Cost Implications of Declining MMR Coverage in England: Modelling NHS Burden and the Value of Catch-Up Vaccination

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Introduction

- Measles remains one of the most contagious infectious diseases, and even small declines in vaccination coverage can create significant immunity gaps.[1] Although the UK achieved measles elimination status in 2017, coverage with the measles, mumps, and rubella (MMR) vaccine has declined since the COVID-19 pandemic, particularly among 2-year-olds.[1] Current coverage is well below the 95% threshold required for herd immunity, creating immunity gaps that have already led to renewed outbreaks across the UK.[1] Since the start of the COVID-19 pandemic, MMR vaccination rates in England have fallen from 90.6% in 2019/2020 to 88.9% in 2023/2024 (-1.7 percentage points).[2] This decline increases susceptibility to outbreaks and adds avoidable healthcare costs. This study assessed the economic consequences of reduced MMR coverage for the UK National Health Service (NHS) and compared these costs with the expense of delivering catch-up vaccination to unprotected children.

Objectives

- **The primary objectives were to estimate (1) NHS and societal costs associated with reduced MMR coverage since 2019/2020; (2) the cost of delivering catch-up vaccination to unprotected children; and (3) the future economic burden if the observed decline continues.**

Methods

- A cost-of-illness model was developed to estimate the impact of declining vaccination coverage on measles cases and costs (**Table 1**). The model focused on the 2023 population of 2-year-old children in England (n=608,924).[3] Vaccination coverage inputs were derived from NHS data,[2] and measles attack rates were based on UK Health Security Agency guidance (41% among unvaccinated children).[4] Case severity distribution was assumed as 67% mild, 31% moderate, and 2% severe, informed by national data on measles cases.[5]
- Direct costs included GP visits, treatment of moderate and severe measles cases, and vaccine acquisition and administration. Indirect costs captured productivity losses from caregiver absenteeism, using Office for National Statistics employment and wage data[6] alongside Green Book assumptions[7] on workdays missed by severity level. Analyses were conducted for both retrospective (2019–2024) and projected (2024–2030) scenarios, adopting an NHS and societal perspective. Costs are reported in 2023/24 GBP with no discounting.

Table 1. Model Inputs

Category	Parameter	Base value	Source
Population	Age 2 population (England)	608,924.00	ONS, 2023[3]
Vaccine coverage	2019/2020 MMR vaccination coverage	90.60%	NHS, 2024[8]
	2023/2024 MMR vaccination coverage	88.90%	NHS, 2024[8]
	Average annual change in MMR coverage (2019–2024)	-0.43 percentage points per year	Calculation
Epidemiology	Measles attack rate	41.00%	UKHSA, 2024[4]
	Proportion of mild measles cases	67.04%	GOV UK, 2019[5]
	Proportion of mild moderate cases	31.41%	GOV UK, 2019[5]
	Proportion of severe measles cases	1.54%	GOV UK, 2019[5]
Costs	Cost per GP visit (mild case)	£45.00	PSSRU, 2024[9]
	Cost per A&E Visit (moderate case)	£605.00	NHS Schedule, 2023/24[8]
	Cost per inpatient visit (severe case)	£3,481.00	NHS Schedule, 2023/24[8]
	MMR vaccine acquisition cost for two doses	£15.00	BNF, 2025[10]
	MMR vaccine administration cost for two doses	£74.00	NHS Schedule, 2023/24[8]
Indirect costs analysis	Caregiver employment rate	75.10%	ONS, 2024[6]
	Average daily wage	£143.20	ONS, 2025[11]
	Days off work (mild case)	2.00	Green Book (UKHSA), 2019[7]
	Days off work (moderate case)	4.00	Green Book (UKHSA), 2019[7]
	Days off work (severe case)	10.00	Green Book (UKHSA), 2019[7]

