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Report and study commissioned by

GSK

Pharmacy-based vaccination in England: Exploring opportunities and impact on health equity

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Content

1) Overall Findings
2) Examining the link between deprivation, uptake and pharmacy use
3) Exploring the potential impact of pharmacy vaccination on:
    - Inequality in vaccine uptake
    - Opportunities for freed-up GP practice time and potential costs
4) Summary and recommendations

Assumptions and Limitations

What this research adds to the knowledge on pharmacy-based vaccination

- This is an **exploratory study**, and the evaluation is based on assumptions around future pharmacy-based programmes. As such, the outputs are illustrative only.
- This research is **intended to start a conversation** regarding the benefits of pharmacy-based vaccination in potential future scenarios.
- The methods **evaluate potential future scenarios** by making **reasonable estimates of costs and other inputs** based on the relevant available current data.
- The administration of vaccinations within the GP Practice is assumed to be proportionally delivered by the nurses (85%), general practitioners (10%) and healthcare assistants (5%). This is an estimate based on Crocker-Buque et al.[18]
- Potential benefits that could result from any future shifts of vaccination from current providers to community pharmacies are considered, **not accounting for the trade-offs** or costs, such as the investment required to set up the delivery infrastructure in pharmacies.
- **Further detailed research is required** for an exact measure of cost effectiveness and to define an optimal implementation strategy for pharmacy-based vaccination.
- Further questions remain and are listed at the end of this presentation.

Executive summary (I): there is a link between higher deprivation and lower uptake in three observed adult national immunisation programmes (NIPs) in 2022/23

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NHS Vaccination Programme	Study Findings		
Shingles GP Practice only	• Uptake **27% lower (9.1pp)** in the **most deprived quintile relative to the least deprived quintile. †**	**27%**	↓
Pneumococcal GP Practice only	• Uptake **17% lower (2.4pp)** in the **most deprived quintile relative to the least deprived quintile. †**	**17%**	↓
Influenza GP Practice **AND** Pharmacy	• Uptake **7% lower (5.5pp)** in the **most deprived quintile relative to the least deprived quintile. †**	**7%**	↓

- Shingles and pneumococcal NIPs currently exhibit **significant deprivation-related disparity** in uptake.
- For **Influenza** (co-delivered by GP Practice and Pharmacy), the link between deprivation and uptake is smaller. In the most deprived quintile, there is a **16% (5.2pp) higher use of pharmacy-based vaccination** vs. least deprived quintile.
- If the NHS shingles and pneumococcal NIPs had the same relative distribution of pharmacy-based vaccination as currently seen for influenza, this could **increase uptake** and **reduce inequalities.***

† These differences still exist after risk-adjusting for area level factors which also impact vaccine uptake

* This cannot be conclusively determined in this analysis

Percentage point (pp) differences are absolute differences between the quintiles. Percentage (%) differences describe the relative size of the differences compared to current uptake levels. I.e. for shingles uptake is 34% in the least deprived quintile so a difference of 9.1pp is 9.1/34% = 27%

Executive summary (II): An increased role for pharmacy in adult national immunisation programmes could have **benefits for patients, healthcare professionals and the NHS**

Having established a link between higher deprivation and lower uptake, next to explore was the potential implementation of pharmacy-based vaccination for the shingles and pneumococcal NIPs, incl. potential impact on opportunities, and costs.

400k
GP practice appts could be saved per year[7]

Opportunities for GPs and nurses

- Increased pharmacy-based adult vaccination would **free-up GP Practice capacity** (>400k appts*[7] per year), which could be used to:
  - Focus on childhood/future NIPs and other incentivised NHS priority services.
  - Reduce the need for nurse and GP locum overtime in times of high demand.

At least cost-neutral for the NHS[7]

Costs

- Assuming similar delivery conditions as for influenza, it is likely that increased pharmacy-based vaccination would be **at least cost-neutral to the NHS.**[7] It would also provide an additional revenue stream for pharmacies.

*35% of adult NHS influenza vaccinations are currently provided in pharmacies. If the same proportion of pharmacy-based vaccinations were provided for the shingles and pneumococcal NHS programmes, more than 400,000 GP practice appointments could be saved per year.

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Examining the link between deprivation, uptake and pharmacy use

How do we examine this link?

(1) We first examine whether there is currently disparity in uptake by deprivation levels, for different vaccine types

- We considered 3 vaccine types: influenza, shingles, and pneumococcal
- We considered vaccinations over the period 2022/23
  - Influenza: September 2022 to February 2023[1]
  - Shingles: April to September 2022[2]
  - Pneumococcal: April 2022 to March 2023[3]
- We used data on 106 sub-Integrated Care Boards (ICBs)*
- We used a continuous measure of deprivation for each sub-ICB: the % of patients living in the most deprived 10% of neighbourhoods. See Appendix 1 for calculation of the deprivation measure and data sources.
- We first explored unadjusted differences in uptake by deprivation, and checked if the disparity observed was sensitive to more robust statistical analysis

(2) We then assess whether pharmacy-based vaccination is more utilised in deprived areas (and therefore could help ease deprivation-related inequality in uptake), for influenza

- We considered influenza only, where pharmacy-based vaccination is currently delivered, and data are available
- We considered vaccinations in the most recent year of available data, over the 2022/23 winter period (September 2022 to March 2023)[4,1]
- The % of pharmacy utilisation is taken from two sources: (1) the number of influenza vaccines in pharmacy[4] divided by (2) the total population vaccinated[1]
- We used data on 42 ICBs*
- We used the same measure of deprivation, calculated for each ICB
- We again explored unadjusted differences in pharmacy use by deprivation, as well as then testing these differences with more robust statistical analyses

