



# DIGITAL NETWORKS AND PUBLIC HEALTH: THE INFLUENCE OF “SOCIAL” PROOF

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## **Oral Health Florida**

July 28<sup>th</sup>, 2016

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Harvard School of Dental Medicine

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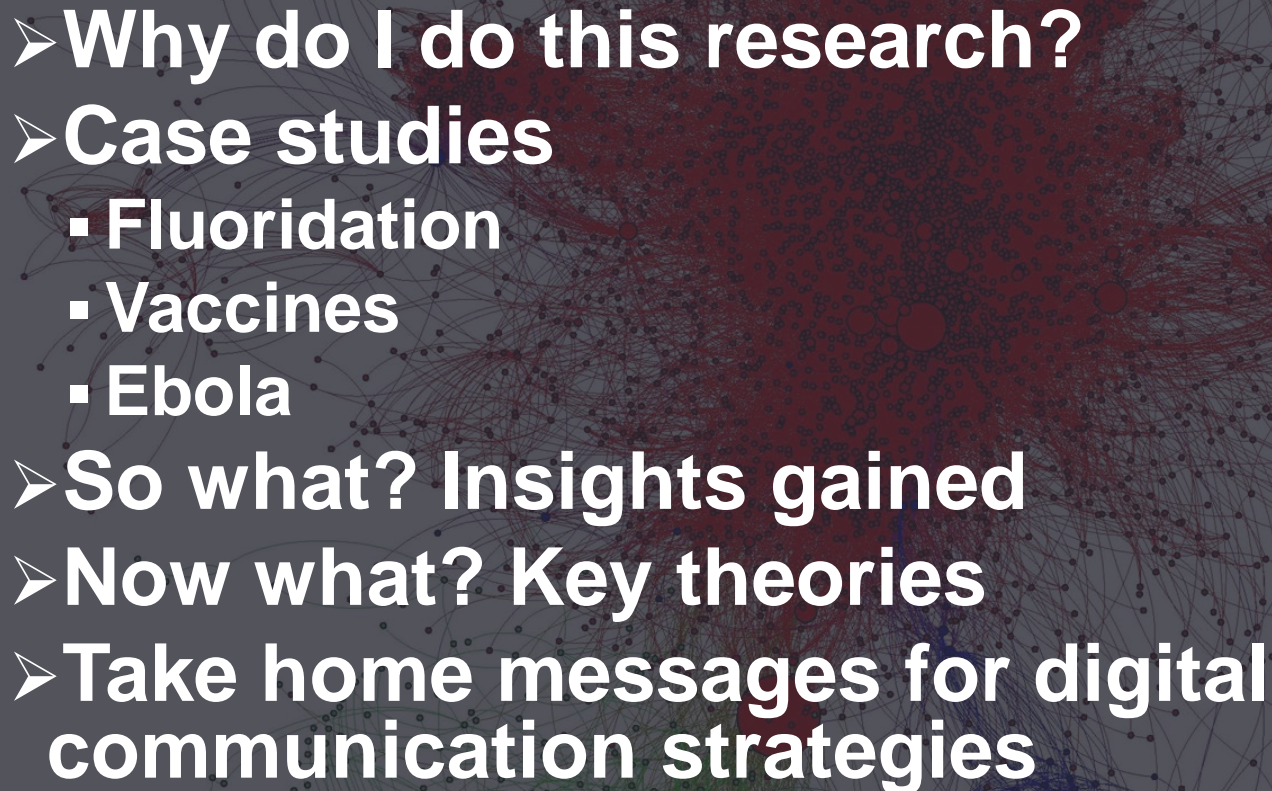
Faculty Associate, Berkman Klein Center for Internet and Society

Digital Health Communication Consultant, MIT





# Today: Visual tour of cyberspace

- 
- A complex network visualization of cyberspace, featuring a dense web of nodes and edges. The nodes are represented by small dots, and the edges are thin lines connecting them. The network is primarily dark red and black, with some green and blue clusters visible at the bottom. The overall shape is irregular and sprawling, suggesting a vast and interconnected digital landscape.
- Why do I do this research?
  - Case studies
    - Fluoridation
    - Vaccines
    - Ebola
  - So what? Insights gained
  - Now what? Key theories
  - Take home messages for digital communication strategies



# Top 10 Public Health Achievements of the 20<sup>th</sup> Century



1. Vaccines
2. Motor vehicle safety
3. Safer workplaces
4. Control of infectious diseases
5. Decline in deaths for coronary heart disease and stroke
6. Safer and healthier foods
7. Healthier mothers and babies
8. Family planning
9. Fluoridation of drinking water
10. Recognition of tobacco use as a health hazard





# The Story of Fluoride

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The Lancet Neurology, [Volume 13, Issue 3](#), Pages 330 - 338, March 2014  
doi:10.1016/S1474-4422(13)70278-3  [Cite or Link Using DOI](#)

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## Neurobehavioural effects of developmental toxicity

Dr [Philippe Grandjean](#) MD  , [Philip J Landrigan](#) MD 

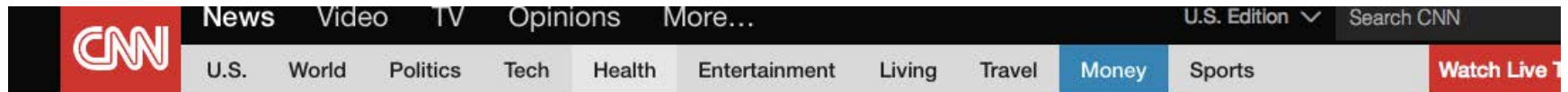
### Summary

Neurodevelopmental disabilities, including autism, attention-deficit hyperactivity disorder, dyslexia, and other cognitive impairments, affect millions of children worldwide, and some diagnoses seem to be increasing in frequency. Industrial chemicals that injure the developing brain are among the known causes for this rise in prevalence. In 2006, we did a systematic review and identified five industrial chemicals as developmental neurotoxicants: lead, methylmercury, polychlorinated biphenyls, arsenic, and toluene. Since 2006, epidemiological studies have documented six additional developmental neurotoxicants—manganese, fluoride, chlorpyrifos, dichlorodiphenyltrichloroethane, tetrachloroethylene, and the polybrominated diphenyl ethers. We postulate that even more neurotoxicants remain undiscovered. To control the pandemic of developmental neurotoxicity, we propose a global prevention strategy. Untested chemicals should not be presumed to be safe to brain development, and chemicals in existing use and all new chemicals must therefore be tested for developmental neurotoxicity. To coordinate these efforts and to





