S1 Supplementary Material: Interview guides

The interviews were guided by a series of questions that were sent to Experts prior to the call. Questions differed slightly for DOH/MOH staff versus WHO/ECDC staff. Calls did not strictly follow the questions and interviewees were encouraged to elaborate and raise other issues, as appropriate.

Proposed questions for interviews with jurisdictions/country MOH staff:

Past pandemic plans:

1. What was the strategic objective of vaccine use prior to/during the 2009 pandemic? ie transmission reduction, mitigation, protect the health workforce (or multiple aims?)
2. Given (1), was there a prioritisation schedule prior to/during the 2009 pandemic? If yes,
    a. Was it followed?
        i. If not, why not? E.g. change in strategy needed in real time, issues with availability, lack of public/practitioner engagement
    b. Was prioritization ranked?
    c. Was prioritization dependent on any factors associated with risk; e.g. if determined that elderly would not be affected, were the no longer a priority group?
    d. Was there a rationale for prioritization?
    e. Was it evaluated?
        i. Did that result in specific changes at the time, or in subsequent preparedness planning?
        ii. What worked best?
        iii. What didn't work?

Current plans:

3. Is there a new prioritization plan? Or is one being planned?
    a. Is it a ranked list?
    b. Is there a rationale for the ranking?
    c. Were practical considerations taken into account?
    d. Were these recommendations evidence based? i.e. based on published references, simulations, ranking of the materials, modelling, etc.
    e. Does the plan include a definition for essential personnel?
    f. Who were the key stakeholders that contributed to the list?
    g. Has a human ethics committee been involved in the development of the list?
4. Has the country ever prioritised delivery of seasonal vaccine?
    a. E.g. by age, or risk group?
5. Are there any specific documents published by your DOH that you can share or we should be aware of?
6. Availability for a follow-up call with ADOH

Proposed questions for interviews with ECDC/WHO:

Pre 2009 preparedness planning:

1. Prior to 2009, did WHO/ECDC have a suggested prioritisation schedule for vaccination?
    a. How did it relate to the strategic objectives of vaccination?
    b. Was prioritization ranked?
    c. Was there a rationale for prioritization?

Evolution of recommendations during pandemic response:

2. How did evolving experience of the 2009 pandemic influence these recommendations?
    a. Did the strategic objective of immunisation change?
    b. Did the priority groups change?
    c. What committees/stakeholders were involved in reviewing evidence and making recommendations?
    d. Was the prioritization evaluated? (formally or informally)
        i. What were the outcomes?

Current pandemic plan:

3. Is there a new set of recommendations for prioritising groups for vaccination? Or is one being planned?
    a. What are the strategic objectives of immunisation as part of the response?
    b. Is there a ranked list of groups for immunisation?
    c. Is there a rationale for the ranking?
    d. Were practical considerations taken into account?
    e. Were these recommendations evidence based? i.e. based on published references, simulations, ranking of the materials, etc.
    f. Does the plan include a definition for essential personnel?
    g. Who were the key stakeholders that contributed to the list?
    h. Has a human ethics committee been involved in the development of the list?
4. Are there any specific documents that we should be aware of?
5. Availability for a follow-up call with ADOH

S2 Supplementary material: mathematical model

S2.1 Model of influenza transmission

The transmission model is based on a classic susceptible-exposed-infectious-recovered (SEIR) paradigm. All individuals are assumed fully susceptible (S) at the outset of the epidemic, and vulnerable to acquiring infection (E) upon contact with an infectious (I) case. Once recovered (R), individuals are assumed to be fully resistant to reinfection. At the time the simulations commence, there are already 100 prevalent infections in the population. There are 50 exposed individuals and 50 infectious individuals, distributed across the population strata in proportion to each stratum's population size.

The model incorporates a dynamic "contact" label, applied to a fixed number of individuals drawn from the whole population each time a new infectious case appears. We define these contacts, based on the findings of sociological studies, as those people who have been sufficiently close to an infected individual to conceivable contract infection. Only contacts of an infectious case may proceed to the exposed and infectious classes, however the majority of contacts escape unscathed, returning to their original state within 72 hours of exposure.

This model has been described in detail in previous publications [7, 8]; here we describe the key modifications and features that were developed and/or used in this study.

S2.1.1 Population stratification and mixing

The Australian population is stratified into 23 distinct sub-groups, agreed in consultation with the Office of Health Protection, with sizes based on June 2014 statistics from the Australian Bureau of Statistics. Population sub-groups are defined in terms of age groups and by Indigenous status, with further sub-categories defined in terms of location (urban/remote), risk factors (pregnant women and adults with comorbidities), and essential workforce (see Table S1).

