

# The ASSET FINAL EVENT

*Share and move for mobilization and mutual learning at local, national and international levels on Science in Society related issues in epidemics and pandemics*

## BEHAVIORAL EPIDEMIOLOGY IN THE POST-TRUST SOCIETY

SESSION: UNSOLVED SCIENTIFIC QUESTIONS

**Alberto D'ONOFRIO**

INTERNATIONAL PREVENTION RESEARCH INSTITUTE

Lyon (France)

[alberto.d'onofrio@i-pri.org](mailto:alberto.d'onofrio@i-pri.org)



International Prevention Research Institute



**30<sup>th</sup> – 31<sup>st</sup> October 2017**

*NH Hotel Via dei Gracchi 324*

*Rome*

# The two pillars of prevention and containment of epidemics

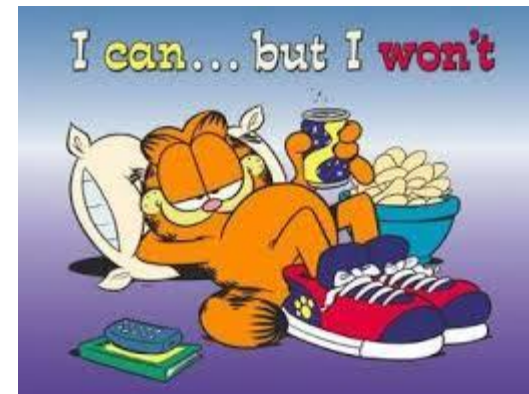
- Pharmacological Steps (Vaccination, Antiviral Drugs)
- Non-pharma steps (decreasing behaviours at risk, social distancing, isolation measures )

# **BOTH DEPEND ON HUMAN BEHAVIOUR !**

- Propensity to vaccinate our own children (or to take an antiviral drug)
- decreasing behaviours at risk, social distancing: behaviour dependent

# Inducing modifications of behaviors at risk is challenging !

- Some RISKY behaviors are considered NOT at risk
- Some behaviors are considered at risk, but they are not
- Some RISKY behaviors are correctly perceived at risk, but changing them implies an effort.... and people are lazy



# Vaccinations

In EU and in other parts of affluent world...to the old basic scenario....

# Traditional Irrational Anti-Vaccinators...



A **NEW AND MORE DANGEROUS** ONE IS  
ADDED

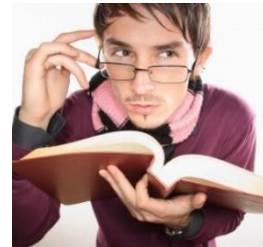
...modern “**Pseudo Rational**”  
Objection/hesitancy to VAccination  
 (“**PROVA**”)  
**typical of rich & learned people...**

Vaccine 34 (2016) 1733–1738

Affluence as a predictor of vaccine refusal and underimmunization  
in California private kindergartens

Louise-Anne McNutt<sup>a,\*</sup>, Cristina Desemone<sup>b</sup>, Erica DeNicola<sup>a</sup>, Hassan El Chebib<sup>c</sup>,  
Jessica A. Nadeau<sup>a</sup>, Robert A. Bednarczyk<sup>d</sup>, Iana Shaw<sup>c</sup>

“OK, polio is serious. However, there are very few cases in my country ! Why should I vaccinate my children exposing them to vaccine-related side effect ?”



“Come on! We must train our children’s Immune System so that it can fight really serious diseases, not funny diseases as measles”

**“Nature Does Things Well, Why Should We Interfere?”: Vaccine Hesitancy Among Mothers**



**Eve Dubé<sup>1</sup>, Maryline Vivion<sup>2</sup>, Chantal Sauvageau<sup>2</sup>, Arnaud Gagneur<sup>3</sup>,  
Raymonde Gagnon<sup>4</sup>, and Maryse Guay<sup>5</sup>**



# ... Moreover: health-care workers are skeptical against vaccinations...

Vaccine 32 (2014) 7128–7134



Contents lists available at [ScienceDirect](#)

## Vaccine

journal homepage: [www.elsevier.com/locate/vaccine](http://www.elsevier.com/locate/vaccine)



## Qualitative motivators and barriers to pandemic vs. seasonal influenza vaccination among healthcare workers: A content analysis

