

Learning and Link to IAQ



Background

- IAQ in schools is poor:
 - Ventilation inadequate
 - Temperatures elevated
- Poor IAQ in schools may affect students' performance (possibly teachers' too)
- School funding is minimal



IAQ/Asthma Environmental Control Strategies

❖ SOURCE MANAGEMENT

- ✓ Removal/substitution
- ✓ Exposure control

❖ Ventilation

- ✓ Dilution
- ✓ Exhaust

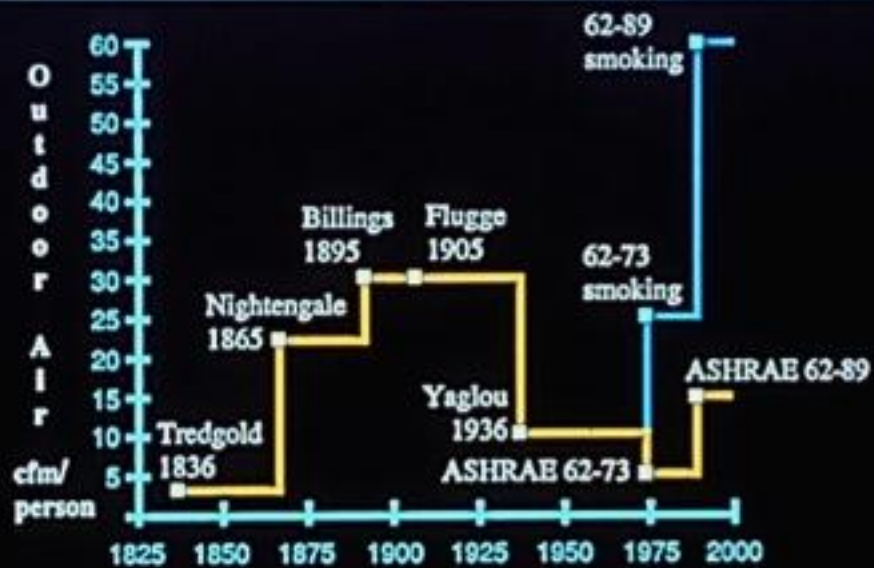
❖ Air Cleaning

❖ Education & Communication

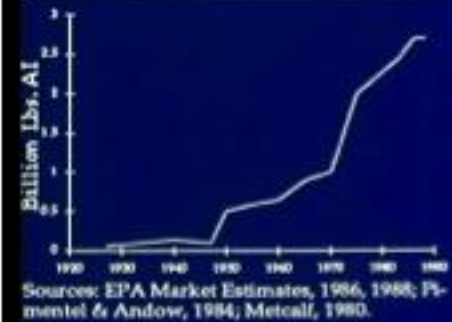
- ✓ Provide information to occupants on sources & controls



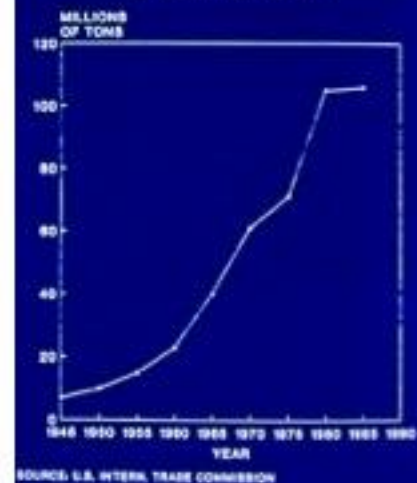
Ventilation Guidelines



U.S. Pesticide Production, All types, 1927-1988



SYNTHETIC ORGANIC CHEMICAL PRODUCTION UNITED STATES, 1948 - 1988



Ventilation decrease/Chemical increase



**Fresh air
intakes??**

Doors & Windows Open



Open windows allow unplanned/unconditioned airflow into School; HVAC unable to control for comfort