Each sub-group can be targeted independently for vaccination; subsequent seroconversion (two weeks post-vaccination) reduces susceptibility to infection, but does not modify the clinical course of disease in the case that a vaccinated individual becomes infected.

In previous iterations of this model, the entire population has mixed homogeneously; population sub-groups were defined in order to support differential risk factors, targeted interventions, and reporting of burden in sub-populations. In this version of the model we incorporated inhomogeneous mixing to facilitate (a) intensive mixing between young children; and (b) intensive mixing between indigenous groups. We assumed that 67% of the contacts of primary-school children were also primary-school children, and that 80% of the contacts of an Indigenous person were also Indigenous.

S2.1.2 Differential risk factors

We have previously defined the risks of ICU admission and death for hospitalised cases *in the absence of treatment*; these values are shown in Table S2. These values were obtained

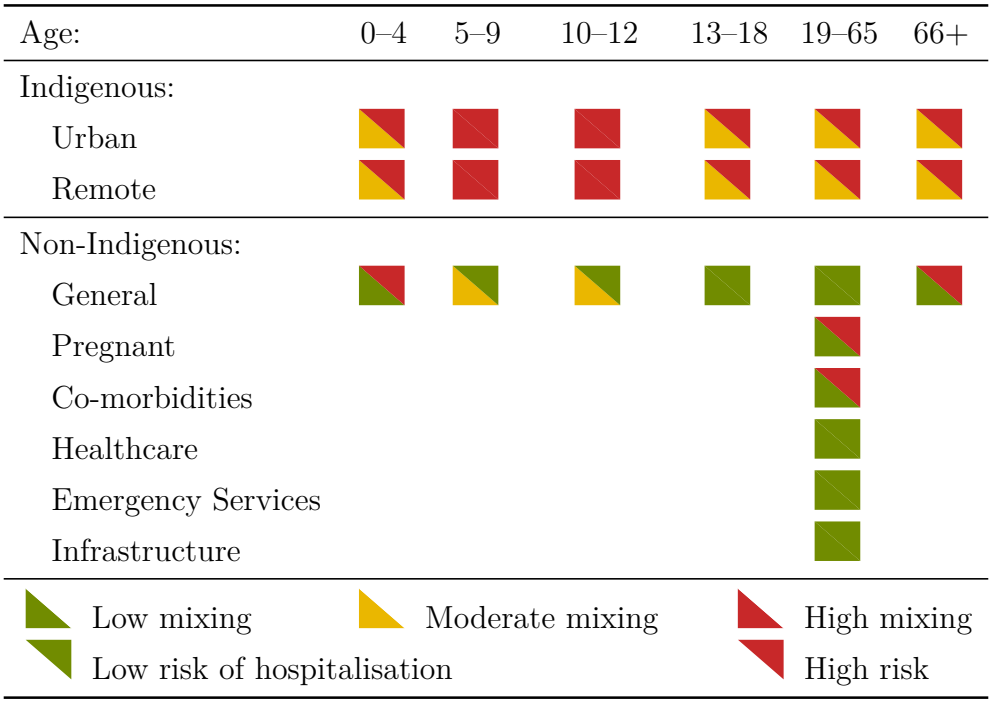

Table S1: Population strata, showing variation in mixing and in risk of severe disease.

	High-Risk	Children	Others
ICU admission	39.5%	14.4%	14.4%
Deaths (in ICU)	94.9%	46.1%	46.1%

Table S2: Risks of ICU admission and death, given hospital admission.

by using risk ratios for total influenza-related complications — 0.74 for otherwise healthy patients and 0.37 for high-risk patients [2] — and calculating the counter-factual risks of ICU admission and death.

We have assumed that (a) all Indigenous strata have the same risks as the "High-Risk" group in Table S2; (b) pregnant women and other adults with co-morbidities have the same risks as the "High-Risk" group in Table S2; and (c) that all other strata (non-Indigenous, no co-morbidities) have the same risks as the "Children" and "Others" groups in Table S2.

We have also assumed that all Indigenous strata, pregnant women, and other adults with co-morbidities, are five times more likely to require hospitalisation, given infection, than the general population.

S2.1.3 Vaccination

The model simulations consider a vaccine that becomes available at 6 weeks after the start of the pandemic, and that batches of 3.4 million doses are delivered at 6-week

intervals starting from this time. Consistent with previous studies, we assume that:

- 5% of vaccine doses are "wasted" and cannot be used to immunise individuals.
- 30% of vaccinated individuals do not seroconvert and receive no benefit from vaccination.
- The maximum rate of vaccine provision is 750,00 doses per week.

