

LPG and Health in India: The Ujjwala-Mamta Proposal

Kirk R. Smith, MPH, PhD

Professor of Global Environmental Health
University of California, Berkeley

WLPGA 2017 Asia LPG Summit

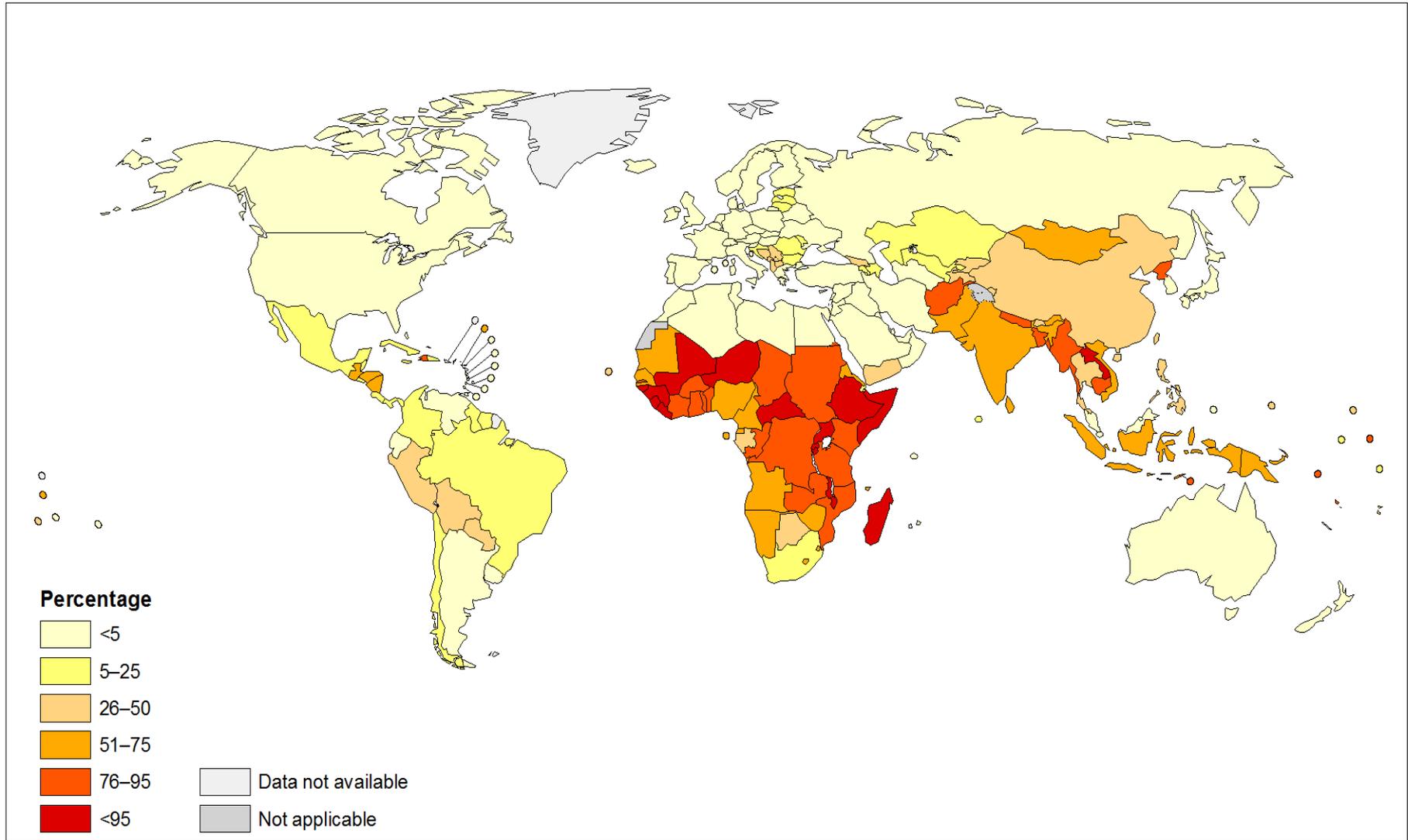
New Delhi, India

February 7, 2017

The three major solid fuels



Population Cooking with Solid Fuels in 2010 (%)



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Public Health Information
and Geographic Information Systems (GIS)
World Health Organization



© WHO 2012. All rights reserved.

