

# Segmentation for Outcomes

Segmentation approaches for  
outcomes based commissioning

Part 2 – Evaluation of the Bridges to  
Health Segmentation Model for Outcomes  
Measurement

**outcomes**based**healthcare**

# Evaluation of Whole Population Segmentation for Outcomes Based Commissioning (OBC)

Integrated care systems are increasingly being established to improve population health and social care services across entire geographies, and to deliver better outcomes for people. Whole population, outcomes based approaches to commissioning, requires an extensive understanding of the population segmentation models available.

The part one report briefly outlined the different approaches to population segmentation in healthcare, including their advantages and disadvantages, when used in the context of outcomes based commissioning.

This report takes a more detailed look at the 'Bridges to Health' model, and describes a methodology developed by OBH, for the practical implementation of this segmentation model, specifically for the purpose of outcomes measurement.

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# 1. Evaluation of the ‘Bridges to Health’ Segmentation Model for Outcomes Measurement

## ‘Bridges to Health’ Summary

The ‘Bridges to Health’ model is fundamentally a person-focused segmentation approach, with the principal goal of ‘pursuing the health of each population segment’. This model does not continue to treat each individual health condition as a separate segment, in the way that some segmentation and clinical approaches do. In this respect, the ‘Bridges to Health’ model appears very well suited to whole-population outcomes based approaches. Being care setting agnostic, the model lends itself well to meaningful population outcomes measurement, reporting and incentivisation. There is emerging national and international evidence of use of the model, or close variants (such as that used by North West London, London Health Commission), for the purposes of population health management approaches.

‘Bridges to Health’ proposes ‘segmenting’ the entire population into eight core groups, shown in Table 1. The proposal of the eight groups was shaped around three considerations<sup>1</sup>:

- I. The set of population segments must be limited if the health care system is to offer a sensible array of integrated services for each segment.
- II. The set of population segments should include everyone; that is, at every point in their life, every person should fit into one of these categories.
- III. The people in each population segment must have sufficiently similar health care needs, but each segment must be different enough to justify separate consideration.

Throughout the paper, a variety of descriptive terms were used by the authors to describe each of the population groups, to help the reader better understand the eight populations, and to enable flexibility in implementation approaches depending on the purpose of use of the model.

Table 1: ‘Bridges to Health’ Population Segments.<sup>1</sup>

Segment	Description
Segment 1:	Healthy
Segment 2:	Maternal and Infant Health
Segment 3:	Acutely ill
Segment 4:	Chronic conditions, normal function
Segment 5:	Stable but serious disability
Segment 6:	Short period of decline before dying (mostly cancer)
Segment 7:	Limited reserve and exacerbations (organ failure)
Segment 8:	Frailty with or without dementia

## Evaluation

As outlined by Vuik et al (2016), there are important trade-offs between simplicity and precision, which apply to any segmentation model.<sup>2</sup> The 'Bridges to Health' model strikes a good balance between the two, defining segments and movements between segments in a sufficiently simple, and clinically relevant manner. At the same time, it allows for precise definitions of each to be constructed for population-level outcomes based commissioning, and outcomes measurement purposes.

The key dimensions of the 'Bridges to Health' Model have been evaluated below:

**Purpose:** the model seeks to build a framework that can shape resource planning, care arrangement and service delivery at a 'macro-' level. Thus ensuring that each person's health needs can be met effectively and efficiently.

**Method:** whole-population model, ensuring that every individual is accounted for and "assigned" to one (or more) segments at any point in time, while allowing for movement between segments. How this movement happens in light of precise segment definitions is discussed below.

**Defining Variables:** health prospects and priorities. Segments are divided according to four main goals for health – staying healthy, getting well, living with illness or disability, and coping with illness at the end of life – as well as eight distinct health priority concerns. These variables describe segmentation characteristics that are relatively stable over a person's life course. More importantly, from an outcomes based perspective, they allow for the identification of similar health needs between each of the eight core groups. This enables a robust, whole-population outcomes framework to be established, monitored and incentivised.

### In summary, the 'Bridges to Health' model:

- Remains sufficiently high-level to be usable/helpful for organising and planning clinical care, with sufficiently distinct segments to design care pathways around;
- Contains segments which are homogenous enough for the purpose of outcomes based commissioning, despite challenges in dealing with segment overlaps, and understanding how people flow between segments;
- Is sufficiently detailed to accommodate precise and meaningful outcomes measurement for sub-populations, subject to any data constraints; and
- Provides sufficient guidance to create granular enough views of financial information for specific sub-populations, in order to devise a capitated budget, including payments contingent on outcomes.

While there are a number of useful risk stratification models, incorporating a wide range of defining variables, the target variable is frequently risk of care activity and/or cost. This renders it generally unsuitable for person-centred outcomes measurement, on its own. The 'Bridges to Health' model (or very close variants) appear to be one of the most suitable, and increasingly widely adopted models internationally, for whole-population, outcomes based commissioning.<sup>3</sup>

Segmentation around population characteristics, rather than provider characteristics, can be challenging. Health systems have historically been organised largely around provider characteristics (for example, clinical specialties like cardiology), rather than population characteristics (for example, people living with frailty). This is increasingly unsustainable both financially and in terms of improving people's outcomes. Care systems organised around people (rather than providers), offers potentially the only sustainable long term solution. Getting population segmentation right is key to this.

## 2. Segmentation Model In Detail

**OBH have adapted and extended the ‘Bridges to Health’ segmentation model, to create a data-driven segmentation model, suitable for outcomes measurement and outcomes based commissioning in the UK.**

This section describes OBH’s approach to segmentation for outcomes measurement based on the foundations of the ‘Bridges to Health’ model described earlier.