In this model, either one dose or two doses are required to confer full protection (i.e., to transition to the S_V compartment) and this requirement can differ for each stratum. In order to represent individuals with partial protection, by virtue having received one dose when two doses are required for full protection, we introduced a new compartment S_{PV}. To confer complete protection to such individuals, two doses are simultaneously consumed from the vaccine stockpile and the individual is moved to the S_{PV} compartment, which has a mean residence time of 2 weeks (after which they transition to S_V).

S2.2 Targeted vaccination strategies

We investigated the impact of two vaccination strategies that prioritised different sub-groups for vaccination. The **Direct Protection** strategy prioritised the provision of vaccine to sub-groups with a disproportionate risk of severe disease, and involved:

1. Provision of vaccine to 300,000 essential services workers, distributed evenly across healthcare, emergency services, and infrastructure.
2. Provision of vaccine to all High-Risk groups, until an intermediate coverage target of 25% was achieved in these groups.
3. Provision of vaccine to all groups, until an ultimate coverage target of 50% in High-Risk groups and 25% in all other groups was achieved.

The **Indirect Protection** strategy prioritised the provision of vaccine to sub-groups that drive the transmission, and involved:

1. Provision of vaccine to 300,000 essential services workers, distributed evenly across healthcare, emergency services, and infrastructure.
2. Provision of vaccine to primary-school children (aged 5–12), until a coverage target of 50% was achieved in these groups.
3. Provision of vaccine to all groups, until an ultimate coverage target of 50% in High-Risk groups and 25% in all other groups was achieved.

Setting	Capacity
ICU	1,000 beds (mean length of stay: 10 days)
Ward	27,600 beds (mean length of stay: 5 days)
ED	8,900 consultations per day
GP	171,000 consultations per day

Table S3: The capacity constraints for each healthcare setting.

S2.3 Measures of impact

Model outputs include the rate of infection, disease, severe disease, and death, for each population sub-group. By comparing these results against the same scenarios, but in the absence of any vaccine, we reported the following measures of population impact:

- Reduction in infections;
- Reduction in clinical presentations;
- Reduction in hospital (general ward) admissions;
- Reduction in ICU admissions; and
- Reduction in observed deaths (in ICUs);

The transmission model described above accounts for the spread of pandemic influenza in the Australian population and the population-level effects of vaccination. But it does not model the clinical pathways and inpatient capacities of the Australian healthcare system. These aspects of the pandemic influenza scenarios are instead captured by a separate model, which uses daily incidence of mild and severe presentations (as generated by the transmission model) to determine the available capabilities for inpatient admission, outpatient consultation, and patient treatment, and reports outcomes such as the peak and excess burden on each healthcare setting [7].

For each pandemic scenario, the transmission model reports the daily number of mild and severe presentations, where "severe cases" are those that will require hospitalisation. All mild presentations are assumed to occur in outpatient settings (i.e., general practice clinics and hospital emergency departments). In addition, we assume that some fraction of the severe cases presents to an outpatient facility prior to requiring hospitalisation.

Patients are admitted to general wards with a mean length of stay of 5 days, and are admitted to ICUs with a mean length of stay of 10 days. Therefore, it is the prevalence of cases requiring hospitalisation that determines the available ward and ICU bed capacities for new admissions. The capacity constraints for each healthcare setting are shown in Table S3.

Transmission	R_0	Clinical Severity	η	Mean α_m	Mean CAR
Low	1.05–1.20	High	10^{-2}-10^{-1}	29.8%	5.7%
Medium	1.20–1.40	Moderate	10^{-3}-10^{-2}	11.6%	4.8%
High	1.40–1.70	High	10^{-2}-10^{-1}	29.8%	17.1%

Table S4: Pandemic influenza scenarios; note that low-transmissibility represents low-level epidemic activity rather than "sporadic cases". The mean presenting proportion (α_m) and the mean Clinical Attack Rate (CAR) summarise some of the key differences between these scenarios.

S2.4 Pandemic influenza scenarios

As per previous consultancies for the Commonwealth Office of Health Protection [7] and as used in the Australian Health Management Plan for Pandemic Influenza [1], pandemic scenarios were classified by pandemic impact. This comprises both transmission (R_0) and clinical severity (η, the proportion of (adult) infections that are sufficiently severe to require hospitalisation), as summarised in Table S4.

