

Top-Down Monitoring of Household Energy Use

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World Health
Organization

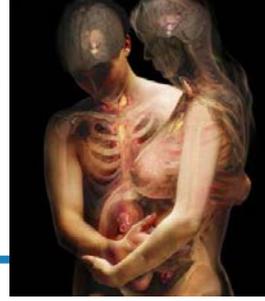
Presentation Overview

- Setting the stage: Why WHO is measuring household energy access
- Current top-down data collection on household energy
- WHO Global Household Energy Database & Reporting
- Moving forward: Global agenda for health and sustainable development
- Moving forward: Survey harmonization process & results from preliminary consultations

SETTING THE STAGE: WHY WHO IS MONITORING HOUSEHOLD ENERGY ACCESS



No. 1 Environmental Risk Factor for Public Health



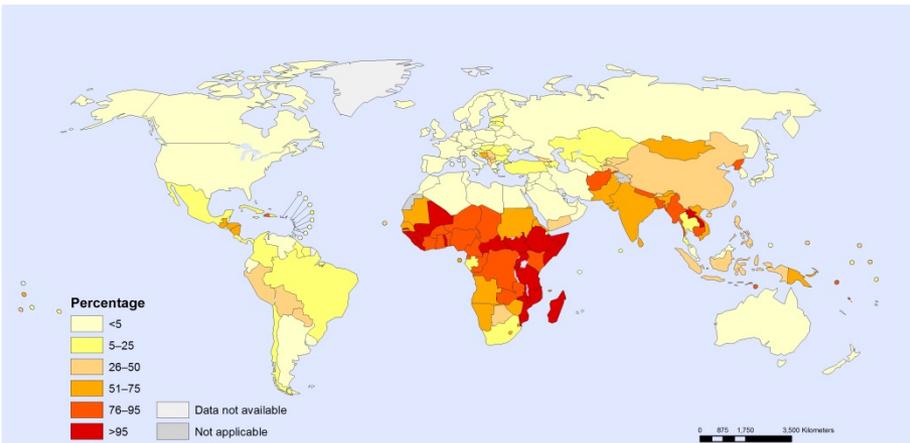
In 2012, 42% of global population rely primarily on solid fuels for cooking



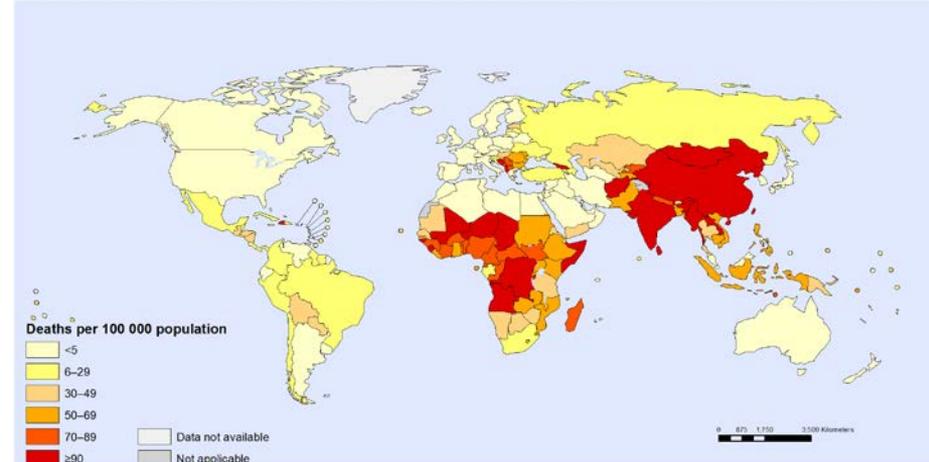
4.3 million premature deaths

- ischaemic heart disease
- stroke
- chronic obstructive pulmonary disease
- lung cancer
- childhood pneumonia

Population using solid fuels (%), 2012



Deaths attributable to household air pollution, 2012



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



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Data Source: World Health Organization
Map Production: Health Statistics and
Information Systems (HSI)
World Health Organization



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Setting the stage: Why WHO is monitoring household energy access

- WHO Health Statistics, MDG reporting, **World Health Assembly Resolution**
- Sustainable Development Goals
- SE4All Global Tracking Framework
- National statistics, policies & implementation (e.g. Honduras, South East Asia Region NCD Action Plan)
- Global Alliance for Clean Cookstoves – 100 by 2020
- CCAC *Clean Cooking and Domestic Heating Initiative*
- Others (e.g. researchers)

CURRENT TOP-DOWN DATA COLLECTION ON HOUSEHOLD ENERGY



What has been measured....

