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The Role of the Unvaccinated in Outbreaks and Effective Messages in Vaccine Promotion

The CDC conducted a review of a 2008 measles outbreak in California[1]. An intentionally unvaccinated 7 year old boy returned to San Diego from a trip to Switzerland where he had unknowingly become infected with measles. He infected his two unvaccinated siblings and exposed students at his charter school where 2 unvaccinated students became infected. Infected children then exposed children and adults at other schools, an amusement park, a swimming facility, two pediatrician offices, a pre-school and on a flight. In all, 839 persons were exposed. 106 were unvaccinated children due to intentional unvaccination by parents (75%) or because they were too young for vaccination (25%). All unvaccinated children were placed under 21-day quarantine at an average cost per family of $775. The outbreak was contained quickly due to the fact that most of the population was vaccinated and the vigorous outbreak response. 12 children in total were infected. All were unvaccinated. One 10 month old child who was too young to be vaccinated was hospitalized. Public-sector cost in containing the outbreak was over $10,000 per case.

Procedures that make claiming an exemption easier than providing proof of vaccination have been associated with lower vaccination rates[2] and higher pertussis[3] and measles incidence[4]. A recent 2013 review of the epidemiology of vaccine hesitancy[5] reviewed the risk of infection in unvaccinated versus vaccinated children in multiple studies. Unvaccinated children were between 22-35 times more likely to get measles, 6-22 times more likely to get pertussis, 8 times more likely to get varicella and 6 times more likely to get serious pneumococcal disease than those who were vaccinated. Schools reporting measles and pertussis outbreaks had higher numbers of vaccine exemptors. Pertussis incidence was found to be higher in states allowing personal belief exemptions when compared with states only offering religious exemptions.

Due to the rising number of outbreaks of associated with unvaccinated individuals and clusters, there has been a call for more high quality social-science research on vaccine hesitancy. Dr. Brendan Nyhan, a researcher for the Dept of Government at Dartmouth specializes in research on misperceptions and false beliefs in politics and health care. In 2014, he and colleagues from the University of Michigan published a large randomized trial of over 1700 U.S. parents to evaluate the effectiveness of different education strategies regarding MMR vaccine[6].

The parents were randomized into one of 5 groups:

1. Information explaining lack of evidence that MMR causes autism
2. Textual information about dangers of the diseases prevented by MMR
3. Images of children who have diseases prevented by MMR vaccine
4. Narrative about an infant who almost died of measles
5. Control group

Results showed that **none of the interventions increased parental intent to vaccinate a child**. Three out of four educational interventions **actually decreased** a parent's intent to vaccinate among parents who had the least favorable vaccine attitudes.

This was followed up with a 2015 study looking at the effects of correcting myths about the influenza vaccine among U.S. adults[7]. Corrective information explaining that the flu vaccine does not cause the flu reduced belief in this myth as well as beliefs that the vaccine is unsafe. However, respondents with high level of concerns about side effects at the outset were **less likely to get vaccinated** after learning this information. Those exposed to a message about the dangers of influenza infection showed no change in likelihood of vaccination.

These findings are consistent with research in non-medical contexts that has found that correcting factual misperceptions may be ineffective and can even make false beliefs more prevalent due to people's motivations to defend their prior beliefs.

In summary, unvaccinated individuals are more likely to become infected with vaccine-preventable illness and spread to others, leading to high costs of containment and harm to others even in areas that generally have high vaccination rates. States that have personal belief exemptions are more likely to experience outbreaks. Recent data shows that educating parents about the safety of vaccines and the danger of infection is ineffective.

If Vermont is committed to increasing vaccination rates to align more closely with those of our neighboring states, the most recent data show us that educating parents with regards to vaccine safety or warning about the dangers of vaccine-preventable illness does not increase intent to vaccinate.

The University of Vermont Medical Center and the University of Vermont Children's Hospital support removal of philosophical exemptions for immunizations. In addition, the Vermont chapters of the American Academy of Pediatrics and the American Academy of Family Physicians and the Vermont Medical Society also urge elimination of the philosophical exemptions so that we can better protect the children of Vermont from preventable infections.

References:

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