Denominators for COVID-19 vaccination statistics

To allow vaccine uptake percentages to be calculated, data on the size of the population is needed for the denominator in the calculation. This paper explains the different denominators that are used in the COVID-19 vaccinations publications, including the strengths and weaknesses of each and implications for the quality of percentage uptake figures calculated using these denominators.

Denominators for demographic characteristics and geographic areas

The weekly and monthly COVID-19 vaccinations publications include estimates of population sizes by certain demographic characteristics and at different geographical levels. These estimates can be used as denominators to calculate approximate vaccine uptake percentages. Two different sources of denominators are used, and the publications provide the best available source for each breakdown as management information. Vaccine uptake rates should be calculated using the most appropriate denominator provided as described below, as the two sources will provide different results. Vaccine uptake percentages calculated using these denominators should be considered as estimates only, as there are known issues with both sources:

1. Office for National Statistics (ONS) 2019 mid-year population estimates

The ONS 2019 mid-year population estimates are the most recent Official Statistics on population size and the best publicly available population estimates. These estimates are consistent with those used in the UK COVID-19 vaccines deployment plan and therefore provide a reference point on progress for management information.

As the ONS population estimates are based on the 2011 Census, they are subject to a degree of uncertainty, and do not reflect changes to the population since 2019. The ONS 2019 mid-year population estimates are likely to be an underestimate.

The ONS estimates are used as denominators for national, regional, Integrated Care System (ICS) / Sustainability Transformation Partnership (STP) and Clinical Commissioning Group (CCG) geographies only, as they are less robust at smaller areas. They are also used as denominators for age

and gender breakdowns, and the breakdown by Index of Multiple Deprivation (IMD) decile.

Some of the uptake rates calculated using the ONS denominators are reported as 100%* in the publications. In these instances, the number of people who have been vaccinated exceeds the ONS population estimate for that group. This predominately happens in the 75-79 age group, although there are also other instances of uptake rates exceeding 100%. The impact is largest in the 75-79 age group because of a large number of people born soon after the second world war who were in the 70-74 age group in mid-2019 but are now in the 75-79 age group. These people are counted in the number of people vaccinated for age 75-79, but in the denominator for age 70-74, resulting in an apparent vaccine uptake rate of more than 100%. Conversely, uptake rates for the 70-74 age group will appear lower as a result.

2. National Immunisation Management System denominators

National Immunisation Management System (NIMS) denominators are the numbers of individuals registered with the NHS who are currently alive in the resident population. Overall they likely overestimate the population and so underestimate vaccine uptake percentages, as death registration data is subject to a reporting lag (more information on this can be found on the NHS Digital website) and there are also concerns about people who are no longer resident in England still being counted in NIMS. Coverage can therefore be viewed as being 'at least' the figures calculated using the NIMS denominators.

Unlike the ONS denominators which are fixed, the NIMS denominators are updated in each weekly and monthly publication, to reflect known changes to the current resident population.

The NIMS denominators do not include those without an NHS number and so do not cover the whole population. However, this aligns with the numbers of people vaccinated reported in the weekly and monthly publications.

NIMS denominators at different geographies are derived from an individual's postcode as recorded on their electronic health record and are therefore based on the resident population. They are used to facilitate management of the vaccination programme at more granular levels and are

provided for Lower Tier Local Authority (LTLA), Middle Layer Super Output Area (MSOA), and Constituency geographies as they are considered more accurate than the ONS estimates at these levels. Other sources of data on COVID-19 vaccinations use NIMS denominators at other levels of geography. More information on this can be found in our summary of [related data sources](#).

NIMS denominators are also used for breakdowns by ethnicity as the ONS 2019 mid-year population estimates are not available by ethnic group. Ethnicity for the NIMS denominators is derived from data extracted by NHS Digital as part of their GP Extraction Service Data for Pandemic Planning and Research (GDPPR) and Hospital Episodes Statistics (HES) datasets. For more information on this, please see the [NHS Digital website](#).

As the NIMS denominators are based on the resident population, people will be counted in the denominators if they live in England and they receive their vaccine outside of England. Therefore, when looking at lower levels of geography, some areas near the borders may appear to have lower vaccine uptake rates than other areas of England.

Denominators for sub-groups of the population

As well as reporting on vaccinations by demographic characteristics and at different geographical levels, the weekly and monthly COVID-19 vaccinations publications also report on some sub-groups of the population:

- Care home staff and residents
- Social care staff
- NHS Trust Healthcare workers
- Primary Care Healthcare workers
- Clinically Extremely Vulnerable individuals
- Individuals aged 16-64 identified as at risk or a carer

Denominators for these sub-groups are not taken from the ONS mid-year population estimates or from NIMS, instead the denominators are taken from the sources used to derive the data:

1. Care home staff/residents and social care staff - the denominators for these sub-groups are the numbers of staff and residents reported in Capacity Tracker. This is a live system for Care Quality Commission (CQC)

registered care providers to enter data and a manual system collated by Local Authorities for non-CQC registered providers. Numbers of residents and staff will fluctuate as individuals enter or leave the social care system and workforce and depending on the response rate for this information in Capacity Tracker.

2. NHS Trust Healthcare workers – the denominators for this sub-group are the numbers of NHS Trust Healthcare workers taken from the NHS Electronic Staff Record (ESR). This covers all directly employed staff in NHS Trusts, with the exception of Chesterfield Royal NHS Foundation Trust. It does not include agency staff and NHS Bank staff who are not paid through ESR. Numbers of NHS Trust Healthcare workers will fluctuate as individuals enter or leave the workforce.

3. Primary Care Healthcare workers – the denominators for this sub-group are the number of Primary Care Healthcare workers taken from a monthly NHS Clinical Commissioning Group Situation Report. The denominator will fluctuate as individuals enter or leave the workforce and depending on the response rate for the Situation Report.

4. Clinically Extremely Vulnerable – the denominators for this sub-group are the numbers of Clinically Extremely Vulnerable (CEV) individuals taken from the Shielded Patient List, which is a record of vulnerable individuals thought to be at high risk of complications from COVID-19. The number of CEV individuals excludes additional patients identified by the QCovid risk assessment tool and a small number of patients who have been flagged as being deceased, who are under 16 years of age or who have not been matched to a GP in England (including those with no GP practice record).

5. Individuals aged 16-64 identified as at risk or a carer – the denominators for this sub-group are derived from five different data sources:
   a. Those identified as At Risk or a Carer in GP records
   b. Those identified as at risk by the QCOVID assessment tool
   c. Those in receipt of a carer's Allowance
   d. Those on the GP Learning Disability Register
   e. Those identified as unpaid carers by Local Authorities.

As the denominators for the sub-groups described above are taken from GP records or other administrative data sources, data quality is dependent

on the accuracy of these records. But as these data sources are specific to these sub-groups, they are considered more accurate than the ONS and NIMS denominators and therefore the vaccine uptake percentages can be considered more accurate than those calculated using ONS or NIMS denominators.