

Vaccination in pregnancy: the vaccine bit is easy, the behaviour is hard

Mohammad S Razai^{1,2} , Pippa Oakeshott² and Jo Parsons³

¹Primary Care Unit, Department of Public Health and Primary Care, University of Cambridge, Cambridge, CB2 0SR, UK

²St George's School of Health and Medical Sciences, Population Health Research Institute, City St George's University of London, London, SW17 0RE, UK

³Health Services Management Centre, School of Social Policy, University of Birmingham, Birmingham, B15 2RT, UK

Corresponding author: Mohammad S Razai. Email: msr37@cam.ac.uk

Behaviour is hard

We often assume that the most challenging part of healthcare innovation is developing the intervention – whether it is designing a vaccine, discovering a drug, or creating new technology. Once this is achieved, we celebrate it as a triumph and expect the rest to fall neatly into place. However, this overlooks the critical – and often more difficult – task of implementation. Our experience with maternal immunisations shows that developing the vaccine is only the beginning.

Evidence over many years has shown that uptake of maternal immunisations for pertussis/whooping cough, influenza and COVID-19 has consistently remained suboptimal.^{1,2} For example, in 2022 in the UK, uptake of vaccination during pregnancy was low: 51% for two doses of the COVID-19 vaccine, 61% for pertussis, and 30% for influenza.^{3,4} The recently added Respiratory Syncytial Virus vaccine also fits the historic trend of low maternal vaccination rates⁵, around 30% in England in September 2024.⁶ This has nothing to do with vaccines' necessity, effectiveness, or safety, nor with the vaccine technology. However, once the vaccine leaves the relative certainty and precision of the laboratory, it enters the messy and often unpredictable world of human behaviour – a world where there is a profusion of conflicting values, beliefs and uncertainties. Vaccines on the shelf or in a fridge cannot save lives or achieve public health objectives unless taken up by the intended population. But this critical stage may receive less attention and effort from scientists and policymakers than vaccine development.

We may need to harness the collective wisdom of psychology, sociology and the art of communication to move the needle on vaccination uptake. In modern free societies, vaccination cannot be mandated as if

updating software in a robot. Human agency, autonomy and the freedom to make choices – even those deemed reckless – must be respected.

We also operate in what sociologists Anthony Giddens and Ulrich Beck describe as 'risk societies',⁷ where the potential for large-scale catastrophes is increasing, yet the uncertainties of science have become more visible to the public.⁸ In such societies, individuals may lack an understanding of complex systems and technologies, relying instead on trust to navigate these uncertainties.⁷ Healthcare professionals, as relatively trusted figures,⁹ hold a unique privilege and responsibility to make 'informed choices' more accessible. Their recommendations are known to increase vaccine uptake during pregnancy.^{2,4}

However, this trust is not unshakeable. It can be eroded by systemic factors such as individual experiences within healthcare systems or by factors that disrupt or distort communication, understanding or decision-making within social systems.¹⁰ This includes myths and misinformation.^{2,10,11} Misinformation can be disruptive because it fosters confusion, uncertainty and anxiety, leading to inaction.¹² Tackling misinformation and rumours, especially when tailored to specific and individual concerns, is a labour-intensive process that requires healthcare professionals to be a good communicator, debunking myths and to be an information maven (gathering and sharing knowledge, and influencing others through expertise and insights)¹³ aware of the kind of misinformation swirling around in the community.

It requires healthcare professionals to counsel individuals exposed to misinformation via social media, engaging in dialogue to dispel myths and address misconceptions.⁴ This is hard work. Even when knowledge exists, it does not always translate into action – a phenomenon known as the 'know-do

gap'. This is a central concern in implementation science. There is also an implicit assumption that the knowledge already exists. We might believe that healthcare professionals are equipped to handle vaccine communication. This is not always the case.^{11,14} Even midwives may feel uncertain about the evidence for maternal vaccines or unclear about how and when to discuss vaccination.¹⁴ Other healthcare professionals, such as GPs, may not see it as part of their role, particularly with burdening workloads and competing priorities.^{14,15}