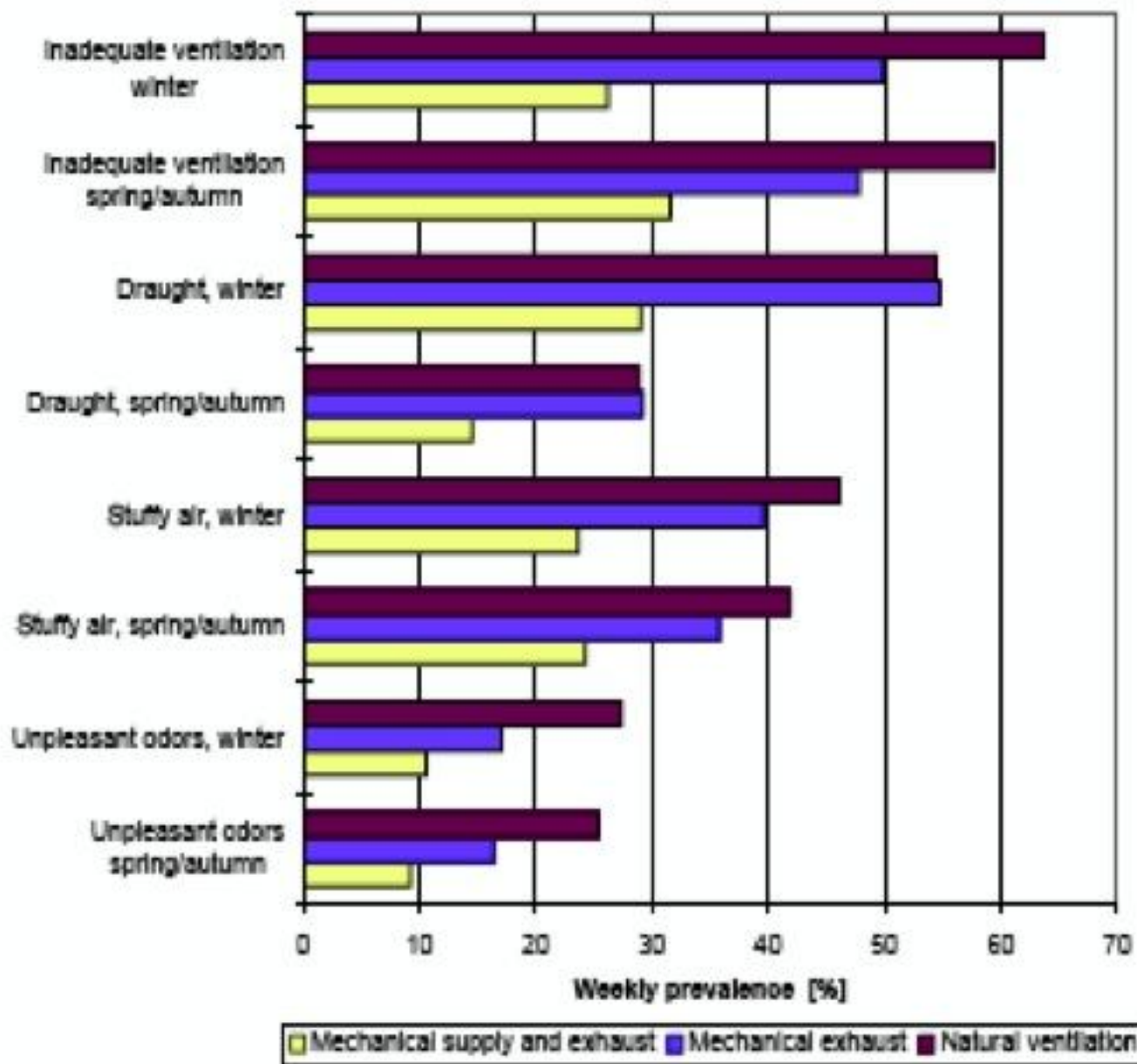


Fig. 1. Prevalence of weekly complaints in Finnish schools.