Primary Fuel type

(all end-uses, but mostly cooking)

- most commonly available
- both individual (i.e. kerosene, wood, biogas) & aggregate indicators

(i.e. solid vs. clean)

Cooking practices

- Stove type
- Location (room)

- Ventilation (chimney, hood)

Other related indicators

- residency/district (e.g. urban v. rural)
- mother's education
- wealth quintile

Survey	Cooking fuel	Cooking location	Stove type	Stove and other ventilation	Educational level of respondent	Wealth quintile of household
DHS ^a	X	X	X	X	X	X
MICS ^b	X	X	X	X	X	X
WHS ^c	X	X	X	X		X
LSMS ^d	X				(X)	(X)

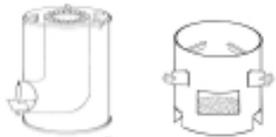
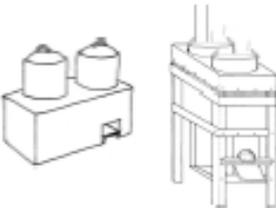
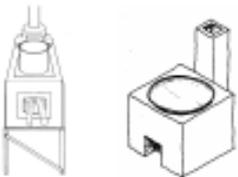
a. DHS: Demographic and Health Survey; b. MICS: Multiple Indicator Cluster Survey; c. WHS: World Health Surveys; d. LSMS: Living Standard Measurement Study; X: information is available, (X) information is sometimes available.

What do these surveys look like?

The good (sort of)...

Q1. WHAT TYPE OF FUEL DOES YOUR HOUSEHOLD MAINLY USE FOR COOKING?	Electricity.....	01	01 → Q5
	Liquefied Petroleum Gas (LPG).....	02	02 → Q5
	Natural gas.....	03	03 → Q5
	Biogas.....	04	04 → Q5
	Kerosene.....	05	04 → Q5
	Coal/ lignite.....	06	
	Charcoal.....	07	
	Wood.....	08	
	Straw/ shrubs/ grass.....	09	
	Animal dung.....	10	
	Agricultural crop residue.....	11	
	No food cooked in household.....	12	12 → Q5
	Other (specify).....	96	
Q2. WHAT TYPE OF STOVE IS USUALLY USED FOR COOKING? <i>Probe for type.</i>	Open fire.....	01	
	Surrounded fire.....	02	
	Improved single pot stove.....	03	
	Improved multiple pot stove.....	04	
	Griddle stove.....	05	
	Other (specify).....	96	
Q2A. IS SMOKE REMOVED BY A CHIMNEY OR HOOD?	Chimney.....	01	02 → Q3
	Hood.....	02	03 → Q3
	Neither.....	03	
Q2B. WHEN WAS THE CHIMNEY LAST CLEANED?	Less than one month ago.....	01	
	Between one and three months ago.....	02	
	More than three months ago.....	03	
	Never.....	04	
	Don't know.....	98	
Q3. IS THE COOKING USUALLY DONE IN THE INDOOR LIVING SPACE, IN A SEPARATE KITCHEN/BUILDING, OR OUTDOORS?	In a room used for living/ sleeping.....	01	
	In a separate room used as kitchen.....	02	
	In a separate building used as kitchen.....	03	
	Outdoors.....	04	
	Other (specify).....	96	
Q4. WHAT TYPE OF VENTILATION IS PRESENT WHERE THE STOVE IS USED?	Closed room.....	01	
	Room with eave spaces.....	02	
	Room with open windows/ door.....	03	
	Room with three or fewer walls.....	04	
	Other (specify).....	96	

Q2: What type of stove is usually used for cooking?