We allowed the proportion of adult infections that require hospitalisation to vary from 1 in 1,000 ($\eta = 10^{-3}$, moderate clinical severity) to 1 in 10 ($\eta = 10^{-1}$, high clinical severity). Within each scenario, uncertainty on the time-course of the epidemic, effectiveness of vaccination, and other biological and epidemiological co-variates was accounted for through the use of Latin Hypercube Sampling, in which 10,000 simulations of the model were run, each with randomly assigned parameterisations [7]. For example, the proportion α_m of all infections that "present" (i.e., are visible in the health system) was determined through a combination of the transmissibility (R_0) and the clinical severity (η), and varied from 5% to 75%.

S2.5 Supplementary figures

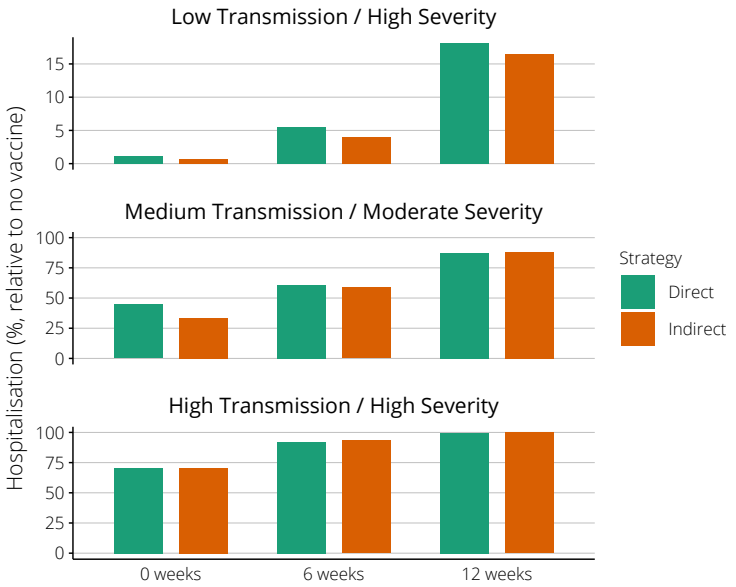

Figure S1: The effect of vaccine availability on vaccine impact. The greatest impact is observed when vaccine is immediately available ("0 weeks"), but the relative impact of a 6-week and a 12-week delay vary across these pandemic scenarios. Note that the y-axis scale for the Low Transmission / High Severity scenario is markedly different from that of the other scenarios.

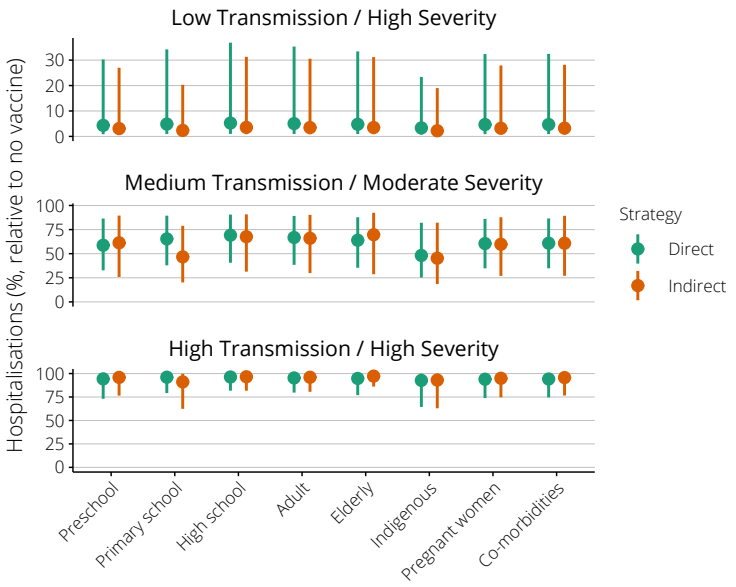

Figure S2: The hospital admissions as a result of each vaccination strategy, shown for population sub-groups as median estimates (points) and the 5th and 95th percentiles (lines). Note that the y-axis scale for the Low Transmission / High Severity scenario is markedly different from that of the other scenarios.

S2.6 Modifications to suit COVID-19

The model described here, which incorporated a number assumptions regarding pandemic influenza, was subsequently tailored to COVID-19 to inform the COVID-19 pandemic response in Australia [9]. This involved the following modifications:

1. Increasing the latent period to 3.2 days, assuming 2 days of pre-symptomatic transmission before completion of incubation period, based on estimates from Ganyani et al. [3] and Tindal et al. [11].

