Overdiagnosis and Public Health:

Inventing an Epidemic in Moldy Montreal Schools

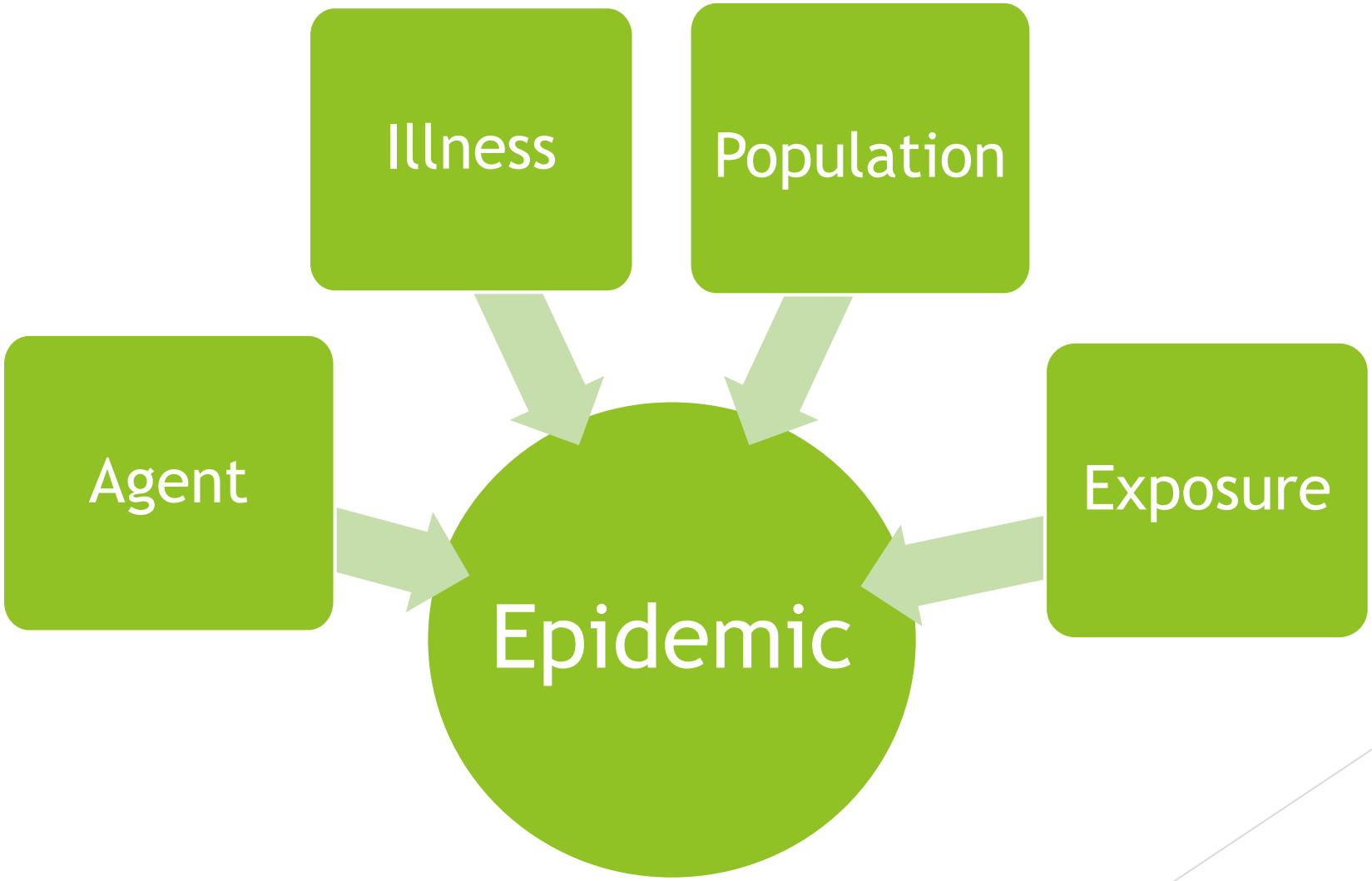
John W. Osterman
MD, ScD, FRCPC

Preventing Overdiagnosis, Quebec City, August 2017