Kurnitski and
Palonen,
HB'06, 2006

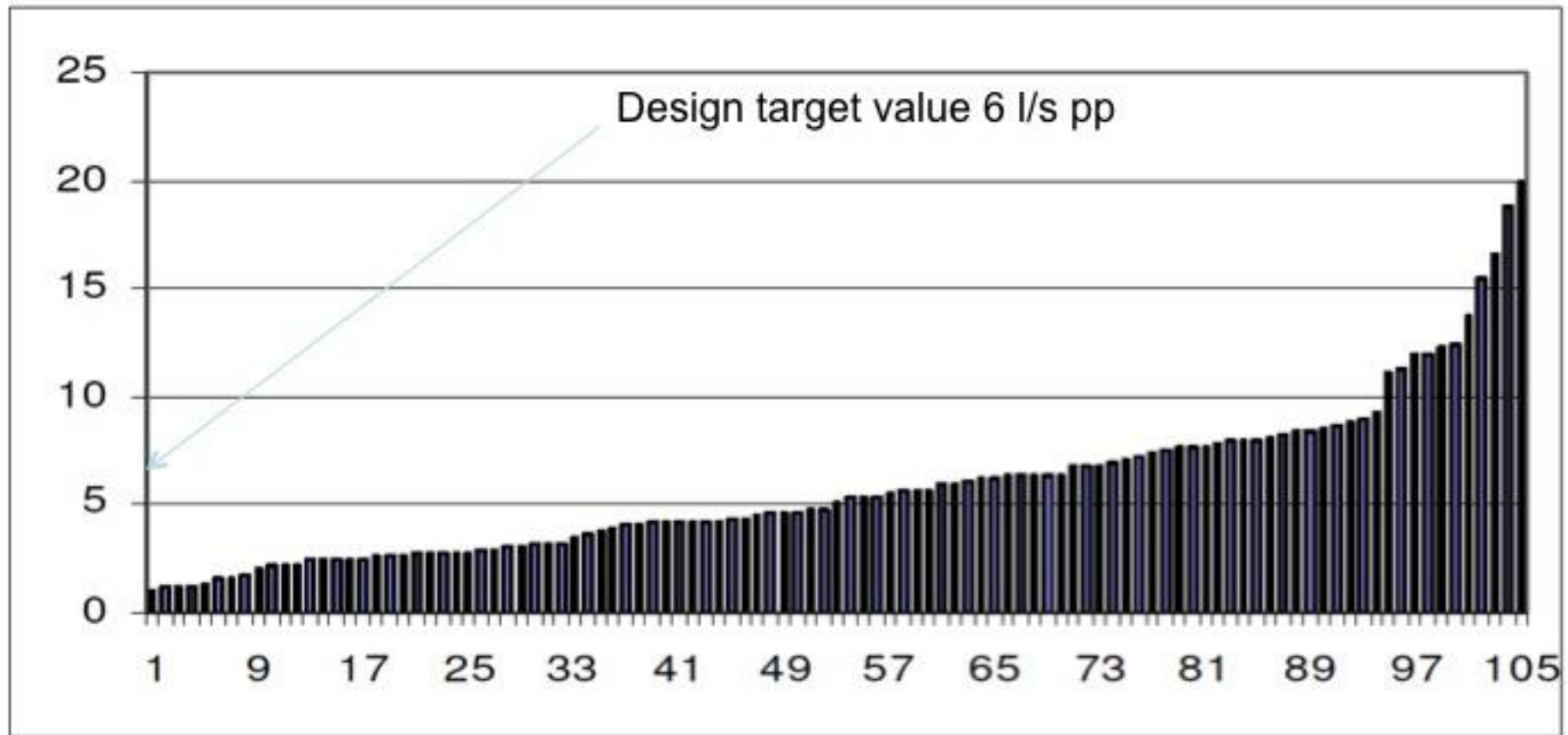


Figure 1b. Measured ventilation rates per student (l/s) in 108 classrooms. [Palonen et al. 2009](#)

