No Jab, No Pay and vaccine refusal in Australia: the jury is out

High immunisation rates in Australia mean that the threat of disease transmission posed by vaccine refusal is low — policy responses should be proportionate

Frank H Beard[1,2]

Julie Leask[2]

Peter B McIntyre[1]

1 National Centre for Immunisation Research and Surveillance, The Children's Hospital at Westmead, Sydney, NSW.

2 School of Public Health, University of Sydney, Sydney, NSW.

peter.mcintyre@health.nsw.gov.au

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The topic of vaccine refusal has received worldwide attention in recent years. Vaccine attitudes span a continuum from complete acceptance to complete rejection. Vaccine refusal (rejection of all vaccines) is at the extreme end, whereas vaccine-hesitant individuals are a more heterogeneous group, with some opting to fully vaccinate despite substantial concerns while others are more selective.[1] People may also change their attitudes and positions over time.

Some countries, including Australia and the United States, have introduced legislative provisions actively targeting vaccine refusal. In Australia, No Jab, No Pay legislation was introduced nationally on 1 January 2016. It removed an exemption, which previously allowed parents whose children were not fully vaccinated, to remain eligible for family assistance payments if a health practitioner certified that they were conscientious objectors to vaccination. The requirement to be fully immunised for age to retain eligibility for family assistance payments commenced in the late 1990s.[2] At state level, No Jab, No Play legislation, which requires children attending childcare centres to be immunised, has been tightened in New South Wales and passed in Queensland and Victoria. Victoria has the strictest requirements, with full immunisation necessary for attendance, unless the child has an approved medical exemption or is on a recognised catch-up schedule. NSW continues to allow a written exemption for children of vaccine-refusing parents, and Queensland allows facilities discretion over whether to apply the requirements. In California, recent school entry legislation has removed all non-medical exemptions to mandatory school immunisation requirements, leaving home schooling as the only option for vaccine-refusing parents.

History of vaccination refusal

Ever since the introduction of widespread vaccination to protect against smallpox in the early 1800s, there have been people and groups who have vociferously opposed vaccination.[3,4] Legislation to make smallpox vaccination compulsory, introduced in the mid-19th century in Britain[4] and in Victoria, South Australia, Western Australia and Tasmania,[5] particularly inflamed anti-vaccination sentiment.[4,6] As a result of concerted opposition, no such legislation was ever enacted in NSW, despite repeated attempts to introduce it between 1853 and 1913.[5,6] In response to sustained pressure, conscientious objection provisions to compulsory vaccination were introduced in Britain in 1898[4] and in South Australia in 1901, Western Australia in 1911 and Victoria in 1920.[5]

Recent vaccination refusal in Australia

The first Australian National Immunisation Strategy in 1993 specifically ruled out compulsory vaccination and recommended that conscientious objection be accepted grounds for not vaccinating.[7] In 1997, the Immunise Australia Program with its Seven Point Plan was introduced and included, for the first time, the notion of linking eligibility for family assistance payments to vaccine receipt.[2] The Australian Childhood Immunisation Register (ACIR) was established in 1996 to collect data on vaccination rates in children under 7 years of age. The ACIR also recorded registered conscientious objection until the introduction of No Jab, No Pay in 2016. Vaccine coverage, as measured by the ACIR, increased markedly over the late 1990s and has remained stable at above 90% since the early 2000s.[8] While there was a ninefold increase in recorded conscientious objection between 1999 and 2014, from 0.2% to 1.8%,[9] this increase was likely driven in part by increasing awareness over time that registered objection preserved eligibility for applicable family assistance payments.[2,10] Our recent study estimated that around 3.3% of children aged 1–6 years in 2013 were affected by registered and unregistered objection combined — not much more than in a previous national survey from 2001, which estimated 2.5–3.0%.[10] Although Australia does not have the enclaves of religious-based objection that occur in countries such as the Netherlands,[11] there have been consistent geographic clusters of recorded objection — highest (about 10%) in regional areas of northern NSW and southeast Queensland, but present in all states.[10] The recent media and government focus on improving vaccination coverage through targeting vaccine refusers can be traced back to the first report of the National Health Performance Authority in 2013,[12] which made data on vaccine coverage publicly available for the first time at a small area level. The report received extensive media coverage,

which focused particularly on low vaccine coverage in some areas of relatively high socio-economic status in large cities and concluded that this heightened disease risk.[13]

Level of vaccine coverage needed to control disease

Australia has set a national vaccination target rate of 95% in children,[14] based on review of the evidence, consultation with experts and practical considerations. As well as direct individual protection, many vaccines also generate significant indirect herd immunity benefits to the broader population when threshold levels of coverage are reached. The proportion of the population required to be immune to achieve community-level protection (the herd immunity threshold) against a particular disease depends on its basic reproduction number (R_0). R_0 is a measure of transmissibility and is calculated as the number of people who will be infected on average by a single case. R_0 varies by disease, and hence the herd immunity threshold also varies, from 83–85% for rubella and diphtheria to 92–94% for measles (80–85% for smallpox, the only vaccine-preventable disease to be eradicated to date) (Box).[15] As rubella and diphtheria vaccines are both highly efficacious (> 95% protective efficacy at the individual level for the recommended schedule), vaccine coverage of 85–90% should be adequate to maintain herd immunity for these diseases. The national 95% coverage target has therefore been chosen specifically with measles control in mind. As 95% of measles vaccine recipients develop immunity after one dose, and 99% after two doses,[16] 95% coverage should theoretically result in population-level immunity comfortably exceeding the 92–94% herd immunity threshold for measles. However, 95% vaccine coverage in children is not a magic threshold at which all cases and outbreaks of measles, and other diseases, suddenly cease. As well as vaccine coverage in specific geographic areas and subpopulations, outbreak risk is also influenced by immunity in other age groups (eg, immunity is lower in young adults as there was poorer vaccination coverage when they were children but also less circulation of wild-type measles), population density, and level of migration and travel. Measles outbreaks in recent years have not been concentrated in areas with the lowest levels of coverage and highest levels of vaccine refusal, but rather in highly populated urban areas with overall vaccination rates of over 90%.[17] This is probably due to both greater population density and likelihood of travel-related importation in such areas.