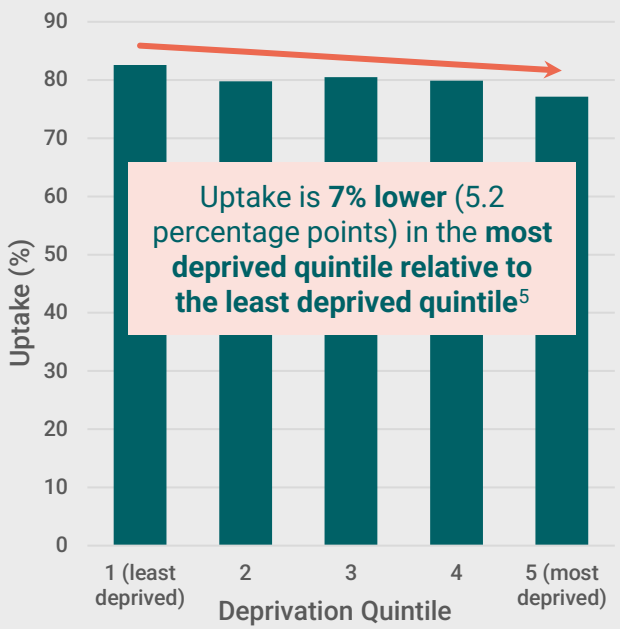
*An ICB is an NHS organisation responsible for planning for the health needs of the population, and managing NHS budget and services in a geographical area. A sub-ICB is a sub-division of an ICB's total geographical area.

Is uptake lower in more deprived areas?

Deprivation inequality is lower for influenza than for shingles and pneumococcal in relative terms. The role of pharmacy in the influenza programme may be a contributing factor for lower inequality in uptake than for shingles. However, this cannot be determined in this analysis.

As deprivation scores increase (along the x-axis), mean uptake decreases (along the y-axis)

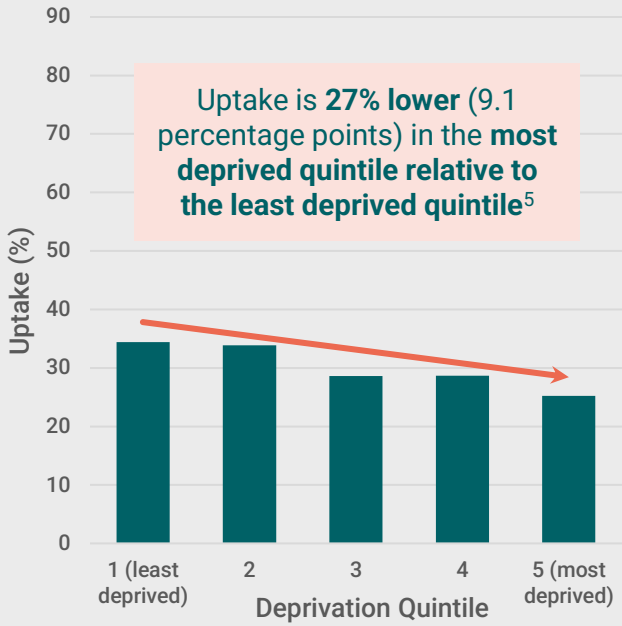
Mean influenza uptake (65yoa and over)



Uptake is **7% lower** (5.2 percentage points) in the **most deprived quintile relative to the least deprived quintile**[5]

Average uptake 80%[1]
(eligible population: 10,723,554)[1]
Sample size: 106 sub ICBs[5]

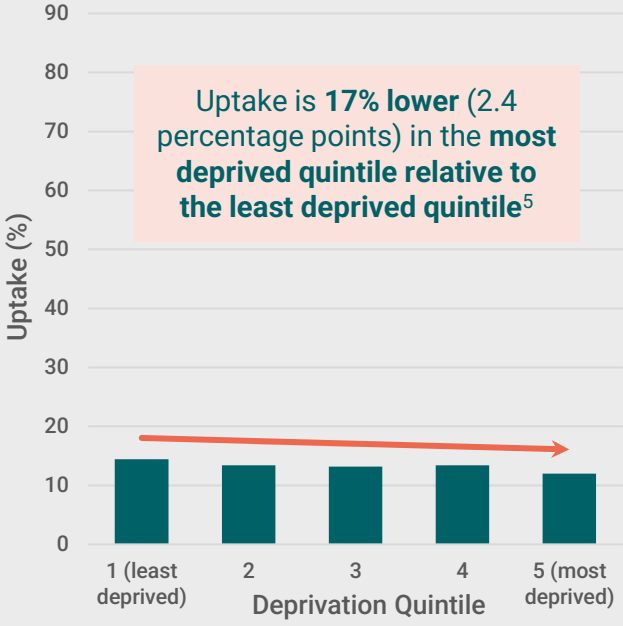
Mean shingles uptake (70yoa only)



Uptake is **27% lower** (9.1 percentage points) in the **most deprived quintile relative to the least deprived quintile**[5]

Average uptake 30%[2]
(eligible population: 271,822)[2]
Sample size: 106 sub ICBs[5]

Mean pneumococcal uptake (65yoa only)



Uptake is **17% lower** (2.4 percentage points) in the **most deprived quintile relative to the least deprived quintile**[5]

Average uptake 13%[3]
(eligible population: 82,119) [3]
Sample size: 106 sub ICBs[5]

Abbreviation: Yoa = Years of age, ICB = Integrated care board, % = percentage, FTE = Full-time Equivalent, pp = percentage point
Notes: Inputs for graph creation can be found in supporting material[6]

Percentage point (pp) differences are absolute differences between the quintiles. Percentage (%) differences describe the relative size of the differences compared to current uptake levels. I.e. for shingles uptake is 34% in the least deprived quintile so a difference of 9.1pp is 9.1/34% = 27%

Checking if the differences are sensitive to other factors which impact uptake

We employed additional statistical analyses to understand if the observed differences in vaccination uptake by deprivation quintiles were meaningful. We implemented regression analyses, which is a statistical modelling process which allowed us to determine the association between deprivation and vaccination uptake of the three separate vaccine types.