Chatura Prematunge<sup>a,b,\*</sup>, Kimberly Corace<sup>b,c,d,e</sup>, Anne McCarthy<sup>b,c,d</sup>, Rama C. Nair<sup>b</sup>, Virginia Roth<sup>b,c,d</sup>, Kathryn N. Suh<sup>b,c,d</sup>, Gary Garber<sup>a,b,c,d</sup>

### RAPID COMMUNICATIONS

Low acceptance of vaccination against the 2009 pandemic influenza A(H1N1) among healthcare workers in Greece

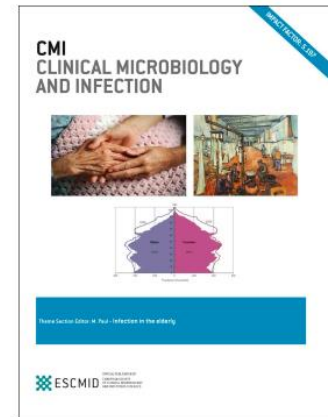
G Rachiotis<sup>1</sup>, V A Mouchtouri<sup>1</sup>, I Kremastinou<sup>2</sup>, K Gourgoulianis<sup>3</sup>, C Hadiichristodoulou (xhatzi@med.uth.gr)<sup>1</sup>

# ...or exhibit **striking discrepancies** between their **family vaccinal choices** and their suggestions to patients

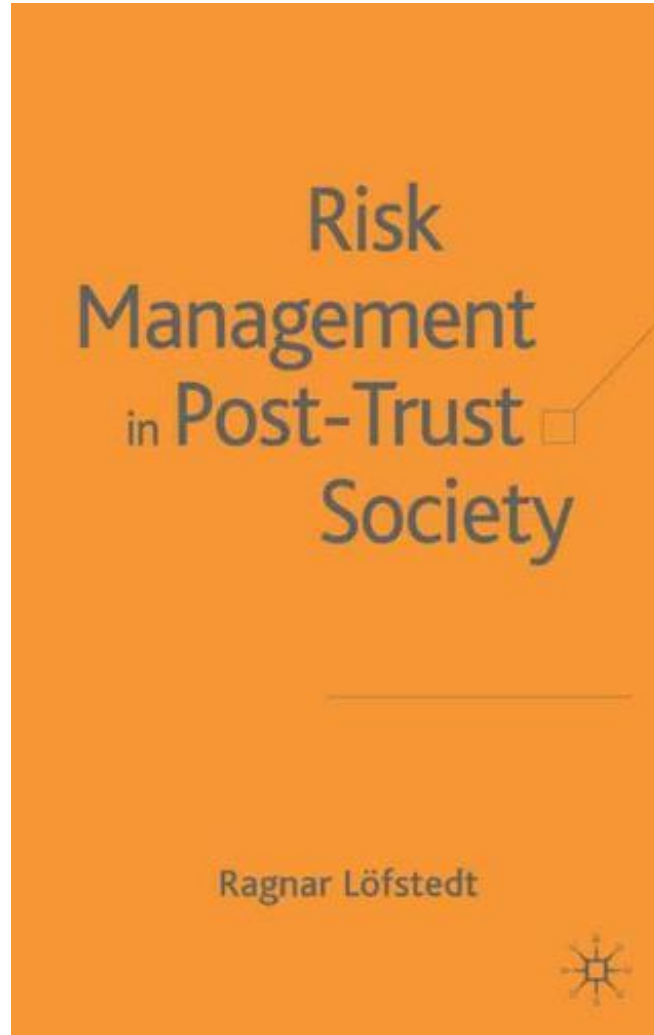
Discrepancies between general practitioners' vaccination recommendations for their patients and practices for their children

Agrinier Nelly, Le Maréchal Marion, Fressard Lisa, Verger Pierre, Pulcini Céline

vaccinated (low level of discordance), while **60% (95%CI 58-64%) had a high level of discordance, that is, most reported that their children were vaccinated, but did not always recommend the same vaccines to their patients.**



TO **REVERSE THE P.R.O.V.A. TREND** IS... a huge challenge for EU Public Health, since we are living in a **“Post-Trust” Society**



TO **REVERSE THE P.R.O.V.A. TREND** IS... a  
huge challenge also because....  
**knowledge** is important but **not enough**  
to **change the behaviour** of vaccine-  
hesitant people !

