EE591

Impact of Flu Vaccine Shortage on the National Health Service (NHS) in England and Wales

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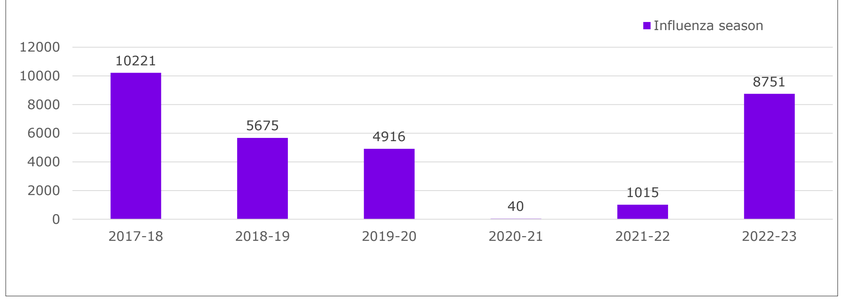
BACKGROUND

- Influenza, a seasonal viral infection causing respiratory symptoms, has also been associated with cardiovascular events including Myocardial Infarction and Stroke[1]. High influenza circulation puts pressure on health services through increased GP consultations and hospitalisations[2].
- Following a period of quiescence during the COVID-19 pandemic, influenza has begun recirculating in the UK resulting in GP consultations and hospital admissions (Figure 1)[3,4]
- Vaccination is an effective means of preventing influenza infection and mitigates the impact of influenza on individuals and the health service[5]
- Influenza vaccine availability is critical in preventing and managing seasonal influenza. This is particularly relevant in the current environment, where 7.7 million patients are on NHS waiting lists for elective care[6]. An increase in influenza related hospitalisations would further exacerbate this crisis.
- Flu vaccines are subject to seasonal issues and production timelines. Seasonal variations and manufacturing processes can lead to flu vaccine shortages and delays.
- Relying on a single supplier for flu vaccine provision poses risk if the supplier cannot meet the entire market demand[7].
- This study assesses the clinical and financial impact of a flu vaccine shortage on the National Health Service (NHS) and workforce productivity.

Figure 1: Incidence of Influenza Hospitalisations 2017-2022



RELEVANCE/IMPACT

Understanding the potential consequences of influenza vaccine shortages on the NHS will help policy makers and healthcare professionals devise strategies to safeguard public health by ensuring provision of a robust healthcare delivery for seasonal influenza vaccines.

METHODS

- A static decision-tree model was used to quantify changes in disease burden from influenza vaccine shortages in England and Wales.
- At-risk population included 9.5 million individuals aged 18-64 and 11.1 million aged 65+[8]. The model used UKHSA's 2021-22 season vaccine coverage rates of 53% for at-risk individuals aged 18-64 and 82% for those aged 65+, to calculate a full supply scenario[9].
- Influenza hospitalizations were calculated using age-stratified rates (defined as ICD10 codes J09, J10, and J11; primary & secondary diagnosis) in the general population from a longitudinal Hospital Episodic Statistics study conducted by the UK NHS over two seasons (2018–19, 2019–20)[10].
- Analysis included age-adjusted, influenza-related primary care and emergency department (ED) visits, hospitalizations, mortality data, and productivity loss, simulating the effects of reduced influenza vaccine supply over a season.
- 2022 NHS tariffs informed the associated costs[11].
- This analysis uses static model and the indirect impact of increased disease transmission due to supply shortages is not considered.

RESULTS

- The impact on healthcare system (Figure 2) and lost workforce productivity (Figure 3) is assessed in scenarios where vaccine supply is reduced by 20%, 40%, and 60% of the requirement.
- From a baseline of 749,836 cases, every 20% reduction in vaccine supply results in an approximately 12% increase for each measured outcome (Table 1); In absolute numbers, this is an increase of 93,772 influenza cases, 2,526 influenza-related ED visits, 1874 hospitalizations, 25,039 GP visits and 359,810 lost workdays for 20% reduction in vaccine supply.
- The modelled increases in healthcare utilisation have substantial financial consequences; Figure 4 shows the economic burden of a reduction in vaccine supply across the relevant healthcare metrics. Each 20% reduction in supply results in an additional £1,051,638 spent on GP visits.
- The total healthcare cost if vaccine supply was reduced by 40% would be £21,831,512.