### Description of each segment

1	Healthy	People in this segment are described simply as ‘healthy’, though may have acute, but self-limiting problems. The principal care processes involved mainly relate to primary prevention, with the aim of slowing people moving to segments 4 or 5 after developing a long term condition or a serious disability. However, over the course of a lifetime, most people will experience one of the end stages of life segments (6, 7 or 8).
2	Maternity and Child Health	Mothers and infants are included in this segment during prenatal, delivery and perinatal care. Children, and young people under the age of 18 years old, are also included in this segment, and may be further segmented into groups of homogeneous needs. This may be best dealt with using a segmentation model specifically designed around children and young people’s needs.
3	Acute	People in this segment have an acute illness, and are likely to return to their former level of health. Acute illness is defined as an illness that develops quickly, often severe, and lasts a relatively short period of time (often less than 1 month). People can enter and exit this segment from any other segment. Occurrences of acute episodes are often outcomes themselves for people in other segments.
4	Long Term Conditions (LTCs)	LTCs are chronic illnesses that are rarely resolved, but which can be treated to maintain stability. People with the following LTCs are included in this segment: arthritis, asthma, atrial fibrillation, cerebrovascular disease (stroke/TIA), chronic kidney disease, COPD, coronary heart disease (MI/angina), depression, diabetes, epilepsy, heart failure, hypertension and serious mental illness (SMI).
5	Disability	This segment includes people with serious disability, including both physical and learning disabilities. Physical disabilities include people with severe visual, sensory or mobility impairment. Learning disabilities include people with Asperger’s or autism.
6	Short period of decline and dying (incurable cancer)	People in this segment have a trajectory described as having a reasonably predictable decline in physical health over a period of weeks, months, or, in some cases, years. Almost all people in this segment are expected to die over a period of 12 months, and therefore often receiving care from palliative care services.
7	Organ Failure	People in this segment have organ system failure, or suffer frequent serious exacerbations of chronic illness. As defined by the Gold Standards Framework, this includes people with neurological conditions (Parkinson’s disease, multiple sclerosis, motor neurone disease), or organ failure (heart, lung, liver, kidney), and includes people in their last 12 months of life.
8	Frailty and Dementia	People in this segment are typically on a gradual course of decline. This includes those living with frailty and/or dementia, and includes people in their last 12 months of life. Frailty is defined using the eFrailty index. <sup>4</sup>

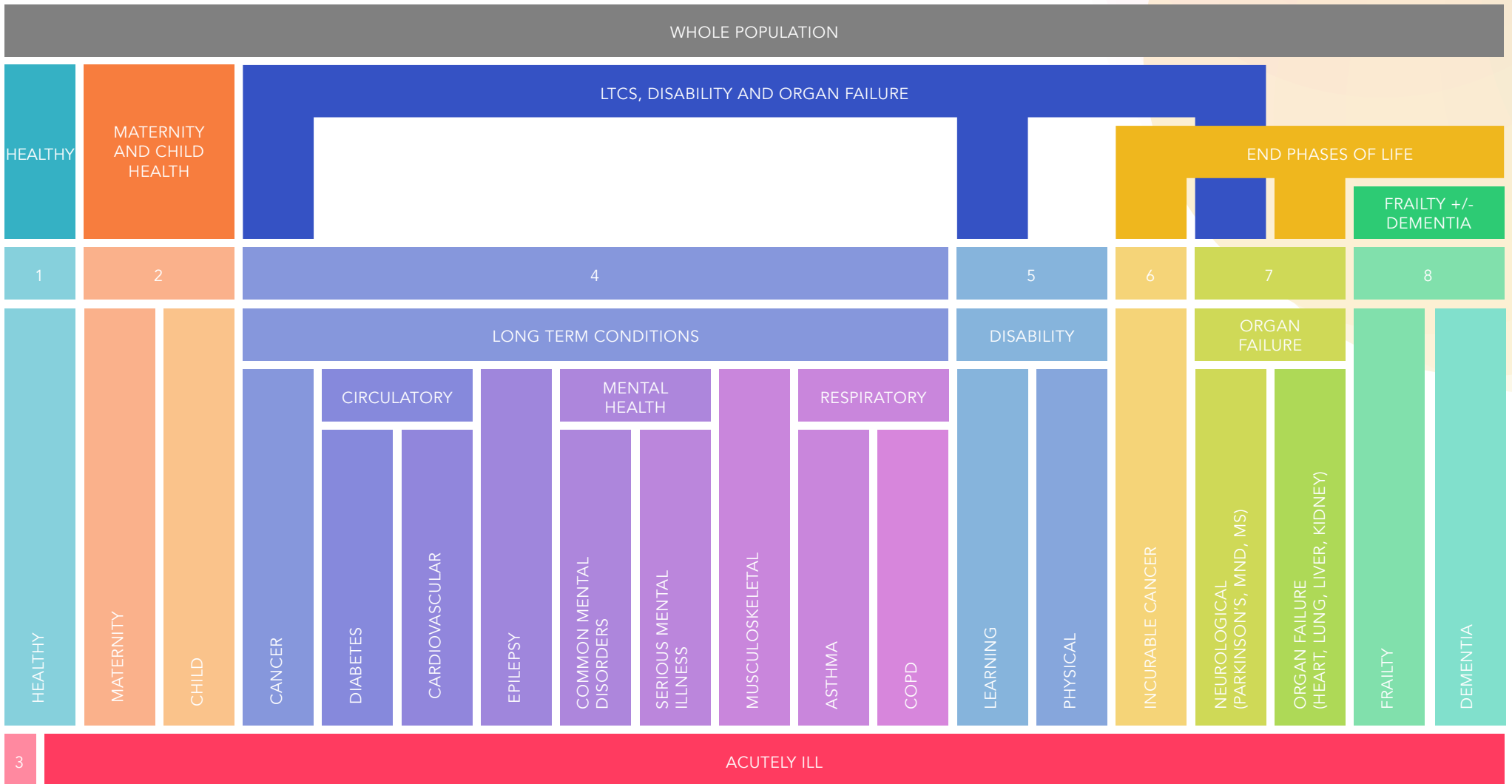


Figure 1 - OBH Segmentation Model, adapted from 'Bridges to Health' model.<sup>1</sup>

## How People Move Between Segments (Inter-Segment Movement)

Though the movement of people from one segment to another does not in itself define the segment, it is helpful in understanding a population's characteristics, and the outcomes which matter to that segment. It may also be helpful from a number of other perspectives; such as care planning, financial and contractual.

