JOHNS HOPKINS MEDICINE

POPULATION HEALTH ANALYTICS

An Overview of the Main Applications and Use Cases for the Johns Hopkins ACG System

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3rd May 2023

AGENDA

Objective

- To provide an overview of the main use cases for ACG System in the UK and to signpost you to where participants can access more information

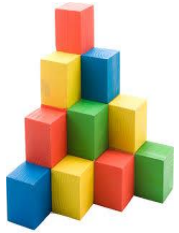
Agenda

- Reminder of content of first 4 webinars and how to access recordings
- Main applications & use cases with examples of insights & benefits
- Future webinars
- Q&A

JOHNS HOPKINS MEDICINE POPULATION HEALTH ANALYTICS

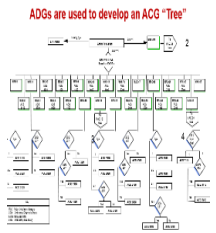
THE ACG SYSTEM IN A NUTSHELL

Aggregated Diagnoses Groups (ADGs):
The Building Block



ADGs classify diagnoses into a limited number of clinically meaningful, but not disease-specific, morbidity groups.

Adjusted Clinical Groups (ACGs):
Patient-Centric Measure of Health Status



Each ACG includes individuals with:

- A similar pattern of morbidity
- Similar expected resource use

Can be collapsed into 6 RUBs to easily assess casemix in different populations

Expanded Diagnosis Clusters (EDCs):
Groups of clinically similar diagnoses

284 groups that can be combined into 27 Major EDC categories of clinical conditions.

Facilitates disease and condition based profiling and sophisticated case finding activities.

Patient Need Groups (PNGs)
An innovative segmentation model

Eleven mutually exclusive population segments, applicable to all age groups, building upon ACG's whole-person approach to health needs across their lifespan.

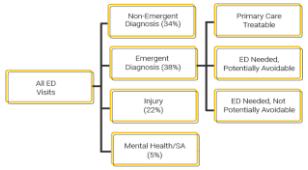
The Johns Hopkins ACG® System

ACG System Predictive Models
Assessing Future Risk

More than a dozen models that predict future resource use (eg total cost, pharmacy cost) and risk of future adverse events (eg hospitalisation).

Additional Mortality Risk Score model assists with identification of patients who may require end-of-life care

Emergency Department Classification



The ACG System's ED classification algorithm categorises people who attend ED based on the condition/diagnosis.

It can be used to identifying people with non-emergent or primary care treatable conditions

Pharmacy-Based Markers
Making Use of Primary Care Prescription Data

A range of markers derived from prescription data including:

- Active ingredient count as a marker of polypharmacy
- Medicine Complexity Score describing each patient's regimen complexity

Additional Markers & Measures

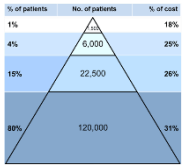
For example:

- Flag of conditions likely to require hospitalisation
- A frailty marker
- Flagging patients likely to have care coordination issues
- Laboratory based markers to assess control of LTC like diabetes

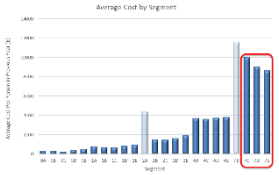
[Webinar Recordings Can Be Found Here]

MAIN APPLICATIONS & USES

Population Health Profiling



- Understanding disease and morbidity distributions within a population
- Quantifying differences in casemix between different practices
- Stratifying based on overall morbidity burden, individual diseases and/or future risk
- Identifying key drivers of cost
- Segmentation of a population into mutually exclusive groups to aid population health management



Case Finding

- Identifying individuals and cohorts of people who are suitable for specific interventions or programmes of care
- Matching the right patients to the right care programmes

'Sophisticated case finding' techniques that further sub-stratify populations based on metrics such as:

- Degree of multimorbidity
- Presence of a mental health condition
- Other social determinants of health

Applications & Uses

Performance Assessment

- Ability to account for differences in casemix when comparing activity metrics such as emergency admission rates or A&E attendances
- Casemix adjustment allows for more meaningful comparisons and facilitates informed discussions with clinicians and managers
- Performance of care programmes and outcomes for people enrolled on these can be compared to outcomes for a clinically similar cohort

Resource Allocation

- The ability to quantify casemix allows for a much more equitable allocation of resources.
- Most primary care funding in Sweden is allocated based on casemix.
- In the UK, there a small but growing number of examples of casemix-adjusted allocation of resources include:
  - Projects in Berkshire and Leicestershire where new funding is allocated based on casemix in GP practices
  - Schemes in Gloucestershire and Berkshire where services are placed based on where the most patients are
  - Community diabetic nurses in Slough focusses on subset of diabetic patients with the most comorbidity

