

Flu Shots:

**Evidence-Based Intervention for
Flu Prevention and Death Prevention?**



Assessing the Evidence

Simonsen, et al. (2007) Mortality benefits of influenza vaccination in elderly people: an ongoing controversy. Lancet Infect Dis 7: 658-66

The people questioning the evidence for the flu vaccine are NOT uncredentialed, unscientific, poorly read, conspiracy theorists. They are HIGHLY RESPECTED SCIENTISTS trying to create policy based on VALID EVIDENCE instead of DOGMA.

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Assessing the Evidence

Simonsen, et al. (2007) Mortality benefits of influenza vaccination in elderly people: an ongoing controversy. *Lancet Infect Dis* 7: 658-66

“Influenza vaccination policy in most high-income countries attempts to reduce the mortality burden of influenza by targeting people aged at least 65 years for vaccination. **However, the effectiveness of this strategy is under debate.**”

“We conclude that frailty selection bias and use of non-specific endpoints such as all cause mortality have led cohort studies to **greatly exaggerate vaccine benefits.**”



Assessing the Evidence

Simonsen, et al. (2007) Mortality benefits of influenza vaccination in elderly people: an ongoing controversy. *Lancet Infect Dis* 7: 658-66

“Recent excess mortality studies were **unable to confirm a decline in influenza-related mortality since 1980**, even as vaccination coverage increased from 15% to 65%.”

“Paradoxically, whereas those studies attribute about 5% of all winter deaths to influenza, many cohort studies report a 50% reduction in the total risk of death in winter—a benefit ten times greater than the estimated influenza mortality burden.”



Assessing the Evidence

Simonsen, et al. (2007) Mortality benefits of influenza vaccination in elderly people: an ongoing controversy. *Lancet Infect Dis* 7: 658-66

“New studies, however, have shown **substantial unadjusted selection bias** in previous cohort studies.”

“The remaining **evidence base is currently insufficient** to indicate the magnitude of the mortality benefit, if any, that elderly people derive from the vaccination programme.”



Flu Vaccine Does NOT Prevent Pneumonia

Jackson et al. (2008) Influenza vaccination and risk of community-acquired pneumonia in immunocompetent elderly people: a population –based, nested case-control study. 372 (9636): 398-405

“1173 cases and 2346 controls were included in the study. After we adjusted for the presence and severity of comorbidities, as defined by chart review, influenza vaccination was not associated with a reduced risk of community-acquired pneumonia (odds ratio 0.92, 95% CI 0.77—1.10) during the influenza season.”



Flu Vaccine Does NOT Prevent Pneumonia

Jackson et al. (2008) Influenza vaccination and risk of community-acquired pneumonia in immunocompetent elderly people: a population –based, nested case-control study. 372 (9636): 398-405

- Pneumonia causes VAST majority of seasonal deaths “associated” with flu (34,000 of 36,000 annual deaths).
- Pneumonia occurs with equal frequency in vaccinated and non-vaccinated citizens.
- Flu Vaccines do NOT prevent pneumonia.
- Flu shots do NOT prevent death from flu or pneumonia.



Flu Shots Do NOT Decrease Mortality from Influenza or Pneumonia

Eurich, D. et al. (2008) Mortality reduction with influenza vaccine in patients with pneumonia outside “flu” season. *Am j Respir Crit Care Med* 178, 527-533

“There remains a **high degree of uncertainty**, however, regarding the overall benefits of routine influenza vaccination for the elderly.”

“In part, this debate has arisen because of the near **absence of valid randomized trials** with clinical endpoints whose results might be directly applicable to the elderly. Most of the evidence evaluating the clinical benefit of influenza vaccines has been derived from **observational data.**”



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“Counterintuitively, the greatest benefit seen in observational studies is with reduction in this last endpoint—on the order of a 50% reduction in **all-cause mortality**.”

“For a number of reasons, however, **experts** have recently suggested that the **magnitude of benefit seen with influenza vaccination in observational studies is implausible**.”



Flu Shots Do NOT Decrease Mortality from Influenza or Pneumonia

Eurich, D. et al. (2008) Mortality reduction with influenza vaccine in patients with pneumonia outside “flu” season. Am j Respir Crit Care Med 178, 527-533

“First, although few randomized trials have been completed, no trial data support a mortality benefit with influenza vaccination.”

“Second, over the last two decades in the United States, even while **vaccination rates** among the elderly have **increased from 15 to 65%**, there has been **no commensurate decrease in hospital admissions or all-cause mortality**. In fact, both admission rates and **mortality** in those 65 years and older have **increased with increasing vaccine coverage** over time.”



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Eurich, D. et al. (2008) Mortality reduction with influenza vaccine in patients with pneumonia outside “flu” season. *Am j Respir Crit Care Med* 178, 527-533

“Third, some studies have observed mortality reduction with influenza vaccination in the “**off-season**” (i.e., the time of year when there is little if any circulating virus).”

“Last, studies that are able to better adjust for health and functional status or other measures of frailty demonstrate attenuation or abolition of mortality benefit, **suggesting substantial residual confounding** in most reported observational studies of vaccine effectiveness.”



Flu Shots Do NOT Decrease Mortality from Influenza or Pneumonia

Eurich, D. et al. (2008) Mortality reduction with influenza vaccine in patients with pneumonia outside “flu” season. *Am j Respir Crit Care Med* 178, 527-533

“This phenomenon has been variously referred to as frailty bias or the **healthy-vaccinee effect** or, more generally, as the **“healthy-user” effect.**”

“The healthy-user is postulated to be a patient who, despite the presence of various coexisting conditions, is relatively healthier and has a predilection for better lifestyle behaviors.”