2. Increasing the infectious period to 9.68 days, based on a doubling time of 6.4 days in Wuhan, China [12] and an incubation period of 5.2 days [4, 6].

3. A higher value for R_0 than the high severity scenario used here (1.4 to 1.7), based on the latent and infectious periods above, and a doubling time of 6.4 days.

Further modifications to this model are required to consider COVID-19 vaccination:

1. The age-specific hospitalisation and mortality rates should be altered to reflect country-specific values for COVID-19.

2. Where relevant to the local context, contact rates should be reduced to reflect population compliance with physical distancing measures [5, 10].

3. The vaccine effectiveness estimate would need to be updated to reflect candidate COVID-19 vaccine estimates. Recently-published estimates for several candidate vaccines range from 70% to 95%, and it appears likely that 2 doses will be required.

4. Our pandemic scenarios considered a vaccine that became available soon after the onset of an epidemic wave in a fully-susceptible population. For countries that have successfully limited local transmission of COVID-19 to date, these timelines remain relevant because the majority of the population in these countries remain susceptible to COVID-19. For countries that have experienced substantial local transmission of COVID-19, and where a substantial proportion of the population are likely to have some degree of protective immunity, the initial model population state should be adapted accordingly.

S2.7 References

[1] Department of Health. Australian Health Management Plan for Pandemic Influenza. Technical report, Australian Government, 2014.

[2] M. E. Falagas, P. K. Koletsi, E. K. Vouloumanou, P. I. Rafailidis, A. M. Kapaskelis, and J. Rello. Effectiveness and safety of neuraminidase inhibitors in reducing influenza complications: a meta-analysis of randomized controlled trials. *Journal of Antimicrobial Chemotherapy*, 65(7):1330–1346, May 2010.

[3] Tapiwa Ganyani, Cécile Kremer, Dongxuan Chen, Andrea Torneri, Christel Faes, Jacco Wallinga, and Niel Hens. Estimating the generation interval for coronavirus disease (COVID-19) based on symptom onset data, March 2020. *Eurosurveillance*, 25(17), 2020.

[4] Stephen A. Lauer, Kyra H. Grantz, Qifang Bi, Forrest K. Jones, Qulu Zheng, Hannah R. Meredith, Andrew S. Azman, Nicholas G. Reich, and Justin Lessler. The incubation period of coronavirus disease 2019 (covid-19) from publicly reported confirmed cases: Estimation and application. *Annals of Internal Medicine*, 172(9):577–582, 2020.

[5] Julie Leask and Claire Hooker. How risk communication could have reduced controversy about school closures in Australia during the COVID-19 pandemic. *Public Health Research & Practice*, 30(2):e3022007, 2020.

[6] Qun Li, Xuhua Guan, Peng Wu, Xiaoye Wang, Lei Zhou, Yeqing Tong, Ruiqi Ren, Kathy S.M. Leung, Eric H.Y. Lau, Jessica Y. Wong, Xuesen Xing, Nijuan Xiang, Yang Wu, Chao Li, Qi Chen, Dan Li, Tian Liu, Jing Zhao, Man Liu, Wenxiao Tu, Chuding Chen, Lianmei Jin, Rui Yang, Qi Wang, Suhua Zhou, Rui Wang, Hui Liu, Yinbo Luo, Yuan Liu, Ge Shao, Huan Li, Zhongfa Tao, Yang Yang, Zhiqiang Deng, Boxi Liu, Zhitao Ma, Yanping Zhang, Guoqing Shi, Tommy T.Y. Lam, Joseph T. Wu, George F. Gao, Benjamin J. Cowling, Bo Yang, Gabriel M. Leung, and Zijian

Feng. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *New England Journal of Medicine*, 382(13):1199–1207, 2020.

[7] Robert Moss, James M. McCaw, Allen C. Cheng, Aeron C. Hurt, and Jodie McVernon. Reducing disease burden in an influenza pandemic by targeted delivery of neuraminidase inhibitors: mathematical models in the Australian context. *BMC Infectious Diseases*, 16(1):552, October 2016.

[8] Robert Moss, James M. McCaw, and Jodie McVernon. Diagnosis and antiviral intervention strategies for mitigating an influenza epidemic. *PLOS ONE*, 6(2):e14505, February 2011.

[9] Robert Moss, James Wood, Damien Brown, Freya Shearer, Andrew Black, Allen Cheng, James McCaw, and Jodie McVernon. Coronavirus Disease Model to Inform Transmission Reducing Measures and Health System Preparedness, Australia. *Emerg Infect Dis*, 12(26), 2020.