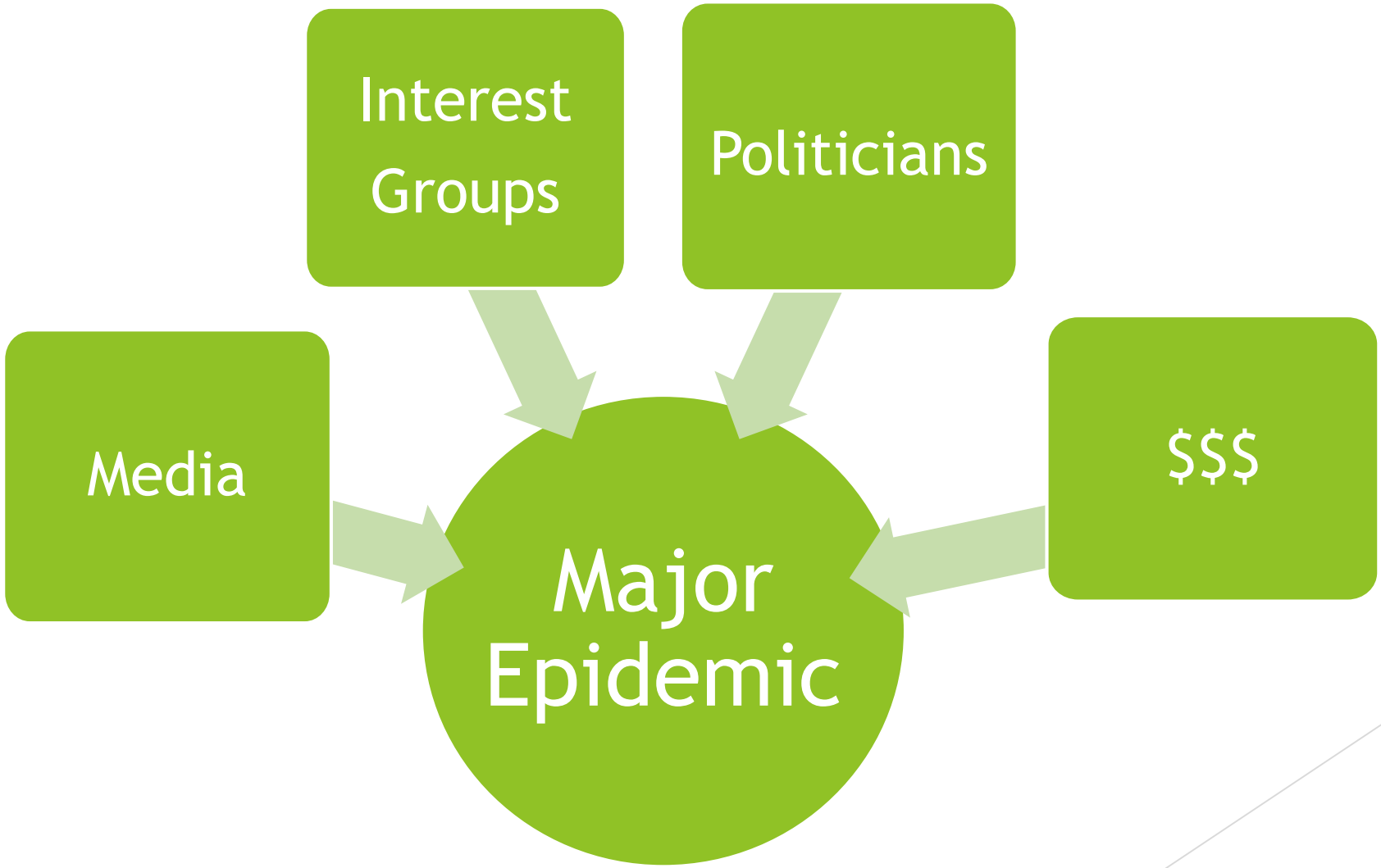
Conflicts of Interest:

- Former Public Health Director for the Western Part of Montreal
- Ad hoc consultant to the Montreal School Commission (CSDM) (worker compensation claims)

