

## Geographical patterns of COVID-19 mortality and vaccine coverage in Bradford

Bradford District Scientific Advisory Group – Vaccine rollout subgroup  
Version 2.0 23rd February 2021 – Preliminary Report

### Summary

In Bradford District, mortality from COVID-19 has been highest in the areas with high levels of deprivation or older populations. However, initial analysis shows that the most deprived areas have had the lowest vaccination coverage so far.

Vaccination coverage is due to both eligibility and uptake. Nationally, eligibility for vaccination has prioritised those in older age groups, those with extreme vulnerabilities and people working in health and social care. In the least deprived areas in the district there are more people in older age groups, who were eligible to receive the vaccination early. Uptake has also been highest in more rural areas of the district, with lowest uptake in areas with deprivation and a higher proportion of people from Black, Asian or minority ethnic backgrounds. A wider range of work is taking place across the District to support uptake in the most vulnerable communities. There are some initial signs that inequalities in uptake by ethnicity are reducing over time.

There are a number of important limitations to this analysis, and initial findings are presented. Further work is planned to monitor change in vaccination inequalities, and to perform more robust analysis using individual level data in the Connected Bradford dataset.

This inequality in vaccine coverage will lead to further inequalities in COVID-19 infection and mortality, and wider health, social and economic impacts. Ongoing monitoring of uptake needs to take place to ensure inequalities reduce over time. The findings suggest a need for further flexibility to prioritise vaccination of communities at highest risk in Bradford, and support continued work to engage with communities around vaccination uptake.

### COVID-19 mortality

In Bradford District, the highest absolute numbers of deaths have been in areas with vulnerable populations in terms of deprivation or age of the population. Figure 1 shows crude mortality rates (i.e. not adjusted for differences in the age of the population between areas). Mortality has been high in areas with high levels of deprivation (including City and Keighley central) and areas with older populations (including Ilkley, Bingley).

Figure 2 takes differences in the age structure of the population into account, showing a clear picture of highest mortality in the central areas of Bradford city which have high levels of deprivation.

### COVID-19 vaccination coverage

In Bradford District, COVID vaccine uptake has been greatest in areas where a large proportion of the population has been eligible, and uptake of invitation is high. Areas with high coverage include Craven, Ilkley, Bingley and Baildon (Figure 1 and Figure 2).

**Eligibility** for the COVID-19 vaccine is determined by the list of priority risk groups developed by the Joint Committee on Vaccination and Immunisation<sup>1</sup>. The list was developed to prioritise prevention of COVID-19 mortality and to protect health and social care staff and systems (88% of all COVID deaths). The Government's initial prioritisation was largely based on age, a small set of extremely high risk conditions, and health and social care workers. Prioritisation does not take account of current or historical COVID-19 prevalence.

From December 2020 to February 15<sup>th</sup> 2021, the top 4 groups in the list were prioritised:

1. Residents and staff working in care homes for older adults
2. All those 80 years of age and over and frontline health and social care workers
3. All those 75 years of age and over
4. All those 70 years of age and over and clinically extremely vulnerable individuals

In the least deprived areas in the District there are more people in these older age groups, so a larger proportion of the population has been eligible to receive the vaccination early. By contrast, the Bradford city area is young, with a relatively small number of older adults, but high levels of ill health and other risk factors for COVID-19 severity.

Vaccine roll-out is fast paced, and groups 5 and 6 are currently being prioritised (including people who are aged 65 and over, clinically vulnerable or carers). In February 2021, the Government identified a list of patients at high risk for COVID-19 using the QCovid risk tool to prioritise in local vaccination roll-out. This score takes into account factors including ethnicity, social and economic circumstances and other long term health conditions.

**Uptake** among people invited to receive the vaccine varies between different geographical areas and population groups. Previous analysis in Bradford has identified a high level of vaccine hesitancy, and a wide range of influences including logistical issues (vaccine supply, access to vaccination centres) and issues related to trust. One of the main reasons for this is the misinformation 'infodemic', causing confusion, distrust and distress. Uptake has been lowest among people from Black, Asian and minority ethnic backgrounds and among people living in deprived areas. There is a wide range of local initiatives taking place across the District (including by GP practices, local community groups, the council, the CCG and others) to engage with communities, build trust and support decision making on vaccination.

Figure 3 shows the percentage of people in eligible age groups who have taken up the vaccine in different areas of Bradford. Uptake has been highest in more rural areas of the district, with lowest uptake in areas around Bradford city and Keighley.

## Patterns of mortality and vaccine coverage in Bradford

The maps in Figures 1 and 2 clearly show the geographical discrepancy between COVID-19 mortality and vaccination coverage.

Looking at crude death rates and overall vaccination coverage (Figure 1), there are patterns by age and deprivation. Some areas with large older populations have experienced high mortality and have had high vaccination coverage (e.g. Ilkley, Bingley) – providing evidence that vaccination has targeted this group at high risk. However, there are many areas with high levels of high mortality related to deprivation that have very low vaccination coverage (e.g. City, Bolton and Undercliffe), where the population remains at high risk.

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<sup>1</sup> [JCVI \(2021\) Joint Committee on Vaccination and Immunisation: advice on priority groups for COVID-19 vaccination, 30 December 2020](#)

The pattern of low vaccine coverage in areas with highest risk is clearly visible after taking age differences between areas into account (Figure 2). Geographical patterns of COVID-19 mortality and vaccination coverage are almost opposite to each other. Areas in the city of Bradford and Keighley have had high rates of age-standardised mortality, but have the lowest vaccination coverage. These are the areas of the city with the highest level of deprivation, and a large proportion of the population from Black, Asian and minority ethnic backgrounds (Figures 4 and 5).

This inverse relationship between mortality and vaccine coverage is related to both eligibility (fewer people in the older age groups who are eligible for vaccination) and uptake (as shown in maps of uptake by age group in Figure 3).

The scatterplots in Figures 6-9 show the correlation between the variables mapped and vaccination coverage. Vaccine coverage has a strong inverse relationship with deprivation (IMD), COVID-19 mortality and the proportion of the population from BAME backgrounds.

