Public Health Challenges Of Air Pollution
KSPCB and CSE Workshop. Bangaluru:22-03-2013

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- **Chairman, Aeroallergens and Human Health, G.O.I**
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- **Chairman, State of Environment and action plan G.O.K and World Bank**
- **Past Chairman TAC. K.S.P.C.B**
- **Founder Chairman of Environment Child Health/Allergy Appl Immul. Chapters of I.A.P**
- **W.H.O Faculty for Environmental Health**

Our Bangaluru – Environmental Profile

- 920m above sea level. Fastest growing city in the world (Forbes – 2010)
- Daily temperature – Max:28.9°C
  Min:18.9°C (07)
- Average Rainfall – 80.8cm per year
- Growth of Bangalore: 69km^2 – 1949
  741km^2 – 2007
  800 km^2 – 2011
- We add 20km of built up area per year and loose 20% of green area per year
- Was named as air conditioned city, garden city, pensioners' paradise

  What is now?
- Sneezing city, wheezing city and pensioners nightmare city

Bangaluru Urban Agglomeration Zone (BUAZ)

- **Population:**
  - **0.1m (1880); 1.6 (1971); 8.678m(2008)**
- **Vehicles:**
  - **3.7 million (2011)**
  - **10 fold increase in the last decade**
  - **10% increase 1 year**
  - **70% are 2-wheelers (2011)**
- **Fuel Consumption:**
  - **3-3 ½ fold increase in consumption of automobile fuel**
- **Slow traffic emit (10 km/hr) 5 ½ times more CO.**
- **Congestion costs ` 3000-4000 Cr/yr. Apart from Health cost**

Source: IOCL - 2008,; Dept of Transport, GoK, 2011

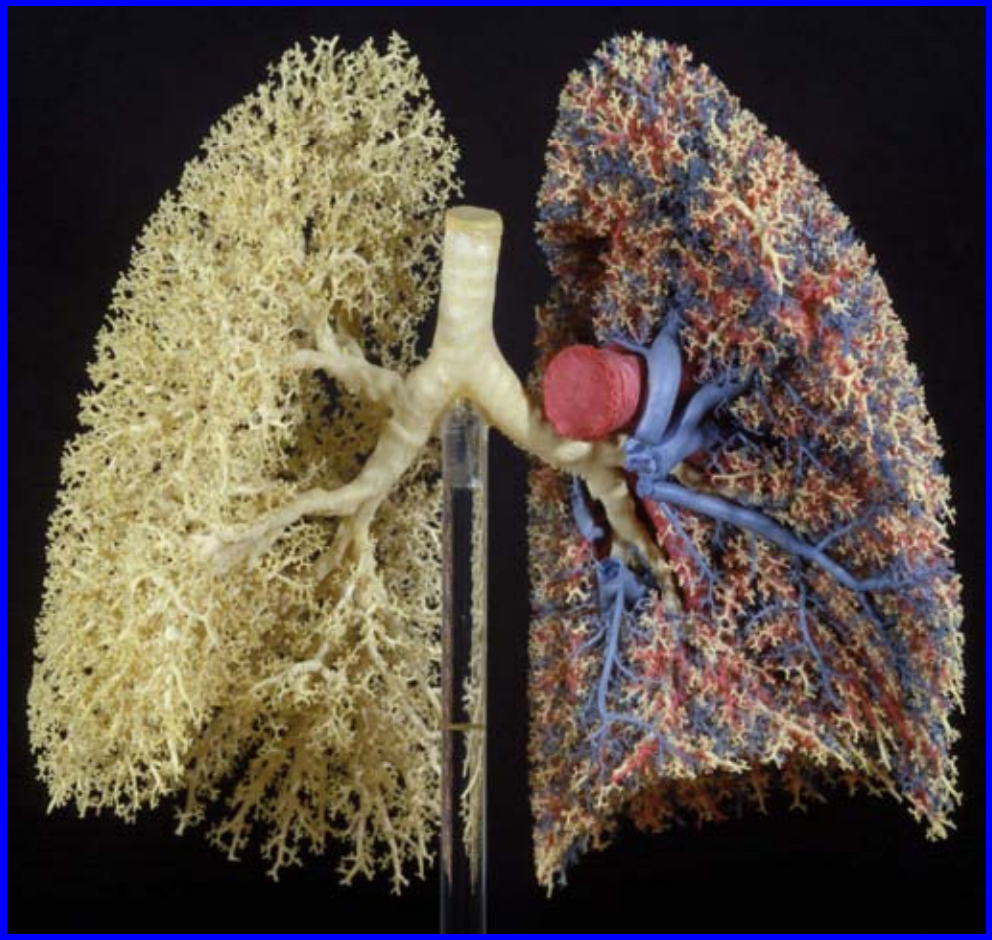
LUNGS: THE AMAZING ORGAN

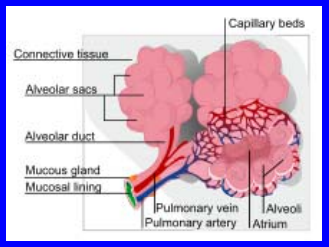
Children Suffer more from air pollution due to anatomic & physiological reasons

100-200 million branching tubes

Should remain patent all the time

10,000 liters air every day





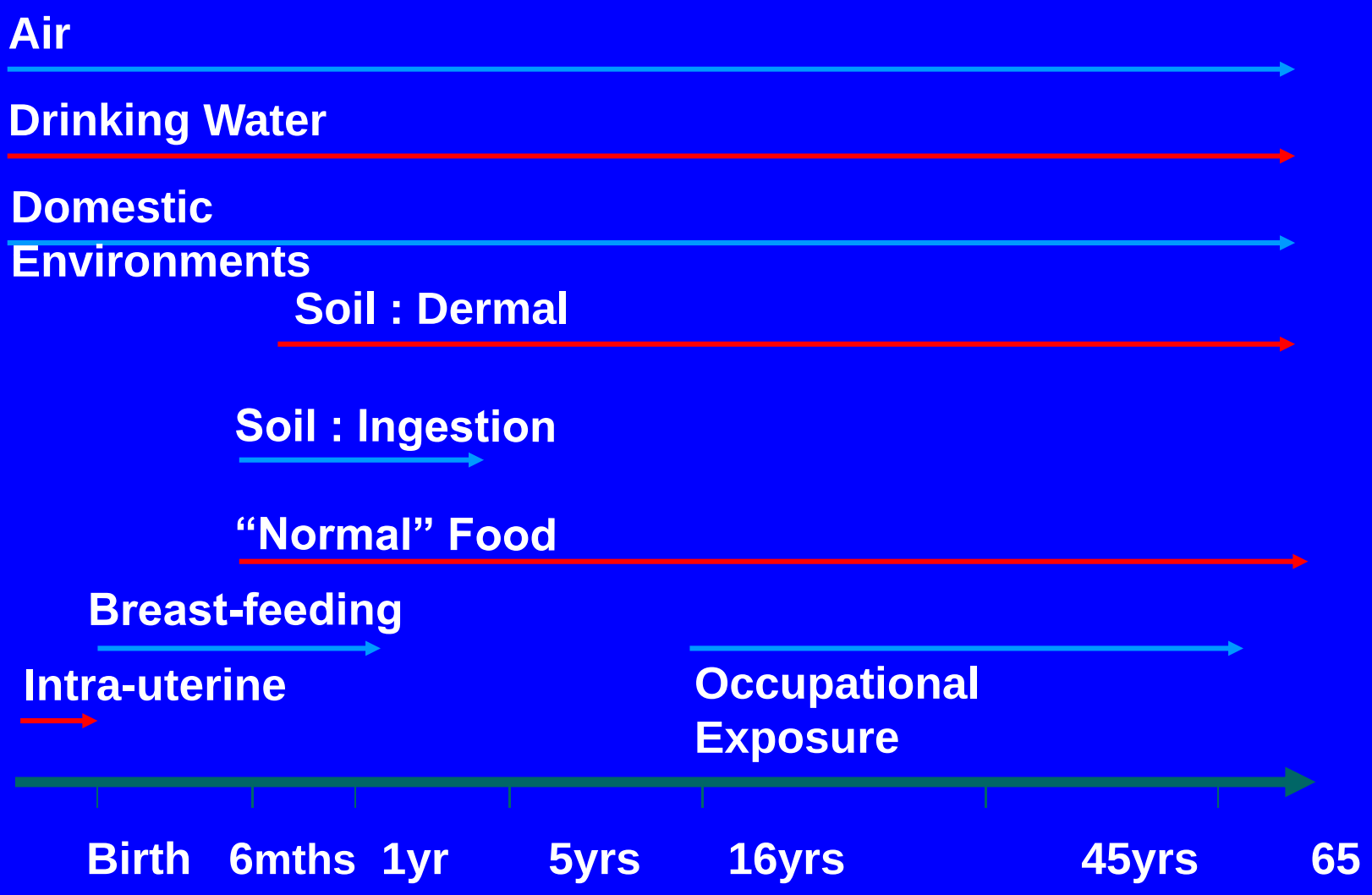
600 million alveoli

Very thin membrane (0.3 micron)

10,000 liters blood every day

420 Lts of Oxygen
350 Lts of Carbon Dioxide

LIFETIME EXPOSURES OF POLLUTANTS



Residential Proximity to main roads during Pregnancy and Risk of Asthma

- **Japanese Birth Cohort Study, 756 pregnant mothers, Babies followed for 2 yrs after birth**

<50 mts versus >200 mts

Doctor diagnosed asthma: 4.0 (1.4-11.2)

Doctor diagnosed eczema: 2.3 (1.1-4.6)

Maternal exposure to vehicular pollutants during pregnancy is strongly associated with early childhood asthma

- **Air Pollution increases the risk of premature birth by 30%**

(Miyake Y et al, Pediatr Allergy Immunol 2010; 21: 22-28)
AAP Smart Brief October 10, 2011

Prenatal exposure to air pollutants and risk of allergic respiratory symptoms at 1 year

- Mothers (n = 333, from Poland) underwent personal monitoring for air pollutants during the second trimester
- Prenatal ambient air exposure to polyaromatic hydrocarbons associated with increased risk of babies (followed over 1 year) developing:

- Cough	**4.80-fold**
- Wheezing	**3.83-fold**
- Sore throat	**2.56-fold**
- Ear infections	**1.82-fold**

(Jedrychowski et al, Eur J Epidemiol 2006; 20(9): 775-782)

Pollen Allergy

↑↑ IgE

↑↑↑↑ IgE

Pollen become more allergenic when these trees grow in an urban environment

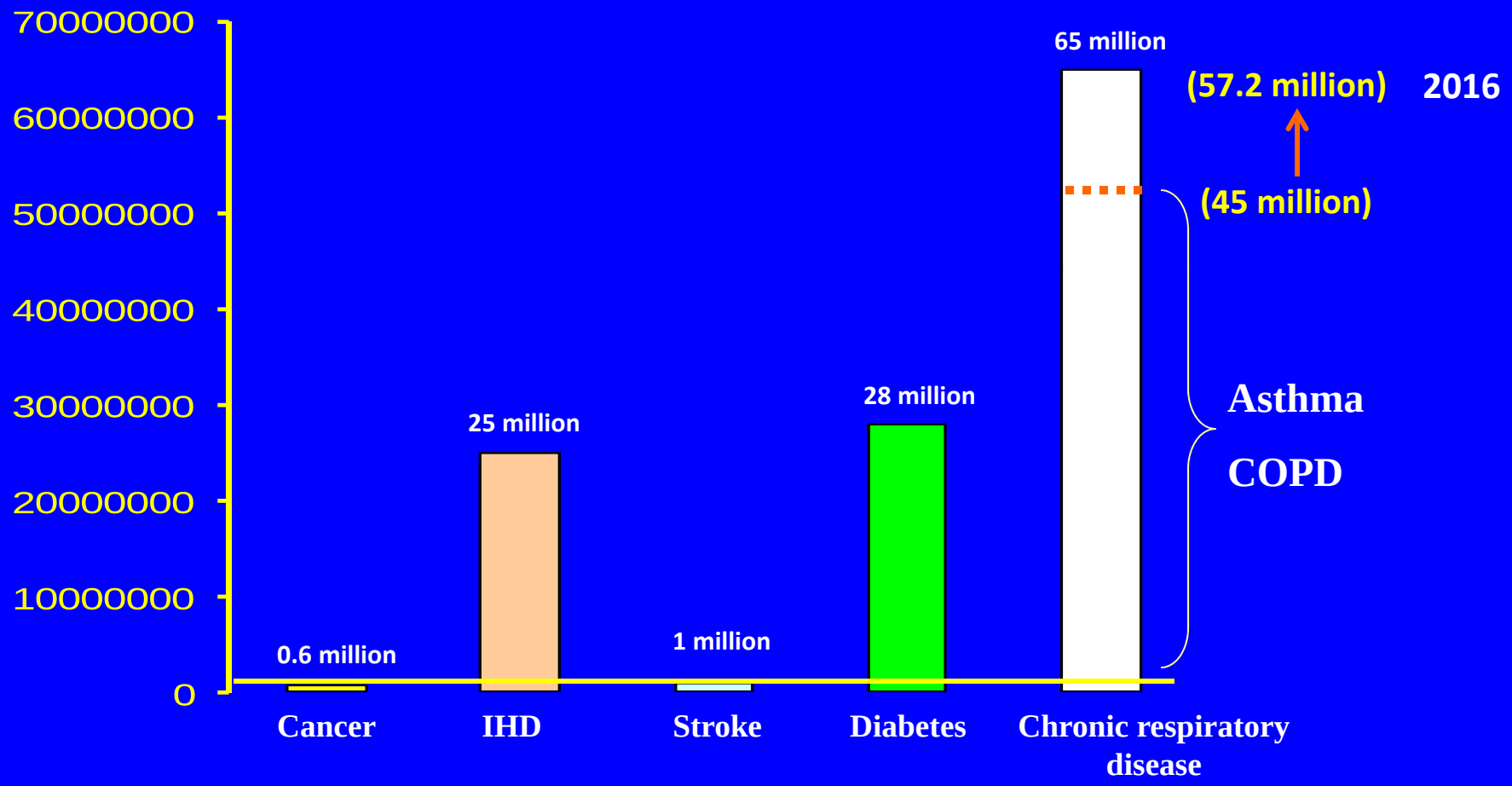
Diesel exhaust particles increase allergen-specific IgE levels by up to <u>50-fold</u>