Toxic Pollutants in Wood Smoke from Simple (poor) Combustion

- Small particles, CO, NO₂
- Hydrocarbons

Typical biomass cookstove
releases

400 cigarettes per hour
worth of smoke

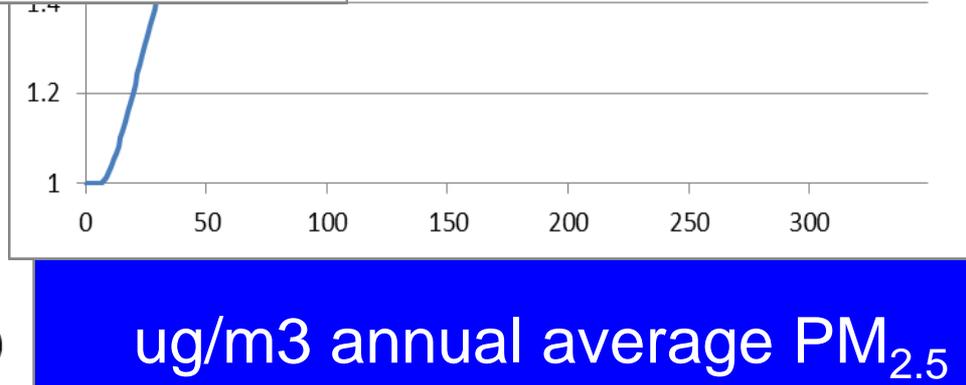
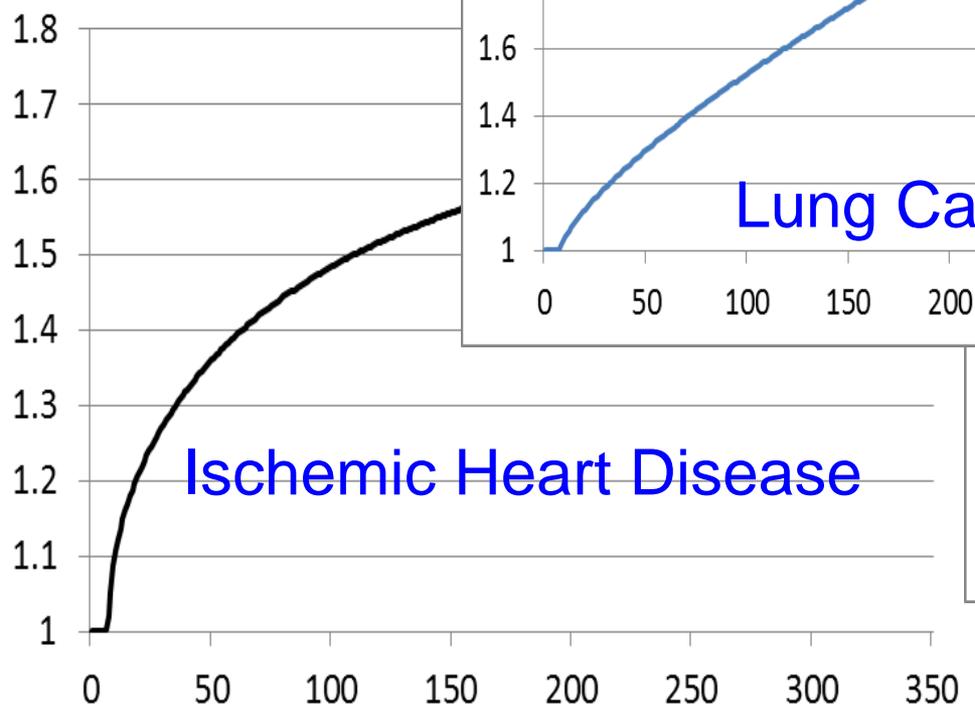
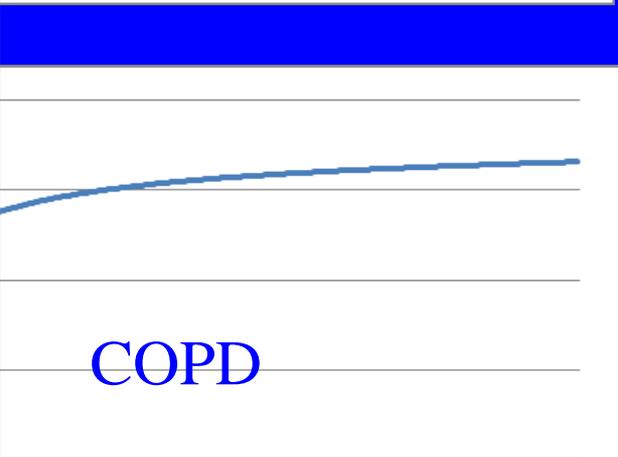
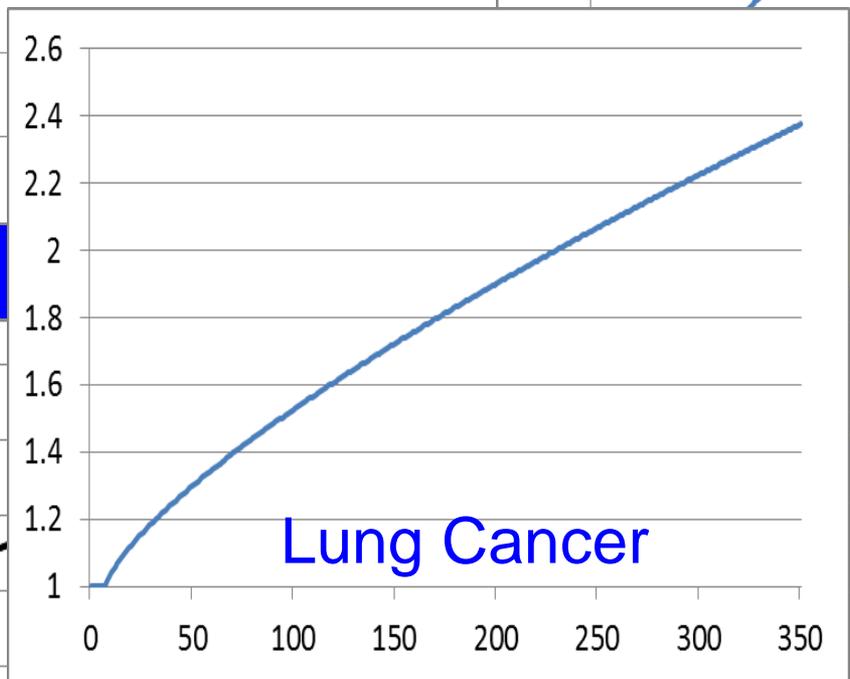
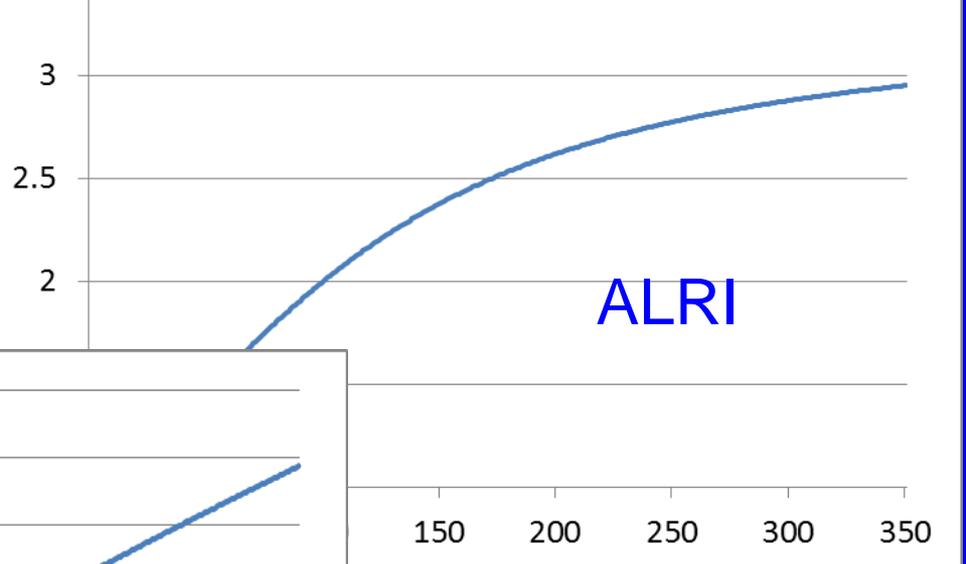
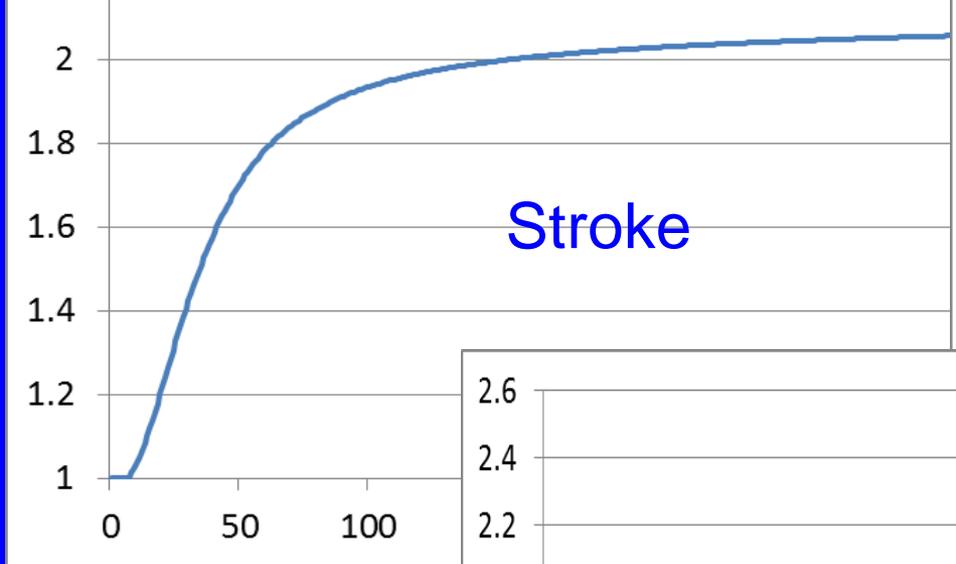
- 25+ alcohols and acids such as *methanol*
 - 33+ phenols such as *catechol* & *cresol*
 - Many quinones such as *hydroquinone*
 - Semi-quinone-type and other radicals
- Chlorinated organics such as *methylene chloride* and *dioxin*