## Changes in vaccination coverage over time

As vaccination rates in the District improve, there is some evidence that inequalities by ethnicity are reducing. Figure 10 shows vaccination coverage in late January and mid-February, by age and ethnicity for Bradford District and Craven CCG. These graphs show that the proportion of people vaccinated in each age group has increased, with notable reductions in differences in uptake between ethnic groups. This suggests that the large amount of community engagement work may have had an impact.

## Public health implications

In areas around Bradford city and Keighley, the population remains at high risk of ongoing COVID-19 transmission and related mortality. This will have a disproportionate impact on the most deprived areas and people from Black, Asian and minority ethnic backgrounds. Inequalities in vaccination coverage will further increase the inequalities that have been amplified by the pandemic - both in terms of health inequalities and in terms of wider social and economic impacts of COVID-19.

These findings have a number of implications.

1. Vaccination roll-out needs to target communities and individuals at greatest risk of COVID (regardless of age).
2. The vaccination roll-out is currently prioritising groups aged 65 and over and with clinical vulnerabilities, including individuals identified as high risk (though the QCovid risk tool). Whilst at present this tool is being used in a relatively limited way, it will help to ensure people at high risk related to deprivation and ethnicity are prioritised for vaccination. Further flexibility of vaccination roll-out within the District would enable other communities at greatest risk to be prioritised. The further use of tools such as QCovid could be supported with data from cBradford and patient-level targeting using links with TPP/SystemOne.
3. These findings show the continued importance of partnership work to support vaccine uptake in the District. This includes addressing access barriers and engagement with communities, guided by behavioural science approaches, to support trust and provide reliable information. Repeated analysis at future time points can demonstrate the impact of this, and highlight areas for additional focussed work.

4. Key parts of the analysis in this paper should be repeated at regular intervals to monitor changes in vaccination coverage, and inequalities between areas, and in relation to deprivation and ethnicity.
5. These results and further work should lead to an increasing granularity of analysis (by area and group) that shows persistent low uptake. The data (in operationalised form) should be shared with vaccination operational groups and system wide communication and engagement forums for a multifaceted approach to increasing vaccine uptake (crossing NHS, Council and VCS workstreams).

## Limitations and further analysis

Due to the fast pace of the vaccine roll-out, coverage data changes quickly. Repeated mapping exercises are planned to monitor changes in vaccine coverage in relation to COVID-19 risk. Further analyses are also planned to investigate a wider range of risk factors for COVID-19 in relation to vaccination coverage, and to conduct a more robust analysis using individual level data from Connected Bradford.

All data presented in the report are provisional. Some of the analyses are based on small numbers (e.g. vaccination uptake among people aged 80+), so need to be interpreted with caution. In some of the figures, the percentage uptake is recorded as above 100% in some groups. This clearly represents issues with the data. We have investigated the various data sources available in the district, and while they do not agree perfectly we feel that there is enough accuracy for a general trend, and across most of the District there is good agreement. Many of the issues come from unclear overlaps between district boundaries and the boundaries of GP/PCN catchment areas – particularly in the North-West of the district.

There are a number of caveats to analysis using maps and area-level data. As data are grouped together for everyone living in small areas, we cannot compare COVID-19 risk and vaccination status for individual people. This means that patterns seen on the map or graph may not apply to individuals. In Figures 7-9, there needs to be some caution in interpreting the scatterplots. When the denominators are the same (MSOA population), you always see some correlation because of this - so although we can see there is a relationship, we cannot say with certainty how strong this is.

## Conclusion

These findings suggest that the vaccination coverage is lowest in some of the areas with greatest risk of COVID-19 mortality. This reflects both the eligibility of older age groups, and the lower uptake in some communities. This inequality in coverage will lead to further inequalities in COVID-19 infection and mortality, and in wider health, social and economic impacts. There are concerns around data quality and limitations to the analysis presented, and further analysis of individual level data are planned.

The findings show the need to monitor vaccination coverage over time in order to ensure that areas with the greatest COVID-19 risk have high levels of vaccination. Further work is planned to review changes over time, and conduct more robust analyses. The findings also suggest the need for further flexibility to prioritise vaccination with communities at highest risk in Bradford, and continued work to support uptake of the vaccine among eligible groups.

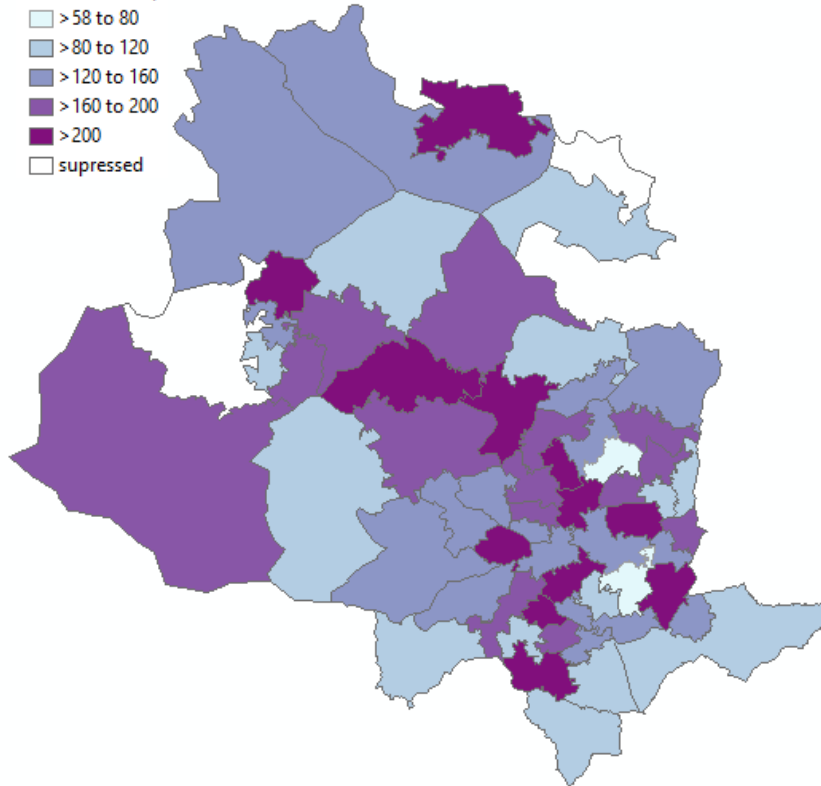
**Figure 1: Crude Mortality Rate per 100,000 and proportion vaccinated in Bradford District**