Vaccine 33 (2015) 4212–4214

Health communication and vaccine hesitancy

Susan Goldstein<sup>a,\*</sup>, Noni E. MacDonald<sup>b</sup>,  
Sherine Guirguis<sup>c</sup>, the SAGE Working Group on Vaccine Hesitancy<sup>2</sup>

# Even more difficult when “science” seems to confirm rumors....

## Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children

A J Wakefield, S H Murch, A Anthony, J Linnell, D M Casson, M Malik, M Berelowitz, A P Dhillon, M A Thomson, P Harvey, A Valentine, S E Davies, J A Walker-Smith

### 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.

**Findings** Onset of behavioural symptoms was associated, by the parents, with measles, mumps, and rubella vaccination in eight of the 12 children, with measles infection in one child, and otitis media in another. All 12 children had intestinal abnormalities, ranging from lymphoid nodular hyperplasia to aphthoid ulceration. Histology showed patchy chronic inflammation in the colon in 11 children and reactive ileal lymphoid hyperplasia in seven, but no granulomas. Behavioural disorders included autism (nine), disintegrative psychosis (one), and possible postviral or vaccinal encephalitis (two). There were no

### Introduction

We saw several children who, after a period of apparent normality, lost acquired skills, including communication. They all had gastrointestinal symptoms, including abdominal pain, diarrhoea, and bloating and, in some cases, food intolerance. We describe the clinical features and gastrointestinal features of these children.

### Patients and methods

12 children, consecutively referred to the paediatric gastroenterology unit with a history of a pervasive developmental disorder with loss of acquired skills and intestinal symptoms (diarrhoea, abdominal pain, bloating and intolerance), were investigated. All children were admitted to hospital for 1 week, accompanied by their parents.

### Clinical investigations

We took histories, including details of immunisation, exposure to infectious diseases, and assessed the children. In all cases the history was obtained by the senior clinician (J). Neurological and psychiatric assessments were done by consultant staff (PH, MB) with HMS-4 criteria.<sup>1</sup> Developmental histories included a review of prospective developmental records from parents, health visitors, and general practitioners. All children did not undergo psychiatric assessment in hospital; they had been assessed professionally elsewhere, so these assessments were used as the basis for their behavioural diagnosis.

After bowel preparation, ileocolonoscopy was performed with SHM or MAT under sedation with midazolam and pethidine. Paired frozen and formalin-fixed mucosal biopsy samples were taken from the terminal ileum; ascending, transverse, and sigmoid colons, and from the rectum. The procedure was recorded by video or still images, and

In reality the acceptance of that paper is one of the major example **of absence of peer review** not of science failure. Any case *the impact was a disaster...*

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Early Report

**RETRACTED: Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children**

Dr AJ Wakefield, FRCS, SH Murch, MB, A Anthony, MB, J Linnell, PhD, DM Casson, MRCP, M Malik, MRCP, M Berelowitz, FRCPsych, AP Dhillon, MRCPsych, MA Thomson, FRCP, P Harvey, FRCP, A Valentine, FRCP, SE Davies, MRCPsych, JA Walker-Smith, FRCP

Published: 28 February 1998

Altmetric 2,325

DOI: [http://dx.doi.org/10.1016/S0140-6736\(97\)11096-0](http://dx.doi.org/10.1016/S0140-6736(97)11096-0)