POPULATION HEALTH PROFILING

KEY NEEDS OF ICSs & PCNs

- To ensure services are delivered in a fair and equitable way
- To undertake Population Health Analytics (PHA) on *whole* population to support Population Health Management (PHM)
- To understand different segments of the population and key drivers of cost in those segments
- To match commissioned services to most suitable patients
- To ensure services are provided in the right location
- To identify gaps in care
- To design new models of care based on PHA
- To undertake casemix-adjusted performance assessment
- To move towards casemix-adjusted allocation of resources

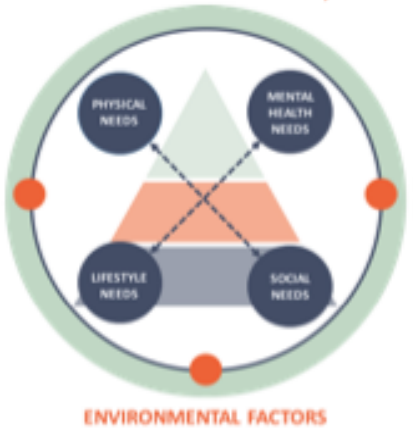
THE JHHC APPROACH TO PHM

Population Health Management Approach

Collection of health data and other data about the population

Population health assessment and interpretation of outputs using the Johns Hopkins ACG System and other available data

Risk stratification and segmentation of population according to needs



Review of risk factors, social determinants, and health needs for each targeted segment

Development of primary, secondary, and tertiary population health interventions within health system context

Implementation and ongoing engagement with stakeholders

Evaluation of data and application of lessons learned

Monitoring and outcomes reporting for management and continuous quality improvement

THE JHHC APPROACH TO PHM

- Access Video Recording of Dr Sherry Discussing PHM Here

SEGMENTATION

- Segmentation is an analytical technique to help understand how disease and morbidity are distributed within a population
- It can identify sub-segments of a population who share similar needs and will benefit from the same type of intervention or treatment
- The resulting segmentation analysis can inform the design of care management programmes

- See recording of our 3rd webinar for more information

SEGMENTATION

High

Low

Frailty	11 Frailty	*Adults aged 65 and older with evidence of 2 or more frailty concepts*
High Complexity; Multi-Morbidity	10 Multi-Morbidity, High Complexity	*Multi-morbidity with high complexity (major and unstable chronic conditions)*
Dominant Chronic	09 Dominant Major Chronic Condition	*Somatic condition with high impact on health, without treatment the condition is progressive and unstable over time*
	08 Dominant Psychiatric/Behavioral Condition	*Psychiatric condition with high impact on health, without treatment the condition is progressive and unstable over time*
Pregnancy	07 Pregnancy, High Complexity	*Pregnancy with or without delivery among women with high morbidity burden*
	06 Pregnancy, Low Complexity	*Pregnancy with or without delivery among women with low morbidity burden*
Moderate Needs	05 Multi-Morbidity, Medium Complexity	*Multi-morbidity with moderate complexity conditions*
	04 Multi-Morbidity, Low Complexity	*Multi-morbidity with low complexity conditions*
Healthy	03 Low Need Adult	*Adults aged 18 and older with acute morbidity and no more than one low complexity condition*
	02 Low Need Child	*Children aged 0 to 17 with acute morbidity and no more than one low complexity condition*
	01 Non-User	*Individuals who have no diagnosis*

Red	11 Frailty
	10 Multi-Morbidity, High Complexity
Amber	09 Dominant Major Chronic Condition
	08 Dominant Psychiatric/Behavioral Condition
	07 Pregnancy, High Complexity
	06 Pregnancy, Low Complexity
Green	05 Multi-Morbidity, Medium Complexity
	04 Multi-Morbidity, Low Complexity
	03 Low Need Adult
	02 Low Need Child
	01 Non-User

- Frimley ICS now use PNGs as their 'clinical currency' for categorising people by complexity
- People in the 'Red' category are automatically referred to their virtual ward programme as over 90% fit the criteria for admission
- Same RAG rating used to identify patients already in A&E who should be contacted by GPs and offered support in primary care
- See Dr Bharan Kumar's presentation about the work here

STRATIFICATION

- Risk stratification differs from segmentation in that it identifies people at high risk of a certain event or high health care costs
- Can stratify within PNGs
- Can stratify within disease groups