**a)** Crude mortality rate per 100,000 population where cause of death was Covid-19 – up to December 2020

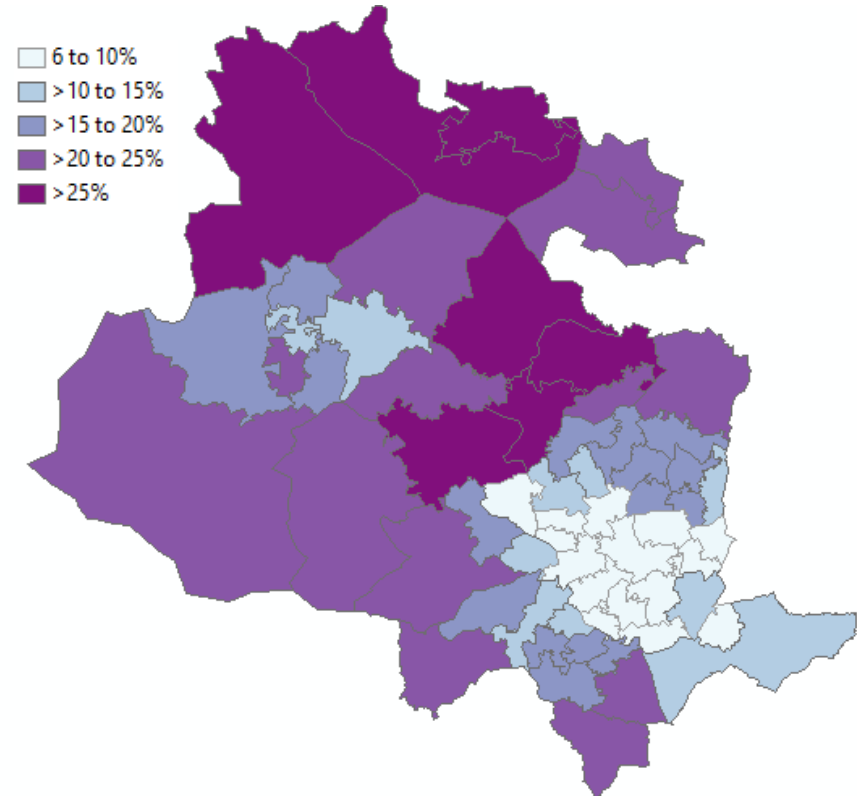
**b)** Proportion of total population (all ages) vaccinated with dose 1 up to 11 Feb 2021.

Data source: Deaths data – PCMD database, Vaccine data – Covid situational dashboard PHE extracted 11/02/2021. All data are provisional.

**a)**



**b)**



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**Figure 2: Directly Standardised Mortality Rate per 100,000 and proportion vaccinated in Bradford District**

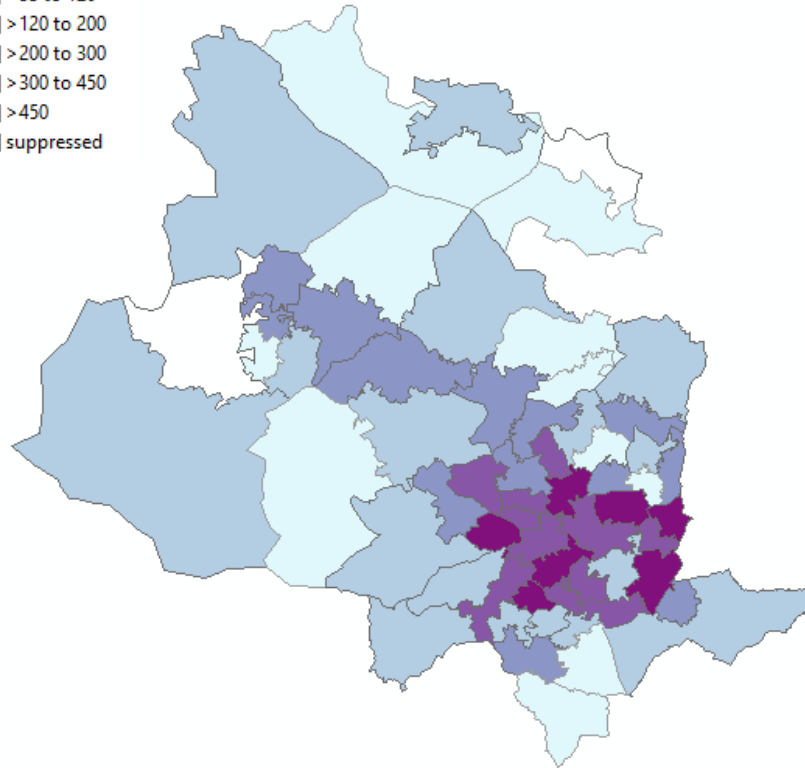
**a)** Directly standardised mortality rate per 100,000 population where cause of death was Covid-19 – up to december 2020

**b)** Proportion of total population (all ages) vaccinated with dose 1 up to 11 Feb 2021.

Data source: Deaths data – PCMD database, Vaccine data – Covid situational dashboard PHE extracted 11/02/2021. All data are provisional.

