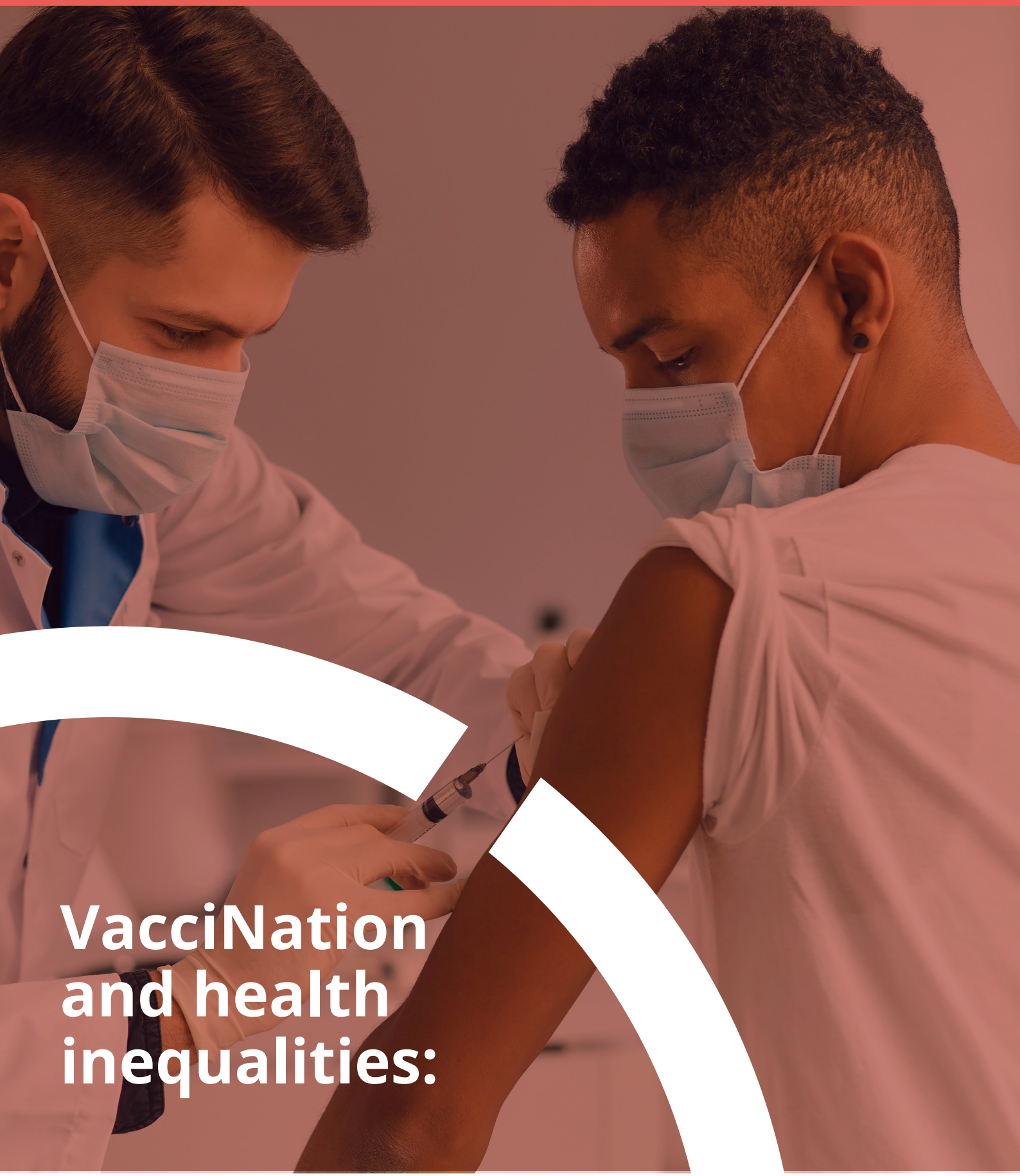


VacciNation and health inequalities:

Tackling variations in adult vaccination uptake in England

FUTURE HEALTH

Pfizer

PP-VAC-GBR-2042

THE PANDEMIC HAS SHOWN US THE VALUE OF VACCINES IN HELPING IMPROVE PUBLIC HEALTH, REDUCING PRESSURES ON OUR HEALTH SERVICE AND SUPPORTING THE WIDER ECONOMY.

EXECUTIVE SUMMARY

The benefits of vaccination for population health and economic and social benefit have been clear during the pandemic. Vaccines have improved public health, reduced pressures on our health service and helped support the re-opening of the economy.

As we seek to learn lessons from the last two years it is clear that effective vaccination programmes need to be at the centre of our future healthcare policy. Before the pandemic, NHS vaccination programmes in England were well established. However, they were not reaching as many people as needed and there were concerns about waning participation in certain areas. There were particular challenges in getting vaccines to certain groups including minority and more deprived communities[1]. The Government had commissioned a new vaccine strategy to be developed before the arrival of COVID-19 to tackle such variations.

This report looks specifically at adult vaccinations, seeking to assess levels of uptake variation across geographies and the wider economic benefits tackling these variations could bring. There is good evidence of these wider vaccination benefits. Analysis has shown that investment in adult vaccination for those over 50 provides a 4:1 return in future government revenue[1].

The COVID-19 vaccine programme has taught us a significant amount about what works and how such benefits can be realised. From targeted, locally driven community engagement to investing in new infrastructure through to the importance of accurate, high quality data. Whilst the pandemic vaccination programme continues with the rolling out of boosters, now is the time to begin thinking about how to apply the lessons to other critical programmes such as seasonal flu, shingles, whooping cough in pregnancy and pneumococcal infections.

These other programmes are often targeted at particular parts of the population who may be more vulnerable, such as older people and pregnant women, and where the use of vaccination can deliver not only a public health dividend but wider health service and economic benefits too. Indeed, by improving the uptake of adult vaccination rates within deprived communities which this analysis shows often have lower rates of adult vaccine uptake, greater economic and social benefits can in turn be realised.

The report includes a twelve point plan that seeks to build from the COVID-19 vaccination programme success and lock in the gains made. Doing so will deliver a healthier and wealthier population, supporting efforts to 'level up' health and help realise the Government's wider life sciences ambitions to be a global leading life sciences hub.

1 https://ilcuk.org.uk/wp-content/uploads/2018/11/Adult-vaccination_a-key-component-of-health-ageing.pdf

SUMMARY OF FINDINGS AND RECOMMENDATIONS

This report finds widespread variation in the adult vaccination uptake rates across England. The analysis looks at the performance of clinical commissioning groups and upper tier local authorities across five adult vaccinations: COVID-19, seasonal flu, shingles, pneumococcal polysaccharide vaccine (PPV) and whooping cough in pregnancy.

The research adopts a quintile grouping model for geographies analysed to look at links between variation in adult vaccination uptake and deprivation, health inequalities and wider social and economic impacts. The headline findings are:

- The highest rates of uptake for adult vaccinations are generally recorded in the South East
- The lowest rates of uptake for adult vaccinations are generally recorded in London and parts of the North West
- For COVID-19 and seasonal flu the areas with the highest recorded uptake rates are more likely in the least deprived areas; by comparison areas with the lowest uptake rates are over-represented in the most deprived areas
- For the shingles, whooping cough and PPV vaccine, the majority of the local authorities with the lowest uptake rates are to be found in the lower quintiles of the Index of Multiple Deprivation (IMD)
- Looking at the wider impact of vaccination, areas with higher rates of GDP per head are over-represented in those areas recording higher rates of adult vaccination and local authorities with the highest overall adult vaccination rates most commonly also record lower proportions of workless households
- There is no clear link between the rates of adult vaccination and the number of carers in an area
- Across the five adult vaccinations analysed, if those areas in the lowest two quintiles could be 'levelled-up' to the bottom of the middle quintile, an extra 1.1 million courses of vaccination would be delivered in England for adults

This report proposes a 12 point plan for tackling variation in adult vaccination and improving uptake rates.

Vaccination strategy 12 point plan

1. Setting new targets for uptake rates within the Government's planned vaccination strategy
2. Piloting vaccine incentives to improve uptake rates amongst populations and communities where vaccine rates are lower
3. Including new incentives on adult vaccination within the Quality and Outcomes Framework in primary care
4. Increasing the knowledge, capability and capacity of the public health and primary care workforce; including a larger role for community pharmacy in adult vaccination programmes
5. Embedding vaccination information easily within the NHS App and creating a public facing version of the 'green book' for adult vaccination
6. Reviewing the value of vaccination and how vaccines are assessed to include their wider economic and social value
7. Increasing access to vaccines through the use of mobile units and community based vaccination sites
8. Expanding the COVID-19 data dashboard to include a wider set of adult vaccinations to track progress on uptake
9. Working in partnership with local government and community leaders to build trusted communications programmes
10. Providing additional resource to London to carry out more regular needs assessments of population given the mobility of the population
11. Unlocking the potential of vaccination as a gateway to wider health improvement
12. Ensuring new emerging system structures across the NHS and public health are stable and set up to deliver effective vaccination programmes

INTRODUCTION – THE VALUE OF ADULT VACCINATION

COVID-19 has clearly demonstrated the importance of vaccination to improved public health.

The rapid research, discovery and deployment of vaccines has helped save thousands of lives and helped control the spread of the disease. The decision to make all adults eligible for COVID-19 booster shots, and all over-50s eligible for flu vaccinations, was designed to provide further population health protection in winter 2021-2.

The pandemic has particularly shown the importance of adult vaccination, which has not always been a health system priority. A report by the Supporting Active Ageing Through Immunisation (SAATI) Partnership exploring adult vaccination across the EU in 2018 argued that:

"vaccination policy in EU Member States is currently inadequate and mainly focused on the young (aged below 18 years), to some extent the old (aged above 65 years), especially for seasonal influenza, and those in high-risk groups (e.g. those with medical conditions that make them more susceptible to certain infectious diseases). Vaccination in adults remains an underused public health strategy in the promotion of healthy ageing. In contrast to childhood immunisation programmes, it is not considered to be a routine health intervention[2]."

This reflects similar work undertaken by the Office for Health Economics (OHE) exploring the value of vaccines in the UK which calculated that Government would save £2.18 for every £1 invested in vaccines[3].

The future of adult vaccination is dynamic and exciting with a number of vaccines being researched. These include in areas such as:

- Cancer vaccines – cited within the recent Life Sciences Vision[4]
- Healthcare associated infections
- More effective flu vaccines

Providing vaccines to adults who need them presents a critical public health mechanism for delivering a more preventative healthcare system that has the potential to support wider economic and societal benefits.

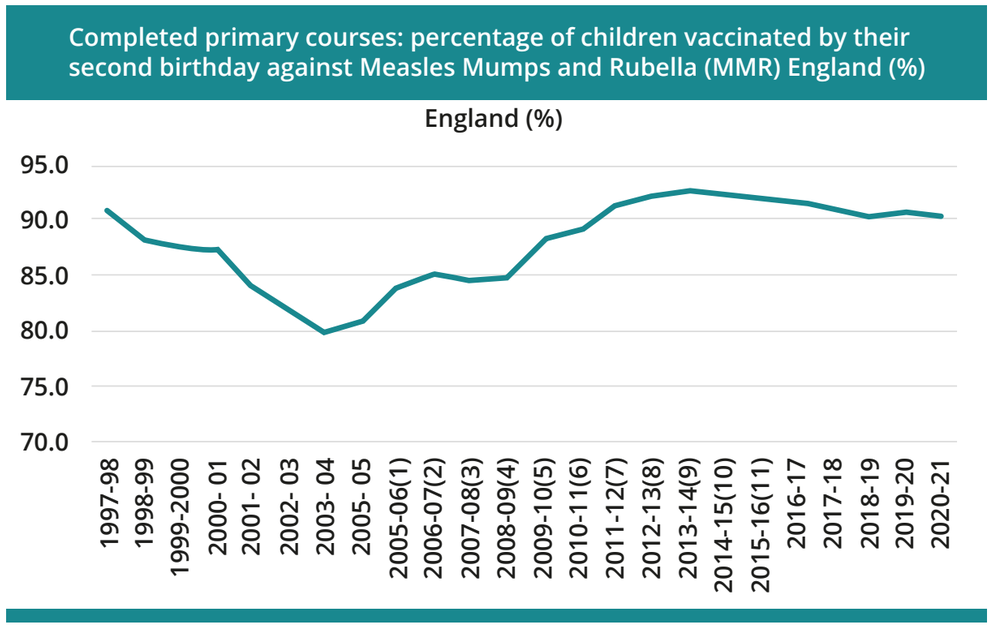
2 https://ilcuk.org.uk/wp-content/uploads/2018/11/Adult-vaccination_a-key-component-of-health-ageing.pdf
3 https://www.ohe.org/publications/broader-value-vaccines-return-investment-governmental-perspective
4 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1013597/life-sciences-vision-2021.pdf

CHAPTER 1: GOVERNMENT ACTION ON VACCINATION RATES

Before the pandemic, vaccine programmes in England were world renowned. High uptake levels were seen across most groups and the UK was at the forefront of research efforts for future vaccines. This platform has helped underpin the discovery and delivery of the UK's successful COVID-19 vaccination programme.

However, there were challenges emerging before COVID-19. The UK had lost its 'measles free status' in August 2019 as vaccination rates fell (see Fig 1 below)[5].