RISK STRATIFICATION WITHIN POPULATION SEGMENTS

	No of Patients	% of Patients	Average of Inpatient Emergency Activity	Average of Inpatient Elective Activity	Average of OP First Attendance Activity	Average of GP Visit Count	Average of Total Cost	Average of Pharmacy Cost	Average of Distinct Drug Count
All Patients with Diabetes	**12224**	**100%**	**0.3**	**0.4**	**1.0**	**17**	**3231**	**547**	**13**
Diabetes Only	**1546**	**13%**	**0.1**	**0.2**	**0.4**	**10**	**1090**	**178**	**7**
Diabetes + 1 other CC	**2386**	**20%**	**0.1**	**0.2**	**0.6**	**13**	**1488**	**304**	**9**
Diabetes + 2 other CC	**2296**	**19%**	**0.1**	**0.2**	**0.7**	**15**	**1875**	**386**	**11**
Diabetes + 3 other CC	**1921**	**16%**	**0.2**	**0.3**	**0.8**	**17**	**2510**	**548**	**13**
Diabetes + 4 other CC	**1329**	**11%**	**0.3**	**0.4**	**1.1**	**19**	**3579**	**723**	**15**
Diabetes + 5 other CC	**924**	**8%**	**0.4**	**0.5**	**1.5**	**23**	**4712**	**805**	**18**
Diabetes + 6 other CC	**618**	**5%**	**0.7**	**0.8**	**1.7**	**24**	**5822**	**1007**	**19**
Diabetes + 7 other CC	**410**	**3%**	**0.8**	**1.0**	**2.0**	**27**	**7056**	**968**	**20**
Diabetes + 8 or more other CC	**794**	**6%**	**2.0**	**2.1**	**2.5**	**32**	**12003**	**1287**	**25**

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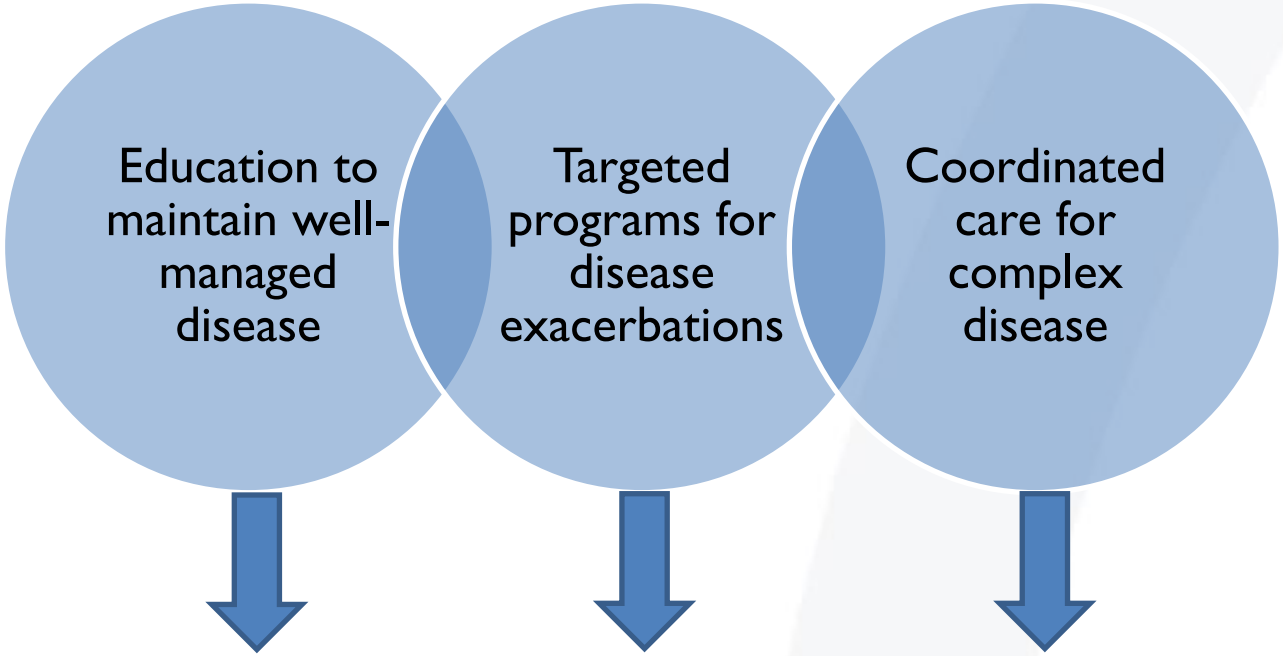
ADDRESSING WITHIN-GROUP VARIATION OF MORBIDITY BURDEN

- Not all patients with diabetes are the same! Patients with diabetes require different care pathways depending other factors such as the complexity of their overall morbidity burden, whether one of these is a mental health condition and their social care needs



Example programmes	Campaigns and information to help manage A1C levels	Intervention for carbohydrate counting	Multiple interventions for diabetic neuropathy, retinal eye-screenings,

STRATIFICATION

- Risk stratification differs from segmentation in that it identifies people at high risk of a certain event or high health care costs
- Can stratify within PNGs
- Can stratify within disease groups
- In Leicestershire, they now stratifying people with learning disabilities for their annual review - targeting most complex patients. Webinar #9 will provide more details of the work
- Another example is stratifying by potential care coordination issues – a smaller cohort where impact of an intervention is likely to be higher