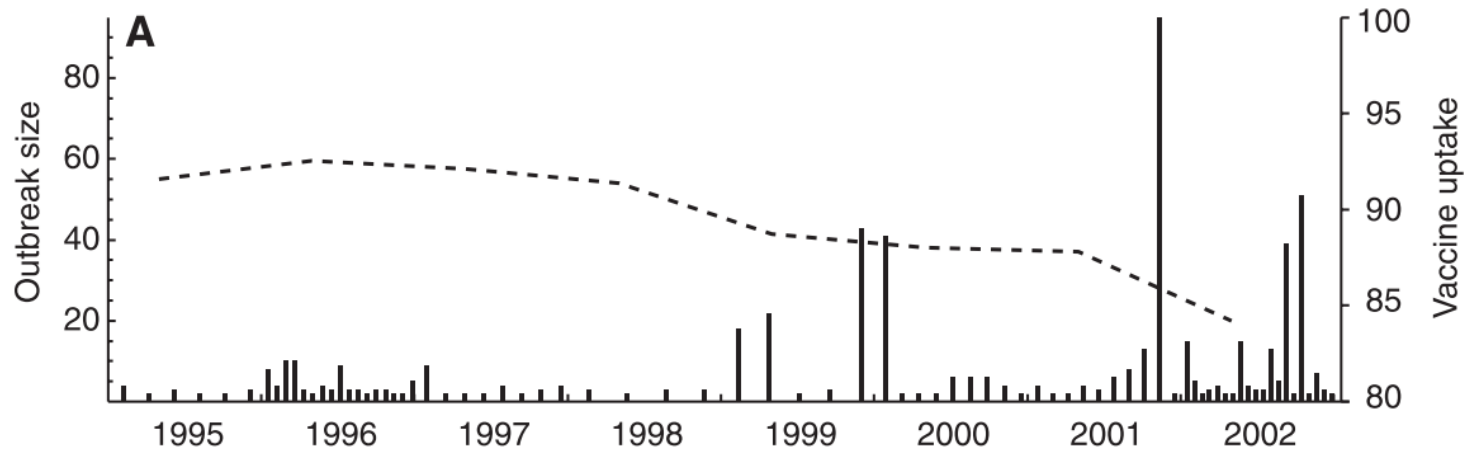
Article Info

Summary Full Text Tables and Figures References

Summary

**RETRACTED**

95% coverage is the theoretical minimum to eliminate measles. **Sudden decrease of MMR vaccine** -> recurrent epidemics predicted &... **really observed !**



Measles outbreaks in England+Wales in 1993-2002 & vaccine uptake in 0-11y children

# Serious Press diffused the news on retraction

The Telegraph

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The MMR scare was 'deliberate fraud' the British Medical Journal has said

The MMR scare was the result of a 'deliberate fraud' by Andrew Wakefield, the British Medical Journal has concluded and argues it was a 'hoax'.



Dr Andrew Wakefield Photo: PA

By Rebecca Smith, Medical Editor  
7:00AM GMT 06 Jan 2011

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The now infamous 1998 research paper in The Lancet medical journal

Health News  
News » UK News »  
Rebecca Smith »

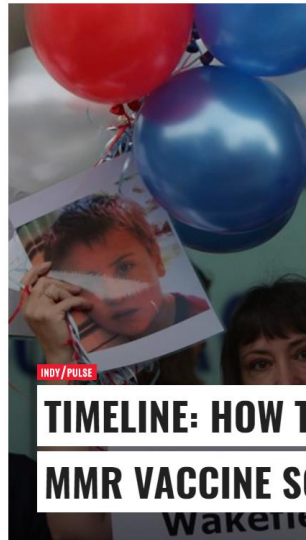
In Health News



Weird X-rays



Life begins at 70



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Wednesday, May

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MMR boycott 'has left two million children at risk of measles': Doctors say outbreak in Wales could spread to London

- Fears over autism link to jab in 1990s means teens are now susceptible
- Chief Government science advisor urges parents to get children vaccinated
- Health scare was based on a study that has since been discredited

PUBLISHED: 01:42 BST, 19 April 2013 | UPDATED: 08:59 BST, 19 April 2013

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Two million children risk catching measles as a result of the MMR scare, doctors warned yesterday.

BUT Wakefield-based fake news against MMR vaccine and the PDF of the paper continue spreading on Internet



# ... political and religious objection...

OPEN ACCESS Freely available online

PLoS MEDICINE

Policy Forum

## What Led to the Nigerian Boycott of the Polio Vaccination Campaign?

Ayodele Samuel Jegede

In northern Nigeria in 2003, the political and religious leaders of Kano, Zamfara, and Kaduna states brought the immunization campaign to a halt by calling on parents not to allow their children to be immunized. These leaders argued that the vaccine could be contaminated with anti-fertility agents (estradiol hormone), HIV, and cancerous agents.

(SCSN), is quoted as saying that polio vaccines were “corrupted and tainted by evildoers from America and their Western allies.” Ahmed went on to say: “We believe that modern-day Hitlers have deliberately adulterated the oral polio vaccines with anti-fertility drugs and...viruses which are known to cause HIV and AIDS” [14].