Figure 1: MMR Vaccine uptake in England



The UK's vaccination system faced difficulties in 2019 including:

- Pressures within the primary care system
- Low levels of vaccine uptake amongst certain population groups
- A fragmented commissioning system between the NHS and public health services
- Concerns with the role of social media in fanning anti-vaccination sentiment

5 NHS Digital data accessed by Future Health on 14 October 2021. 30 September 2021 data analysed: https://www.england.nhs.uk/statistics/statistical-work-areas/child-immunisation/

Government action

The Prevention Green Paper published in the final days of the Theresa May Government set out plans for a new vaccine strategy to improve vaccine uptake, summarised in box 1 below.

Box 1: Prevention Green Paper commitments on vaccination

By spring 2020, we will launch a Vaccination Strategy, to maintain and develop our world-leading immunisation programme. The strategy will include action on:

- Operational work to increase uptake of all recommended vaccinations across all communities and areas, to include the medium-term aim of reaching over 95% uptake for childhood vaccinations and continuing to increase uptake of the seasonal influenza vaccine. This includes implementing the UK measles and rubella elimination strategy to increase uptake of the second dose of the MMR vaccine to at least 95%, to match the aspiration for the first dose.
- Enhanced use of local immunisation co-ordinators and primary care networks, ensuring the right mechanisms are in place to increase uptake (through the GP Vaccines review) including consistent application of call and recall, and improved data services.
- Continued evolution of our immunisation programme, incorporating new, more effective and cost-effective vaccines and new uses for existing vaccines across the life course, as advised by our expert group, the Joint Committee on Vaccination and Immunisation.[6]

One of the first acts of Boris Johnson's Government was to re-commit to the strategy alongside a package of other measures to support uptake including the promotion of 'catch-up' programmes, calling a social media summit and strengthening the role of local immunisation co-ordinators[7].

COVID-19 and Government action

In response to the COVID-19 pandemic the Government launched the largest vaccination programme in British history. In April 2020 the Department for Business, Energy and Industrial Strategy set up the Vaccine Taskforce, which aimed both to ensure the UK population had access to vaccines as quickly as possible and to support equitable access for populations worldwide[8].

The approach of the Taskforce was focused on building a diverse portfolio, and by December 2020 it had access to vaccines across four different formats: adenoviral vectors, mRNA, adjuvanted proteins and whole inactivated viral vaccines[9]. It prioritised vaccines which were expected to elicit immune responses in the over-65s, owing to the much higher chance of death from COVID-19 for those of that age; which could be manufactured at scale; and which were likely to be approved by regulators for use within months[10]. The taskforce enabled the UK Government to secure access to 367 million doses of seven vaccines by January 2021[11].

Once the first clinically approved COVID-19 vaccines were administered, the Government published a strategy to build immunity rapidly, particularly by getting first doses to vulnerable parts of the population as quickly as possible. The vaccination programme was expanded to include 206 active hospital sites, 50 vaccination centres and around 1,200 local vaccination sites, to ensure everyone could access a vaccination locally, and drew on the expertise and resources of the NHS, the armed forces, local councils and the devolved administrations.

The Government and the NHS mobilised a workforce of over 80,000 health professionals to help in the delivery of the programme, while a concurrent drive for volunteers to help with non-clinical roles drew a huge response[12].

The Government said the most at-risk members of the population would be given a first dose by mid-February 2021and all adults would be offered the chance to have one by September; in the event this timetable was accelerated, so every adult could be offered a second dose by September 2021[13] . Government campaigns also encouraged people to get vaccinated, including the 'every vaccination gives us hope' campaign which featured TV adverts, a special Royal Mail postmark on stamped mail, messaging from Google and YouTube and advertising on LinkedIn[14].

In the late Summer and Autumn of 2021 this was followed by efforts to vaccinate older children, aged between 12 and 17. The Autumn also saw the launch of the booster programme. Initially, groups considered more vulnerable were given an extra dose of the vaccine, timed at least six months after the previous dose, to boost their immunity. Within the first four weeks NHS staff had delivered more than 4.5 million boosters and third jabs. The programme was extended and following the World Health Organisation (WHO)'s decision to classify Omicron as a variant of concern in November, all adults became eligible for boosters[15].

6 https://www.gov.uk/government/consultations/advancing-our-health-prevention-in-the-2020s/advancing-our-health-prevention-in-the-2020s-consultation-document
7 https://www.gov.uk/government/news/prime-minister-orders-urgent-action-to-improve-vaccination-uptake
8 https://www.gov.uk/government/news/government-launches-vaccine-taskforce-to-combat-coronavirus
9 https://www.gov.uk/government/news/governments-vaccines-taskforce-has-worked-decisively-and-at-great-pace-to-improve-uks-pandemic-preparedness
10 https://www.thelancet.com/article/S0140-6736(20)32175-9/fulltext
11 https://www.gov.uk/government/news/government-publishes-plan-for-the-largest-vaccination-programme-in-british-history
13 https://www.gov.uk/government/news/government-publishes-plan-for-the-largest-vaccination-programme-in-british-historyy
14 https://www.gov.uk/government/news/new-campaign-launches-urging-the-public-to-get-COVID-19-vaccine
15 https://www.england.nhs.uk/2021/10/former-vaccine-chief-returns-as-nhs-prepares-for-winter/

> THE UK HAS BEEN WIDELY APPLAUDED FOR ITS WORK ON THE COVID-19 VACCINES. HOWEVER, AS HIGHLIGHTED IN THE PREVIOUS SECTION, THERE WERE GROWING CONCERNS BEFORE THE PANDEMIC REGARDING THE PERFORMANCE OF THE NHS VACCINATION SYSTEM.

CHAPTER 2: VARIATION IN ADULT VACCINATION UPTAKE IN ENGLAND

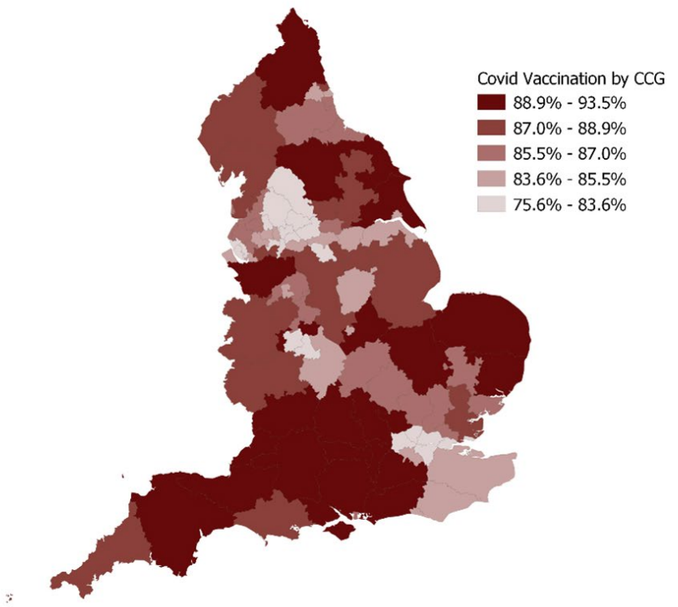
The UK has been widely applauded for its COVID-19 vaccination strategy and rollout. However, as highlighted in the previous section, there were growing concerns before the pandemic regarding the performance of the NHS vaccination system. To assess the level of system performance Future Health mapped the uptake of 5 major adult vaccination programmes in England:

- COVID-19
- Seasonal flu
- PPV
- Shingles
- Whooping cough for pregnant women

These programmes cover a wide range of the population and provide a suitable sample for assessment.

COVID-19[16]

Map showing variations in % of population double vaccinated against COVID-19



16 Data: https://www.gov.uk/government/collections/vaccine-uptake; accessed 14 October 21 Map Source: Office for National Statistics licensed under the Open Government Licence v.3.0, Contains OS data © Crown copyright and database right [2021]

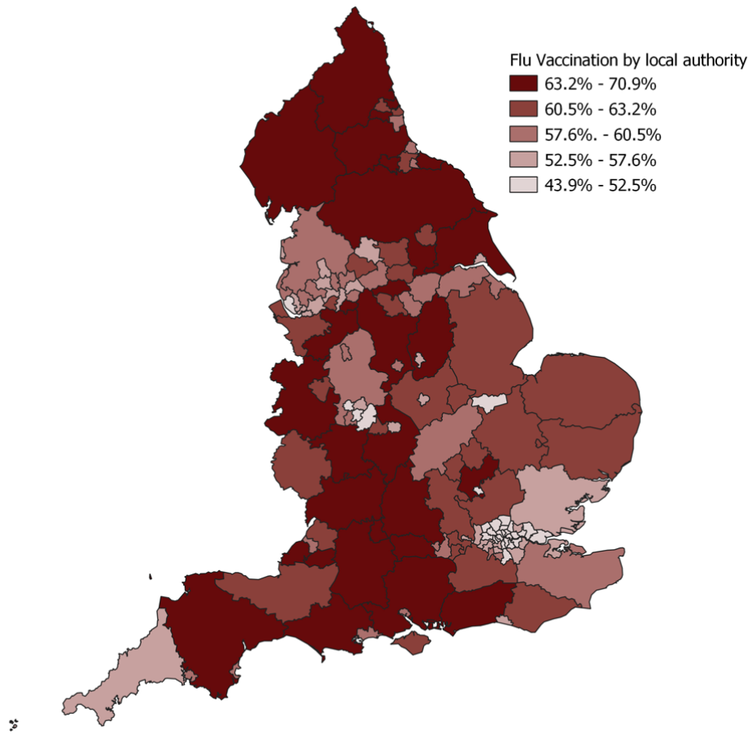
Uptake of COVID-19 vaccines is strong across the South West, where all seven CCGs are in the top two quintiles and five are in the top quintile. The figures are similarly encouraging across most of the South East, where seven of the 11 CCGs are in the top quintile, although Brighton and Hove, East Sussex and Kent and Medway are all in the fourth quintile. Uptake in the East of England is largely around or above the national average, although two CCGs in Essex (Southend and Thurrock) are in the bottom quintile.

Four of London's five CCGs are in the bottom quintile (and towards or at the bottom of it), with the other in the fourth quintile. Uptake is also poor across much of the North West, where nine out of 27 CCGs are in the bottom quintile and only Cheshire is in the top quintile. There is a more mixed picture in the North East and Yorkshire, where 11 CCGs are in the bottom two quintiles but nine are in the top two; North Yorkshire, East Riding of Yorkshire and Northumberland are in the top quintile.

As a general trend the figures from major cities appear to be a cause for most attention: alongside most of London, Liverpool, Manchester, two Birmingham CCGs and Sheffield are all in the bottom quintile.

Seasonal flu[17]

Map showing variations in seasonal flu vaccination uptake amongst eligible adults in England



17 Data: https://www.gov.uk/government/collections/vaccine-uptake ; accessed October/November 2021: Map Source: Office for National Statistics licensed under the Open Government Licence v.3.0, Contains OS data ©Crown copyright and database right [2019]

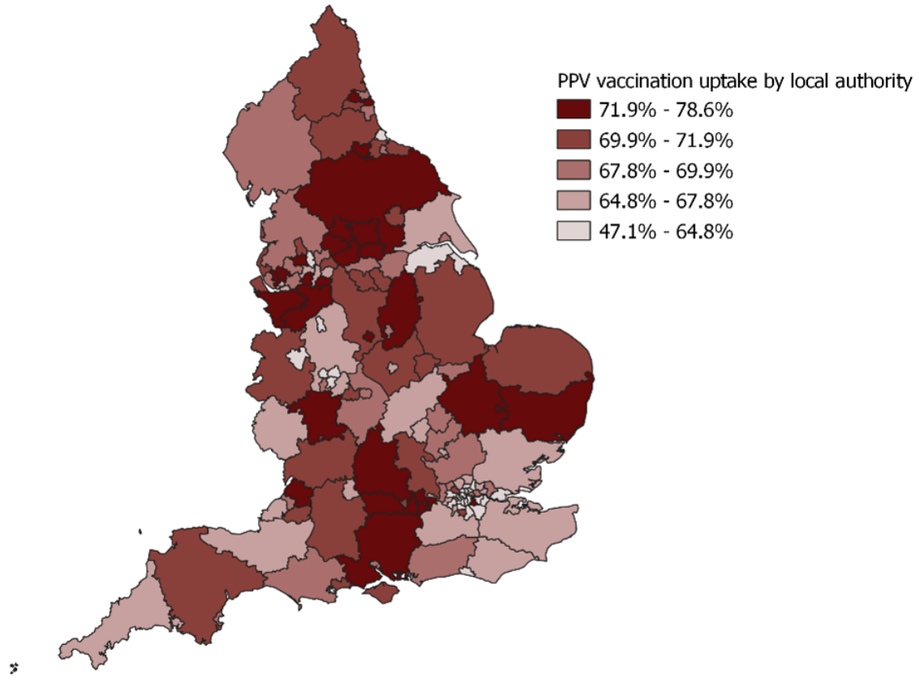
A substantial majority of local authorities are above average in the North East (11 out of 12), Yorkshire and the Humber (13 out of 15), the South East (16 out of 19) and the South West (11 out of 14). None of these regions have any areas in the bottom quintile; the North East has no areas in the fourth quintile either, while the South West has only one.