# The Story of Fluoride



## 'Putting the next generation of brains in danger'

By Sandra Young, CNN

⌚ Updated 4:26 PM ET, Mon February 17, 2014



### More from CNN



Waitress responds to LOL cheapskate



What CDC could do about brain-eat amoeba



Tropical Storm Erika heading toward



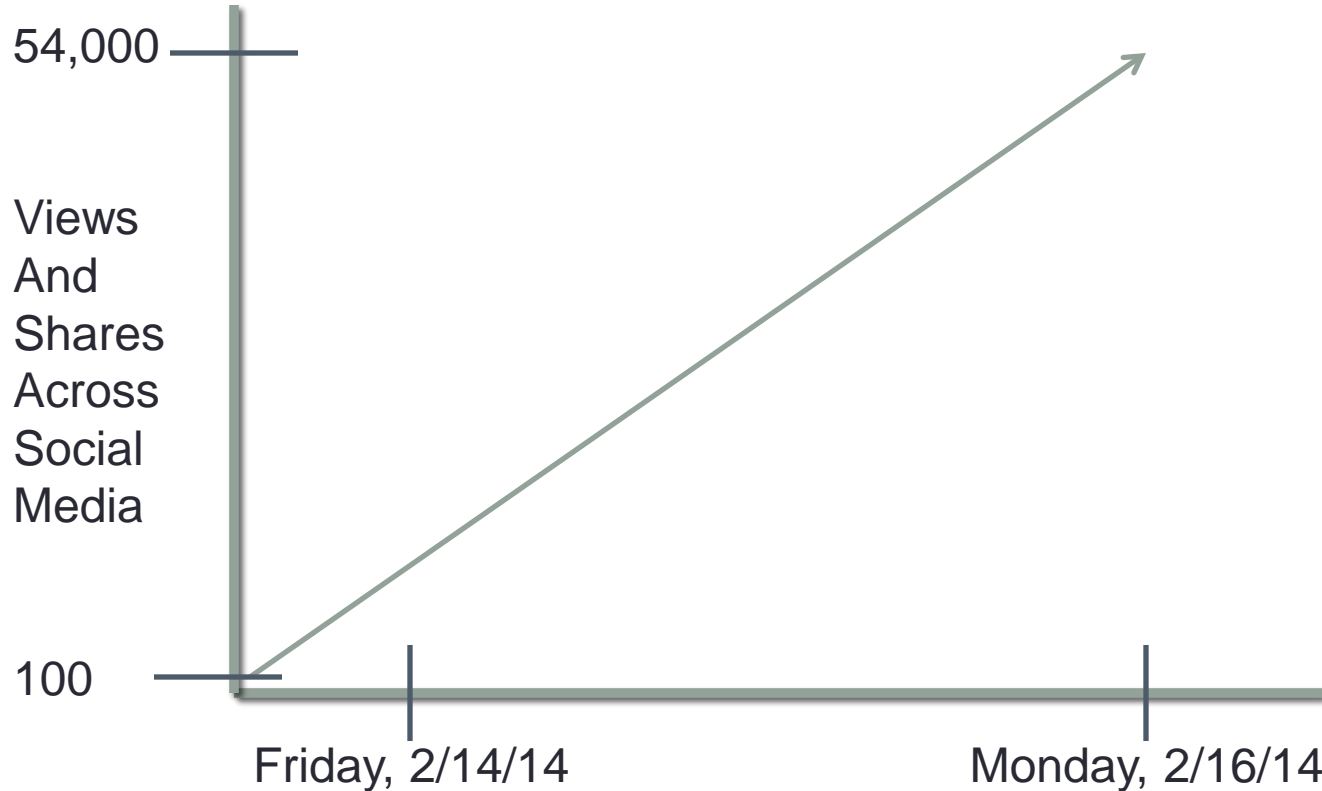
The world in 20 Same size, a lot





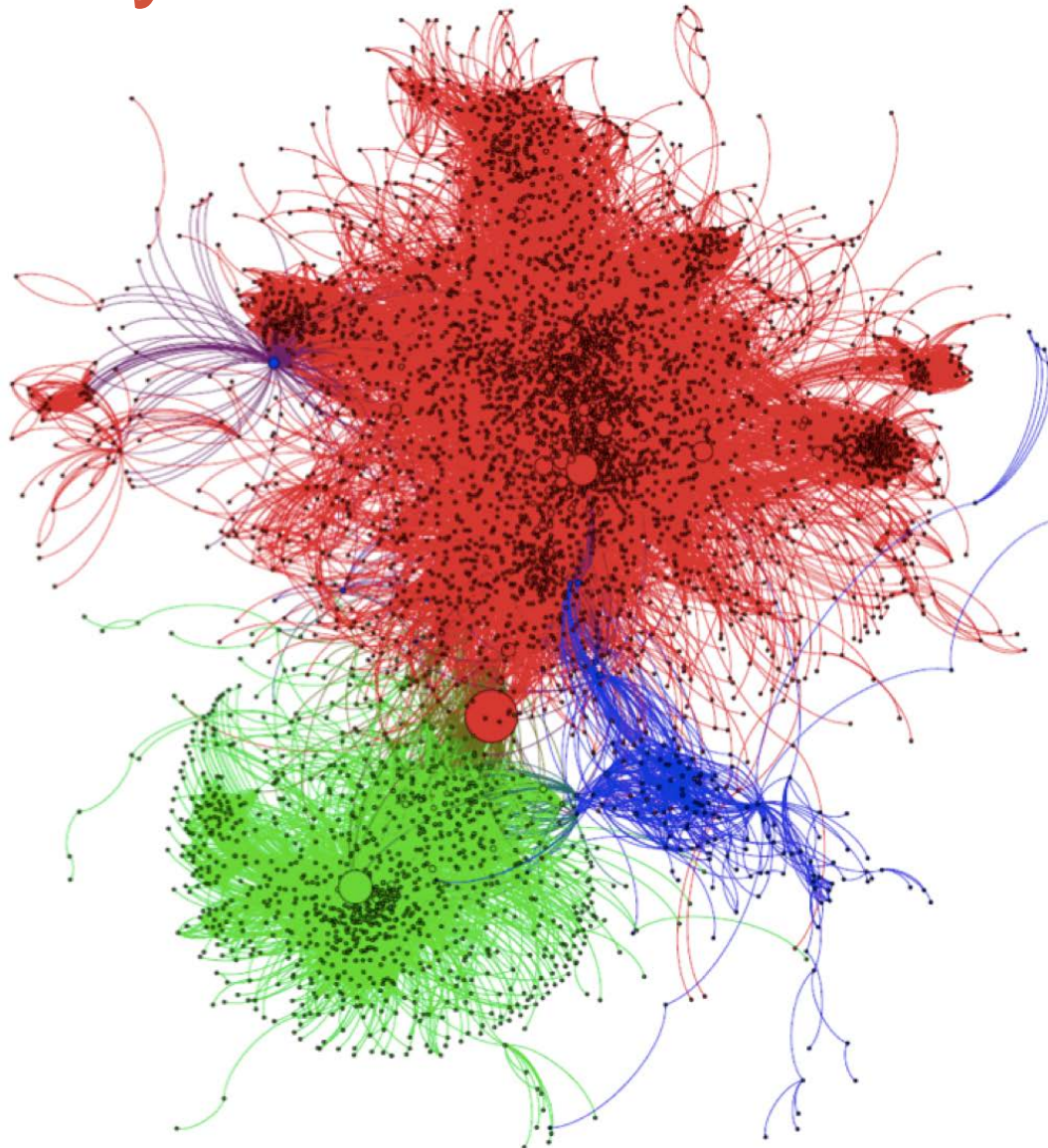
# The Story of Fluoride

CNN, Forbes, Time, USA Today



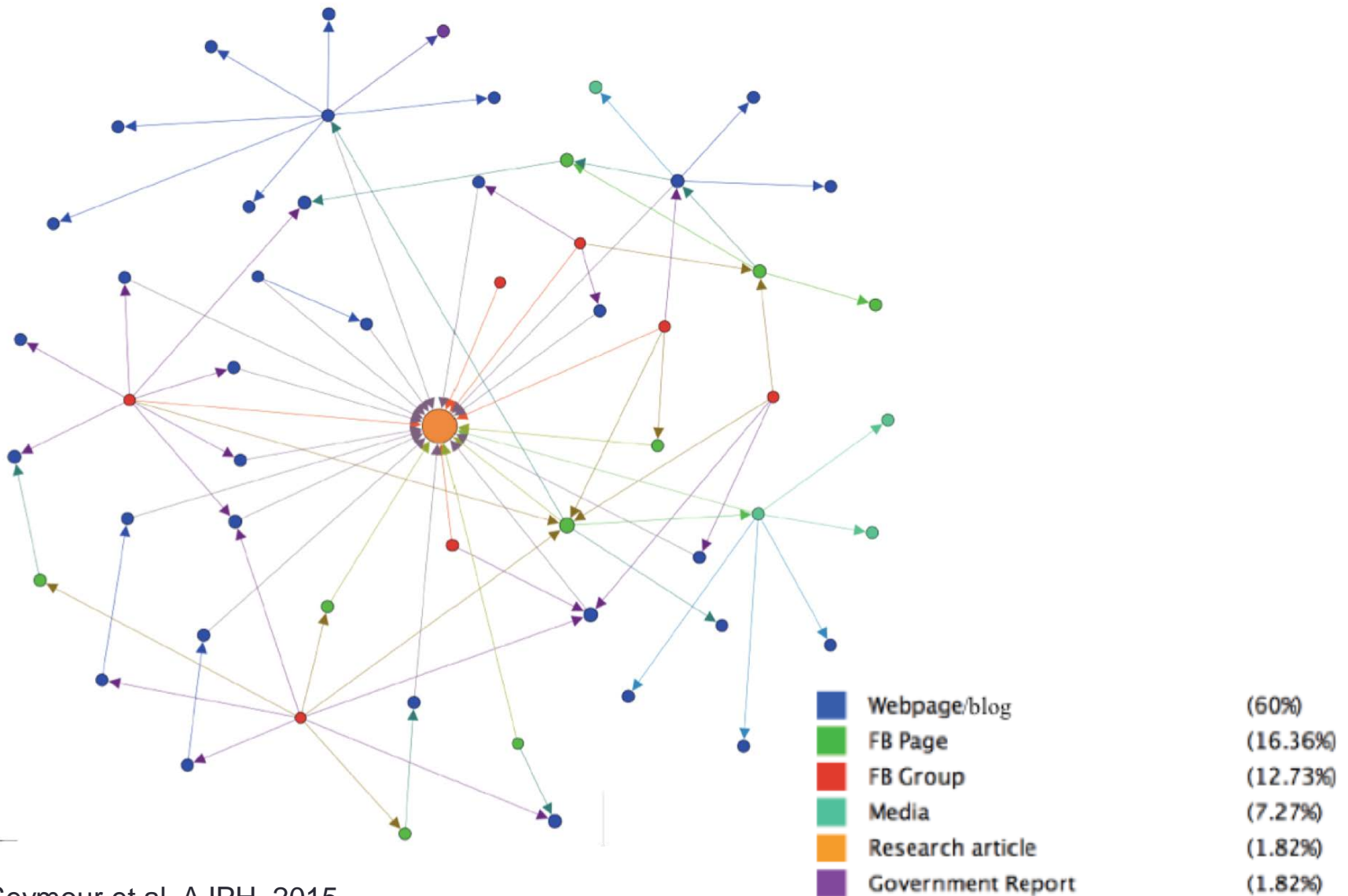


# The Story of Fluoride





# The Story of Fluoride





# Top 10 Public Health Achievements of the 20<sup>th</sup> Century



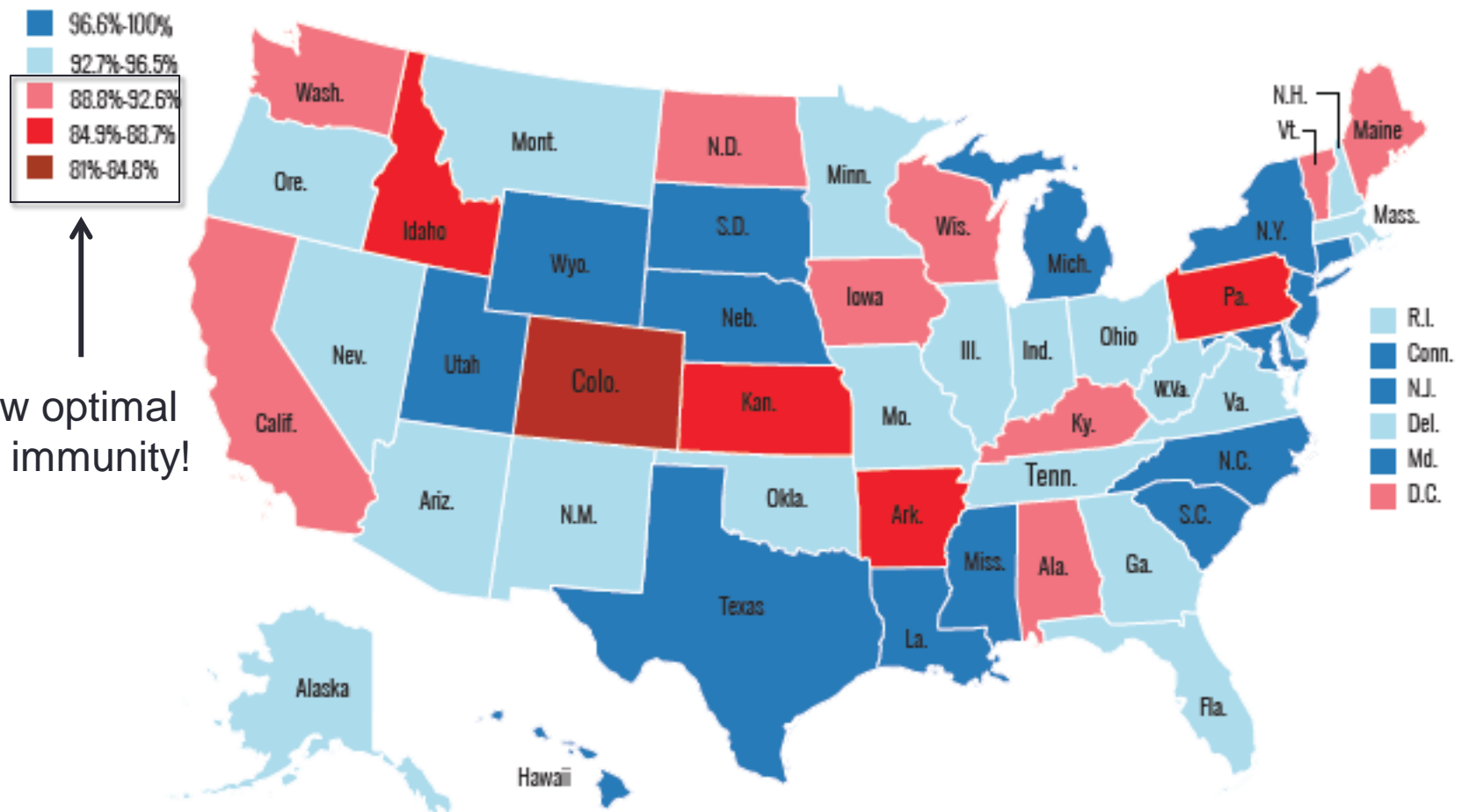