[10] Holly Seale, Anita E. Heywood, Julie Leask, Meru Sheel, Susan Thomas, David N. Durrheim, Katarzyna Bolsewicz, and Rajneesh Kaur. COVID-19 is rapidly changing: Examining public perceptions and behaviors in response to this evolving pandemic. *PLOS ONE*, 15(6):e0235112, 2020.

[11] Lauren C Tindale, Jessica E Stockdale, Michelle Coombe, Emma S Garlock, Wing Yin Venus Lau, Manu Saraswat, Louxin Zhang, Dongxuan Chen, Jacco Wallinga, and Caroline Colijn. Evidence for transmission of COVID-19 prior to symptom onset. *eLife*, 9:e57149, 2020.

[12] Joseph T. Wu, Kathy Leung, and Gabriel M. Leung. Nowcasting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study. *The Lancet*, 395:689–697, 2020.

S0 Supplementary material: Experience of pandemic vaccine use in 2009

Multinational Level

Title of source document	Summary	Issues identified	Lessons learnt
2009 Influenza A/H1N1 Mass Vaccination Strategy: A Multinational Comparison[32]	Multinational review of vaccination strategies in the 2009 pandemic published by the Canadian National Collaborating Centre for Infectious Diseases (methodology unclear but provides information on countries including Australia, Canada, France, Italy, Greece, Korea, Maldives, Sweden, UK and US).	Difficulties in obtaining accurate estimates of number of individuals within priority groups/ subgroups, and number of people within each group intending to get the vaccine. Canada, Singapore[33] and Mexico[34] reported vaccination intention rates of between 69-80%. However, intention rates were not representative of actual vaccine uptake, which ranged from 4% (across all target groups) in Italy[35] to 45% in Canada. In countries with low vaccine uptake, reported reasons for vaccine refusal consistently and overwhelmingly included concerns regarding vaccine safety and efficacy. Previous acceptance of seasonal influenza vaccination was strongly correlated with pandemic vaccine acceptance in health care workers.[36,37]	Having well-defined priority groups is not useful unless people within the groups are willing to be vaccinated – need for education, communication and better understanding of the public's perception of risk. Decisions regarding goals of the vaccination program should be made before priority groups are assigned. Priority groups should be reevaluated during the pandemic with changes made, if necessary, based on epidemiological data.
European Commission Assessment Report on EU-wide Pandemic Vaccine Strategies[38]	Survey of 27 member countries and three European Free Trade Association countries regarding vaccination strategies in the 2009 pandemic and experiences in implementing.	11 out of 29 countries reported altering the goals/objectives of their pandemic vaccination strategy during the course of the pandemic. The main reasons reported for change were to protect vulnerable/at risk groups and maintain health care services (more specific detail not provided). The major factors influencing change were reported to be the clearer picture regarding	Importance of early access to epidemiological and surveillance information. Importance of finding ways to improve uptake in priority groups – particular importance of ensuring high uptake among HCWs to maintain both health

		groups at risk for serious infections, transmissibility and severity. Most countries (17-19/20, depending on the target group) stated that they fell short of their national vaccination goals for health care workers (HCWs), pregnant women and people with underlying chronic diseases (no data provided on actual coverage). Of countries that reported difficulties in achieving vaccine uptake goals, most attributed this to scepticism and/or limited interest among HCWs (21/21) and the general population (20/21), as well as the moderate nature of the pandemic and concern over the safety of the vaccine (18/20). The four countries that reported successfully meeting their vaccine uptake goals cited reasons including: universal/free vaccination, good seasonal influenza vaccine uptake, positive public attitudes towards authorities and vaccination, severity of first cases, early access to vaccine, joint key messages from authorities, and transparency of process.	care services and confidence of general population in vaccination.
Did pandemic preparedness aid the response to pandemic (H1N1) 2009? A qualitative analysis in	Qualitative review of 7 randomly-selected countries from within WHO European Region (Armenia, Bosnia and Herzegovina, Denmark, Germany, Portugal,	All countries (number not specified) with plans which stated that the entire country would be vaccinated modified their strategies to vaccinate only those groups at risk of severe disease once it was established that the pandemic was milder than had been expected.	Lack of flexibility in pandemic plans limited their practical relevance to a milder pandemic scenario (unclear what actual impact was given that all