Source: Naeher et al,
J Inhal Tox, 2007

First person in human history to
have her exposure measured
doing the oldest task in human history

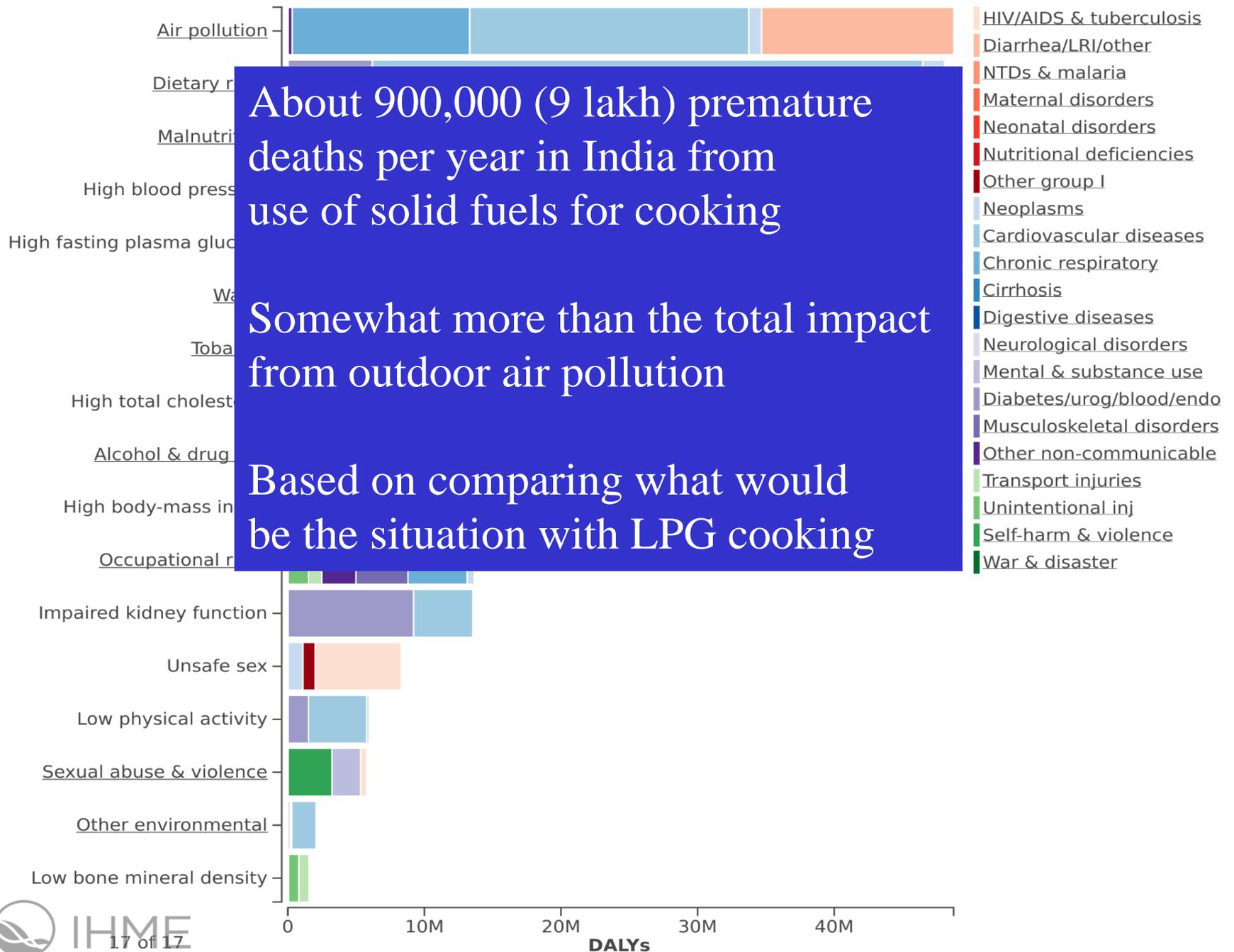


Kheda District
Gujarat, 1981



ug/m3 annual average PM_{2.5}

India, Both sexes, All ages, 2015



Wait for development to work?

- Percent using solid fuel slowly declines with development alone (no special policies)
- But in India, the number of people exposed has never declined

