Childhood Immunisations for Pre-School Children

Summary

Immunisation is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine. Vaccines stimulate the body's own immune system to protect the person against subsequent infection or disease. Immunisation is a safe and cost effective means to improve the health of populations and globally is estimated to save between 2 and 3 million lives per year[1]. The World Health Organisation (WHO) states that after clean water, vaccination is the most effective public health intervention in the world.

This JSNA chapter covers immunisations routinely administered to pre-school children in the UK in accordance with the NHS vaccination schedule[2]. There is a linked chapter which covers immunisations for school-age children.

Local context

The uptake rates for the majority of pre-school immunisations in Bristol are lower than South West regional averages and lower than, or in line with, national averages. In addition, coverage has been declining over the last 5-10 years for the majority of pre-school vaccinations. In comparison, school-age immunisations are generally improving but are still lagging behind national and regional averages.

There is significant variation across Bristol in pre-school vaccination uptake rates and, unlike many other Public Health indicators, this variation does not clearly correspond with deprivation.

National targets and herd immunity

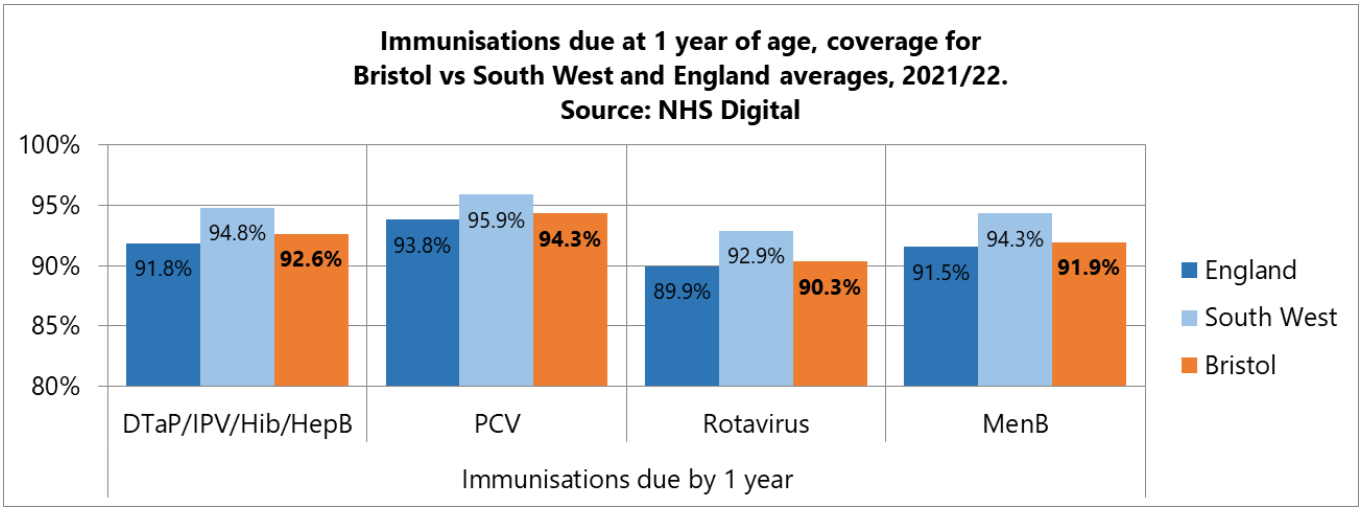
For most immunisations, the WHO states a target of immunising at least 95% of all children because this is the level where 'herd immunity' can be achieved. Herd immunity occurs when a high percentage of the population are vaccinated, making it difficult for a disease to spread because there are so few unprotected people left to infect.

This means that the few people unable to receive vaccinations (e.g. because they are too young or are having treatment for other diseases which prevents them from having vaccinations) can still be protected from catching the disease because there is less of it circulating[1]. In order for immunisation to be effective, it is therefore vital to monitor the coverage levels within the population. Below is the latest data available on pre-school immunisation coverage levels for Bristol.

Immunisations due by 1 year old

- Diphtheria, tetanus, polio, pertussis, Haemophilus influenza type B and hepatitis B* (6-in-1; DTaP/IPV/HIB/HepB*)
- Pneumococcal disease (PCV)
- Rotavirus
- Meningitis B (MenB)

Figure 1: Immunisations due at 1 year of age, coverage for Bristol vs South West and England averages, 2021/22. Source: NHS Digital

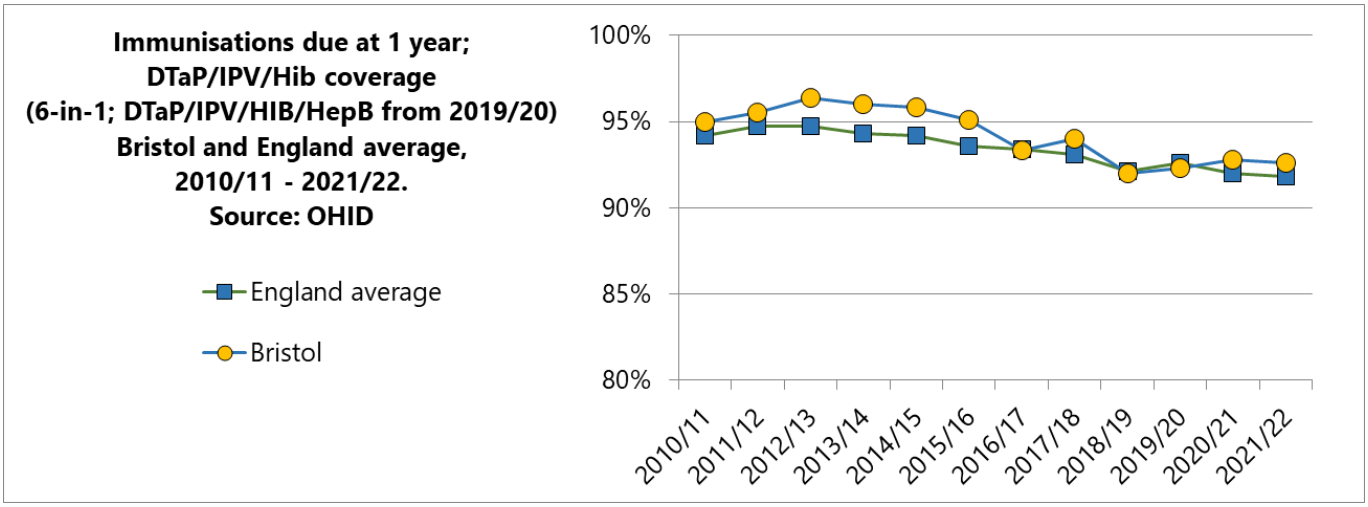


Diphtheria, tetanus, polio, pertussis, Haemophilus influenza type B and hepatitis B (6-in-1; DTaP/IPV/HIB/HepB) is a single vaccination that protects children against six serious diseases; Diphtheria, Tetanus, Pertussis (Whooping Cough), Polio, Haemophilus influenza type B (a cause of meningitis and pneumonia as well as other types of infection) and hepatitis B. By the age of one year a child is recommended to have been given 3 doses of the vaccine; all three doses are required to protect the child. Immunisation against hepatitis B was added to the previous 1-in-5 vaccination with effect from 2019/20, but the scheduling of this vaccination remains unaltered.