Figure 2: Impact of influenza vaccine shortage on the healthcare system over one season

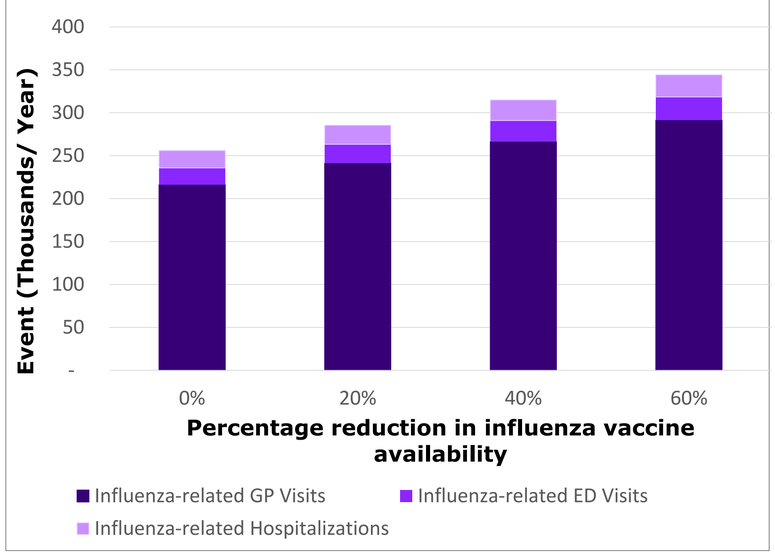


Figure 3: Impact of influenza vaccine shortage on productivity over one season

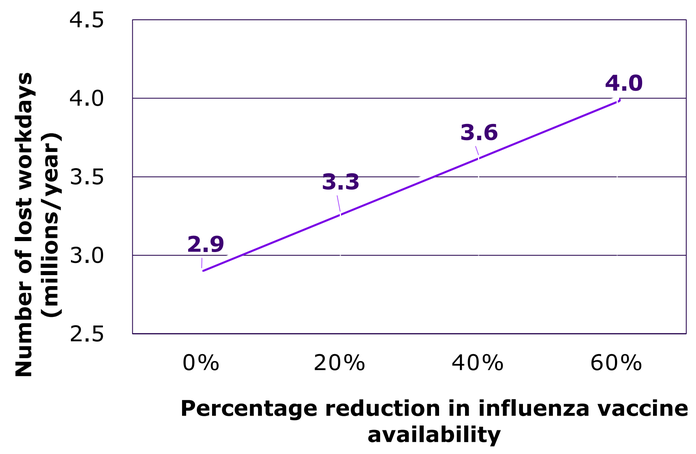


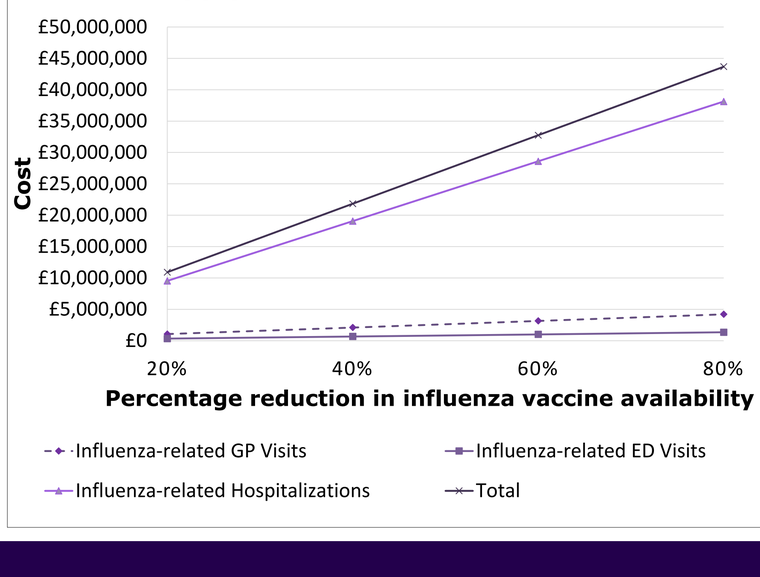
Table 1: Health and economic outcomes of influenza vaccine shortage