Twenty-two of London's 32 local authorities are in the bottom quintile – and this includes all of the bottom 13 LAs, all of which have an uptake below 50%. Eight of London's remaining LAs are in the fourth quintile, with only Kingston-upon-Thames and Sutton matching the national average uptake of 59.2%. Some areas of the East of England (Peterborough, Thurrock and Luton) are also in the bottom quintile, but Central Bedfordshire is in the top quintile and four more local authorities are in the second quintile. There is similar variation in the West Midlands, where Shropshire, Worcestershire and Warwickshire are in the top quintile but Wolverhampton, Birmingham and Sandwell are in the bottom quintile. Nine of the 23 local authorities in the North West are in the fourth quintile with one more in the bottom quintile.

As with COVID-19, there are notably low uptake rates in some of the major cities: Liverpool joins Birmingham and most of London in the bottom quintile, while Manchester is towards the bottom of the fourth quintile. By contrast several of the areas with the highest uptakes, such as North Yorkshire, Shropshire and Dorset, have low population densities – although this is not true of Stockport, which has the highest uptake rate in the country.

PPV[18]

Map showing variation in PPV vaccination coverage among those over 65 in England



18 Data: https://www.gov.uk/government/collections/vaccine-uptake ; accessed October/November 2021 Source: Office for National Statistics licensed under the Open Government Licence v.3.0, Contains OS data © Crown copyright and database right [2019]

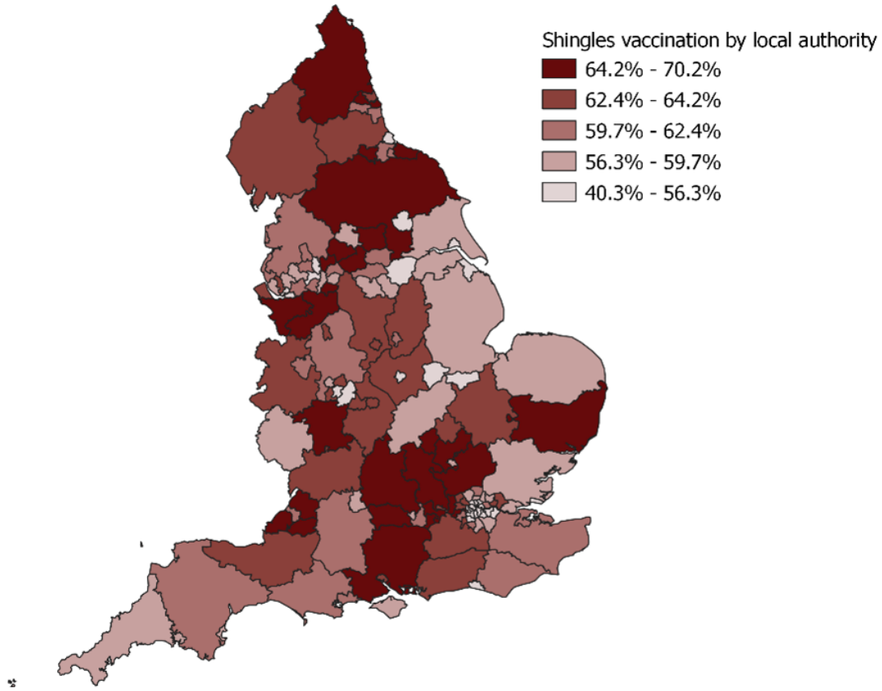
The top quintile is dominated by parts of the South East, the North West and Yorkshire and the Humber. But all three of these regions also have pockets of low uptake: Brighton and Hove, Bury, North Lincolnshire and North East Lincolnshire are all in the bottom quintile. Nine of the 12 local authorities in the North East have uptake above the national average, with just one (Hartlepool) in the bottom two quintiles. In the East Midlands uptake rates are above average in seven out of nine local authorities and none are in the bottom quintile. There is a similar although weaker pattern in the South West, where eight out of 15 local authorities are above average and none are in the bottom quintile.

Eighteen of London's 33 local authorities are in the bottom quintile, with seven more in the fourth quintile – although Lewisham, which is in the top quintile, bucks the trend. Five of the 14 local authorities in the West Midlands also feature in the bottom quintile, with three more in the fourth quintile. The pattern in the East of England is roughly in line with the national average, with individual LAs spread fairly evenly across the five quintiles.

The sparsely populated Isles of Scilly has the highest uptake rate in the country, but several of the areas closely behind it – such as Knowsley, Portsmouth and Kirklees – are densely populated. At the other end, Kensington and Chelsea is the only area with an uptake rate below 50%.

Shingles[19]

Map showing variation in shingles vaccination coverage for eligible adults in England



19 Data: https://www.gov.uk/government/collections/vaccine-uptake ; accessed October/November 2021 Source: Office for National Statistics licensed under the Open Government Licence v.3.0, Contains OS data © Crown copyright and database right [2019]

Uptake rates are strong in the North East, where five out of 12 local authorities are in the top quintile and only one is in the bottom quintile. Eight of the 19 local authorities in the South East are in the top quintile, with four more in the second quintile. The figures from the West Midlands, where more than half of local authorities are in the top two quintiles, are more positive (relative to the rest of the country) than for several other vaccines analysed.

The figures from the South West, where no local authorities are in the bottom quintile, are again fairly encouraging.

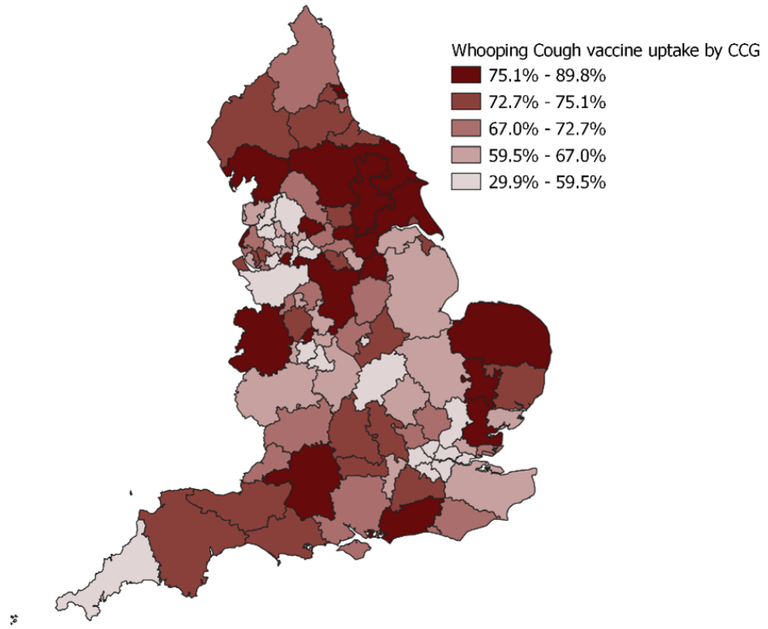
Fourteen of London's 32 local authorities are in the bottom quintile, with a further six in the fourth quintile. It's worth noting, though, that eight LAs from London are in the top two quintiles in this instance, and Hounslow has the sixth highest uptake rate in the country. The figures from Yorkshire and the Humber, where nine out of 15 LAs are in the bottom two quintiles, are generally more disappointing than for other conditions – although North Yorkshire, Leeds, Kirklees and Calderdale are in the top quintile.

Local authorities are fairly evenly spread in the North West and East of England. Stockport, Suffolk and Central Bedfordshire are all near the top of the top quintile, but Salford and Southend-on-Sea are both among the bottom six CCGs in the country. The East Midlands has four CCGs in the second quintile but also four in the bottom two quintiles, including Rutland and Leicester in the bottom quintile.

West Berkshire has the highest rate of uptake in the country at 70.2%, but this is lower than the highest rates for the other conditions covered in this study. Although several major cities again have relatively low rates – with Liverpool, Manchester and Birmingham all in the bottom two quintiles – this is not an absolute rule: Newcastle-upon-Tyne joins Leeds in the top quintile.

Whooping cough in pregnancy[20]

Map showing variation in whooping cough vaccination coverage among pregnant women in England



20 Data: https://www.gov.uk/government/collections/vaccine-uptake ; accessed October/November 2021 Map Source: Office for National Statistics licensed under the Open Government Licence v.3.0, Contains OS data © Crown copyright and database right [2021]

Five of the CCGs in the North East and Yorkshire are in the top six in the country; nine are in the top quintile and another eight are in the second quintile. Rotherham is the only one of its 24 CCGs below the national average. Ten out of 11 CCGs in the South East are also above average, with Frimley the exception; six are in the top two quintiles. Four of the seven CCGs in the South West are in the top two quintiles and six are above average, although the exceptionally low uptake figure from Kernow (noted below) is likely to drag the region's overall average down considerably.

All five of London's CCGs are in the bottom 12 CCGs in the country. Sixteen of the 27 CCGs in the north west are in the bottom two quintiles, including nine in the bottom quintile. Ten out of 18 CCGs in the Midlands are in the bottom two quintiles and 10 of the 14 in the East of England are in the bottom three, although each of those two regions also has three CCGs in the top quintile.

The variation on whooping cough uptake rates is much more substantial than for the other conditions covered in this study. Uptake rates are over 80% in eight CCGs – a figure which no local area has managed for any of the other conditions except COVID-19. In the top two CCGs – Southport and Formby and Vale of York – the rate approaches 90%.

But there are also particularly low figures in some areas. Uptake in Kernow CCG is just 29.9%, while it is 35% in North Central London and 38.5% in North East London. This may be due to these areas vaccinating babies rather than pregnant mothers. Eight CCGs have uptake below 50%, including the populous Birmingham and Solihull (48.5%). These low rates help to drag the overall average uptake across England down to 64.4%; 72 of the 106 CCGs in the country have higher rates than this.

Understanding variation in vaccine uptake

The COVID-19 vaccination programme has shown the challenges that affect vaccine uptake and drive variation particularly clearly.

Age UK identifies 3 groups of people with regards to vaccination:

Vaccine confident and vaccinated

Vaccine hesitant and vaccinated

Vaccine hesitant and not vaccinated[21]

An analysis by the Local Government Association, created as part of an effort to improve COVID-19 vaccination rates, highlights data and evidence that shows that uptake in the following groups may be more challenging[22]:

Some ethnic minority groups – Studies have shown that members of ethnic minorities are less likely to accept COVID-19 vaccines, with a December 2020 survey finding that hesitancy was highest among black, Bangladeshi and Pakistani populations compared to those from a white ethnic background[23]. Data from January 2021 also showed substantially lower rates of vaccination among black over-80s than their white counterparts[24].

These figures are particularly concerning because there is a higher risk of mortality from COVID-19 for those from ethnic minorities[25], and because of the risk that it will exacerbate existing health inequalities.

Some religious groups – Research from King's College London found that 67% of Muslims had accepted an invitation to get a COVID-19 vaccine or were certain or very likely to do so, in April 2021. This was significantly lower than other groups outlined in the research.

21 Age UK/Britain thinks. Underserved audiences. May 2021
22 https://www.local.gov.uk/our-support/coronavirus-information-councils/COVID-19-service-information/COVID-19-vaccinations/behavioural-insights/resources/research
23 https://www.bmj.com/content/372/bmj.n513
24 https://www.bmj.com/content/372/bmj.n513
25 https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/articles/updatingethniccontrastsindeathsinvolvingthecoronaviruscovid19englandandwales/24january2020to31march2021

Muslims were notably more likely to express concern that COVID-19 vaccines caused blood clots, with 41% saying this, and that those who have the vaccine may find it harder to have children in future (29%).

A smaller proportion – 19% – expressed the more explicitly religious concern that the vaccines contain pork products[26].

A study from the London School of Hygiene and Tropical Medicine in February 2021 found that COVID-19 rates in London's Orthodox Jewish community were nine times higher than the UK average[27]. The LGA review also noted hesitancy among some Orthodox Protestants[28].

Pregnant women – Figures quoted by RCOG suggested that only 15% of pregnant women had been vaccinated for COVID-19 at the end of August 2021[29] – these numbers have since improved. In June two maternity colleges also warned of vaccine hesitancy among pregnant women[30].

Occupational groups – In November 2020 YouGov found that almost half of Britons (47%) in the C2DE social demographic group were unsure about, or unwilling to take, a COVID-19 vaccine. This fell substantially in the following months: in April 2021, the hesitancy rate in this group was 14%, although this was still higher than the 10% rate in the ABC1 social group[31]. The LGA's review of research also noted that semi-skilled and unskilled workers, and the unemployed, were less likely to get vaccinated than those in managerial or professional positions; and there are concerns that key workers are less likely to get vaccinated[32].

Mental health and disability – ONS figures released in June 2021 showed that disabled people who reported being "limited a lot" in their day-to-day activities had slightly lower uptake of second doses of the COVID-19 vaccine (93.1% of those who had a first dose) than non-disabled people (96.6%)[33].

Rethink Mental Illness and Mind have also shown that people with mental health conditions may face barriers to accessing vaccines, for example because their condition may make it harder to go to a vaccination centre[34,35].