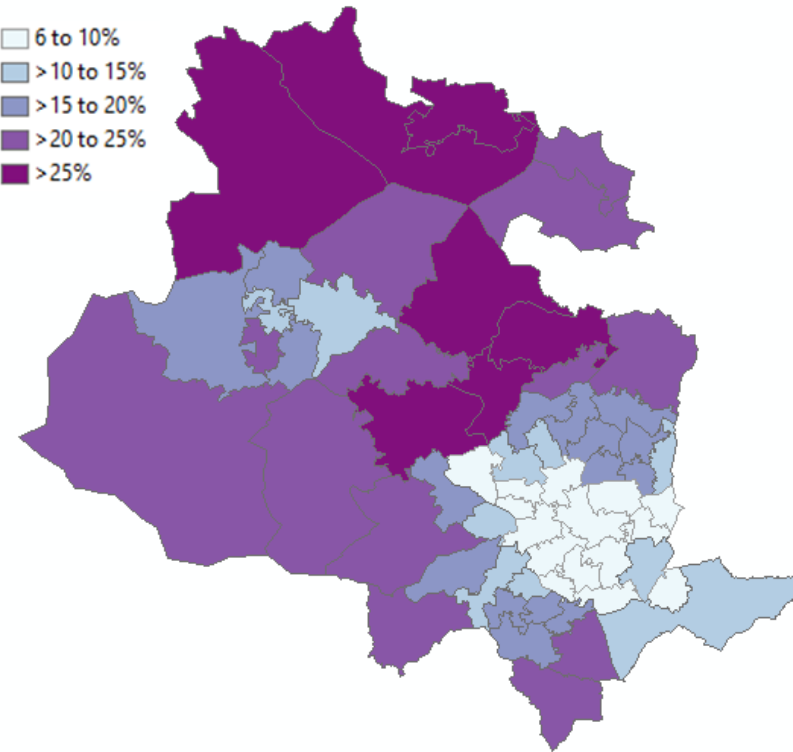
**a)**

- < 53 to 120
- > 120 to 200
- > 200 to 300
- > 300 to 450
- > 450
- suppressed



**b)**

- 6 to 10%
- > 10 to 15%
- > 15 to 20%
- > 20 to 25%
- > 25%



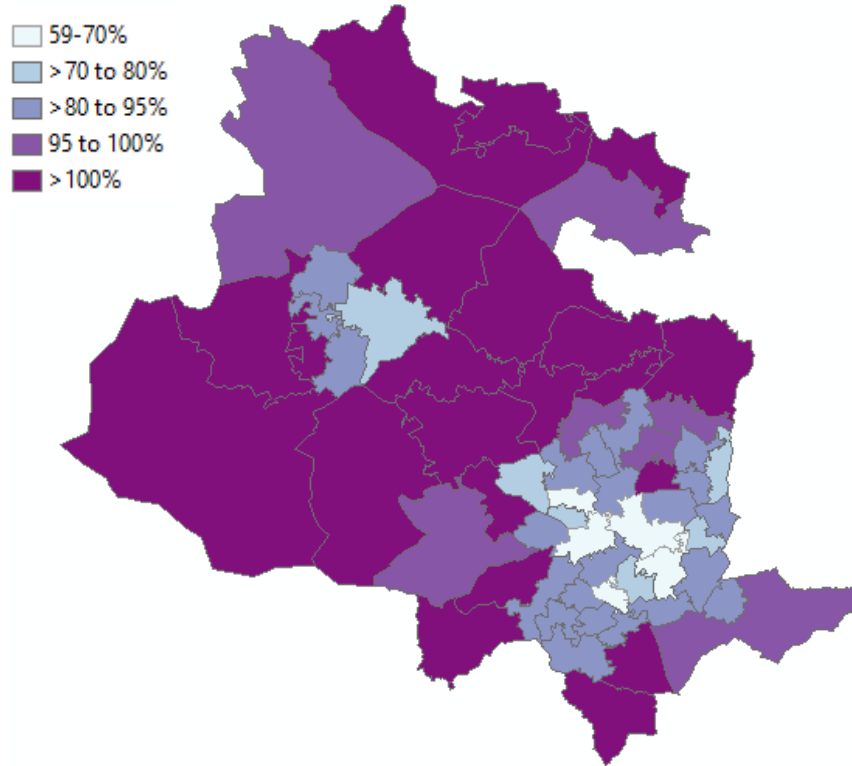
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**Figure 3: Proportion of eligible age groups vaccinated in Bradford District**

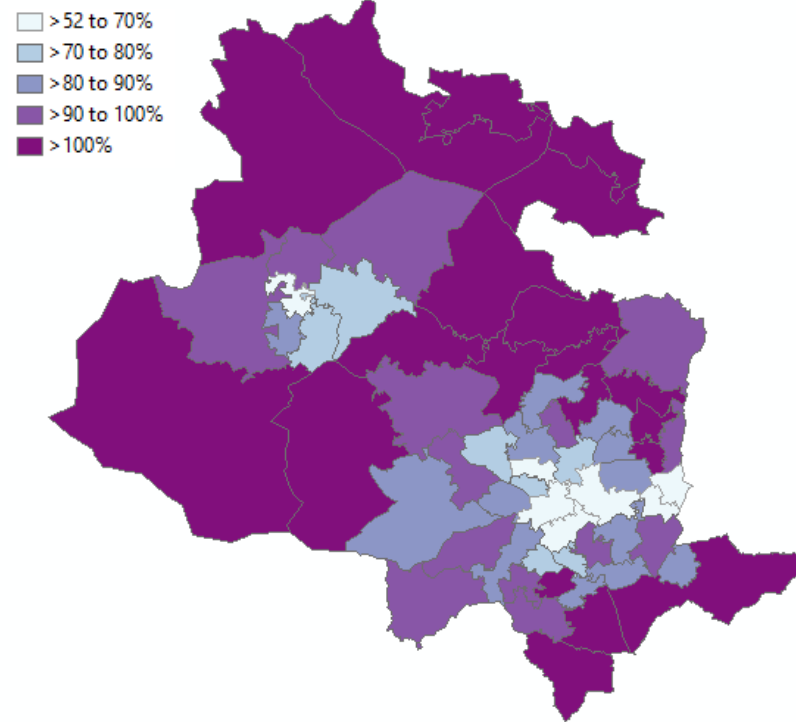
Proportion of population vaccinated with dose 1 up to 11 Feb 2021 a) 80+ years b) 75-79 .

Data source: Vaccine data – Covid situational dashboard PHE extracted 11/02/2021. All data are provisional.