How to Invent an Epidemic



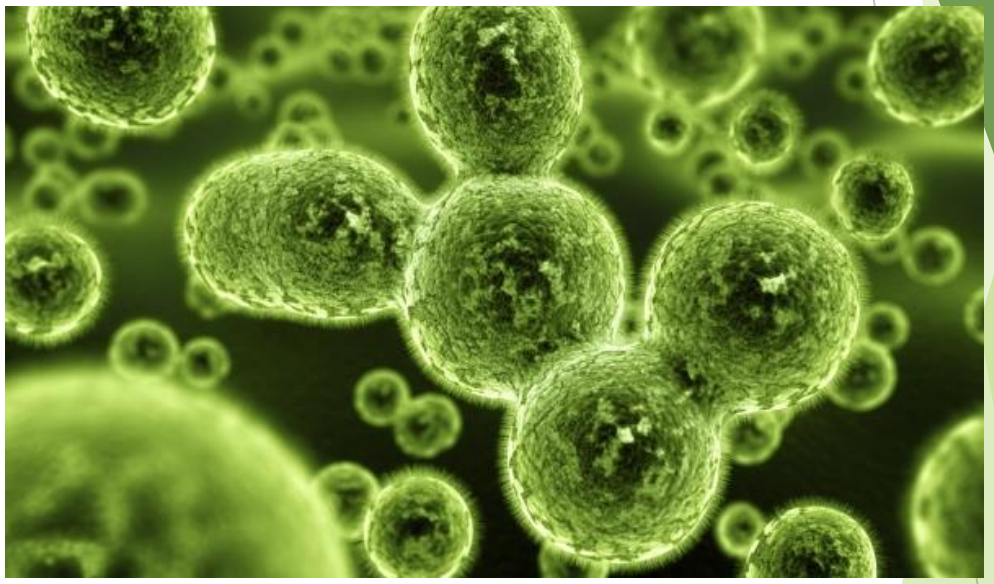
How to Invent a Major Epidemic



Agent

Criteria

- Widespread
- Looks dangerous
- Bad reputation



The Perfect Candidate: MOLD

Mold is all around us

Ambient air mold concentrations in diverse environments

Environment	CFU / m3
Exterior	1 000
Agriculture (normal)	1 000 – 10 000
Agriculture (rotten hay)	1 000 000 000
Bakery	100 - 1 000
Compost Center	10 000
Household Trash	10 000
Office Building	100 – 1 000
Humidifier	100 – 1 000
Paper Mill	1 000
Saw Mill	1 000 000
Peat Moss Production	100 000 000

Source: Les bioaérosols en milieu de travail, IRSST 2001

Airborne mold found in 126 work environments

Mold Type	%
Penicillium sp.	100
Aspergillus sp.	90
Cladosporium sp.	79
Alternia sp.	35
Mycellia sterilia	34
Acremonium sp.	19
Basidomycètes	18
Phoma sp.	18
Trichoderma sp.	15
Stachybotrys chartarum	11

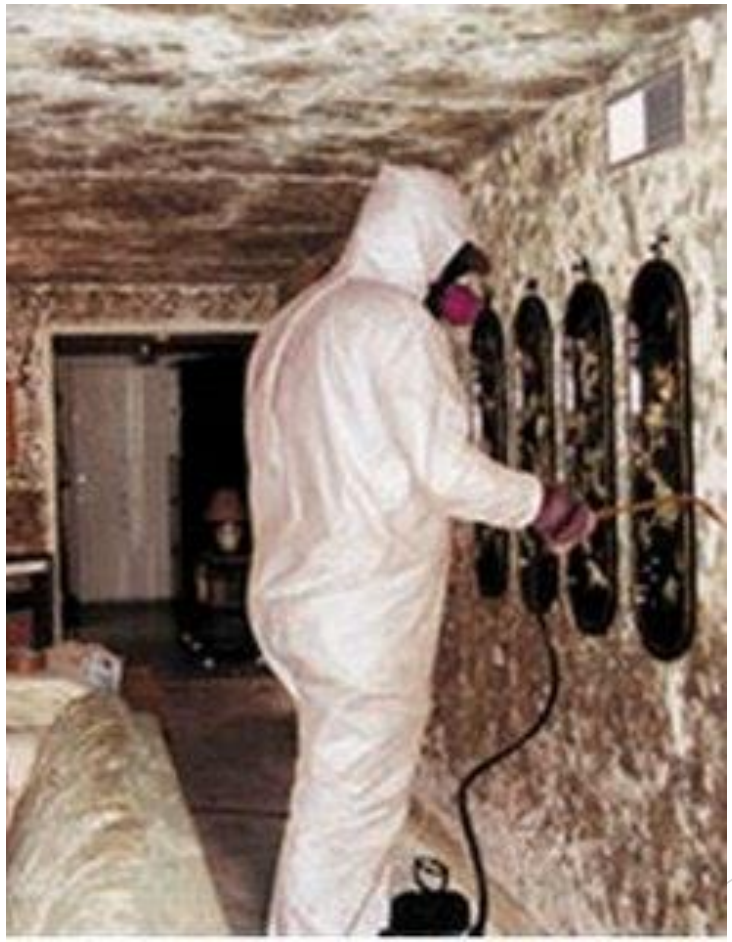
Source: Les bioaérosols en milieu de travail, IRSST 2001