700 million
people in the
Chulha Trap

1990:
85%: 700
million people
using solid fuels

2010:
60%: 700
million people

~1980
700 million
people
in entire country

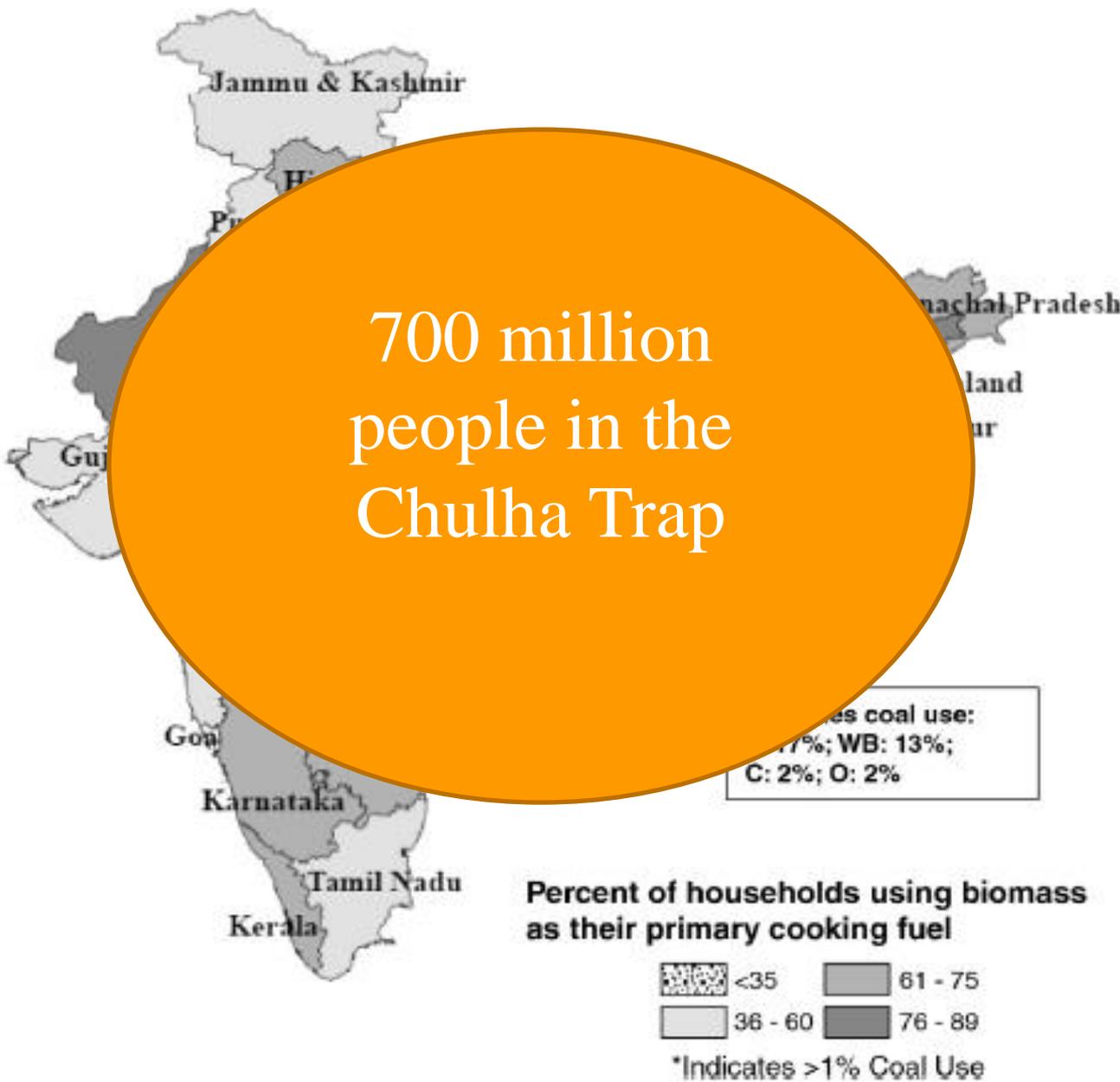


Fig. 1. Distribution by state of households using biomass or coal as their main cooking fuel in 2005. From (IIPS, 2007).

India
Household air pollution from solid fuels
Both sexes, All ages



In India, no progress over
25 years in number of deaths
due to household biomass fuels

LPG growth has just kept up
with population growth

Making the clean
available

India's Pioneering LPG Programs

- Direct bank transfer of subsidies – big cut in leakage and illegal connections
- Middle class gives up their LPG subsidies – >12 million households respond
- Income limit to receive fuel subsidies
- Ujjwala program for enhancing women's status – connection costs covered
- Target of 50 million poor households over normal in 3 years – double growth rate
- Apparently above trend to do so.