**a) % uptake in 80+ age group**



**b) % uptake in 75-79 age group**



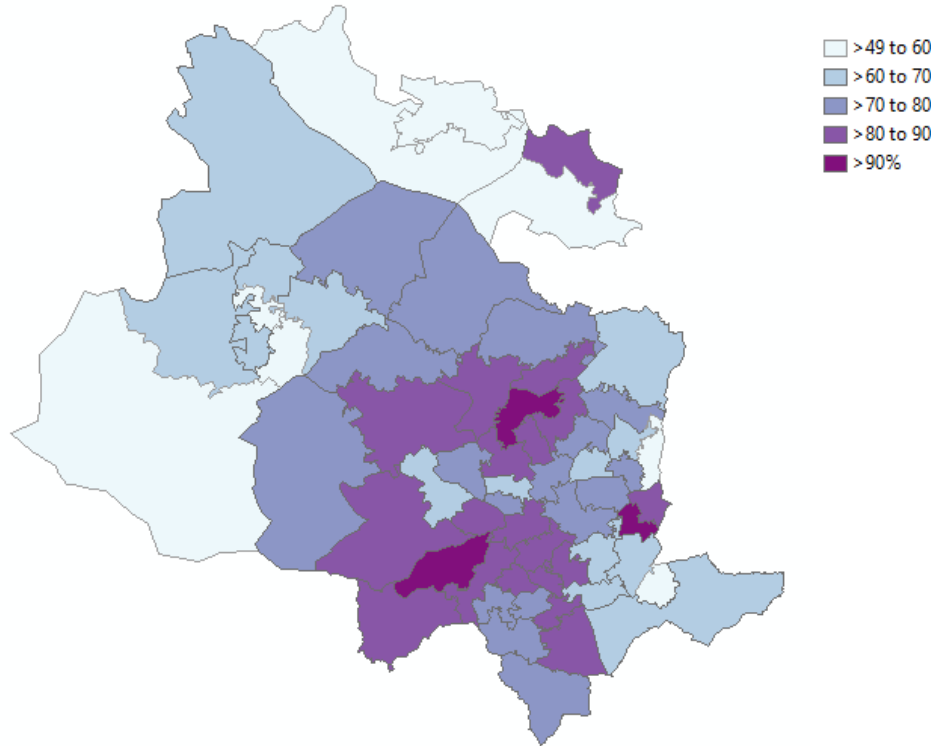
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**Figure 3 cont.**

c) 70 -74.

Data source: Vaccine data – Covid situational dashboard PHE extracted 11/02/2021. All data are provisional.

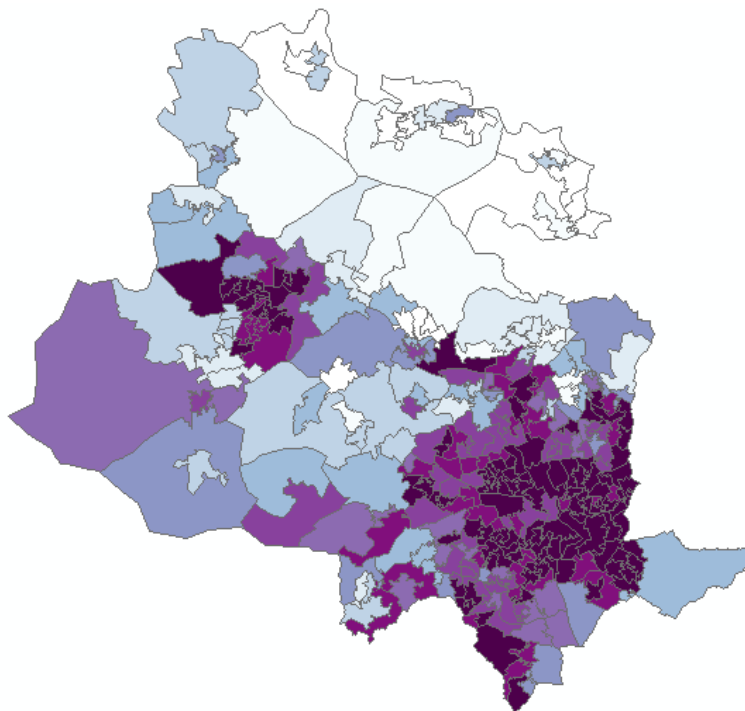
**% uptake in 70-74 age group**



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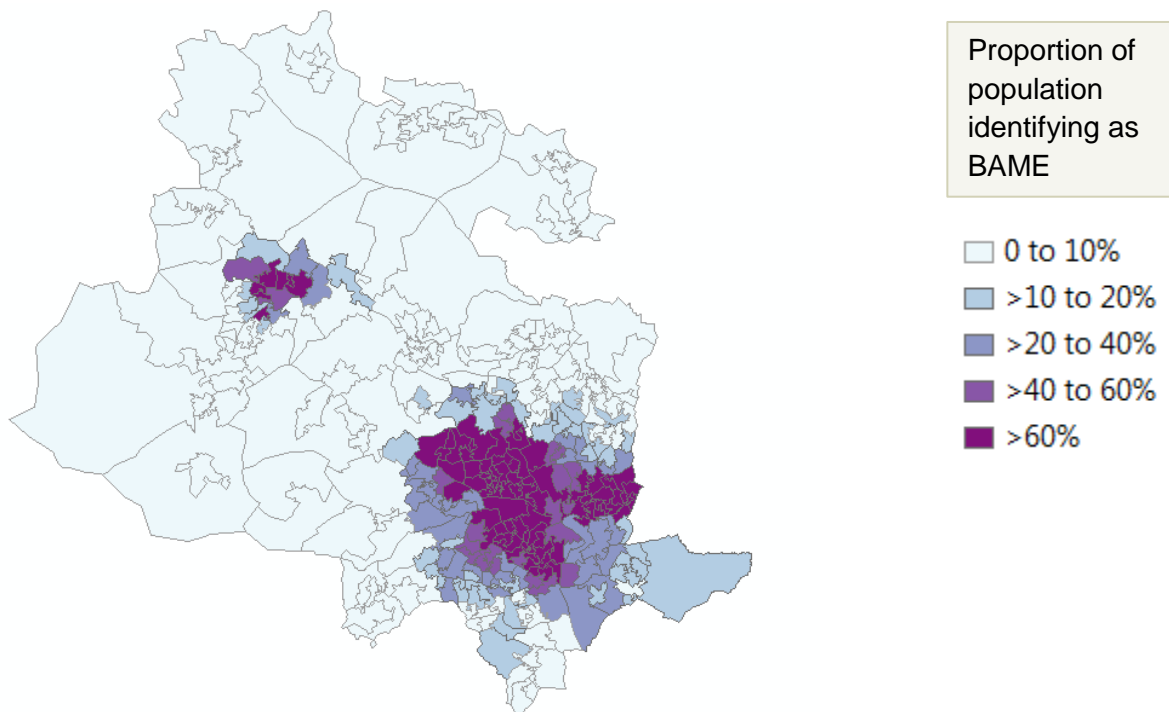