1. Vaccines
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7. Healthier mothers and babies
8. Family planning
9. Fluoridation of drinking water
10. Recognition of tobacco use as a health hazard



# The Story of Vaccines

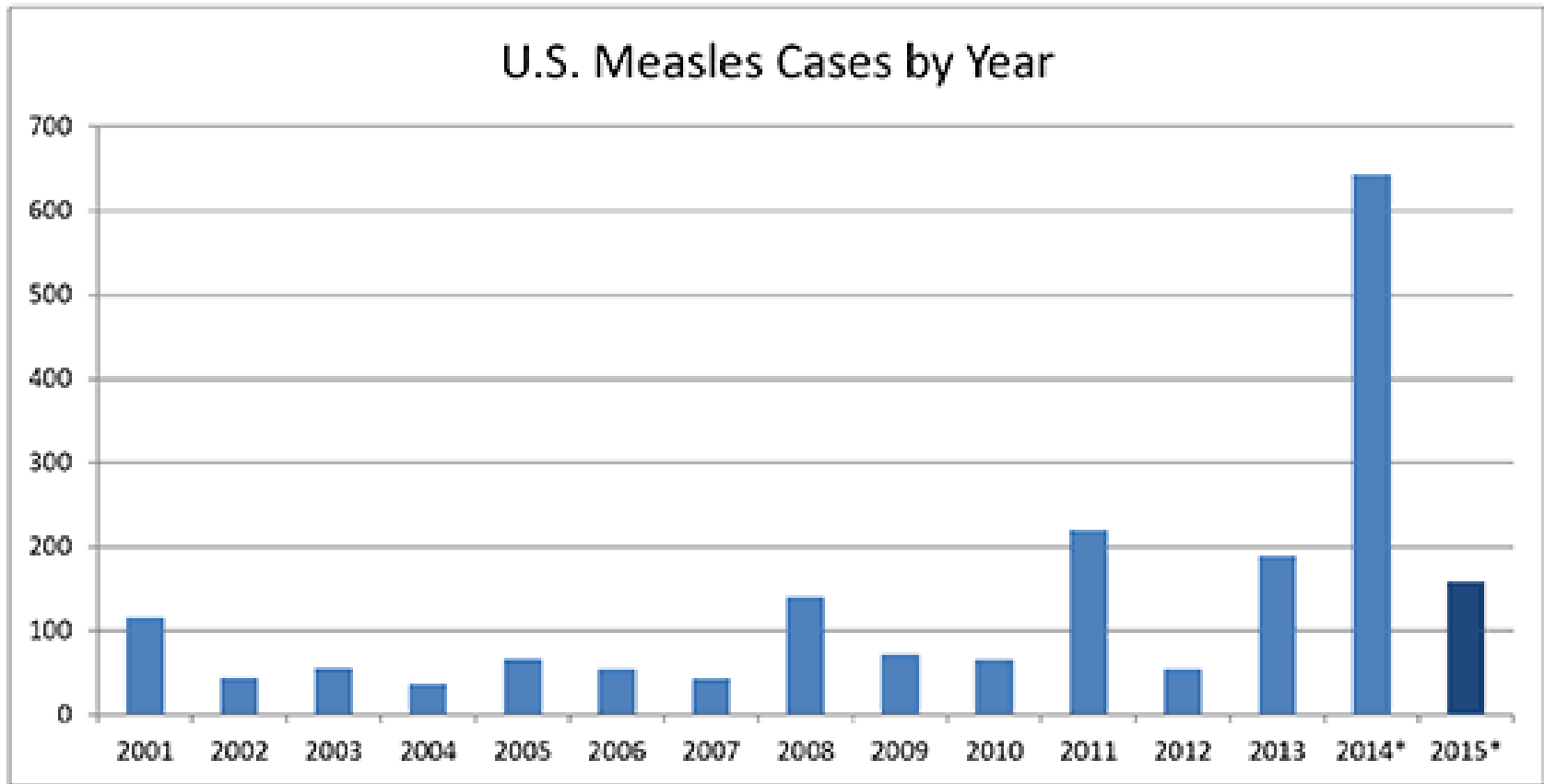
## Vaccination Rates by State

Percentage of kindergartners vaccinated by state, 2013-2014 school year





# The Story of Vaccines



**\*Most were unvaccinated, and several hospitalizations were infants too young to be vaccinated**



# The Story of Vaccines

[Lancet](#). 1998 Feb 28;351(9103):637-41.