Feel the Joy of Giving

: Initiated by



Ministry of Petroleum & Natural Gas
Government of India

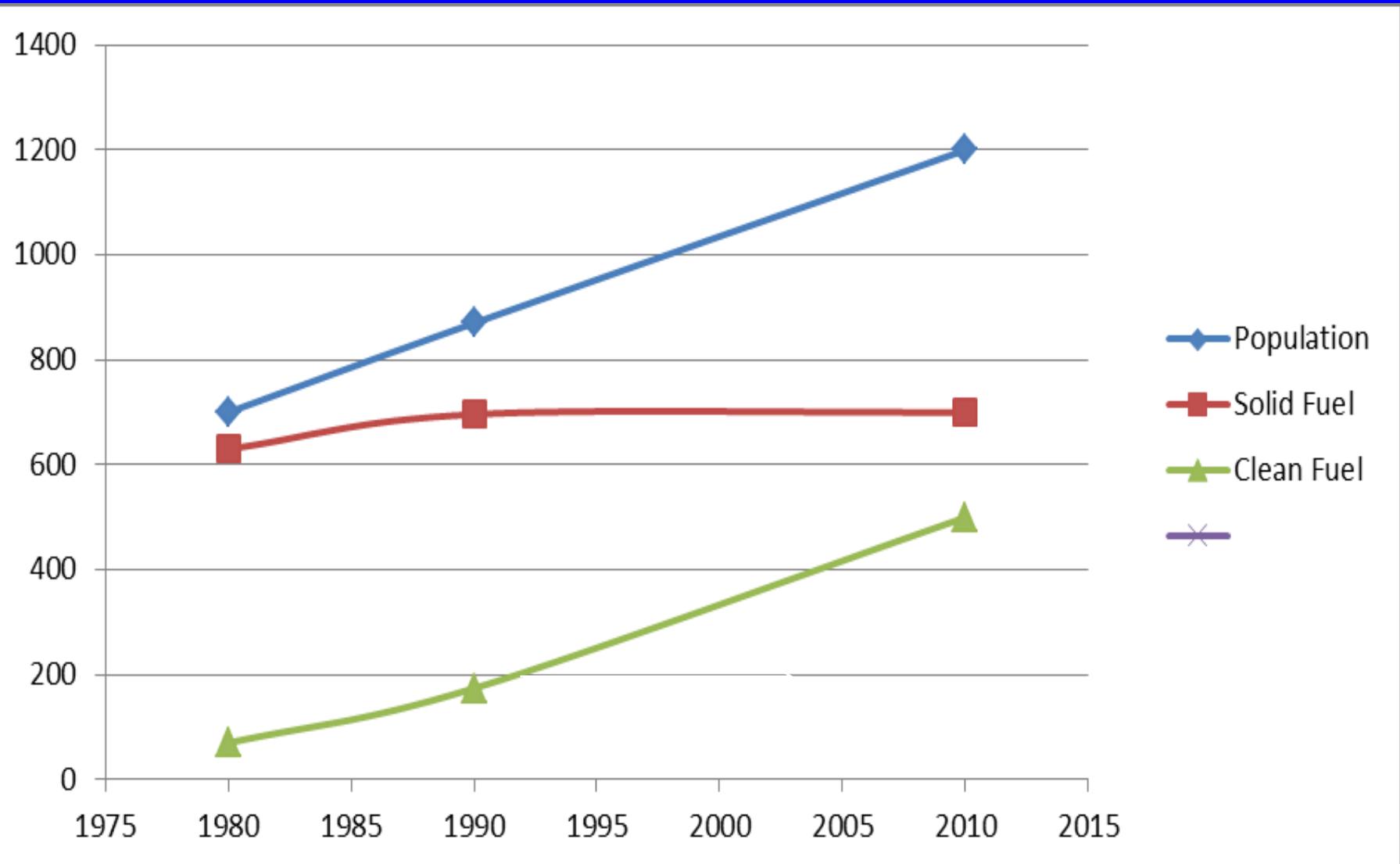


Household biomass fuel
causes much of India's outdoor
air pollution

Estimates range from 25-40%

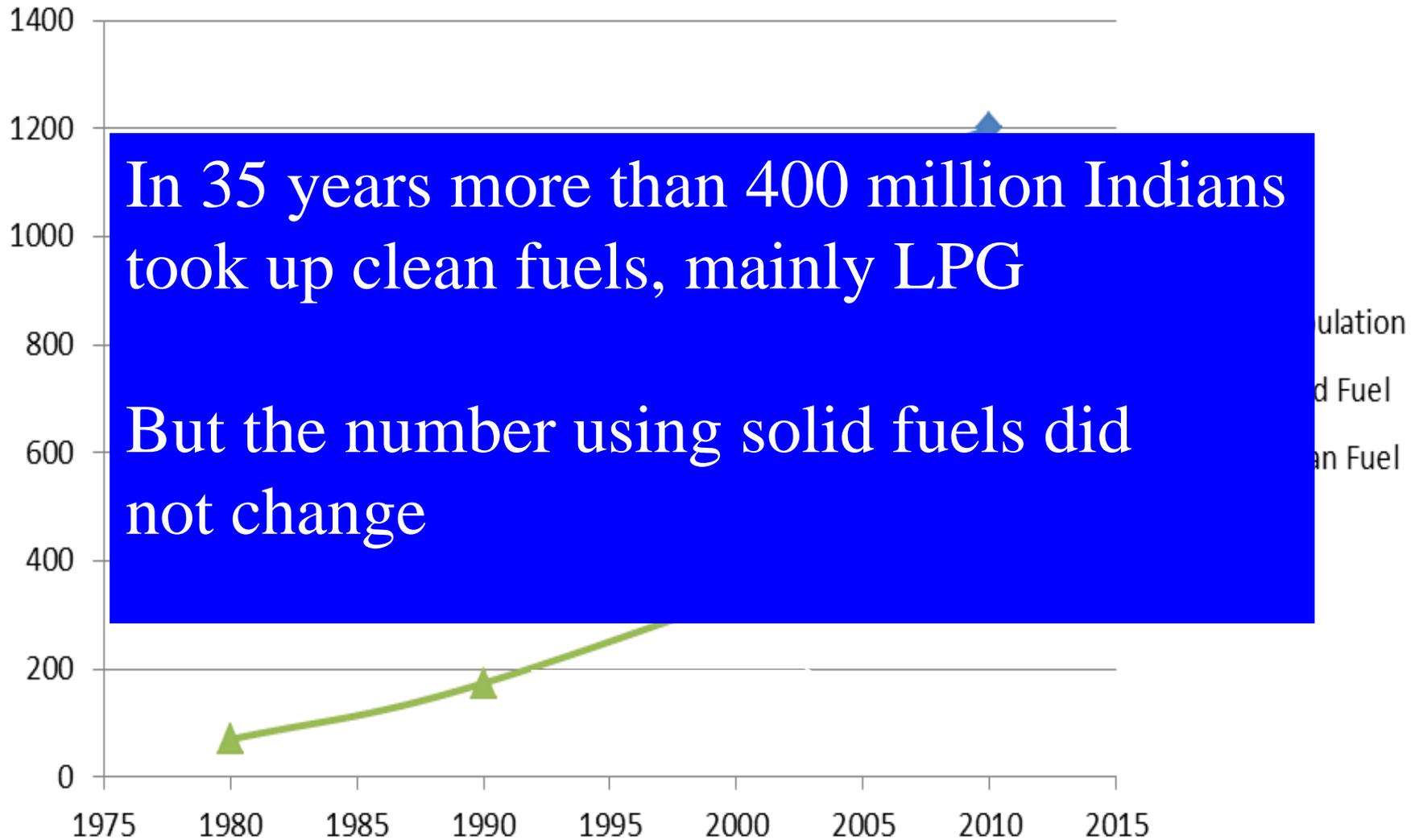
India: What happened?

Millions



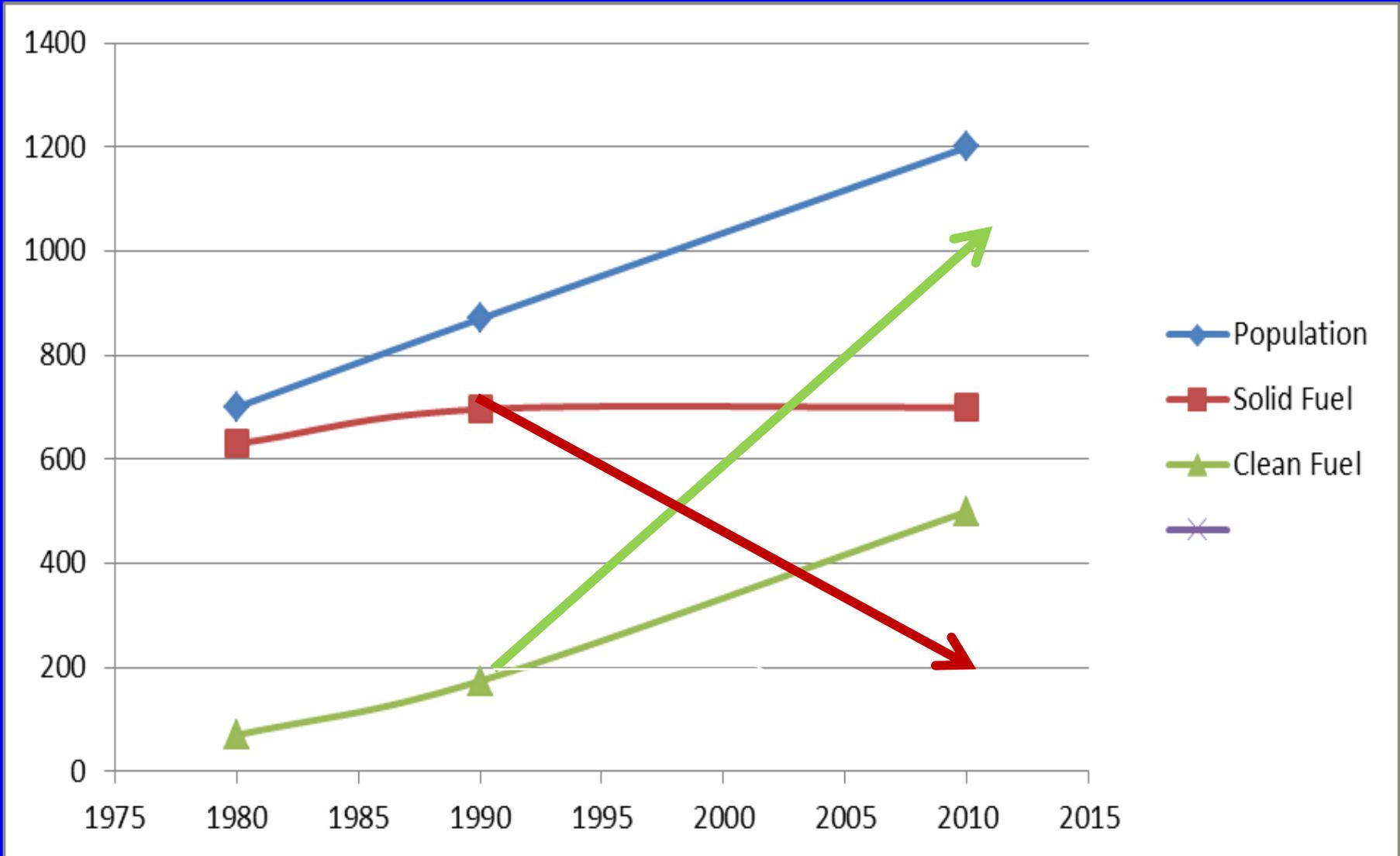
India: What happened?

Millions



India: What If?

Millions



What if?

- In 1990, the country had embarked on a major LPG expansion as it is doing now
- And LPG usage had thus grown at 9% instead of 6%.
- Then, by today there would have been only 15% non-LPG users, instead of 65%
- This is what India is trying to do now.

In essence, India

- Has found a way to provide LPG access to hundreds of millions now using solid fuels
- We know, however, that initially people tend to continue to use biomass fuel as well, reducing the health benefit of LPG use
- How can we accelerate the natural transition to nearly complete usage?