(Knox et al, Clin Exp Allergy 1997

Takenaka et al, J Allergy Clin Immunol 1995; 95: 103-115)

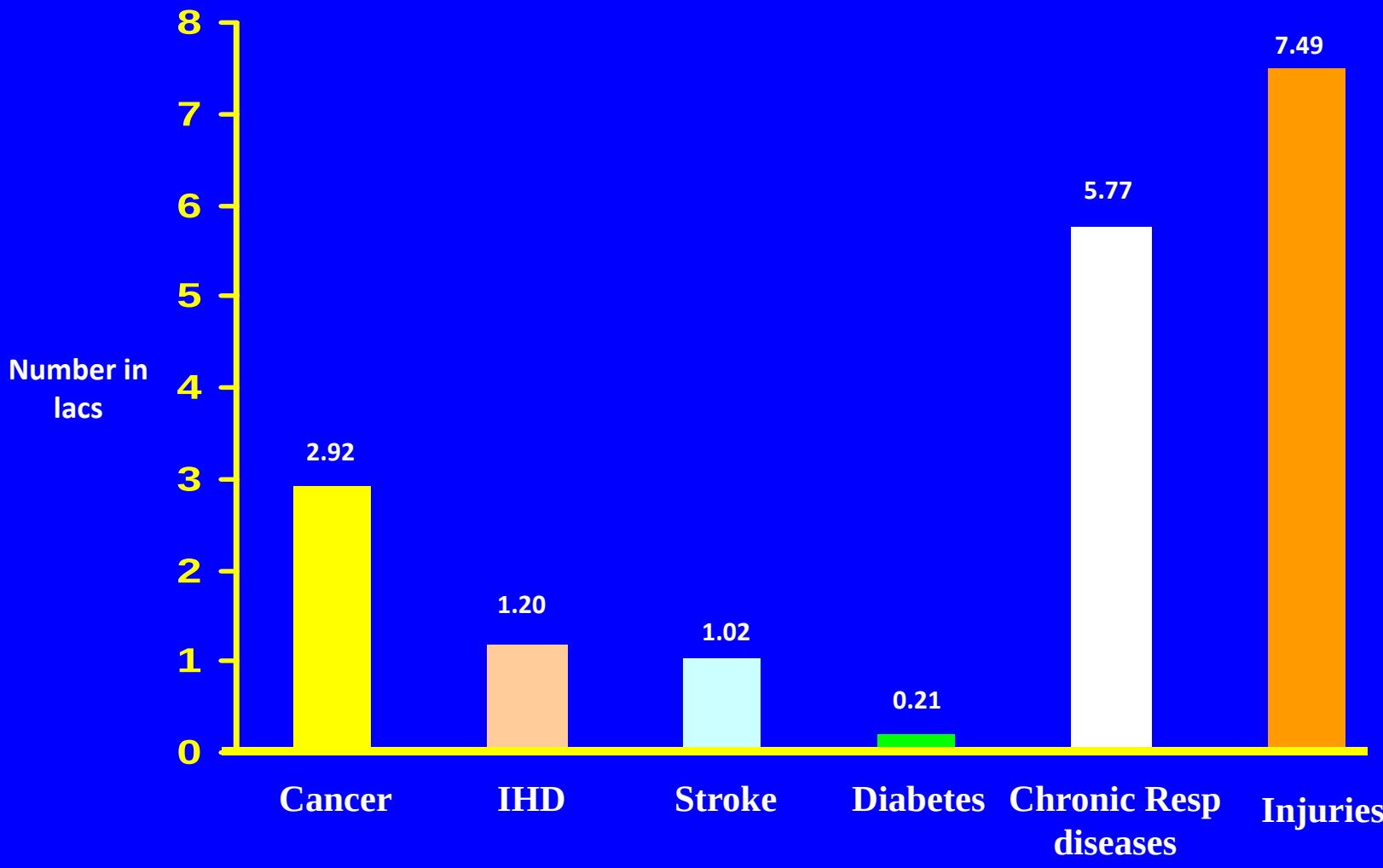
(Bryce M et al., Int Arch Alergy Immunol 2010; 151: 45-65)

ESTIMATED MORBIDITY FOR NON COMMUNICABLE DISEASES BURDEN IN INDIA



National Commission of Macroeconomics and Health GOI-2005

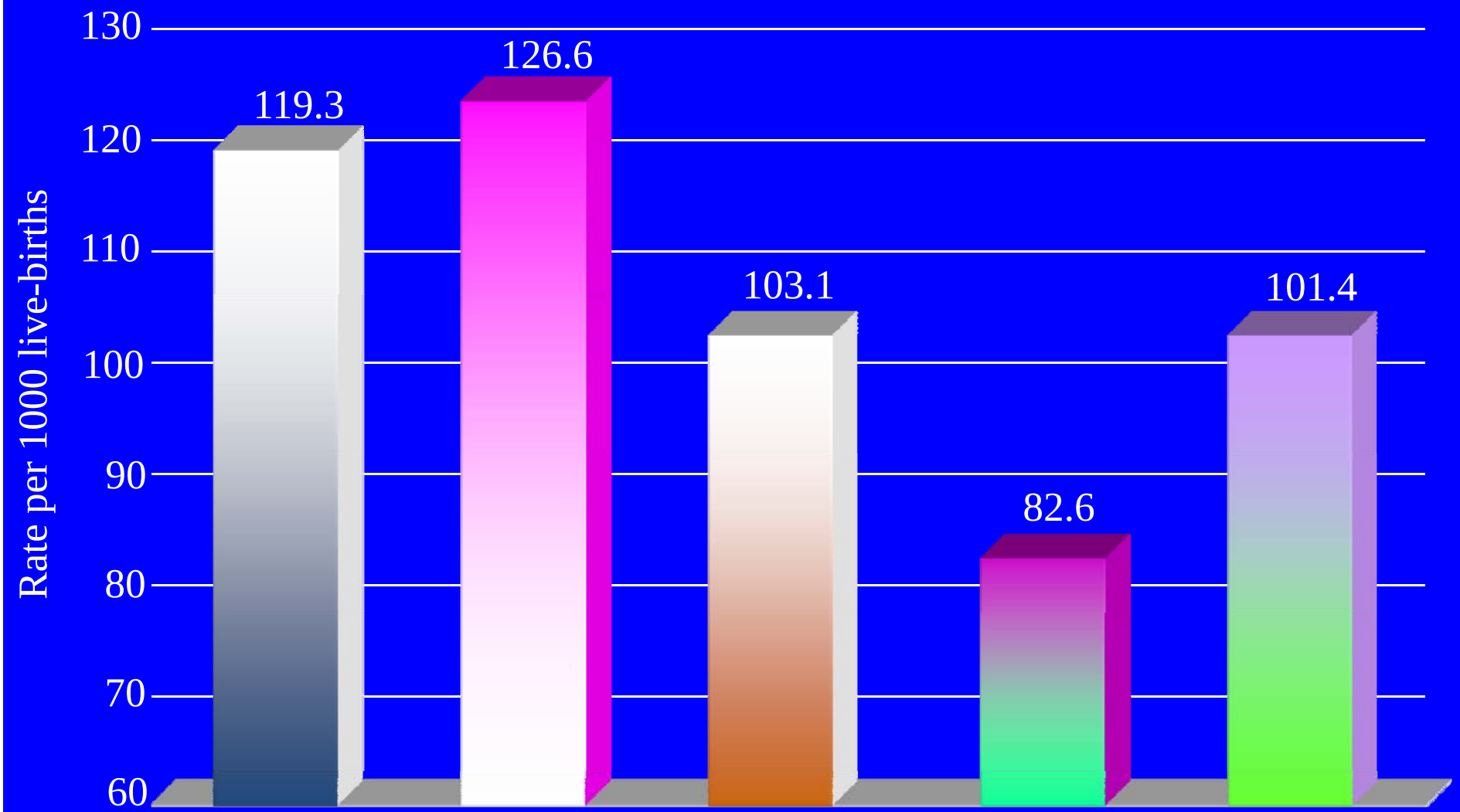
ESTIMATED MORTALITY FOR NON COMMUNICABLE DISEASES BURDEN IN INDIA



(Nongkynrih B et al, JAPI 2004 Feb; 52: 118-123) WHO, 2002 data

Under-five mortality by social groups in India

HP



NCMH 2005

Ultrastructural nasal pathology in children chronically and sequentially exposed to air pollutants

VERACRUZ CITY

MEXICO CITY

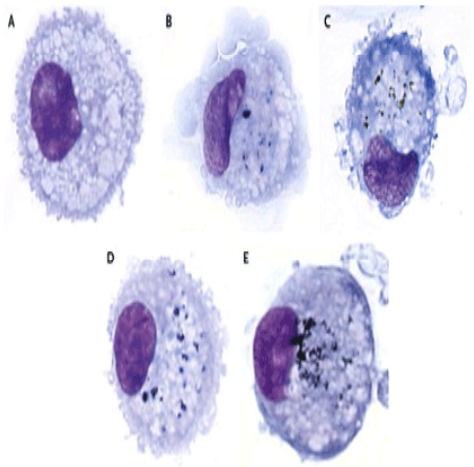
Electron microscopy of nasal mucosa

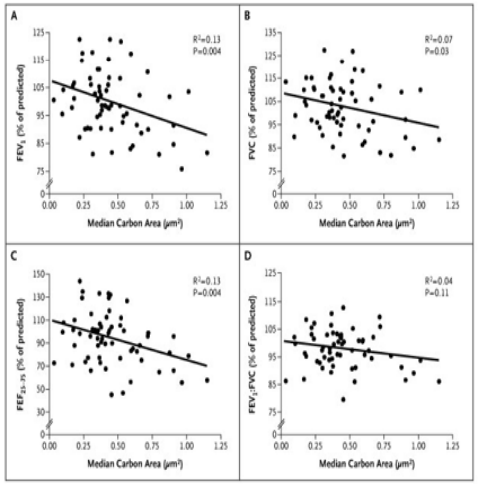
PARAMETERS	Veracruz (n = 11)	Mexico city (n = 15)
Epithelial shedding	0	14
Necrotic cells	0	12
Goblet hyperplasia	0	4
Patchy absent cilia	0	15
Squamous metaplasia	0	8
Intraepithelial PMN	2	15
Intraepithelial monocyte	0	3
Particulate matter in intercellular spaces	0	5

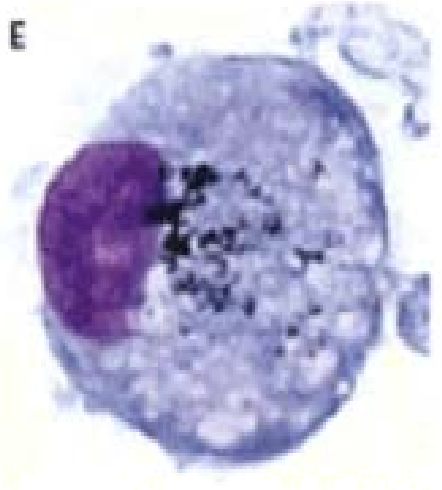
Calderon-Garciduenas L et al, AJRCMB 2001; 24: 132-138