CIA organised fake vaccination drive to get Osama bin Laden's family DNA

# ... often the reasons of vaccinators are of anti-vaccinators can be deeply rooted in local culture....

Body, Body Politic and  
Vaccination in the UK

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*with Michael Poltorak*<sup>1</sup>

Research

Open Access

**Determinants of parents' reticence toward vaccination in urban areas in Benin (West Africa)**

Léonard Fourn<sup>1\*</sup>, Slim Haddad<sup>2</sup>, Pierre Fournier<sup>2</sup>, Roméo Gansey<sup>3</sup>

## Introduction

This chapter analyses anxieties around vaccination in contemporary Britain, at a time when **one element of the childhood vaccination schedule – the combined measles, mumps and rubella (MMR) vaccination – became the focus of scientific and public controversy**. How this controversy unfolded as certain parents mobilized, mobilized science and met a vociferous counter-mobilization from health institutions is the focus of the next chapter. **Here, we are interested in how, against this backdrop, 'ordinary' parents considered the vaccination of their children.**

... **vaccine waning** and the related issue of  
revaccination is adding into the play of  
vaccination hesitancy **new hesitant actors**  
with a particular psychology: **teenagers....**

Review

Vaccine 31 (2013) 5366–5374

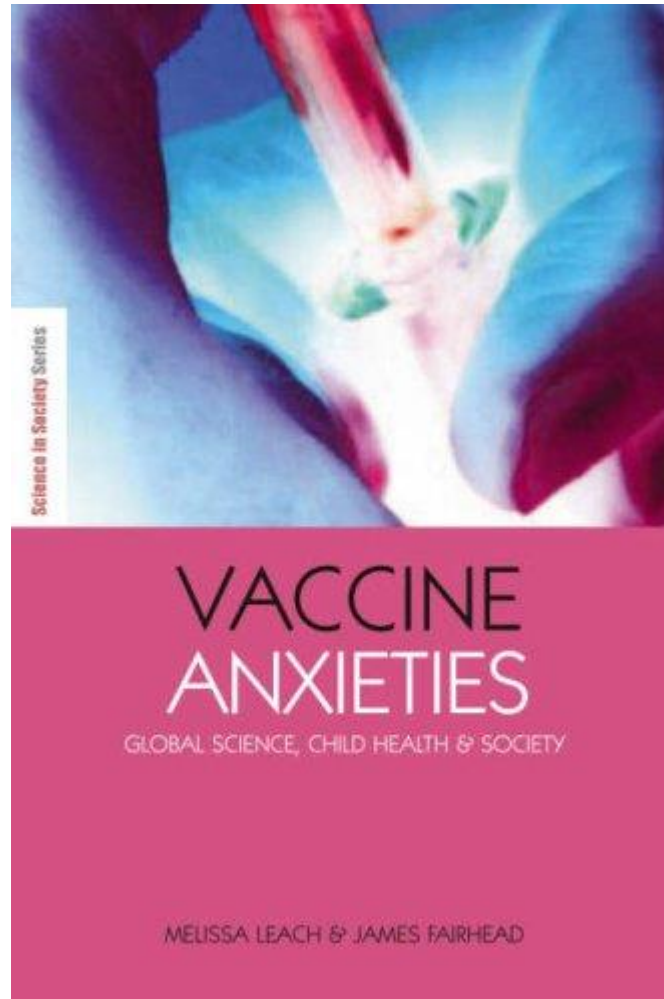
Adolescents and vaccines in the western world

Nicola Principi\*, Susanna Esposito

*Pediatric High Intensity Care Unit, Department of Pathophysiology and Transplantation, Università degli Studi di Milano, Fondazione IRCCS Ca' Granda  
Ospedale Maggiore Policlinico, Milan, Italy*

ually received in most countries, even in those in which vaccination programmes are usually adequately implemented and monitored. Adolescence is a particular period of life characterised by changes in intellectual, moral, physical, emotional and psychological development. All of these can have a considerable impact on compliance with immunisation schedules because the approach to any preventive method no longer entirely depends on parents' and pediatricians' judgements as in the first years of life but is the consequence of a more complex process involving the adolescents' thoughts and opinions, their relationships with their parents, friends and physicians, and the information they receive from the mass media. Every effort should be made to overcome the barriers to adolescent immunisation, including those arising from the adolescents themselves.