seven countries within the WHO European Region[39]	Switzerland, Uzbekistan) to evaluate pandemic preparedness activities before the 2009 pandemic compared with subsequent pandemic responses.		countries reported having modified their plans).
Main operational lessons learnt from the WHO Pandemic Influenza A(H1N1) Vaccine Deployment Initiative: Report of a WHO Meeting held in Geneva, Switzerland, 13–15 December 2010[40]	Report from WHO meeting attended by representatives of governments, international organisations and vaccine manufacturers. Meeting objectives included reviewing the issues and processes involved in pandemic vaccine deployment in the 2009 pandemic.	In the WHO European region, vaccine uptake in target groups varied widely (4-88%) among the 41 countries that deployed the vaccine. In the WHO region of the Americas, vaccine uptake in target groups was generally high but lower in pregnant women (in some countries due to physicians refusing to recommend the vaccine in this group).	
Lessons learnt from pandemic A(H1N1) 2009 influenza vaccination: Highlights of a European workshop in Brussels (22 March 2010)[41]	Report from workshop on vaccination in the 2009 pandemic organised by the Belgian Medicine Agency and the Belgian Inter-Ministers Influenza Cell. Participants included representatives from the European Medicines Agency, WHO, European Commission, European Centre for Disease Prevention and Control and seven European countries (Belgium, Germany,	In spite of international recommendations (WHO, ECDC, EC) target groups for vaccination differed across the seven countries and evolved during the pandemic, according to disease burden in specific groups and vaccine availability. Some countries had planned to vaccinate their entire populations but changed their strategy due to the mild nature of the pandemic, with priority groups targeted first instead in a stepwise fashion as recommended by the WHO. Other countries vaccinated a larger population than planned, using a single dose rather than the two doses initially thought to be required. Healthy children were targeted in the second phase of the campaign in 4/7	Variations in priority target groups for vaccination across countries and over time impaired public confidence: decision-making process for the prioritisation of target groups should be improved, or at least be made more transparent. Important to determine how best to convince target groups to get vaccinated when they feel at low risk and lack confidence in the vaccines.

	Hungary, Italy, Netherlands, Sweden, UK).	countries (as recommended by WHO); caretakers/contacts of infants and/or high risk groups were targeted in 4/7 countries. All countries prioritised patients with underlying conditions, HCWs and pregnant women. After vaccinating priority groups, only 3/7 countries made the vaccines available to the general public. Uptake in target groups varied widely across countries: in the Netherlands and Sweden it was up to 80% in some target groups. In UK and Sweden, uptake in HCWs was reportedly higher than for seasonal vaccine. Vaccination coverage in HCWs varied considerably across countries, with Italy and Germany reporting around 15% and Sweden and Hungary 70–80%.	
The 2009–2010 influenza pandemic: effects on pandemic and seasonal vaccine uptake and lessons learned for seasonal vaccination campaigns[42]	Review of the effects of the 2009 pandemic and pandemic vaccination on public attitudes.	The likelihood of receiving pandemic vaccine appears to correlate with previous seasonal influenza vaccination in both HCWs and the general public, along with concerns about vaccine safety, efficacy, and perception of risk to self.	It is critical that HCWs are vaccinated, not just to protect their patients and preserve healthcare services, but also because they are role models for the public and the public is more likely to accept vaccination if it is recommended by a trusted HCW.

National Level

Country Title of source document	Summary	Issues identified	Lessons learnt
Australia Review of Australia's Health Sector Response to Pandemic (H1N1) 2009: Lessons identified[43]	Government review of the Australian health sector response to the 2009 H1N1 pandemic	While initial plans were for vaccine to be offered only to those most at risk of severe outcomes from influenza, plus a sufficient proportion of the population (33%) to control the spread of infection, the vaccine was offered to all Australians aged ≥10 years from the outset, following confirmation that a single dose was sufficient. Due to regulatory requirements (initial safety data from adult trials needed before commencing paediatric trials) the vaccine was not registered for use and able to be rolled out in children aged <10 years until over 2 months later. There were difficulties in providing vaccine to Aboriginal and Torres Strait Islander people in remote communities (a group documented to be at particularly high risk).	The discrepancy between timing of vaccine registration and availability for children and adults needs to be considered when planning the objectives of a pandemic vaccination strategy. Planning also needs to consider when use of an unregistered vaccine is warranted, and appropriate triggers. Solutions for the supply of vaccine to target groups in remote communities are needed.
Canada Canada's Response to the 2009 H1N1 Influenza Pandemic, Standing senate Committee on Social Affairs, Science and Technology, December 2010 [44]	Senate committee review of Canada's response to the 2009 pandemic. The committee heard from representatives of the federal government, several provincial and territorial governments, healthcare professions, First Nations	Interviewees felt that although prioritisation was justifiable from an evidence-based standpoint, it was difficult to implement on the ground. They criticised communication of the goals of vaccine prioritisation as well as the fact that they were merely guidelines and that jurisdictions could, and did, deviate from them. HCWs questioned how to enforce a priority list	Need for good communication regarding rationale for prioritisation.