IMPACT OF PARTICULATE MATTER POLLUTION ON LUNG FUNCTION IN CHILDREN

(64 children in Leicester city, UK)







8-15 yrs old
Excluded children with chronic respiratory infection

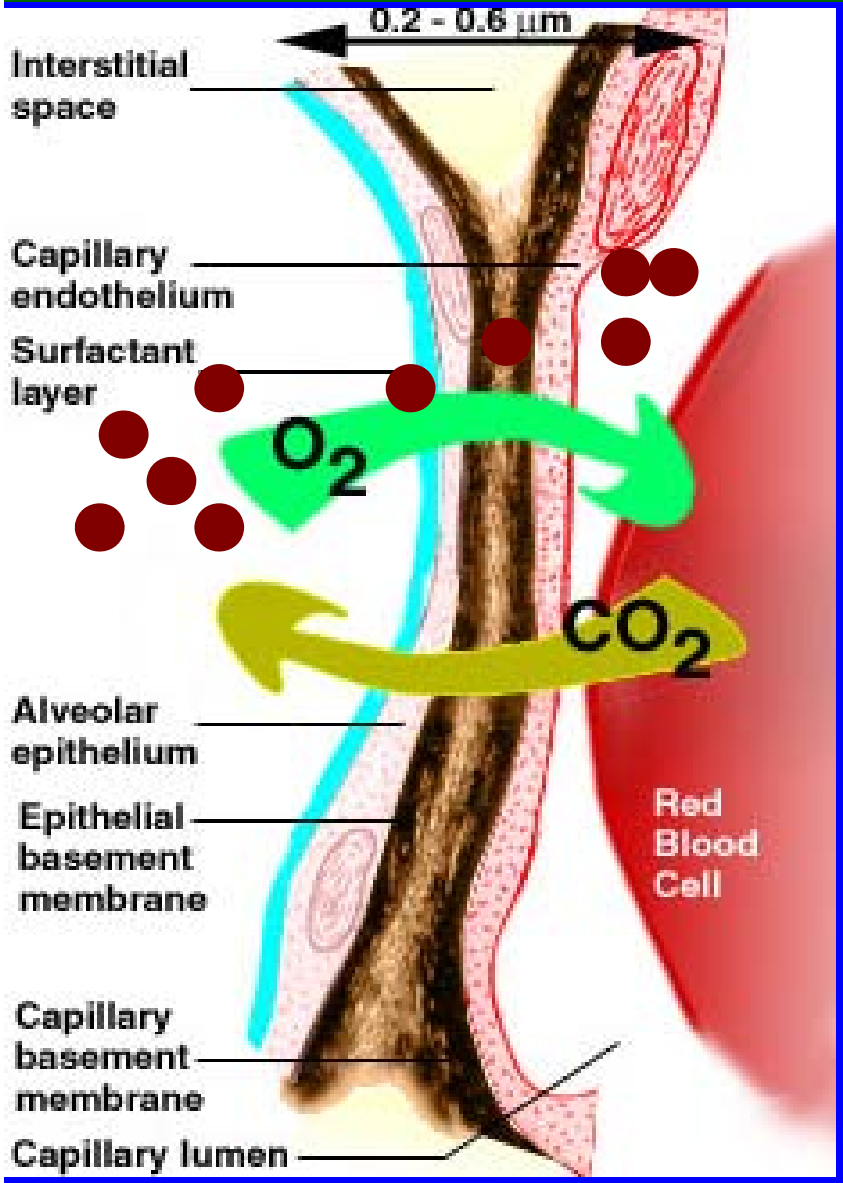
Sputum induction for alveolar macrophages

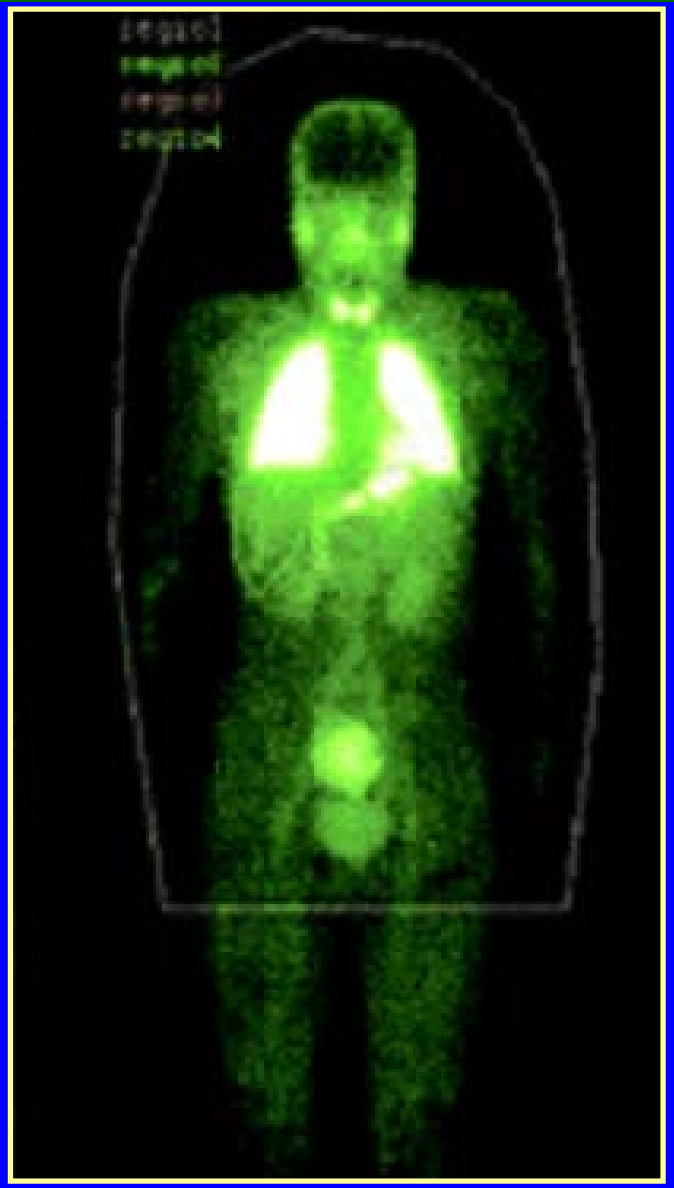
Alveolar macrophages showing different amounts of intracellular carbon particles

Each increase of 1μm2 in carbon content in the alveolar macrophage –
17% ↓ in FEV1
12.9% ↓ in FVC
34.7% ↓ in FEF25-75%

(Kulkarni N, New Engl J Med 2006; 355: 21-30)

Passage of Inhaled Particles into the Blood Circulation in Humans



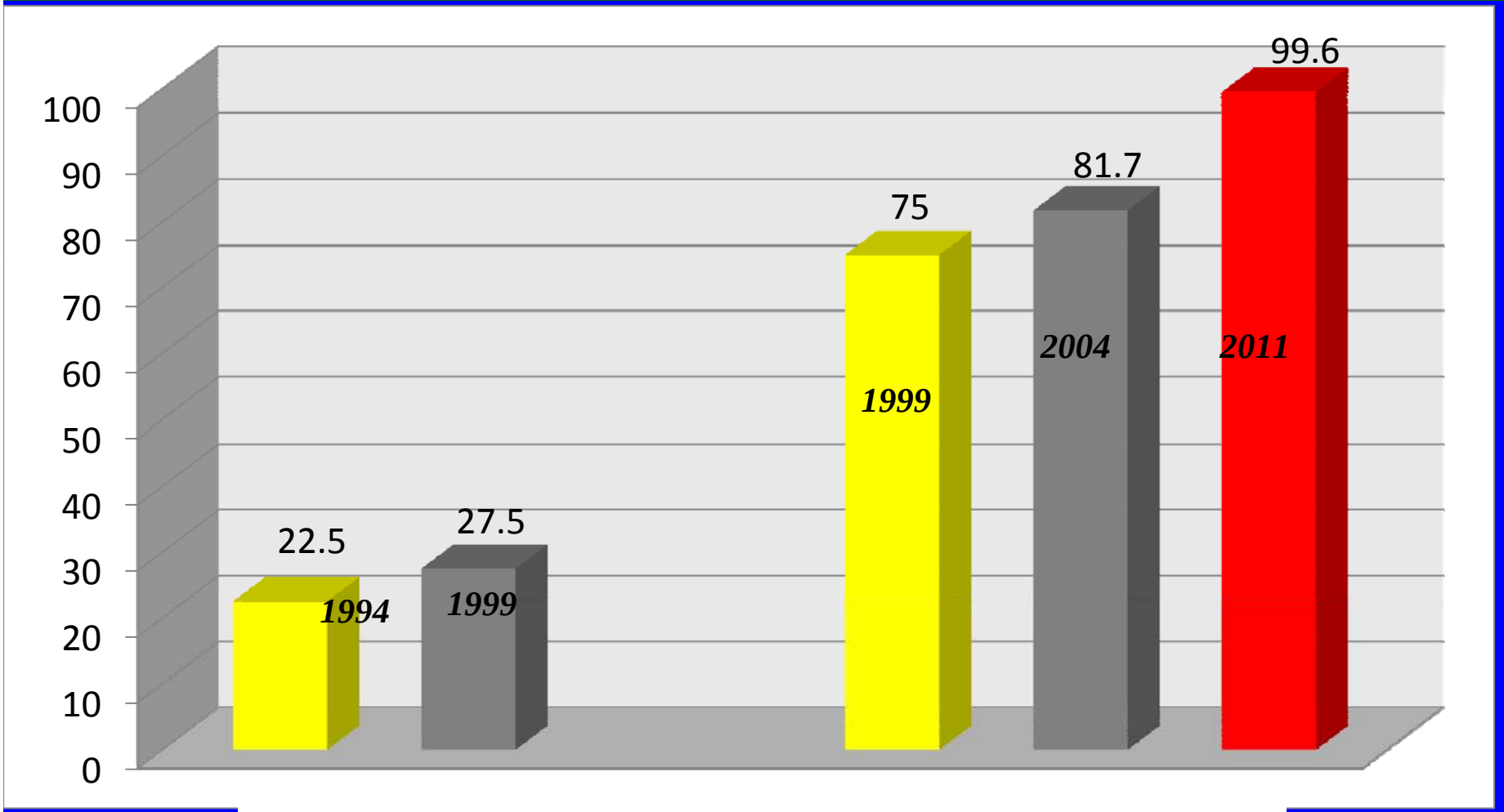


Radio-labeled Tc^{99} particles <100nm

Found in blood within 1 minute and peak after 10-20 mins

(Nemmar et al, Circulation 2002; 105: 411)

Allergic Rhinitis: Magnitude



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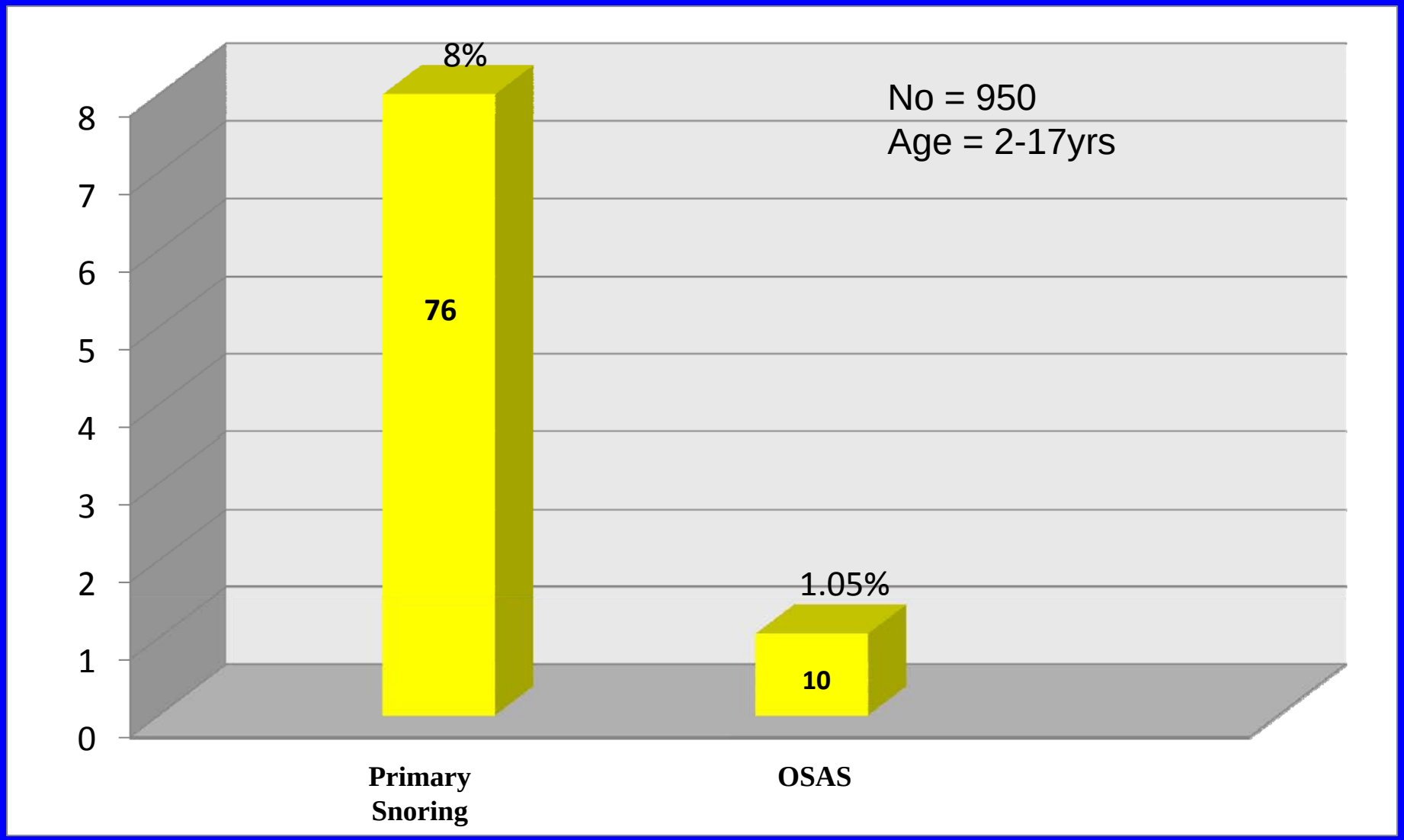
Prevelence of Snoring/OSAS