Flu Shots Do NOT Decrease Mortality from Influenza or Pneumonia

Fireman, B. et al. (2009) Influenza Vaccination and Mortality: Differentiating Vaccine Effects from Bias. *Am J Epidemiol* 170: 650-656

“Vaccine coverage peaked in people whose predicted probability of death during the upcoming flu year was 3.0%–7.4% and fell below 50% in patients whose probability of death within a year was over 30%.”

“In **higher-risk patients**, who drive mortality rates in the upcoming flu season, the **propensity to obtain flu shots waned.**”



Flu Shots Do NOT Decrease Mortality from Influenza or Pneumonia

Fireman, B. et al. (2009) Influenza Vaccination and Mortality: Differentiating Vaccine Effects from Bias. *Am J Epidemiol* 170: 650-656

“In a meta-analysis of results from 20 cohort and case-control studies, Voordouw et al. (6) found that flu shots reduce winter deaths by 50%, on average; and in a more recent study, Nichol et al. (19) reported a 48% reduction in all-cause mortality among the elderly during flu season.”

“We found that flu shots reduced all-cause mortality among elderly Kaiser Permanente members by **4.6%** during 9 laboratory-defined flu seasons in Northern California.”



Flu Shots Do NOT Decrease Mortality from Influenza or Pneumonia

Fireman, B. et al. (2009) Influenza Vaccination and Mortality: Differentiating Vaccine Effects from Bias. *Am J Epidemiol* 170: 650-656

“This excess mortality of **7.8%** is what we found in a population with over 60% vaccine coverage. Our findings suggest that had none of the elderly been vaccinated, excess mortality during flu season would have averaged about **9.8%.**”

“We **infer** that our **4.6% VE** estimate amounts to a 47% reduction ($4.6/9.8 = 47\%$) in the number of flu attributable deaths that would have occurred had none of the elderly been vaccinated.”

ARE YOU KIDDING ME??!



You MUST Understand Relative vs Absolute Risk Reduction

Do you see what they are doing here? This is EXACTLY what they do when they report reduced deaths due to cholesterol medication or blood pressure medication. They report **RELATIVE** difference instead of **ABSOLUTE** difference between the two groups.

The ABSOLUTE difference (and this was based on their **estimates** in a population where the most likely to die are NOT vaccinated and the least likely to die ARE vaccinated) is 2% (9.8% vs 7.8%) death rate amongst unvaccinated vs vaccinated. BUT they then use their VE **estimate** of 4.6 % and claim this represents 47% of 9.8%!! This is CRIMINALLY MISLEADING!!



Flu Shots Do NOT Decrease Mortality from Influenza or Pneumonia

Govaert, M.E. et al. (1994) The Efficacy of Influenza Vaccination in Elderly Individuals: A Randomized Double-Blind Placebo-Controlled Trial. J.A.M.A. 272: 1661-1665

1838 subjects age 60 and over randomized to receive a flu shot or placebo (saline).

Study concludes that flu shot results in a 50% reduction in flu.

This was the RELATIVE risk reduction. Actual results were that 3% of the unvaccinated group got flu and 2% of the vaccinated group got flu. So without vaccination 97% remained flu-free. With vaccination 98% remained flu-free.



Flu Shots Do NOT Decrease Mortality from Influenza or Pneumonia

Govaert, M.E. et al. (1994) The Efficacy of Influenza Vaccination in Elderly Individuals: A Randomized Double-Blind Placebo-Controlled Trial. J.A.M.A. 272: 1661-1665

“In the 70 years and older category, little difference was found in the incidence of influenza and influenza-like illness between vaccinated and nonvaccinated participants.”

“It is known that older people have a lower antibody titer response to vaccination than younger people, but other factors, such as cellular immunity (**innate immunity**), may influence resistance to influenza.”



Annual Vaccination Policies are NOT Evidence-Based

Osterholm, M. et al. (2012) Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis. *Lancet Infect Dis* 12: 36-44

“In 1960, the US Surgeon General, in response to substantial morbidity and mortality during the 1957–58 pandemic, recommended annual influenza vaccination for individuals with chronic debilitating disease, people aged 65 years or older, and pregnant women.”

“This recommendation was made **without data** for vaccine efficacy or effectiveness for these high-risk populations.”



Annual Vaccination Policies are NOT Evidence-Based

Osterholm, M. et al. (2012) Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis. *Lancet Infect Dis* 12: 36-44

“In 1964, the Advisory Committee on Immunization Practices (ACIP) reaffirmed this recommendation but noted the **absence of efficacy data.**”

“**Because of the longstanding public health recommendation of annual vaccination in the elderly and other high-risk groups, such patients have been excluded from placebo-controlled randomised clinical trials in the USA for the past 50 years.**”



Annual Vaccination Policies are NOT Evidence-Based

Osterholm, M. et al. (2012) Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis. *Lancet Infect Dis* 12: 36-44

“The ACIP supports the widely held view that inclusion of individuals at high-risk of influenza in placebo-controlled trials would be unethical.”

“In 2010, the ACIP established the first recommendation of national universal seasonal influenza vaccination.”



Annual Vaccination Policies are NOT Evidence-Based

Osterholm, M. et al. (2012) Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis. *Lancet Infect Dis* 12: 36-44

“Vaccination every year is now recommended with trivalent inactivated vaccine (TIV) **for all individuals** aged 6 months or older, or live attenuated influenza vaccine (LAIV) for healthy non-pregnant people aged 2–49 years.”

“The universal influenza vaccination recommendation came after a decade of incremental changes during which the ACIP expanded recommendations to include an ever increasing proportion of the US population.”



Annual Vaccination Policies are NOT Evidence-Based

Osterholm, M. et al. (2012) Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis. *Lancet Infect Dis* 12: 36-44

“Ten randomised controlled trials assessed TIV efficacy during 12 influenza seasons; eight (67%) analyses for these seasons showed significant efficacy and four (33%) did not.”