Promoting Usage

- Is a common requirement for household health interventions
- Just providing access to latrines, condoms, low salt foods, bednets, institutional delivery facilities, is not enough
- Need to encourage their use to obtain the health benefits

How best to encourage usage?

Choose an already identified vulnerable population that is particularly open to behavioral change

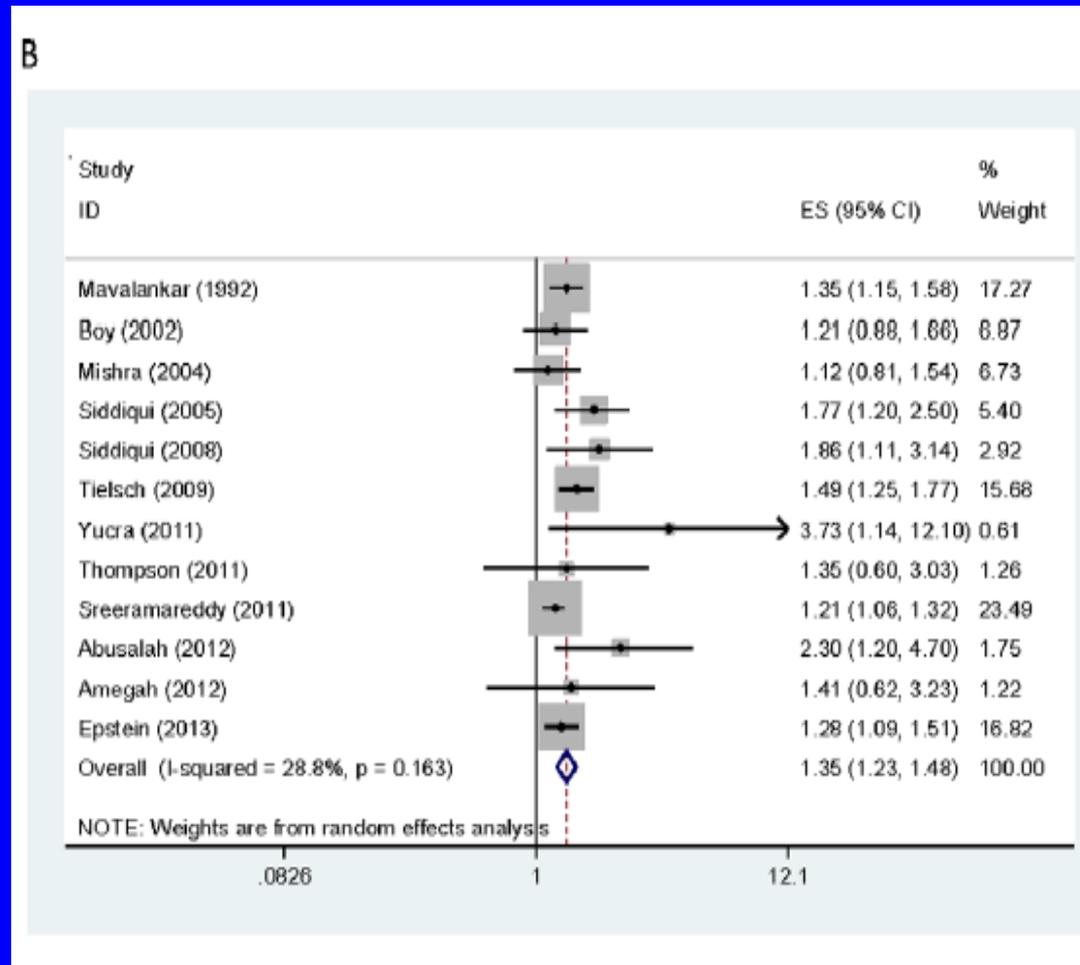
Who is the most vulnerable to the smoke and easily identified?

- Pregnant women and their unborn children because adverse pregnancy outcomes are among the most well established outcomes of air pollution exposure of all types

Low Birthweight (< 2,500 grams)

12 studies – half in South Asia

Cookfire smoke associated with a 35% increase in low birthweight



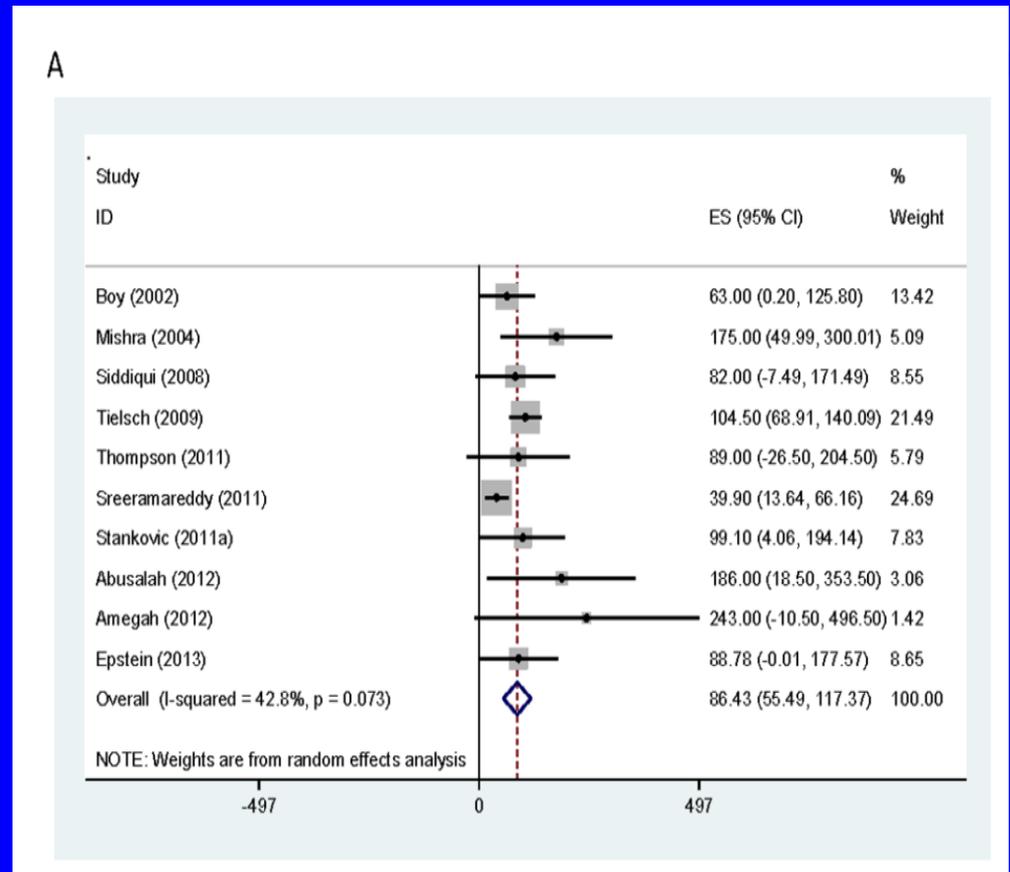
Low Birthweight

- Low birthweight associated with a range of problems including
 - Infant mortality
 - Low cognitive function
 - Adult chronic disease risks
- According to UNICEF, India has world's third highest rate – 27% (after Pakistan and Yemen)