Mold found in 1096 American homes

Mold Type	%
Cladosporium clasosporiodes	99
Eurotium amstelodami	98
Aurobasidium pullulans	94
Epicoccum nigrum	93
Mucor sp.	92
Aspergillus sp.	90
Alternia alternata	88
Cladosporium herbarum	84
Cladosporium sphaerospermum	82
Walleremia sebi	75
Penicillium sp.	66
Acremonium strictum	57
Stachybotrys chartarum	35
Trichoderma sp.	27

Source: Vesper et al, Development of an environmental relative moldiness index for US homes, JOEM 2007, 49: 829-33

Looks dangerous



Bad Reputation

Stachybotrys chartarum, anyone?

Illness

Recognized medical effects of mold

- Infection
  - Very ill, debilitated, immunocompromised
- Irritation
  - Massive Exposure
- Intoxication
  - Ingestion only
- Allergy
  - Asthma, hay fever, skin reactions

Sources

Institute of Medicine

Damp Indoor Spaces and Health, National Academy of Science, Washington, DC, 2004

WHO (Europe)

Dampness and Mould, WHO guidelines for indoor air quality, 2009

American College of Occupational and Environmental Medicine

Adverse human health effects associated with molds in the indoor environment, ACOEM Evidence-based statement, Oct 27, 2002, & Public Affairs: Adverse human health effects associated with molds in the indoor environment, press release, Feb. 24, 2011

American Academy of Allergy, Asthma and Immunology

Bush RK et al, The medical effects of mold exposure, J Allergy Clin. Immunol, 2006, 117: 326- 333, et Baxi SN Exposure and health effects of fungi on humans, J Allergy Clin. Immunol. Pract. 2016, 4:396-404

Institut National de la Santé Publique du Québec

Les risques à la santé associés à la présence de moisissures en milieu intérieur, MSSS, 2002

Population

Why not try schools?

- Vulnerable population
- Great potential for community angst
- Since 2003-2006, two schools with widespread, non-specific health complaints among teachers, purportedly due to the work environment

Health complaints among teachers at two Montreal Elementary Schools

- **Fatigue**
- **Headache**
- **Eye irritation**
- **Dry skin**
- **Nasal congestion, rhinitis, sinusitis, post-nasal drip, bleeding**
- **Sneeze**
- **Allergies**
- **Dizziness**
- **Frequent colds**
- **Acute sinusitis**
- **Acute bronchitis**
- **Chronic nasal symptoms**
- **Asthma**
- **Chronic cough without asthma**
- **Joint Pain**
- **Chronic disease with immune suppression**

Source: Questionnaire distributed to school personnel by the MPHD

But these symptoms do not always correspond to symptoms of mold-related illnesses recognized by expert groups....

- So what do you do?

Answer:

- Broaden the case-definition!

Illnesses caused by mold according to the Montreal Public Health Department

- **Rhinitis or rhinosinovitis (acute/chronic/infectious/irritative/allergic)**
- **Chronic cough, wheezing, dyspnea, in the absence of another diagnosis**
- **Asthma (new onset or aggravated), severe or poorly controlled**
- **Common upper and lower respiratory tract infections (any biological agent)**
- **Internal ear problems (pain, tubular dysfunction, vertigo)**
- **Allergic dermatitis, eczema**
- **Conjunctivitis, pharyngitis, laryngitis (infectious/irritative/allergic)**
- **Aggravated COPD**
- **Hypersensitive pneumonitis, other interstitial pulmonary diseases**
- **Insomnia**
- **Obstructive sleep apnea**
- **Chronic fatigue**
- **Fibromyalgia or chronic pain**
- **Serious fungal infections in severely immuno-suppressed persons**
- **Mental illness**
- **Inflammatory arthritis and other inflammatory diseases**

Source: Dr Louis Jacques, 8e Journée de formation interdiscplinaire, FMSQ, 13 novembre 2015

Why the difference?