Figure 2 overleaf shows that the uptake in Bristol has fallen overall since 2012/13, although there have been some fluctuations in uptake rates during that time, and signs of some recovery 2018/19 to 2020/21. Coverage fell slightly 2020/21 to 2021/22 (92.8% to 92.6%). After four years of coverage better than the national average to 2015/16, uptake in Bristol (92.6%) is now statistically similar to the England average (91.8%), and below the south-west regional average (94.8%), as it has been for the previous 5 years.

The 2021/22 coverage in the English Core Cities ranged from 83.3% in Liverpool to 92.6% in Bristol, Bristol's coverage is at top of this range. The Bristol coverage for this vaccination remains some way short of the 95% population coverage target for herd immunity.

Figure 2: DTaP/IPV/HIB coverage (6-in-1; DTaP/IPV/HIB/HepB from 2019/20) at 1 year of age, Bristol and England averages, 2010/11 - 2021/22. Source: Office for Health Improvement & Disparities



PCV (or pneumococcal conjugate vaccine) protects against an infection which can cause serious and potentially life threatening pneumonia, meningitis and septicaemia.

There has been a change recently to the scheduling and administration of this immunisation which should be borne in mind when interpreting the trends in coverage. All babies born on or after 1 January 2020 received their 1st dose of PCV at 12 weeks of age. Prior to this, PCV primary at 12 months was 2 doses administered at 8 and 16 weeks. 2021/22 is the first year that coverage reported is based on the single dose primary course, and no data is available for the year 2020/21.

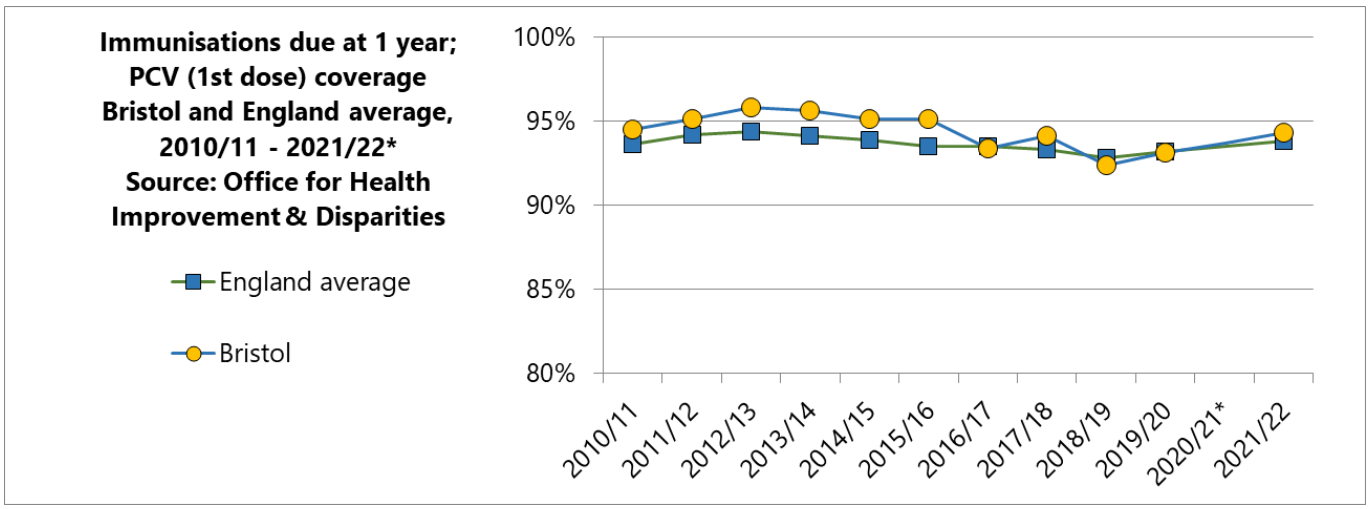
Figure 3 overleaf shows that the uptake of this vaccine in Bristol fell overall during the period between 2012/13 (95.8%) and 2018/19 (92.4%), but subsequently and just prior to the change to a single dose primary course and since that change, the coverage has recovered to 94.3% in 2021/22. Since 2016/17, uptake in Bristol has been statistically similar to the national average and that remains the case in 2021/22 and coverage remains a little short of the 95% population coverage target for herd immunity.

In 2021/22 Bristol had the second highest coverage for this immunisation within the English Core Cities group, which ranged from 87.6% in Liverpool and 95.3% in Newcastle-upon-Tyne.

Rotavirus is a highly infectious stomach bug that typically strikes babies and young children, causing an unpleasant bout of diarrhoea, sometimes with vomiting, tummy ache and fever. Most children recover at home within a few days, but nearly 1 in 5 will need to see their doctor, and 1 in 10 of these end up in hospital as a result of complications such as extreme dehydration. Since its introduction into the vaccination programme, the rotavirus vaccine has prevented more than 70% of cases. The vaccination is delivered as 2 oral doses between 8 and 12 weeks of age[2].

The Bristol coverage during 2021/22 (90.3%) fell a little from the 2020/21 coverage level of 91.0% but remains a little higher than the national average (89.9%). Bristol uptake for this vaccination remains well below the south-west regional average (92.9%) but is typical of the best performing English Core Cities (Newcastle-upon-Tyne 90.5% and Sheffield 90.3%).

Figure 3: PCV (1st dose) coverage at 1 year of age, Bristol and England averages, 2010/11 - 2021/22*. Source: Office for Health Improvement & Disparities



**PCV coverage data at 12 months was unavailable in 2020-21 due to a change in the schedule for this vaccine*

MenB - Meningococcal disease occurs due to infection by a bacteria that can cause both meningitis (infection of the membrane that covers the brain inside the skull), and septicaemia (infection of the blood stream). This vaccine is against type B (MenB), which is responsible for more than 90% of meningococcal infections in young children, an infection that can lead to serious illness, potentially cause brain damage, amputations and even death[2].

In 2021/22, 91.9% of children in Bristol had the MenB vaccine by the age of 1, lower than the equivalent statistic for 2020/21 (92.5%), statistically similar to the national average (91.5%) but lower than the south-west regional average (94.3%) and the 95% population coverage target for herd immunity.

Variation across Bristol in childhood immunisation coverage – At 1 year

Local authority Public Health teams do not routinely have access to up-to-date immunisation uptake analyses at a very detailed granular level in relation to where our residents live, their ethnicity or other important equality characteristics. This can prove a significant barrier to understanding the variation in uptake within the LA area of responsibility.

Annual uptake statistics by GP practice where the vaccination is delivered by GP practice based teams or staff (as for all childhood pre-school immunisations), allow for some insight into the variation across the LA area. In Bristol we are able to map our wards in an approximate fashion to those GP practices that mainly serve their residents, in the form of GP localities. The map overleaf (figure 4) indicates which wards relate to which GP localities via a best-fit methodology.

For all of the immunisations due in the first year of life, the Inner City and East locality has the lowest uptake, below the city average. The uptake in the other two localities is typically closer and above the city average. Deprivation tends to be associated with a lower level of immunisation uptake on average but the GP localities are not particularly homogenous in terms of the levels of deprivation to be found within their boundaries, and other analyses where more detailed granular

data was available previously, has tended not to identify deprivation in isolation as the strongest predictor of uptake levels. What tends to be found is that deprivation working in combination with a number of other cultural and demographic factors will explain much more of the variation in uptake. Inner City and East has much higher levels of ethnic diversity than the other localities and this is believed to be another important contributory factor to lower uptake in this area.