<p>1. Open fire</p> <ul style="list-style-type: none"> unprotected fire pot or griddle is supported with rocks, mud or other materials 	<p>2. Surrounded fire</p> <ul style="list-style-type: none"> fire is partially or completely surrounded pot or griddle is supported with rocks, mud or other materials 
<p>3. Improved single pot stove</p> <ul style="list-style-type: none"> fire is completely surrounded open pot hole pot may be sunken into the stove to improve combustion, fuel is placed on grate or inside combustion chamber heat goes directly to a single pot 	<p>4. Improved multiple pot stove</p> <ul style="list-style-type: none"> fire is completely surrounded open pot hole pot may be sunken into the stove to improve combustion, fuel is placed on grate or inside combustion chamber heat goes directly to multiple pots 
<p>5. Griddle stove</p> <ul style="list-style-type: none"> fire is completely surrounded pot is placed on top of a metal or clay cooking surface 	

What do these surveys look like?

The bad. . .

110	What type of fuel does your household mainly use for cooking?	ELECTRICITY 01 LPG 02 NATURAL GAS 03 BIOGAS 04 KEROSENE 05 COAL, LIGNITE 06 CHARCOAL 07 WOOD 08 STRAW/SHRUBS/GRASS 09 AGRICULTURAL CROP 10 ANIMAL DUNG 11 OTHER _____ 96 (SPECIFY)	
111	What type of cooking stove is mainly used in your house?	KEROSENE STOVE 1 GAS STOVE 2 OPEN FIRE 3 OPEN FIRE OR STOVE WITH CHIMNEY OR HOOD 4 CLOSED STOVE WITH CHIMNEY 5 OTHER _____ 6 (SPECIFY)	
113	Where is cooking usually done?	IN A ROOM USED FOR LIVING OR SLEEPING 1 IN A SEPARATE ROOM IN SAME BUILDING USED AS KITCHEN 2 IN A SEPARATE BUILDING USED AS KITCHEN 3 OUTDOORS 4 OTHER _____ 6 (SPECIFY)	

What do these surveys look like?

The ugly...

<i>H9FPREP 7.1. On what do you primarily prepare food?</i>	
On a gas stove	1
On an electric stove	2
On something else	3
<i>DOESN'T KNOW</i>	7
<i>REFUSES TO ANSWER</i>	8

WHO GLOBAL HOUSEHOLD ENERGY DATABASE & REPORTING



What is the WHO Household Energy (HHE) Database?

- The WHO Household energy database compiles information from household surveys and censuses on national household energy use end-use (i.e. cooking, heating lighting)
- The top-down data housed in the database is used to conduct global, regional and national level assessments of both exposure and disease burden from household air pollution
- Publicly available (upon request) in Microsoft Excel



What kind of data are housed in the WHO HHE database?

National level statistics from surveys related to household energy practices including...

- **Fuel type for cooking, lighting, and heating**
 - most commonly available
 - both individual (i.e. kerosene) & aggregated indicators (i.e. dirty vs. clean)
- **Cooking practices**
 - Location (aka room), ventilation, stove type
- **Other related indicators**
 - residency/district (e.g. urban v. rural)
 - mother's education
 - wealth quintile



WHO Household Energy Database

(as of July 2015)

- The WHO HHE database currently houses data on the main energy source for:
- Cooking: 800 surveys, 159 countries, 1970-2013
- Lighting: 162 surveys, 71 countries, 1963-2013
- Heating: 42 surveys, 22 countries, 1980-2012