Moving the needle on vaccination

To tackle these challenges, the system needs to think laterally. For example, borrowing from urban planning, just as cities are designed to guide behaviour (e.g. pedestrian-friendly streets), vaccination programmes should design systems to make the 'right choice' the easiest and most accessible. Behavioural scientists Richard Thaler and Cass Sunstein coined the term 'choice architecture' to describe this, showing how small tweaks to the environment can guide decisions.¹⁶ For instance, integrating vaccinations into routine antenatal care and ensuring vaccines are readily available at convenient locations can remove barriers to inaction.¹⁵ Behavioural nudges could also increase uptake, such as making vaccination the default option unless declined. Even subtle visual cues can make a difference. In Copenhagen, the city painted green footprints leading to waste bins in public parks, resulting in¹⁷ a 46% reduction in littering, showing the power of environmental cues in influencing behaviour.¹⁸ Other instances where subtle environmental cues made a difference are even more fascinating, like the problem of spillage in men's toilets in Schiphol airport in Amsterdam. The airport authorities etched a small image of a housefly into the urinals.¹⁶ The economist Aad Kieboom, who came up with the idea, believed that fly-in-the-urinal 'improves the aim... If a man sees a fly, he aims at it'.¹⁶ This tiny, unexpected visual cue captured attention and subtly guided behaviour, reducing spillage by an astonishing 80%.¹⁶ No rules were imposed, no penalties threatened; instead, a playful tweak in the environment altered actions almost effortlessly.

It is natural to search for a single 'silver bullet' solution, but behaviour change often results from the accumulation of small, deliberate actions. These incremental changes can create a tipping point for big effects.¹³ For example, making vaccination the social norm can have a powerful influence. If pregnant

women see their peers getting vaccinated, they are more likely to do the same.^{11,14} Social cues and peer effects are critical drivers of behaviour, and context can also amplify social norms. In a now-famous experiment, hotel guests were more likely to reuse towels when signs informed them that the majority of previous guests had done so.¹⁹ People look to the behaviour of others to guide their own.

Healthcare systems must also invest in creating the time, space and resources for healthcare professionals to discuss vaccination confidently. Vaccination training for midwives, clear guidelines, access to accurate and timely information and opportunities to incorporate vaccinations into existing appointments can empower professionals to recommend vaccines effectively.^{2,4}

Leventhal's research on tetanus vaccinations at Yale University in the 1960s provides a compelling example of the challenges in translating knowledge into action, even with well-designed public health campaigns.²⁰ Students received informational booklets, either with high-fear content (vividly detailing the dangers of tetanus with dramatic language and photographs) or low-fear content (toned-down descriptions without imagery). While those exposed to the high-fear booklet expressed greater concern about tetanus and stronger intentions to get vaccinated, only 3% of participants ultimately sought the free vaccine offered on campus. Although fear increased the intention to take up the vaccine, it did not change behaviour. The key insight came from a follow-up iteration of the study: a simple addition of a campus map with the health centre's location and clinic hours increased uptake to 28%, regardless of the booklet's content.²⁰

The lesson from Leventhal's study remains highly relevant. Providing information, even when compelling and fear-inducing, often does not lead to behaviour change. This is also confirmed in more recent studies that show that increased risk messages do not change vaccination behaviour.²¹ The crucial element is that public health campaigns must transform abstract messages into practical and personal considerations, including logistical details – such as clinic locations or appointment times – to prompt individuals to consider how such actions fit into their daily routines.¹³ In Leventhal's study, the students most likely did not need the location map. However, this subtle shift made vaccination a tangible, immediate task rather than an abstract goal.¹³ This shows that small yet targeted adjustments in how information is presented and access is facilitated can yield disproportionately large outcomes.

Multidisciplinary thinking

Vaccination programmes must move beyond the laboratory and into the lived realities of pregnant women, where trust, misinformation, systemic barriers and social norms converge. The challenging work begins here. Many public health interventions falter because they attempt to address a single factor in isolation, neglecting the complex and interacting web of drivers that influence behaviour. As David Epstein argues in *Range*,²² solving multifaceted problems requires broad, multidisciplinary thinking that connects seemingly unrelated ideas.²² A narrow focus may miss critical nuances, whereas a more integrative approach – drawing on behavioural science, sociology and public health – can uncover novel solutions.

Declarations

Competing Interests: None declared.

Funding: MSR is an NIHR Clinical Lecturer in Primary Care. MSR and PO are co-investigators on a Programme Development Grant (NIHR 207562) on vaccination in pregnancy. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health and Social Care.

Ethics approval: Not applicable.

Guarantor: MSR.

Contributorship: MSR conceived the article and drafted the original manuscript. PO and JP contributed to the development of the concepts and to revisions. All authors reviewed and approved the final version of the article.

Provenance: Not commissioned; editorial review.

