Vaccination Safety and Benefits FAQ

What are the primary reasons why vaccinations are crucial for older adults?

As individuals age, their immune systems naturally weaken, making them more susceptible to severe outcomes from infectious diseases. Vaccines help prepare the body to fight off these infections more quickly, preventing serious complications. Additionally, vaccination protects not only the individual but also others in the community, especially those who cannot be vaccinated or mount a strong immune response. The protection offered by vaccines can also wane over time, necessitating booster doses to maintain immunity. Vaccines undergo rigorous testing and continuous monitoring to ensure their safety, with side effects typically being mild and short-lived.

What are some of the key vaccines recommended for older Canadians?

To promote healthy aging and maintain independence, older Canadians are recommended to be vaccinated against several infectious diseases. These include COVID-19, Influenza (flu), Respiratory Syncytial Virus (RSV), Pneumococcal disease (pneumonia), Shingles, and Tetanus and Diphtheria. For those planning international travel, additional vaccines such as Hepatitis A & B, Yellow Fever, or Rabies may also be recommended. It is advisable for older adults to consult their healthcare provider to determine which vaccines are most appropriate for their individual needs and health status.

How effective are routine childhood vaccinations in preventing illness and death?

Routine childhood immunizations have a profound impact on public health, preventing millions of cases of illness, hospitalizations, and deaths. For instance, a study in the United States estimated that routine childhood vaccinations for children born between 1994 and 2023 would prevent approximately 508 million lifetime cases of illness, 32 million hospitalizations, and over 1.1 million premature deaths. Globally, between 1990 and 2019, vaccines for diphtheria-tetanus-pertussis (DTP), measles, rotavirus, and Haemophilus influenzae type b (Hib) were associated with an

estimated 86.9 million fewer deaths in children under five years old worldwide, representing a 24.2% reduction in deaths compared to a scenario without vaccines. The measles vaccine alone has saved over 94 million lives in the last 50 years globally.

What are the economic benefits of widespread childhood immunization programs?

Childhood immunization programs offer substantial economic benefits by averting healthcare costs and productivity losses. In the United States, routine childhood vaccinations for children born from 1994 to 2023 are estimated to result in a net savings of $540 billion in direct healthcare costs and $2.7 trillion in societal costs (which include productivity losses). This means that every $1 spent on childhood immunizations generates approximately $11 in societal savings. These programs also promote health equity by reducing financial barriers to vaccination, particularly for vulnerable populations, and preventing catastrophic health expenditures that can push families into poverty, especially in low- and middle-income countries.

Do vaccines cause autism or other chronic diseases, and are their ingredients safe?

Extensive research, including large-scale studies involving millions of children over decades, has consistently found no link between vaccines and autism or other chronic diseases such as asthma, allergies, or autoimmune disorders. The 1998 study that suggested a connection between the MMR vaccine and autism has been discredited and retracted. Concerns about vaccine ingredients like aluminum and thimerosal have also been thoroughly investigated and proven to be unfounded. Aluminum, used as an adjuvant to enhance immune response, is present in tiny, safe amounts, far less than what a baby is exposed to daily through food. Thimerosal, a mercury-based preservative previously used in some vaccines, has been removed from most routine childhood vaccines in Canada by the mid-1990s, and its use has never been reliably linked to developmental disorders.

How does the immune response to COVID-19 vaccination differ between children and adults, and what does this imply for vaccination strategies?

Epidemiological evidence suggests that children generally experience a milder course of COVID-19 disease and have reduced mortality compared to adults. Studies on immune responses to

COVID-19 vaccines, specifically the Pfizer-BioNTech mRNA vaccine, indicate that children and adolescents (aged 5-15 years) generated a greater antibody response to the vaccine than younger adults (aged 16-25 years). This parallels the observation that children produce a stronger anti-viral response after natural infection. These findings suggest that individualized vaccination strategies might be formulated for children, possibly involving dynamic monitoring of immune responses to optimize dosage and interval. Booster doses may be recommended for older children and adolescents who show suboptimal initial responses.

What is an "immunisation stress-related response" (ISRR), and how is it addressed?

