Vaccine Scientist, Pediatrician, Autism Dad
UNDER 5 CHILDHOOD DEATHS

• Measles  478,727
• Pertussis  138,048
• Tetanus   105,333
• H. flu     86,104
• Diphtheria 10,413

UN Millennium Summit and MDGs

Millennium Development Goals

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. A global partnership for development

Reduce child mortality

UN Millennium Summit and MDGs
<table>
<thead>
<tr>
<th>OLD</th>
<th>NEW</th>
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<tbody>
<tr>
<td>GAVI ALLIANCE</td>
<td>Gavi, The Vaccine Alliance</td>
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# Under 5 Child Deaths 2000-2017

**GBD 2017**

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measles</td>
<td>478,727</td>
<td>83,438 (-83%)</td>
</tr>
<tr>
<td>Pertussis</td>
<td>138,048</td>
<td>86,091 (-38%)</td>
</tr>
<tr>
<td>Tetanus</td>
<td>105,333</td>
<td>18,623 (-82%)</td>
</tr>
<tr>
<td>H. flu</td>
<td>86,104</td>
<td>36,185 (-58%)</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>10,413</td>
<td>2,914 (-72%)</td>
</tr>
</tbody>
</table>
Can we eliminate measles globally?
Measles Transmissibility

Average Number Infected Per Case

- Recent Ebola Outbreaks
- 1918 Flu Pandemic
- SARS
- Smallpox
- Measles

$R_0$
Europe in 2018: 60,000+ Measles
20 Years of ‘Vaccine Hesitancy’ 1998-2018

IMAGE(S) REMOVED FOR COPYRIGHT PURPOSES
RETRACTED: Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children

Dr AJ Wakefield FRCS a, SH Murch MB b, A Anthony MB a, J Linnell PhD a, DM Casson MRCP b, M Malik MRCP b, M Berelowitz FRCPsych c, AP Dhillon MRCPath a, MA Thomson FRCP b, P Harvey FRCP d, A Valentine FRCR e, SF Davies MRCPath a, JA Walker-Smith FRCP a

Summary

Background
We investigated a consecutive series of children with chronic enterocolitis and regressive developmental disorder.

Methods
12 children (mean age 6 years [range 3–10], 11 boys) were referred to a paediatric gastroenterology unit with a history of normal development followed by loss of acquired skills, including language, together with diarrhoea and abdominal pain. Children underwent gastroenterological, neurological, and developmental assessment and review of developmental records. Ileocolonoscopy and biopsy sampling, magnetic-resonance imaging (MRI), electroencephalography (EEG), and lumbar puncture were done under sedation. Barium follow-through radiography was done where possible. Biochemical, haematological, and immunological profiles were examined.
The spread of anti-vax sentiment in California

Share of public school kindergartners with personal belief exemptions to vaccination requirements

2000

2007

2013

Source: California Department of Public Health

WASHINGTONPOST.COM/WONKBLOG
Figure 1. Percent of Students in Kindergarten through 12th Grade with a Conscientious Exemption on file for at least one vaccine

Reported Conscientious Exemptions by County, 2018-2019 School Year

Percent of Students in K-12 with a Conscientious Exemption
- No schools/districts reporting
- 0%
- 0.01-0.67%
- 0.68-1.57%
- 1.58-2.99%
- > 3.00%

Source: DSHS Immunization Unit, April 2019
## Schools with Highest Rates of Vaccination Exemptions

<table>
<thead>
<tr>
<th>School</th>
<th>Percent exempted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austin Waldorf School (Travis)</td>
<td>40.51%</td>
</tr>
<tr>
<td>Regents Academy (Nacogdoches)</td>
<td>37.75%</td>
</tr>
<tr>
<td>Austin Discovery School (Travis)</td>
<td>30.06%</td>
</tr>
<tr>
<td>Joshua Adv Multi-Gr Sch (Johnson)</td>
<td>26.67%</td>
</tr>
<tr>
<td>Trinity Christian Academy Paris (Lamar)</td>
<td>23.86%</td>
</tr>
<tr>
<td>The Khabele School (Travis)</td>
<td>22.08%</td>
</tr>
<tr>
<td>Aesa Prep Academy (Travis)</td>
<td>20.65%</td>
</tr>
</tbody>
</table>
Vaccine Hesitancy in USA

IMAGE(S) REMOVED FOR COPYRIGHT PURPOSES
Heat map of county-level NME rates in 2016 to 2017

http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002616
Heat map of counties with >400 kindergarteners with NMEs in 2016 to 2017

http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002616
Public Health and Economic Consequences of Vaccine Hesitancy for Measles in the United States

Nathan C. Lo, BS; Peter J. Hotez, MD, PhD

Key Points

**Question**  How does vaccine hesitancy affect annual measles cases and economic costs in the United States?

**Findings**  In this modeling study of children (age 2-11 years), a 5% reduction in measles, mumps, and rubella vaccination coverage resulted in a 3-fold increase in annual measles cases with an additional US$2.1 million in public sector costs.

**Meaning**  Even small declines in vaccination coverage in children owing to vaccine hesitancy may have substantial public health and economic consequences that will be larger when considering unvaccinated infants, adolescents, and adults.
Measles reached a peak of 763,000 cases in 1958. Fast-forward 42 years and it was eliminated in the U.S. In 2019, the virus has mounted a comeback, reaching its highest level in 25 years.

**DATA PULLOUT: CASES SINCE 2000**

Measles on the rise this decade

- 1,044 cases by June 13, 2019

Source: Centers for Disease Control and Prevention
Measles resurgence in the USA: how international travel compounds vaccine resistance

IMAGE(S) REMOVED FOR COPYRIGHT PURPOSES
Four Factors Driving Antivax in America

• The Media Empire

• The Political Machine

• Deliberate Predation

• Lack of Robust Vaccine Advocacy
The Antivax Media Empire
Dominating the Internet

>480 Antivaccine Misinformation Websites
The Antivax Political Machine

TEXANS for Vaccine Choice

OKLAHOMANS FOR VACCINE CHOICE
MANDATES ARE NOT OK

OREGONIANS for MEDICAL FREEDOM

Scientific Integrity * Healthy Immunity * Informed Choice
Predation in NY: 40 Hospitalizations, including 11 ICU Admissions

IMAGE(S) REMOVED FOR COPYRIGHT PURPOSES
Patches of Disorganization in the Neocortex of Children with Autism

Rich Stoner, Ph.D., Maggie L. Chow, Ph.D., Maureen P. Boyle, Ph.D., Susan M. Sunkin, Ph.D., Peter R. Mouton, Ph.D., Subhojit Roy, M.D., Ph.D., Anthony Wynshaw-Boris, M.D., Ph.D., Sophia A. Colamarino, Ph.D., Ed S. Lein, Ph.D., and Eric Courchesne, Ph.D.

ABSTRACT

BACKGROUND
Autism involves early brain overgrowth and dysfunction, which is most strongly evident in the prefrontal cortex. As assessed on pathological analysis, an excess of neurons in the prefrontal cortex among children with autism signals a disturbance in prenatal development and may be concomitant with abnormal cell type and...
Science and Public Engagement

Most Americans Cannot Name a Living Scientist

Can you name a living scientist?

- Yes, I can name: 19%
  - Stephen Hawking (27%)
  - Neil deGrasse Tyson (19%)
  - Bill Nye (5%)
  - Richard Dawkins (3%)
  - Jane Goodall (2%)
  - Anthony Fauci (2%)
  - Michio Kaku (2%)
  - Me (2%)
  - James Watson (1%)

- No, I cannot name/Not sure: 81%