26 https://www.kcl.ac.uk/policy-institute/assets/COVID-19-vaccine-take-up-and-trust.pdf
27 https://www.lshtm.ac.uk/newsevents/news/2021/sars-cov-2-infection-rate-very-high-amongst-uk-strictly-orthodox-jewish
28 https://www.local.gov.uk/our-support/coronavirus-information-councils/COVID-19-service-information/COVID-19-vaccinations/behavioural-insights/resources/research
29 https://www.rcog.org.uk/en/news/rcog-supports-calls-from-nhs-to-pregnant-women-to-get-vaccinated-against-COVID-19/
30 https://www.rcog.org.uk/en/news/maternity-colleges-express-concern-over-vaccine-hesitancy-in-pregnant-women/
31 https://yougov.co.uk/topics/health/articles-reports/2021/04/28/vaccine-hesitancy-has-fallen-across-british-societ
32 https://www.local.gov.uk/our-support/coronavirus-information-councils/COVID-19-service-information/COVID-19-vaccinations/behavioural-insights/resources/research
33 https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthinequalities/bulletins/coronavirusandvaccinationratesinpeopleaged70yearsandoverbysociodemographiccharacteristicengland/8december2020to9may
34 https://www.rethink.org/advice-and-information/COVID-19-support/COVID-19-vaccine-and-people-living-with-severe-mental-illness/
35 https://www.mind.org.uk/information-support/coronavirus/COVID-19-vaccine-and-mental-health/

One study from Denmark also appeared to show slightly lower willingness to take the COVID-19 vaccine in mentally ill patients (84.8%)[36] compared to the general population (89.5%). But studies also suggest this gap can be addressed through targeted prevention programmes[37]. Cipriani et al have argued that people with mental health conditions have increased risk of COVID-19 infection and subsequent mortality[38].

Economic deprivation – A survey from the ONS, conducted in January and February 2021, found that 16% of adults living in the most deprived areas of England were hesitant over taking a COVID-19 vaccine. This was a higher proportion than in more affluent areas, with seven per cent of those in the least deprived quintile reporting vaccine hesitancy[39].

Looking across adult vaccinations analysed in this report there are also variations in vaccine uptake by **age** among eligible groups. In March 2021 the uptake rate for the PPV vaccine among those aged exactly 65 was 34.2%. This rate gradually rose as the age range went up, and stood at 83% for those over 75[40].

The highest cumulative rate for uptake of the shingles vaccine was among 76-year-olds, at 76.8%, in March 2021. Those aged 71, who had not been eligible for the vaccine for as long, had a 47.9% vaccination rate. Above the age of 76 the uptake rate was also lower, including among 77- and 78-year-olds, who had both been eligible since 2013 (a year longer than those aged 76)[41].

Flu vaccination rates are significantly higher among the over-65s than among those under 65 who are eligible for the vaccine, or among pregnant women[42]. The Government is aiming to vaccinate at least 85% of over-65s in 2021-22, reflecting the WHO target for that group, and at least 75% in all clinical risk groups for those under 65[43].

As a general rule COVID-19 vaccination coverage is higher among older age groups, who are widely known to be more vulnerable to serious illness and death from the virus. By mid-October 2021 97.2% of men and 97.1% of women aged 75-79 had received at least two doses of the vaccine. Among 18-24 year olds this figure was just 57.9% for men and 67.1% for women (although that age group had not generally been eligible for a second dose for as long as their elders). Those in their 20s and 30s were also significantly less likely to have been vaccinated than those in older age groups: for example, uptake rates for those aged 25-29 were 62.8% of men and 70.8% of women.

There was also a notable and concerning drop-off among the over-80s. Although the percentages were still high – 89.9% of men and 90% of women had had both doses – this was significantly lower than the proportion of those aged 75-79 who had received both jabs[44].

36 https://www.cambridge.org/core/journals/acta-neuropsychiatrica/article/abs/covid19-vaccine-willingness-among-patients-with-mental-illness-compared-with-the-general-population/949CE2AD-F019A3D78F64E704146EE348
37 https://www.thelancet.com/journals/lanpsy/article/PIIS2215-0366(21)00301-1/fulltext
38 https://blogs.bmj.com/bmj/2021/02/16/COVID-19-vaccination-programme-where-do-people-with-mental-health-difficulties-lie-within-the-order-of-priority/
39 https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandwellbeing/bulletins/coronavirusandvaccinehesitancygreatbritain/13januaryto7february2021
40 https://www.gov.uk/government/collections/vaccine-uptake
41 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/999152/hpr15_7__shngls-vc_crrctd_v2.pdf
42 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/996033/Annual-Report_SeasonalFlu-Vaccine_GPs_2020_to_2021.pdf
43 https://www.gov.uk/government/publications/national-flu-immunisation-programme-plan/national-flu-immunisation-programme-2021-to-2022-letter
44 https://www.england.nhs.uk/statistics/statistical-work-areas/COVID-19-vaccinations/

Barriers to vaccination

Alongside assessing and understanding why vaccination rates for particular groups are lower, it is critical to also understand some of the barriers to this. In June 2021 Tracy Epton, a lecturer in Health Psychology at the University of Manchester, identified three key barriers to vaccination for COVID-19[45]:

- Capability: the knowledge and skills needed to take up the vaccines
- Opportunity: the necessary conditions to take it up, which may require encouragement, social support and convenience of access
- The motivation to have it – requiring, for example, a belief that it will work

She also noted recent research which found that previous interventions had mainly focused on capability and motivation, but had done little to address lack of opportunity.

The Strategic Advisory Group of Experts on Immunisation (SAGE) working group on vaccine hesitancy has also highlighted three groups of barriers to vaccination in general[46], relating to:

- Confidence: including whether, the system and people who deliver it are seen as reliable and competent, and policy makers and the NHS are trusted
- Complacency: whether people see no major risk from catching an illness
- Convenience: including whether vaccines are accessible and affordable, whether the purpose of vaccination is clear and whether vaccines are supported by cultural context

These barriers have had heightened relevance during the pandemic, but they are also relevant to – and draw on evidence from – vaccination drives other than those related to COVID-19.

Elsewhere a report from the Royal Society for Public Health (RSPH), published before the pandemic in 2019, studied barriers to uptake for vaccines in childhood, working-age adulthood and later life[47]. For every adult vaccine it studied, fear of side effects was the most common reason why people chose not to vaccinate.

The RSPH also highlighted a range of issues relating to access to appointments. It noted that timing and availability of appointments were commonly cited as barriers to accessing vaccinations for working-age adults and parents, while the availability and location of appointments were the key barriers for older adults. Forgotten appointments also appeared to be a significant problem: more practitioners who responded to the RSPH surveys cited this as a barrier than any other issue. More than 40% of practitioners also cited language barriers as a concern among working-age adults, with more than 20% seeing them as a concern among older adults. More than 30% of practitioners also expressed concerns around cost for older adults. Research also suggests difficulties with access are particularly relevant among some vulnerable groups, such as the homeless.

The RSPH also argued that raising awareness and countering popular myths and health misinformation, particularly in the media and on social media, would be valuable. On the shingles vaccine specifically, the society said raising awareness may be the primary way of improving uptake[48].

45 https://www.manchester.ac.uk/discover/news/covid-the-three-barriers-that-stop-people-being-vaccinated/
46 https://www.local.gov.uk/our-support/coronavirus-information-councils/COVID-19-service-information/COVID-19-vaccinations/behavioural-insights/resources/3Cmodel-vaccine-hesitancy
47 https://www.rsph.org.uk/static/uploaded/3b82db00-a7ef-494c-85451e78ce18a779.pdf
48 https://www.rsph.org.uk/static/uploaded/3b82db00-a7ef-494c-85451e78ce18a779.pdf

Case study: London vaccination rates study

As set out above areas of London often have lower vaccination rates than other parts of the country. There are a range of explanations for this, including London's generally more diverse and younger population. There is also the challenge of people moving around within and in and out of the city more frequently making it difficult to accurately track uptake figures.

During COVID-19, Public Health England (PHE, which has now handed associated powers to the UK Health Security Agency) has been running the 'Keep London Safe' campaign aimed at providing trusted, accurate information about the pandemic. The project has been largely co-ordinated through Hackney Council but has been a joint effort involving the Mayor's office, local authorities, the NHS, PHE and the Greater London Authority. It has gathered first hand insights through interviews, focus groups and an online survey to help develop multi-language materials and information toolkits to support efforts in improving vaccine uptake rates[49].

Priorities for ensuring greater take-up of vaccines should therefore include:

- **Building trust:** This requires local and community engagement, proven expertise in recognisable leaders, and efforts to address people's concerns sympathetically
- **Securing sustainable vaccine supplies and making them easily accessible:** Those who are most vulnerable are particularly likely to rely on public transport, be confined to their homes, or be homeless. A drive to increase uptake should also fully utilise text, phone and digital reminder services
- **Ensuring data on population health is accurate and up-to-date:** Data should reflect movement in and out of the area, and efforts should be made to ensure people are registered with the authorities

49 https://ukhsa.blog.gov.uk/2021/04/01/how-london-is-reaching-diverse-communities-with-vital-COVID-19-information/

CHAPTER 3: VACCINATION AND HEALTH INEQUALITIES

The variations and challenges outlined in the previous chapter highlight a clear need to assess the links between vaccination and health inequalities.

The UK health inequalities challenge

Studies by Michael Marmot in 2010 and 2020 have highlighted the issue of growing health inequalities across the country. The most recent 2020 review found:

- There is a strong relationship between deprivation measured at the small area level and healthy life expectancy at birth. The poorer the area, the worse the health
- There is a social gradient in the proportion of life spent in ill health: those in poorer areas live shorter lives and spend more of them in ill health
- Healthy life expectancy has declined for women since 2010 and the percentage of life spent in ill health has increased for men and women[50]

The pandemic has highlighted the impact of these inequalities on health outcomes. Data from the Health Foundation cited by the All Party Parliamentary Group for Longevity found that:

- 90% of those who died with COVID-19 had significant prior poor health
- The most deprived places had much higher COVID-19 mortality rates; in Blackburn and Darwen 345 people per 100,000 died, five times more than in South Cambridgeshire, where 68 per 100,000 died
- There would have been 40,000 fewer deaths in the UK if the national COVID-19 mortality rate had been as low as the least deprived places[51]

Government and NHS action on health inequalities

The Conservative manifesto included a pledge to increase healthy life expectancy by 5 years by 2035. However progress on healthy life expectancy has stalled in recent years. A study by Policy Exchange found that on current progress the Government would not hit the target for males until 2050 and for females until 2085[52].

The Health and Social Care Secretary Sajid Javid has identified health inequalities as an early priority; he used a speech in Blackpool to set out the importance of tackling the "social backlog" as well as the elective care backlog[53]. The Prime Minister referenced differences in life expectancy rates in his summer 2021 levelling up speech[54] and returned to them in his 2021 Party Conference speech[55].

The Government has created a new Office of Health Improvement and Disparities (OHID), which – along with the UKHSA – assumed some PHE responsibilities in October 2021. OHID has a core focus on the issue of health disparities[56]. The new Health and Social Care Levy is primarily to be used to fund the NHS elective backlog, but the Government is also exploring plans to boost prevention through a national prevention service, linked to a revamped NHS Health Check[57].

50 https://www.instituteofhealthequity.org/resources-reports/marmot-review-10-years-on/the-marmot-review-10-years-on-full-report.pdf
51 https://static1.squarespace.com/static/5d349e15bf59a30001efeaeb/t/6081711f326bde0ee-a34a3f6/1619095840963/Levelling+Up+Health+Report+Digital+Final+2.pdf
52 https://policyexchange.org.uk/publication/saving-a-lost-decade/
53 https://www.gov.uk/government/speeches/the-hidden-costs-of-COVID-19-the-social-backlog
54 https://www.gov.uk/government/speeches/the-prime-ministers-levelling-up-speech-15-july-2021
55 https://www.bbc.co.uk/news/58818531
56 https://www.gov.uk/government/organisations/office-for-health-improvement-and-disparities/about
57 https://www.gov.uk/government/publications/build-back-better-our-plan-for-health-and-social-care/build-back-better-our-plan-for-health-and-social-care

The NHS is itself taking the issue of health inequalities more seriously with a new central team leading work in the area. The NHS operational guidance from October 2021-March 2022 includes "expanding primary care capacity" to tackle health inequalities as one of its overarching six priorities[58]. There are five areas where the NHS is seeking to make progress on health inequalities and these are:

- Restoring NHS services inclusively
- Mitigating against digital exclusion
- Ensuring datasets are complete and timely
- Accelerating preventative programmes that support those at risk of poor health outcomes
- Strengthening board level leadership[59]

The NHS is also consulting on a new programme, Core 20 + 5, which calls for energy, attention and resources to be directed in a way that makes a substantial impact on health inequalities. The programme urges a focus on the 20% most deprived population identified by the Index of Multiple Deprivation (IMD), along with groups experiencing poorer than average access, experience or outcomes (as determined by ICSs). It also calls for a focus on five clinical areas where there is a particular opportunity to narrow the current gap in life expectancy due to health inequalities[60].

New Integrated Care Systems (ICSs) through the work of Integrated Care Partnerships are expected to work closely with local government, the voluntary sector and others to deliver improvements in population health.

58 https://www.england.nhs.uk/wp-content/uploads/2021/09/C1400-2122-priorites-and-operational-planning-guidance-oct21-march21.pdf
59 https://www.england.nhs.uk/wp-content/uploads/2021/03/B0468-implementation-guidance-21-22-priorities-and-operational-planning-guidance.pdf
60 https://www.england.nhs.uk/blog/help-us-to-shape-core20plus5-nhs-england-and-nhs-improvements-approach-to-tackling-health-inequalities/

Exploring links between adult vaccination and health inequalities

The IMD captures the relative level of deprivation of localities across England. The IMD is calculated based on seven domains of deprivation covering:

- Income
- Employment
- Health
- Crime
- Education
- Housing
- Living Environment[61]

On the most recent data the following Upper Tier local authorities are ranked as being the most deprived in England; defined as those in the lowest quintile by their rank of average ranks across the different indices of deprivation[62].