**Figure 4: Index of multiple deprivation (2019) decile by LSOA in Bradford District**



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**Figure 5: Proportion of the population identifying as Black, Asian or minority ethnic by LSOA in Bradford District**

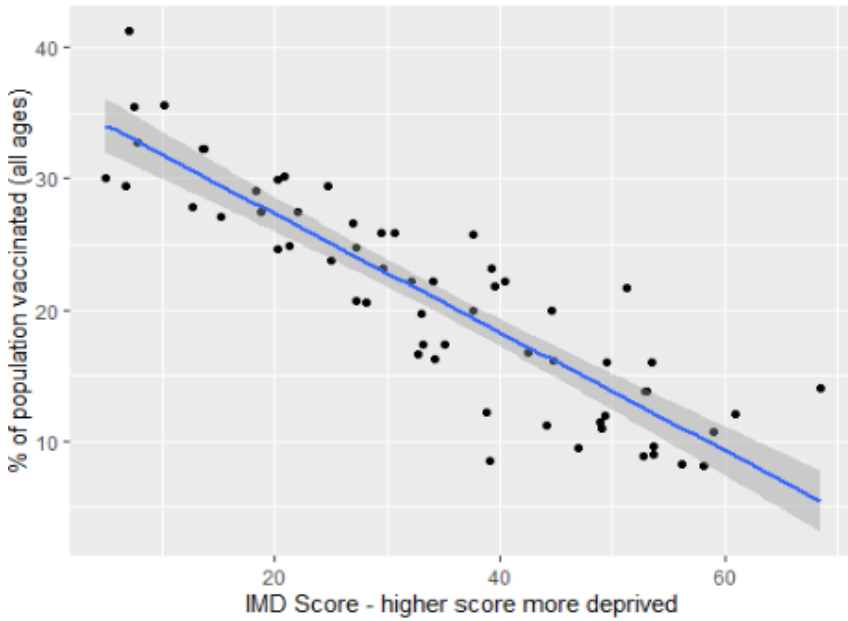


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Nomis (2011) *Nomis - KS201EW - Ethnic group- 2011 Census, Nomis*. Available at: <https://www.nomisweb.co.uk/query/construct/submit.asp?forward=yes&menuopt=201&subcomp=> (Accessed: 12 May 2020).

**Figure 6: Proportion of the population vaccinated (all ages) and Index of Multiple Deprivation in Bradford district**

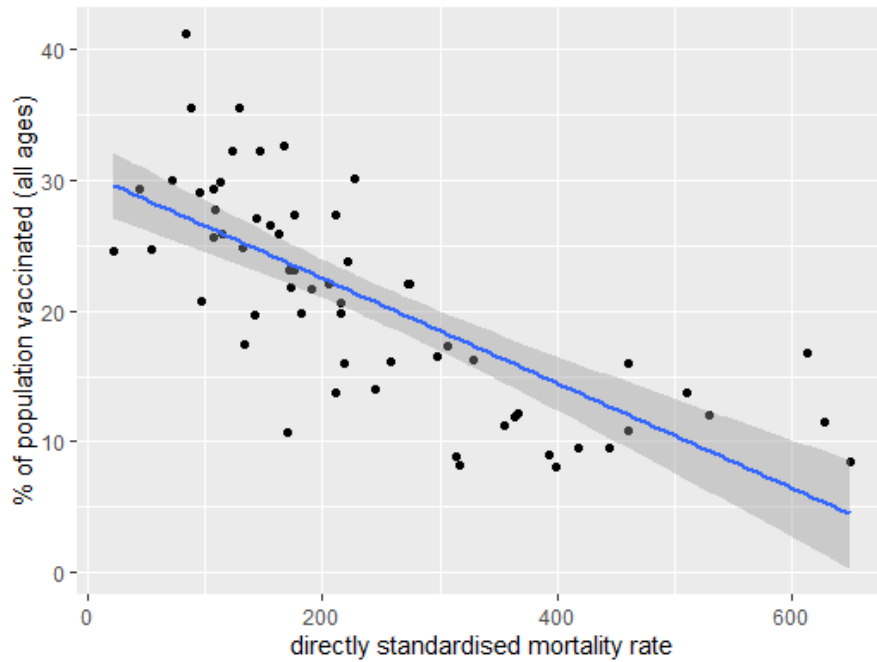
Data source: Vaccine data extract: 17/02/2021-Covid-19 Situational awareness dashboard. IMD: MSOA estimates taken from <https://research.mysociety.org/sites/imd2019/about/>



$\rho$ ; -0.89; 95%CI (-0.93 to -0.83)

**Figure 7: Proportion of the population vaccinated (all ages) and directly standardised mortality rate per 100,000 population in Bradford District**

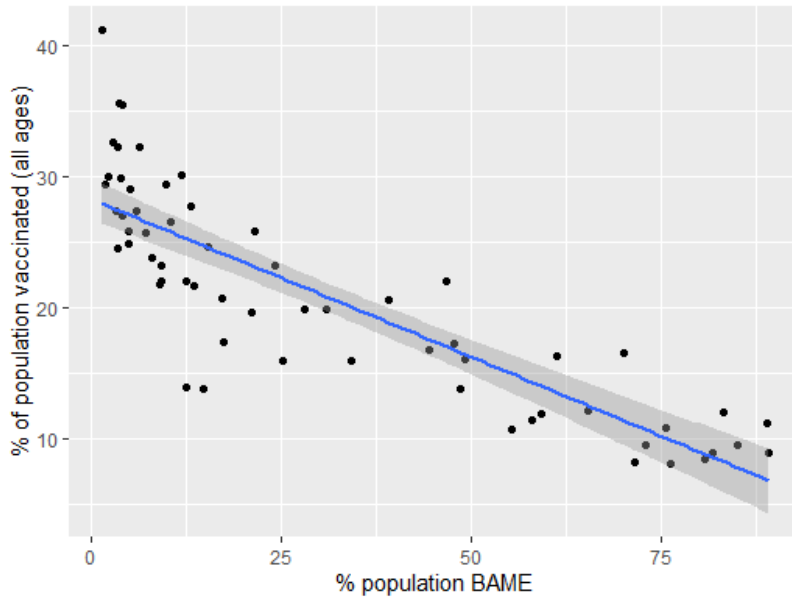
Data source: Vaccine data extract: 17/02/2021-Covid-19 Situational awareness dashboard. Deaths data: Primary Care Mortality Database – COVID-19 deaths up to 31 December 2020.