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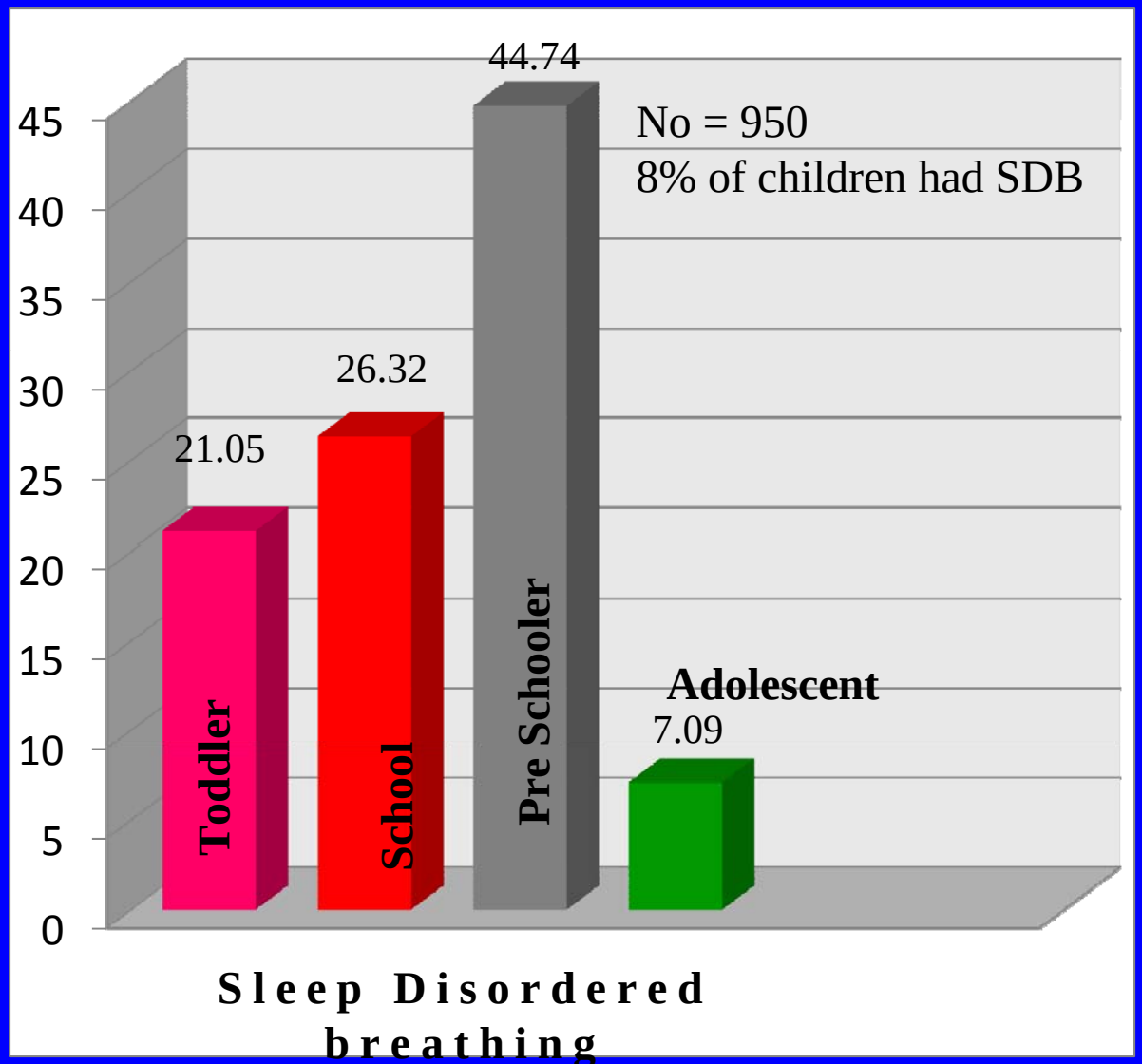
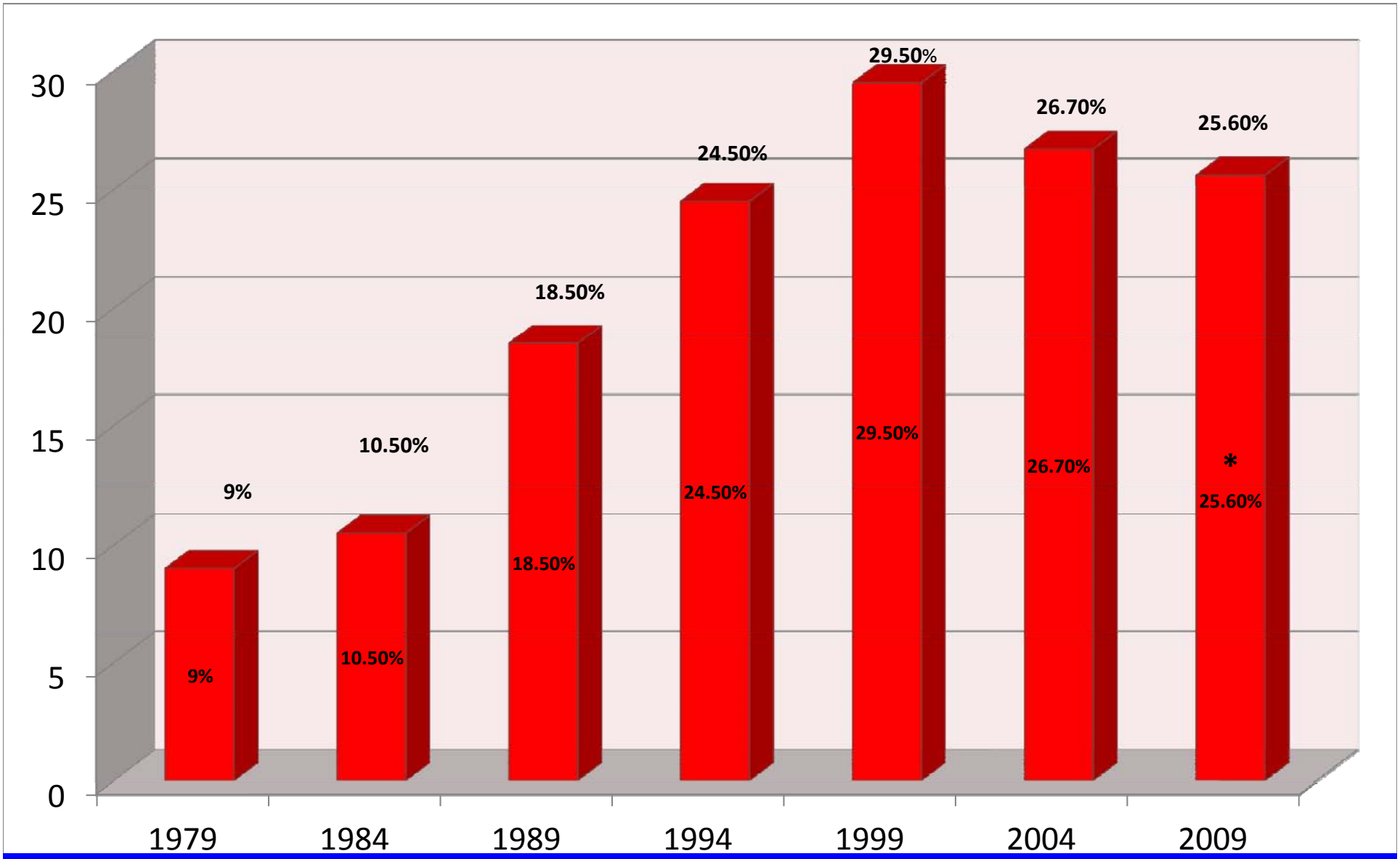
Sleep disorder breathing (SDB) & Causes



- Allergic Rhinitis = 58%
- Adenoid Hypertrophy = 50%
- Asthma = 35%
- Adenoid Hypertrophy = 7.9% &Asthma
- Adenoid Hypertrophy, = 5.2% AR & Asthma

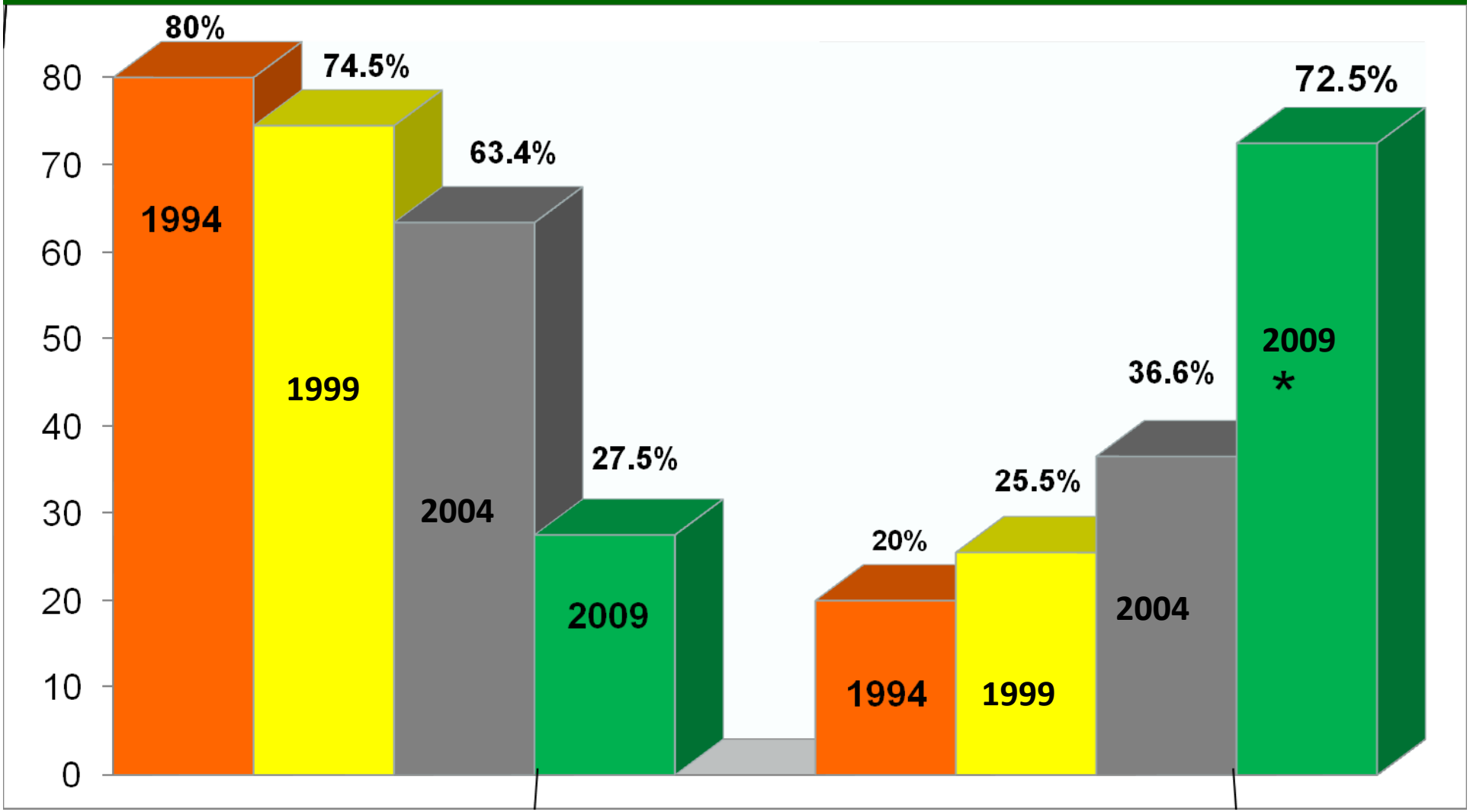
H Paramesh. Pankaj Sharma OSAS and DNB thesis Study 2010