These analyses allowed us to assess:

(1) Whether the differences are **statistically significant**

Statistical significance tells us whether the differences we estimate are driven by a true association between deprivation and uptake, or due to random variation in the data

(1) Whether the **size** of the differences changes after we **control for other factors**

Other factors (rurality, population size, availability of GPs and nurses) influence differences in uptake. Analyses were conducted where we risk-adjust for these other factors.

See Appendix 2 for more detail on the regression methodology. All data sources for the regression results are referenced in this appendix. Analysis was carried out in STATA[5].

We found:

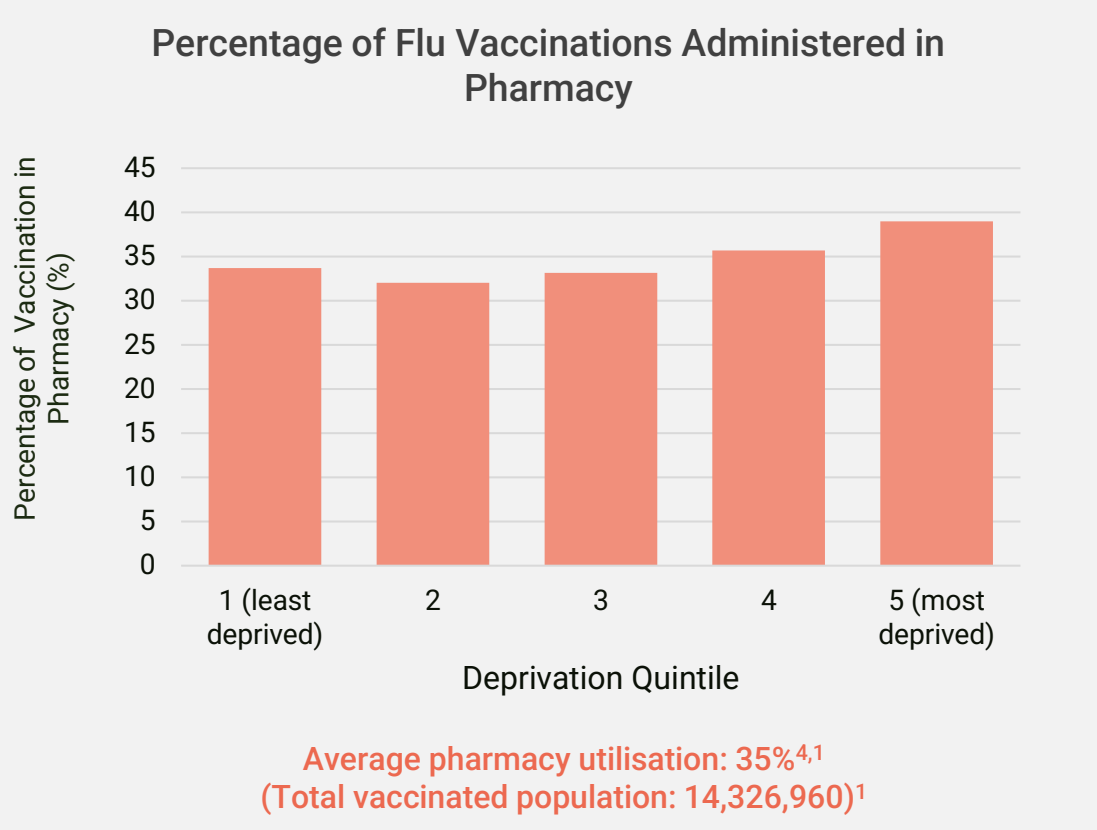
The level of relative disparity in uptake between the most and least deprived quintiles is even greater for shingles and pneumococcal, and even smaller for influenza after we controlled (risk-adjusted) for other factors which influence uptake (rurality, number of patients, number of practices, GP FTE, nurse head count). These differences were all statistically significant at the 5% significance level.

NHS Vaccination Programme	Unadjusted differences	Regression Findings (risk adjusted)
Shingles GP Practice only	Uptake **27% lower** (9.1pp) in the **most deprived quintile relative to the least deprived quintile.**	Uptake **29% lower** (10pp) in the **most deprived quintile relative to the least deprived quintile.**
Pneumococcal GP Practice only	Uptake **17% lower** (2.4pp) in the **most deprived quintile relative to the least deprived quintile.**	Uptake **26% lower** (4pp) in the **most deprived quintile relative to the least deprived quintile.**
Influenza GP Practice **AND** Pharmacy	Uptake **7% lower** (5.5pp) in the **most deprived quintile relative to the least deprived quintile.**	Uptake **4% lower** (3pp) in the **most deprived quintile relative to the least deprived quintile.**

Abbreviation: pp = percentage point

Is pharmacy use higher in more deprived areas?

There appears to be slightly higher use of pharmacy vaccination in more deprived areas for influenza



Average pharmacy utilisation: 35%[4,1]
(Total vaccinated population: 14,326,960)[1]

Please note the assumptions

As data are not available at the sub-ICB level, this analysis is based on data from 42 ICBs

Using larger areas in England (ICBs compared to sub-ICBs) may mask differences in deprivation within those areas

Total vaccinated population includes individuals aged 50+ and pregnant women

We find that the percentage of pharmacy utilisation is 16% higher (5.2 percentage points)[5] in the most deprived quintile relative to the least deprived quintile