Thus: **anthropological** and **sociology**  
viewpoints are fundamental....



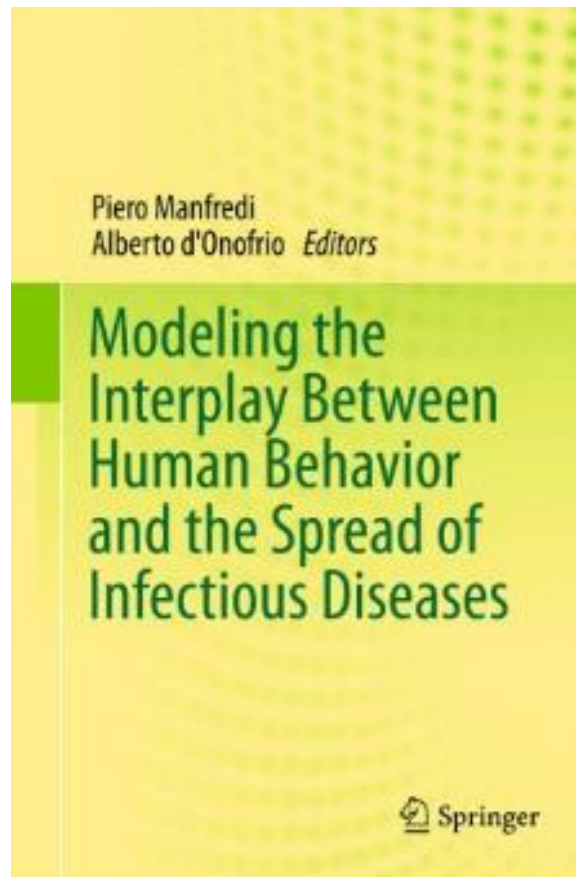
Modern Vaccine Hesitancy is a  
challenge for science which

**MUST  
ADAPT  
!**

# Traditional tool for public health planning & analysis

- Mathematical models
- Useful tool employed by public health agencies
- **LIMITATION: human behaviour NOT** included.
- Humans = molecules, contagion = chemical reaction

# A new branch of Epidemiology: **Behavioral Epidemiology** of Infectious Diseases



# Aim & Features

- AIM: investigating the impact of changes of behaviour in disease spreading.
- Feature: BE is multi-disciplinary, math & stat EPI but also: economy, sociology & anthropology
- Feature: fundamental role of the diffusion of information



# Example

- Spread of a diseases
- Spread of the information of on the epidemics
- People **may** change their **behaviors at risk** & their **propensity to vaccinate**
- The behavior impacts on the spread itself
- Etc...