Figure 4: Bristol GP localities mapped to Bristol LA wards. Source: Bristol City Council Public Health

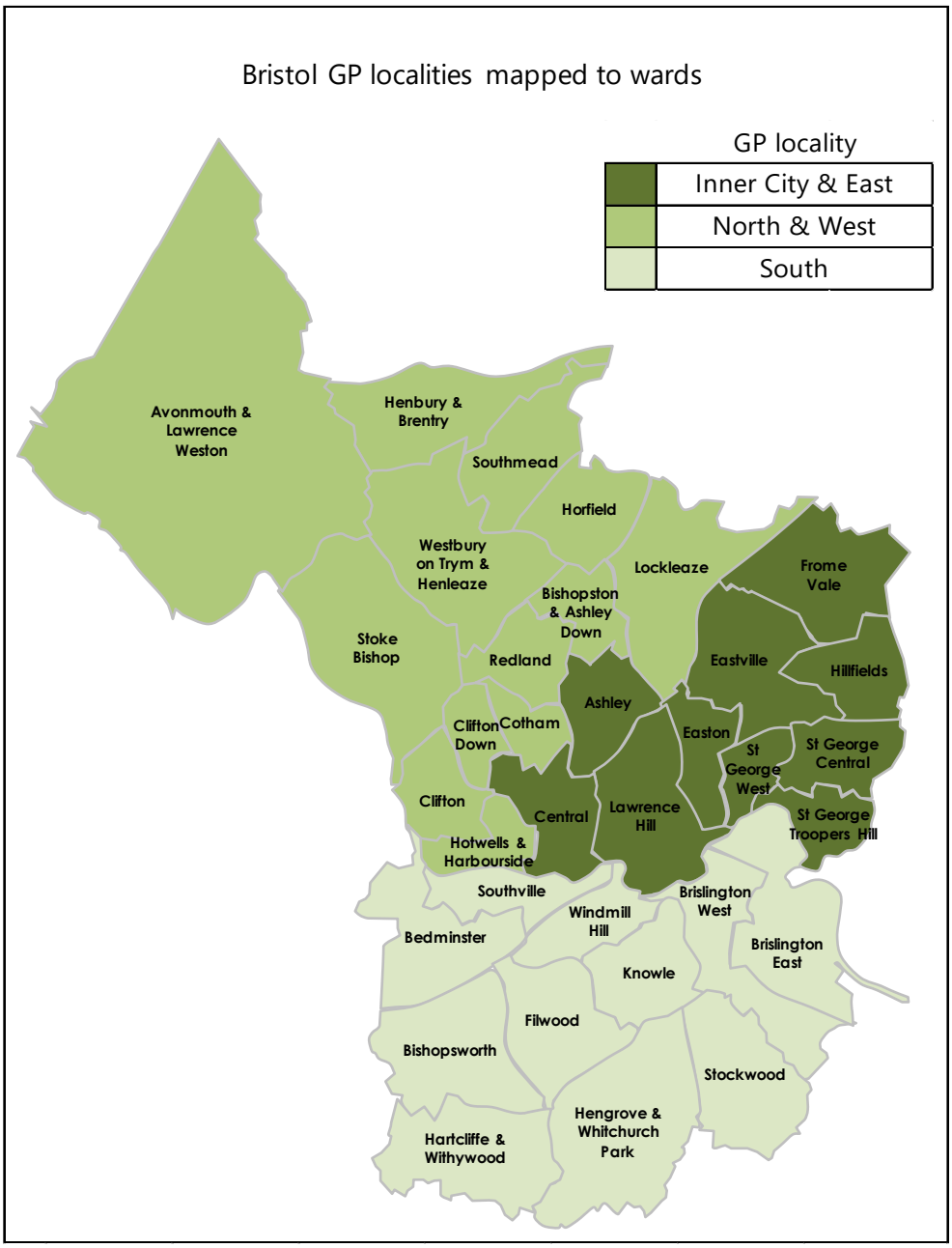
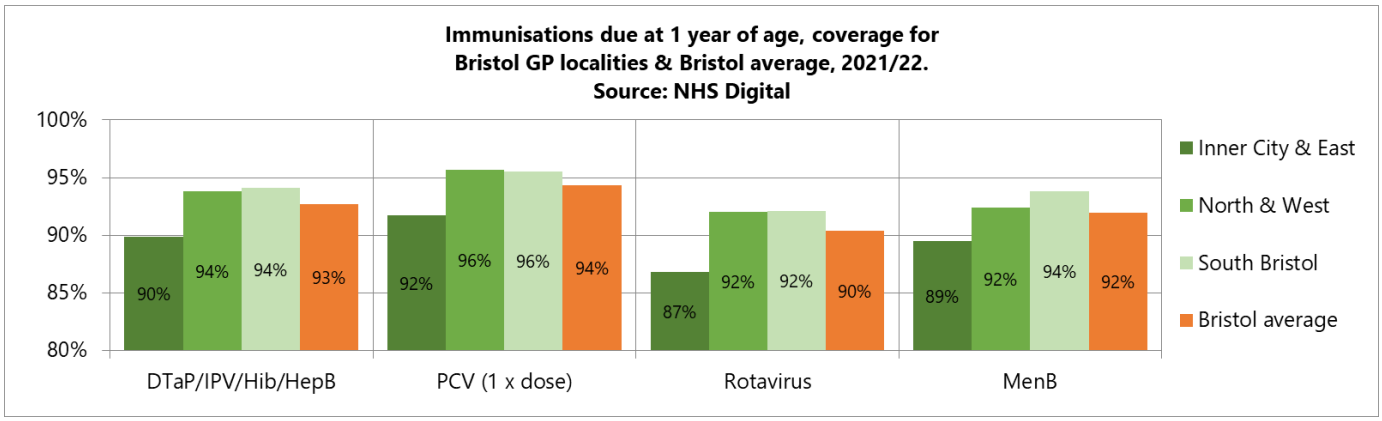


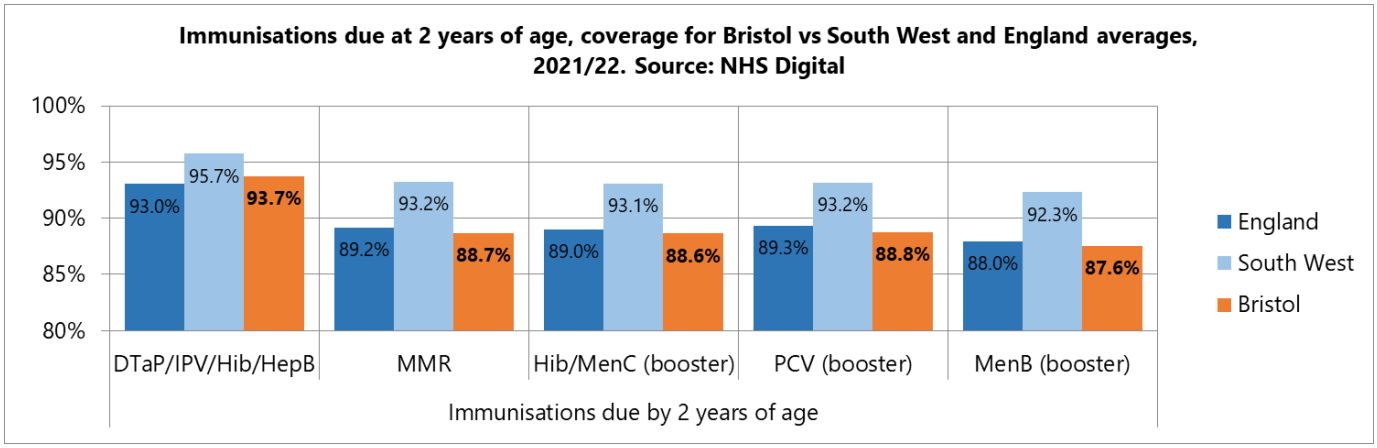
Figure 5: Immunisations due at 1 year of age, coverage for Bristol GP localities vs Bristol average, 2021/22. Source: NHS Digital