Immunization Stress-Related Response (ISRR) is a term introduced by the WHO to describe the spectrum of physical symptoms and signs of a stress response that can occur following immunization. These reactions are not caused by the vaccine itself but are an interplay of the social context of immunization, individual psychological vulnerability, knowledge, and preparedness. Symptoms can range from mild worry and increased heart rate to fainting, anxiety, hyperventilation, and even non-epileptic seizures, particularly when they occur in clusters due to emotional contagion, amplified by social media. Healthcare providers are being trained to recognize and differentiate ISRR from other conditions like anaphylaxis to prevent mismanagement. Effective responses include empathetic communication, addressing individual needs, and transparent communication strategies to counter misinformation and rebuild public trust in vaccination programs.

Why are older adults at a higher risk for serious outcomes from pneumonia and influenza, and how effective are current vaccines?

Older adults are at a significantly higher risk of severe complications, hospitalization, and death from pneumonia and influenza due to a naturally weakening immune system with age. Pneumococcal disease and influenza are leading causes of infection-related mortality in the elderly, with 90% of related deaths occurring in individuals aged 65 and older.
For pneumococcal disease, the 23-valent pneumococcal polysaccharide vaccine (PPSV23) is recommended for adults 65 and older. While effective against invasive pneumococcal disease, its effectiveness in preventing all-cause pneumonia or death in non-institutionalized older adults has been controversial in clinical trials, though some observational studies suggest benefit. Newer pneumococcal conjugate vaccines (like PCV13, PCV15, PCV20) are more immunogenic in the

elderly and are being increasingly recommended, with ongoing studies to confirm their broader protective benefits against pneumonia in this age group.
For influenza, annual vaccination is recommended because viral strains change frequently. Observational studies consistently report reductions in all-cause mortality and hospital admissions for vaccinated seniors during flu season. However, the effectiveness of the vaccine can be lower in very elderly individuals (aged 70+) due to immune senescence. Enhanced influenza vaccines (e.g., high-dose or adjuvanted) are recommended for older adults to provide increased benefit. Combined influenza and pneumococcal vaccination can offer an additive preventive effect, reducing the incidence of all-cause pneumonia and death rates in older adults.

Why are vaccines especially important for older Canadians?

As people age, their immune systems naturally weaken, making them more susceptible to severe outcomes from infectious diseases. Vaccines help prepare the body to fight off these infections more quickly, reducing the risk of serious illness, hospitalization, and death. Furthermore, high vaccination rates contribute to community immunity, protecting individuals who cannot be vaccinated or who have weakened immune responses. This is crucial for healthy aging, maintaining independence, and safeguarding public health.

What are some of the key vaccines recommended for older Canadians?

Several vaccines are specifically recommended for older Canadians to help maintain their health and independence. These include vaccines for COVID-19, influenza (flu shot), Respiratory Syncytial Virus (RSV, new in 2023), pneumococcal disease (pneumonia), shingles, and tetanus and diphtheria. It's also advised to discuss travel-specific vaccines with a healthcare provider if planning international trips.

What is the Vaccine Adverse Event Reporting System (VAERS) and how reliable is its data?

VAERS is a U.S. program co-managed by the CDC and FDA for post-marketing surveillance of vaccine safety. It collects reports of possible harmful side effects after vaccination. While it serves as an "early warning system" to identify potential unforeseen reactions for further study, it has limitations. VAERS relies on public submissions, which can lead to unverified reports, misattribution,

underreporting, and inconsistent data quality. Therefore, raw, unverified data from VAERS is not sufficient to determine cause and effect and should not be used in isolation to draw conclusions about vaccine safety. For example, a report of a vaccine turning someone into the Incredible Hulk was accepted, highlighting the system's openness to unverified claims.

Is there any scientific evidence linking vaccines to autism or other developmental disorders?

No, extensive research consistently shows no link between vaccines and autism or other developmental disorders. Numerous studies, including a landmark Danish study of over 1.2 million children and 23 other studies, have found no connection between vaccination and autism rates. The 1998 study that initially suggested a link between the MMR vaccine and autism has been discredited and retracted by most of its authors due to methodological flaws and selection bias. Leading medical organizations worldwide, including the Canadian Paediatric Society, the Canadian Medical Association, the U.S. Institute of Medicine, and the World Health Organization, affirm there is no connection.