# Basic Tools

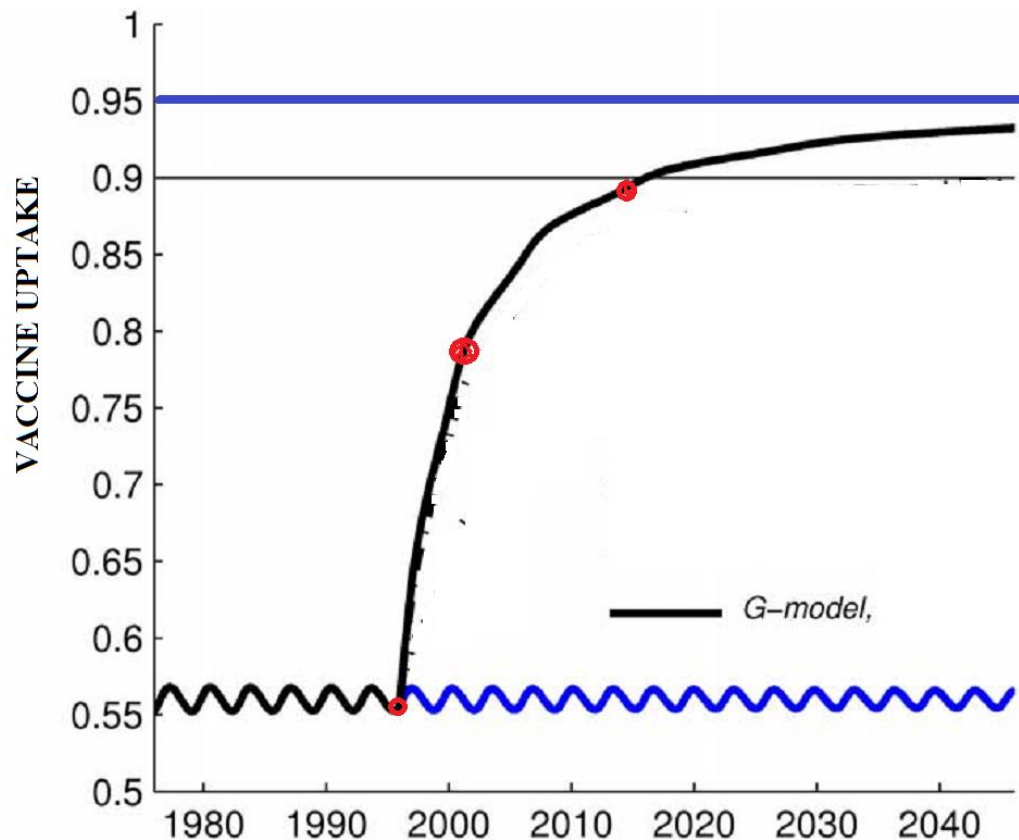
- Role of memory (short or long)
- THEORY OF GAMES: The propensity to vaccinate is ruled by an imitation game (vaccination propensity increases depending on the information on the spread; it decreases depending on news and rumours on vaccine side effects)
- Irrationality as stochasticity
- Local vs Global Information

# Basic Results

- If **vaccination** is not mandatory & no **awareness campaign** is enacted: eradication impossible
- IN OTHER WORDS: **spontaneous changes** in favour of vaccination **CANNOT** fully **compensate** the **fear** of vaccine side effects
- If **awareness campaign** is included eradication seem possible

# Measles Vaccination Italy

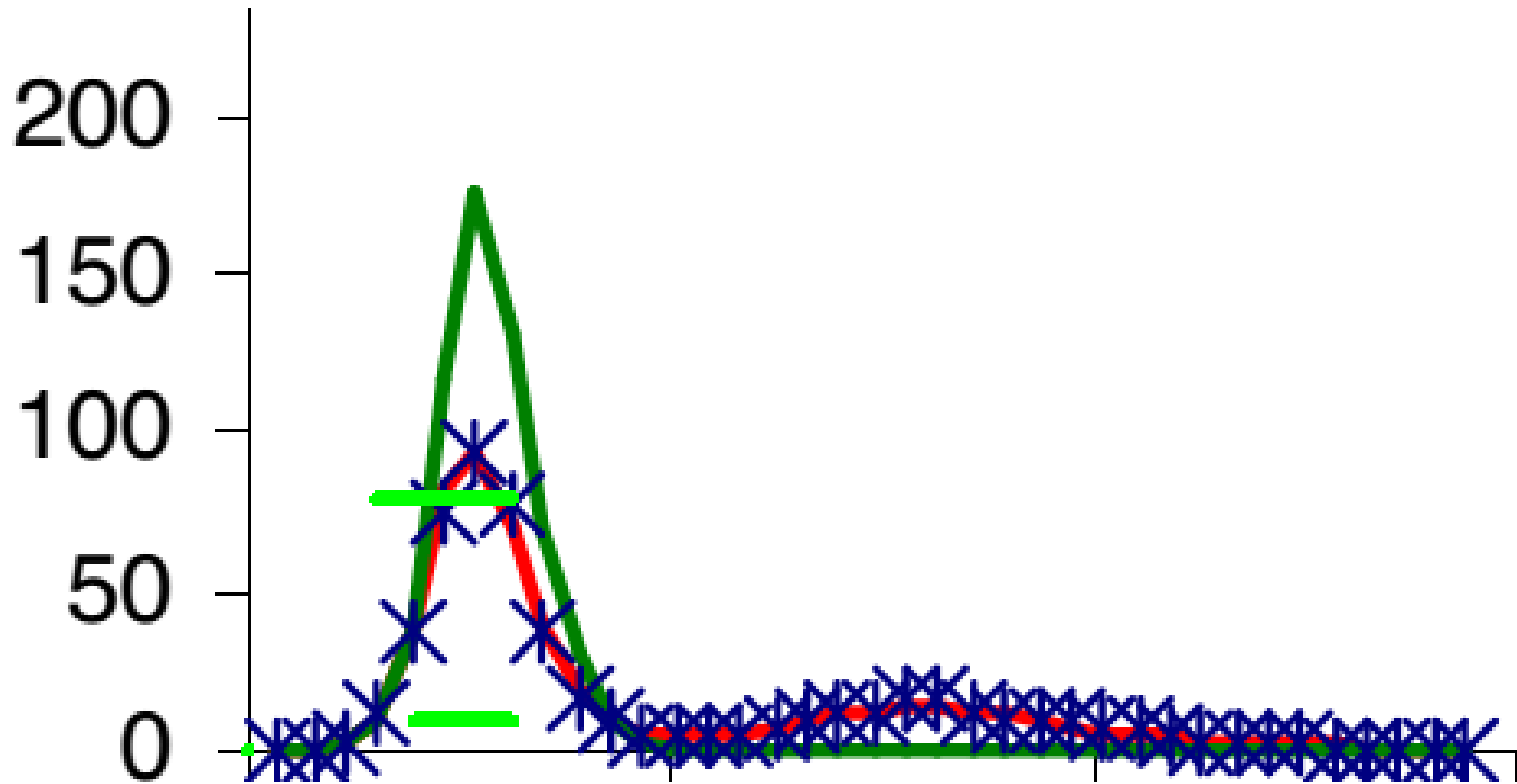
- (d'Onofrio et al, 2012) Increasing vaccine awareness -> rise of Vaccine uptake.  
However **more effort needed to eradicate**