Outcome	Percentage reduction in vaccine availability				
	0%	20%	40%	60%	80%
Influenza Cases	749,836	843,608	937,380	1,031,152	1,124,924
Influenza-related GP Visits	216,223	241,262	266,302	291,342	316,381
Influenza-related ED Visits	19,546	22,072	24,598	27,124	29,650
Influenza-related Hospitalizations	20,241	22,115	23,989	25,863	27,737
Influenza-related Deaths	7,083	8,058	9,033	10,008	10,983
Lost Workforce Days	2,918,494	3,278,304	3,638,114	3,997,924	4,357,734

Table 4: Healthcare costs of reduced influenza vaccine supply

Outcome	Percentage reduction in vaccine availability			
	20%	40%	60%	80%
Influenza-related GP Visits	£1,051,638	£2,103,276	£3,154,914	£4,206,552
Influenza-related ED Visits	£335,958	£671,916	£1,007,874	£1,343,832
Influenza-related Hospitalizations	£9,528,160	£19,056,320	£28,584,480	£38,112,640
Total	£10,915,756	£21,831,512	£32,747,268	£43,663,024

Figure 4: Healthcare costs of reduced influenza vaccine supply



DISCUSSION

- **The findings demonstrate that a shortage in influenza vaccine supply has detrimental effects across the healthcare system.**
- **The study highlights the risks of relying on a single-supplier and the adverse impact of shortages on influenza incidence, healthcare utilisation, and workforce productivity.**
- **One limitation of our study is that the static model employed for the analysis doesn't account for the potential secondary effects of increased disease transmission in the event of a vaccine shortage. This may have resulted in a conservative estimation of the outcomes in such a situation.**

CONCLUSIONS

- A reliable vaccine supply through multi-supplier approach is critical for healthcare system resilience during influenza seasons.
- Research to understand factors that influence influenza vaccine purchasing decisions could inform procurement models to effectively mitigate the adverse impact of shortages.

REFERENCES
1. Macias AE, et al. *Vaccine* 2021;39(Suppl 1):A6–14; DOI: 10.1016/j.vaccine.2020.09.048 (Accessed 26.06.23); 2. ECDC. Factsheet about seasonal influenza. Available at: https://www.ecdc.europa.eu/en/seasonal-influenza/facts/factsheet (Accessed 26.06.23); 3. Gov.uk. Surveillance of influenza and other seasonal respiratory viruses in winter 2021 to 2022. Available at: https://www.gov.uk/government/statistics/annual-flu-reports/surveillance-of-influenza-and-other-seasonal-respiratory-viruses-in-winter-2021-to-2022(Accessed 26.06.23); 4. Gov.uk. National flu and COVID-19 surveillance data report. Available at: https://www.gov.uk/government/statistics/national-flu-and-covid-19-surveillance-reports-2022-to-2023-season (Accessed 26.06.23); 5. Five simple steps to protect against flu (who.int) (Accessed 26.06.23); 6. NHS England. Statistical Press Notice NHS referral to treatment (RTT) waiting times data July 2023. Available at: https://www.england.nhs.uk/statistics/wp-content/uploads/sites/2/2023/09/Jul23-RTT-SPN-publication-version-PDF-422K-01493.pdf (Accessed 05.11.2023); 7. Gov.uk. National flu immunisation programme 2023 to 2024 letter. Available at: https://www.gov.uk/government/publications/national-flu-immunisation-programme-plan/national-flu-immunisation-programme-2023-to-2024-letter (Accessed 20.08.2023); 9.Nealon J, et al. npj Vaccines (2022) 7:25; https://doi.org/10.1038/s41541-022-00444-6 (Accessed 26.06.23); 8. Gov.uk. Surveillance of influenza and other seasonal respiratory viruses in winter 2021 to 2022. Available at: https://www.gov.uk/government/statistics/annual-flu-reports/surveillance-of-influenza-and-other-seasonal-respiratory-viruses-in-winter-2021-to-2022(Accessed 21.08.23); 10. Coleman BL, et al. Influenza Other Respi Viruses. 2018; 12: 22–29. https://doi.org/10.1111/irv.12504 (Accessed 26.06.23); 11. Jones KC, et al. Unit Costs of Health and Social Care 2022 Manual. doi:10.22024/UniKent/01.02.100519 (Accessed 26.06.23).

DISCLOSURES: FA, HL, TP, GO and GC are employees of Sanofi at the conduct of this study and may hold shares and/or stock options in the company.

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