How are new vaccines developed and monitored for safety?

New vaccines undergo a rigorous and transparent process through regulatory bodies like the FDA and CDC. Before approval or emergency use authorization, vaccines must complete three phases of clinical trials to ensure safety and efficacy. After authorization, close monitoring continues through surveillance systems such as the "v-safe after vaccination health checker" and VAERS to identify any uncommon adverse reactions or long-term complications that may not have appeared in trials. While side effects are usually mild and temporary, serious reactions are extremely rare.

Do vaccines contain harmful ingredients like aluminum or thimerosal?

Vaccines contain tiny amounts of ingredients for specific purposes, and there is no evidence that these ingredients are harmful. Aluminum is used as an adjuvant to boost the immune response to the vaccine; babies receive more aluminum from their daily diet than from vaccines. Thimerosal, a mercury-containing preservative (ethylmercury), was removed from routine Canadian childhood vaccines by the mid-1990s, with only influenza and some hepatitis B vaccines still containing it. No reliable study has found a link between thimerosal in vaccines and developmental disorders, including autism.

How do children's immune responses to vaccines compare to adults, particularly for COVID-19?

Epidemiological evidence suggests children typically have a milder course of disease and reduced mortality from SARS-CoV-2 infection compared to adults. Preliminary data indicate that children may also develop stronger immune responses to COVID-19 vaccines compared to adults. For instance, studies have shown greater antibody responses to the Pfizer-BioNTech COVID-19 vaccine in participants aged 5-15 years than in those aged 16-25 years. This suggests that individualized vaccination strategies for children may be beneficial, potentially involving optimized dosages and intervals, and considering booster doses for older children and adolescents with suboptimal initial responses.

Can certain vaccines reduce the risk of dementia?

Recent studies, such as one analyzing the UK Biobank cohort, suggest a potential protective effect of certain vaccines against dementia. Specifically, subjects who received the Zostavax vaccine (for shingles) showed a reduced risk of developing dementia by approximately 20%. While a history of shingles itself was not significantly associated with an increased dementia risk in this study, the vaccination appears to offer a protective benefit. This protective effect might be due to a direct impact of the vaccine or "off-target" effects that influence the immune system and potentially reduce neuroinflammation, which has been implicated in dementia. Further research is needed to understand the causal pathways.

Timeline of Key Events

Pre-1945

Before 1945: Aluminum has been used as an adjuvant in vaccines for nearly a century to enhance the immune system's response.

1940s

1945: The first population-scale use of an inactivated influenza vaccine occurs among US military personnel.

1947: Kaufman's observational study finds a 92% vaccine effectiveness against all-cause pneumonia in long-term care facility residents in New York City.

1950s

1950s: Conrad Waddington proposes the classic definition of an epigenetic trait.

1960s

1960: The US health agencies begin to pursue a policy of widespread influenza vaccination, targeting high-risk populations including patients with chronic conditions and elderly people, in response to the substantial morbidity and mortality during the 1957-58 pandemic.
1963: Measles vaccine is introduced. Prior to this, major measles epidemics occurred approximately every two to three years, causing an estimated 2.6 million deaths annually.
1964: The Advisory Committee on Immunization Practices (ACIP) reaffirms its recommendation for influenza vaccination but notes the absence of efficacy data.
1968-1969: Bacterial pneumonia is observed during the Hong Kong influenza epidemic.

1970s

1974: The World Health Assembly forms the Essential Programme on Immunization (EPI), aiming to vaccinate all children globally against major diseases.
1977: A 14-valent pneumococcal vaccine is introduced.
1978: The Metropolitan Atlanta Congenital Defects Program 6-Digit Code Defect List is developed.

1980s

1980: Austrian conducts the "Surveillance of Pneumococcal Infection for Field Trials of Polyvalent Pneumococcal Vaccines."
1983: The 23-valent pneumococcal polysaccharide vaccine (PPSV23) is licensed, replacing the 14-valent vaccine.
1984: The National Research Council publishes an analytical framework for the study of child survival in developing countries.
1986: The National Childhood Vaccine Injury Act (NCVIA) is established in the U.S., requiring healthcare providers to report specific adverse events following vaccination.
1989: D. Morley publishes "Saving children's lives by vaccination."