REMEMBER: EVERY single report of vaccine efficacy is based on RELATIVE difference between vaccinated and non-vaccinated subjects!



You MUST Understand Relative vs Absolute Risk Reduction

As examples:

Jackson et al. (2010) Safety, efficacy, and immunogenicity of an inactivated influenza vaccine in healthy adults: a randomized, placebo-controlled trial over two influenza seasons. BMC 10: 71 (1-14)

“The point estimate for efficacy in the **prevention of all laboratory-confirmed influenza was 63.2%** (97.5% confidence interval [CI] lower bound of 48.2%), the point estimate for the primary endpoint, **efficacy of TIV against VMCCI across both influenza seasons, was 46.3%** with a 97.5% CI lower bound of 9.8%.



You MUST Understand Relative vs Absolute Risk Reduction

ACTUAL DIFFERENCE:

Their reported 63% efficacy rate against all laboratory confirmed influenza was actually based on a 1.2% flu infection rate in the vaccinated group and a 3.2% flu infection rate in the non-vaccinated group for an ABSOLUTE difference of **2%**.

Their reported 46% efficacy rate against VMCCI (vaccine-matched culture-confirmed influenza) was actually based on a 0.6% flu infection rate in the vaccinated group and a 1.2% flu infection rate in the non-vaccinated group for an ABSOLUTE difference of **0.6%**.



You MUST Understand Relative vs Absolute Risk Reduction

As examples:

Beran et al. (2009) Efficacy of Inactivated Split-Virus Influenza Vaccine against Culture-Confirmed Influenza in Healthy Adults: A Prospective, Randomized, Placebo-Controlled Trial. Journal of Infectious Diseases 200: 1861-9

“Vaccine efficacy against culture-confirmed influenza A and/or B due to strains antigenically matched to the vaccine was 66.9% (95% confidence interval [CI], 51.9%–77.4%; $P < .001$) and to any strain was 61.6% (95% CI, 46.0%–72.8%; $P < .001$).

Conclusion. TIV is efficacious against culture-confirmed influenza in healthy adults.



You MUST Understand Relative vs Absolute Risk Reduction

ACTUAL EFFECT:

Their reported 66.9% efficacy rate against culturally confirmed influenza was actually based on a 1.0% flu infection rate in the vaccinated group and a 2.9% flu infection rate in the non-vaccinated group for an ABSOLUTE difference of **1.9%**.

Their reported 61.6% efficacy rate against any influenza strain was actually based on a 1.2% flu infection rate in the vaccinated group and a 3.2% flu infection rate in the non-vaccinated group for an ABSOLUTE difference of **2%**.



Annual Vaccination Policies: Evidence or Dogma?

The CDC's 15-member Advisory Committee on Immunization Practices (ACIP) makes recommendations each year on who should be vaccinated.

Ten years ago, for the 1999–2000 season, the committee recommended that people over age 65 and children with medical conditions have a flu shot. **Seventy-four million people were vaccinated.** Next season (2000–01) the committee lowered the age for universal vaccination from 65 to 50 years old, **adding 41 million people to the list.**



No Valid Evidence Flu Shots Effective in the Elderly

Jefferson, T. et al. (2010) Vaccines for Preventing Influenza in the elderly. Cochrane Database of Systematic Reviews. ; 8: Article #CD004879

“The available evidence is of poor quality and provides **no guidance regarding the safety, efficacy or effectiveness of influenza vaccines for people aged 65 years or older.**”

“To resolve the uncertainty, an adequately powered publicly-funded randomised, placebo-controlled trial run over several seasons should be undertaken.”



No Valid Evidence Flu Shots Effective in the Elderly

Osterholm, M. et al. (2012) Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis. *Lancet Infect Dis* 12: 36-44

“Every year, large-scale campaigns in many developed countries are undertaken to **vaccinate all people aged 65 years or older to prevent serious illness and mortality.**”

“However, **this is the age group for which we have the least data** supporting the efficacy or effectiveness of influenza vaccines to reduce morbidity or mortality.”



Annual Vaccination Policies: Evidence or Dogma?

Osterholm, M. et al. (2012) Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis. *Lancet Infect Dis* 12: 36-44

“There are **no randomised controlled trials showing efficacy** of TIV in people aged 2–17 years or adults aged **65 years or older.**”

“For LAIV, there are **no randomised controlled trials showing efficacy** for people aged **8–59 years.**”



Annual Vaccination Policies: Evidence or Dogma?

For the 2002–03 season, the ACIP added **healthy children 6 months to 23 months old**, and for 2004–05, **children up to 5 years old**.

For the 2008–09 season the committee has advised that **healthy children 6 months to 18 years old have a flu shot each year**.

In 2012 the recommendations include every citizen over 6 months of age, about 300,000,000 people.



Annual Vaccination Policies: Evidence or Dogma?

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“There are **no randomised controlled trials showing efficacy** of TIV in people aged 2–17 years or adults aged **65 years or older.**”

“For LAIV, there are **no randomised controlled trials showing efficacy** for people aged **8–59 years.**”



No Evidence Flu Shots Effective in Young Children

Jefferson, T. et al. (2012) Vaccines for Preventing Influenza in Healthy Children. Cochrane Database of Systematic Reviews. ; 8: Article #CD004879

“Inactivated vaccines in children aged two years or younger are **not significantly more efficacious than placebo.**”

“The review showed that reliable evidence on influenza vaccines is thin but there is evidence of **widespread manipulation of conclusions** and spurious notoriety of the studies.”



No Valid Evidence Flu Shots Effective in Healthy Adults

Jefferson, T. et al. (2010) Vaccines for Preventing Influenza in healthy adults. Cochrane Database of Systematic Reviews. ; 8: Article #CDOO4879

“In the **relatively uncommon circumstance of vaccine matching** the viral circulating strain and high circulation, **4% of unvaccinated** people **versus 1% of vaccinated** people developed influenza symptoms (risk difference (RD) 3%, 95% confidence interval (CI) 2% to 5%).”