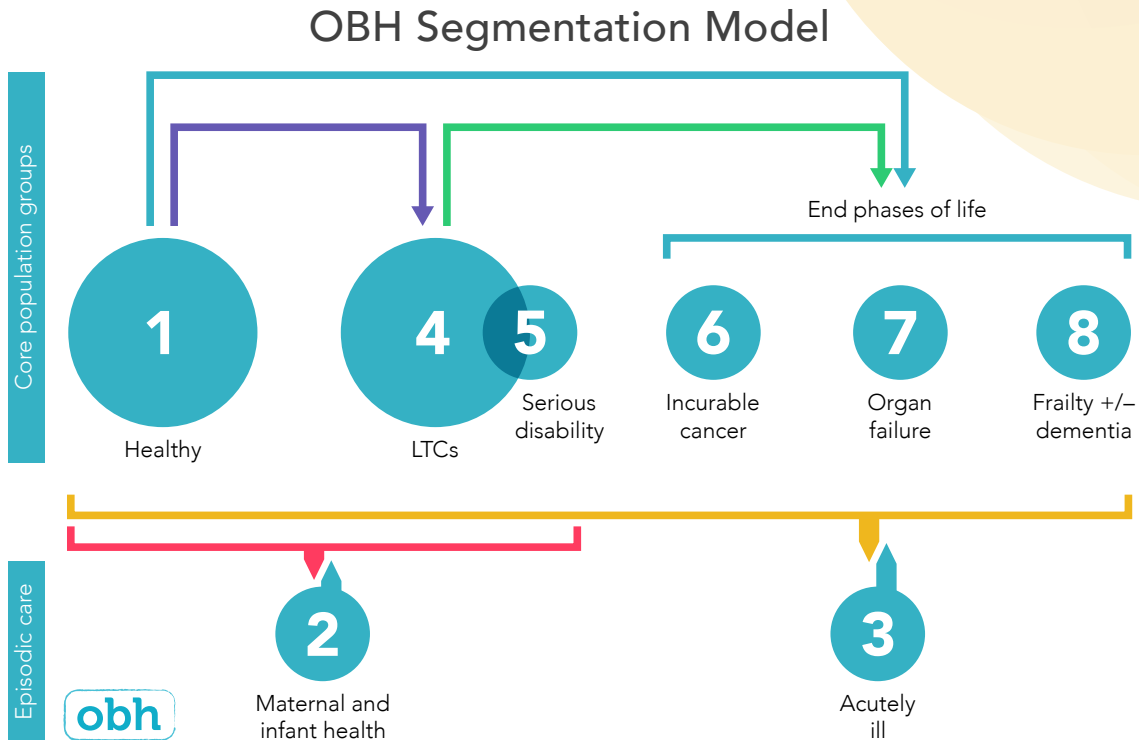


Figure 2: Inter Segment-Movement<sup>1</sup>

### General principles describing how people move between segments:

- a) **Overview:** in order to fulfil several key segmentation principles, every individual should be captured in one or more core population groups (**segments 1, 4, 5, 6, 7, 8**) at any one point in time. That is, even if they receive care and services in an acute segment- acute and/or maternity groups (**segments 2 and 3**), they will still be captured in their core group. From an outcomes perspective, movements in the overall numbers of people within each of these segments will continually occur, as people naturally progress through segments. The guidance below documents how people will generally move between segments, but there is no requirement for any of these movements to occur, from an outcomes measurement perspective. **With precise inclusion criteria, outcomes values can be accurately monitored while these movements occur on a continual basis, irrespective of what actually happens in practice.**
- b) **Three key 'super-segments':** each of the base segments are most sensibly grouped into one of three broad super-segments:
  - i. **People who are currently predominantly 'healthy' (segment 1)** (ie. without known illness as yet), or have a reasonable expectation of returning to being healthy after treatment. The overarching outcomes theme/goal here is staying healthy, promoting healthy lifestyles, and avoidance of illness ie. primary prevention.
  - ii. **People who are currently living with an established long term condition or serious disability (segments 4 & 5).** The principal outcome themes/goals here are more focused on secondary prevention; reducing the impact of already established disease, illness or disability, enabling autonomy, and preventing asymptomatic disease from progressing to symptomatic disease.
  - iii. **People who are in one of the main 'end phases of life' (segments 6, 7 & 8).** The overarching