KEY INSIGHTS FROM RECENT PHA WORK

1. **The need for healthcare varies** – a small percentage of people consume a large amount of resource
2. **Multimorbidity is the norm** – it is more common for people to have multiple chronic conditions that to have just one
3. **Not all patients with a particular disease are the same –** multimorbidity affects cost and resource use
4. **Multimorbidity is not distributed evenly** across a population and case-mix varies quite significantly between GP practices
5. **Multimorbidity more than age is a key driver of cost**, activity and future risk and **multimorbidity occurs across the whole adult age range**
6. **The high risk/high-cost group is not homogeneous** – there's not as much overlap between different risk groups as you may think
7. **Casemix-adjusted comparisons** reveal new opportunities not seen when traditional comparisons are used

CASE FINDING

CASE FINDING OBJECTIVES

- Population health profiling helps identify:
  - Segments of population who require intervention
  - Potential gaps in care
  - People where the *impact* of the intervention may be more significant

- Case finding helps:
  - Identify right patients for right services
  - Which people to prioritise
  - Where these patients are located

Two sides of the same coin!

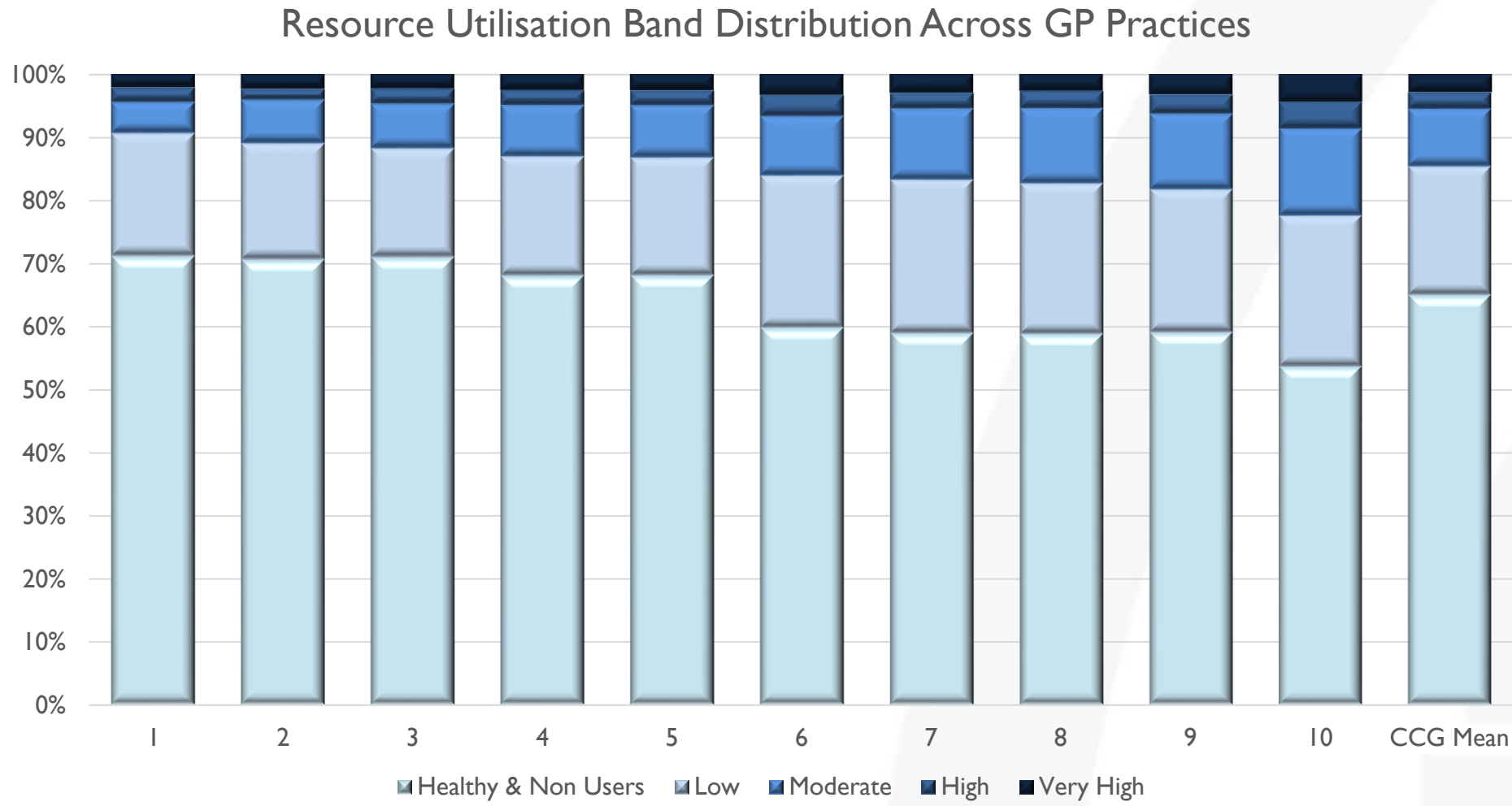
EXAMPLES

1. Matching the right patients to the right care management programmes
2. Identifying & addressing polypharmacy
3. Effectively managing multimorbidity - Slough Complex Care Management Programme or webinar #7
4. Optimising use of GPs and primary care services
5. Supporting palliative and end-of-life care – webinar #6