Immunisations due by 2 years old

- Diphtheria, tetanus, polio, pertussis, Haemophilus influenza type B and hepatitis B* (6-in-1; DTaP/IPV/HIB/HepB*)
- Measles, mumps and rubella (MMR) – one dose
- Haemophilus influenzae type b and meningitis C (Hib/MenC) - booster
- Pneumococcal disease (PCV) - booster
- Meningitis B (MenB) – booster

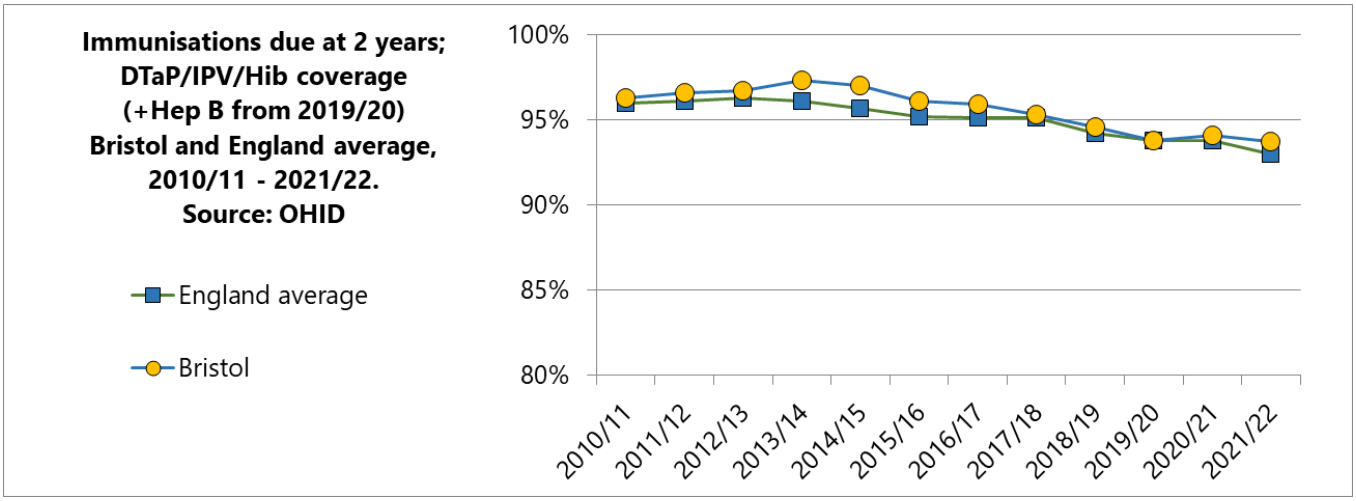
Figure 6: Immunisations due at 2 years of age, coverage for Bristol vs South West and England averages, 2021/22. Source: NHS Digital



Diphtheria, tetanus, polio, pertussis, Haemophilus influenza type B and hepatitis B (6-in-1) By the age of two years old, a child should have been given 3 doses of the vaccine (NB same doses as above, due to be given by 1 years old).

The 2021/22 uptake of this vaccine in Bristol, by 2 years of age was (93.7%), statistically similar to the national average (93.0%) but below the south west regional average (95.7%) and the 95% population coverage target for herd immunity. From 2013/14 to 2019/20 the rate fell year-on-year, but the decline in coverage appears to have levelled off more recently.

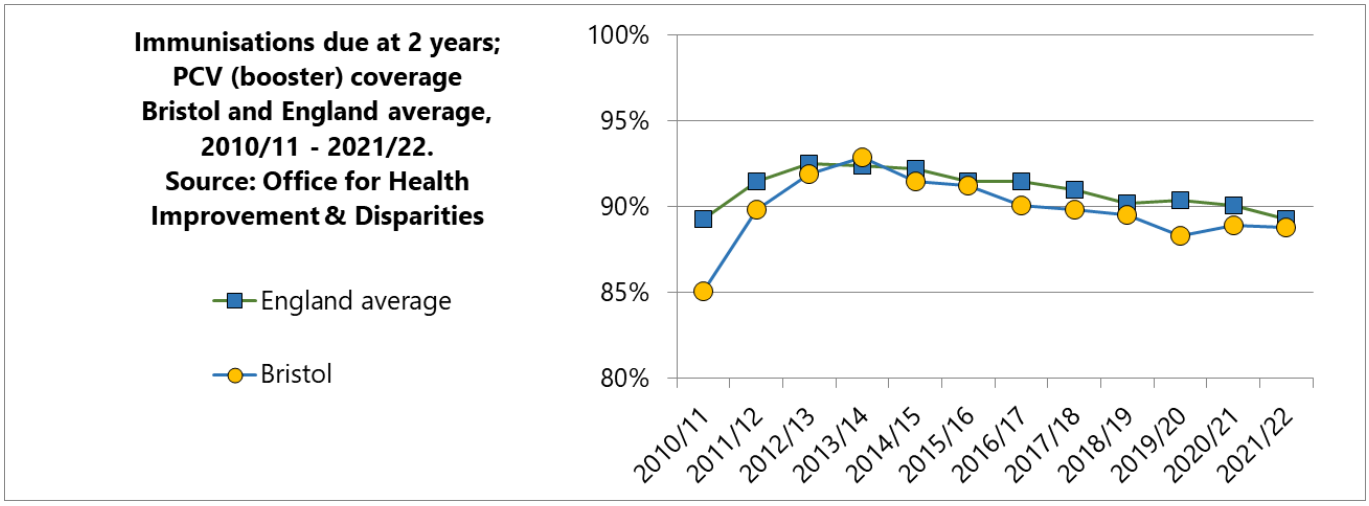
Figure 7: DTaP/IPV/HIB (+Hep B from 2019/20) coverage at 2 years of age, Bristol and England averages, 2010/11 - 2021/22. Source: Office for Health Improvement & Disparities



PCV booster – For children born prior to January 2020, in addition to the 2 doses of the PCV vaccine during their first year of life, a booster dose is due in the following year, before their second birthday.

Following a trend similar to that described for the 5-in-1 / 6-in-1 immunisation above, the uptake of the PCV booster vaccine in Bristol fell between 2013/14 and 2019/20 (from 92.9% to 88.3%). Since then uptake in Bristol has recovered a little to 88.8% in 2021/22, but this is still significantly lower than the England average of 89.3%, as it has been since 2017/18 but the gap has been reduced over the last two years. Bristol uptake for this vaccination remains well short of the 95% population coverage target for herd immunity.