- outcome theme/goals for this group is 'coping with illness at the 'end of life', and having a good death, ensuring that care services across multiple care settings meet the needs and priorities of these individuals.
- c) **Access to acute and maternity services:** people in each of the base segments may still require access to the services of one of the more transient care-focused segments, acute (**segment 3**) or maternity (**segment 2**), which they may at various times enter and leave, as their health needs dictate. Typically, people move from their base segment into an acute or maternity segment, and back to their original base segment. However, this is not always the case.
  - d) **Transitions over a life course:** Individual segments are described in detail below, and while movement within each super-segment may be relatively common, people will generally move to a super-segment with higher acuity over a life course.
  - e) **Transitions between segments:** Although it is possible that someone in a higher acuity super-segment moves to a lower acuity, this is the 'exception rather than the rule'. As 'Bridges to Health' states: 'return from one of the last phase of life trajectories (**segments 6,7,8**) to other population segments is so unlikely as to justify only an occasional exception to the routine'. Example: someone's long term condition may completely resolve, meaning that they move from segment 4 to segment 1, but it is far more common that their condition endures and people either remain in that segment for life, or progress to one of the relatively higher acuity segments.
  - f) **Dealing with overlaps:** although people are often captured in just one base segment, some overlaps do occur between segments, where people's characteristics mean they meet the inclusion criteria for more than one segment. This is particularly relevant for those in the three 'end phases of life' segments, who may also have a long term condition and/or disability, as it is important to monitor outcomes relevant to different conditions. Another example would be an older person with frailty, who may have a super-imposed, incurable cancer diagnosis, where again outcomes relevant to frailty, such as falls, may be captured, as well as outcomes related to the last period of life and having a good death. The only segment which does not overlap with another is segment 1 (healthy), as by definition, people in this segment are those that do not fit the inclusion criteria for another segment.
  - g) **Dealing with exceptions:** there will naturally be exceptions to the above general principles, but segmentation for outcomes based commissioning requires designing for the rule rather than the exception, thereby allowing more resources to manage any exceptions to the rule.

### How People Move Within Segments (Intra-Segment Movement)

There are two principal ways in which movement of people within each segment can manifest itself:

- a) Intra-segment variation (each segment will contain people with different levels of severity/complexity/acuity of their condition/s)
- b) Intra-segment movement (people will move between various levels of severity/complexity/acuity within a segment)

### Why is this important for outcomes measurement?

Using a whole population approach, whereby all people need to be accounted for in a segment, and at the same time limiting the number of segments in the approach, means that there will always be some variation in the degree of severity in any given segment.

Within each segment people will vary from 'mild' to 'severe'; mild being that the condition(s), and/or their health circumstances, enable a person to go about their life with little disruption or impact to their life and are able to confidently self-manage.

For example, someone with a LTC in segment 4, with a diagnosis such as diabetes or asthma, may have very little disruption to their life in the early stages of the disease, with very little medical intervention and management required. They may even consider themselves to be 'healthy', and pursue otherwise healthy lifestyles. However, unless their condition resolves, even 'healthy' people in this segment will



need some level of condition monitoring, health/care interventions, and surveillance for complications or progression for life ie. secondary prevention. At the other end of the spectrum, another person with poorly controlled diabetes may have multiple complications already arising, such as poor sight or cardiovascular complications, that disrupt their life to a far greater extent, and which likely require a different treatment/management approach by health and care. The diagram below conceptually visualises this intra-segment variation.

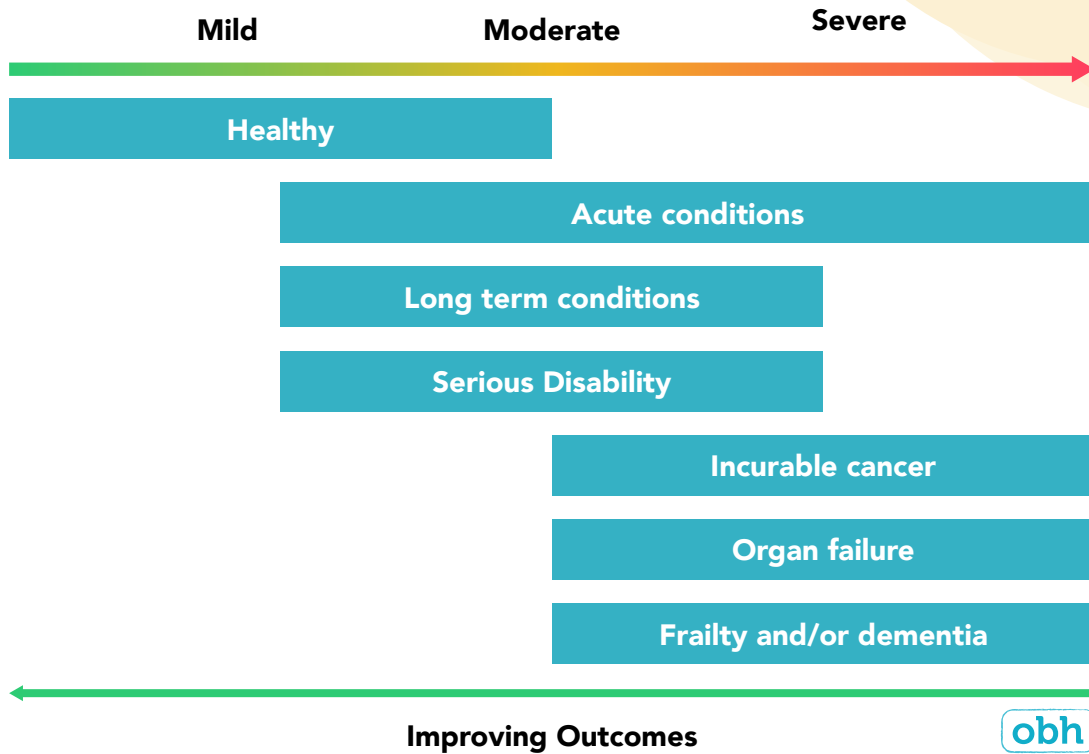


Figure 3: Intra-segment variation in different segments

Naturally, people with a mild form of the condition will tend to have better outcomes (better health, less illness) than those at the more severe end, at a specific point in time. As well as slowing, or halting, any progression to a higher acuity segment, maintaining people at the lower end of the severity spectrum in any segment will generally lead to better outcomes. From a population-based outcomes measurement perspective, year-on-year improvements would be evidenced by a shift towards more people in each segment living with a 'milder' form of a condition, with less impact on their lives – ie. good health, and avoiding illness, as well as fewer people moving to a higher acuity segment.