“The corresponding figures for poor vaccine matching were **2% and 1%** (RD 1%, 95% CI 0% to 3%).”



No Valid Evidence Flu Shots Effective in Healthy Adults

Jefferson, T. et al. (2010) Vaccines for Preventing Influenza in healthy adults. Cochrane Database of Systematic Reviews. ; 8: Article #CDOO4879

“In average conditions (partially matching vaccine) 100 people need to be vaccinated to avoid one set of influenza symptoms.”

“Vaccination had a modest effect on time off work and had **no effect on hospital admissions or (flu) complication rates.**”

There is no evidence that vaccines affect complications, such as pneumonia, **or transmission.**



No Valid Evidence Flu Shots Effective in Healthcare Workers

Jefferson, T. et al. (2010) Influenza vaccination for healthcare workers who work with the elderly. Cochrane Database of Systematic Reviews. ; 2: Article #CDOO5187

“The studies found that vaccinating healthcare workers who look after the elderly in long-term care facilities **did not show any effect** on the specific outcomes of interest, namely **laboratory-proven influenza, pneumonia or deaths from pneumonia .”**



Annual Vaccination Policies: Evidence or Dogma?

The CDC mounts a well-orchestrated campaign each season to generate interest and demand for flu shots. Along with posters for the public, flyers, and health care provider materials, it encourages doctors to "recommend/urge flu shots." Medical groups, nonmedical organizations (like the YMCA), and the media trumpet CDC-released messages on influenza, notably: "Flu kills 36,000 per year," "This could be a bad/serious flu year," and "Flu vaccine is the best defense against flu." The government promotes National Vaccination Week each December.



Annual Vaccination Policies: Evidence or Dogma?

The [National Vital Statistics Reports](#) compiled by the CDC show that only 1,138 deaths a year occur due to influenza alone (257 in 2001, 727 in 2002, 1,792 in 2003, 1,100 in 2004, and 1,812 in 2005).

“More than 34,000 of those "36,000" flu deaths are what officials estimate are "influenza-associated" pneumonic and cardiovascular deaths.”

The flu vaccine does NOT prevent pneumonia or cardiovascular disease and the sickest cardiovascular patients don't get vaccinated and then their deaths are attributed to lack of flu vaccine!!



Annual Vaccination Policies: Evidence or Dogma?

**FACA: Conflict of Interest and vaccine development – preserving the integrity of the process. Committee on Government Reform: House of Representatives USA June 15, 2000
Serial Number 106-239**

“We’ve looked very carefully at conflicts of interest. We’ve taken a good, hard look at whether the **pharmaceutical industry has too much influence over these committees. **From the evidence we’ve found, we believe that they do.**”**



Annual Vaccination Policies: Evidence or Dogma?

**FACA: Conflict of Interest and vaccine development – preserving the integrity of the process.
Committee on Government Reform: House of Representatives USA June 15, 2000 Serial
Number 106-239**

“How confident in the safety and need of specific vaccines would doctors and parents be if they learned the following:

“The **chair of the FDA and CDC advisory committees** who make these decisions **own stock in drug companies that make the vaccines.**”

“Individuals on both advisory committees **own patents for vaccines under consideration, or affected by the decisions of the committees.**”



Annual Vaccination Policies: Evidence or Dogma?

Jefferson, T. et al. (2006) Influenza vaccination: policy vs evidence. BMJ 2006; 333:912-915

“The US Advisory Committee on Immunisation Practices produces a regularly updated rationale for vaccination against influenza.”

“The rationale rests on the heavy burden that influenza imposes on the population and the benefits of vaccination.”



Annual Vaccination Policies: Evidence or Dogma?

Jefferson, T. et al. (2006) Influenza vaccination: policy vs evidence. *BMJ* 2006; 333:912-915

“For example, reductions in cases, admissions to hospital, mortality of elderly people in families with children, contacts with healthcare professionals, antibiotic prescriptions, and absenteeism for children and household contacts are the main arguments.”

“Less comprehensive policies recommending vaccination for all people aged 60 or 65 and over are in place in 40 of 51 developed or rapidly developing countries.”



Annual Vaccination Policies: Evidence or Dogma?

Jefferson, T. et al. (2006) Influenza vaccination: policy vs evidence. *BMJ* 2006; 333:912-915

“On the basis of single studies, the World Health Organization estimates that “vaccination of the elderly reduces the risk of serious complications or of death by 70-85%.”

“Given the global nature of these recommendations, what type of evidence should we expect to support them and what does available evidence tell us?”



Annual Vaccination Policies: Evidence or Dogma?

Jefferson, T. et al. (2006) Influenza vaccination: policy vs evidence. *BMJ* 2006; 333:912-915

“A meta-analysis of inactivated vaccines in elderly people showed a gradient from no effect against influenza or influenza-like illness to a large effect (up to 60%) in preventing all-cause mortality.”

“These findings are both counterintuitive and implausible, as other causes of death are far more prevalent in elderly people even in the winter months. It is impossible for a vaccine that does not prevent influenza to prevent its complications, including admission to hospital.”



Annual Vaccination Policies: Evidence or Dogma?

Jefferson, T. et al. (2006) Influenza vaccination: policy vs evidence. *BMJ* 2006; 333:912-915

“This problem (in the opposite direction—with frailer people more likely to be vaccinated) has been identified before but not heeded.”

“In children under 2 years inactivated vaccines had the same field efficacy as placebo, and in healthy people under 65 vaccination did not affect hospital stay, time off work, or death from influenza and its complications.”



Annual Vaccination Policies: Evidence or Dogma?

Jefferson, T. et al. (2006) Influenza vaccination: policy vs evidence. *BMJ* 2006; 333:912-915

“The large gap between policy and what the data tell us (when rigorously assembled and evaluated) is surprising.”