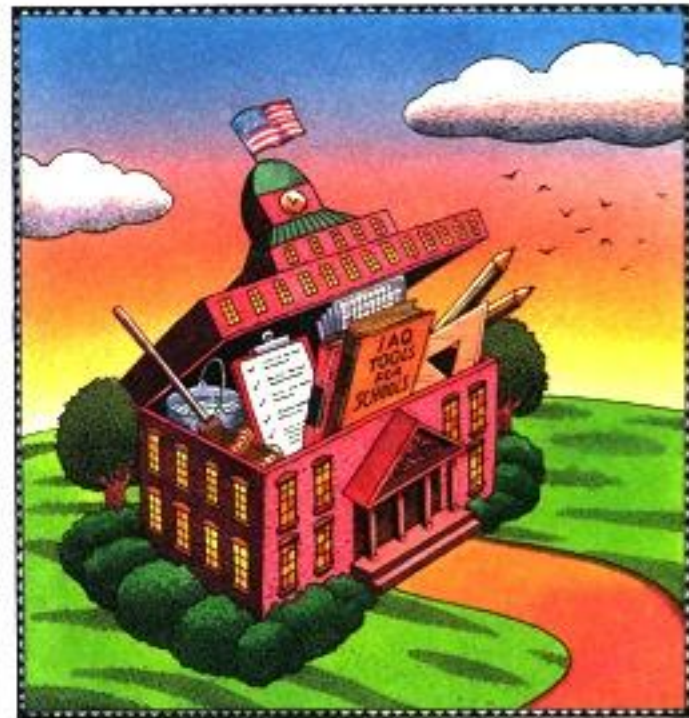
- **Ventilation measurements performed in 60 schools in Southern Finland**
- **Median value was 4 l/s per student**
- **Ventilation is insufficient in a large number of classrooms**

Education for Schools

(In the USA have TFS kits))

School Administrators need definitive outcomes to divert funds to undertaking significant improvements to IAQ

Indoor Air Quality



Tools For Schools

WHY VENTILATION?

Body Odor

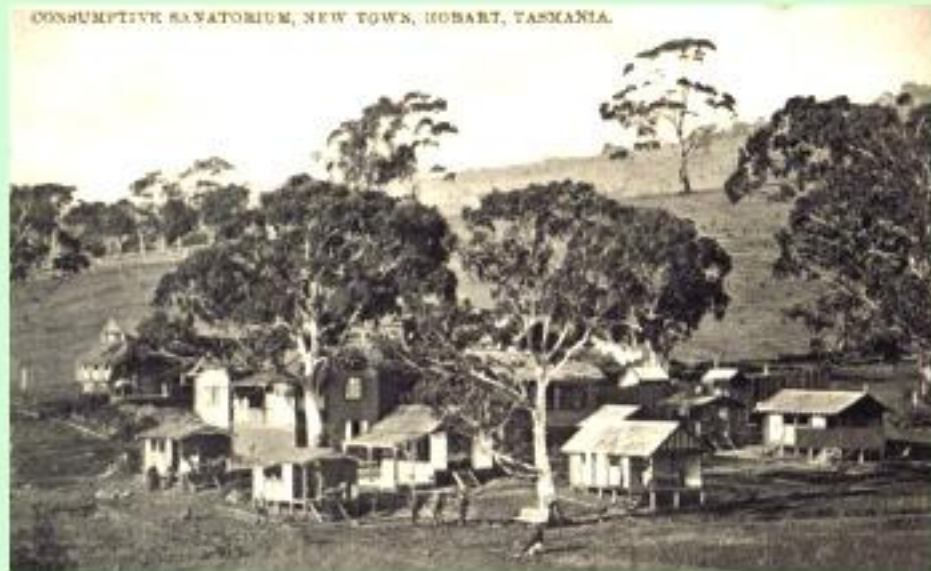


VENTILATION AND REDUCED RISK OF AIRBORNE TRANSMISSION OF DISEASE





TB Sanatorium, early 1900's



Isolation, Ventilation, Sunshine

November 4, 2008

Breathing Dirty Air May Lower Kids' IQ

<http://www.reuters.com/article/healthNews/idUSKUA57144920080215>
[reuters.com](http://www.reuters.com)