### A Whole Population Segmentation Approach for Outcomes Measurement

Given that 'Bridges to Health' is a whole population segmentation model, only a small proportion of outcomes will map perfectly for all people in a given segment. There are three different ways outcomes can be applied to one or more given segments:

- Outcomes that apply to everyone in the segment (**ie. one whole segment**), or
- Outcomes that apply to a smaller cohort within the segment (**ie. a subsegment within a segment**), and
- Outcomes that apply to more than one segments (**ie. multiple segments**).

There may also be a small number of outcomes which could apply to all segments (**ie. whole population outcomes**), but even these are unlikely to be equally relevant to everyone, and may not adequately address health inequalities.

In addition, even if the segment criteria are helpful in determining what is important to people within a segment, and overall numbers of people within each segment, the segment criteria themselves will often not form the 'denominator value' of the outcomes for a given segment.

### 3. Segmentation for Outcomes Measurement

With defined technical descriptions, parameters and criteria for a segment, the **outcome values** for any segmented population can be robustly, accurately, and reproducibly measured over time.

The purpose of these outcome values is to:

- understand the baseline and change of the given outcome (compared to previous years),
- establish targets and improvement trajectories (for the future), and
- be able to commission contingent on improvements in that value.

This enables health systems to create a 'population-level' view of whether the care being provided is making a difference to specific groups of people, using outcomes that matter to them.

#### Considerations on segment definitions for outcomes measurement:

- Segment definitions can be locally configured for local priorities and needs, including age, health inequalities, and clinical conditions.
- If no segmentation is applied to CSOMs, all of the outcomes will be measured for all people, but the results would be hard to interpret. Segmentation allows specific outcomes which matter to be measured for specific groups of people.
- What this approach does not necessitate is the ability to identify individual people clinically for direct patient care, or by particular service, care setting, department, or specialty. Segment definitions, in this context, are for population-level outcomes based commissioning. So there is no requirement to 'allocate' people to specific segments, as they will routinely be captured in existing clinical data systems. Clinicians and service providers principally just need to be clear what type of outcomes are being measured, and for broadly what types of people.
- Ultimately, one key purpose of segmentation for outcomes based commissioning is to ensure payment structures support established best clinical practice, rather than conflicting with, or hindering best clinical practice in any way.
- There is a distinction between use of segmentation for population-based outcomes measurement, and segmenting a population in a given electronic health record, or for individual patient care, where stratification is more commonly used rather than just segmentation.
- Not all outcomes apply equally within each segment, so while broad segment definitions are helpful, particularly from a finance perspective, each outcome will have a slightly different focus and technical composition, even within a segment.

#### Segmentation for different types of outcome measures

- **Clinical and Social Outcome Measures (CSOMs)** use existing data from clinical and administrative systems. With defined technical descriptions, which include coding inclusions, exclusions, and calculations for different datasets across all of health and social care, an accurate list of people included (or excluded) from each segment can be derived. The outcome definition and calculation is further applied to those people who meet the population segment definition.
- **Person-Centred Outcome Measures (PCOMs)** use data collected through surveys. The segment definitions supports understanding 'who' to survey, and how to distribute the survey to the population segment, using data required to identify whether an individual is included or excluded from a segment.

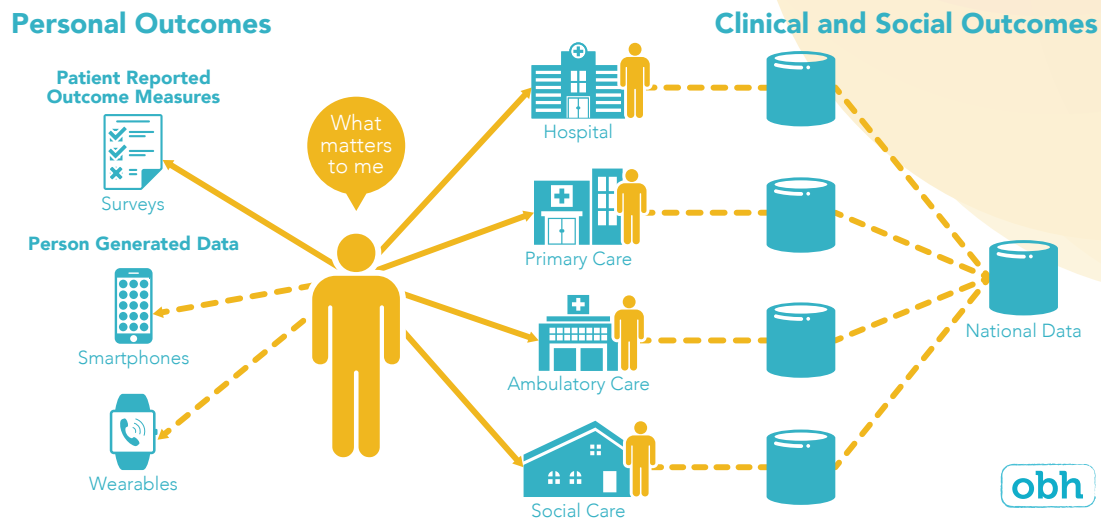


Figure 4: Types of Outcome Measures

## 4. Practical Implementation of the Segmentation Model

**OBH have developed a data-driven segmentation model, based on the foundations of 'Bridges to Health'.**

**Segmentation and outcomes measurement for specific groups of people, across whole care pathways, different care settings and different providers, requires a person-centred dataset.** This means that data related to health and care activities for the entire population, that is currently largely held separately by each care setting, needs to be joined together. However, not all data collected and stored by clinical record systems needs to be joined. Only the minimum data required to establish the segmentation model and outcomes selected should be processed.

### Data Use and Governance for Segmentation and Outcome Measurement

For population-level segmentation and outcomes measurement, only anonymous data is required. However, a pseudonymised NHS number is required to join records for the same individual, both within a single dataset, and between multiple datasets. This facilitates a person-centred and complete view of an individual and their care.