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

[Wakefield AJ](#)<sup>1</sup>, [Murch SH](#), [Anthony A](#), [Linnell J](#), [Casson DM](#), [Malik M](#), [Berelowitz M](#), [Dhillon AP](#), [Thomson MA](#), [Harvey P](#), [Valentine A](#), [Davies SE](#), [Walker-Smith JA](#).

### Author information

#### **Retraction in**

Retraction—Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. [[Lancet](#). 2010]

#### **Partial retraction in**

Retraction of an interpretation. [[Lancet](#). 2004]

### **Abstract**

**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 focal neurological abnormalities and MRI and EEG tests were normal. Abnormal laboratory results were significantly raised urinary methylmalonic acid compared with age-matched controls ( $p=0.003$ ), low haemoglobin in four children, and a low serum IgA in four children.



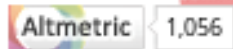
# The Story of Vaccines



Early Report


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

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



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

RETRACTED



# The Story of Vaccines



Expert?  
Social influencer?  
Both/Neither?



# The Story of Vaccines

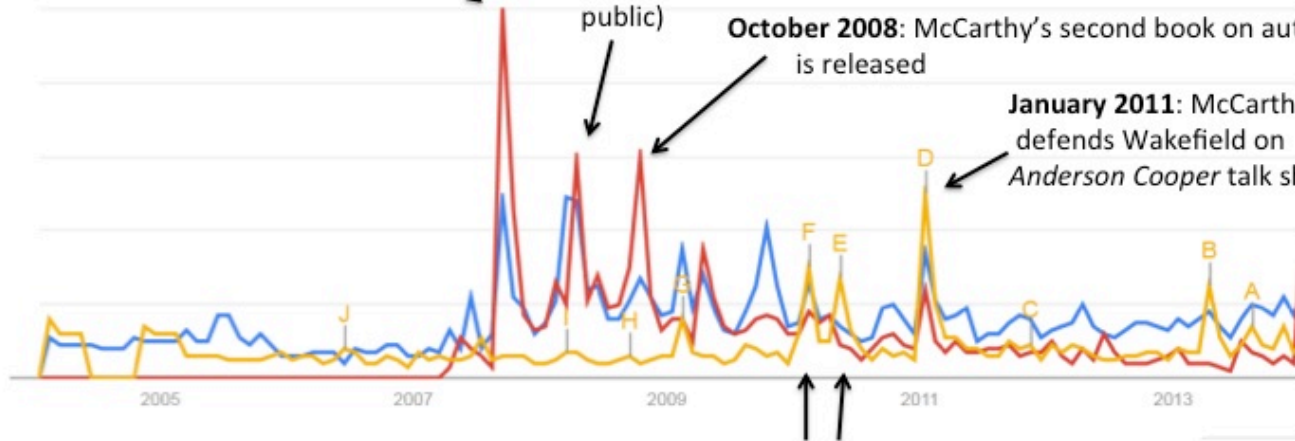
## Example of a celebrity influencer on perceptions of vaccine safety

**September 2007:** McCarthy releases her first book on autism, is featured on *Oprah*, *20/20*, and in *People Magazine*

**April 2008:** McCarthy is on *Larry King Live* ("Too many too soon" phrasing emerges, correlates with rise in alternative vaccine schedule requests in the public)

**October 2008:** McCarthy's second book on autism is released

**January 2011:** McCarthy defends Wakefield on *Anderson Cooper* talk show



**February 2010:** Lancet retracts Wakefield's article

**May 2010:** Wakefield loses medical license

■ "Vaccines autism"

■ "Jenny McCarthy autism"

■ "Andrew Wakefield"



# The Story of Vaccines



Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives, Protecting People™

- [Autism and Vaccines](#)

- 
- [Vaccine Adjuvants](#) (Additives)
  - [Autism and Vaccines](#)
  - [Fainting \(Syncope\)](#)
  - [Febrile Seizures after Childhood Vaccinations](#)
  - [Guillain-Barré Syndrome \(GBS\)](#)
  - [Sudden Infant Death Syndrome \(SIDS\)](#)
  - [Thimerosal](#) (Preservative used in Some Flu Vaccines)
  - [Multiple Vaccines and the Immune System](#)
  - [Vaccines During Pregnancy](#)
  - [Vaccine Recalls](#)
  - [Historical Vaccine Safety Concerns](#)





# The Story of Vaccines

## The Vaccine Mom on the Power of Information - Voices For ...

[www.voicesforvaccines.org/the-vaccine-mom-on-the-power-of-informat...](http://www.voicesforvaccines.org/the-vaccine-mom-on-the-power-of-informat...) ▼

The Vaccine Mom on the Power of Information. Email ... She is the biggest driving force, though not the only one, in my creation of the blog The Vaccine Mom.

## anti-vaccine mommy bloggers | Shot of Prevention

[shotofprevention.com/tag/anti-vaccine-mommy-bloggers/](http://shotofprevention.com/tag/anti-vaccine-mommy-bloggers/) ▼

Posts about anti-vaccine mommy bloggers written by Christine Vara.

## All Natural Mom: Why We Don't Vaccinate

[www.allnaturalmomof4.com/2009/06/why-we-dont-vaccinate.html](http://www.allnaturalmomof4.com/2009/06/why-we-dont-vaccinate.html) ▼

Jun 8, 2009 - I could devote an entire blog to this subject, but I'll try to keep it as ... I asked her if she thought it was from the vaccines, and she said she did ...

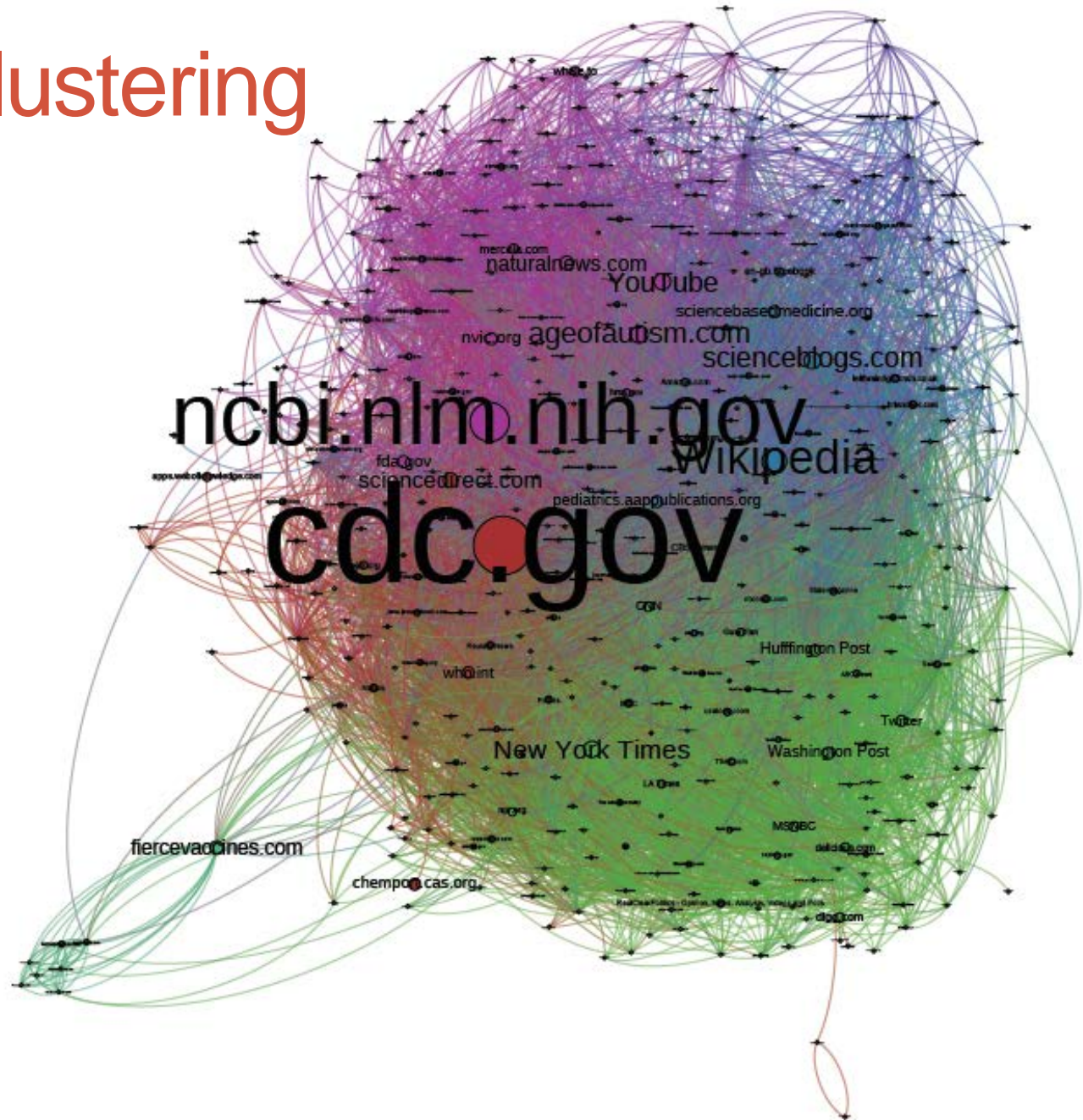
## Dear Mom Who Thinks I Need to Vaccinate My Kids Against ...