by Anne Harding

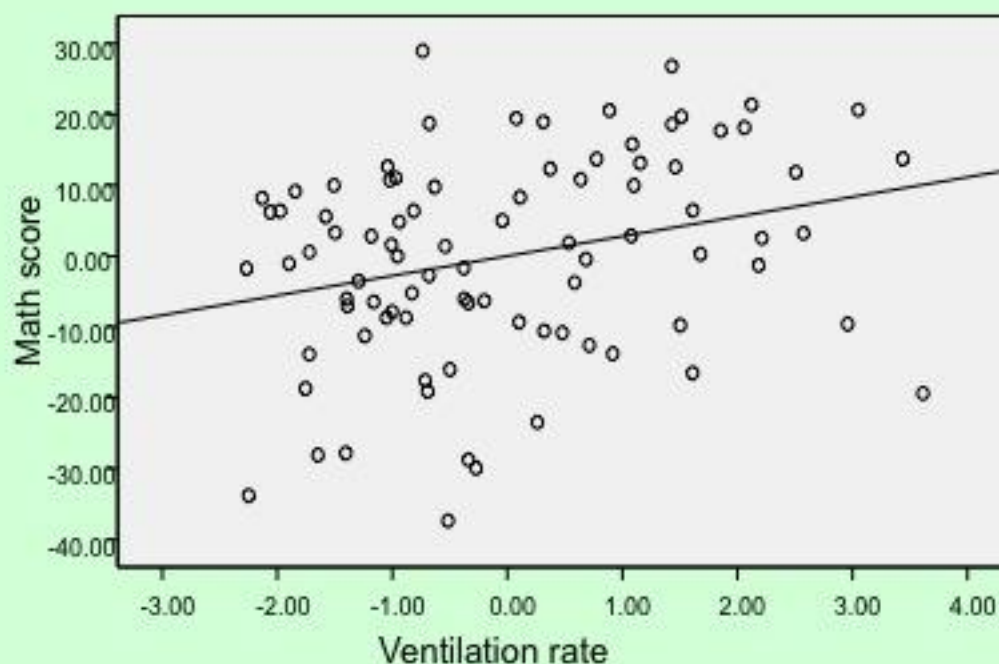


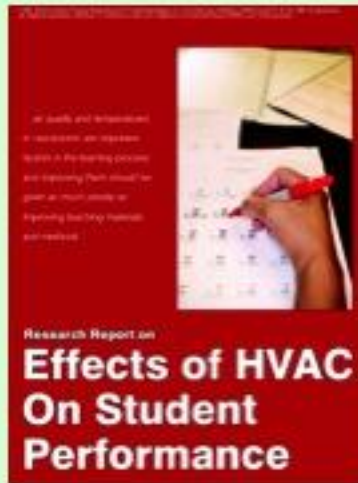
Association between Sub-Standard Classroom Ventilation Rates and Students' Academic Achievement in the US



(Haverinen-Shaughnessy et al. Journal Indoor Air 2011)

- Results reveal linear association between ventilation rate and students' AP (independent of socioeconomic factors)





Parallel Studies

- Reducing moderately elevated classroom temperatures & increasing outdoor air supply rate improved the performance of schoolwork
- Speed at which the tasks were performed was improved; effect on errors more confounded

Wargoeki and Lyons (2008)