To enable processing of any data for segmentation and outcomes measurement, the appropriate information governance requirements and data regulations need to first be satisfied. This is a complex and constantly evolving area. The following are some key considerations and principles that need to be applied in this context:

- In an NHS context, outcomes measurement is a 'secondary use' of data (for indirect patient care).
- Pseudonymised data should be treated as 'personal data' under the EU General Data Protection Regulation.
- The sharing of confidential personal information for the purpose of outcomes measurement must be lawful.
- Any organisations processing data for population-level segmentation and outcome measurement requires a Data Sharing/Processing Agreement with the Data Controller, or to be named as a Data Processor in existing Data Sharing Agreements.

### **Using the patient-level pseudonymised health and care data**

Segments are defined using technical descriptions, and rules based around criteria and parameters, whilst still allowing for local configuration, according to local needs.<sup>5</sup> These can be set through a number of variables, for example: age parameters, clinical scores, diagnoses, procedure codes, deprivation scores, and so-on. In the ideal scenario, pseudonymised patient-level datasets from each care setting are required for these rules to be applied to.

For the purpose of outcome measurement, the following rules are applied to the linked dataset:

**1. Cohort Identification: A set of rules is applied to identify all people who meet the criteria of a segment, at any given time.**

Rules or ontologies are applied to this data, so that 'cohort' registers are up-to-date. Data to identify a cohort may sit in different care setting specific datasets, and coded using different clinical coding systems. For example, to identify people with physical disability, data from social care and primary care is required; to identify people with mental health conditions, data from primary care and mental health trusts is required. In addition, the definitions of these cohorts if based on clinical codes may vary depending on the dataset.

**2. Outcome Measurement: A set of rules defining the outcome of interest is applied to the cohort identified above.**

Once the cohort/segment has been identified, a set of rules can be used to identify whether the outcome has or has not occurred for those people. Many adverse outcomes are acute or chronic health complications that require treatment or an intervention from health and care providers. When this is serious, people will most often require treatment in secondary care. Therefore most outcome data is captured in hospital data. Even though, often the health and care providers who can impact that outcome may also include primary, community and other care providers. Typically SUS (Secondary Uses Service) data or HES (Hospital Episode Statistic) data can be used for this secondary care activity. Importantly, this means that any activity happening out-of-area can be captured for people registered at a local GP practice. For example, where an adverse outcome that relates to an acute condition (e.g. a heart attack, or a stroke) presents with a sudden onset and requires emergency acute care services, somewhere away from an individual's local area.

### **Data maturity stages for outcome measurement**

Not all health and care systems are yet set-up to allow for data to be processed under Data Sharing Agreements, that allow the use of pseudonymised data for ‘secondary uses’ or indirect patient care. As a result, each local area will be at a different stage of data maturity for outcome measurement. However, at all stages of maturity, outcome measurement is possible. For the early stages of maturity, there will be more constraints and limitations to the outcomes available to be measured, and the accuracy of the outcome value, compared with those operating at more mature stages. Although this is not the ideal scenario, this is frequently the initial baseline position in current care systems. The resulting outcome measures will give the most accurate and robust outcome values currently available, and will generally be valid for commissioning purposes, whilst a data maturity process is implemented.

A summary of the maturity stages of health and care systems for outcome measurement is set out below.

#### **Maturity stage 1:** Single, publicly available, aggregate datasets

For example, QOF (Quality Outcomes Framework), ONS (Office for National Statistics), and other national outcomes frameworks.

- This enables measurement of only those outcomes that are currently processed and available through an alternate data source, and in the public domain.
- There are challenges and issues around poor matching with local commissioning requirements, and an inability to locally configure measures, long time lags to access data, with only annual figures becoming available. Although these often cause significant challenges when agreeing on and monitoring an outcomes-based contract, it is often the starting point for many organisations.
- See section below on ‘Use of Publicly Available Aggregated Data’ for further details of this

**Maturity stage 2:** Pseudonymised, patient-level SUS/HES data for all people registered to a group of GP practices. Used alongside other single, publicly available aggregate datasets (e.g. QOF).

- This enables measurement of outcomes where the event being measured is one which presents to secondary care, and is diagnosed and treated in secondary care.
- There will generally be significant undercoding of underlying conditions or co-morbidities in the SUS/HES dataset, which are required for cohort identification. At this stage/level, sharing and processing of primary care data from all local GP practices has not been established for secondary purposes, not all people in specific segment can be identified, depending on the outcome and segment of interest. It is common in this scenario to use population figures from ONS, or segment denominators from QOF.
- The outcomes available to be measured will be constrained to those where the acute event (often captured by the numerator) is coded in secondary care data.

**Maturity stage 3:** Pseudonymised, patient-level datasets for all health and social care, that can be joined using a unique pseudonym.

- This will enable accurate and valid measurement of outcomes.
- Undercoding of underlying conditions and co-morbidities in the SUS/HES dataset will be significantly reduced through the use of data from primary care, social care, community care and mental health trusts.
- All outcomes are available to be measured to a high degree of accuracy.

## Use of publicly available, aggregated data

Some examples of these are described below:

**Quality Outcomes Framework (QOF):** Aggregate information submitted by nearly all GP practices to NHS Digital. Data from QOF extracted from NHS Digital can be used to identify outcome denominator population numbers, as it includes total number of people on disease registers (prevalence), whole population sizes, amongst other indicators. Annual data is provided, released approximately 7 months after the end of the financial year.

**Office of National Statistics (ONS):** Includes data on resident population numbers, GP registered population estimates and mortality data. Population numbers can be used for outcome denominators.

**National Audits:** Wide range of clinical audits, several condition-specific with data helpful for benchmarking certain outcomes. Time lag to access data is often prolonged.