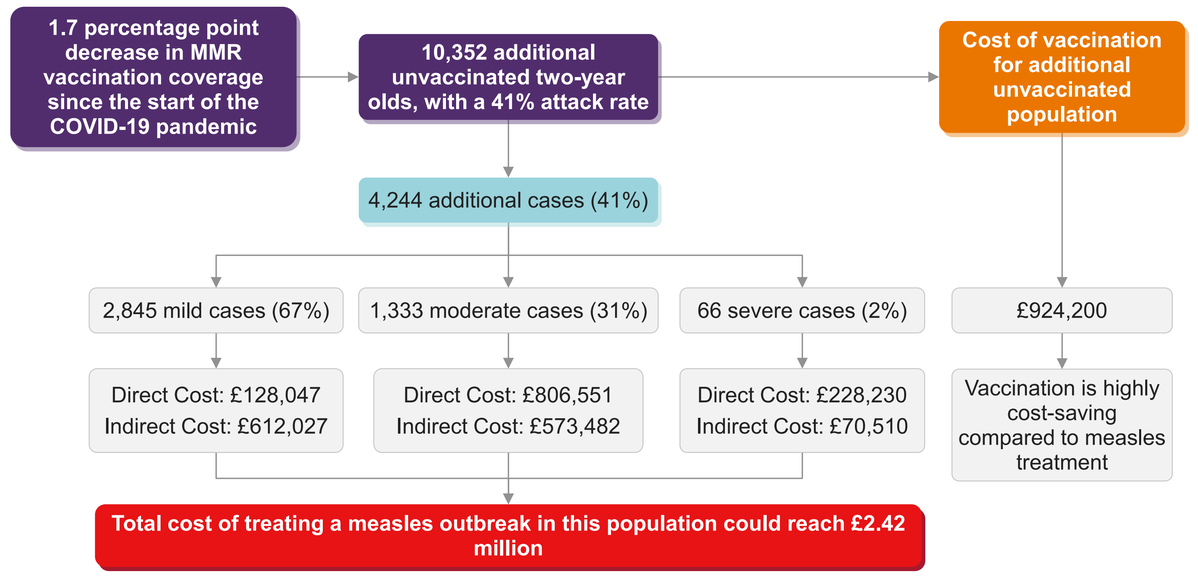
Abbreviations: NHS = National Health Service; ONS = Office for National Statistics; UKHSA = UK Health Security Agency;

Results

- Between 2019/2020 and 2023/2024, the decline in MMR coverage resulted in an additional 10,352 unvaccinated children (**Figure 1**). If exposed during an outbreak in this period, this group could have generated approximately 4,244 excess measles cases. Managing these excess cases could have cost the NHS an estimated £1.16M, with an additional £1.26M in caregiver productivity losses (total £2.42M). By comparison, providing catch-up vaccination to this group would have cost £0.92M, yielding a net saving of £1.50M, making vaccination a cost-saving strategy.
- If the observed decline of 0.43 percentage points per year continues, coverage is projected to fall to 86.3% by 2029/2030 (**Figure 2**). This would correspond to more than 83,000 unvaccinated children per birth cohort and over 34,000 measles cases per year under outbreak conditions. The cumulative six-year economic burden between 2024/2025 and 2029/2030 is projected at £79.0M, comprising £51.8M in direct NHS costs and £27.2M in caregiver productivity losses (**Figure 3**).

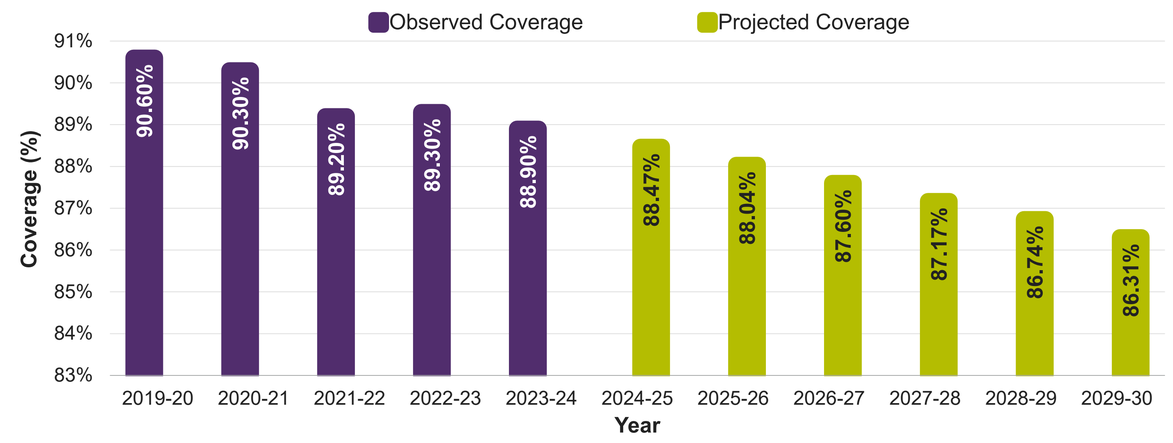
Results (cont.)