<https://leviquackenboss.wordpress.com/.../dear-mom-who-thinks-i-need-t...> ▼

Jan 27, 2015 - I know this vaccination subject is pretty touchy with the undertones of ... to a "mom who decided not to vaccinate her kids against measles," I just ...



# Social Clustering

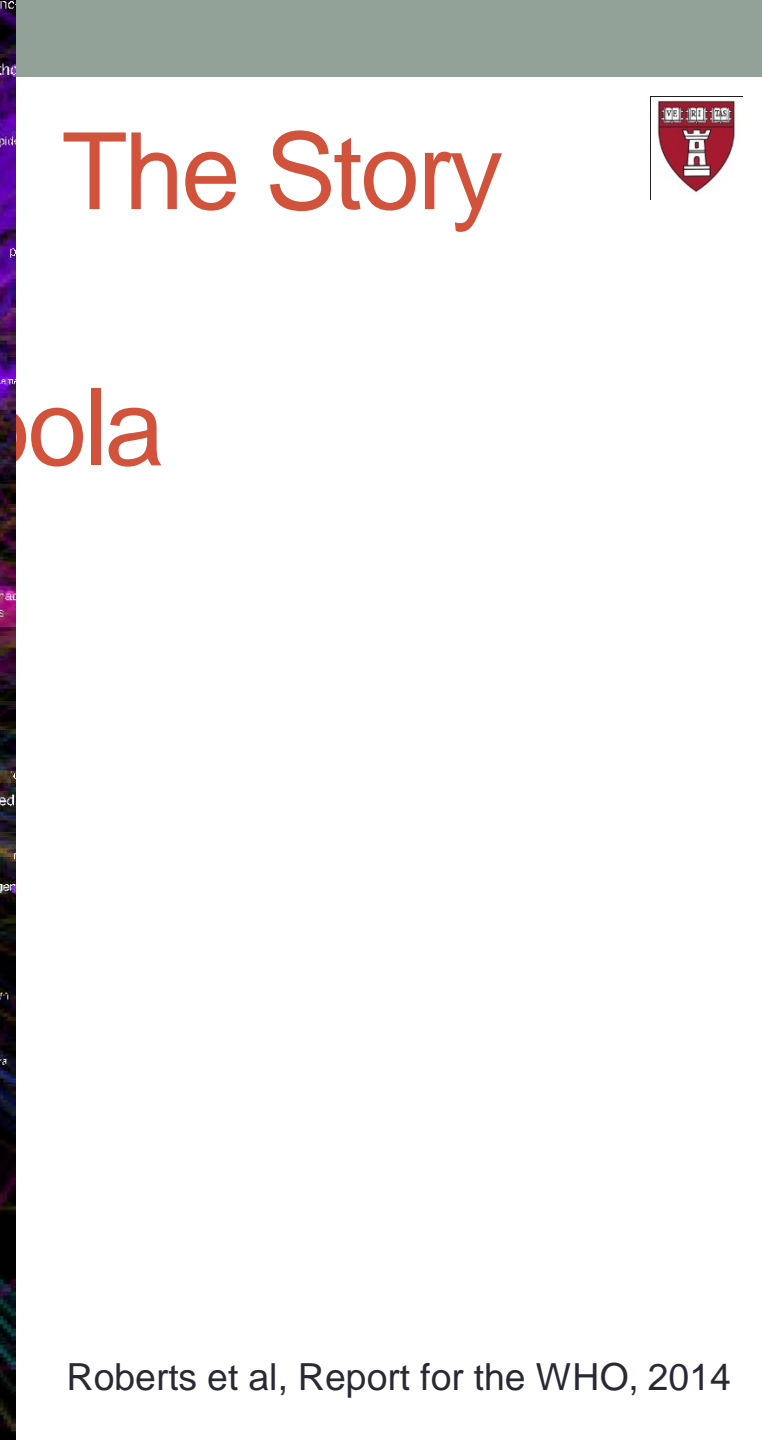




# The Story of Ebola







ola

Roberts et al, Report for the WHO, 2014





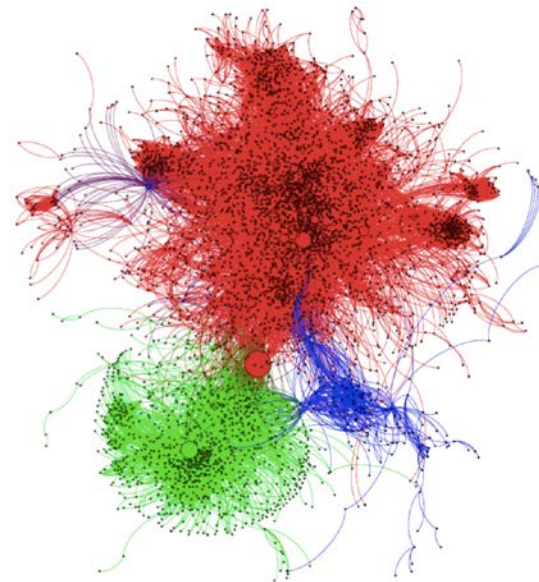
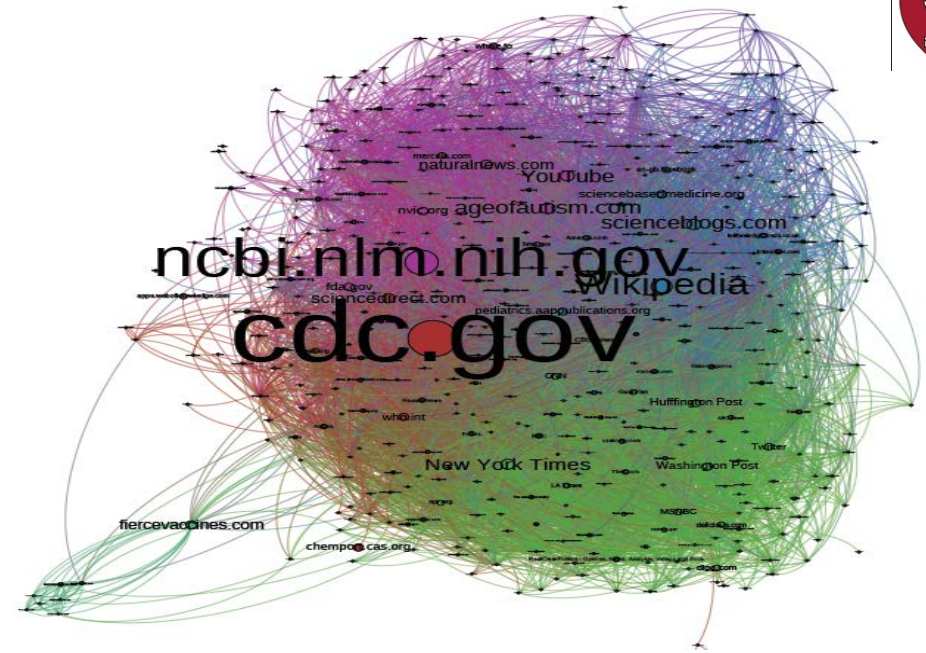
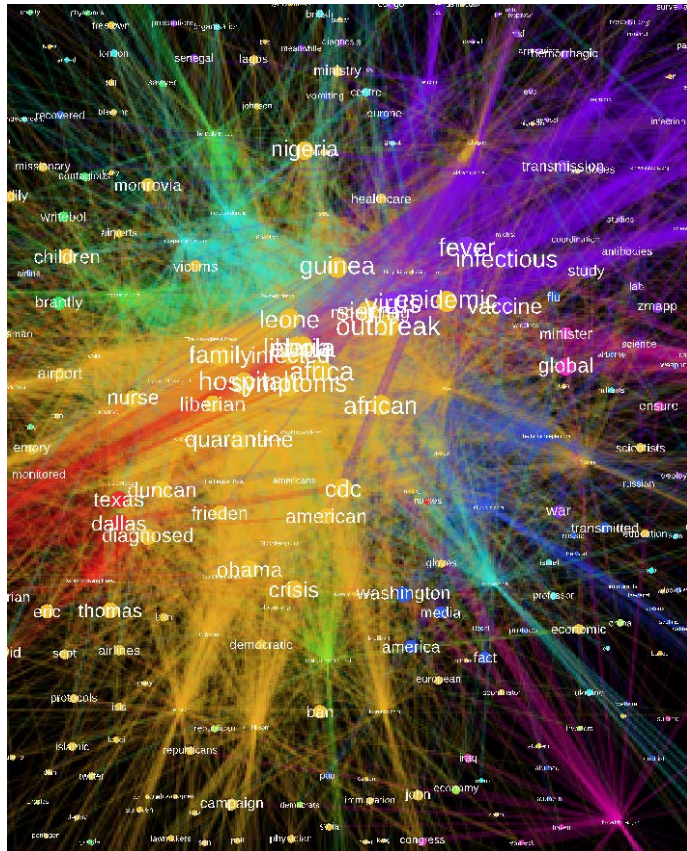
# Preliminary Patterns