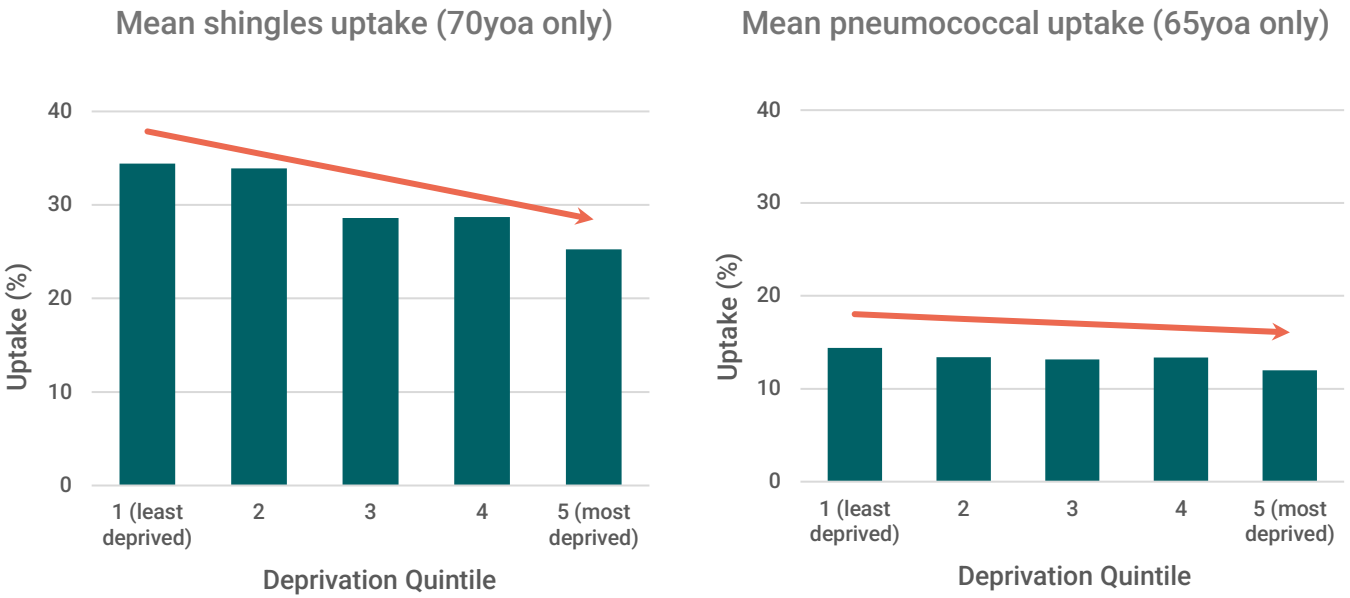
- **Regression analysis** can again control for other factors which influence pharmacy use (rurality, number of patients, number of practices, GP FTE, nurse head count, number of pharmacies).
- We find that the percentage of pharmacy utilisation is 17% higher (5.9 percentage points)[4] in the most deprived quintile relative to the least deprived quintile after risk-adjusting for these factors, **however this difference is not *statistically* significant.**
  - That is, we cannot confidently conclude that the differences in pharmacy use by deprivation level are not due to random chance
  - The regression is likely to have low statistical power and therefore loss of statistical significance due to a small sample size (42 ICBs)

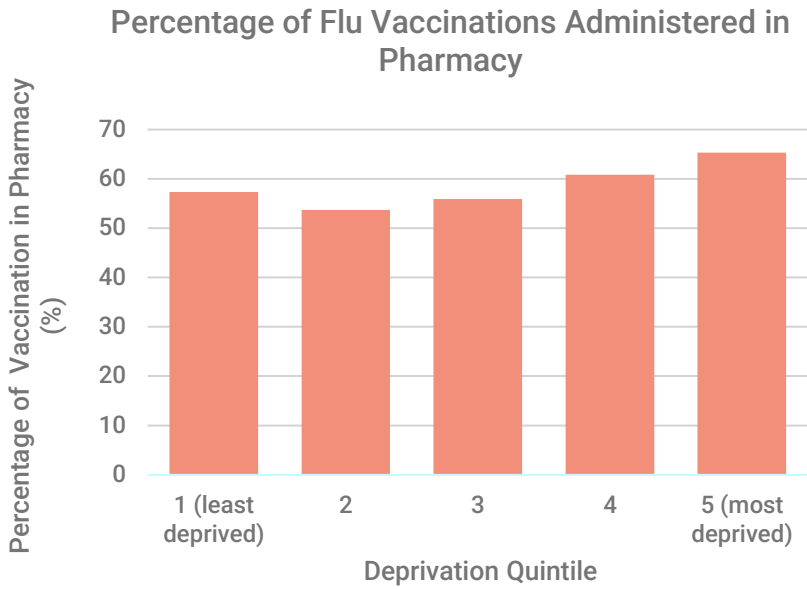
See Appendix 2 for more details on the regression methodology, where analysis was carried out in STATA[5]. Inputs for graph creation can be found in supporting material[6]

Summarising the inequality findings so far

So far, we have seen evidence of deprivation-related inequality in uptake of vaccine programmes which are not rolled out in pharmacy…

…And some indication that pharmacy vaccination is more utilised in deprived areas for flu, so could potentially reduce this inequality





Abbreviations: Yoa = Years of age

Notes: results are replicated from slide 10, 11 and 13. Inputs for graph creation can be found in supporting material[6]

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Potential gains from reducing deprivation-related inequality on shingles and pneumococcal vaccination uptake

In our previous analysis, we outlined the differences in uptake across deprivation levels for each vaccine programme.

We identified some evidence of deprivation-related inequality for all vaccine types, but the relative differences in uptake across deprivation quintiles was larger for shingles and pneumococcal than for influenza.