$\rho$ ; -0.74; 95%CI (-0.83 to -0.60)

**Figure 8: Proportion of the population vaccinated (all ages) and the proportion of the population from Black, Asian and minority ethnic backgrounds in Bradford District**

Data source: Vaccine data extract: 17/02/2021-Covid-19 Situational awareness dashboard. Ethnicity – 2011 Census (NOMIS)

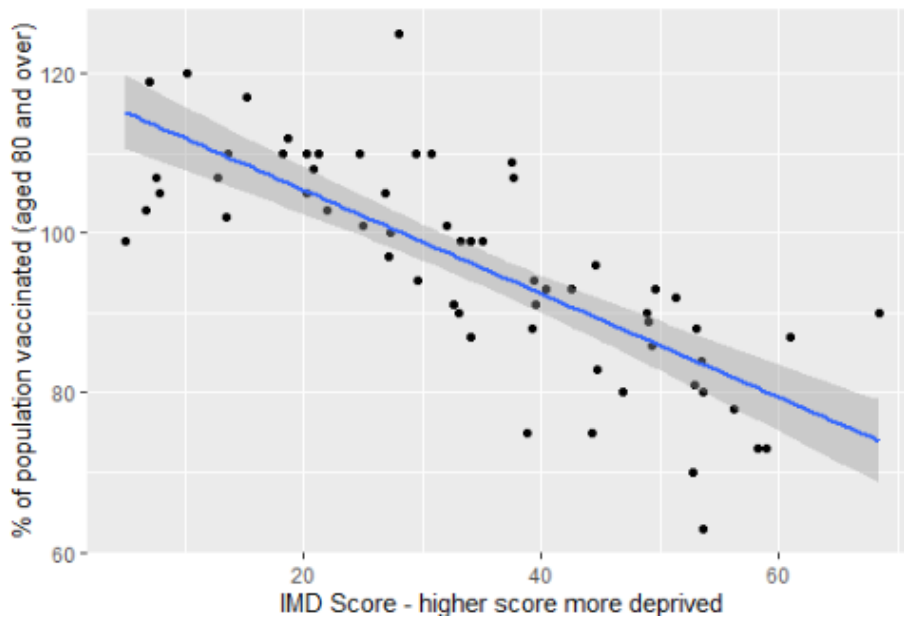


$\rho$ ; -0.86; 95%CI (-0.91 to -0.77)

**Figure 9: Proportion of the population vaccinated by age group and index of multiple deprivation score in Bradford District**

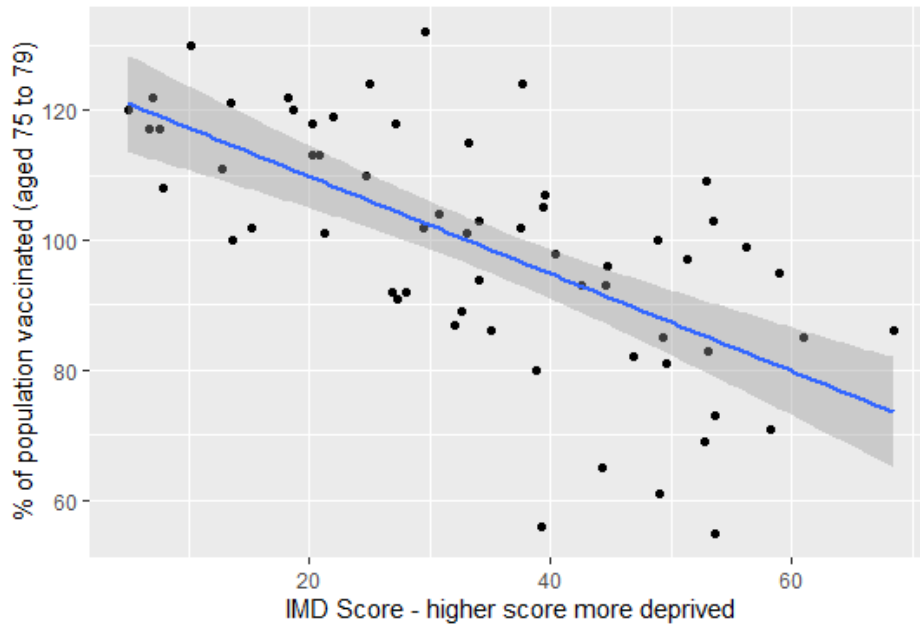
Data source: Vaccine data extract: 17/02/2021-Covid-19 Situational awareness dashboard. IMD: MSOA estimates taken from <https://research.mysociety.org/sites/imd2019/about/>