Table 1: Most deprived upper tier local authorities in England (by rank of average rank in IMD)

Blackpool	Newham
Manchester	Blackburn with Darwen
Knowsley	Stoke-on-Trent
Liverpool	Middlesbrough
Barking and Dagenham	Rochdale
Birmingham	Wolverhampton
Hackney	Salford
Sandwell	Bradford
Kingston upon Hull, City of	Leicester
Nottingham	Tameside

61 https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019

62 A quintile approach has been adopted for the majority of this analysis. This aligns with the proposed core 20+5 model of addressing health inequalities within the NHS which looks to improve the bottom 20% of those identified by the Index of Multiple Deprivation and improve care in 5 key clinical areas: https://www.england.nhs.uk/about/equality/equality-hub/core20plus5/

And the following authorities were ranked as the least deprived.

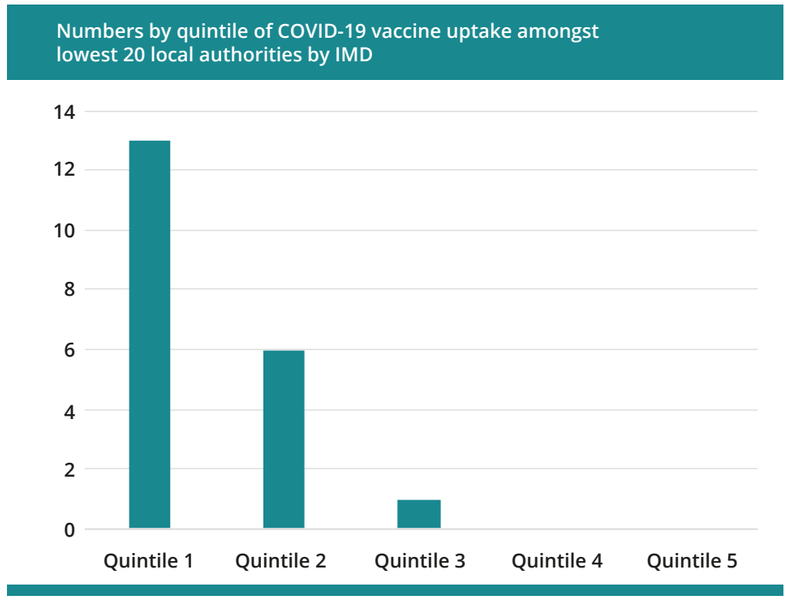
Table 2: Least deprived upper tier local authorities in England (by rank of average rank in IMD)

Bromley	Oxfordshire
Wiltshire	York
Isles of Scilly	Bracknell Forest
Hertfordshire	Buckinghamshire
Hampshire	West Berkshire
Leicestershire	Surrey
Central Bedfordshire	Richmond upon Thames
South Gloucestershire	Rutland
Kingston upon Thames	Windsor and Maidenhead
Bath and North East Somerset	Wokingham

The following seeks to compare vaccination rates for adult vaccinations to deprivation using the IMD. This approach is not designed to make distant judgements on whether areas are good or bad at vaccinating their populations. Rather it is designed to assess why variation in vaccination between areas may be occurring and in doing so support the development of policy solutions to address it.

COVID-19

Figure 2: Uptake rates of COVID-19 vaccine amongst most deprived local authorities (Quintile 1 – lowest vaccine uptake; Quintile 5 – highest vaccine uptake)

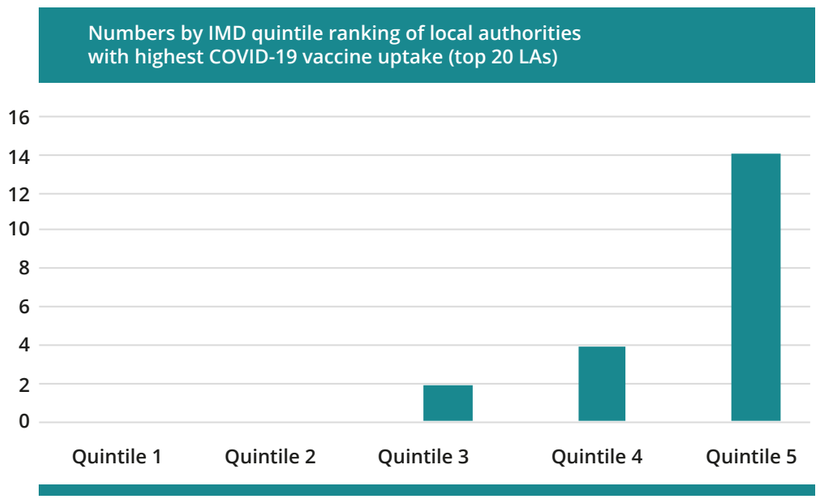


The above sets out how many local authorities identified as being the most deprived by the IMD are in each quintile of COVID-19 vaccine uptake. The data show that 13 of the 20 are in the bottom quintile for uptake (quintile 1, lowest uptake), with 6 in the second quintile (second lowest uptake). No authorities are in the fourth or fifth quintiles where uptake is highest[63].

Looking at areas where the vaccine uptake is highest one finds a near-mirror image (figure 3). Here 14 local authorities with the highest vaccine uptake are in quintile 5 (least deprived), with four in the fourth quintile (second least deprived). No authorities are recorded in the most or second most deprived quintiles.

Figure 3: Highest COVID-19 vaccine uptake areas by IMD quintile ranking

(Quintile 1 – most deprived; Quintile 5 – least deprived)



These two graphs show that in the areas where COVID-19 vaccine uptake is highest, levels of deprivation are generally lower. By contrast 95% of the most deprived areas in the IMD are in the lowest 2 quintiles of COVID-19 vaccine uptake.

63 Data extrapolated from CCG uptake data to local authority and taken from 14 Oct 2021 COVID-19 dashboard

Seasonal flu vaccination

For the seasonal flu vaccination, the following authorities had the lowest uptake averaged across the three eligible groups (over 65s, under 65s with health needs and pregnant women).

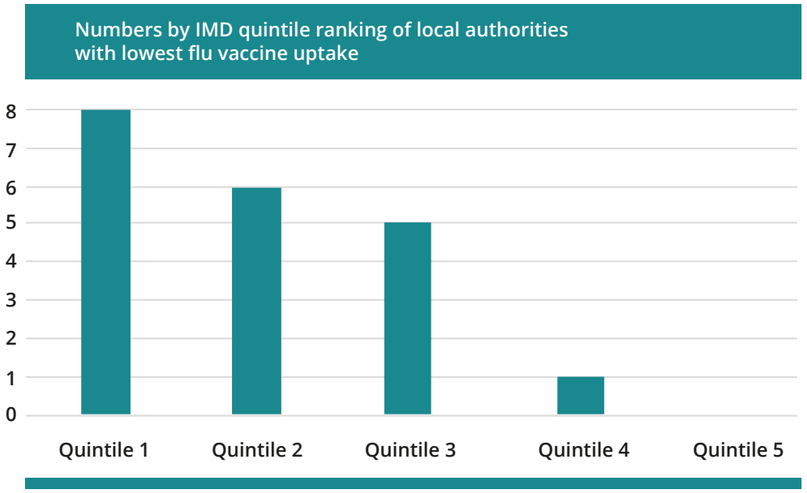
Table 3: Local authorities with lowest uptake rates for seasonal flu vaccine

Thurrock	Lewisham
Greenwich	Lambeth
Birmingham	Newham
Islington	Barking And Dagenham
Luton	Westminster
Barnet	Waltham Forest
Sandwell	Enfield
Croydon	City and Hackney
Kensington And Chelsea	Haringey
Brent	Hammersmith And Fulham

When these areas are broken down by IMD quintile again the highest figure recorded is in the most deprived quintile with 8 authorities. Eleven authorities are in the second and third quintiles. Only 1, Barnet, is in either of the top two quintiles (the least deprived).

Figure 4: Lowest flu vaccine uptake areas by IMD quintile ranking

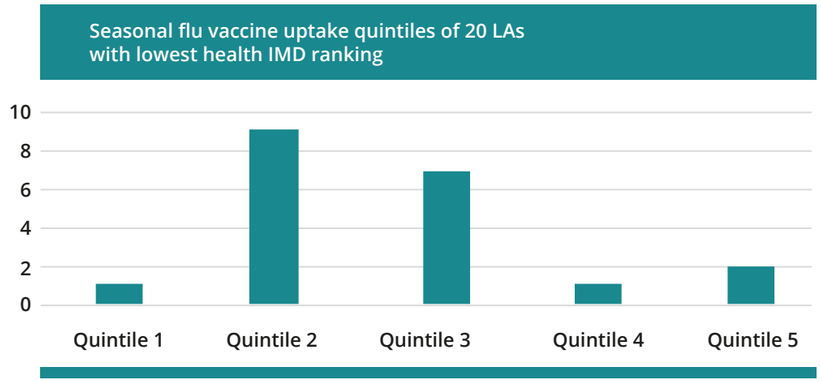
(Quintile 1 – most deprived; Quintile 5 – least deprived)



Similarly when looking at the local authorities with the poorest health indicator scores as part of their performance in the IMD, again half are in the bottom two quintiles for flu vaccine uptake and only 3 of 20 are in the top 2 quintiles[64]. This reflects the trends for the vaccines above.

Figure 5: Local authorities with lowest health deprivation score compared with seasonal flu vaccine uptake

(Quintile 1 – lowest uptake; Quintile 5 – highest uptake)



Shingles, whooping cough and PPV

Shingles

For shingles the following 20 local authorities recorded the lowest uptake figures.

Table 4: Local authorities with lowest uptake rates for shingles vaccine

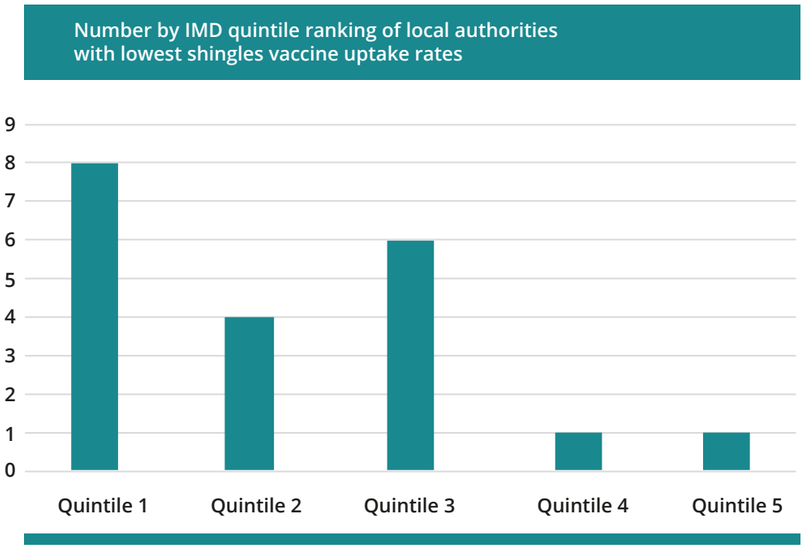
Rutland local authority	Lambeth local authority
Bexley local authority	Southwark local authority
Camden local authority	Halton local authority
Bury local authority	Leicester local authority
Hammersmith and Fulham local authority	Hartlepool local authority
Southend-on-Sea local authority	Lewisham local authority
Westminster local authority	Tower Hamlets local authority
Kensington and Chelsea local authority	Sandwell local authority
Peterborough local authority	Salford local authority
Greenwich local authority	Hackney and City of London local authorities

As set out in figure 6 below, the highest number of these authorities was again recorded in the most deprived quintile by IMD ranking (quintile 1). Six authorities were in the third quintile with 4 in the second most deprived quintile. Rutland and Bexley were in the top two quintiles respectively.

64 This graph looks specifically at the health indices of the IMD; rather than overall IMD and maps this to vaccine uptake rates

Figure 6: Local authorities with lowest uptake of shingles vaccine classified by IMD quintile ranking

(Quintile 1 – most deprived; quintile 5 – least deprived)

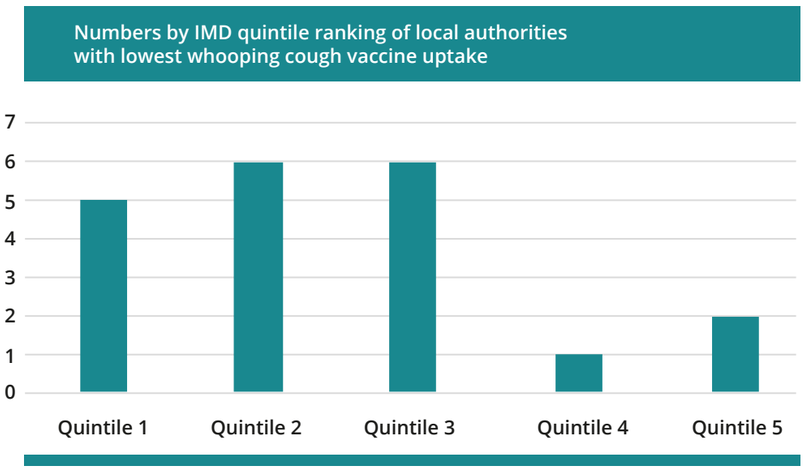


Whooping cough

There are slight differences in the picture for the whooping cough vaccine for pregnant women (figure 7 below). Again looking at areas of lowest uptake, there are six authorities in the 2nd and 3rd most deprived quintiles whereas the most deprived quintile (quintile 1) has only 5. Once again though the top two quintiles have very low representation with 1 authority and 2 authorities respectively.