In this analysis, we adjust the **relative differences in uptake** across deprivation quintiles for shingles and pneumococcal to match that of influenza, and see how this would impact uptake and inequality

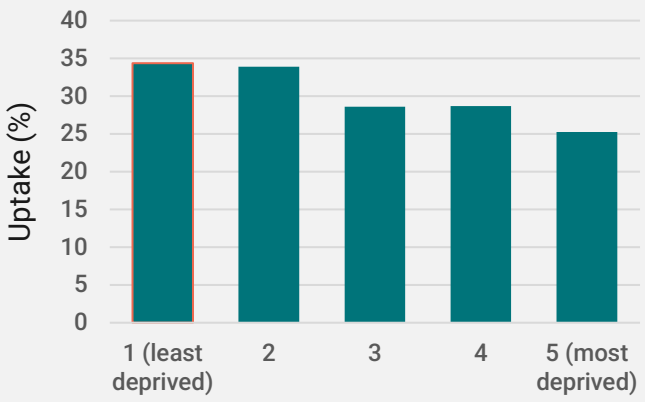
We assume the relative differences in relation to the least deprived group. Therefore, uptake in the least deprived group does not change in this hypothetical analysis.

Potential gains from reducing deprivation-related inequality on shingles and pneumococcal vaccination uptake

If we apply the same relative differences of the distribution across deprivation to shingles as currently exists for influenza, there would be reduced inequality and higher uptake for shingles vaccination.

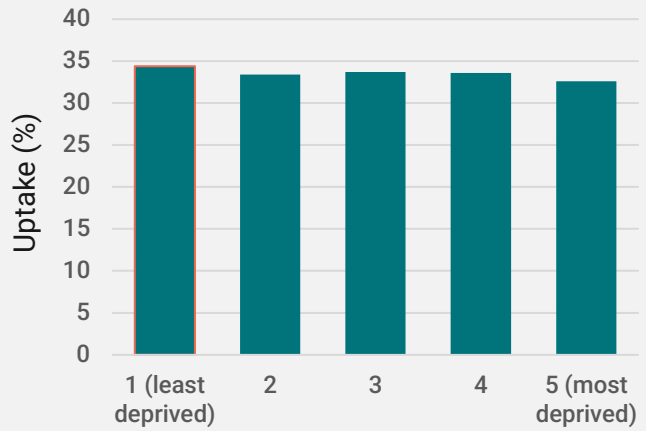
Applying the relative differences between deprivation quintiles for influenza to shingles uptake

Actual mean shingles uptake (70yoa only)



Average uptake 30.1%

Hypothetical mean shingles uptake (70yoa only)



Average uptake 33.5%

Pharmacy-based vaccination could increase overall uptake by 3.3 percentage points (11% compared to average current uptake levels), with main increase in most deprived quintiles.

Assumptions and limitations

- Influenza and shingles consider different eligible populations
- We apply the relative differences in uptake to the least deprived quintile for shingles, so this will by design mean a relative increase in uptake for the more deprived groups

What could be the implications of the shingles national immunisation programme moving to two doses?

- This could exaggerate inequalities further, as there could be a higher chance of non-return
- The availability of pharmacy vaccination could help to ameliorate this impact

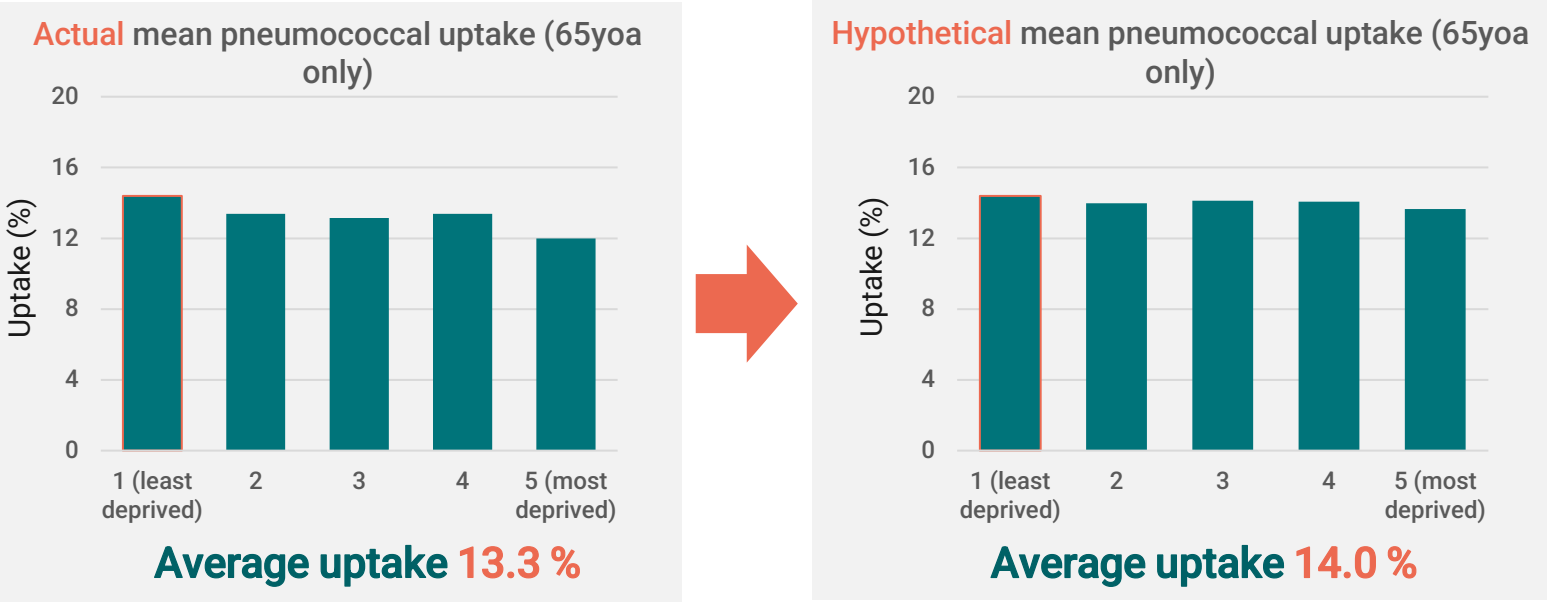
Note: This is a hypothetical scenario where the relative inequality levels are taken from current figures for influenza. The role of pharmacy in the influenza programme may be a contributing factor in facilitating changes to inequality and uptake, but this analysis should not be interpreted that pharmacy-based vaccination would be solely responsible for this change.