“In their efforts to deal with, or be seen to deal with, policy makers favour intervention with what is available—registered influenza vaccines.”

“A similar philosophy is the “we have to make decisions and cannot wait to have perfect data” approach.”



Annual Vaccination Policies: Evidence or Dogma?

Jefferson, T. et al. (2006) Influenza vaccination: policy vs evidence. *BMJ* 2006; 333:912-915

“A further consequence is reliance on non-randomised studies once the campaign is under way.”

“Ultimately non-randomised designs cannot answer questions on the effects of influenza vaccines.”

The optimistic and confident tone of some predictions of viral circulation and of the impact of inactivated vaccines, which are at odds with the evidence, is striking.



Annual Vaccination Policies: Evidence or Dogma?

Jefferson, T. et al. (2006) Influenza vaccination: policy vs evidence. *BMJ* 2006; 333:912-915

Summary points

- Public policy worldwide recommends the use of inactivated influenza vaccines to prevent seasonal outbreaks
- Because viral circulation and antigenic match vary each year and non-randomised studies predominate, systematic reviews of large datasets from several decades provide the best information on vaccine performance
- Evidence from systematic reviews shows that inactivated vaccines have little or no effect on the effects measured
- Most studies are of poor methodological quality and the impact of confounders is high
- Little comparative evidence exists on the safety of these vaccines
- Reasons for the current gap between policy and evidence are unclear, but given the huge resources involved, a re-evaluation should be urgently undertaken



Annual Vaccination Policies: Evidence or Dogma?

Jefferson, T. et al. (2006) Influenza vaccination: policy vs evidence. *BMJ* 2006; 333:912-915

“This attitude may have an altruistic basis but has two important consequences:

1. The inception of a vaccination campaign seems to preclude the assessment of a vaccine through placebo controlled randomised trials on ethical grounds.”
2. It uses up resources that could be invested in a proper evaluation of influenza vaccines or on **other health interventions of proven effectiveness.**



What is the CAUSE of “Seasonal” Flu

Have you ever wondered why there is such a thing as “seasonal” illness? Why would viruses and bacteria only come around during the fall and winter months? They don’t - this is a MYTH!

The truth is that we are exposed to viruses and bacteria every day of our lives; the thing determining who gets sick and who stays well is NOT the presence of the viruses or bacteria, or the ambient temperature – it is the state of our IMMUNE FUNCTION.



What is the CAUSE of “Seasonal” Flu

In other words it is not the seed it is the soil. This has been shown to be true many times, perhaps one of the best known studies was by Cohen et al. in 1991 where they exposed ALL subjects to the cold virus but only those who were “stressed” developed a cold! (**Cohen, S. et al. Psychological stress and susceptibility to the common cold. N. Engl. J Med 1991 Aug 29; 325 (9); 606-612).**)



What is the CAUSE of “Seasonal” Flu

The state, or function, of our immune system is influenced by **two main variables**.

The first is the amount of **stressors** in our lives; and thus the amount of neurobiochemical down-regulation of our immune system via our sympathetic nervous system and stress hormones - i.e. cortisol and catecholamines (adrenaline).

The second is whether or not we are **supplying our immune system cells with sufficient amounts of the essential nutrients** they need to function properly.



What is the CAUSE of “Seasonal” Flu

Increased stressors in our lives causes an epigenetic down regulation of our immune system and also drives a switch away from Th 1 (cellular/innate) immunity toward Th2 (humoral/antibody) immunity.

*We use our cellular/innate immunity to fight cold and flu viruses – the flu virus is different every year so antibodies to a previous year’s virus would not be effective)

Th 2 immune dominance is associated with more allergies and atopic disorders such as eczema and asthma. **(Elenkov et al. The Sympathetic Nerve - An Integrative Interface between Two Supersystems: The Brain and the Immune System Vol. 52, Issue 4, 595-638, December 2000).**



What is the CAUSE of “Seasonal” Flu

Clearly the amount of stress in our lives is NOT SEASONAL, this is why many people still get colds and flus in the summer months.

So, the variable determining why we get more colds and flus in the fall and winter months must be related to innate immune function status.

The question being begged is, why would we have worse innate immune function in the winter months?



Vitamin D, Immunity, and Seasonal Influenza

- Cold and flu season is indistinguishable from Vitamin D deficiency season and completely unrelated to ambient temperature (flu season is during the warm rainy season (cloud cover decreasing sunlight) in the Tropics).
- As exposure to sunlight, and thus Vitamin D levels, plummet in the fall and winter months (or the rainy season (cloud cover), in the Tropics) the incidence of “seasonal” colds and flu skyrocket.
- As go Vitamin D levels so goes your innate immunity, especially the production of innate natural antivirals and antibiotics – **antimicrobial peptides [AMPs]**.



Understanding The Cause of Seasonal Influenza

Cannell, John, M.D. Epidemic Influenza and Vitamin D (2006) Vitamin D Council News

“Long ago, American flu experts fell in love with Ms. Acquired Immunity (boosting antibodies with flu shots), while ignoring her twin, Ms. Innate Immunity (the body's inherent ability to immediately attack and kill the flu virus).”

“Throughout their seventy year marriage to Ms. Acquired Immunity, American influenza experts failed to notice that Ms. Innate Immunity's mercurial nature went up and down with the seasons of the year.”



Understanding The Cause of Seasonal Influenza

Cannell, John, M.D. Epidemic Influenza and Vitamin D (2006) Vitamin D Council News

“American influenzologists continue to believe that flu vaccines, which stimulate acquired immunity or viral-specific antibodies, will protect us from the coming pandemic.”

“Unfortunately, a recent meta-analysis in the British journal, the Lancet, concluded, "In elderly individuals living in the community, (influenza) vaccines were not significantly effective against influenza, influenza-like illness, or pneumonia."