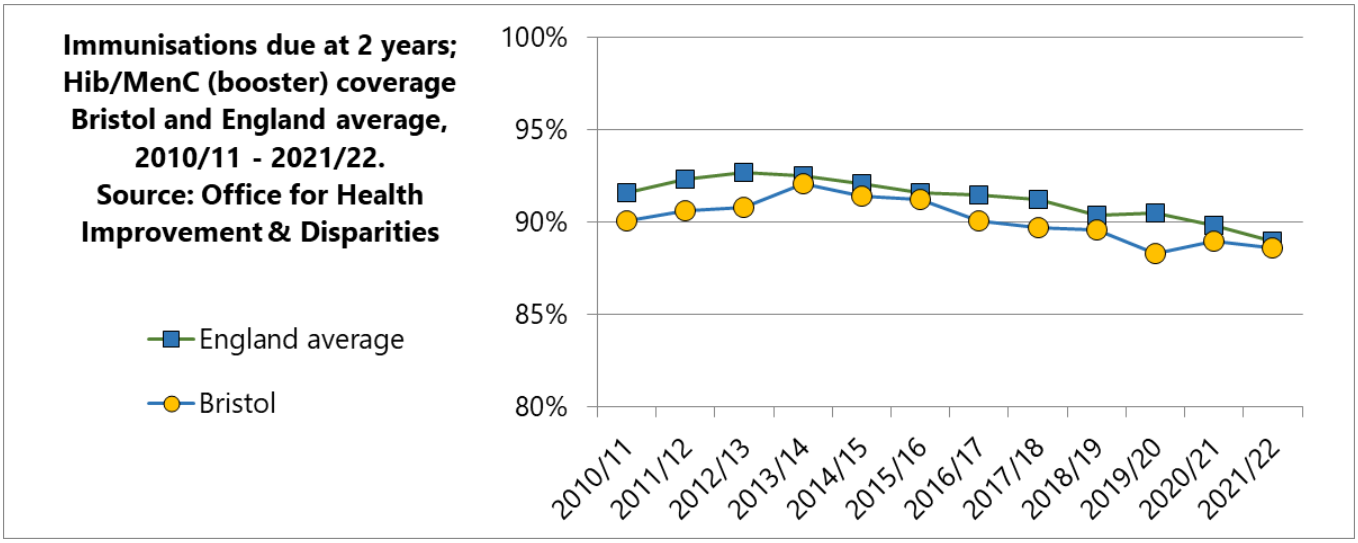
Figure 8: PCV booster coverage at 2 years of age, Bristol and England averages, 2010/11 - 2021/22. Source: Office for Health Improvement & Disparities



Hib / MenC booster - The Hib / MenC vaccine is a single injection given to 1-year-old babies to boost their protection against Haemophilus influenzae type b (Hib) and meningitis C. Hib and meningitis C infections are serious and potentially fatal. They can both cause meningitis and blood poisoning (septicaemia)[2].

The uptake of this immunisation in 2021/22 was 88.6%, below the national average (89.0%) and the south-west regional average (93.1%). The trend in the uptake for this vaccine is very similar to that for the PCV booster, described above, of decline from 2013/14 until the last two years, and in terms of recently closing the gap with the equivalent national average. Bristol uptake has been significantly lower than the national average for the past 5 years.

Figure 9: Hib/MenC booster coverage at 2 years of age, Bristol and England averages, 2010/11 - 2021/22. Source: Office for Health Improvement & Disparities



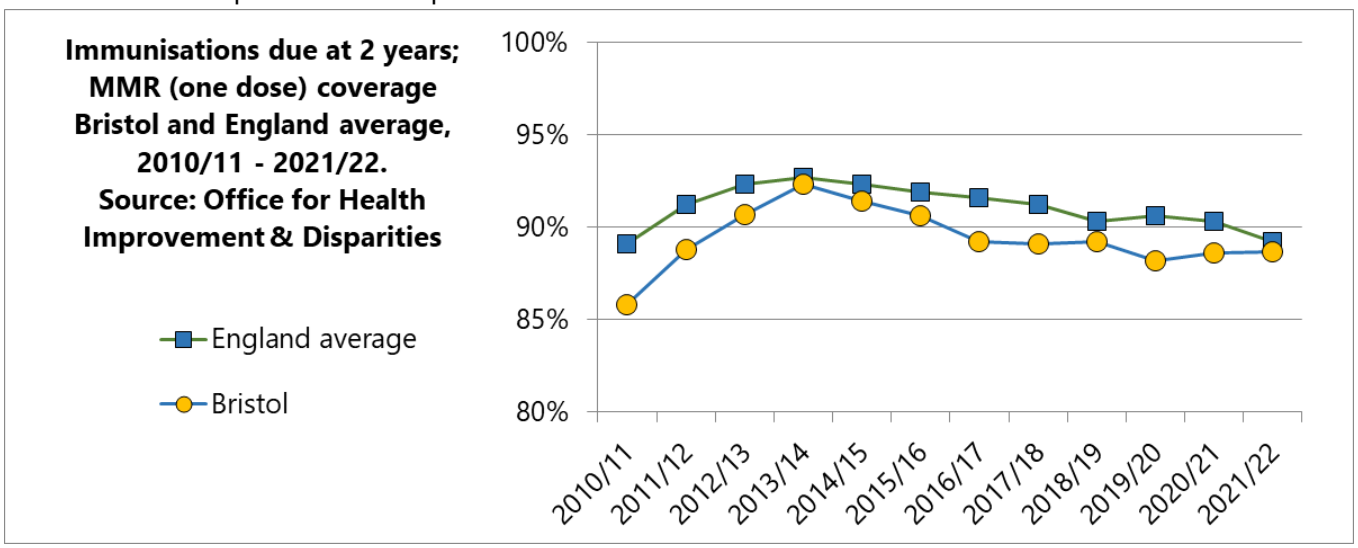
MMR one dose - Measles, mumps and rubella (MMR) are highly infectious conditions that can have serious, potentially fatal complications, including meningitis, swelling of the brain (encephalitis) and deafness. They can also lead to complications in pregnancy that affect the unborn baby, and can lead to miscarriage[2]. The MMR single vaccine protects against Measles, Mumps and Rubella (German measles). One dose should be received by 2 years age (usually around 12 months).

Nationally, MMR uptake was low during the 1990s, partly due to the reported link between MMR, bowel disease and autism. This link has since been firmly discredited, and uptake has risen, but as coverage has failed to reach the 95% population coverage target for herd immunity there have still been outbreaks of measles in the UK.

The uptake of one dose of MMR by age 2 years fell considerably for three years from 2013/14 in Bristol, but this decline appears to have slowed from 2016/17 as seen for several other immunisations delivered in the second year of life. There has been a slight recovery in uptake in Bristol since the lowest point in recent trends (88.2% in 2019/20). The 88.7% uptake in Bristol in 2021/22 was still well below the 95% population target for herd immunity and remains significantly lower than the south-west regional average (93.2%) and the England average (89.2%), although the gap with the latter has been reducing for the last two years.

The coverage in the English Core Cities ranges from 82.1% in Liverpool to 90.4% in Sheffield, Bristol's coverage is in the top half of this range.