Trends in Asthma Prevalence in Bangalore



H. Paramesh; Indian Journal of Pediatrics; Special Issue 2002, 2006
•H Paramesh International Conf on Environment and health 2010

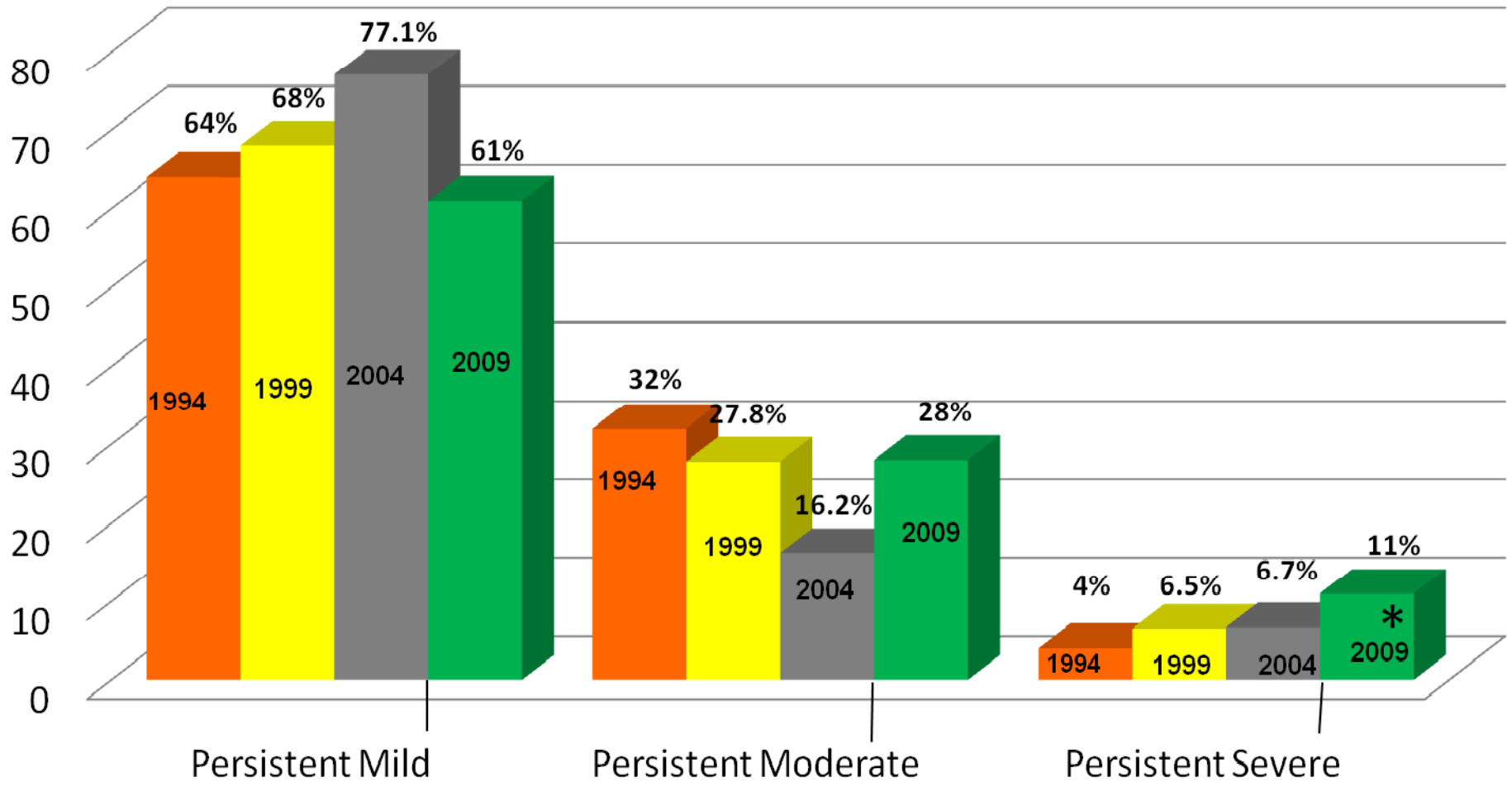
Prevalence of Persistent Asthma



Indian Journal of Paediatrics: Special Issue 2006

** H.Paramesh International Conf on Environment and health 2010*

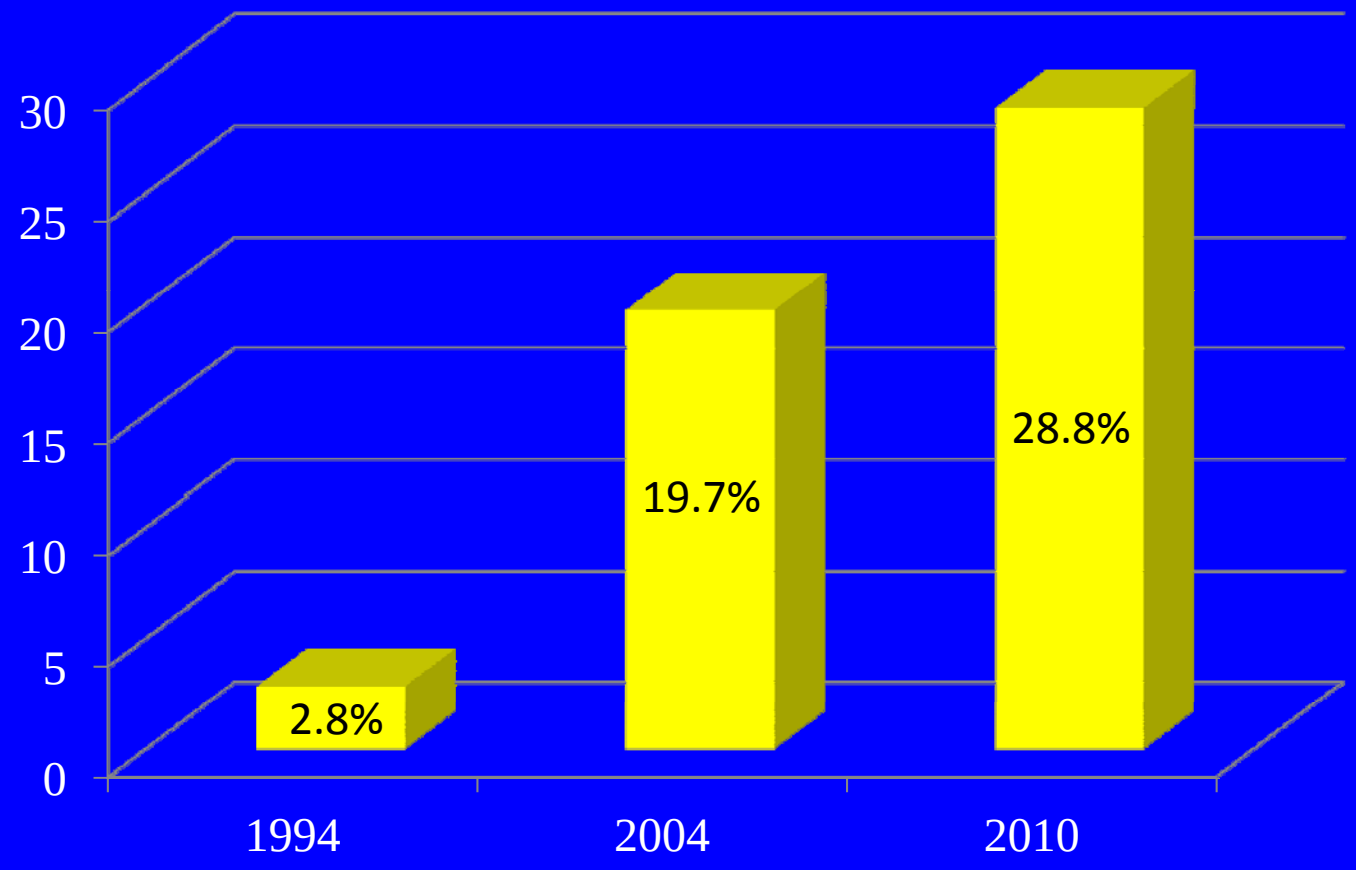
Persistent Asthma Grades and Prevalence



H.Paramesh . Ind . J. Ped 2006

** H.Paramesh International Conf on Environment and health 2010*

Changing Seasonal Pattern of Asthma Episodes

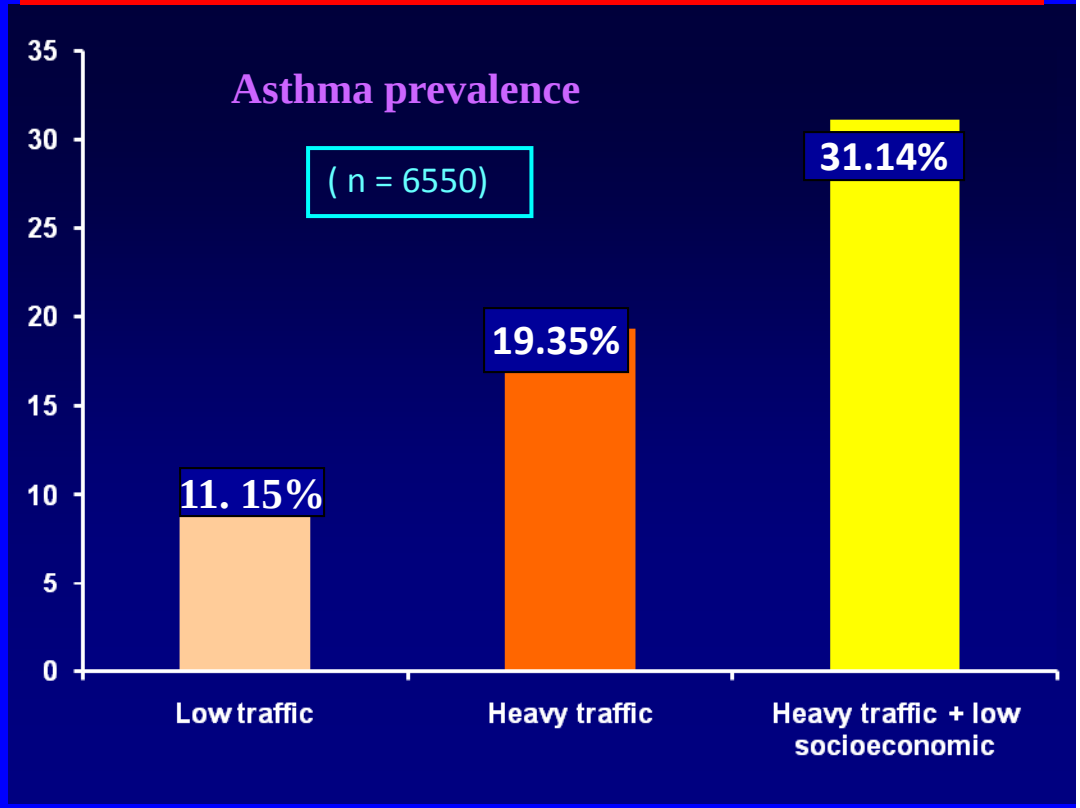


Dr. H. Paramesh: International Journal on Env Health 2008 Vol 12, nos ¾
H. Paramesh. I.A.P Text book of Ped - 2013

IMPACT OF AMBIENT AIR POLLUTION ON ALLERGIC DISEASES

- Worsening of pre-existing asthma
- Increased emergency room visits for asthma exacerbations
- Increased hospitalization for asthma
- Increased use of anti-asthma medication
- **Increased prevalence of Allergic Rhinitis, Otitis Media and Sinusitis.**

