The smart use of vaccines for children's health is a subject which warrants open discussion. At a time when 54% of parents have concerns about vaccine-safety and 89% of parents rate vaccine-safety as a top research priority, the public needs to receive the unvarnished facts. Unfortunately there are some people who are propaga ting vaccine misconceptions that are at odds with the science or, in other cases, making statements that are technically correct but are scientifically misleading. It is important to recognize these misconceptions:

Misconception #1: Parent organizations who question the vaccine schedule are "Anti-vax". In reality, these parent organizations are advocating for safer vaccines and have consistently stated that vaccines are important health tools. As an analogy: If a person advocates for safer food, that does not make that person "anti-food". The "anti-vax" label is used in an attempt to discredit these organizations; a more appropriate name for these organizations would be to call them "SmartVax advocates".

Misconception #2: The whooping cough outbreak in California is due to unvaccinated children. In reality, there is no correlation between whooping cough outbreaks in California counties and the rate of unvaccinated in those counties (HERE). Instead, the outbreak is likely due to the ineffectiveness of the vaccine and the increase in the related parapertussis bacteria which causes whooping cough but is not covered by the vaccine.

Misconception #3: A person can handle up to 10,000 vaccines at one time. This statement was written by Dr. Paul Offit, a vaccine inventor who is a leading purveyor of the "Max-Vax" philosophy. The statement ignores the scientific fact that 10,000 times the amount of mercury in one vaccine would be lethal if injected into a person. Scientifically, it is highly probable that 10,000 times the amount of aluminum-salt in one vaccine would cause kidney failure or death if injected into a infant. This misconception is based upon a calculation of the number of antigens (bacteria or virus) that could be theoretically handled by the B immune cells available in the body. On the contrary, research indicates that even a small increase in antigens in a vaccine can increase vaccine-injury. As example, a recent study found that adding one new antigen

(varicella, a.k.a. 'chicken pox') to the three-antigen Measles-Mumps-Rubella vaccine increased the
risk of seizures by 2x
.

Misconception #4: Studies that compare autism rates in vaccinated vs unvaccinated children have proven that vaccines don't cause autism. In reality, it is a fact that autism rates have not been studied in fully vaccinated vs fully unvaccinated children, nor have there been studies of autism rates in children who were vaccinated vs not vaccinated for most vaccines administered in the first year of life: Hib, PCV, DTaP, IPV, Rotavirus, and Influenza. There have been some studies on the Hepatitis B vaccine, administered at birth, with the most recent study finding a 3x
increased risk of autism
amongst children who received this vaccine in the 1990's. There have been studies on the MMR vaccine (administered after one year of age) and thimerosal (a mercury preservative that is a component in some vaccines) that have not found a correlation with autism prevalence, but these studies are fraught with design problems and potential bias (see
Why is the vaccine-autism question far from answered?
for more details).

Misconception #5: Aluminum in vaccines must be safe, because a child gets more aluminum from infant formula than from vaccines. It is technically correct that a child gets more aluminum from infant formula over a several-month period than from vaccines in one day, but that is scientifically irrelevant fact that appears designed to mislead. Scientists have understood for 70 years that a tiny amount of aluminum-salt, when injected as part of a vaccine, has very different properties from when eating aluminum. Specifically, aluminum-salt in a vaccine is an 'adjuvant' that triggers an abnormally strong immune response to the ingredients in the vaccine. In essence, the person builds the desired immune response to the antigen (bacteria or virus) in the vaccine because of the aluminum-salt. The safety of aluminum adjuvants in vaccines have not been extensively tested in human populations, but a recent animal study found that aluminum-adjuvants in vaccines cause brain damage in mice
. A dramatic
increase in administration of aluminum-adjuvants in the late 1980's
, and continuing to increase in the last decade, corresponds
closely with the increase in autism rates
in those same years.

Misconception #6: Influenza kills 36,000 Americans each year. This number actually refers to 36,000 deaths from influenza-like illnesses each year, which is only a CDC estimate without

data to support. The actual influenza deaths per year, according to the CDC, is about 1/20th that number with only about 44 deaths per year in children under age of 5 (1 in 455,000 children).

Misconception #7: Mercury in vaccines is safe, because mercury was removed from vaccines and autism rates still went up. There is a long list of scientific research including animal studies which indicate that thimerosal in vaccines is harmful (see Thimerosal Science Summary and the 2010 study which showed vaccinated infant monkeys developed symptoms similar to human autism). This misconception is based upon a California study in which the authors concluded that mercury in vaccines is not linked to autism because autism rates did not decrease after mercury was removed from childhood vaccines. However, the authors neglected to consider that during those years there was a significant increase in pregnant women receiving mercury-containing vaccines. This oversight is typical of the bias towards exonerating vaccines that has been pervasive in the studies performed on mercury-containing vaccines (for more on design flaws and bias in these studies, see Why is the vaccine-autism question far from answered?).