- 1 Online information: pretty good
- 2 Social use of that information: not so good
- 3 Disconnect between what people link to and what they share and talk about

*How does this difference in “Internet behavior” impact health beliefs and behaviors, if at all?*



# What are these?



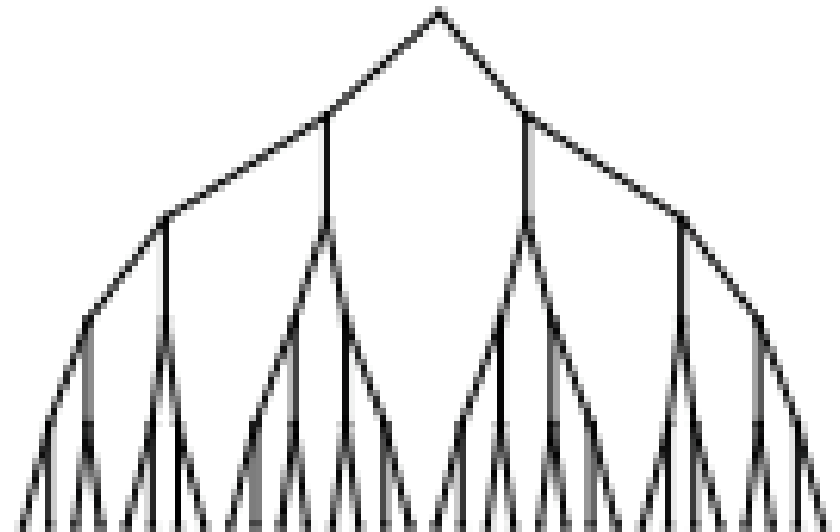
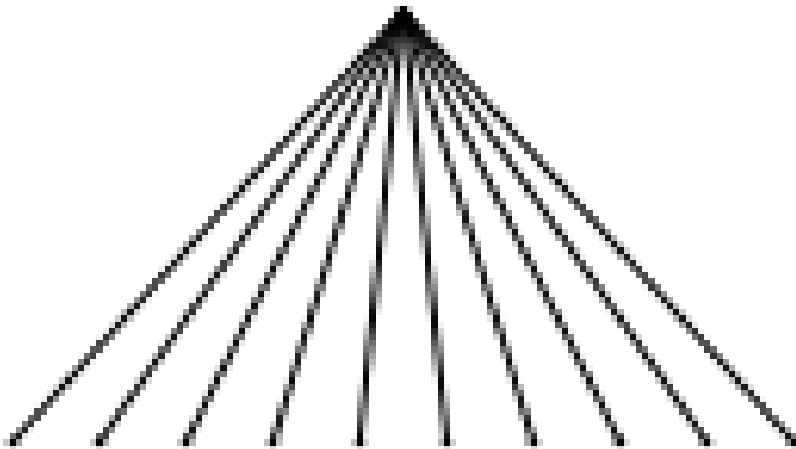


# So what?

Broadcast

vs.

Social Diffusion:



*Image source:* Goel, et al. The structural virality of online diffusion. 2013





# Today's Internet Practices:

Cconsumption

Ccreation

Curation

Cconversation

“The Four C's”



# Now what?!



## *Social Health Communication Strategies*

### **Key theories:**

- Peers over authority/expert
- Content creation versus consumption
- Social first, information second
- Advocacy versus accuracy



# Empirical *Social* Communication Strategies



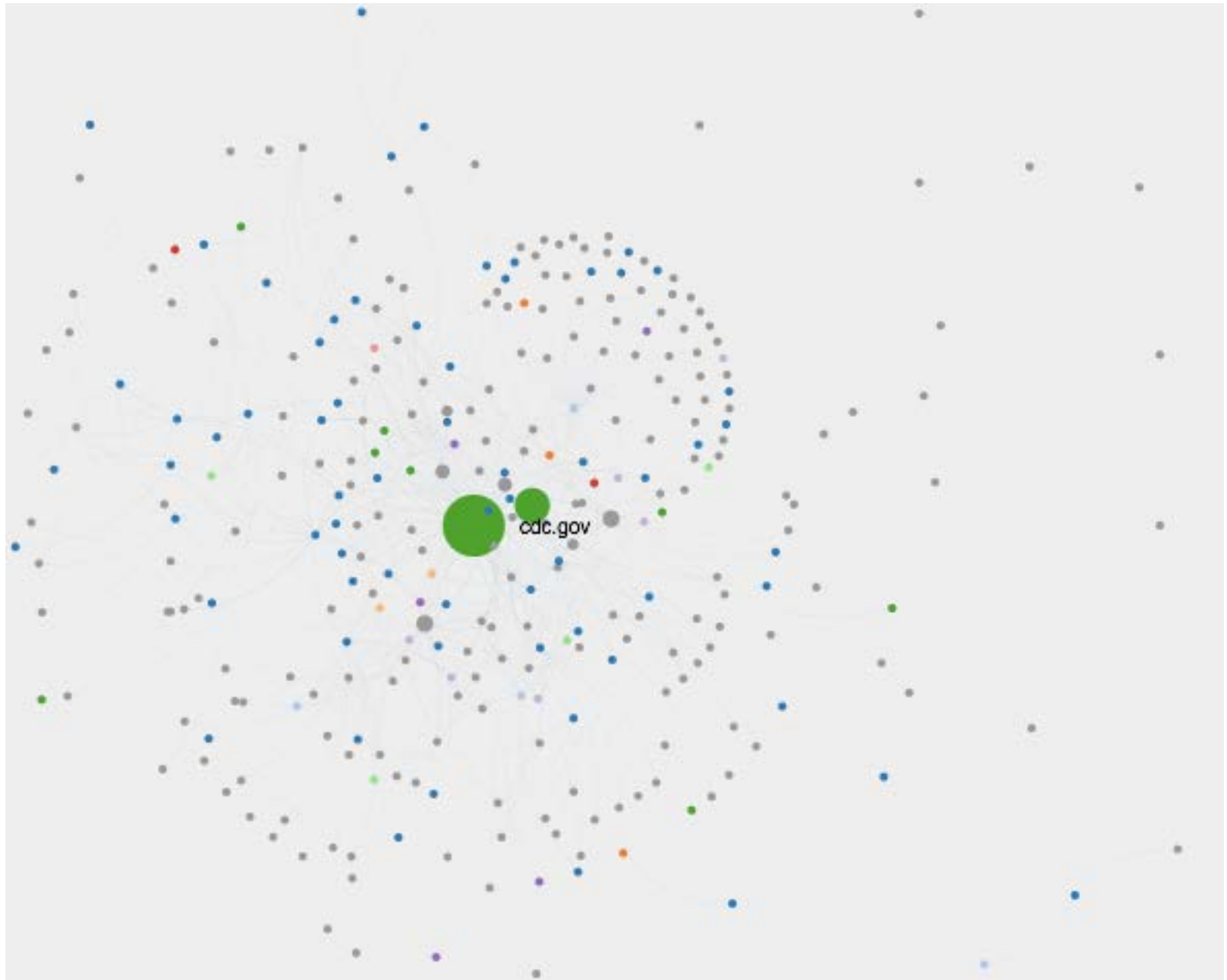
## **The question we are asking:**

“How can we share our evidence-based health messages with our target audiences?”