Figure 1. Model Structure for Estimating the Economic Impact of Declining MMR Coverage



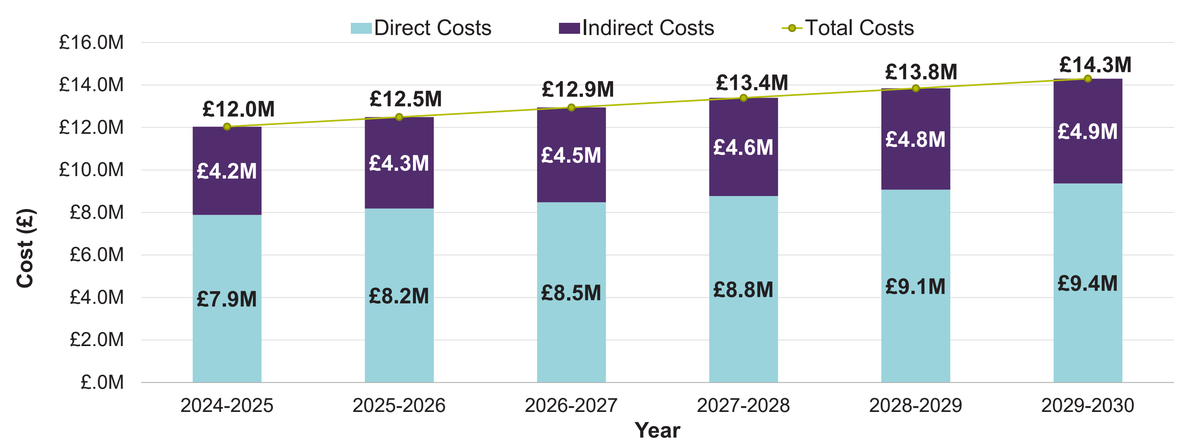
Abbreviations MMR = measles, mumps, and rubella

Figure 2. Observed and Projected MMR Vaccination Coverage Among Two-Year-Olds in England (2019–2030)



Abbreviation: MMR = measles, mumps, and rubella

Figure 3. Projected Annual NHS and Caregiver Costs from Measles Outbreaks (2024–2030)



Abbreviation: NHS = National Health Service

Conclusions

- **Declining MMR coverage has already created an immunity gap that risks costly and preventable measles outbreaks. In this model, catch-up vaccination is cost-saving compared to outbreak management, as supported by UK evidence from the 2012/2013 Merseyside outbreak, where the total outbreak cost (£4.4M) far exceeded the cost of vaccinating the susceptible population (£0.18M).[9]**
- **This pattern is also consistent with evidence that productivity losses dominate measles societal costs in England (74% of total when patients and carers are both included).[8] If current trends continue, the NHS could face almost £80M in excess costs over the next six years.**
- **These findings underscore the urgency of strengthening vaccination programmes and implementing targeted catch-up campaigns to protect public health and reduce avoidable NHS spending.**

References

1. UK Health Security Agency. Risk assessment for measles resurgence in the UK. 2023. https://assets.publishing.service.gov.uk/media/64aff9448bc29f00132ccd07/risk-assessment-for-measles-resurgence-in-the-UK-2023.pdf
2. National Health Service England. Childhood vaccination coverage statistics, England, 2023-24. 2024. Childhood vaccination coverage statistics. August 26, 2025. https://digital.nhs.uk/data-and-information/publications/statistical/nhs-immunisation-statistics/england-2023-24
3. Office for National Statistics. Estimates for the population for England and Wales. https://ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/estimatesofthepopulationforenglandandwales
4. Amirthalingam G, Brown K. *National measles guidelines*. Vol. 6.0. 2024:60.
5. Public Health England. Measles cases in England: January to December 2018. https://gov.uk/government/publications/measles-mumps-and-rubella-laboratory-confirmed-cases-in-england-2018/measles-cases-in-england-january-to-december-2018
6. Office for National Statistics. Employment and employee types. https://ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes
7. UK Health Security Agency. *Measles: the green book,* chapter 21. 2013.
8. National Heath Service England. Childhood vaccination coverage statistics, England, 2023-24. 2024. Childhood vaccination coverage statistics. August 26, 2025.https://digital.nhs.uk/data-and-information/publications/statistical/nhs-immunisation-statistics/england-2023-24
9. Jones KC, et al. Unit costs of health and social care 2024 manual. 2025. https://kar.kent.ac.uk/id/eprint/109563
10. British National Formulary. BMJ Group and Pharmaceutical Press. https://medicinescomplete.com
11. Office for National Statistics. Average weekly earnings in Great Britain: April 2025. 2025. https://ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/averageweeklyearningsingreatbritain/april2025
12. Olivera Mesa D, et al. *Vaccine*. 2023;41(28):4129-37.

Disclosures

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