ORCID iD: Mohammad S Razai  <https://orcid.org/0000-0002-6671-5557>

References

1. Razai MS, Mansour R, Goldsmith LP, Freeman S, Mason-Apps C, Ravindran P, et al. Interventions to increase vaccination against COVID-19, influenza and pertussis during pregnancy: a systematic review and meta-analysis. *J Travel Med* 2023; 30: taad138.
2. Razai MS, Mansour R, Ravindran K, Freeman S, Mason-Apps C, Morris J, et al. Facilitators and barriers to vaccination uptake in pregnancy: a qualitative systematic review. *PLoS One* 2023; 19: e0298407.
3. UK Health Security Agency. Prenatal pertussis vaccination coverage in England from July to September 2022, 2023. See <https://www.gov.uk/government/publications/pertussis-immunisation-in-pregnancy-vaccine-coverage-estimates-in-england-october-2013-to-march-2014/prenatal-pertussis-vaccination-coverage-in-england-from-july-to-september-2022> (last checked 9 May 2025).
4. Razai MS, Mansour R, Goldsmith L, Freeman S, Mason-Apps C, Ravindran P, et al. Interventions to increase vaccination against COVID-19, influenza and pertussis during pregnancy: a systematic review and meta-analysis. *J Travel Med* 2023; 30: taad138.
5. Razzaghi H, Garacci E, Kahn KE, Lindley MC, Jones JM, Stokley S, et al. Maternal respiratory syncytial virus vaccination and receipt of respiratory syncytial virus antibody (Nirsevimab) by infants aged 8 months – United States, April 2024. *MMWR Morb Mortal Wkly Rep* 2024; 73: 837–843.
6. UKHSA. RSV maternal vaccination coverage in England: September 2024. See www.gov.uk/government/publications/rsv-immunisation-for-older-adults-and-pregnant-women-vaccine-coverage-in-england/rsv-maternal-vaccination-coverage-in-england-september-2024 (last checked 9 May 2025).
7. Giddens A. Risk and responsibility. *Mod L Rev* 1999; 62: 1.
8. Baxter J. Health and environmental risk. In: Kobayashi A, ed. *International Encyclopedia of Human Geography* (Second Edition). Oxford: Elsevier, 2020: 303–307.
9. Husain F, Powys VR, White E, Jones R, Goldsmith LP, Heath PT, et al. COVID-19 vaccination uptake in 441 socially and ethnically diverse pregnant women. *PLoS One* 2022; 17: e0271834.
10. Razai MS, Osama T, McKechnie DG and Majeed AM. Covid-19 vaccine hesitancy among ethnic minority groups. *BMJ* 2021; 372: n513.
11. Razai MS, Ussher M, Goldsmith L, Hargreaves S and Oakeshott P. Navigating vaccination in pregnancy: qualitative study in 21 ethnically diverse pregnant women. *PLoS One* 2025; 20: e0310823.
12. Razai MS, Oakeshott P, Esmail A, Wiysonge CS, Viswanath K and Mills MC. COVID-19 vaccine hesitancy: the five Cs to tackle behavioural and sociodemographic factors. *J R Soc Med* 2021; 114: 295–298.
13. Gladwell M. *The Tipping Point: How Little Things can Make a Big Difference*. New York: Little, Brown, 2006.
14. Berendes S, Mounier-Jack S, Ojo-Aromokudu O, Ivory A, Tucker JD, Larson HJ, et al. “Figuring stuff out myself” – a qualitative study on maternal vaccination in socially and ethnically diverse areas in England. *BMC Public Health* 2023; 23: 1408.
15. Razai MS, Hargreaves S and Oakeshott P. Challenges and opportunities of vaccination during pregnancy: perspectives of 20 healthcare professionals. *J Public Health Policy* 2025. doi: 10.1057/s41271-025-00548-y
16. Thaler RH and Sunstein CR. *Nudge: Improving Decisions about Health, Wealth, and Happiness*. New York: Penguin, 2009.
17. Hansen PG and Jespersen AM. Nudge and the manipulation of choice: a framework for the responsible use of the nudge approach to behaviour change in public policy. *Eur J Risk Regul* 2013; 4: 3–28.

18. Footprint art on pavements to tackle litter problem. BBC. 2013. See www.bbc.co.uk/news/uk-wales-21769616 (last checked 9 May 2025).
19. Goldstein NJ, Cialdini RB and Griskevicius V. A room with a viewpoint: using social norms to motivate environmental conservation in hotels. *J Cons Res* 2008; 35: 472–482.
20. Leventhal H, Singer R and Jones S. Effects of fear and specificity of recommendation upon attitudes and behavior. *J Pers Soc Psychol* 1965; 2: 20.
21. Parsons JE, Newby KV and French DP. Do interventions containing risk messages increase risk appraisal and the subsequent vaccination intentions and uptake? A systematic review and meta-analysis. *Br J Health Psychol* 2018; 23: 1084–1106.
22. Epstein D. *Range: Why Generalists Triumph in a Specialized World*. New York: Penguin, 2021.