Abbreviations: Yoa = Years of age. Inputs for graph creation can be found in supporting material[6]

Potential gains from reducing deprivation-related inequality on shingles and pneumococcal vaccination uptake

If we apply the same relative differences of the distribution across deprivation to shingles as currently exists for influenza, there would be reduced inequality and higher uptake for pneumococcal vaccination.

Applying the relative differences between deprivation quintiles for influenza to pneumococcal uptake



Pharmacy-based vaccination could increase overall uptake by 0.7 percentage points (6% compared to average current uptake levels), with main increase in most deprived quintiles.

Assumptions and limitations

- This is an assumed impact, where influenza and pneumococcal consider different eligible populations
- We apply the relative differences in uptake to the least deprived quintile for pneumococcal, so this will impose a relative increase in uptake for the more deprived groups
- This hypothesises the impact on uptake of addressing relative inequalities and does not consider the overall potential effect of pharmacy vaccination on pneumococcal uptake for all deprivation levels, which could increase uptake further

Note: This is a hypothetical scenario where the relative inequality levels are taken from current figures for influenza. The role of pharmacy in the influenza programme may be a contributing factor in facilitating changes to inequality and uptake, but this analysis should not be interpreted that pharmacy-based vaccination would be solely responsible for this change.

Abbreviations: Yoa = Years of age. Inputs for graph creation can be found in supporting material[6]

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Impact on costs and opportunities

We explore the impact of the potential delivery of the shingles and pneumococcal vaccination programme within pharmacies.

Remit of analysis

- The shingles and pneumococcal programme data is derived from published statistics on the season 2022/23.
- For shingles, we created a hypothetical scenario that estimates the number of shingles vaccinations after recent changes to the shingles programme in 2023. The scenario proxies a two-dose vaccination programme for those aged 65 and 70.
    - It is proxied by applying the Shingles coverage rates of the 65yos and 70yos for the first two quarters in 2022 to the 65yos and 70yos population in mid-2022.
    - The aggregate number of vaccinations delivered was doubled to reflect that from 1 September 2023, the NHS shingles vaccination programme moved from a one-dose to a two-dose schedule. This amounts to an estimated 680,940 administered doses.
- For the pneumococcal programme, we consider vaccine delivery for individuals in England aged 65 years and over who received PPV between 1 April 2022 and 31 March 2023. This amounts to 465,779 administered doses.

More than 400,000 GP practice appointments could be saved per year

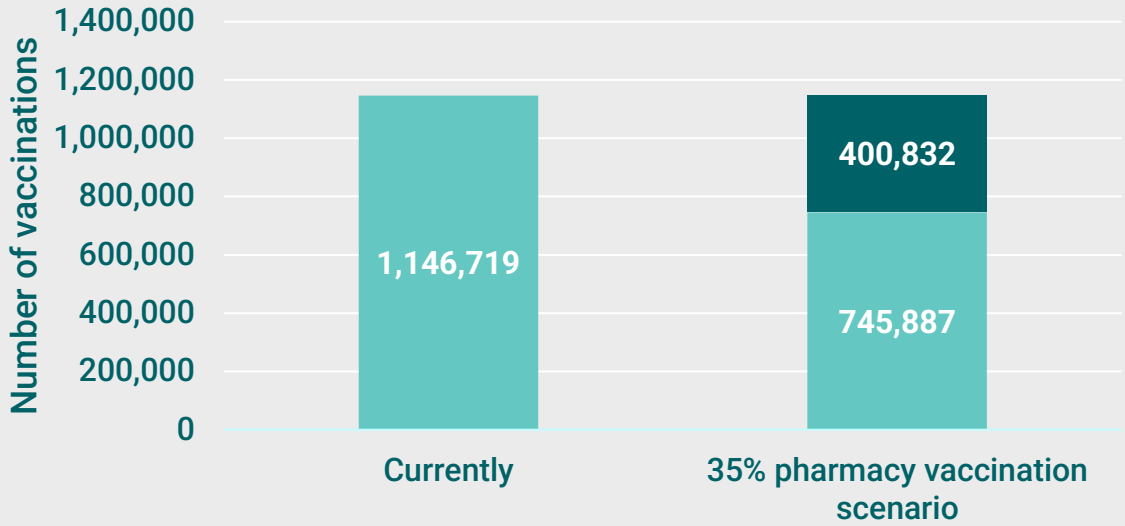
35% of adult NHS influenza vaccinations are currently provided in pharmacies*. If the same proportion of pharmacy-based vaccinations were provided for the shingles and pneumococcal NHS programmes, **more than 400,000 GP practice appointments could be saved per year**. This equates to more than 80,000 hours of HCP (majority Practice Nurse) time within the GP setting.
To support delivery of these programmes, it is likely pharmacy would require additional funding, staff and enhanced access to integrated IT software.