Understanding The Cause of Seasonal Influenza

Cannell, John, M.D. Epidemic Influenza and Vitamin D (2006) Vitamin D Council News

“British influenzologists have not been as infatuated with acquired immunity as their American counterparts. In 1976, British experts warned the United States not to embark on the mass immunization of 43,000,000 Americans with the swine flu vaccine. The Americans ignored the British warning, which proved prophetic when swine flu failed to appear, but an outbreak of immunization related Guillain-Barre Syndrome did. The program was halted and the director of the Centers for Disease Control (CDC) fired.”



Understanding The Cause of Seasonal Influenza

Cannell, John, M.D. Epidemic Influenza and Vitamin D (2006) Vitamin D Council News

“American virologists continue to ignore the most remarkable aspect of influenza—it kills [*very few die from flu*] us in the winter but virtually disappears in the summer. In 1992, the British epidemiologist, Edgar Hope-Simpson, wrote that understanding influenza's "seasonal factor may be of critical value in designing prophylaxis against the disease." In effect, he was reminding his American colleagues that the key to influenza may not be down the road of boosting acquired immunity by flu shots but rather through better understanding innate immunity.”



Flu Shots are not Physiological Logical or Clinically Effective

Cannell, John, M.D. Epidemic Influenza and Vitamin D (2006) Vitamin D Council News

“Among the last sentences Hope-Simpson ever published, he pleaded that "it might be rewarding if persons, who are in a position to do so, will look more closely at the operative mechanisms that are causing such seasonal behavior." That was a plea to American influenza experts to look more closely at innate immunity. They ignored his plea and continued down "the road more traveled by." For those who like scientists who took the other road, Hope-Simpson's 1992 book, [The Transmission of Epidemic Influenza \(The Language of Science\)](#), is a masterpiece.



Vitamin D Deficiency as the Cause of Seasonal Flu

Cannell, J. et al. Epidemic Influenza and vitamin D. *Epidemiol Infect* 134 (6) 1129-1140

“In 1981, R. Edgar Hope-Simpson proposed that a ‘seasonal stimulus’ intimately associated with solar radiation explained the remarkable seasonality of epidemic influenza.

“Solar radiation triggers robust seasonal vitamin D production in the skin; vitamin D deficiency is common in the winter, and activated vitamin D, $1,25(\text{OH})_2\text{D}$, a steroid hormone, has profound effects on human immunity.”



Vitamin D Deficiency as the Cause of Seasonal Flu

Cannell, J. et al. Epidemic Influenza and vitamin D. Epidemiol Infect 134 (6) 1129-1140

Many distinctive features of the biology, physiology, and epidemiology of vitamin D point to it as a likely candidate for Hope-Simpson's 'seasonal stimulus' for the cause of the flu.

1. Vitamin D has profound and multiple effects on human immunity.
2. Inadequate vitamin D nutrition is endemic among the elderly in the winter.
3. Serum levels of 25(OH)D are low in many people of all ages who live at temperate latitudes, especially in the winter.
4. Humans acquire most of their vitamin D from casual sun exposure, and to a degree that is a function of skin surface area exposed.
5. The elderly only make about 25% of the vitamin D as 20-year-olds do after exposure to the same amount of sunlight.
6. Seasonal variations – and vitamin D deficiency – occur in both subtropical and tropical latitudes .
7. Routine daily supplementation with 400 IU of vitamin D does not prevent wintertime insufficiency.



Vitamin D Deficiency as the Cause of Seasonal Flu

Cannell, J. et al. Epidemic Influenza and vitamin D. *Epidemiol Infect* 134 (6) 1129-1140

“Perhaps most importantly, three independent research groups have recently shown that $1,25(\text{OH})_2\text{D}$ (Vitamin D) dramatically stimulates genetic expression of antimicrobial peptides (AMP) in human monocytes, neutrophils, and other human cell lines.”

“These endogenous antibiotics, such as defensins and cathelicidins, directly destroy invading microorganisms. AMP display broad-spectrum antimicrobial activity, including antiviral activity, and have been shown to inactivate the influenza virus.”



Vitamin D Deficiency as the Cause of Seasonal Flu

Cannell, J. et al. Epidemic Influenza and vitamin D. *Epidemiol Infect* 134 (6) 1129-1140

“If vitamin D is Hope-Simpson's ‘seasonal stimulus’, then countries with low 25(OH)D levels and marked wintertime troughs should have higher excess wintertime mortality than do countries with high 25(OH)D levels and little seasonal variation.”



Vitamin D Deficiency as the Cause of Seasonal Flu

Cannell, J. et al. Epidemic Influenza and vitamin D. *Epidemiol Infect* 134 (6) 1129-1140

“For example, Norway has the highest 25(OH)D levels in Europe (thought to be due to its high year-round consumption of fish and cod liver oil).”

“On the other hand, the elderly in Great Britain have low 25(OH)D levels and such deficiencies are much more common during the influenza season.”

“Excess wintertime mortality is twice as high in Great Britain as in Norway.”



Vitamin D Deficiency as the Cause of Seasonal Flu

Cannell, J. et al. Epidemic Influenza and vitamin D. *Epidemiol Infect* 134 (6) 1129-1140

Shadrin *et al.* inoculated 834 non-immune males (age 16–18 years) with live attenuated influenza virus in St Petersburg (62° N) and Krasnodar, Russia (45° N), during different seasons of the year, comparing them to 414 vehicle placebo controls.

“In St Petersburg, they found that the attenuated virus was about eight times more likely to cause physical evidence of infection (fever) in the winter than the summer (6.7% vs. 0.8%). In Krasnodar, 8% of inoculated subjects developed a fever from the virus in January, but only 0.1% did so in May.”