	and Inuit organizations, the research community, first responders (firefighters) and front-line workers (teachers).	as individuals do not live in isolation and exist as families and communities.	
Canada Lessons Learned Review: Public Health Agency of Canada and Health Canada Response to the 2009 H1N1 Pandemic[45]	A review by Public Health Agency of Canada of the Canadian response to the 2009 pandemic.	Implementation of sequencing (priority group) recommendations varied across the country from the outset of the pandemic. This resulted in some confusion.	No specific recommendations pertaining to prioritisation. Positive feedback about the priority given to distribution to target groups in remote and isolated areas.
UK The 2009 Influenza Pandemic: An independent official review of the UK response to the 2009 influenza pandemic[46]	An independent review of the UK response to the 2009 pandemic.	Although the UK ordered enough vaccine for the whole population, initial supply was very limited. As a result, the Joint Committee on Vaccination and Immunisation (JCVI) confirmed a prioritisation strategy in October 2009. Despite JCVI advising that vaccine should be made available to anyone after vaccination of priority groups completed, due to operational supply issues there was still a need to undertake this on a staged basis, with children aged between 6 months and 5 years vaccinated in the next stage. Due to epidemiology of the pandemic, a decision was subsequently made to complete vaccination of children aged between 6 months to 5 years but not to extend the program to other healthy groups.	No specific prioritisation recommendations made in the report. Report summary highlighted the overall positive experience the UK had with prioritisation of vaccines.
USA	Report to US Congress on lessons learnt from the 2009	Whilst the Advisory Committee on Immunization Practices (ACIP) recommended	No specific recommendations regarding prioritisation. Noted

Influenza pandemic: Lessons from the H1N1 Pandemic Should Be Incorporated into Future Planning[47]	pandemic, produced by the United States Government Accountability Office.	that states and local jurisdictions initially provide vaccine to individuals in priority target groups, CDC allowed for state and local flexibility over vaccine distribution. However, differences across neighbouring jurisdictions regarding target groups led to some public confusion.	that state and local jurisdictions valued the flexibility that they had regarding vaccine distribution.
Japan Japan's Actions to Combat Pandemic Influenza (A/H1N1)[48]	Review of Japan's response to 2009 H1N1 pandemic.	Limited description of prioritisation – no specific issues identified	While priority groups should be determined by the national government considering citizens' opinions, prefectures and municipalities should be able to implement rules flexibly according to local situations.

Jurisdictional Level

Country/Jurisdiction Title of source document	Summary	Issues identified	Lessons learnt
USA (North Carolina) Evaluation of the implementation of the H1N1 pandemic influenza vaccine in local health departments (LHDs) in North Carolina[49]	Survey of 25 of the 26 local health departments in North Carolina in order to identify and share lessons learned relating in H1N1 vaccination activities at the LHDs	84% of LHDs vaccinated outside of target groups during the time when vaccination was recommended to be restricted to target groups. Common reasons included; the LHD had a lot of vaccine, LHD staff told not to turn anyone away and/or to accommodate people who became angry or who came with a spouse or children. Several LHDs mentioned lack of clarity surrounding the North Carolina Division of Public Health's position on vaccinating outside of target groups (vaccinate anyone who seeks vaccine), particularly as it conflicted with CDC recommendations (restrict vaccine to members of target groups).	Inconsistencies in guidelines provided to LHDs meant that the majority of LHDs vaccinated outside of target groups.
USA (multiple jurisdictions) Lessons About the State and Local Public Health System Response to the 2009 H1N1 Pandemic: A Workshop Summary[50]	Findings from workshop attended by representatives from the CDC, state and local public health departments and other organisations.	Concerns raised that the priority groups specified by ACIP were not always enforced. Some participants felt that the number of priority groups led to confusion and breaches in protocol.	No specific lessons pertaining to prioritisation
Canada (Ontario) pH1N1 - a comparative analysis of public health responses in Ontario to the influenza outbreak, public health and primary care: lessons learned and policy suggestions[51]	A comparative analysis study comprises of semi-structured key informant interviews with 29 out of 36 Ontario Medical Officers of Health and 20 Primary Care Physicians	Priority groups sequencing and guidelines presented problems; reported to be a lack of public understanding and both Public Health and Primary Care physicians had problems adhering to the guidelines.	Clear need to further evaluate priority groups and vaccine sequencing policy.