Current parameters

NHS vaccinations per year provided by GP Practices	Shingles [a]	680,940
	Pneumococcal [b]	465,779
	Total:	**1,146,719**
Average consultation time per vaccine appt	General practice	13.22 mins
	Pharmacy	17 mins

[a] this is a projected estimate in the case of a two-dose programme. We applied the Q1 and Q2 2022/23 uptake rate to the population of 65 and 70-year-olds.
[b] ages 65 and over

Notes: Consultation time estimates are provided in Appendix 3



Notes: The model estimates and output can be found in supporting material[7]

*The % of vaccines is taken from two sources: (1) the number of influenza vaccines in pharmacy[4] divided by (2) the total population vaccinated[1]

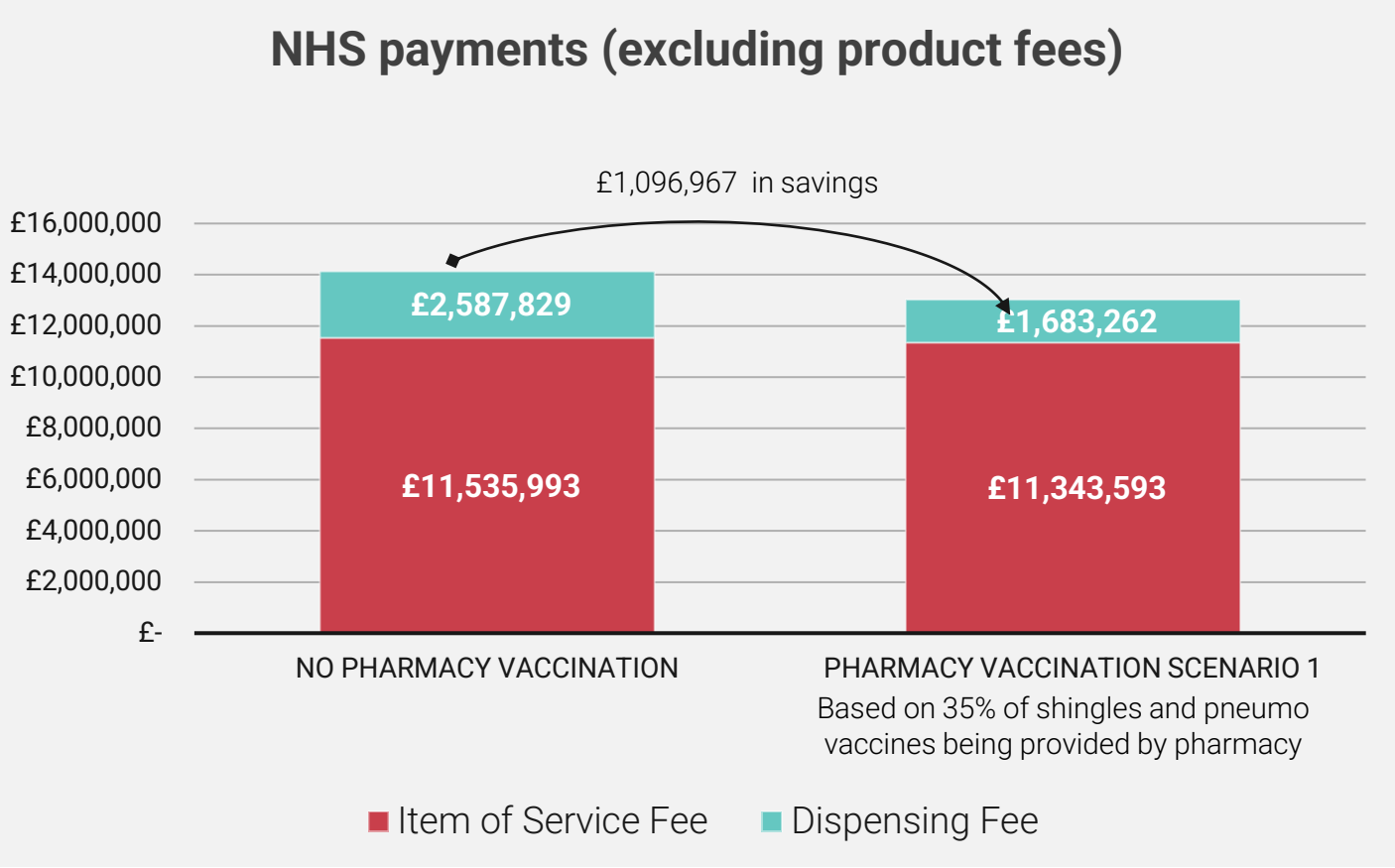
Opportunities for freed-up GP Practice time

We explore what GP Practices could do with the time spared by Pharmacy delivering a proportion of the shingles and pneumococcal NHS vaccination programmes

- GP Practices could use this spare capacity to focus on other services, e.g. the childhood vaccination programme or other priority services, incl. those incentivised by QOF).
  - One example is the NHS's ambition to increase the proportion of cancers diagnosed at stage I and II to 75% by 2028[8] This can only be achieved with improvements to screening and early diagnosis activities
- When GPs are at full capacity, costly locum GPs are often brought in to support and/or nurses are paid for overtime. If GPs have freed-up capacity, this could be avoided.
  - The freed-up GP appointments alone could be worth £0.7 Million - £0.9 Million in locum GP rates saving
  - This assumes GP locum day rates averaging between £600 - £800[8], 7.5 working hours a day and 11.7 min per GP appointment.[19]
- The freed-up nursing time could be valued at ~£5.1[7] Million assuming
  - Community nurse hourly rate of £46 [9], 11.7 min per nurse appointment[19] and an hourly overtime multiplicator of 1.5 [10]

In the long-run, the shift could be (at least) cost-neutral to the NHS and could generate increased revenues for pharmacy

Based on current fees, the NHS could save ~7.8% in dispensing fees. Further savings are possible if payment structures are optimised. For Pharmacy, an increased role could also create opportunities for greater revenues.



- Shifting parts of the delivery of the shingles and the pneumococcal programmes to pharmacies is likely to be cost-neutral to the NHS.
- With no adjustments made to NHS payments to pharmacy or GP practices, absolute savings of ~£1M per year to the NHS could be achievable. This is because GPs receive an item of service fee and a dispensing fee, while pharmacy only receive an item of service fee.[23]
- At the same time, the shift increases the market for pharmacies to supply a profitable immunisation service.
- If pharmacists can unlock further efficiency gains, the increased profit could be shared with the NHS, creating a win-win situation for both parties.

Notes: Model outputs in this graph are provided in supporting material[7].