1990s

1989-1991: A U.S. measles resurgence occurs.
1990: The Vaccine Adverse Event Reporting System (VAERS) is established as a national spontaneous-reporting (passive-surveillance) system.
1990-2019: Diphtheria–tetanus–pertussis (DTP), measles, rotavirus, and *Haemophilus influenzae* type b (Hib) vaccines are associated with an estimated 86.9 million fewer deaths in children younger than 5 years worldwide.
1991-1992 influenza season: The largest placebo-controlled randomized controlled trial (RCT) on influenza vaccine in healthy elderly volunteers is conducted in the Netherlands.
1994: The U.S. Congress establishes the Vaccines for Children (VFC) program to provide vaccines at no cost to eligible children. This program initially covers vaccines for diphtheria, tetanus, pertussis (DTP), *Haemophilus influenzae* type b (Hib), polio (OPV then IPV), measles, mumps, rubella (MMR), and hepatitis B (HepB) for children aged ≤6 years.
Mid-1990s: All vaccines in the routine Canadian childhood immunization schedule become thimerosal-free.
1996: Varicella (VAR) vaccine is added to the routine U.S. immunization schedule for children aged ≤6 years.
1996-1999: Hepatitis A (HepA) vaccine is added to the routine U.S. immunization schedule for high-risk areas.
1997-2018: A landmark Danish study analyzes data from over 1.2 million children, finding no link between aluminum in vaccines and chronic diseases.

1998: A study by Wakefield and colleagues, published in *Lancet*, suggests a link between MMR vaccine and autism or bowel disease, later discredited.
1998-1999: VAERS identifies an increased risk of bowel obstruction associated with a rotavirus vaccine, leading to the vaccine's suspension.
1999: Gavi, the Vaccine Alliance, is established.
August 1999: The UK government bans the routine use of separate measles and mumps vaccines.

2000s

2000: Measles is declared eliminated in the U.S.
2000: The first pediatric pneumococcal vaccine, the 7-valent PCV (PCV7), is licensed for prevention of pneumococcal disease in children younger than 5 years.
April 2000: Parental concern in the UK regarding MMR is refueled by media reports of "compelling new evidence" for a link between MMR and autism.
2000-2019: In Gavi-supported countries, vaccines are linked to a reduction of 45.4 million deaths in children younger than 5 years.
2000-2023: Measles vaccination is estimated to have averted more than 60 million deaths globally.
2001: The Measles and Rubella Initiative (now M&RP) is launched.
2004: Influenza vaccine is recommended for U.S. children aged 6-23 months.
June 2004: A study in the *Journal of Nutrition* shows that human intestinal cells exposed to genistein exhibit a biphasic response: low doses stimulate growth, while high doses inhibit proliferation and alter cell cycle dynamics.
2005: Pneumococcal disease and influenza are the eighth-leading cause of death in the United States and the leading cause of infection-related mortality for all age-groups.
February 2005: A study in *Pediatric Research* finds that high-genistein piglets had a 50% decrease in intestinal cell proliferation and a 20% decrease in cell migration, although no changes in growth or digestive function.
2006: Hepatitis A (HepA) vaccine is recommended for all U.S. states.
2006: Influenza vaccine is recommended for U.S. children aged 6-59 months.
2006: Rotavirus vaccine (Rota) is added to the routine U.S. immunization schedule.
2007: An outbreak in Nova Scotia sees more than 900 college and university students develop mumps.
2008: Two unvaccinated siblings from Switzerland become ill with measles during a visit to Canada, leading to 23 more cases in Ontario.
June 28, 2008: *The New York Times* quotes Dr. Darryl De Vivo as stating he cannot recall a single complication from vaccination among hundreds of children with mitochondrial disease.
2009: The Pneumococcal Advanced Market Commitment, facilitating the global roll-out of the PCV vaccine, begins.
2009: Miscarriage is the most common adverse event reported by pregnant persons who received the 2009 H1N1 inactivated influenza vaccine to VAERS.

2010s

2010: The 13-valent PCV (PCV13) is introduced.
2010-2024: A meta-analysis of 43 studies, encompassing 1.8 million children across 35 countries, finds that routine childhood vaccination programs led to a 59% reduction in all-cause mortality among children under five years.