Country	EGYPT	Source	DHS	Series	2005															Total resp
Main cooking fuel among households																				
	Electricity	LPG	Natural gas	Biogas	Kerosene	Clean fuels	Coal	Charcoal	Wood	Dung	Crop waste	Biomass	Solid fuels	No cooking	Others	Missing				
Urban	0.16	76.17	22.38	0.04	1.04	99.81	0.00	0.00	0.04	0.00	0.00	0.04	0.04	0.14	0.00	0.02	10,533.01			
Rural	0.13	93.48	0.12	0.00	5.52	99.25	0.01	0.00	0.38	0.21	0.02	0.61	0.62	0.12	0.00	0.01	11,438.99			
Total	0.15	85.18	10.79	0.02	3.37	99.52	0.01	0.00	0.22	0.11	0.01	0.34	0.34	0.13	0.00	0.01	21,972.00			
Stove type																				
	Open fire	Open above	Closed above	Others	Missing solid fuel users %	Total solid fuel														
Urban	97.13	-b	0.17	0.00	2.69	113.64														
Rural	93.69	-b	0.24	0.33	0.60	702.62														
Total	93.56	-b	0.23	0.28	0.89	816.25														
Cooking exhaust																				
	Chimney	Hood	None	Others	Missing solid fuel users %	Total solid fuel														
Urban	4.58	-%	92.72	0.00	2.69	113.64														
Rural	5.38	-%	93.99	0.33	0.60	702.62														
Total	5.27	-%	93.56	0.28	0.89	816.25														
Cooking location																				
	Living/sleeping room	Separate room	Separate building	Outdoors	Others	Missing solid fuel users %	Total solid fuel													
Urban	99.83	-b	0.00	0.17	-	113.64														
Rural	97.82	-b	0.82	1.35	-	702.62														
Total	98.10	-b	0.71	1.19	-	816.25														
Education among women of reproductive age																				
	Electricity	LPG	Natural gas	Biogas	Kerosene	Clean fuels	Coal	Charcoal	Wood	Dung	Crop waste	Biomass	Solid fuels	No cooking	Others	Missing	Total resp			
None	0.12	88.14	2.21	0.02	7.16	98.65	0.04	0.01	0.86	0.40	0.03	1.22	1.36	0.01	0.00	0.00	7,756.13			
Primary	0.26	91.74	4.43	0.00	3.14	99.57	0.04	0.00	0.23	0.16	0.00	0.39	0.43	0.00	0.00	0.00	3,688.80			
Secondary	0.13	89.24	9.29	0.04	1.19	99.89	0.00	0.00	0.08	0.01	0.00	0.09	0.09	0.00	0.00	0.02	13,267.80			
Higher	0.13	73.58	26.05	0.04	0.17	99.97	0.00	0.00	0.00	0.00	0.00	0	0	0.01	0.00	0.02	4,225.80			
Missing	0.00	86.22	11.18	0.00	1.33	98.73	0.00	0.00	1.27	0.00	0.00	1.27	1.27	0.00	0.00	0.00	30.88			
Total	0.14	87.24	9.32	0.03	2.89	99.93	0.01	0.00	0.30	0.13	0.01	0.45	0.46	0.01	0.00	0.01	28,911.41			
Wealth quintile among households																				
	Electricity	LPG	Natural gas	Biogas	Kerosene	Clean fuels	Coal	Charcoal	Wood	Dung	Crop waste	Biomass	Solid fuels	No cooking	Others	Missing	Total resp			
Lowest	0.16	76.13	0.23	0.02	16.80	97.34	0.04	0.01	1.25	0.05	0.02	1.93	1.97	0.67	0.01	0.02	3,811.49			
Second	0.24	96.87	0.38	0.00	0.68	99.93	0.00	0.00	0.02	0.00	0.00	0.02	0.02	0.05	0.00	0.00	3,649.85			
Middle	0.10	97.96	1.94	0.00	0.00	100	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	4,262.95			
Fourth	0.13	88.40	11.43	0.00	0.00	99.96	0.00	0.00	0.00	0.00	0.00	0	0	0.02	0.00	0.02	5,023.84			
Highest	0.14	87.38	32.39	0.07	0.00	99.96	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.02	5,224.07			
Missing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total	0.15	85.18	10.79	0.02	3.37	99.51	0.01	0.00	0.22	0.11	0.01	0.34	0.35	0.13	0.00	0.01	21,972.00			