See Seven Quick Wins for more details of these and other ideas

PERFORMANCE ASSESSMENT

MORBIDITY IS NOT DISTRIBUTED EVENLY



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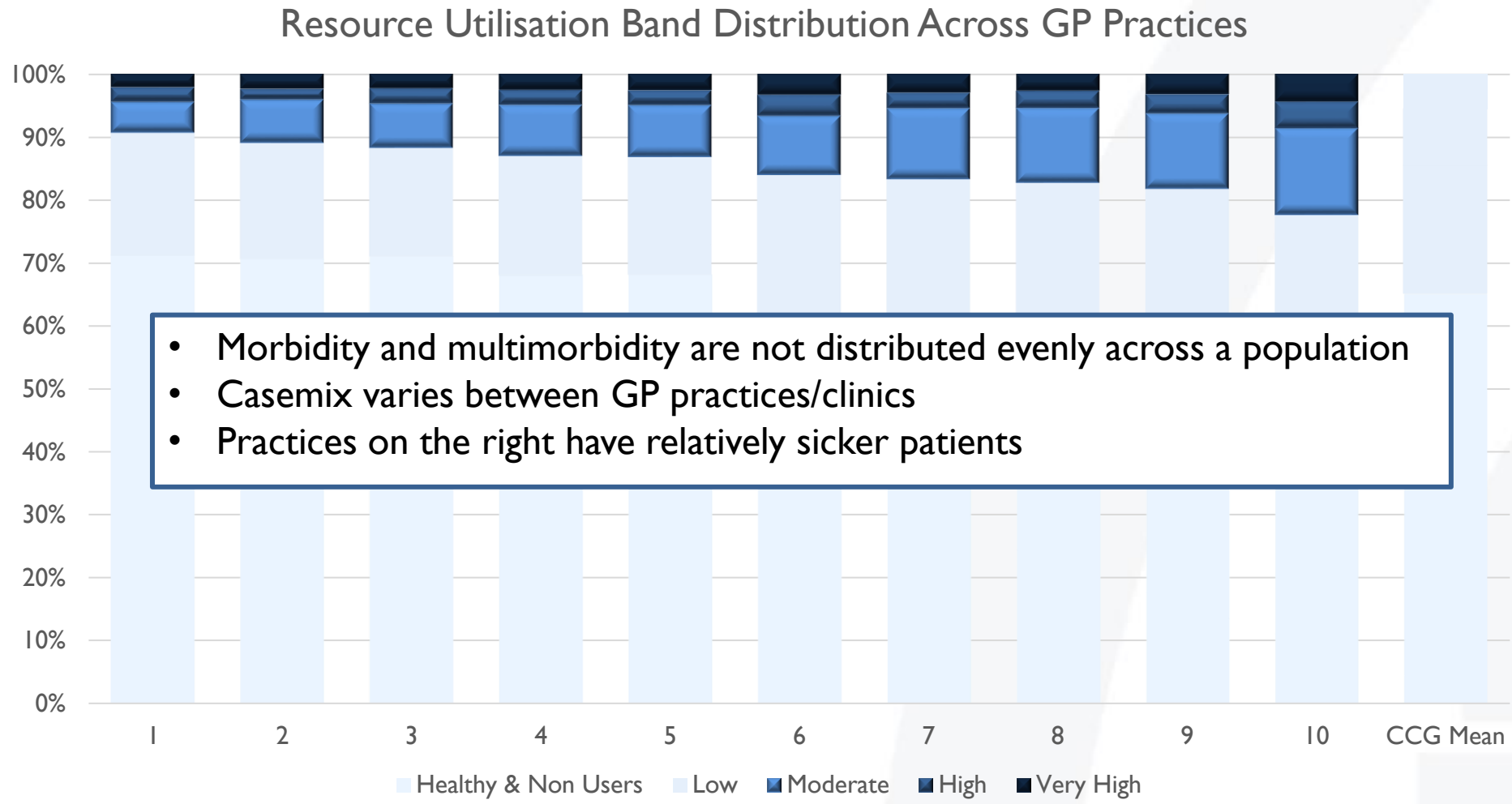
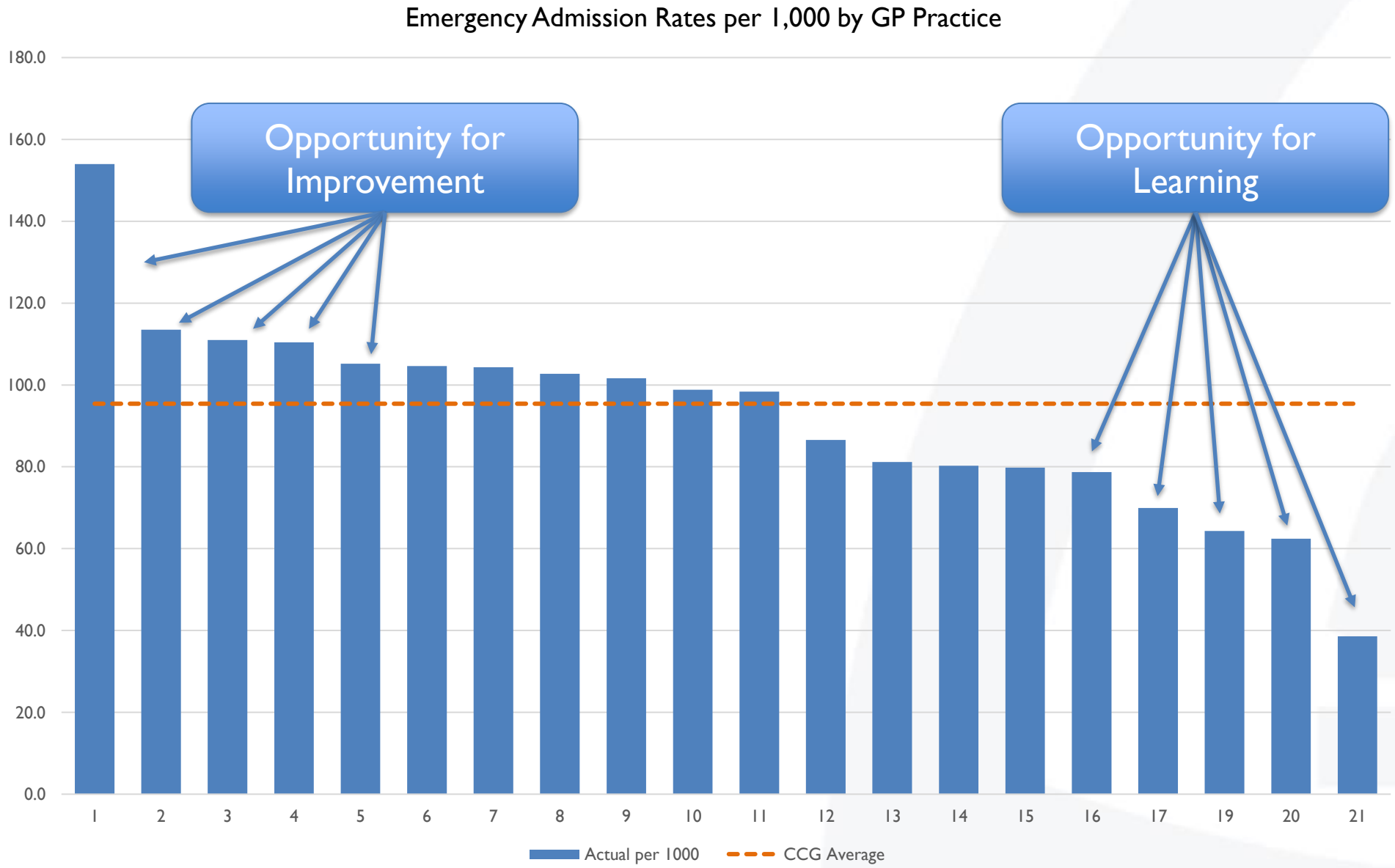
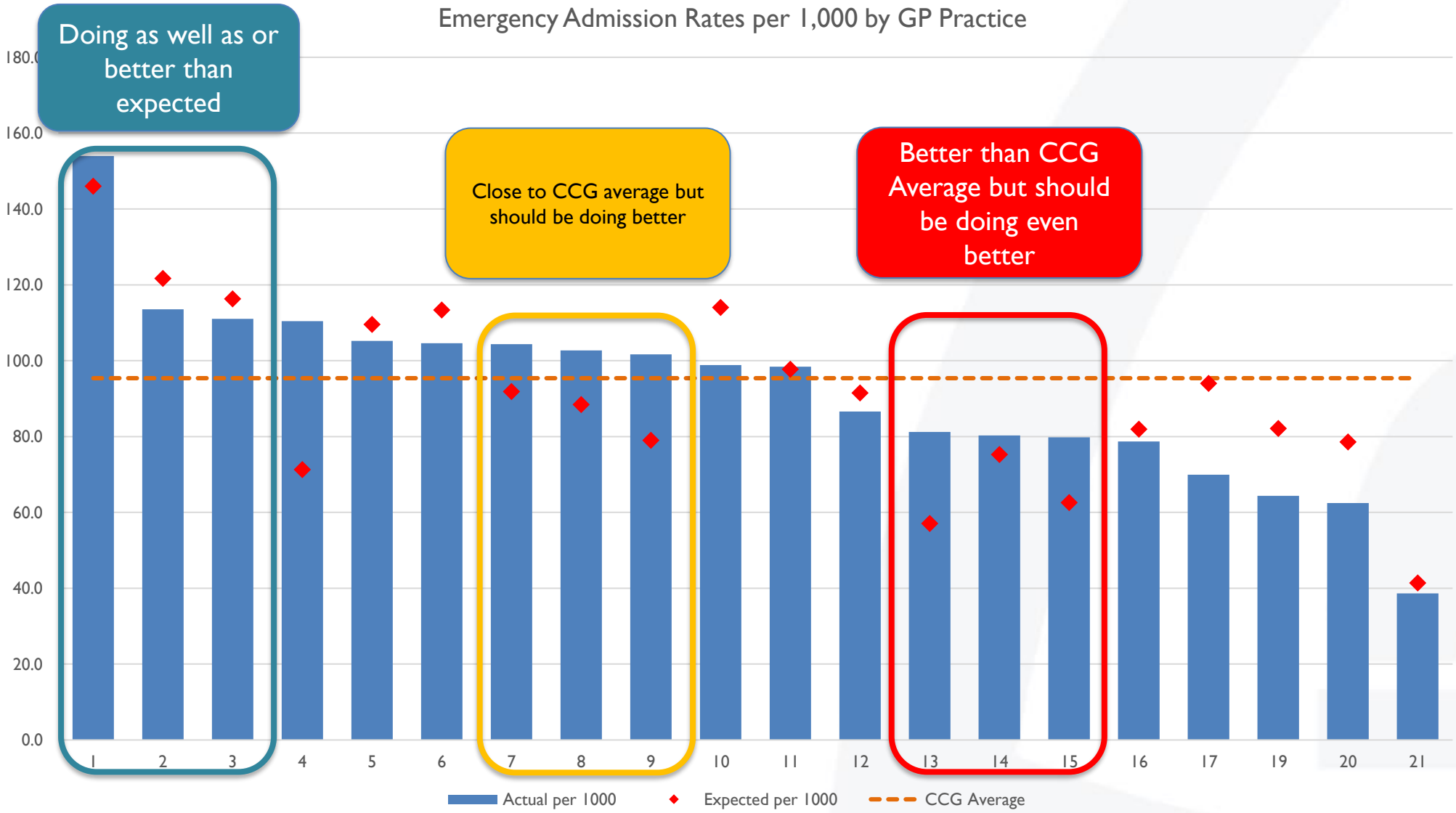