**National Outcomes Frameworks:** NHS Outcomes Framework (NHSOF), CCG Indicator Outcome Specification (CCGIOS), Adult Social Care Outcomes Framework (ASCOF), Public Health Outcomes Framework (PHOF): These frameworks include a number of indicators often using ONS and HES datasets as their sources, where appropriate, amongst others, such as national survey data. Where any of the outcomes framework indicator definitions use a national dataset, such as HES, those indicators can be locally configured and then translated to provide a more accurate, and timely monthly baseline value using locally sourced data.

## Limitations of publicly available datasets

Although helpful, there are several important limitations to using these aggregated publicly available datasets, for the purpose of outcomes measurement or outcomes based commissioning:

- a) **Meeting local commissioning requirements:** the data has already been aggregated based on agreed rules, which may not match with local commissioning requirements. For example, GP practices nationally submit data on how many people have a diagnosis of heart failure in people who are 18 years and over, as part of QOF. For local commissioning purposes, if the number required is for people who have heart failure who are 65 years and over, it is not possible to extract a number for a different age band (without access to the underlying source primary care data).
- b) **Timeliness of data:** these data sources often report data with approximately a year (and sometimes considerably longer) time lag. For example, QOF data is collected between April of one year until March the following year. Aggregated annual figures are released in October with a 7-month time lag. Data published by the National Diabetes Audit often has a variable time lag, which can extend to several years, due to data acquisition/collection, processing and validation. Typically, publicly available datasets are subject to such significant delays, that their usefulness for OBC purposes is limited to benchmarking and data validation, rather than as 'contractable' outcomes measures.
- c) **Incompleteness of data:** for example, the National Diabetes Audit relies on primary care data and HES data; however, it only received data from 57% of all GP practices nationally in 2014/15, which has more recently increased to 95%. Other examples include indicators in frameworks such as ASCOF, where surveys are used that are distributed to only a sample of the population (though could be statistically significant), or where the data extraction only occurs for 3 months of any year, to produce an annual result.
- d) **Accuracy of outcome values:** When limited to single, unlinked and aggregate publicly available data for outcome measurement, each individual outcome measure could be composed of a numerator or denominator definition that uses a different data source, even for outcomes that exist in the same segment.

## Glossary

There are a number of terms used in this paper – definitions of these are set out below for reference:

TERM	DEFINITION
ASCOF: Adult Social Care Outcomes Framework	Collection of outcomes measures published by the Health and Social Care Information Centre, focusing on people using social care services and their carers
CSOM: Clinical and Social Outcome Measure	Measure that describes clinically relevant outcomes for an individual, irrespective of care setting. Source data to measure these outcomes are already captured by clinical or administrative systems
HES: Hospital Episode Statistics data	Data for official statistics on hospital activity, including inpatient admissions, outpatient appointments, and A&E attendances at NHS hospitals in England. The information that feeds it comes from SUS
ICD-10 Diagnosis Codes	International Classification of Diseases (ICD version 10), is a medical classification list developed by the World Health Organisation and used by clinicians and healthcare providers to classify and code diseases and other health problems recorded on health records. In the UK, this classification list is often used in secondary care
NHS Digital	NHS Digital is the new name for Health and Social Care Information Centre (HSCIC). It is the national provider of information, data and IT systems for commissioners, analysts and clinicians in health and social care
NHSOF: NHS Outcomes Framework	Collection of indicators developed by the Department of Health, that can be measured at Clinical Commissioning Group level, together with additional indicators developed by NICE and the Health and Social Care Information Centre. It is set out to measure outcomes and health inequalities in England
ONS: Office for National Statistics	Independent producer of official statistics in the UK, ONS collects, analyses and disseminates statistics about the economy, society and population
Outcome	Results of care that matter to people, or things that make a meaningful difference to people's lives. Usually measured from a person-perspective- ie. Across a complete care cycles, often spanning multiple different providers of care
Outcomes Based Commissioning	Approach to healthcare commissioning based on outcomes, where providers are incentivised to improve whole pathway outcomes for people, spanning multiple care settings
Outcomes Framework	Full outcome set covering a whole population that is segmented according to local configurations
Outcome Measure	Description of the method used to derive a meaningful numerical value for an outcome. This usually means a numerator and denominator definition that can be applied to data, and the data source to be used (including a survey/PROM tool for personal outcomes)
PCOM: Person-Centred Outcome Measure	Measure that describes the holistic health status of an individual, irrespective of care setting- sometimes more simply referred to as a 'personal outcome'. It uses an individual's voice to describe an impact eg. "I feel in confident in managing my health". Data to measured these outcomes are typically currently captured using validated surveys, or Patient Reported Outcome Measurement (PROM) tools
PID: Personal Identifiable Data	Any information that can identify a person. It can be one piece of data i.e. person's name, or a collection of data i.e. postcode and date of birth
Primary Care Records	Collection of information recorded by general practitioners about patients, including health status, activity in primary care, prescriptions, and more

## Segmentation approaches for outcomes based commissioning

### Part 2 – Evaluation of Whole Population Segmentation for Outcomes Based Commissioning (OBC)

Pseudonymisation	Method by which personal identifiable data within a data record (e.g. NHS number) are replaced by artificial identifiers, or pseudonyms. If pseudonymisation is undertaken on the same PID it can be used for linking datasets
PHOF: Public Health Outcomes Framework	Framework that sets out the vision for public health, desired outcomes, and a collection of indicators aimed at measuring how well public health is being improved and protected
QOF: Quality and Outcomes Framework	Annual reward and incentive programme detailing GP practice achievement results. Quality indicators are reviewed annually. The framework awards practices for improving management of certain chronic diseases, major public health concerns and preventative measures
Read Codes	Dictionary of clinical codes used in the NHS since 1985. There are two versions – Read V2 and CTV3 – providing a standard vocabulary by which clinicians can record patient findings and procedures in primary care datasets
SUS: Secondary Uses Service data	Patient-level information, populated from data input by users in hospital trusts, using Patient Administration Systems (PAS). It includes hospital activity including inpatient admissions, outpatient appointments and A&E attendances
SNOMED: Systemised Nomenclature of Medicine	Multilingual healthcare terminology that is computer processable. Provides codes, terms, synonyms and definitions used in clinical documentation and reporting