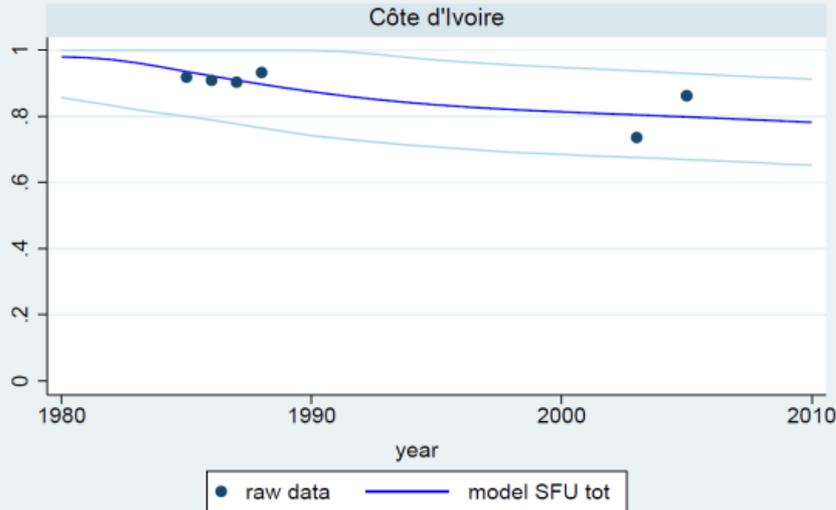
WHO REPORTED ESTIMATES

- For the World Health Statistics and other official reporting (e.g. MDG, SE4ALL GTF), WHO estimates *the percentage of households primarily relying on solid fuels for cooking*
- Estimates are available for the *total, urban* and *rural* populations at a *national, regional* and *global* level for 194 member states
- A non-parametrical model is used which uses all survey data in the WHO HHE database
- Relies of *regional trends* for countries *missing surveys*
- Updated/reported annually/biannually