Figure 7: Local authorities with lowest uptake rates for whooping cough in pregnancy classified by IMD quintile ranking

(Quintile 1 – most deprived; quintile 5 – least deprived)



These data reflect a 2018 study which found that coverage for the vaccine: "decreased with increasing deprivation and was 14·0% lower in the most deprived quintile compared with the least deprived for the pertussis programme and 4·4% lower for rotavirus[65]."

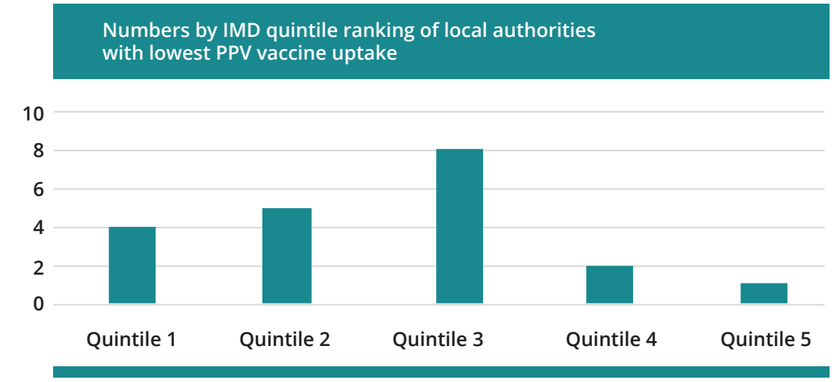
PPV

For PPV, the following were the local authorities with the lowest recorded uptake figures.

Table 5: Local authorities with lowest uptake rates for PPV vaccine

North East Lincolnshire local authority	Waltham Forest local authority
Islington local authority	Thurrock local authority
Greenwich local authority	Lambeth local authority
Richmond upon Thames local authority	Hackney local authority
Camden local authority	Haringey local authority
Wandsworth local authority	Southend-on-Sea local authority
Brighton and Hove local authority	Southwark local authority
Bury local authority	Hammersmith and Fulham local authority
Hartlepool local authority	Westminster local authority
Bexley local authority	Kensington and Chelsea local authority

Figure 8: Local authorities with lowest uptake rates for PPV classified by IMD quintile ranking (Quintile 1 – most deprived; quintile 5 – least deprived)



Here the highest number of local authorities (eight) was in the third most deprived quintile. Five authorities were in the second most deprived quintile and 4 in the most deprived quintile. Two authorities were in quintile 4 (the second least deprived) and one, Richmond Upon Thames, was in the least deprived.

65 https://pubmed.ncbi.nlm.nih.gov/29239285/

Summary of findings and limitations

The above analysis would indicate a relationship between areas with poorer adult vaccination coverage and deprivation and health inequalities.

When looking at the areas of lowest vaccine uptake across all five vaccines and mapped against level of deprivation, the following picture emerges:

Table 6: Deprivation in areas with lowest uptake rates of five adult vaccinations

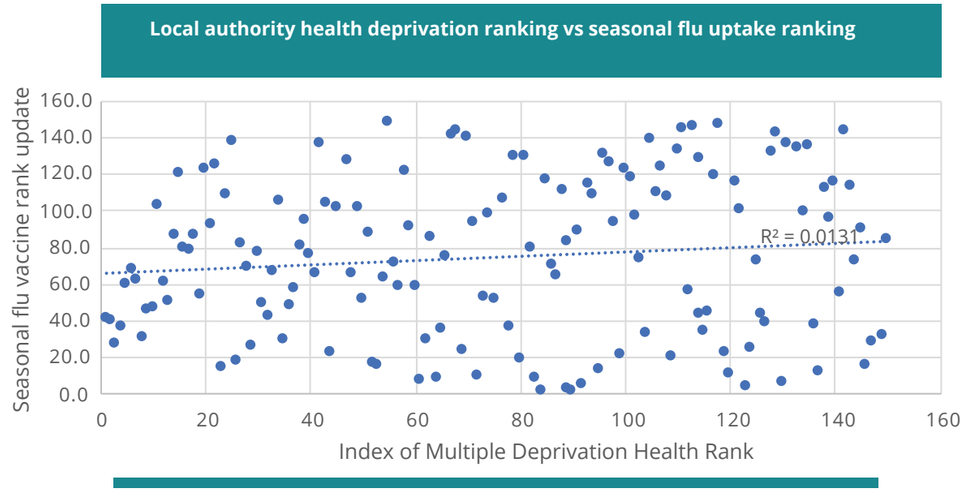
IMD quintile number	% representation
1 (most deprived)	38
2	27
3	26
4	5
5 (least deprived)	4

As the above grid shows the level of representation in the analysis increases with deprivation. The least deprived areas are the least likely to have particularly low vaccination coverage. By comparison the most deprived areas are the most likely to, with 38% representation across the five vaccinations.

However it is important not to overplay the correlation and relationship found here. This analysis takes only one representation of deprivation/inequality – the IMD at one time – and assesses it against a sample of primarily the lowest but on occasion the highest vaccine uptake areas.

As an example when looking at the uptake of seasonal flu vaccine across all local authorities mapped against the health specific sub-metrics within the IMD the picture is very mixed.

Figure 9: Local authority health deprivation ranking mapped against seasonal flu uptake rates



Whilst it would appear from the analysis here that deprivation is a likely factor in explaining vaccine variation, particularly for areas where uptake is more challenging, a number of issues are likely to explain the differences in rates between areas. Some of these may well in turn be linked to deprivation but others may not.

CHAPTER 4: WIDER IMPACTS AND BENEFITS OF IMPROVEMENTS IN VACCINATION RATES

Research shows that vaccination coverage offers significant health benefits and improvements in quality of life in older adults[66]. It also has vital benefits for public health more generally, particularly because it can help to tackle antibiotic resistance. Vaccines reduce the need for antibiotics and the perceived need for them, as patients often erroneously take antibiotics for viral infections; and their use to tackle secondary bacterial infections caused by viral illnesses[67]. Vaccines also have very substantial economic benefits. By preventing illness, vaccination helps to prevent working adults from having to take sick leave and maintain their productivity while at work. It also enables older or non-working adults to make economic contributions in other ways – for example, by helping families with childcare. Research also suggests improvements in life expectancy have a knock-on impact on economic growth[68].

In 2020 a study led by academics at Johns Hopkins University in the US estimated that vaccination programmes targeting 10 infectious diseases had averted approximately $682bn of economic burden in 94 low- and middle-income countries since 2011. The programmes' estimated net economic benefit, of approximately $657bn, was 26 times their cost. The researchers also estimated that the programmes would save a further $829bn between 2021 and 2030 – about 20 times their predicted cost. A further model within the same research also found that the value of lives saved by the vaccination programmes would be around 51 times their cost from 2011 to 2020 and 52 times their cost from 2021 to 2030[69].

A 2020 report from the Office of Health Economics also warned of an "imminent risk" that the value of future immunisation programmes would be underestimated[70]. The report, and a follow-up with more specific recommendations the following year[71], called for new ways of recognising and rewarding the productivity gains accruing from vaccination programmes.

66 https://www.tandfonline.com/doi/full/10.1080/07853890.2019.1588470
67 https://www.rsph.org.uk/static/uploaded/3b82db00-a7ef-494c-85451e78ce18a779.pdf
68 https://www.tandfonline.com/doi/full/10.3402/jmahp.v3.27044
69 https://www.newscientist.com/article/2250696-economic-benefits-of-vaccination-programmes-vastly-outweigh-costs/
70 https://www.ohe.org/publications/realising-broader-value-vaccines-uk
71 https://www.ohe.org/publications/realising-broader-value-vaccines-uk-ready-prime-time

Economic and social impacts of vaccination rates

To assess the possible wider impacts of improvements in vaccination rates we sought to develop a rank of ranks for each local authority for the selected adult vaccination programmes looked at in this report.

We ranked each local authority by their relative rate of uptake of vaccines for the five programmes in our study. This enabled us to give each local authority an overall score for vaccination coverage, to rank them in order according to that score. As with the previous analysis we then divided those rankings into quintiles[72].

Thirty-one local authorities were in the top quintile, meaning they had the best overall vaccination rates (with two LAs tied in 30th place). These were:

North Yorkshire local authority	Leeds local authority
West Berkshire local authority	West Sussex local authority
Stockport local authority	Cheshire East local authority
Bath and North East Somerset local authority	Worcestershire local authority
Oxfordshire local authority	Gloucestershire local authority
Portsmouth local authority	North Tyneside local authority
Suffolk local authority	Trafford local authority
Northumberland local authority	Windsor and Maidenhead local authority
South Gloucestershire local authority	County Durham local authority
Darlington local authority	North Somerset local authority
Shropshire local authority	Cheshire West and Chester local authority
Bracknell Forest local authority	Cambridgeshire local authority
Hampshire local authority	Buckinghamshire local authority
Wiltshire local authority	Newcastle upon Tyne local authority
Derbyshire local authority	Cumbria local authority
	Redcar and Cleveland local authority

72 For PPV, flu and shingles, the data was divided by local authority; for COVID-19 and whooping cough, CCG level data was transferred to upper tier local authority boundaries. These data are therefore a best estimate rather than an accurate reflection.

Twenty-nine LAs were in the bottom quintile, meaning they had the lowest overall vaccination rates. They were:

Manchester local authority	Bexley local authority
Barking and Dagenham local authority	Thurrock local authority
Newham local authority	Greenwich local authority
Enfield local authority	Sandwell local authority
Leicester local authority	Islington local authority
Merton local authority	Camden local authority
Redbridge local authority	Haringey local authority
Barnet local authority	Waltham Forest local authority
Tower Hamlets local authority	Southwark local authority
Southend-on-Sea local authority	Lambeth local authority
Salford local authority	Hackney and City of London local authorities
Croydon local authority	Kensington and Chelsea local authority
Wandsworth local authority	Hammersmith and Fulham local authority
Wolverhampton local authority	Westminster local authority
Birmingham local authority	

To look at the potential broader benefits of improved vaccination rates, we then looked to use this overall composite system for adult vaccination and explore links with economic and social variables.

The variables selected were based on areas of the policy and academic literature as being of relevance. This included an analysis of previous studies looking at the economic and social impacts of vaccines and a review of publicly available and up to date UK Government and NHS data. Based on this the following variables were selected for analysis:

- GDP per head - capturing the economic outputs of an area
- Workless households – assessing levels of employment in an area
- Number of carers per head – providing an insight into the care needs of an area

Economic activity – GDP per head

Figure 10: Highest performing areas on adult vaccination scorecard classified by GDP per head quintiles

(Quintile 1 – highest GDP per head; Quintile 5 – lowest GDP per head)

Figure 10 shows how the local authorities with the highest vaccination rates fare on GDP per capita. The areas at the top of the scorecard tend to have higher GDP per capita than average, with more than half (16 out of 31) in the top two quintiles. In contrast only seven of them are in the bottom two quintiles.

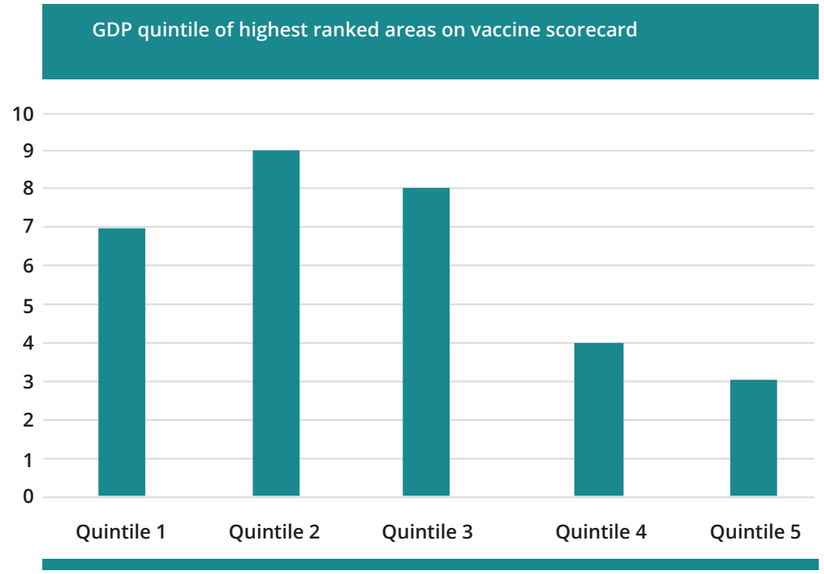


Figure 11: Lowest performing areas on adult vaccination scorecard classified by GDP per head quintiles

(Quintile 1 – highest GDP per head; Quintile 5 – lowest GDP per head)

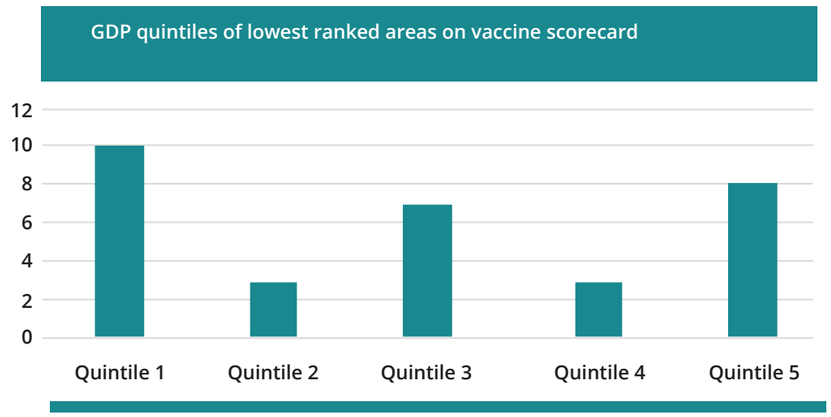


Figure 11 shows how the local authorities at the bottom of the vaccine scorecard perform on GDP per capita. Perhaps surprisingly a substantial 10 of these 29 local authorities are in the top quintile. However nine of those 10 areas are in London with the other in Manchester, suggesting that the wealth generated within major cities does not necessarily translate into higher vaccination rates. Elsewhere, six of the local authorities are in the bottom quintile for GDP – and four of these are again in London.