## Appendix 1: Outcome Themes for Adult Segmentation Model\*

SEGMENT	TIER 1 OUTCOMES	TIER 2 OUTCOMES	TIER 3 OUTCOMES
1	<ul style="list-style-type: none"> <li>• Reduce premature mortality</li> <li>• Staying well, quality of life</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce acute conditions, and frequency</li> </ul>	<ul style="list-style-type: none"> <li>• Remain well over time, ie. reducing LTCs, disability, cancers (primary prevention focused such as nutrition, exercise)</li> <li>• Maintaining meaningful activity</li> </ul>
2	<ul style="list-style-type: none"> <li>• Reduce perinatal mortality</li> <li>• Increase proportion of healthy babies</li> <li>• Reduce impact of pregnancy on day-to-day life</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce complications of pregnancy and labour</li> <li>• Reduce post-partum depression</li> <li>• Improve outcomes related to overall experience of maternity care</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce long term post-partum complications (eg. urinary incontinence, fistula)</li> </ul>
3	<ul style="list-style-type: none"> <li>• Reduce acute mortality</li> <li>• Reduce impact of acute condition on day-to-day life</li> <li>• Reduce symptoms related to acute conditions</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce time to return to baseline state, recovery</li> <li>• Reduce complications/adverse effects of acute condition or treatment</li> <li>• Reduce recurrences of the acute condition/event</li> <li>• Improved outcomes related to overall experience of care/ treatment process</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce long term complications of acute conditions</li> <li>• Reduce long term complications of treatment for acute conditions</li> </ul>
4	<ul style="list-style-type: none"> <li>• Reduce premature mortality</li> <li>• Improve quality of life</li> <li>• Remain stable and/or asymptomatic</li> <li>• Reduce the impact of the condition(s) on day-to-day life</li> <li>• Improve ability to self-manage and control over daily life</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce acute on chronic exacerbations</li> <li>• Reduce time to recovery when acutely unwell</li> <li>• Reduce complications associated with treatment/therapies</li> <li>• Improved outcomes related to overall experience of care/ treatment process (eg. care coordination, timely access to care service, seeing the right person at the right time)</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce long term complications (ie. the 'purpose' of secondary prevention)</li> <li>• Reduce underlying progression of the disease (ie. with or without complications)</li> <li>• Increase age of onset of complications</li> </ul>
5	<ul style="list-style-type: none"> <li>• Reduce premature mortality</li> <li>• Improve quality of life</li> <li>• Remain stable and/or asymptomatic</li> <li>• Reduce the impact of the condition(s) on day-to-day life</li> <li>• Improve ability to self-manage and control over daily life</li> <li>• Improve personal dignity, independence and autonomy</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce acute conditions</li> <li>• Improve time to recovery when acutely unwell</li> <li>• Reduce complications associated with treatment/therapies</li> <li>• Improve outcomes related to overall experience of care/ treatment process (eg. care coordination, timely access to care service, seeing the right person at the right time)</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce disease progression (if applicable)</li> <li>• Reduce long term complications (the purpose of secondary prevention), if applicable</li> <li>• Increase age of onset of complications</li> <li>• Increase people involved in meaningful activity (work, education)</li> <li>• Increase people living in safe housing</li> </ul>
6	<ul style="list-style-type: none"> <li>• Improve quality of life</li> <li>• Improve feeling of control and being listened to</li> <li>• Improve pain and symptom management</li> <li>• Increase time spent at home/ place of residence</li> </ul>	<ul style="list-style-type: none"> <li>• Improve outcomes related to overall experience of care/ treatment process (eg. care coordination, timely access to care service, seeing the right person at the right time)</li> </ul>	<ul style="list-style-type: none"> <li>• Have a 'good' death ie. preferred place, pain, own views respected</li> <li>• Reduce disease progression/ rate of deterioration</li> </ul>

## Segmentation approaches for outcomes based commissioning

### Part 2 – Evaluation of Whole Population Segmentation for Outcomes Based Commissioning (OBC)

7	<ul style="list-style-type: none"><li>• Improve quality of life</li><li>• Increase time spent at home/ place of residence</li></ul>	<ul style="list-style-type: none"><li>• Reduce exacerbations (frequency and severity)</li><li>• Improved outcomes related to overall experience of care/ treatment process (eg care coordination, timely access to care service, seeing the right person at the right time)</li></ul>	<ul style="list-style-type: none"><li>• Increase age of onset</li><li>• Have a 'good' death ie. preferred place, pain, own views respected</li><li>• Reduce disease progression/ rate of deterioration</li></ul>
8	<ul style="list-style-type: none"><li>• Improve quality of life</li><li>• Reduce social isolation, fear and anxiety</li><li>• Increase time spent at home/ place of residence</li></ul>	<ul style="list-style-type: none"><li>• Improve outcomes related to overall experience of care/ treatment process (eg care coordination, timely access to care service, seeing the right person at the right time)</li></ul>	<ul style="list-style-type: none"><li>• Have a 'good' death ie. preferred place, pain, own views respected</li><li>• Reduce disease progression/ rate of deterioration</li></ul>

\*Tier structures refer to Michael Porter's Outcomes Hierarchy.<sup>6</sup>

## References

<sup>1</sup> Lynn J, Straube BM, Bell KM, et al. **Using population segmentation to provide better health care for all: the “Bridges to Health” model.** *The Milbank Quarterly* 2007; 85(2): 185-208.

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<sup>6</sup> Porter ME. **What is value in health care?** *New England Journal of Medicine* 2010; 363(26):2481-3