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Pharmacy-based vaccination might generate benefits for different stakeholder groups

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NHS

- Allows NHS to focus on higher priority appointments in a GP setting while maintaining (or improving) access to vaccination
- Potentially higher vaccine coverage as it could increase uptake in more deprived areas
- Small cost savings which could be increased if delivery and payment structures were optimised

Patient

- Improved patient access for vaccination, including possibility of after work and weekend vaccination
- More GP time available for higher priority patients (e.g. chronic conditions or cancer screening)
- Lower inequality in access

Pharmacy

- Higher profits are possible if pharmacies have the capacity for this shift
- However this would require consideration of how this would be delivered in practice, and who would deliver the additional vaccinations (i.e. pharmacy technicians)

GP

- More time available to focus on NHS priorities
- More time available to focus on financially rewarding activities
- However, the shift in activity would have to be sufficient to cover the loss of GP activity on vaccinations

Questions that arise out of this research:

What is the efficient level of pharmacy-based vaccination delivery?
What changes would have to be implemented to create pharmacy capacity for delivery?
What alternative models could be explored (e.g. vaccination hubs)?

Recommendations and suggestions for further research

Pharmacy vaccination for shingles and pneumococcal should be explored to address the current inequality in access by deprivation level (and to increase uptake)

A shift in service delivery should not place unnecessary strain on pharmacy services

- Evidence shows a long-term trend of pharmacy closures in England, with figures showing that 40% of community pharmacy closures between 2015 and 2022 took place in the most deprived areas of England[11]
- The implementation of this policy change would need to ensure that it would be beneficial and feasible for pharmacies financially and in terms of additional workload
- Optimising the pharmacy-based vaccination delivery and potentially reconsidering payment incentives might increase efficiency
- Consideration of how much capacity current pharmacy staff have to take on additional work, and how much increased staffing will be required
- Consideration of pharmacy to be utilised to meet demand only when GPs reach full capacity

There should be awareness of potential operational issues when implementing pharmacy vaccination

- Vaccines delivered in pharmacy may increase issues tracking the vaccines administrated. Functional IT infrastructure and processes are required to mitigate that risk.

Alternative models of vaccination delivery should also be considered

- Vaccination Hubs have been delivered in Scotland as part of the Vaccination Transformation Programme (VTP) to move the provision of vaccinations away from GP Practices. This alternative model could be explored by NHS England

Appendix 1: Deprivation indicator

For our measure of deprivation for each sub-ICB, we calculated the percentage of patients in that sub-ICB who live in the bottom 10% neighbourhoods in terms of deprivation

To create this, we used:

- Data on the LSOAs (neighbourhoods) of patients registered at a GP practice in April 2022, and mapped GP practice data to sub-ICBs[12]
- Index of Multiple Deprivation (IMD) data is available by LSOA, showing the decile of deprivation of that LSOA[13]
    - From the above, we calculated the % of patients within a sub-ICB who are in the lowest IMD decile of LSOAs
    - This gives a more accurate depiction of the deprivation of the patient population being served within an area, rather than the deprivation level of the area itself

Appendix 2: Regression analysis methods and sources

We estimated the following regression, using OLS, for each vaccine type, for the **uptake analysis**:

$$Uptake_i = \beta_0 + \beta_1 Deprivation_i + \boldsymbol{\beta X_i} + \varepsilon_i$$

Where,

- i= Sub-ICB
- $Uptake_i$ is the vaccinated population as a % of the eligible population, for each vaccine type [1,2,3]
- $\boldsymbol{X_i}$ are the set of sub-ICB level control variables (rurality[14], number of patients[12], GP FTE[15], nurse head count[15], number of practices[12])
- ε_i is the error term

We estimated the following regression, using OLS, for influenza, for the **pharmacy use analysis:**

$$PharmacyUse_j = \beta_0 + \beta_1 Deprivation_j + \boldsymbol{\beta X_j} + \varepsilon_j$$

Where,

- j= ICB
- $PharmacyUse_j$ is the number of vaccinations in pharmacy[4] as a percentage of the total vaccinated population[1]
- $\boldsymbol{X_i}$ are the set of ICB level control variables variables (rurality[14], number of patients[12], GP FTE[15], nurse head count[15], number of practices[12], number of pharmacies[16])
- ε_i is the error term

Appendix 3: Parameter estimates and sources

General Practice Setting

Domain	Parameter	Value	Source	Note
Shingles & Pneumococcal Vaccination Vaccination	Item of Service Fee	*£10.06 per patient*	17	* The dispensing Fee was adjusted based on a weighted average of dispensing general practices (15%) and non-dispensing general practices (85%) in UK 2022 [17] aligned with the methodology presented in Atkins et al. (2015) [24]
	Dispensing Fee	*£2.26 per vaccine**	17	
	Duration of Clinical Appointment	*13.22 minutes per patient*	18	
Missed Opportunities	Average GP Appointment (2016)	*11.70 minutes per patient*	19	
	Average Hypertension-related Consultation Time (2021)	*7.94 minutes per patient*	20	
	Cervical Smear Test Appointment Time	*10.00 minutes per patient*	21	
	HbA1C Monitoring Appointment Time (2017)	*24.00 minutes per patient*	22	

Community Pharmacy Setting Estimates

Domain	Parameter	Value	Source	Note
Shingles and Pneumococcal vaccination	Item of Service Fee	*£ 9.58 per vaccine*	Assumptions similar to Influenza programme based on Community Pharmacy England (2024)[23]	Costs estimations are based on payments listed by the Community Pharmacy England. *Dispensing Fee was not included as in Atkins et al. (2016)[24]
	Duration: Average vaccination appointment time for adults in GP Setting	*17 minutes per patient*	Assumptions similar to Influenza programme based on Atkins et al. (2016)[24]	

All costs are provided in 2023 GBP.

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