Figure 10: MMR (one dose) coverage at 2 years of age, Bristol and England averages, 2010/11 - 2021/22. Source: Office for Health Improvement & Disparities

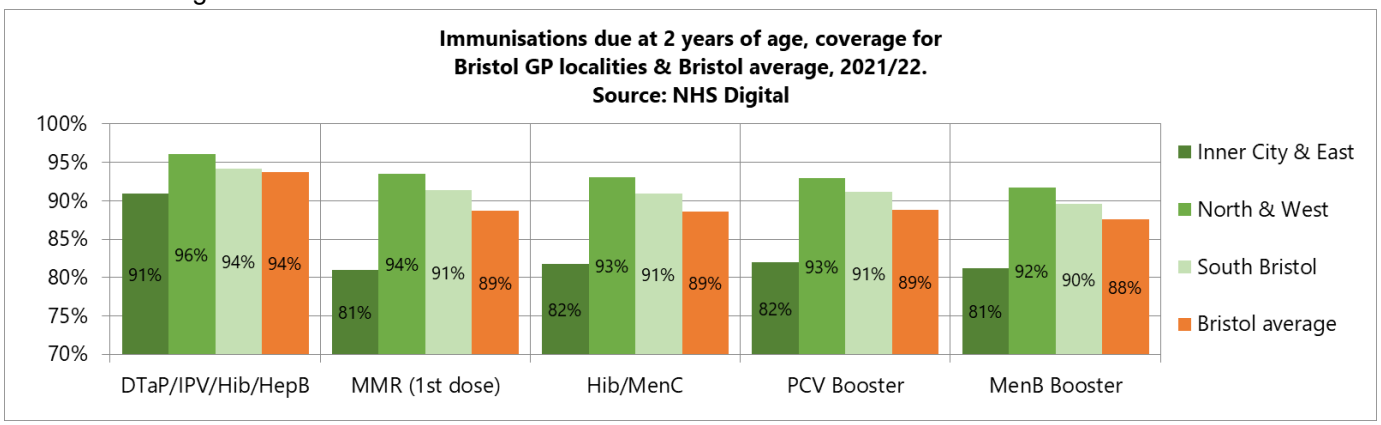


Variation across Bristol in childhood immunisation coverage – At 2 years

Please see the description of this analysis for the immunisations due by 1 year of age.

As observed for the childhood vaccinations due by 1 year of age, Inner City and East locality has the lowest uptake levels for all of the immunisations due by 2 years of age also, and by a greater margin than was observed for the immunisations due by 1 year of age for all but the 6-in-1 vaccination. Similarly, the other localities have much higher and closer levels of uptake, above the city average, with North & West locality reporting the highest levels of coverage for all 5 immunisations. Residents of the North & West locality have the lowest average levels of deprivation of the three localities. Factors associated with deprivation and ethnicity/culture are likely again to be a large part of the explanation for the variation in vaccination uptake across the city.

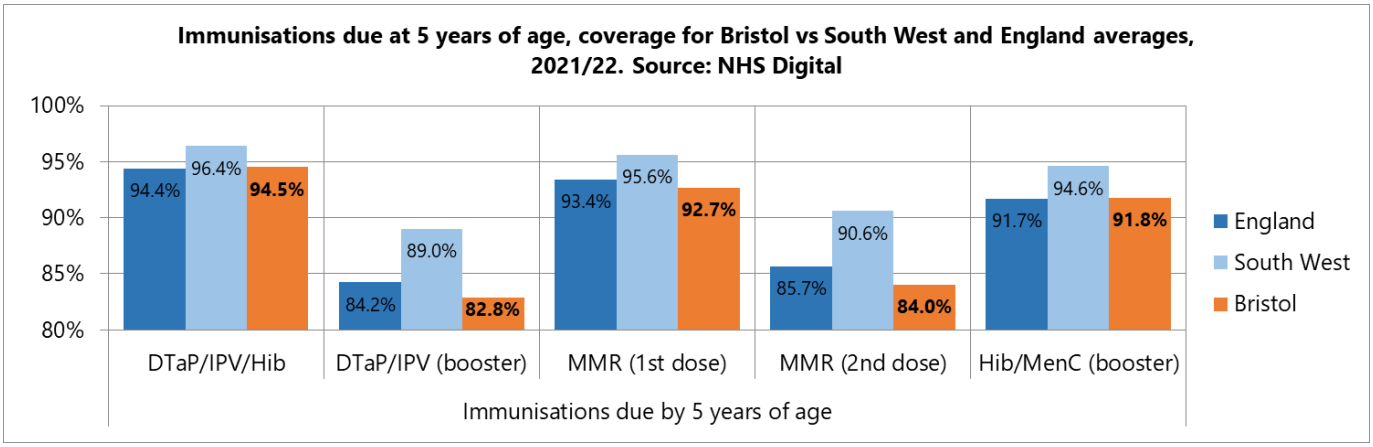
Figure 11: Immunisations due at 2 years of age, coverage for Bristol GP localities vs Bristol average, 2021/22. Source: NHS Digital



Immunisations due by 5 years old

- Diphtheria, tetanus, polio, pertussis and Haemophilus influenza type B (DTaP/IPV/HIB) – Primary course
- Diphtheria, tetanus, polio and pertussis (DTaP/IPV booster)
- Measles, mumps and rubella (MMR) – First dose
- Measles, mumps and rubella (MMR) – First and second doses
- Haemophilus influenzae type b and meningitis C (Hib/MenC – booster)

Figure 12: Immunisations due by 5 years of age, coverage for Bristol vs South West and England averages, 2021/22. Source: NHS Digital



Diphtheria, tetanus, polio, pertussis and Haemophilus influenza type B (DTaP/IPV/HIB) –

A child should have been given 3 doses of the vaccine by the time they are 1 year old, but if a dose is missed it can be given at a later date.

The 2021/22 uptake of this vaccine in Bristol, by 5 years of age was (94.5%), just below the 95% population coverage target for herd immunity, similar to the national average (95.4%) but below the south-west regional average (96.4%).

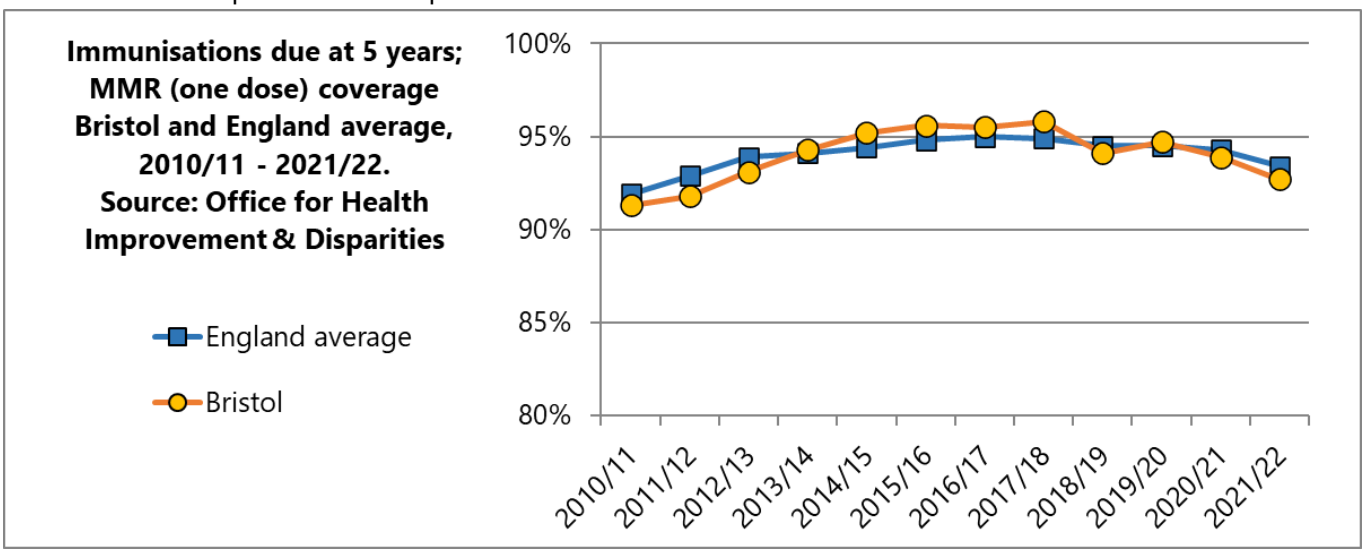
Diphtheria, tetanus, polio and pertussis (DTaP/IPV booster) – This immunisation is offered pre-school, typically from 3 years and 4 months of age onwards, to boost protection against diphtheria, tetanus, polio and pertussis (whooping cough) even further than the vaccine referred to above.