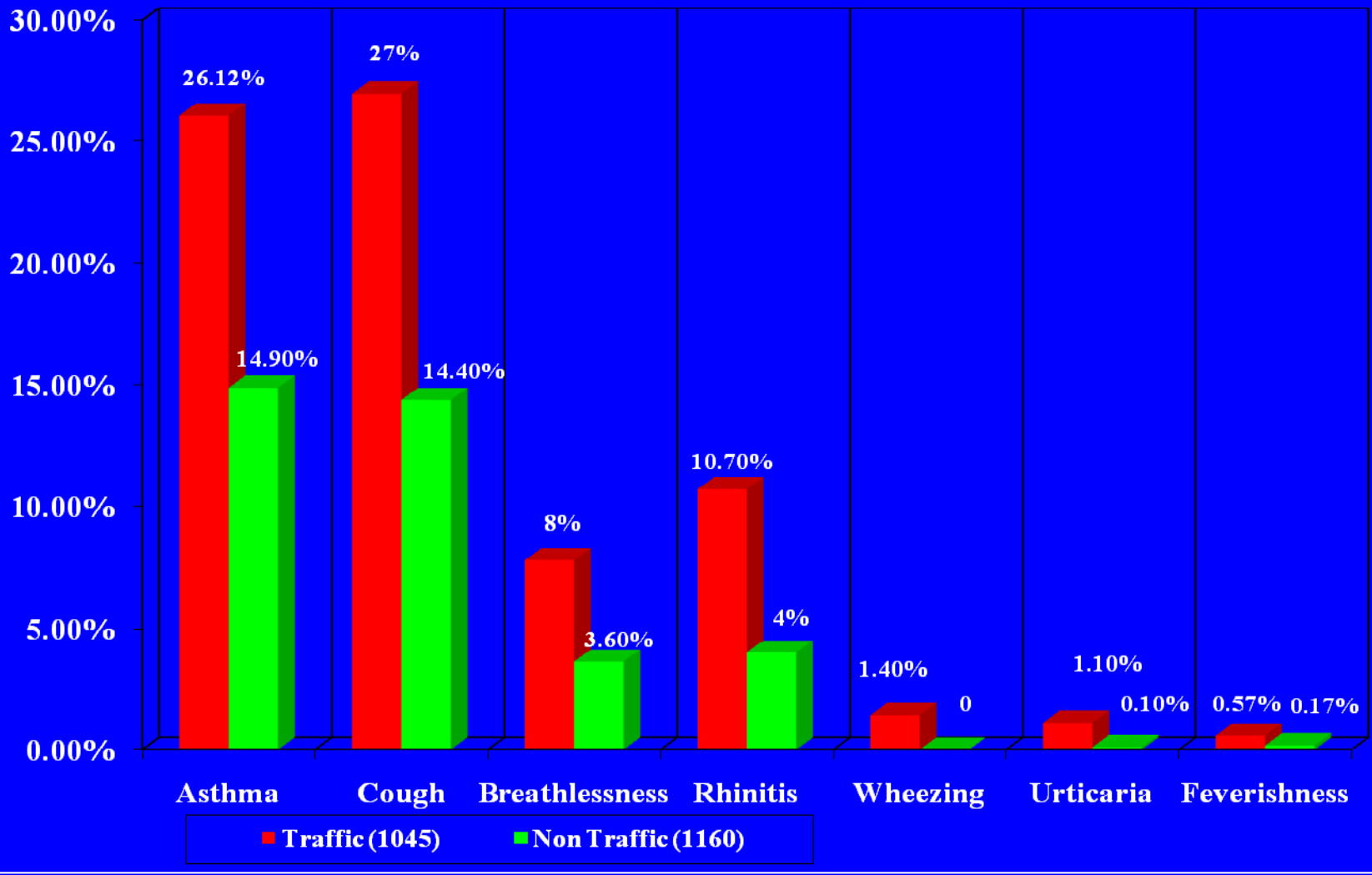
Children of heavy traffic school suffer more from asthma; it further increases in low socioeconomic children



Dr. H. Paramesh; Indian Journal of Paediatrics, 2002; 69(4): 309-312

H.Paramesh I.A.P Text book of Pediatrics -2013

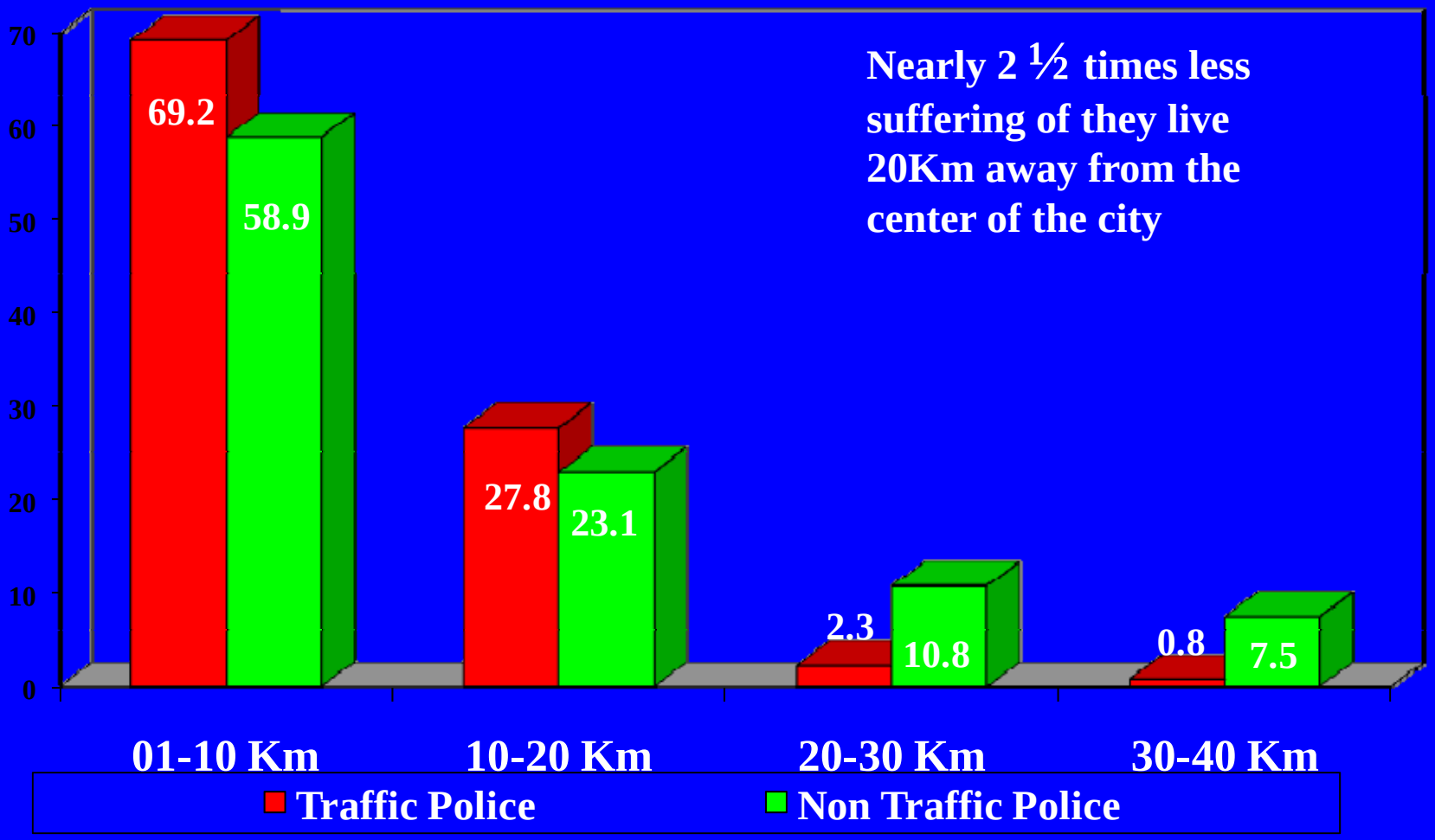
Traffic Police Suffer More from Air Pollution than Non-Traffic Police



H. Paramesh, XI National Symposium on Environment, BARC, 2002

H. Paramesh State of Env& action plan - 2005

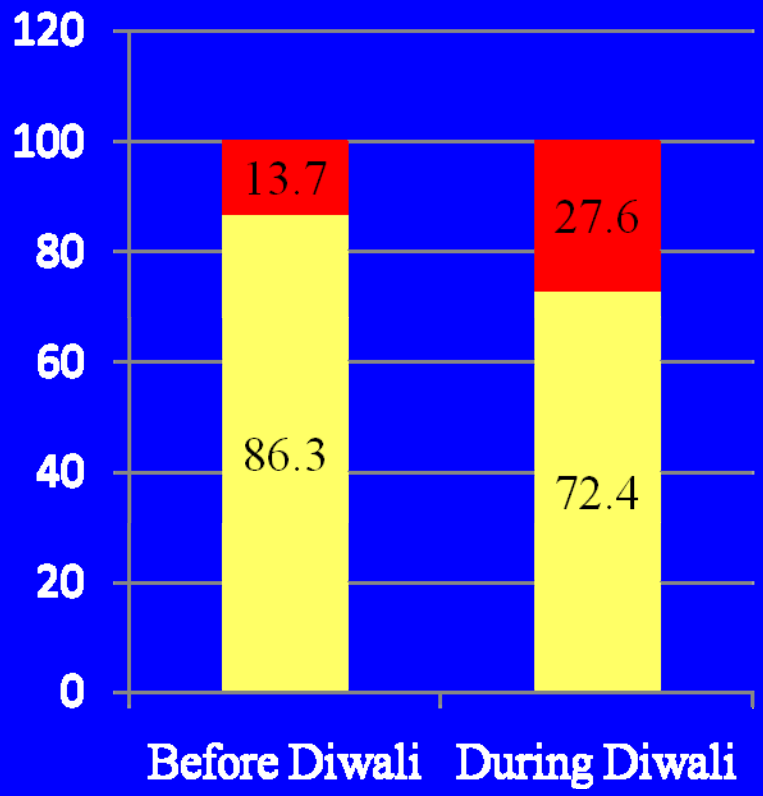
Distance of living away from the center of the city / asthma



Source - H. Paramesh, XI National Symposium on Environment 2002
H. Paramesh State of Environment & action plan - 2005

BARC

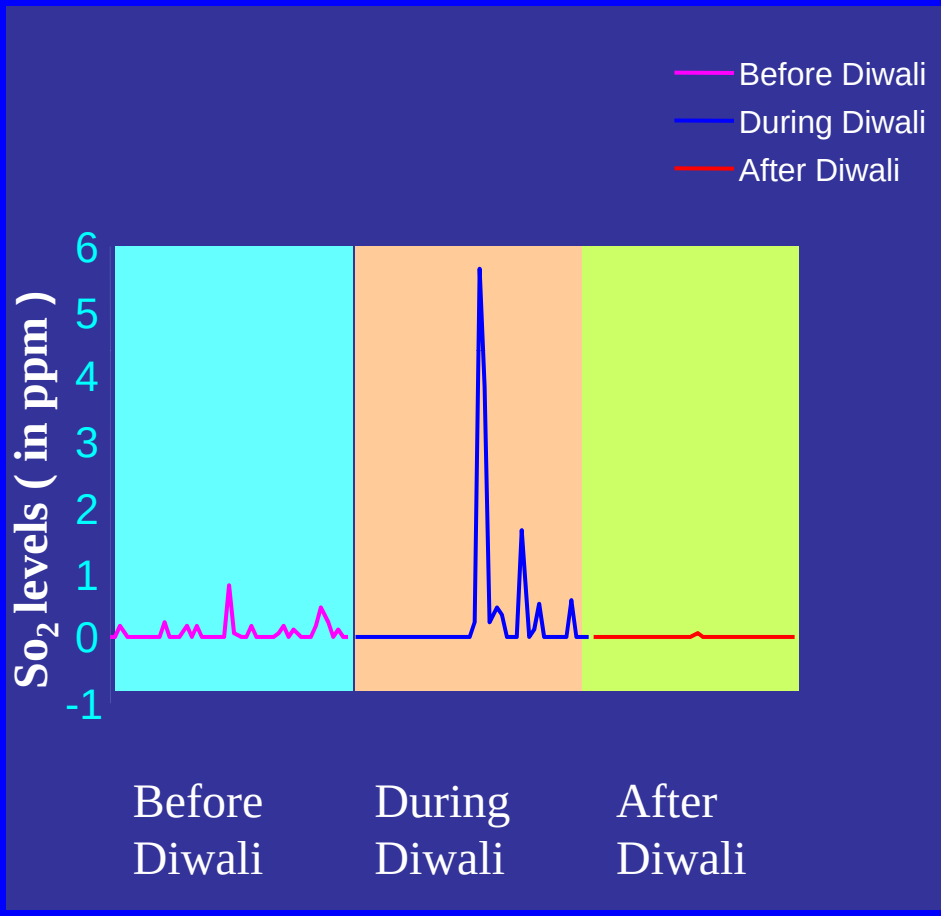
E.R visits for Wheezing During Diwali (Light) Festival increased by 100%



P Value : 0.064

H Paramesh 5th Intnl conft env & health - 2010
H Paramesh . I.A.P Text book of Pediatric - 2013

Mean Changes in So_2 Levels (ppm)



Ambient SO2 levels reached values **200 times** above the safety limits recommended by WHO

Lead Poisoning

- Ingested, inhaled or absorbed through skin
- Source:
  - 86% of atmospheric lead – auto exhaust, leaded petrol, water pipes, paint, battery storage, crystal glass, ceramic glaze, enamel jewelry, etc .
  - Lead concentration in dust is directly proportional to the volume of traffic
  - Children absorb 50% and adults 10-20% of ingested lead.
  - Lead in tissue, cord blood correlate with air levels.
  - Global burden 0.6% (WHO – 2010).
- Effect:
  - GIT, peripheral nerve, central nervous system, decreased IQ, convulsions, coma, death. 1microgrm / dl decreases I.Q by 0.25 points
  - Saudi Arabia study – 5000 children – 1989 – using 0.8 G/L of lead in petrol showed no alarming lead poisoning.
  - Bangalore study – 863 children – using 0.59 G/L of lead in petrol showed – 4.6% of increased lead level over 10µg/dl*.
- Trend:
  - Use of unleaded petrol will reduce lead pollution. No cause for fear psychosis, however there should not be any complacence in preventive measures.