A separate analysis compared the position of local authorities outside London on the vaccine scorecard with their position on GDP. The areas in the top quintile of the vaccine scorecard were most commonly in the top quintile for GDP (nine out of 25), while only two of them were in the bottom quintile. The correlation between lower scores on the vaccine scorecard and low GDP remained weaker overall. But only two of the lowest ranked areas on the vaccine scorecard were now in quintile one for GDP, with quintile five now the joint highest (with seven local authorities).

Unemployment – workless households

Figure 12: Highest performing areas on adult vaccination scorecard classified by proportion of workless households quintiles

(Quintile 1 – most workless households, Quintile 5 – least workless households)

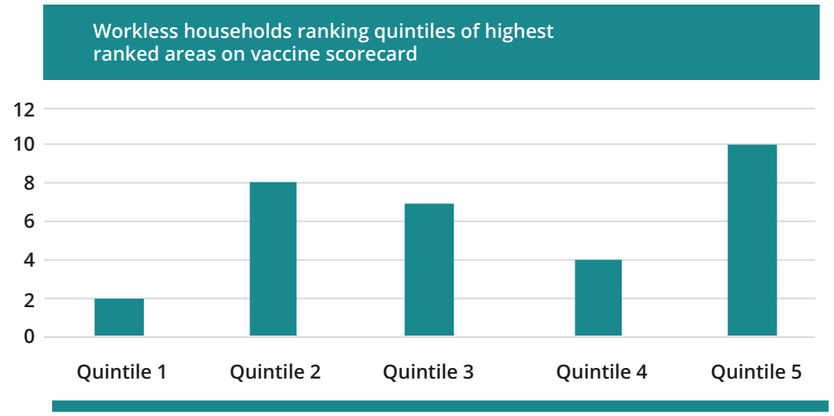


Figure 12 shows how the local authorities with the highest overall vaccination rates rank according to their proportion of workless households. Quintile 1 represents the areas with the most workless households, and quintile 5 the least.

The local authorities with the highest overall vaccination rates most commonly also have the lowest proportion of workless households. By contrast only two are in quintile 1; both of those are also in the bottom quintile for GDP per capita.

Figure 13: Lowest performing areas on adult vaccination scorecard classified by proportion of workless households quintiles

(Quintile 1 – most workless households, Quintile 5 – least workless households)

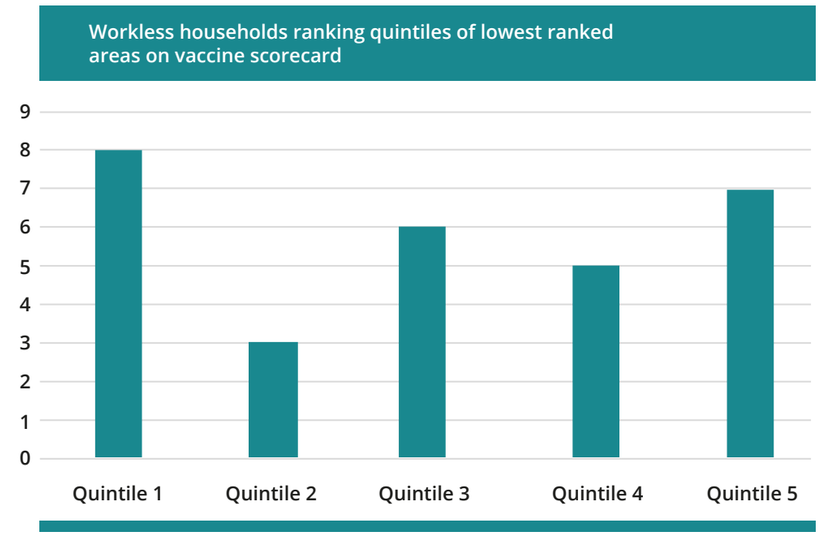


Figure 13 shows how the local authorities with the lowest vaccination rates fare on the same measure. The local authorities at the bottom of the vaccine scorecard most commonly also have the highest proportion of workless households (placing them in quintile 1).

The overall relationship is weaker here, with a substantial number of local authorities appearing at the other end of the scale, although this appears largely explicable as a London-specific phenomenon. Five of the seven local authorities in quintile 5 are in London, as are four of the five in quintile 4. In contrast, four of the eight LAs in quintile 1 are in London. Three are in the West Midlands (including Birmingham), and the other is Manchester.

Care needs – Number of carers per head

Figure 14: Highest performing areas on adult vaccination scorecard classified by number of carers per head quintiles

(Quintile 1 – most carers per head; Quintile 5 – least carers per head)

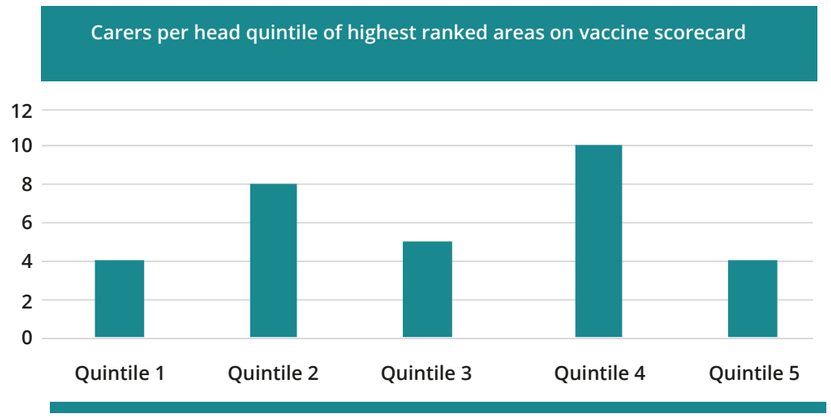
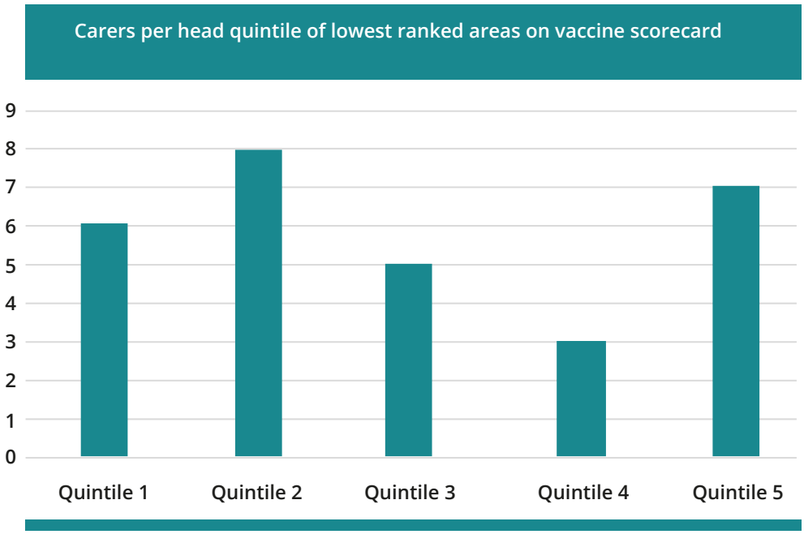


Figure 15: Lowest performing areas on adult vaccination scorecard classified by number of carers per head quintiles

(Quintile 1 – most carers per head; Quintile 5 – least carers per head



Figures 14 and 15 show how the highest and lowest local authorities respectively on the vaccine scorecard rate on the number of carers per head, with quintile 1 meaning they have the most carers. There appears to be no notable relationship between the number of registered carers per head and overall vaccination rates. To explore this point further we also conducted a separate analysis from the reverse perspective, to see how the local authorities with the most and least carers respectively fare on the vaccine scorecard. This again showed no notable relationship.

Summary

Areas with higher rates of vaccination appear to also have higher proportionate GDP per head figures and lower proportions of workless households. But several areas buck these trends – both positively and negatively – in both cases.

There is no clear relationship between vaccine uptake and the number of registered carers in an area. This may partly reflect the fact that much care is provided informally. It remains particularly important for carers to get vaccinated for certain conditions (eg COVID-19), given they are likely to be looking after vulnerable people.

CHAPTER 5: OPPORTUNITIES AND RECOMMENDATIONS FOR IMPROVING VACCINE UPTAKE RATES

Levelling up vaccination rates

Tackling regional variation in vaccination rates could bring considerable benefits. Our analysis estimates that bringing the local authorities or CCGs in the fourth and fifth quintiles for each vaccine up to the bottom of quintile three would mean more than 1.1m more courses of vaccination being administered.

This would include:

- Almost 700,000 more adults being fully vaccinated for COVID-19
- More than a quarter of a million being vaccinated for seasonal flu
- More than 100,000 being vaccinated against pneumococcal disease
- More than 50,000 shingles vaccinations
- Around 40,000 whooping cough jabs for pregnant women

It is also worth noting that the Government has offered free flu vaccines to all those aged over 50 as a temporary measure in 2020-1 and 2021-2. If ministers make this arrangement permanent, our estimate for seasonal flu could prove a considerable underestimate. In the data we analysed, the only adults eligible for the vaccine were over-65s, those in clinical risk categories and pregnant women.

Further analysis shows the potential of bringing areas with low vaccination rates up nearer to those with high rates. If rates in the areas in quintiles three to five were raised to match those at the bottom of quintile two:

- More than a million more adults would be fully vaccinated against COVID-19
- More than 200,000 adults would be vaccinated against pneumococcal disease
- More than 100,000 adults in their 70s would be vaccinated against shingles
- More than 60,000 pregnant women would be given the whooping cough vaccine

If rates in the areas in quintiles two to five were brought up to match those at the bottom of quintile one:

- More than one and a half million adults would be fully vaccinated against COVID-19
- Almost 340,000 would be vaccinated against pneumococcal disease
- Almost 170,000 would get the shingles vaccine
- More than 70,000 pregnant women would get the whooping cough vaccine

There is also the potential for substantial growth if the Government reaches its targets on seasonal flu[73]. Around 1.8m people under 65 at clinical risk would be vaccinated (including some children in clinical risk categories), along with 450,000 of those aged over 65. The data also indicate that around 190,000 more pregnant women would be vaccinated, although Public Health England (now the UKHSA) has noted that uptake among pregnant women is likely to be underestimated.

73 Vaccinating 85% of those over 65 and 75% of those in all clinical risk groups below 65 and pregnant women, in line with WHO recommendations as outlined above.

The analysis in this report across a wider set of adult vaccination programmes has shown the variation in rates across the country, and relationships with health inequalities and wider economic impact.Tackling such variation can support the development of more preventative healthcare systems and improved population health. But to do so barriers need to be overcome, including improved access, increased trust and improvements in data and information.

The following 12 point plan is designed to address this.

12 point vaccine uptake plan

1. Recommendation: Set clear adult vaccination uptake ambitions for a new national vaccine strategy

The Government's ambitions for a new national vaccine strategy should include clear targets for improved uptake across all adult vaccinations. As this report sets out moving lower uptake areas up to middle uptake areas would see over a million more people vaccinated each year. The Government should include these commitments within the mandate to NHS England and in the agenda setting of UKHSA and OHID.

2. Recommendation: Tackling variation and vaccine inequality, including piloting incentives

For some communities vaccination rates are lower than average and this report explores some of the reasons and implications of this. Any effort to improve uptake rates will need to be tailored to the communities involved and learn lessons from efforts such as the WHO Tailored Immunisation Programme[74].

The core 20+5 approach being introduced by NHS England for tackling health inequalities in major areas of health system spend, presents an opportunity for systems to tackle variation in vaccine uptake. The third area of the programme, chronic respiratory disease, includes commitments to tackle COVID-19, flu and pneumococcal vaccines. For systems implementing the programme presents an opportunity to improve vaccine uptake amongst groups with lower uptake rates.

Whilst there is evidence that some of the main barriers to vaccination are the availability and accessibility of appointments; one other issue highlighted is cost, which could be in the form of travel costs or loss of earnings[75].

There is international evidence that the use of financial incentives can support the uptake of vaccination[76]. For areas with higher levels of deprivation and low vaccine uptake the use of targeted incentives should be piloted. The incentives will need to be proportionate with the activity requested, community oriented and economically viable.

74 https://www.euro.who.int/en/health-topics/communicable-diseases/measles-and-rubella/activities/tailoring-immunization-programmes-tip
75 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/952716/s0979-factors-influencing-vaccine-uptake-minority-ethnic-groups.pdf
76 https://www.sciencedirect.com/science/article/pii/S0091743521000050?via%3Dihub

Incentives will clearly not work for everyone, those who are anti-vaccination are unlikely to be swayed by a financial outlay, but uptake could be increased amongst those where cost is a barrier. The approach should be piloted to assess the trade-offs and consequences of its introduction. There are also opportunities to link in with the work of the obesity incentives programme being run by the Department of Health and Social Care[77].