- Morbidity and multimorbidity are not distributed evenly across a population
- Casemix varies between GP practices/clinics
- Practices on the right have relatively sicker patients

TRADITIONAL BENCHMARKING APPROACH



CASEMIX ADJUSTED BENCHMARKING



LEICESTER CITY CCG

JOHNS HOPKINS ACG® SYSTEM

Casemix Adjustment in Leicester

The Challenge

The city of Leicester, England has been using the Johns Hopkins ACG System since 2012 to help them to understand the health of their population.

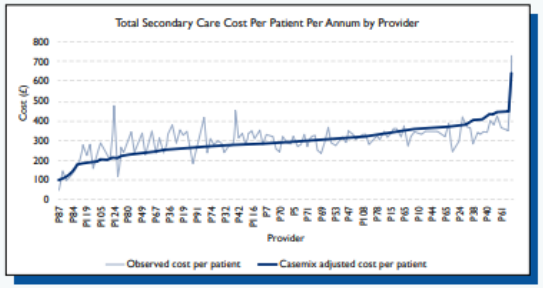
Over the last couple of years, the team at Leicester have been trying to understand the variation in the use of secondary care services from their primary care providers' populations, but it was difficult using traditional analytical techniques. They were finding that parameters - such as total secondary care cost, rates of attendance at the emergency department (ED) and emergency admissions (unplanned hospitalizations) – could be explained to a certain extent when combined with known variables such as variations in age/sex distribution or degrees of multiple deprivation. But because they were unable to quantify these variations, much remained inexplicable.

This information gap was leading to misplaced initiatives, wasted time and miscommunications between providers and commissioners (payers). For this reason, the team decided to use a casemix adjustment approach to get to the bottom of the issue.

The Solution

The team decided to use data from the ACG System to casemix adjust their primary care provider activity and cost data.

By considering the full range of diagnoses and their widely variable combinations, as well as age and sex, the ACG System enabled the team at Leicester to unpick the variability, making sense of data that previously defied explanation. This analysis allows a much more nuanced view of their provider costs than merely taking an average (£302 in the chart to the right).



The new approach now provides data relating to the expected level of cost per patient and the observed or actual level of cost. This allows for exploration of why observed cost varies between providers with similar expected cost, having removed age, sex and casemix as possible explanations.

