of Johns Hopkins will be carried out in Gloucestershire within the lifespan of the current contract (until March 2027) and there will then be an opportunity to review whether to continue this arrangement in the new cluster organisation.

**8. How long is the contract with Johns Hopkins?**

It is a two year commitment that has already been paid for by NHS Gloucestershire ICB. The two year contract runs from March 2025 to March 2027.

**9. How will whole population segmentation allow us to tailor care at an individual level?**

Segmentation can highlight inequities across patient groups allowing for more focused work on inclusion, access and inequity.

Supplementary to stratification, ACG includes expanded diagnostic clusters which enables us to tailor interventions to individual needs.

**10. In Q Risk, a patient's postcode is used as a proxy for local area based socioeconomic deprivation based on the Townsend score. Does the Johns Hopkins system use a similar approach?**

The Johns Hopkins ACG System can use area deprivation, but it does this through optional Social Determinants of Health add ons rather than building it into every risk score by default.

The ACG GeoHealth module includes the Area Deprivation Index (ADI) as one of its geography-based risk measures, alongside things like poverty, housing and access indicators.

These GeoHealth measures can be combined with the usual ACG morbidity and utilisation markers to predict future cost, use of services and poor outcomes, so deprivation can feed directly into risk models when switched on.

ADI and similar deprivation measures are optional; organisations turn them on when they want to bring local social factors into their population health analytics and prediction work.

Case studies describe ACG users plugging ADI into GeoHealth and Social Need Markers to pick out high-need, high-deprivation groups and target resources more effectively.

**11. Who is missed if we use Primary Care and Secondary Care data?**

The data is currently the best it can be and we are exploring with Johns Hopkins if they have plans to build in community trust (and ideally adult social care) into the algorithm.

The positives of using a national/internal algorithm are that these are robust and have strong defensibility, based on evidence, quality and safety. The cons are that there is a lack of flexibility to change the algorithm.

The mitigation for this is that we could do a deep dive to pull out the cohorts of GHC activity and see how it aligns with GHC internal data to check if its reliable for use. We are planning to hold GHC specific workshops to build up use cases once they've been sighted on the algorithm in general in March 2026.

Whilst only primary and secondary care data is used to score the stratification algorithms and allocate to the population to segments, the output of the tool is linkable to any of the local or national health data sets as well as the Gloucestershire Linked data asset. The risk algorithms can be amended locally to take account of other modifiers within alternative datasets.

## **12. How will Johns Hopkins link with other clinical systems such as SystemOne?**

There is currently an issue around risk stratification relating to how Johns Hopkins interfaces with clinical systems such as SystemOne and EMiS.

A stratification discovery paper is currently in progress to document this in more detail and an options appraisal will follow from that.

Please note that Johns Hopkins will not interface with clinical systems in the immediate future.

## **13. Has Johns Hopkins been cyber assessed as part of procurement process?**

On-going.

## **14. Low need children segment appears to be reducing proportionately. Why would that be?**

## Glossary

(Technical descriptions to follow)

- Aggregated Diagnostic Groups (ADGs)
- Care Modifiers
- Joint Strategic Needs Assessment (JSNA)
- ACORN tool
- Cambridge Multi-morbidity tool