3. Recommendation: Expand how the value of vaccines is assessed

As we have moved through the different phases of the pandemic the link between the value of vaccines, and the economy has been clear[78]. With a strong focus in healthcare policy and system delivery on integrated care, with the creation of Integrated Care Systems and Primary Care Networks there is a chance to evaluate the impact of vaccines more widely. Integrated Care Systems for example have a key objective in their remit for supporting their local economies[79].

With new adult vaccinations being developed efforts should be taken by the Joint Committee on Vaccination and Immunisation to review the approach for assessing the value of vaccines to consider the wider economic and social impact of their introduction so it is better aligned with the emerging healthcare system and landscape.

4. Recommendation: Unlock the vaccination healthcare gateway

The creation of new health service structures with a focus on improving wider population health should see a greater focus on personalised care approaches.

Vaccination should be seen as critical to this and viewed by health systems as a gateway to other health services and support. Those presenting for vaccinations should be asked about their wider health service needs and use and directed for additional service support and check-ups where needed. In addition, those attending health services for non-vaccination related needs should be asked about their vaccination status and referred for vaccination where needed.

Case study

'Vaxi Taxi' is a taxi service designed to get vulnerable people to their vaccination appointments. It has helped to make COVID-19 vaccinations accessible to communities which have proved difficult to reach across much of London, including homeless people and rough sleepers. The service has also taken the chance to offer those it serves further health services, including blood pressure checks, podiatrists, pulse checks and hepatitis C testing[8081].

77 https://www.gov.uk/government/news/new-pilot-to-help-people-exercise-more-and-eat-better
78 https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(21)00079-7/fulltext
79 https://www.england.nhs.uk/wp-content/uploads/2021/06/B0660-ics-implementation-guidance-on-thriving-places.pdf
80 https://www.england.nhs.uk/2021/06/thousands-of-lives-to-be-saved-by-health-mots-at-nhs-vaccination-services/
81 https://www.itv.com/news/london/2021-05-27/vaxi-taxi-free-black-cab-helping-vulnerable-people-get-vaccinated

5. Recommendation: Embed vaccination information within the NHS App

The pandemic has seen significant strides taken in the use of digital tools in supporting patient care. The most high profile has been the NHS COVID-19 App, but there has also been greater uptake of the general NHS App[82] and use of other digital platforms such as online and video consultations[83] for patient and clinician engagement.

Digital can play a key role in supporting the uptake of future adult vaccinations and the NHS App provides a good platform for this. The App should be expanded to ensure easy access to people's vaccination status for eligible vaccines, building from the success of the COVID-19 vaccination certificates in the App. The App should have the ability to send eligibility reminders for vaccines and include information on the different vaccinations available. Alongside this for those without the App, further work is needed to ensure that GP systems are able to send out text and other reminders for vaccination to patients.

6. Recommendation: Build knowledge and capability on vaccination across the public health and primary care workforce

COVID-19 has highlighted the gaps in the public health workforce and the ability and need for teams across public health and primary care to work together closely to deliver vaccination programmes rapidly and at scale.

Whilst there is a need to recruit and retain staff across public health and primary care, there is also a need to maximise the existing resource and knowledge available. For Government ambitions on vaccination to be realised it will be critical that the workforce is enabled and equipped to answer questions on their use effectiveness. UKHSA and NHS England working with relevant representative bodies and groups should lead new efforts on adult vaccination education for healthcare staff. Mechanisms should be introduced within primary care contracts to increase the use of community pharmacy in delivering adult vaccination programmes.

7. Recommendation: Partner with local government on trusted vaccine communication campaigns

As Razai et al note: "the most common reasons for hesitancy are concerns about side effects and the long term effects on health, and lack of trust in vaccines[84]." They add that "trust could be established by funding and supporting community and primary care led vaccination efforts, as GPs are likely to be more trusted by the communities they serve because of relationships built over time. Engaging community groups, champions, and faith leaders, and resourcing targeted, culturally competent interventions would also help reduce vaccine hesitancy[85]."

Government should work with local public health leaders on effective tailored and trusted vaccine communication campaigns particularly for groups where vaccine uptake rates are lower.

With more adult vaccinations becoming available, having clear messages about the purpose and benefits of vaccination will be critical to deliver improvements in uptake.

The use of trusted community leaders that has worked so effectively during the pandemic should be built from.

82 https://digital.nhs.uk/news/latest-news/around-half-of-people-in-england-now-have-access-to-digital-healthcare
83 https://www.cqc.org.uk/guidance-providers/gps/gp-mythbuster-100-online-video-consultations-receiving-storing-handling
84 https://www.bmj.com/content/372/bmj.n513
85 https://www.bmj.com/content/372/bmj.n513

The existing vaccination green book aimed at healthcare professionals should be adapted into a public facing adult vaccine information guide for the public setting out the latest information on approved adult vaccines[86]. This could be embedded within the NHS App.

Case study

The Wellcome Trust in its analysis has found that boosting the voices of those with the social power to position vaccination as normal – particularly healthcare workers – is a more effective tactic than an approach which seeks to counter widely-circulated myths. Elsewhere the Trust has also said there is evidence that the information from "big player communication campaigns" is not "breaking into echo chambers and reaching target audiences"[87].

Several councils including Wigan and Newham have held question and answer sessions with the public, to effectively address questions over COVID-19 vaccines[88,89,90].

8. Recommendation: Further develop an integrated vaccination data dashboard

Adult vaccination programmes include a complex web of commissioners and providers. For the system to function effectively it is critical to have interoperable and connected data systems so that information flows easily. The NHSX data strategy and the integration white paper present opportunities for the system to make further progress on this and in particular linking NHS and non NHS health data together to support the monitoring of vaccine uptake rates. The dashboard used for the pandemic response should be built out from and include other major vaccination programmes including adult vaccinations to track uptake rates and address variation.

9. Recommendation: Find innovative ways to make vaccination more accessible

As highlighted earlier, a study by the RSPH in 2018 found that two of the main reasons amongst the public for not getting vaccinated were the availability and timing of appointments. Forty-six per cent also said that the location of appointments was important[91].

The mass COVID-19 rollout has shown the ability of the system to think creatively and flexibly about making vaccination appointments more accessible. The creation of mass vaccination centres, mobile units and the use of well trusted community centres helped drive rapid early uptake of vaccines across the population[92]. There are learnings for other adult vaccination programmes in these approaches. For example deploying mobile vaccine units used successfully during COVID-19 to care homes for older people to have other vaccines[93] and offering the whooping cough vaccine to pregnant women alongside their 20 week scan as per NICE guidelines[94].

86 https://www.gov.uk/government/publications/immunisation-against-infectious-disease-the-green-book-front-cover-and-contents-page
87 https://shiftdesign.org/content/uploads/2020/07/Healthier_Internet_Report.pdf
88 https://www.local.gov.uk/our-support/guidance-and-resources/comms-hub-communications-support/coronavirus-communications-12
89 https://www.lbbd.gov.uk/news/find-out-fact-from-fiction-with-online-COVID-19-vaccine-qa-session
90 https://www.newham.gov.uk/coronavirus-COVID-19/COVID-19-vaccination/11
91 https://www.rsph.org.uk/static/uploaded/3b82db00-a7ef-494c-85451e78ce18a779.pdf
92 https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2021/03/C1226-maximising-vaccine-uptake-in-underserved-communities-a-framework-.pdf
93 https://www.england.nhs.uk/south/wp-content/uploads/sites/6/2021/06/C1306-COVID-19-sop-roving-and-mobile-models.pdf
94 https://bnf.nice.org.uk/treatment-summary/pertussis-vaccine.html

Case study

Northumberland CCG set up a roving vaccination service, designed to transport COVID-19 vaccines to people in the most rural parts of the county and minority groups who are harder to reach[95].

The county is in the bottom quintile for GDP and unemployment, but was in the top quintile for COVID-19 vaccine uptake in October 2021. Northumberland's local authority, meanwhile, was eighth on the overall vaccine scorecard.

In Wakefield, uptake of the flu jab among care home staff was increased after the council commissioned pharmacists to increase uptake in a pilot programme in a select number of care homes[96]. Managers were able to arrange clinics based on staff availability and working patterns in a flexible vaccination programme.

10. Recommendation: Incentivise and support vaccination in primary care

The primary care system has been at the forefront of the COVID-19 vaccination programme. Whilst the number of primary care appointments fell at the start of the COVID-19 pandemic, millions of GP consultations continued to take place remotely over the phone or online[97]. As COVID-19 restrictions have eased, the care backlog has seen primary care appointments at record levels presenting challenges for delivering the care that patients need.

The current Quality and Outcomes Framework (QOF) includes a set of indicators on vaccination and immunisation to improve uptake. But only one – shingles vaccine rates - is focused on adult vaccination[98]. In the next update to QOF there should be an expansion of adult vaccination indicators to ensure that GPs and wider primary care networks are suitably prioritising the vaccination of their populations.

11. Recommendation: Stability of vaccination system structures

With major health service reform underway in the creation of new integrated structures it will be critical that there are strong joint working and collaborative arrangements for delivering adult vaccination programmes. The existing commissioning arrangements for vaccination between the NHS and the public health system should be maintained with a strong focus on ensuring system stability during the transition.

12. Recommendation: Support for a population needs assessment fund in cities

As this report shows there are particular challenges in London and cities with regards to high population mobility and the impact of this on the reliability of the data when it comes to vaccination. It also presents challenges in following up with patients[99].

To support more regular population needs assessments London local authorities should be given access to funds that can support more regular population audits and mapping. This in turn can help inform more effective Joint Strategic Needs Assessments and Joint Health and Wellbeing Strategies including efforts to improve vaccination rates.

95 https://www.northumberlandccg.nhs.uk/COVID-19-vaccination-pop-up-pilot-launched-in-northumberland/
96 https://www.local.gov.uk/publications/increasing-uptake-vaccinations-maximising-role-councils
97 https://www.england.nhs.uk/2020/05/millions-of-patients-benefiting-from-remote-consultations-as-family-doctors-respond-to-COVID-19/
98 https://www.england.nhs.uk/wp-content/uploads/2021/03/B0456-update-on-quality-outcomes-framework-changes-for-21-22-.pdf
99 https://medium.com/rcpch-insight/why-is-the-uk-falling-short-of-immunisation-targets-a1dd8df5ad14

Conclusion

Before the arrival of the pandemic the UK's performance on vaccination was slipping and varied. The COVID-19 programme in some ways reflected this, particularly struggling initially to engage with certain communities and groups where vaccine uptake is typically lower.

This report sets out the relationship between vaccination rates and health inequalities and points to some of the wider economic impacts of vaccination.

With an expanding number of adult vaccinations being launched and in the pipeline there is an opportunity to learn lessons from the COVID-19 vaccination programme and apply these more widely to improve vaccination uptake in the NHS.

This report's 12 point plan for Government sets out a path for doing this which can both ensure that the planned 2022 Government vaccine strategy delivers improvements in public health and that these translate into wider economic and societal benefits.

Annex A: Levelling up vaccination rates: note on methodology

Our analysis looked at how many vaccinations would be administered if the local authorities and CCGs in quintiles 4 and 5 for each condition were raised to the bottom of quintile 3.

As part of this process we estimated the eligible population for each vaccine in each local area in quintiles 4 and 5.

For the PPV and shingles vaccines, we used ONS estimates of the mid-2020 population which are broken down by age and local authority[100]. We used the number of over 65s in an area for PPV and those aged between 70 and 79 for shingles.

For the flu vaccine, we took the number of registered adult patients in categories who were eligible (those over 65, those under 65 at clinical risk, and pregnant women) from seasonal flu uptake data on GP-registered patients[101]. Our figures are therefore likely to be underestimates, as they do not include patients registered at the minority of practices that did not respond, or patients who are not registered with a GP.

For the COVID-19 vaccine, we took an average of the percentage of fully vaccinated people in each age band covered by NHS England, using its figures on the COVID-19 data dashboard in each local authority from 14 October[102]. This gave us an estimate of the overall percentage of vaccine uptake across that population. We then took the population of over-18s in each CCG, based on ONS data[103], to estimate how many more people could be fully vaccinated if inequalities were addressed.

For the whooping cough vaccine, we took the population of children aged zero in the same ONS data used for the COVID-19 vaccine as a reflection of the number of women who are pregnant over the course of a year within a CCG. We accounted for multiple births using an average figure for England as a whole[104]. We did not account for stillbirths, which were around one in 255 births in England and Wales in 2019, according to the ONS[105].

Using this method, we calculate that 1,161,802 more courses of vaccination in total would be delivered across the adult vaccinations within this report.

100 https://www.ons.gov.uk/datasets/ageing-population-estimates/editions/time-series/versions/1
101 https://www.gov.uk/government/statistics/seasonal-flu-vaccine-uptake-in-gp-patients-monthly-data-2020-to-2021
102 COVID-19 dashboard data analysed 141021: https://www.gov.uk/government/collections/vaccine-uptake
103 https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/clinicalcommissioninggroupmidyearpopulationestimates
104 http://www.multiplebirths.org.uk/media.asp
105 https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/datasets/birthsummarytables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