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- Casemix-adjustment of primary care cost & activity data
- Led to a richer understanding of variation in cost and activity rates

> "The casemix adjustment work has contributed to improved feedback that the Leicester team gives to their providers on their activity rates".
>
> Dr David Shepherd

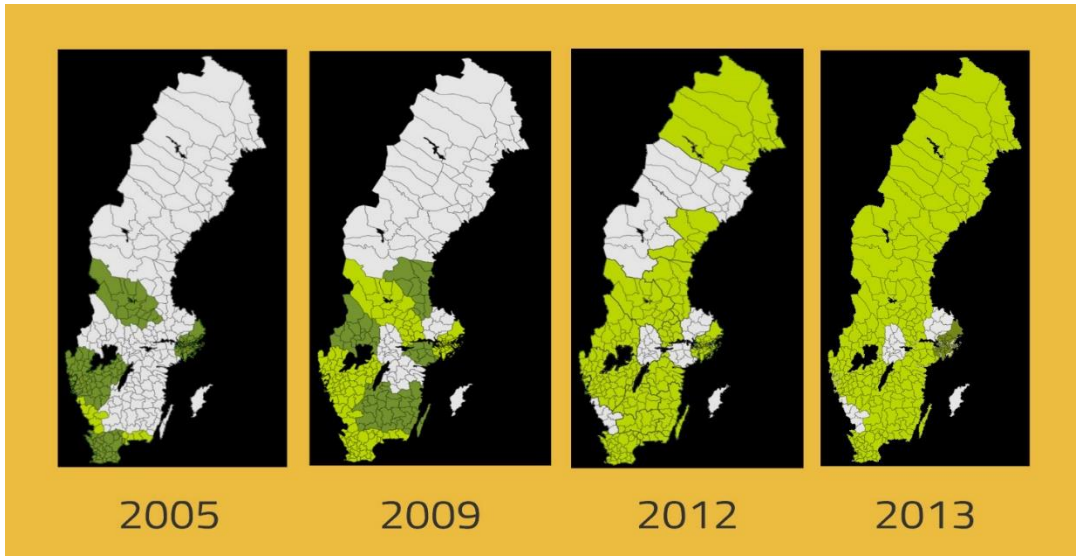
- Full case study can be found here

EVALUATING OUTCOMES

- ACG System segments people who are similar in expected resource use (ACGs) and who share similar clinical characteristics (PNGs)
- This provides the building block for evaluating benefits and effectiveness of specific interventions or new models of care using techniques such as
  - Matched cohort analysis
  - Propensity score matching
- Not planning to talk about these in this webinar series but we can run an ad-hoc session if there is demand

RESOURCE ALLOCATION

CASE-MIX ADJUSTED FINANCIAL ALLOCATION



Growth in Use of ACG System to Support Allocation of Primary Care Funding

In Sweden primary health care resources are allocated based on a combination of a care needs index (based on socio-economic factors) and morbidity burden as measured by the ACG System.

Case Study Found Here

Iceland have adopted a similar approach. Chile are planning to do something similar.

Benefits include:

- Rewarding doctors or organisations that care for sicker patient populations.
- Deterring doctors from selectively attracting healthier patients.
- Supporting organisations wishing to specialise in treating people with higher-than-average illness burden.

- Leicester, Leicestershire and Rutland (LLR) ICS have created a new funding model for primary care that more closely aligns with population need.
- The new funding model was introduced in the summer of 2021 and since then, it has helped address many of the issues related to inequity in health outcomes that existed using the old funding formula

Component	Description	% of Total
Core funding component	• A fixed sum based on essential functions and fixed costs, common to all practices	41.3%
Needs-based funding component	• A variable sum based on patients' needs using a case mix adjusted methodology (driven by the ACG System). This element is the largest part of this component of the funding model • A further adjustment for patient turnover • A further adjustment for communications issues	52.9%
Deprivation component	• Based on practice level Index of Multiple Deprivation (IMD) derived from postal code areas or registered patients	5.9%

Will feature in a future webinar

Case Study Found Here

FUTURE WEBINARS

Ref	Day	Date	Time	Topic	Speaker(s)
6	Wednesday	17 May 2023	13.00 - 13.45	Improving end-of-life care in Dorset	Janine Ord, Head of Population Health Management for Dorset ICS
7	Wednesday	07 June 2023	13.00 - 13.45	The "Planning for Integrated Care in General Practice (PIC GP)" project in Leicester, Leicestershire & Rutland ICS	Mark Pierce, Head of Population Health Management, LLR ICB
8	Wednesday	21 June 2023	13.00 - 13.45	To be confirmed	
9	Wednesday	05 July 2023	14.00 - 14.45	Improving Care for People with Learning Disabilities in Leicestershire	Kate Allardyce, BI Delivery Lead, NHS Midlands and Lancashire CSU
10	Wednesday	19 July 2023	13.00 - 13.45	To be confirmed	

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Thank You

Questions?