AVOID MEDIAGENIC DISEASE

H. Paramesh, Report on State of Environment Action Plan, Karnataka, World Bank Project, 2003

Indoor Air Pollution

Aero-biologicals

- **Dust mite** - 50%
  5000/g
- **Cockroach** - 25.00%
- **Fungi Pollens** - 07.50%
- **Pets** - 05.00% (2002)
  05.7% (2010)
- **Viruses** - 40.00%
  - RSV
  - Para influenza
  - Corono
  - Adeno
  - *Rhino*
- **Food** - 19.90%

Irritants

- **Cigarette smoke**
  - 1994 - 6.0%
  - 1999 - 7.5%
  - 2004 - 7.9%
- **Mosquito Coil** - 5.0%
  - 2002 - 5.0%
  - 2010 - 7.9%
- **Other smokes**
- **Formaldehyde**
- **Volatile organic compounds**

H. Paramesh Indian Journal of Pediatrics – 2002 ,2006

Childhood Pets Linked to Lower Allergy Risk

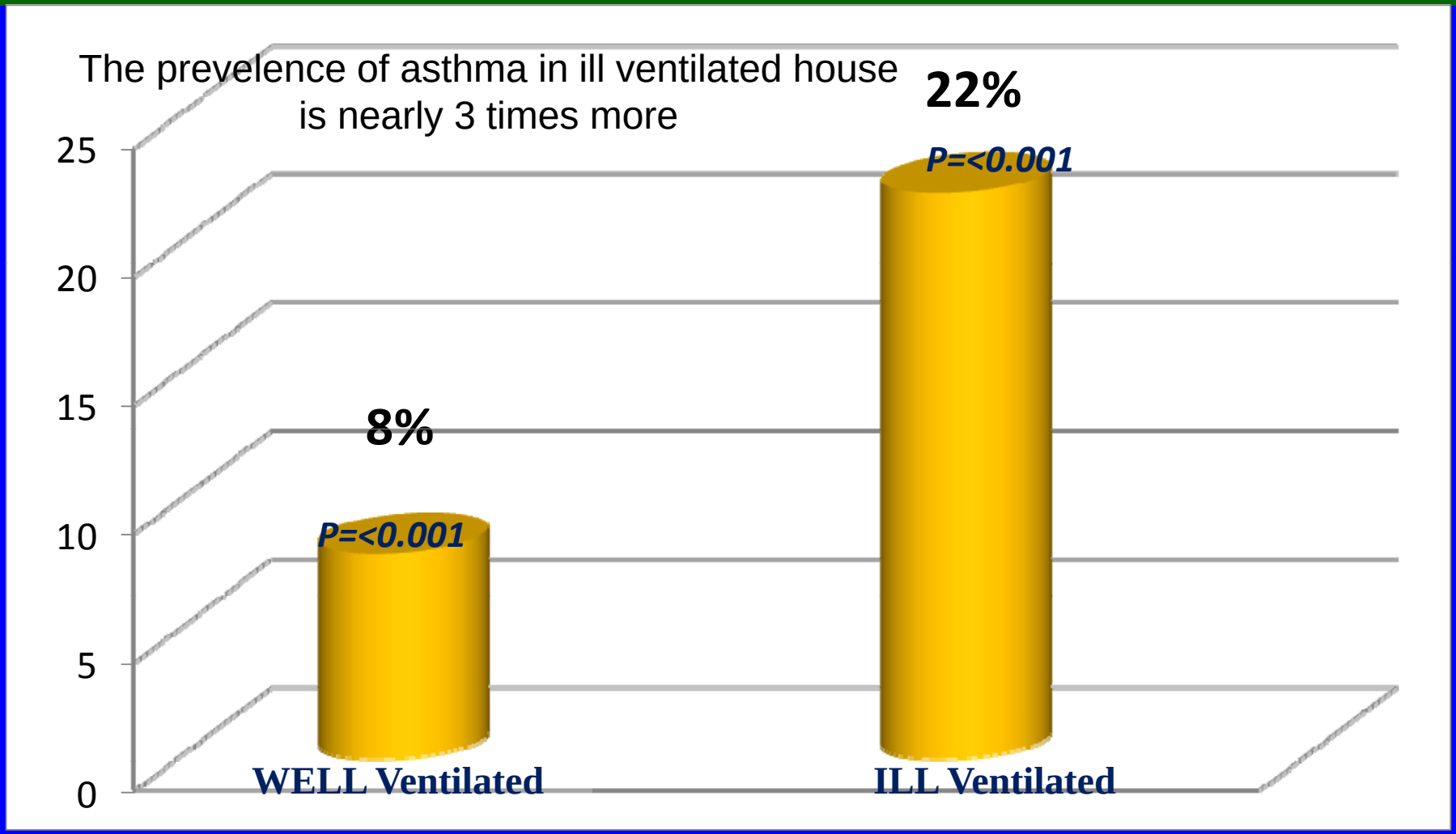
Family pets, in particular dogs, need not be removed to prevent allergies and in fact may protect against allergies.

Mclance Matheson etal Journal of Allergy and clinical immunology online July 13,2011

Pets are not the cause for increased prevalence of asthma. They are stress busters

H. Paramesh Indian Jourl of Ped - 2002

Ventilation & Asthma. no - 418



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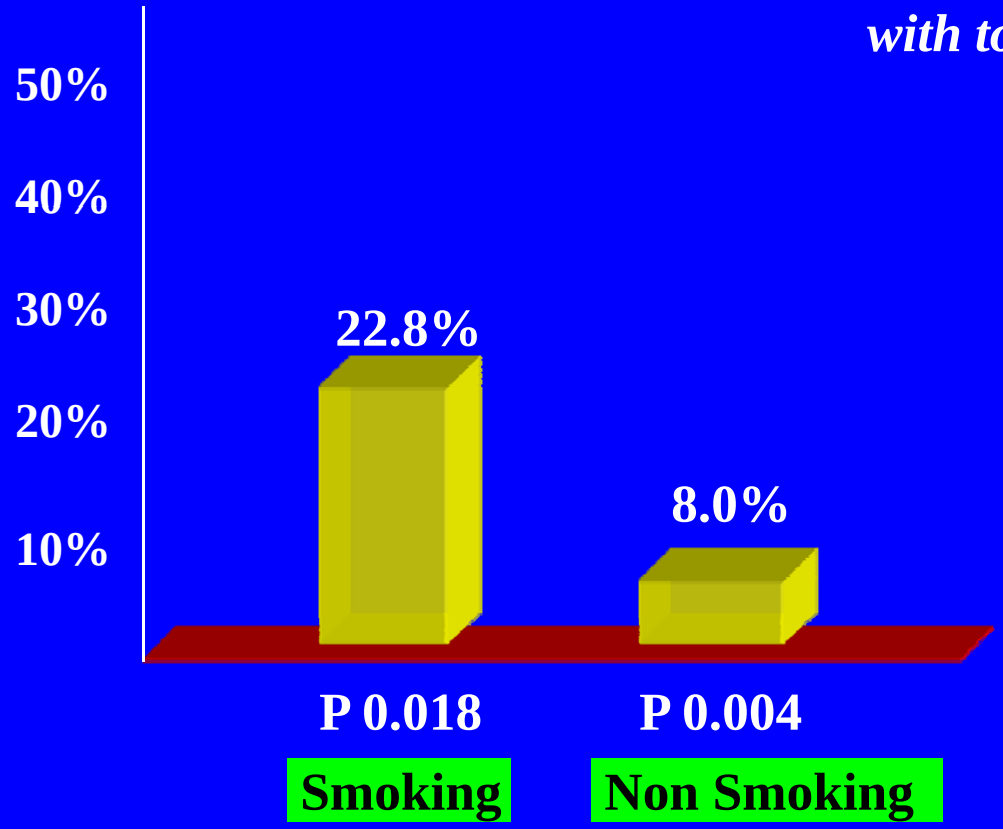
Cigarette Smoking Parents V/s Asthma Prevelence in Children no - 418

Nearly 3 fold increase in asthma in a home with tobacco smoking parent



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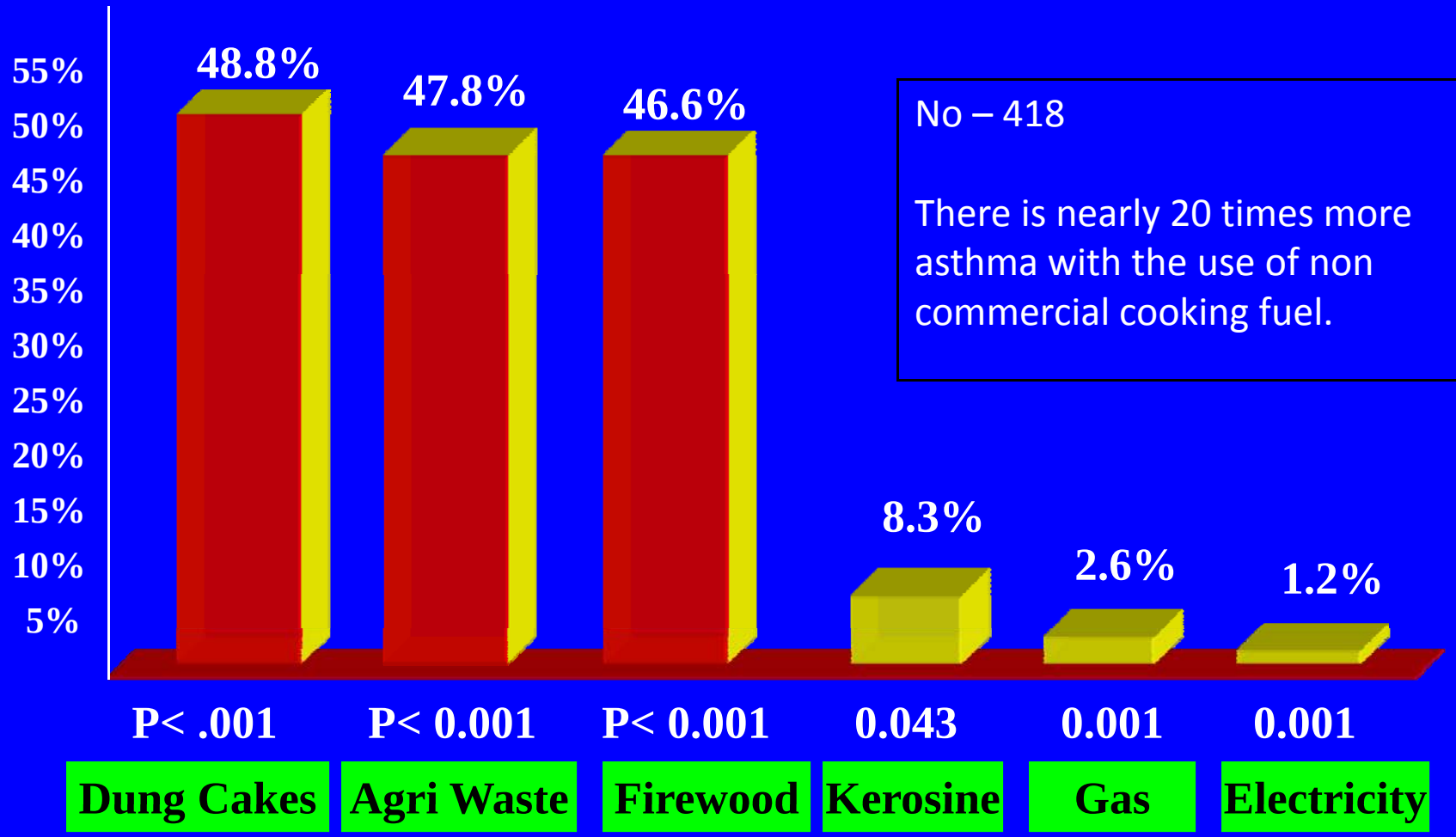
Cooking Fuel V/s Prevelence of Asthma in Children