- **Treat studies using survey (questionnaire) data on a par with those using objective clinical/laboratory data.**
  - **eg: Asthma**
    - **Mendel et al., Respiratory and allergic health effects of dampness mold and dampness related agents: A review of the epidemiologic evidence, Environ. Health Perspectives 2011, 119: 748-756**
- **Overgeneralize results obtained from one population or environment to significantly different populations or environments**
  - **eg: Children (infants) vs. Adults**
    Home vs. School
    - **Jaakkola MS et al, Association of indoor dampness and mold with Rhinitis risk: A systematic review and meta-analysis, J Allergy Clin. Immunol 2013, 132: 1099-1110**
- **Do not consider bias**
  - **Selection**
  - **Observation**
  - **Confounding (alternative explanations)**

Teachers v. other working women:

Symptom:	Teachers(%)	Other working women (%)
Eye symptoms (2 wks)	7.4	2.9
Nasal symptoms (2 wks)	8.1	2.7
Throat symptoms(2 wks)	5.7	1.3
Wheezing (2 wks)	28.4	16.4
Chest symptoms (last 3 yrs)	19.3	7.2
Ever physician Dx asthma	13.3	11.8
Current physician Dx asthma	8.8	8.6

Source: Whelan et al, Prevalence of respiratory symptoms among female flight attendants and teachers, Occup. Environ. Med. 2003, 62: 929-934

Exposure

Diseases caused by airborne contaminants require exposure to airborne contaminants.

But what if mold contaminants are not found in the air?

Answer:

- Broaden the exposure definition!

MPHD definition of “mold exposure” in schools:

- Measurable quantities of airborne mold or mold spores (very little found)
- Visible mold (window sills, bathrooms, sinks, etc.)
- Hidden mold (attics, basements, crawl spaces, behind/inside walls)
- Mold odor, damp odor
- Dampness, condensation
- Water stains
- Water damage (current or previous)
- Google street view of building

If you cannot measure it, then it is not science

Lord Kelvin

The Epidemic

Affected Montreal schools, children, personnel

- 50/214 schools affected
  - 29 schools prioritized
  - 8 schools closed
    - 1 school which was torn down
    - 2 schools which were abandoned

- 10 000 students affected by school closures
- Approx. 600 personnel with health complaints
- Approx. 40 worker compensation claims

- $46.6 million for immediate renovations
- $30 million for surveillance and detection
- $324.7 million for maintenance

Sources: Couillard, Kathleen, Moisissures dans les écoles, OIIQ Nov 2013
La Presse, Le J. de Montréal, Radio Canada, (diverses dates)

What about the children?

Primary school B:

- **190 children at risk**
- **171 parents who answered questionnaire about their children**
- **100 children with symptoms**
- **39 for whom clinical evaluation was suggested**
- **22 made appointments**
- **16 showed up**
- **6 with rhinitis including**
  - **1 with more severe respiratory problems in need of further investigation (results not available)**

The Press (etc.)

Des problèmes de moisissures dans une deuxième école de la CSDM

PUBLIÉ LE MERCREDI 9 NOVEMBRE 2011 À 14 H 39 | Mis à jour le 9 novembre 2011 à 19 h 11

Mould problem forces N.D.G. students into another school

MARIAN SCOTT, MONTREAL GAZETTE

More from Marian Scott, Montreal Gazette

Published on: January 16, 2015 | Last Updated: January 16, 2015 7:28 PM EDT

Moisissures: la liste des écoles touchées s'allonge

REPORTAGES

Mon école est pourrie

COMMISSION SCOLAIRE DE MONTRÉAL

Moisissures : 29 écoles priorisées

10 mai 2012 | Jeanne Corriveau | Éducation

50 écoles visées à Montréal

CSDM: syndicats et parents réclament un milliard contre les moisissures

Écoles aux prises avec des moisissures: le maire Coderre veut aider la CSDM

Par Marie-Eve Shaffer
Métro

Courriel | Tweeter

ACDSA

CITIZENS FOR DEMOCRATIC AND AUTONOMOUS SCHOOLS / CITOYENS POUR LA DÉMOCR

À PROPOS DE NOUS | ABOUT ACDSA

Foul air, failing grades in our schools

onnel scolaire.

Roxane Léouzon/Métro

postal (optionnel)

(optionnel)

Je veux rester anonyme

Conclusion

There was no true “epidemic” in moldy Montreal schools

The perceived “epidemic” was due to the following factors:

- **Poorly defined case definition (overdiagnosis)**
- **No objective laboratory diagnostic criteria (more overdiagnosis)**
- **Poorly defined exposure criteria (even more overdiagnosis)**
- **Uncritical literature review**
- **Bias**
- **Pressure from interest groups**
- **Financial considerations on the part of school board/unions**
- **Alarmist reporting by the media**
- **No attempt by the MPHD to set the record straight (they, in fact, made the situation worse)**