# Spanish Flu model by Bootsma & Ferguson

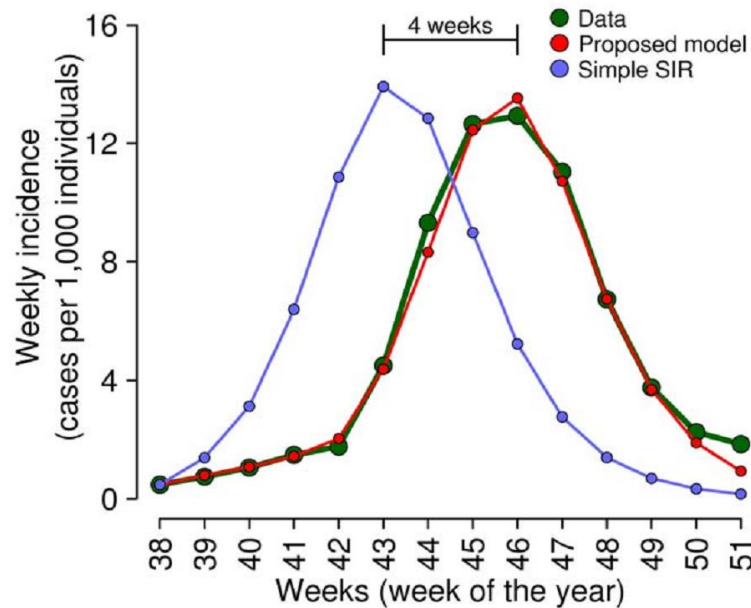
- Risky behaviours decrease if disease-related deaths increase in a given time interval of “public memory”
- Explain the impact of public health measures in various cities of USA during pandemics

# Spanish Flu model by Bootsma & Ferguson



Dark green curve: simulation of a scenario where no Public health measure are enacted

# Influenza-Like-Illness during H1N1 pandemics in Italy (Poletti et al)



Data not fit by non behavioural model  
model suggests: first phase of pandemics “prudent”  
behaviour was prevalent, later normal behaviour  
was prevalent

# Summarizing:

- **Vaccine are victims of their success** : preventing and containing epidemics is more complex now than in the past
- Planning of ID control strategies has to take into the account the **role of human behavior**: both in the propensity to vaccination and the daily behaviours at risk
- Vaccination campaign must be **paired** with **vaccine awareness campaigns**
- **Behavioral Epi: new generation of mathematical and statistical models** taking in account **human behavior**