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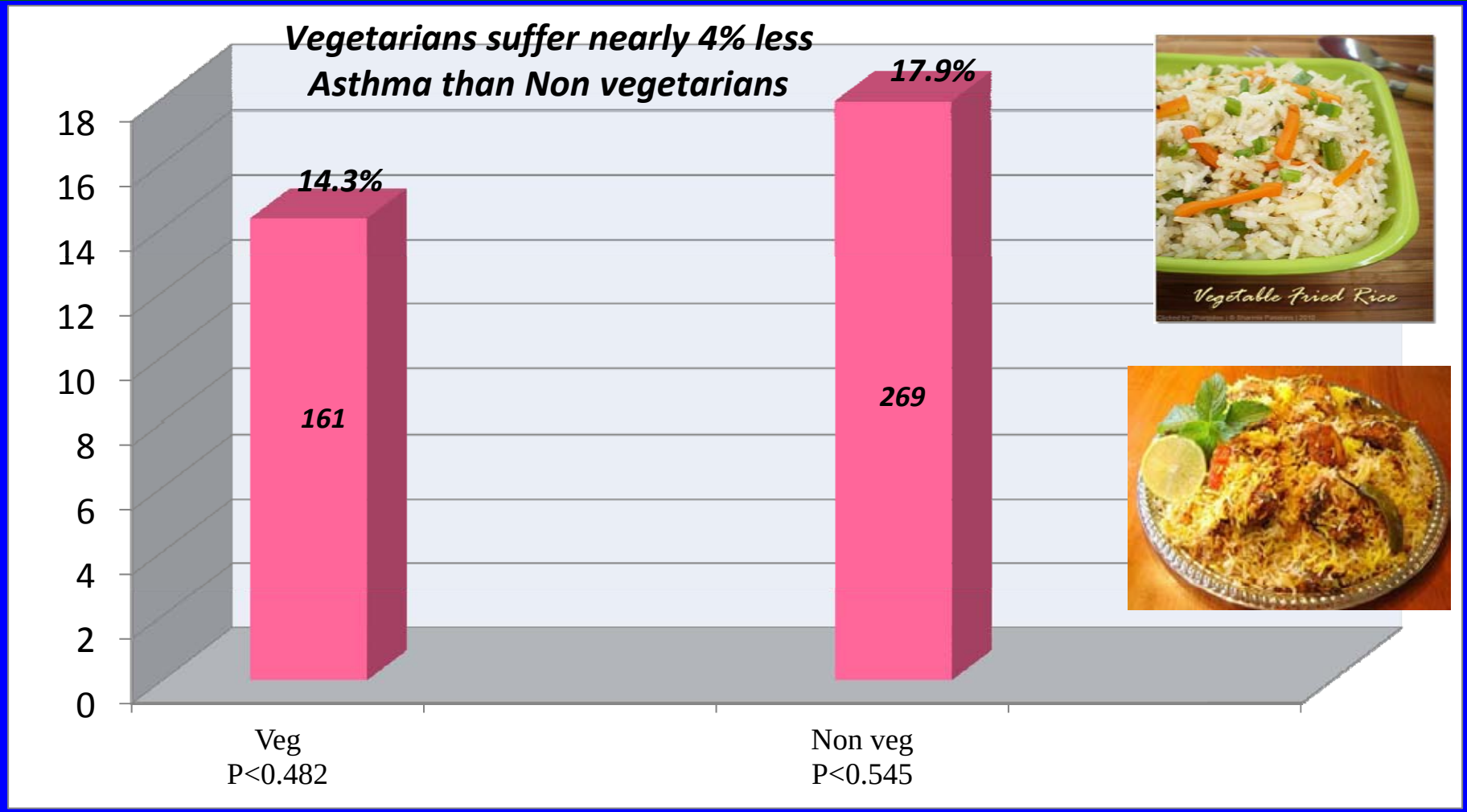
Asthma v/s Dietary Habits

No 418



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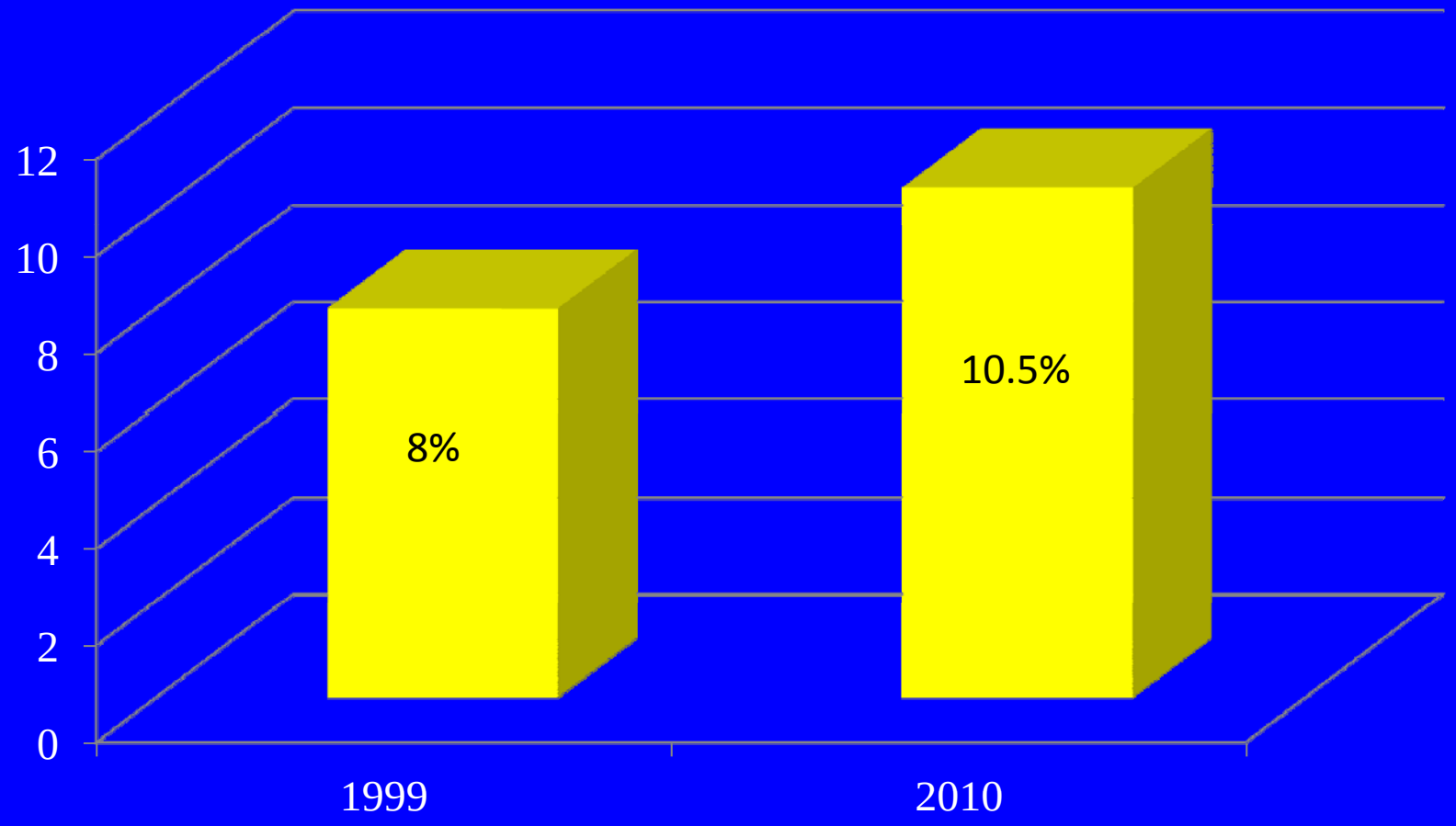
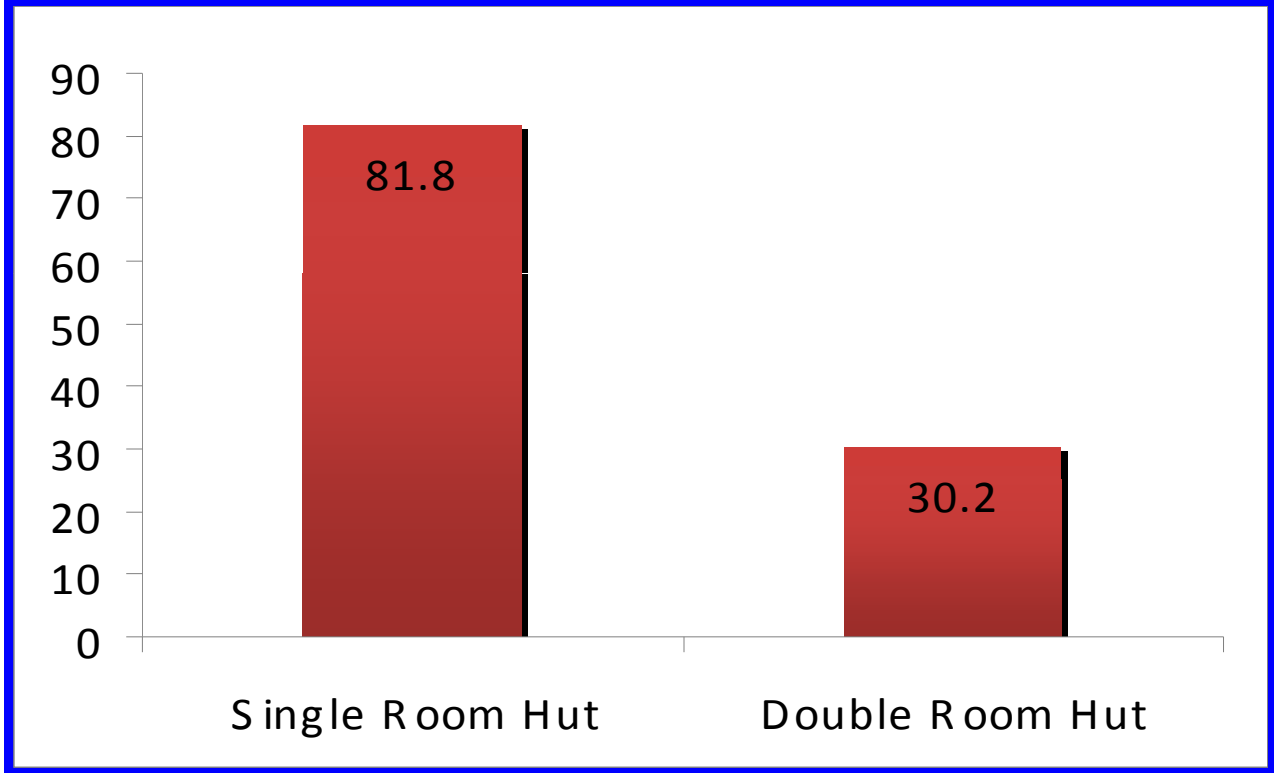
Incidence of Chronic Cough



Paramesh H Ped today 1999
Paramesh H Cherian E 5th Intnl Conf Env child health 2010

Point Prevalence of respiratory infection/indoor pollution A Rural Study

No. of houses 612, children <5 years 301



Children living in single room are 10.5 times more likely to develop respiratory infection when compared to children living in double rooms. P<0.001**

Dr. H. Paramesh, Elizabeth Cherian; International Conference on Environment and Child Health, Vienna, Austria 2007.

Take home message

- Air Pollution increases the non communicable respiratory diseases significantly.
- The economic and social burden is horrendous
- The environmental degradation is unimaginable
- We all have to pay thru our nose, lungs and heart
- It is time that the preventive measures are taken at the earliest, while we are moving forward with less air pollution which can be sustained.

The Impact of Our Research Work

- Utilized by **Supreme Court of India**
  - -In appointing Bhurelal Committee to **clean up the cities in a time-bound fashion**
  - - Instructions to builders to follow strict **guidelines at school environment**
- Police personnel study **discussed in the Parliament** for remedial measures of the air pollution
- Brining **legislation to ban tobacco smoke in public places in Karnataka**
- Our work been citied various peer reviewed journals and text books
- Instituted **lung functions, pulse oximetry and audiometry** to all the employees and public who have been affected by all industries in Karnataka
- Instituted measurement of **ozone, ultra-fine-particles(2.5micorons) and sulphate** particles by Bangalore Metro Rail system

What Comes out:

Clean up the mess.

We hold our future in our hands and it is our children

Poster Contest by HRIDAY with support from WHO SEARO

I end with this beautiful reminder to us from a child in India. We must recognize the **environmental risks** to our **Politically powerless** children and assume our responsibilities for preventing them, because we hold our future in our hands — and it is our children.


“ A Healthy Breath will always bring Healthy life”
“Each one Teach one and plant one tree”
Thank You!
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