Birthweight

10 studies – half in South Asia

- Exposure to smoke from biomass cookfires associated with 86 gram reduction in birthweight



Tamil Nadu Air Pollution and Health Effects (TAPHE) Study

Multi-year cohort of ~1200 pregnant women

**“We estimate a 70 gm decrease in birthweight associated with solid fuel use under conditions in Chennai”
(preliminary results, 2017)**

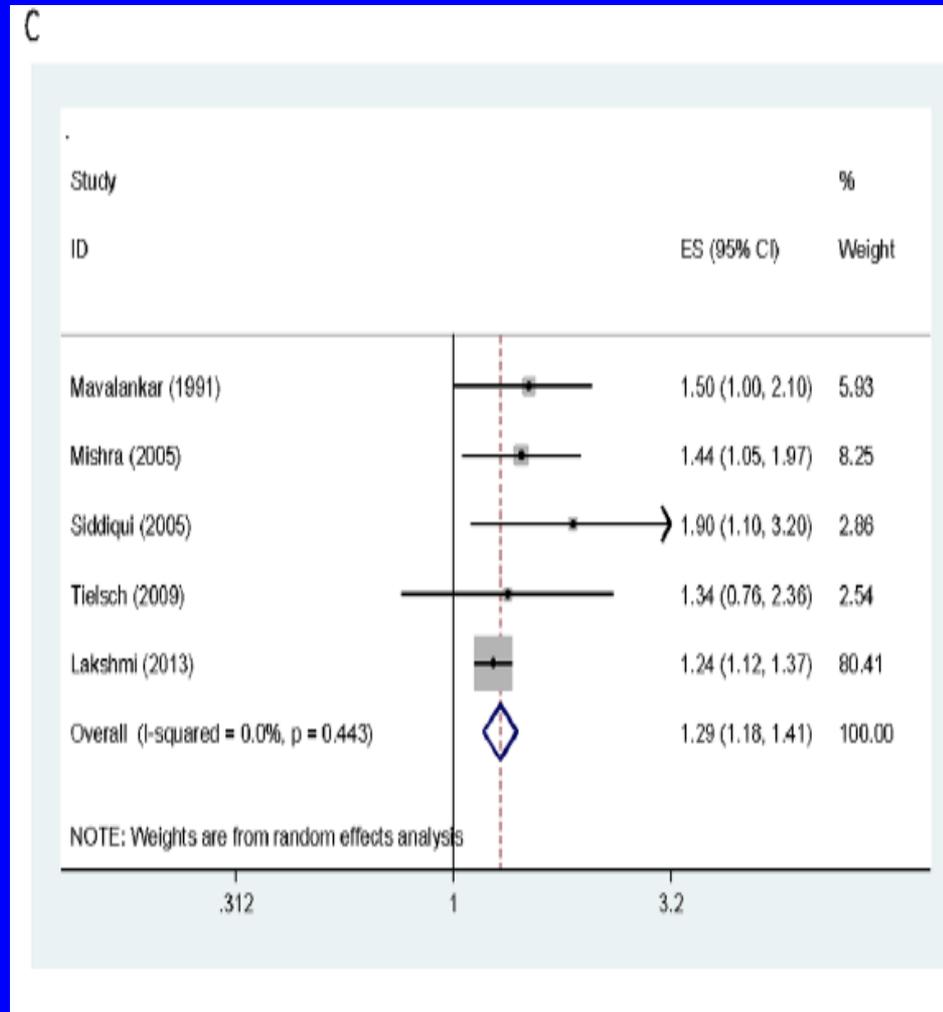
Within the confidence interval (55-117) of the 86 gram estimate from many previous studies.

How does 86 grams compare with other known risks for LBW?

- Outdoor air pollution studies done in developed countries find about a 16 gram decline
- Pregnant women living with a smoker have about 30-40 gram smaller babies
- Pregnant women who smoke themselves have babies that are over 200 grams lighter.

Stillbirth (5 studies)

Cookfire smoke exposure associated with a 29% increase in stillbirth)



Other adverse birth outcomes

- Cookfire smoke additionally associated with:
 - Preterm birth (3 studies):
 - **OR: 1.30** (95%CI: 1.06, 1.59)
 - Intrauterine growth retardation (IUGR) (2 studies):
 - **OR: 1.23** (95%CI: 1.01, 1.49)
 - Neural tube defect (1 study):
 - **OR: 1.9** (95%CI: 1.4, 2.6)
 - Miscarriage (2 studies):
 - **OR: 1.65** (95%CI: 0.74, 3.67)
 - Moderate stunting (2 studies):
 - **OR: 1.27** (95%CI: 1.12, 1.43)
 - Severe stunting (2 studies):
 - **OR: 1.55** (95%CI: 1.04, 2.30)

Who is the most vulnerable to the smoke and easily identified?

- Pregnant women in rural India already benefit from a massive program run by the Ministry of Health and Family Welfare
- Operated through the Accredited Social Health Activist (ASHA) workers.
- 870,079 ASHAs in 2014 – far more than one per village nationally.

What benefits are now available to poor pregnant women?

- Conditional cash transfer (CCT) is a well-developed way to encourage healthy behaviors
- India has a CCT for pregnant women operated via its rural health system, including ASHAs.
- Now (Dec 31, 2016) 6000 Rs./pregnancy
 - ~one-third for completing medical visits;
 - ~one-third for delivering in an institution;
 - ~one-third for vaccinating the baby
- All delivered through electronic bank accounts to women alone

Ujjwala-Mamta Initiative

“Bright Motherhood”

- Provide full refund of LPG to all pregnant women using biomass fuels - ~ 15 million/year.
- Use ASHA workers as primary contact plus coordination with local LPG distributors.
- Use existing electronic bank accounts of the women to facilitate payments.
- Cost ~1800 Rs per pregnancy, less than a third of current CCT payments
- Engender a lifetime behavioral change to LPG



“ASHA Meeting”

On
ISN-LPG Project

In association with

Public Health Department,
University of California, Berkeley
Sri Ramchandra University, Chennai
and
K.E.M. Hospital Research Centre, Pune