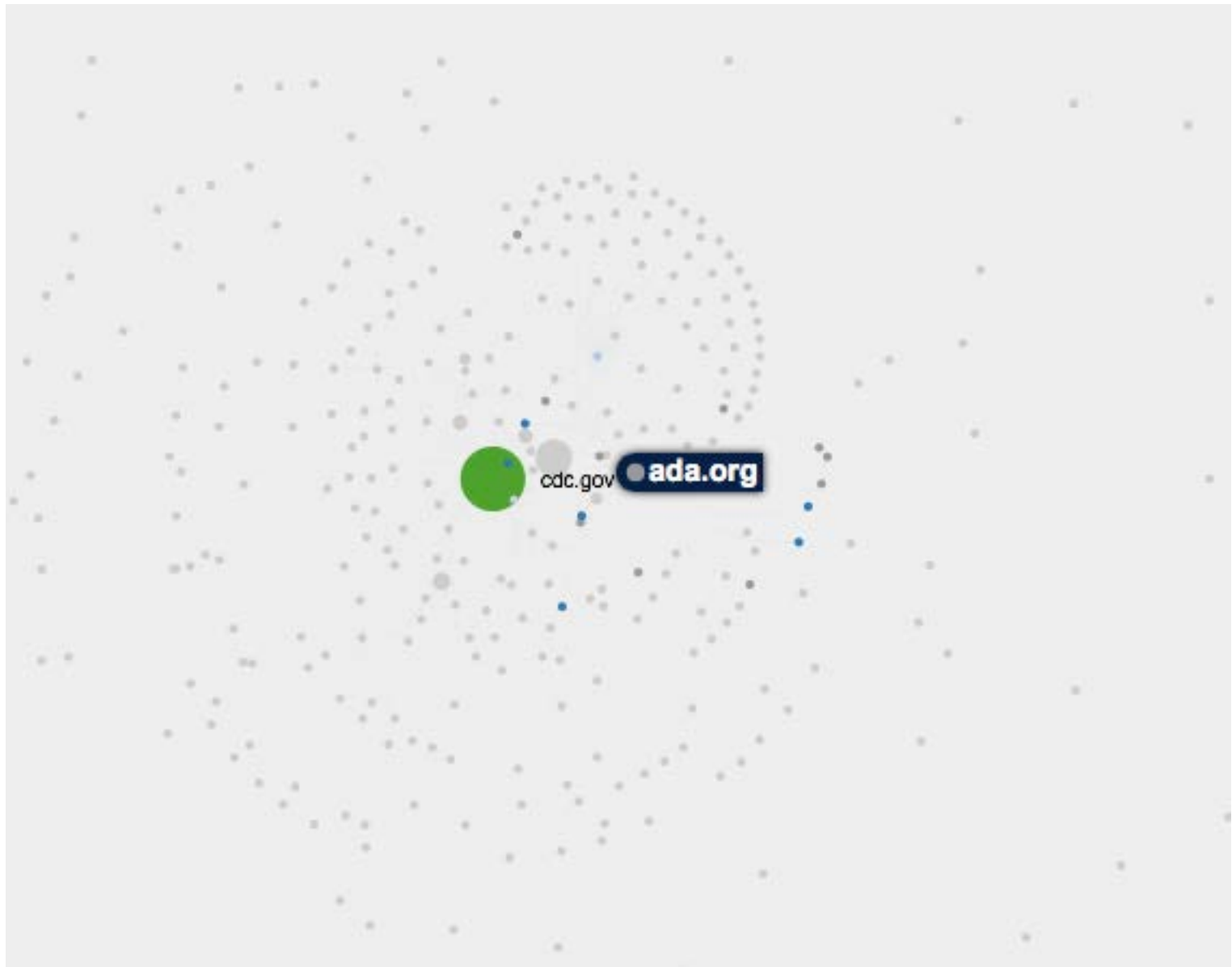
## **The question we should be asking?**

“How can we influence our target audiences to share our evidence-based health messages?”













Search Results in 2014-08-01 - 2016-06-05 Time Slice

Rank	Media_id	Name	Media Type	Stories	Inlinks
1	<a href="#">19740</a>	<a href="#">cdc.gov</a>	Government	61	145
2	<a href="#">23457</a>	<a href="#">PubMed</a>	Government	64	84
3	<a href="#">24094</a>	<a href="#">fluoridealert.org</a>	Not Typed	135	40
4	<a href="#">142670</a>	<a href="#">ada.org</a>	Not Typed	19	35
5	<a href="#">33154</a>	<a href="#">bmj.com</a>	Not Typed	12	30
6	<a href="#">68760</a>	<a href="#">wiley.com</a>	Not Typed	22	28
7	<a href="#">283486</a>	<a href="#">ncbi.nlm.nih.gov</a>	Not Typed	16	23
8	<a href="#">239670</a>	<a href="#">fluoridation.com</a>	Not Typed	18	22
9	<a href="#">18362</a>	<a href="#">YouTube</a>	User Gen.	13	18
10	<a href="#">27538</a>	<a href="#">Nature</a>	Other	6	15
11	<a href="#">20250</a>	<a href="#">prweb.com</a>	Private Sec.	2	11
12	<a href="#">118461</a>	<a href="#">scielosp.org</a>	Not Typed	3	11
13	<a href="#">144784</a>	<a href="#">nhmrc.gov.au</a>	Not Typed	3	11
14	<a href="#">18370</a>	<a href="#">Wikipedia</a>	User Gen.	18	10
15	<a href="#">20263</a>	<a href="#">scientificamerican.com</a>	Tech Media	4	9
16	<a href="#">20678</a>	<a href="#">springer.com</a>	Not Typed	4	9
17	<a href="#">19233</a>	<a href="#">archive.org</a>	Other	4	8
18	<a href="#">19765</a>	<a href="#">who.int</a>	Ind. Group	4	8
19	<a href="#">227486</a>	<a href="#">ilikemyteeth.org</a>	Not Typed	6	8
20	<a href="#">268694</a>	<a href="#">bfsweb.org</a>	Not Typed	3	8





fluoridation Stories in ada.org in 2014-08-01 - 2016-06-05 Time Slice (19 stories)

[story stats](#) [dashboard query](#)

Rank	Stories_id	Title	Publish Date	Medium	Inlinks
1	<a href="#">315726164</a>	<a href="#">Fluoride and Fluoridation</a>	undateable	<a href="#">ada.org</a>	11
2	<a href="#">371726259</a>	<a href="#">ADA Applauds HHS Final Recommendation on O...</a>	undateable	<a href="#">ada.org</a>	4
3	<a href="#">371726494</a>	<a href="#">Fluoride and Infant Formula FAQ</a>	undateable	<a href="#">ada.org</a>	2
4	<a href="#">371722587</a>	<a href="#">http://www.ada.org/~media/ADA/Member%20Cente...</a>	2012-02-22 07:00:00	<a href="#">ada.org</a>	2
5	<a href="#">371726557</a>	<a href="#">http://ada.org/public/topics/fluoride/facts/f...</a>	undateable	<a href="#">ada.org</a>	2
6	<a href="#">371726462</a>	<a href="#">http://www.ada.org/~media/ADA/Member%20Cente...</a>	2012-02-22 07:00:00	<a href="#">ada.org</a>	1
7	<a href="#">371726471</a>	<a href="#">Fluoridation Facts Publication</a>	undateable	<a href="#">ada.org</a>	1
8	<a href="#">371726481</a>	<a href="#">Medical Testimonials about Fluoridation</a>	undateable	<a href="#">ada.org</a>	1
9	<a href="#">371726484</a>	<a href="#">http://www.ada.org/en/public-programs/advocat...</a>	undateable	<a href="#">ada.org</a>	1
10	<a href="#">371722647</a>	<a href="#">ADA Advocacy for Fluoride and Fluoridation</a>	undateable	<a href="#">ada.org</a>	1
11	<a href="#">371726507</a>	<a href="#">Fluoridation FAQ</a>	undateable	<a href="#">ada.org</a>	1
12	<a href="#">474754937</a>	<a href="#">Fluoridation Facts Compendium</a>	undateable	<a href="#">ada.org</a>	1
13	<a href="#">371726564</a>	<a href="#">5 Reasons Why Fluoride in Water is Good fo...</a>	2015-04-27 11:25:13	<a href="#">ada.org</a>	1
14	<a href="#">474754681</a>	<a href="#">Reducing early childhood caries in a Medicaid...</a>	2015-01-04 07:00:00	<a href="#">ada.org</a>	1
15	<a href="#">474754818</a>	<a href="#">Fluoride in Water</a>	undateable	<a href="#">ada.org</a>	1
16	<a href="#">474754890</a>	<a href="#">Water Fluoridation Press Kit</a>	undateable	<a href="#">ada.org</a>	1
17	<a href="#">474754909</a>	<a href="#">http://www.ada.org/~media/ADA/Member%20Cente...</a>	2012-02-22 07:00:00	<a href="#">ada.org</a>	1
18	<a href="#">474754929</a>	<a href="#">ADA Statement: New CDC Statistics Show Need f...</a>	undateable	<a href="#">ada.org</a>	1
19	<a href="#">371723523</a>	<a href="#">Fluoride Supplements</a>	undateable	<a href="#">ada.org</a>	1