The 2021/22 uptake of this vaccine in Bristol, by 5 years of age was (82.8%), significantly lower than the national average (84.2%) and well below the south-west regional average (89.0%).

Measles, mumps and rubella (MMR) – Two MMR doses should have been received by the age of 5 years (one at about 12 months and one at about 3 & ½ years of age).

In Bristol in 2021/22, the proportion of 5 year olds that had received at least one dose of MMR vaccine by this age, was 92.7%, similar to the national average (93.4%) but lower than the south west regional average (95.6%). Figure 13 overleaf shows that after many years of increasing uptake, from 2018/19 onwards uptake fell, particularly so over the last two years.

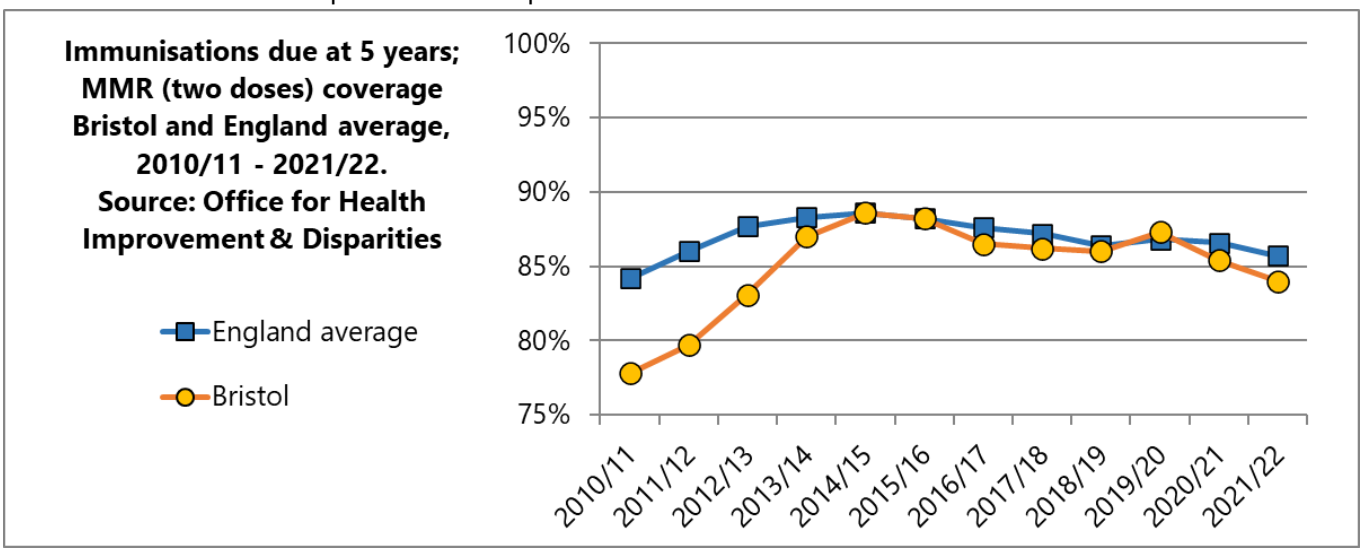
Figure 13: MMR (one dose) coverage at 5 years of age, Bristol and England averages, 2010/11 - 2021/22. Source: Office for Health Improvement & Disparities



A single immunisation with the MMR vaccine will provide most recipients with protection from mumps, measles and rubella, but a second vaccination provides superior and longer lasting protection and so a second dose is recommended.

In Bristol in 2021/22, uptake of two doses of the MMR vaccine at 5 years of age, was 84.0% (much lower than the 92.7% for the first dose), and significantly lower than the national average (85.7%) and the south-west regional average (90.6%). Bristol's uptake of two doses of MMR vaccine at 5 years of age is towards the top of the range for the Core Cities group, where coverage in 2021/22 ranged from 76.5% in Liverpool to 86.9% in Newcastle-upon-Tyne. Uptake in Bristol and nationally declined 2014/15 to 2018/19, recovered slightly in Bristol in 2019/20 before declining considerably again since then.

Figure 14: MMR (two doses) coverage at 5 years of age, Bristol and England averages, 2010/11 - 2021/22. Source: Office for Health Improvement & Disparities



Haemophilus influenza type b and meningitis C (Hib/MenC – booster) – A booster dose of Hib/MenC vaccine is recommended around 1 year of age and would not ordinarily be used for older children, so the coverage rates published for Hib/MenC booster immunisation at 5 years of age mainly relate to previous trends in uptake at 2 years of age.

The proportion of Bristol 5 year olds that had received a Hib/MenC booster by the time of their 5th birthday, in 2021/22, was 91.8%, similar to the national average (91.7%) but considerably lower than the south west regional average (94.6%).

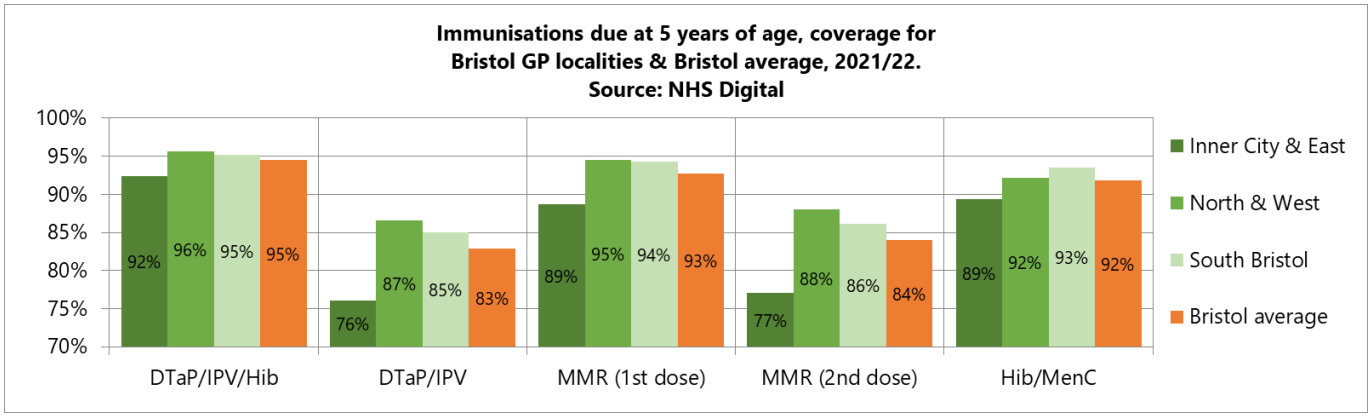
Variation across Bristol in childhood immunisation coverage – By 5 years of age

Please see the description of this analysis by GP locality for the immunisations due by 1 year of age.

As observed for immunisations due by 1 or 2 years of age, Inner City and East locality has the lowest average level of uptake for all childhood immunisations due by the age of 5 years.