Date: 4 Feb 2017

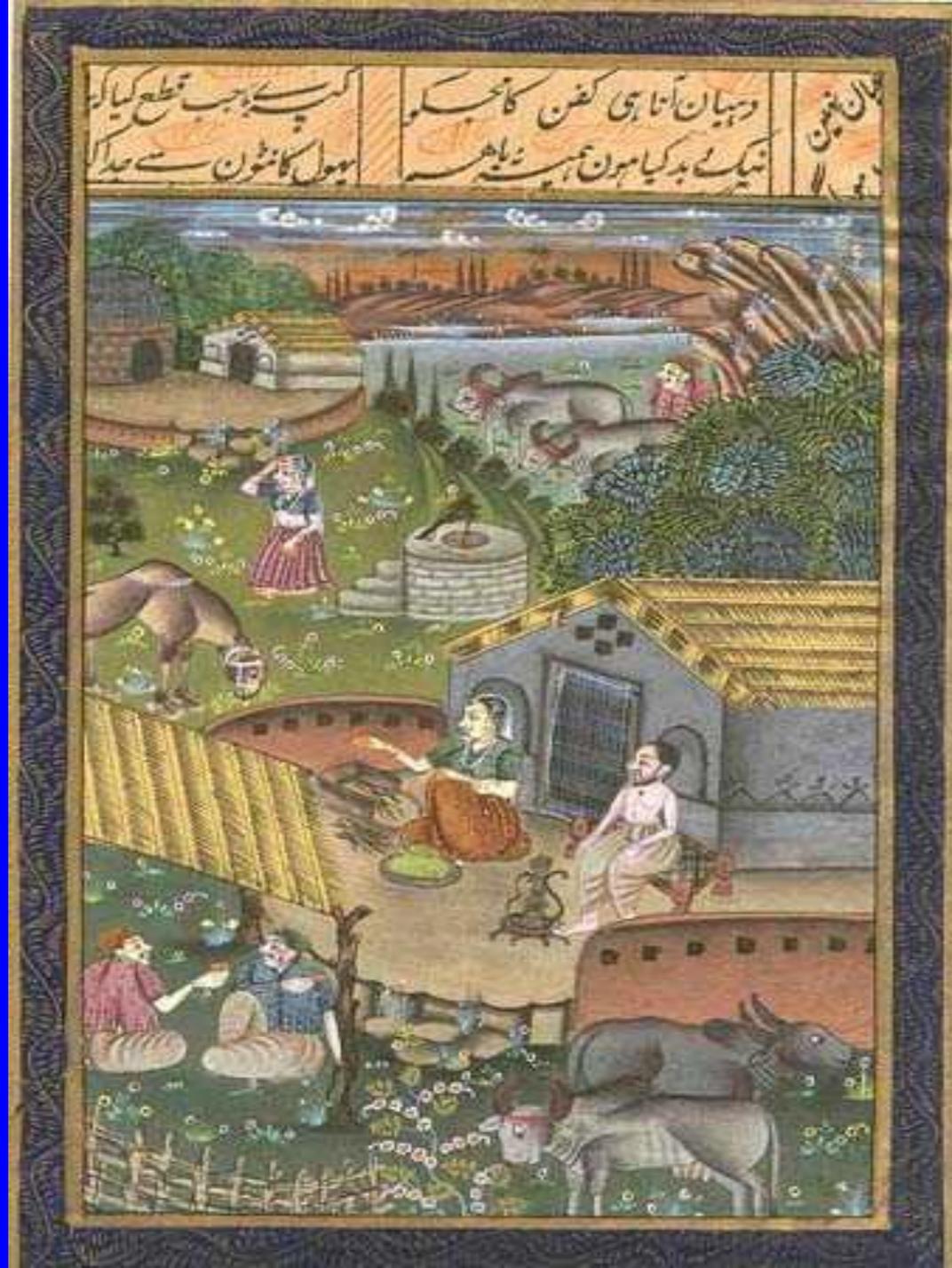
venue: Training Hall, PHC Aptale, Block Junner, Dist Pune

Subsidy or ?

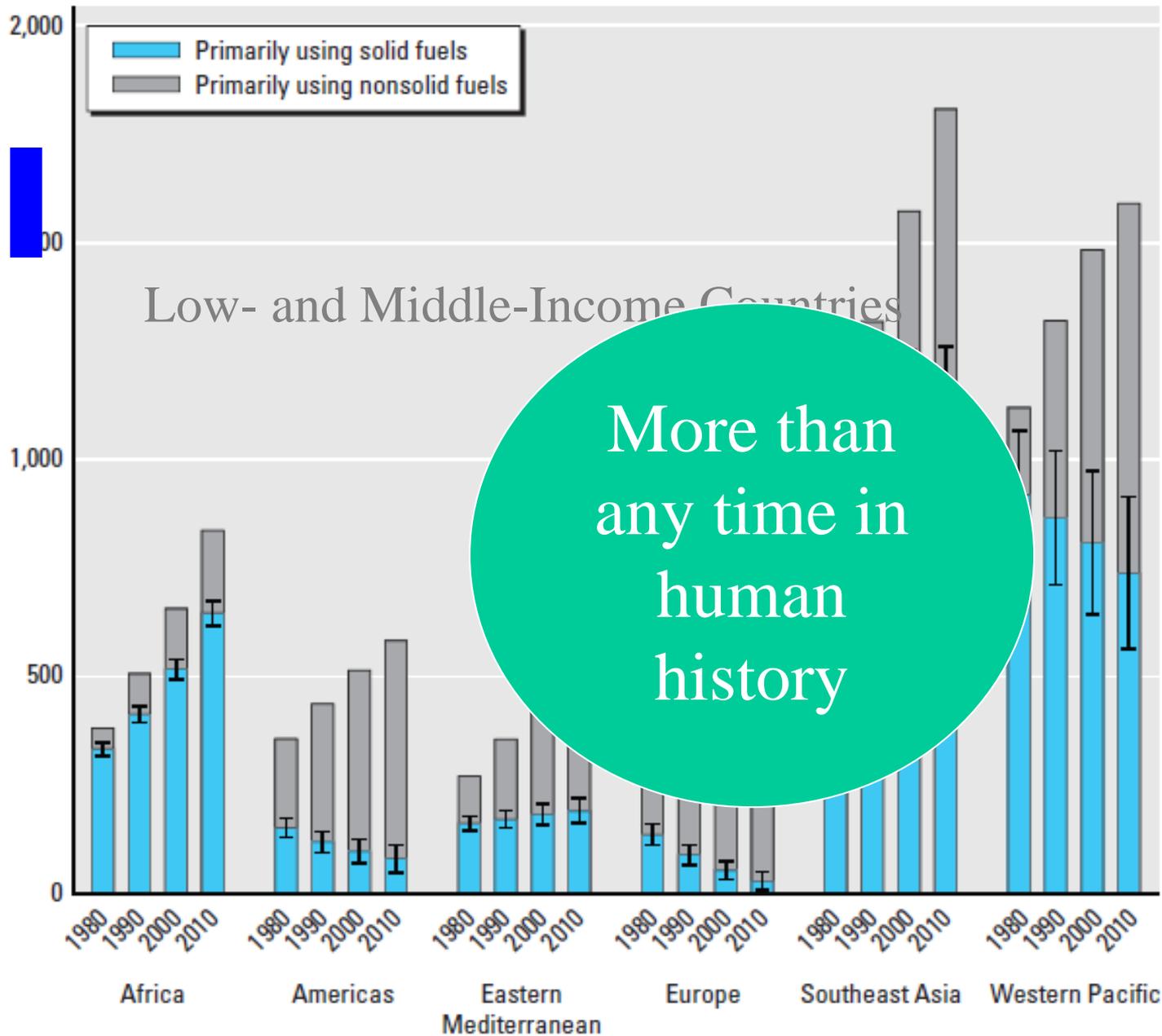
- Health sector does not refer to programs to vaccinate or provide maternal care to the poor as “subsidies” but rather
- **Social investments**
- In order for public support of clean fuels to be termed social investments, they need to be far better targeted than in the past to those whose health would benefit most.
- Modern IT technology provides ways to do so

Many thanks

For publications
& presentations:
Just “Google”
Kirk R. Smith



Population (millions)



More than any time in human history