December 30, 2011: The FDA approves PCV13 for prevention of pneumonia and invasive disease in adults aged 50 years and older.
2015: The Global Advisory Committee on Vaccine Safety (GACVS) characterizes and gives more attention to "immunization stress-related response" (ISRR).
2015: The government of India initiates the Mission Indradhanush campaign.
2016: The Vaccine Confidence Project publishes a study on the global state of vaccine confidence, finding that confidence in vaccine safety is consistently lower than confidence in the importance of vaccines.
May 2019: Approximately 30 vaccine safety experts gather at the Wellcome Trust to discuss vaccine safety questions.
2019: A polio mass immunization campaign in Pakistan results in mass contagion and angry protests after hundreds of children are rushed to hospitals with various complaints following vaccination.
2019: More than 1,200 confirmed cases of measles are reported in 31 U.S. states, the greatest number since 1992 and since measles elimination was declared in 2000.

2020s

December 2020: The Pfizer-BioNTech and Moderna mRNA COVID-19 vaccines are granted Emergency Use Authorization (EUA) by the FDA and recommended for use by ACIP.
December 14, 2020 - February 28, 2021: Preliminary findings from U.S. surveillance systems (v-safe, v-safe pregnancy registry, VAERS) show no obvious safety signals among pregnant persons who received mRNA Covid-19 vaccines.
2021-2030: WHO and global stakeholders endorse the Immunization Agenda 2021–2030, aiming to achieve regional measles and rubella elimination targets.
2022: The 15-valent PCV (PCV-15) is introduced.
2022: Influenza, COVID-19, and RSV immunization are not included in the CDC's analysis of health and economic benefits of routine U.S. childhood immunizations for children born during 1994-2023, potentially underestimating benefits.
2022: Together with pneumonia, influenza ranks as the eighth-leading cause of death in Canada, with 90% of these deaths occurring among an estimated 5,375 older Canadians.
October 2022: Approximately 11.13 million children aged 5-11 years have received at least one dose of the Pfizer-BioNTech COVID-19 vaccine in the United States.
December 2023: The Novavax XBB.1.5-containing COVID-19 vaccine is approved and is currently under review by NACI.
2023: Approximately 54% of U.S. children aged ≤18 years are eligible to receive VFC vaccines.
2023: COVID-19 and Respiratory Syncytial Virus (RSV) vaccines are added to the routine U.S. immunization schedule for children aged ≤6 years.
2023: An estimated 107,500 people die from measles globally, mostly children under 5 years, despite the availability of a safe and cost-effective vaccine.
2023: The proportion of children receiving a first dose of measles vaccine is 83%, below the 2019 level of 86%.
2023: 74% of children receive both doses of the measles vaccine.
2023: Approximately 22 million infants miss at least one dose of measles vaccine.
2023 criteria: 54 countries receive Gavi support.
Winter 2024: "A Guide To Vaccines for Older Canadians" is published, highlighting the new RSV vaccine in 2023.

Spring 2024: NACI recommends older Canadians, immunocompromised individuals, and residents of long-term care homes receive an additional dose of XBB.1.5-containing mRNA COVID-19 vaccine.

January 6, 2025: CDC reports the first death in the United States from avian influenza A(H5N1) illness in Louisiana. As of this date, there have been 66 confirmed human cases of H5N1 bird flu in the U.S. since 2024, and 67 since 2022.

March 20, 2025: "The Role of Vaccination in Reducing Infant and Childhood Mortality: A Systematic Review" is published, asserting vaccines prevent an estimated 4.4 million deaths annually worldwide.

July 24, 2025: "Major new study finds no health risks from aluminium in childhood vaccines" is published, reporting on the Danish study.

July 31, 2025: "Did the pandemic increase vaccine confidence?" is published.

Ongoing

Pneumococcal Conjugate Vaccine (PCV20) is introduced in 2023.

Whooping cough cases are on the rise in Canada, particularly in teens and adults, tripling in the last 10 years.

The FDA monitors vaccines closely for adverse events and to confirm benefits outweigh risks. CDC immunization guidance is reviewed and updated annually.