Vitamin D Deficiency as the Cause of Seasonal Flu

Cannell, J. et al. Epidemic Influenza and vitamin D. *Epidemiol Infect* 134 (6) 1129-1140

In 1990, Gigineishvili *et al.* administered sub-erythemal courses of UVR (sun exposure) twice a year for 3 years to 410 teenage Russian athletes and compared them to 446 non-irradiated athletes.

The non-UVR controls had 50% more respiratory viral infections, 300% more days of absences and 30% longer duration of illness than did the UVR subjects.”

“The irradiated (sun exposed) subjects also had significant increases in salivary IgA, IgG and IgM compared to controls.”



The Physiological Importance of Vitamin D in Immunity

Heaney, R. Vitamin D in Health and Disease. Clin J Am Soc Neph. Vol 3 (5) pp 1535-1541

“Without vitamin D, the ability of the cell to respond adequately to pathologic and physiologic signals is impaired.”

“Macrophages use vitamin D to enable the synthesis of the bactericidal peptides needed to deal with bacterial and viral invaders.”



The Physiological Importance of Vitamin D in Immunity

Heaney, R. Vitamin D in Health and Disease. Clin J Am Soc Neph. Vol 3 (5) pp 1535-1541

Vitamin D dramatically up-regulates the genetic expression of antimicrobial proteins (AMPs) in immune cells of the innate immune system (the part of the immune system that **immediately** attacks and kills viruses, bacteria, and fungi).

This is VERY important because the viruses that cause seasonal cold and flu DIFFER every year! It is also why colds and flu are more common in the winter or tropical cloudy months (less sun, less vitamin D, less immunity).



The Physiological Importance of Vitamin D in Immunity

Cannell et al. (2008). Cod Liver Oil, Vitamin A Toxicity, Frequent Respiratory Infections, and the Vitamin D Deficiency Epidemic. *Annals of Otology, Rhinology, and Laryngology* 117 (11): 864-70

“2 large, controlled studies in the 1930s found that cod liver oil given to 185 adults for 4 months reduced the incidence of colds by 50%, and the second study found that cod liver oil given to 1,561 adults reduced the incidence of respiratory infections by 30%. We suggest that the much higher vitamin D content in the 1930s cod liver oil may explain the different results.”



Vitamin D and Pregnancy

Wagner CL et al. "Vitamin D supplementation during Pregnancy Part 2 NICHD/CTSA Randomized Clinical Trial (RCT): Outcomes" PAS 2010; Abstract 1665.6.

“Limited vitamin D passes through the breast milk. As a result, many pregnant women and their offspring are vitamin D deficient.”

Pregnant women sufficient in vitamin D had lower rates of preterm labor and preterm birth, and lower rates of infection.



Vitamin D and Pregnancy

Wagner CL et al. "Vitamin D supplementation during Pregnancy Part 2 NICHD/CTSA Randomized Clinical Trial (RCT): Outcomes" PAS 2010; Abstract 1665.6.

The greatest effects were seen among women taking **4,000 IU of vitamin D per day**. Therefore, the researchers recommend this daily regimen for all pregnant women.

"No adverse events related to vitamin D dosing were found in any of the three arms of the study."



Vitamin D Sufficiency and Prevention of Cold and Flu

Urashima, et al. Randomized trial of vitamin D supplementation to prevent seasonal influenza in schoolchildren. Am J Clin Nutr May 2010 Vol 91 (5) 1255-60

A randomized, double-blind, placebo-controlled study published in the American Journal of Clinical Nutrition reported that children taking 1,200 international units of vitamin D₃ supplements daily in winter were **67%** less likely to get Type A influenza (H1N1 varieties).



Vitamin D Sufficiency and Prevention of Cold and Flu

Urashima, et al. Randomized trial of vitamin D supplementation to prevent seasonal influenza in schoolchildren. Am J Clin Nutr May 2010 Vol 91 (5) 1255-60

11% of Vit D group (18 of 167) got the flu.

19% of Control group (31 of 167) got the flu.

The **RELATIVE** difference was actually **42%** (13 fewer cases per 31).

The **ABSOLUTE** difference was **8%** or 13 cases of flu prevented for every 167 subjects.

REMEMBER: Flu vaccines score about 2% on average and this is with confounding!!



Vitamin D Sufficiency and Prevention of Cold and Flu

Urashima, et al. Randomized trial of vitamin D supplementation to prevent seasonal influenza in schoolchildren. Am J Clin Nutr May 2010 Vol 91 (5) 1255-60

4% of Vit D group (2 of 54) had an asthma attack.

23% of Control group (12 of 53) had an asthma attack.

The **RELATIVE** difference was **83%**.

The **ABSOLUTE** difference was **19%** or 10 asthma attacks prevented for every 53 subjects.

This is an ACTUAL reduction in comorbidity!!



Vitamin D Sufficiency and Cost Savings

Grant, W. et al. (2009) Estimated benefit of increased vitamin D status in reducing the economic burden of disease in Western Europe. *Progress in Biophysics and Molecular Biology*

“The reduction in direct plus indirect economic burden of disease was based on increasing the mean serum 25(OH)D level to 40 ng/mL, which could be achieved by a daily intake of 2000–3000 IU of vitamin D.”

“For 2007, the cost reduction is estimated at €187,000,000,000 (\$300 Billion)/year. The estimated cost of 2000–3000 IU of vitamin D3/day along with ancillary costs such as education and testing might be about €10,000,000,000 (\$14 Billion)/year.”



The Economic and Human Burden of Vitamin D Sufficiency

Grant, W. et al. (2010) An estimate of the economic burden and premature deaths due to vitamin D deficiency in Canada. *Mol. Nutr. Food Res.* 54, 1-10.

“The estimated benefits in disease reduction were based on increasing the mean serum 25(OH)D level to 105 nmol/L.”