fluoridation Stories Linking to ada.org in 2014-08-01 - 2016-06-05 Time Slice (24 stories)

story stats dashboard query wc

Rank	Stories_id	Title	Publish Date	Medium	Inlinks	Outlinks
1	<a href="#">371726360</a>	<a href="#">Fluoride - American Dental Association</a>	undateable	<a href="#">mouthhealthy.org</a>	4	2
2	<a href="#">474754869</a>	<a href="#">Water fluoridation controversy - Wikipedia, t...</a>	undateable	<a href="#">Wikipedia</a>	3	74
3	<a href="#">371726372</a>	<a href="#">Fluoride in Water - American Dental Associ...</a>	undateable	<a href="#">mouthhealthy.org</a>	2	10
4	<a href="#">371726394</a>	<a href="#">Water fluoridation - Wikipedia, the free ency...</a>	undateable	<a href="#">Wikipedia</a>	2	67
5	<a href="#">371726409</a>	<a href="#">Dental fluorosis - Wikipedia, the free encycl...</a>	undateable	<a href="#">Wikipedia</a>	2	5
6	<a href="#">474754783</a>	<a href="#">The Fluoride Conundrum: Is Fluoride Safe For ...</a>	undateable	<a href="#">healthychild.org</a>	2	1
7	<a href="#">371722461</a>	<a href="#">Fluoridation May Not Prevent Cavities, Scient...</a>	2015-06-29 14:57:50	<a href="#">Washington Post</a>	1	14
8	<a href="#">371722487</a>	<a href="#">Evidence of xylitol's cavity-preventing benef...</a>	2015-03-25 20:17:16	<a href="#">Reuters News</a>	1	1
9	<a href="#">371722530</a>	<a href="#">Water Fluoridation Linked to Higher ADHD Rates</a>	2015-03-10 14:44:34	<a href="#">Washington Post</a>	1	17
10	<a href="#">371726303</a>	<a href="#">What is fluoride? What does fluoride do?</a>	2014-09-08 08:00:00	<a href="#">Health News from Medical News...</a>	1	3
11	<a href="#">371726327</a>	<a href="#">HHS updates fluoride level</a>	2015-04-27 08:00:00	<a href="#">cdhp.org</a>	1	8
12	<a href="#">474754858</a>	<a href="#">The Fluoride Debate Rages On In Some Massachu...</a>	2015-02-05 07:00:00	<a href="#">wbur.org</a>	1	7
13	<a href="#">474754905</a>	<a href="#">Free pediatric dental care on February 5th</a>	2016-01-18 13:17:19	<a href="#">rvanews.com</a>	1	1
14	<a href="#">270423197</a>	<a href="#">Multnomah County phasing out fluoride tablet ...</a>	2014-09-07 00:33:04	<a href="#">KATU ABC</a>	0	2
15	<a href="#">284774224</a>	<a href="#">Racial inequality alleged in federal governme...</a>	2014-10-20 14:04:48	<a href="#">Examiner.com</a>	0	7
16	<a href="#">329324296</a>	<a href="#">Against fluoridation: members of ConnFACT spe...</a>	2015-03-24 08:27:12	<a href="#">Examiner.com</a>	0	13
17	<a href="#">339478471</a>	<a href="#">Gov't Lowering This Chemical in Water for the...</a>	2015-04-27 15:25:13	<a href="#">bredred.com</a>	0	1
18	<a href="#">340985334</a>	<a href="#">70 years of evidence prove fluoride in public...</a>	2015-05-01 11:40:34	<a href="#">mlive.com</a>	0	3
19	<a href="#">371722451</a>	<a href="#">Israel May Restart Water Fluoridation Shortly...</a>	2015-06-02 13:55:33	<a href="#">Washington Post</a>	0	6
20	<a href="#">371726281</a>	<a href="#">Fluoride won't be added to Portland, Ore. wat...</a>	undateable	<a href="#">CBS News</a>	0	1
21	<a href="#">392833152</a>	<a href="#">Fluoride under fire: Banning chemical makes l...</a>	2015-11-01 06:59:10	<a href="#">mlive.com</a>	0	13
22	<a href="#">463189457</a>	<a href="#">Gov't Lowering This Chemical in Water for the...</a>	2015-04-27 13:46:25	<a href="#">theblaze.com</a>	0	1
23	<a href="#">474754696</a>	<a href="#">The Key To Aging Beauty Begins With This</a>	2016-03-30 07:11:49	<a href="#">huffingtonpost.com</a>	0	3
24	<a href="#">474754722</a>	<a href="#">The Key To Aging Beauty Begins With This</a>	2016-03-30 07:11:49	<a href="#">huffingtonpost.com</a>	0	3



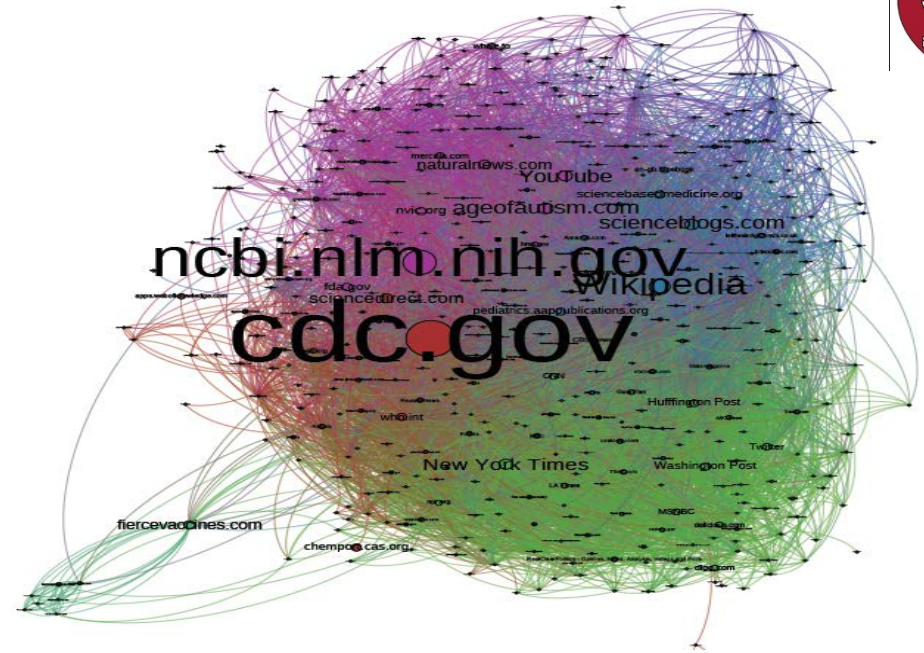
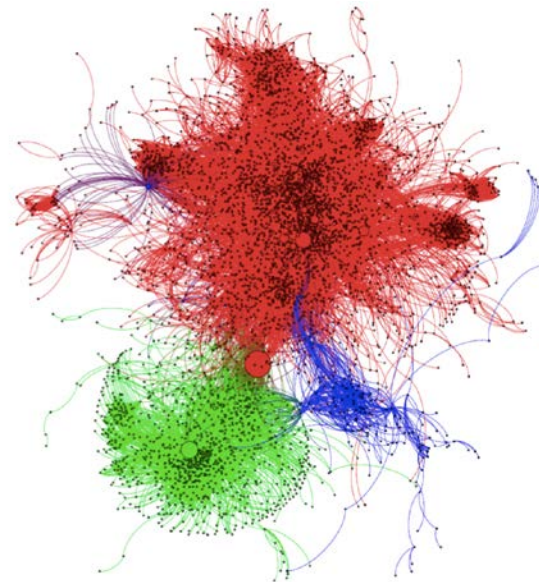


Fluoridation Stories Linked from ada.org in 2014-08-01 - 2016-06-05 Time Slice (4 stories)

story stats dashboard query w

Rank	Stories_id	Title	Publish Date	Medium	Inlinks	Outlinks
1	<a href="#">101041322</a>	<a href="#">CDC - Community Water Fluoridation - Oral Health</a>	2012-10-31 05:00:00	<a href="#">cdc.gov</a>	26	0
2	<a href="#">371726360</a>	<a href="#">Fluoride - American Dental Association</a>	undateable	<a href="#">mouthhealthy.org</a>	4	2
3	<a href="#">371726100</a>	<a href="#">Public Health Reports</a>	undateable	<a href="#">publichealthreports.org</a>	2	0
4	<a href="#">371726372</a>	<a href="#">Fluoride in Water - American Dental Associ...</a>	undateable	<a href="#">mouthhealthy.org</a>	2	10









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