Misconception #8: "It's Parents vs Scientists" (as in a NY Times article), implying that the debate is between parents on one side and scientists on the other. In reality, a significant number of top scientists and medical doctors are calling for research into environmental causes of autism including vaccines (See Top Scientists Calling for Environmental Research into Autism).

Misconception #9: Autism is genetic. In reality, the momentum in science is towards an understanding of autism as an environmentally-triggered condition for which there might be a genetic susceptibility, but that most cases of autism are not caused by genetics (see Study debunks autism as a primarily genetic disorder). Large genetics studies continue to find that inherited genes don't cause autism (see Inherited Genes Don't Cause Autism). A 2010 EPA study found that the cause of autism is environmental, and that the environmental cause occurred beginning with children born around 1988. An EPA study that autism has an environmental cause which began to occur with children born in 1988 (see EPA Study: Autism Boom Began in 1988, Environmental Factors Are Assumed).

Misconception #10: There is no autism epidemic, it's just better diagnosis. This misconception states that children today are getting diagnosed with autism that in previous generations received mental retardation diagnoses. This “diagnostic replacement” was based on a 2002 study but after fundamental flaws were pointed out, the authors withdrew their conclusion and stated that diagnostic substitution did not appear to occur. Two other studies also reached the conclusion that diagnostic substitution did not occur, and the theory has been discarded but some Pro-vax adherents still propagate this misconception (see page 1 of Response to Dr. Ari Brown and the Immunization Action Coalition , which also includes a detailed scientific rebuttal of many of the talking points currently put forth by pro-vax adherents regarding autism).

Misconception #11: The increase in autism rates is due to broadening of the definition of autism – In reality, an important study by the University of California-Davis found that autism increases cannot be explained by changes in doctors’ diagnoses and suggested that there must be an environmental cause to the real increase in autism. (see New Study: Autism Linked to Environment).

Misconception #12: Autism is the 'New Normal', implying that autism is just a normal form of social awkwardness that shouldn’t be considered an adverse health condition. In reality, individuals with autism are physically sick. Recent clinical investigations have identified numerous co-morbid disease states in children with autism (see Presentation on Autism Treatment Network). These include abnormal gastrointestinal function and inflammatory bowel disease, evidence of increased oxidative stress, severely altered serum chemistries, methylation disturbances, increased heavy metal burdens and microglial activation in the brain. These disease states are amenable to medical and nutritional interventions as reported by clinicians treating autism. A 2011 review in Journal of Immunotoxicology summarizes evidence of biomarkers that are indicative of common co-morbid conditions such as oxidative stress, immune glutamatergic dysfunction, and pineal gland malfunction.

Misconception #13: There’s no increase, Autism has always been with us but was undiagnosed in past generations. In reality, autism rates amongst adults are dramatically lower than in children less than 22 years of age (see EPA Study: Autism Boom Began in 1988, Environmental Factors Are Assumed). A recent UK study claimed that undiagnosed adult autism rates similar to diagnosed rates in

children, but on further inspection the study was defining adult autism in an unusually broad manner (effectively, anyone with social awkwardness). The vast weight of scientific studies indicates that autism rates had a real increase in the late 1980's, and that current autism rates in adults (undiagnosed + diagnosed) are significantly lower than rates amongst children.

Misconception #14: Now that the Wakefield MMR study has been retracted, the vaccine-autism theory is dead. In reality, it is a fact that autism rates have not been studied in fully vaccinated vs fully unvaccinated children, nor have there been studies of autism rates in children who were vaccinated vs not vaccinated for most vaccines administered in the first year of life: Hib, PCV, DTaP, IPV, Rotavirus, and Influenza. There have been some studies on the Hepatitis B vaccine, administered at birth, with the most recent study finding a 3x increased risk of autism amongst children who received this vaccine in the 1990's. So the vaccine-autism question is far from answered, and there are plausible hypotheses that haven't even been studied -- such as aluminum adjuvant in vaccines, which has been shown to be a neurotoxin when injected into mice and which has increased in the vaccination schedule in parallel with the increase in autism rates.

Side note: Wakefield and colleagues were the first to find that gastrointestinal abnormalities are common in autism, an important finding that has been replicated by research in five countries. There is much more to the Wakefield story than has been shared widely in the press; for details, see Who is Dr. Andrew Wakefield? by Mary Holland, JD (an online chapter of the book "Vaccine Epidemic") or read the book Callous Disregard by Dr. Wakefield.