The apparent disparity between the uptake for Inner City and East and the other localities is a little less pronounced for those vaccinations that could have been delivered at an earlier age (DTaP/IPV/HIB, 1st dose of MMR and Hib/MenC), so it is possible that a proportion of children in Inner City and East are subject to delayed vaccination rather than an avoidance or refusal of vaccination altogether. They appear in effect catch-up by age 5, to a certain extent for these immunisations where the opportunity is available for example there was an 8% increase in 1st MMR between age 2 and age 5 in Inner City and East locality. For the other two immunisations routinely delivered later in life (DTaP/IPV booster and the 2nd dose of MMR), the disparity between Inner City and East and the other two localities, is just as large as was observed for the vaccinations due by the age of 2 years.

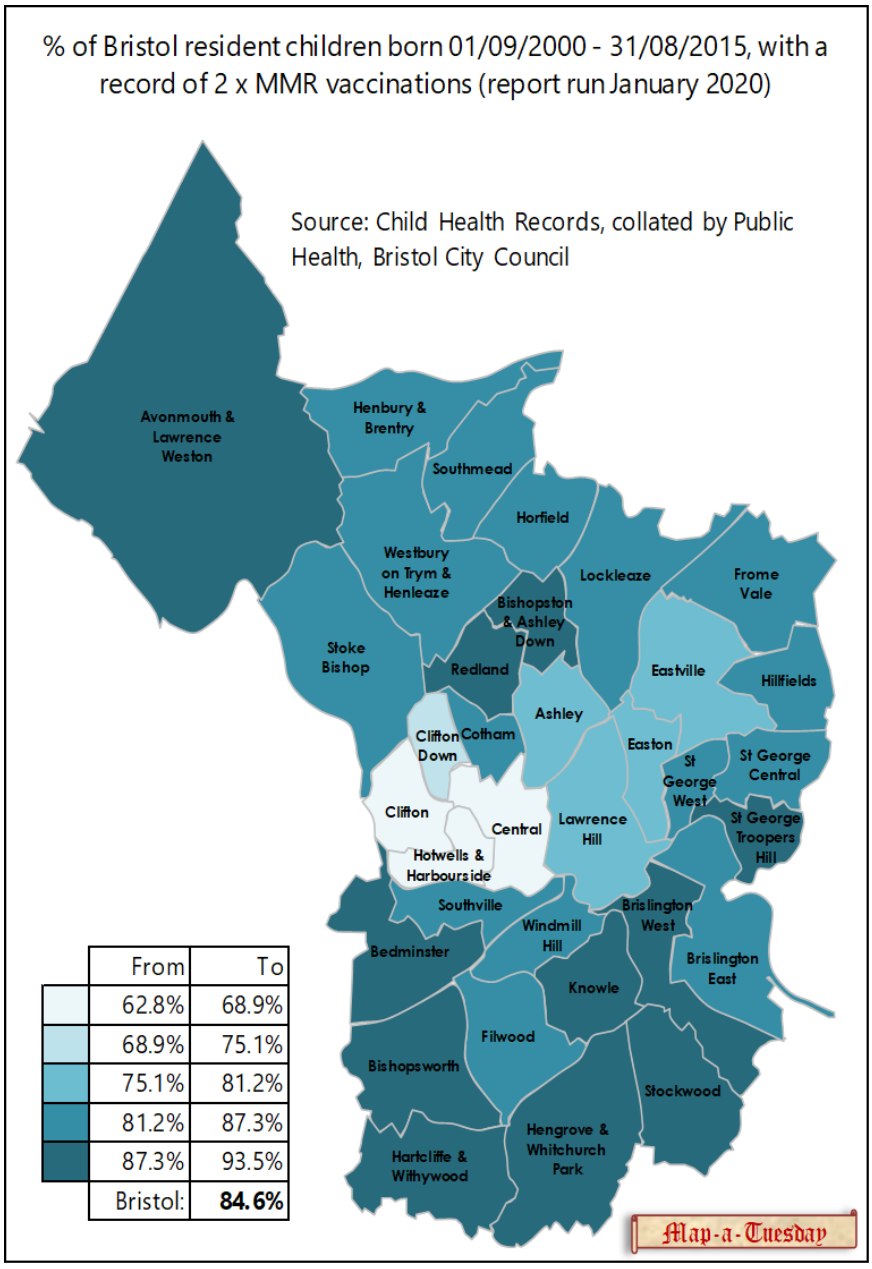
Figure 15: Immunisations due at 5 years of age, coverage for Bristol GP localities vs Bristol average, 2021/22. Source: NHS Digital



Variation across Bristol in childhood immunisation coverage – MMR x2

A one-off piece of research was conducted in early 2020 using data from child health records, which did allow a more precise look at vaccination uptake by ward of residence within Bristol. This was conducted only in relation to MMR immunisations received by January 2020, for children of primary and secondary school age (4-years to 19-years of age), for a broad appraisal of vaccination coverage in the school-age population and is not directly comparable to the other statistics within this section that relate to discrete one-year population cohorts. It does though allow for some triangulation of the conclusions taken from the GP locality based analyses in respect of the variation in uptake across the city.

Figure 16: Estimated vaccination coverage by ward of residence, two doses of MMR immunisation, school-age population (reception to year 13), Bristol, January 2020. Source: Local analysis of child health records, Bristol City Council Public Health.



The uptake map shows there is considerable variation in vaccination uptake historically within the areas described by GP localities (identified previously in figure 4). Analysis shows that there is little or no consistent association between estimated ward uptake and ward average deprivation scores when analysed at the ward-scale. Some of the most deprived wards in the city; Hartcliffe & Withywood, Filwood, Southmead and Avonmouth & Lawrence Weston, have population coverage around or better than the city average. The lowest uptake in this analysis is to be found in the centre of the city and in the most ethnically diverse wards to the east of the centre. This would go some way to triangulate the low uptake observed for the Inner City and East locality previously, where most of these wards are located.

Covid-19 Impact:

Although childhood immunisations were not paused at any point during the pandemic, the impact of COVID-19 on primary care teams in terms of redeployment, sickness, shielding, and supporting the rollout of the COVID-19 vaccination programme did affect uptake. Uptake was also influenced by factors within families such as nervousness among parents in bringing their children in to a healthcare setting where there may have been high rates of COVID-19, parental shielding, working and schooling from home. However, it's important to note that coverage of childhood immunisations has been below 90% in Bristol for at least the last 4 years, and longer for the pre-school immunisations given at 3 years and 4 months. System work to improve uptake across the city and within areas / populations where uptake is low is a key priority as focus on reducing risk of vaccine preventable infections to this group.

Further Information / References:

1) World Health Organization. https://www.who.int/topics/immunization/en/

2) NHS. https://www.nhs.uk/conditions/vaccinations/nhs-vaccinations-and-when-to-have-them/

3) Office for Health Improvement & Disparities – Fingertips tool: https://fingertips.phe.org.uk/

4) Childhood Vaccination Coverage Statistics- England, 2021-22: https://digital.nhs.uk/data-and-information/publications/statistical/nhs-immunisation-statistics/2021-22

5) Annual GP vaccination coverage statistics for children aged up to 5 years in England April 2021 to March 2022: https://www.gov.uk/government/publications/cover-of-vaccination-evaluated-rapidly-cover-programme-annual-data

Date updated: May 2023 **Next Update Due:** May 2024