The ability to achieve herd immunity and prevent outbreaks is also influenced by vaccine characteristics. For example, although highly effective against severe disease in the short term, acellular pertussis vaccines have relatively low (71–78%) efficacy against milder disease, and immunity wanes relatively rapidly.[16] As a result, even if 100% of children were fully vaccinated against pertussis, this would not generate strong herd immunity comparable to that achieved by high coverage of measles or rubella vaccine.

Herd immunity threshold for selected vaccine-preventable diseases[15]

Infection	Basic reproduction number*	Herd immunity threshold
Diphtheria	6–7	83–85%
Measles	12–18	92–94%
Mumps	4–7	75–86%
Pertussis	5–17	92–94%
Polio	2–20	50–95%
Rubella	6–7	83–85%
Smallpox	5–7	80–85%

* Basic reproduction number is a measure of transmissibility and is calculated as the number of people who will be infected on average by a single case. ◆

Although 95% vaccination coverage in children is a reasonable goal, it is more than is required for some diseases but, at the same time, is no panacaea for highly infectious diseases (measles, pertussis), waning immunity (pertussis) and disease importations (measles). The effort and resources required to achieve incremental improvements in vaccine coverage are proportionately much greater when coverage is already over 90%. Similarly, at such high levels, under-ascertainment of vaccine coverage on the ACIR by only a few percentage points may have a substantial impact on measurement of improved coverage.[18]

Is No Jab, No Pay a proportionate response to the threat posed by vaccine refusal?

The importance of vaccine refusal as a potential contributor to disease transmission is mainly limited to relatively small geographic areas where levels of vaccine refusal are high. The proportion of the overall population strongly opposed to vaccination is small, with little evidence that it is increasing. This is fortunate, as the scope for attitudinal change among entrenched vaccine refusers is minimal. In contrast, vaccine-hesitant parents can be influenced by appropriate clinician communication, reducing the chance of their hesitancy becoming refusal. Levels of vaccine hesitancy in the population should be closely monitored to allow early detection of significant increases, such as those arising from vaccine safety scares. These scares occur when an adverse event is attributed to vaccination and, regardless of the quality of evidence supporting such a link, becomes broadly disseminated in mainstream and social media. The most widely known example of a vaccine safety scare is that surrounding the subsequently retracted *Lancet* study that linked measles–mumps–rubella (MMR) vaccine with autism, which, in the United Kingdom (but notably not in Australia), led to falls in MMR vaccine coverage sufficient to cause measles outbreaks.[19] Such scares should be identified early so that relevant stakeholders can be engaged and coordinated communication strategies implemented.

Most parents of incompletely vaccinated children in Australia do not disagree with immunisation, but have been unable to overcome a range of logistic and

access barriers.[20] It follows that measures to improve access to services, assist families challenged by logistic issues, and minimise missed opportunities to vaccinate are the most important means to raise levels of complete immunisation. Measures shown to be effective, both overseas and in Australia, include client reminder and recall systems, incentives, enforcing childcare entry vaccination requirements, audit and feedback of health professionals, opportunistic vaccination in primary, secondary and tertiary care, catch-up plans, standing orders, home visiting, and minimising out-of-pocket expenses to access services and vaccines.[21,22]

Based on the above considerations, we believe that the stated intent of No Jab, No Pay and of state-based No Jab, No Play legislation — to target vaccine refusal and, in turn, the spread of vaccine-preventable diseases — may prove to be misplaced for two reasons. First, vaccine refusal is the least important of the three factors (refusal, hesitancy and barriers to access) contributing to lower vaccine coverage. Second, there is limited evidence that monetary sanctions are effective in this context of families receiving government assistance,[21] among whom the potential for unintended impacts on the health and welfare of children may be greatest. Unintended adverse impacts are arguably even more likely from the highly restrictive Victorian legislation reducing access to appropriate early childhood education. Given the unique nature of these initiatives, and uncertainty about both their effectiveness in reducing disease transmission and potential for adverse impacts, it will be particularly important to carefully evaluate both No Jab, No Pay and No Jab, No Play. Evaluation should focus on identifying differential effects on vaccine uptake, as well as any unintended adverse consequences, among the three key groups (children of vaccine-refusing parents, vaccine-hesitant parents and parents affected by access or logistic issues). As conscientious objection is no longer recorded in the ACIR, national surveys will be required to monitor levels of vaccine refusal.

In summary, unlike in the 1990s when the Immunise Australia Program was introduced, vaccination rates in Australian children are relatively high and at least comparable with similar developed countries. Vaccine refusal is only one of a range of factors relevant to further improvements in vaccine coverage and disease control. The greatest yield is likely to come from first implementing measures already shown to be effective in improving accessibility and minimising logistic barriers to vaccination, and second, from well structured research and evaluation of new interventions to overcome vaccine refusal and hesitancy.

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