**a) Population aged 80 and over**



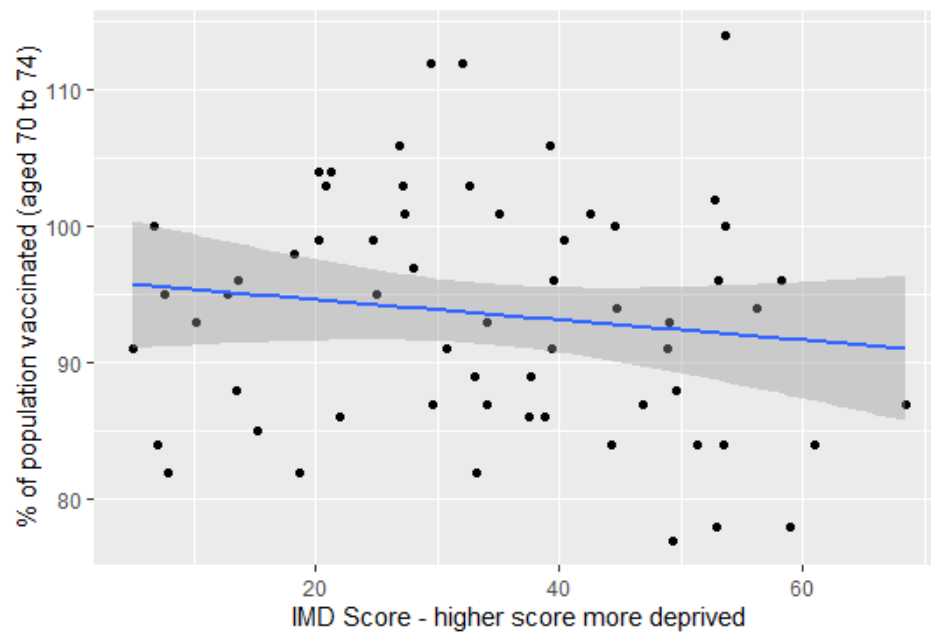
$\rho$ ; -0.73; 95%CI (-0.83 to -0.59)

**b) Population aged 75-79**



$\rho$ ; -0.65; 95%CI (-0.78 to -0.49)

**c) Population aged 70-74**

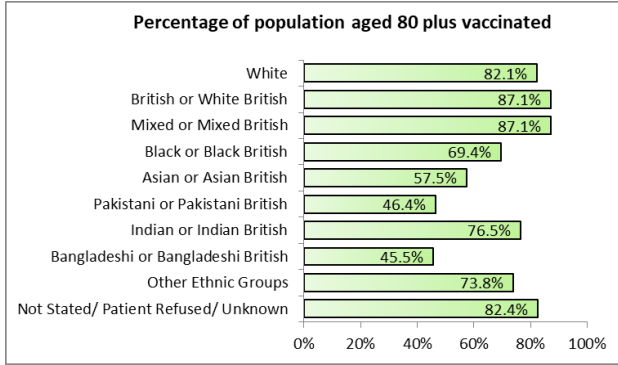


$\rho$ ; 0.18; 95%CI (-0.07 to 0.41)

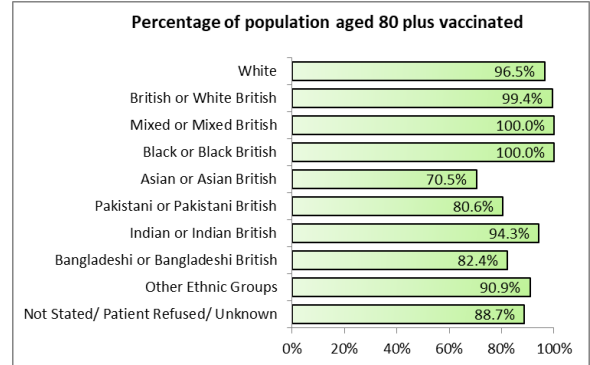
**Figure 10: Percentage of population vaccinated by age group and ethnicity on 30th January and 13th February in Bradford District and Craven**

Data Source: Bradford District and Craven CCG vaccination data - latest vaccination date in data is 13th February 2021.

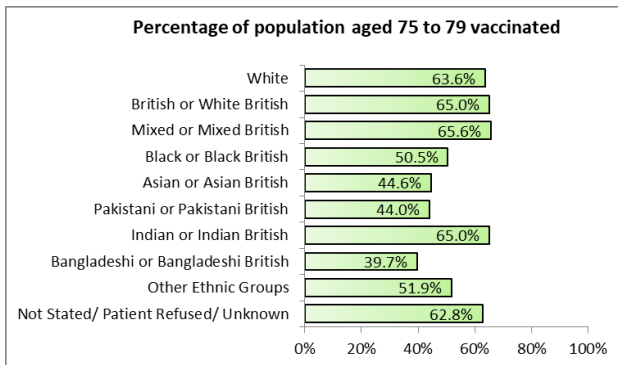
**a) Population aged 80 plus at 30<sup>th</sup> January**



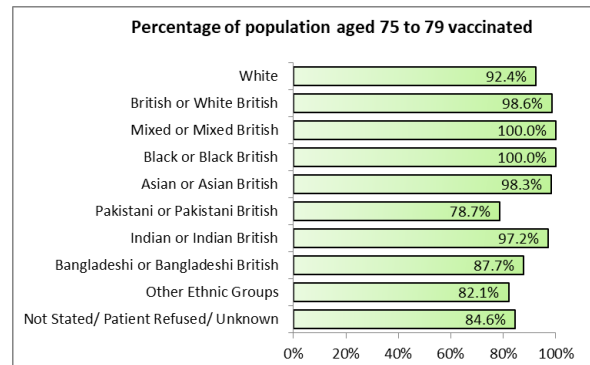
**b) Population aged 80 plus at 13<sup>th</sup> February**



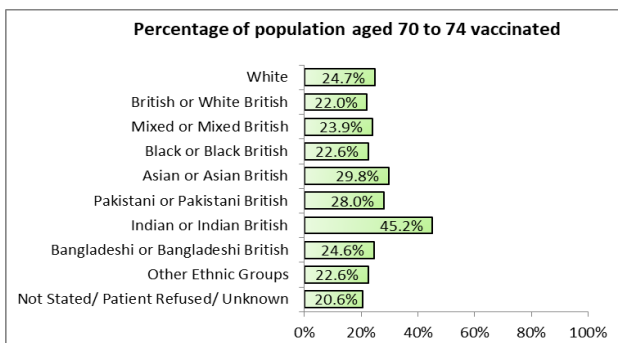
**c) Population aged 75-79 at 30<sup>th</sup> January**



**d) Population aged 75-79 at 13<sup>th</sup> February**



**e) Population aged 70-74 at 30<sup>th</sup> January**



**f) Population aged 70-74 at 13<sup>th</sup> February**