“It is estimated that the death rate could fall by 37 000 deaths (16.1% of annual deaths) and the economic burden by 6.9% (\$14.4 billion) less the cost of the program.”

“It is recommended that Canadian health policy leaders consider measures to increase serum 25(OH)D levels for all Canadians.”



Vitamin D Deficiency Increases the Incidence of Colds and Flu

Aloia, JF. Li-Ng M. Re: epidemic influenza and vitamin D. *Epidemiol Infect.* 2007 Oct;135(7):1095-6; author reply 1097-8.

“The physiological basis of the protective effect of vitamin D lies in its ability to stimulate innate immunity and to moderate inflammation.”

“Vitamin D, 1,25-dihydroxyvitamin D (1,25-OH₂D) stimulates the genetic expression of antimicrobial peptides (AMPs) in human monocytes, neutrophils, and epithelial cells.”

“These peptides have a broad range of actions against microorganisms, including bacteria, fungi and viruses.”



Vitamin D Sufficiency and Prevention of Cold and Flu

Aloia, J et al. Epidemic Influenza and Vitamin D. *Epidemiology and Infection* 2007, Vol 135 (7)
pp. 1095-1098

In a 3 year trial taking 800 IU/day of Vitamin D reduced the incidence of colds and flu by **70%**.



Vitamin D Sufficiency and Prevention of Cold and Flu

Aloia, J et al. Epidemic Influenza and Vitamin D. *Epidemiology and Infection* 2007, Vol 135 (7) pp. 1095-1098

8 of 104 or 8% in Vit D group experience cold or flu symptoms

26 of 104 or 25% in placebo group expressed cold or flu symptoms

The **RELATIVE** difference was actually **70%** (18 fewer cases per 26 cases).

The **ABSOLUTE** difference was **17%** or 18 cases of flu prevented for every 104 subjects.



Vitamin D Sufficiency and Prevention of Cold and Flu

Aloia, J et al. Epidemic Influenza and Vitamin D. *Epidemiology and Infection* 2007, Vol 135 (7) pp. 1095-1098

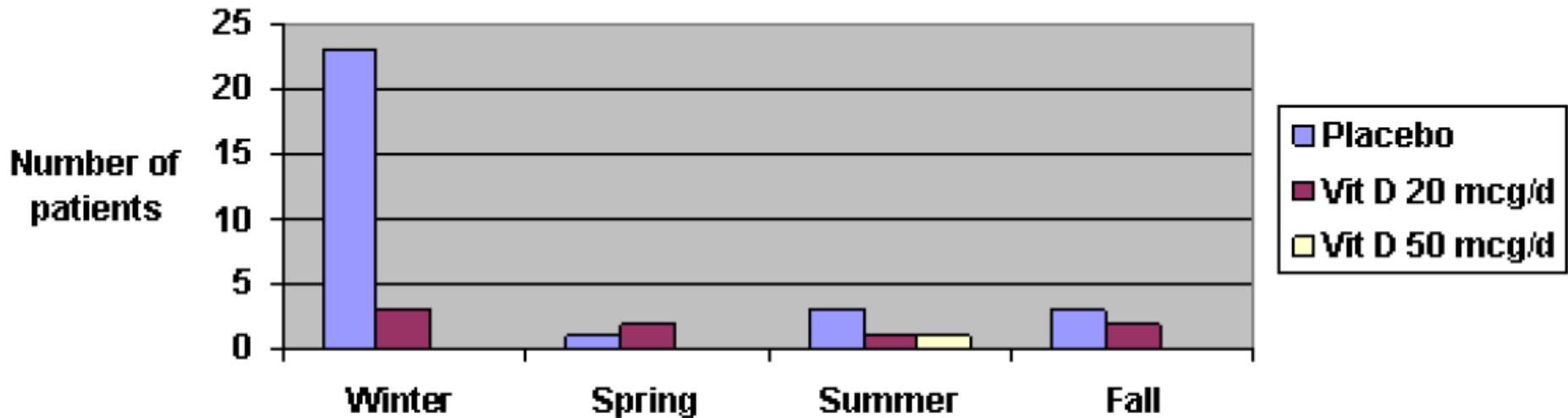
After two years they increased the Vit D to 2000 IU/day and the incidence of colds and flu was reduced by almost 100% (only 1 of 104 subjects developed cold or flu in the final year).

This is an ABSOLUTE reduction in cases of almost 100%!!



Vitamin D Sufficiency and Prevention of Cold and Flu

Aloia, JF. Li-Ng M. Re: epidemic influenza and vitamin D. *Epidemiol Infect.* 2007 Oct;135(7):1095-6; author reply 1097-8.



Vitamin D Sufficiency and Prevention of Cold and Flu

Yamshchikov, A et al. (2009) Vitamin D for Treatment and Prevention of Infectious Diseases: A Systematic Review of Randomized Controlled Trials. *Endocrine Practice* 15 (5) 438-449

“Ten trials were placebo controlled, and 9 of the 10 were conducted in a **rigorous double-blind design.**”

“On the basis of studies reviewed to date, the strongest evidence supports further research into adjunctive vitamin D therapy for tuberculosis, **influenza**, and **viral upper respiratory tract illnesses.**”



Vitamin D Deficiency is Pandemic Without Supplementation

Industrial humans are almost completely devoid of Vitamin D from sunlight.

Anyone who does not get adequate sun exposure and who remains mostly clothed or wears sunscreen when in the sun requires a Vitamin D supplement.



Vitamin D Sufficiency Requires Supplementation

Stewart Leavitt, Ph.D. Vitamin D – A Neglected ‘Analgesic’ for Chronic Musculoskeletal Pain. Pain Treatment Topics June 2008

“Experts recommend 3000 IU to 4000 IU per day as necessary to create sufficiency [Holick 2007; Vasquez et al. 2004; Vieth et al. 2004].”