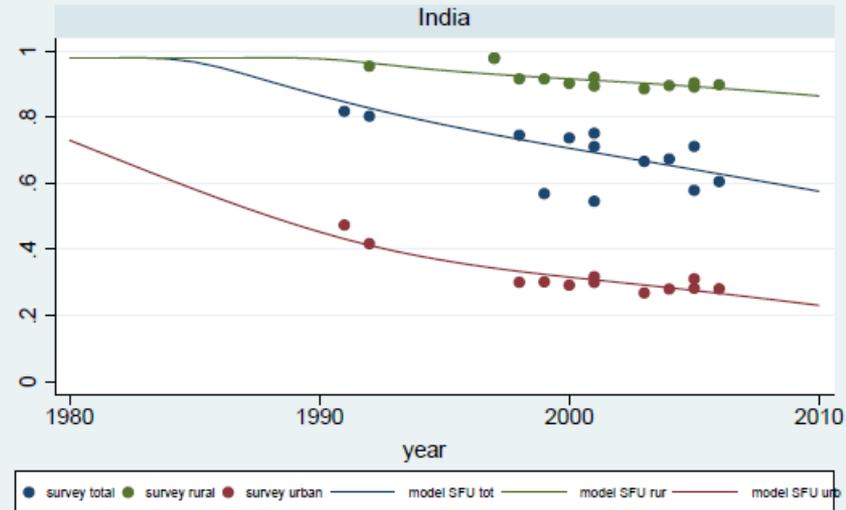
SFU Prevalence - Total

Côte d'Ivoire



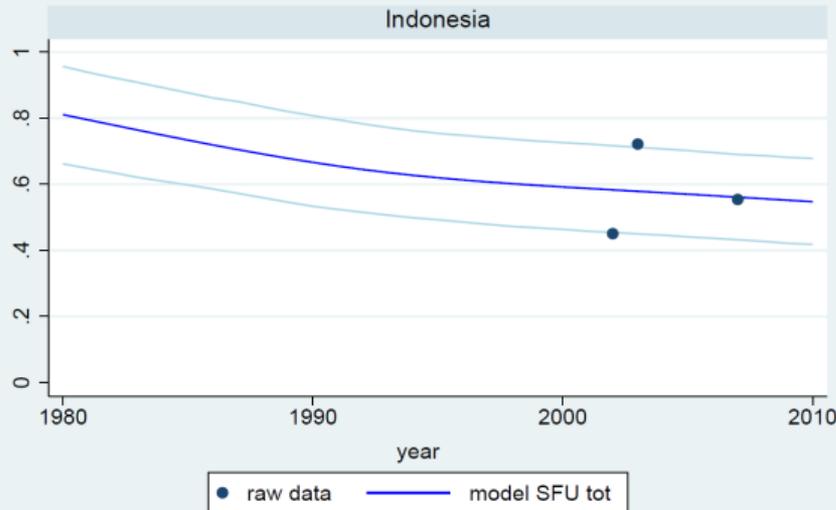
SFU Prevalence - all settings

India



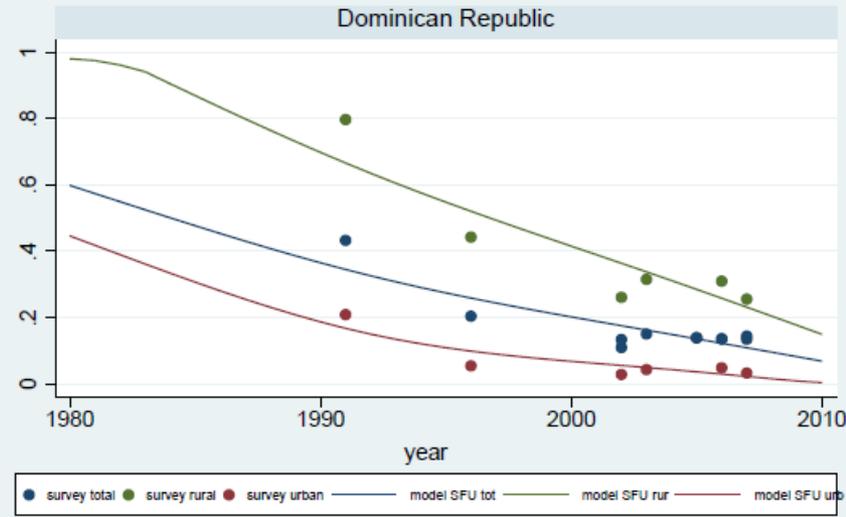
SFU Prevalence - Total

Indonesia



SFU Prevalence - all settings

Dominican Republic



MOVING FORWARD: GLOBAL AGENDA FOR HEALTH AND SUSTAINABLE DEVELOPMENT



Moving Forward: What has changed?



WHO IAQG: Household fuel combustion

Recommendation 1(a) Emission rate targets

For 90% of homes to meet the WHO AQGs for PM_{2.5}, emission rates should not exceed the emission rate targets (ERTs) set out below.

Emissions rate targets (ERT)	Emission rate (mg/min)	Percentage of kitchens meeting AQG (10 µg/m ³)	Percentage of kitchens meeting AQG IT-1 (35 µg/m ³)
Unvented			
Intermediate	1.75	9%	60%
Final	0.23	90%	100%
Vented			
Intermediate	7.15	4%	60%
Final	0.80	90%	100%



WHO IAQG: Household fuel combustion

Recommendation 3:

Unprocessed coal should not be used as a household fuel

Recommendation 4:

Household combustion of kerosene is discouraged while further research into its health impacts is conducted



UN Secretary General's Sustainable Energy for All Initiative (SEFA)



Achieving the three objectives of Sustainable Energy for All ...

... makes many development goals possible



Ensuring universal
ENERGY ACCESS

- Improved health
- Improved agricultural productivity
- Empowerment of women
- Business and employment creation
- Economic development
- Achievement of the Millennium Development Goals



Doubling the share of
RENEWABLE ENERGY

- Affordable energy even where grid does not reach
- New opportunities for small entrepreneurs
- Decreased variability in energy costs
- Energy security and reduced import bills
- Reduced environmental impacts



Doubling the rate of improvement in
ENERGY EFFICIENCY

- Lighting / appliances that require less power
- Fossil fuel resources used more effectively
- Reduced energy costs for consumers
- Redistribution of electricity that now is wasted or lost
- More reliable electricity systems

From: Sustainable Energy For All: A Global Action Agenda



Moving Forward: WHO Health Statistics

- % of household primarily relying on solid fuels for cooking

WHO REPORTED ESTIMATES (cont'd)

- To better estimate exposure, disease burden and align with the WHO guidelines for indoor air quality, WHO is currently transitioning to reporting (*not finalized wording for indicators*):
 - % of population using **clean fuels and technologies/modern energy at the household level***
 - % of population using **polluting fuels and technologies at the household level**
 - % of population using **solid fuels and polluting technologies at the household level**
- * Where clean fuels and technologies are defined by the WHO guidelines for indoor air quality: household fuel combustion

What we need to measure....



- Individual Fuels
- Cooking fuel/stove stacking
- Heating fuel & device
- Lighting fuel & device
- Characteristics of cookstove
- Other impacts:
 - Time savings
 - Fuel costs (affordability)
 - Availability (reliability)
 - Safety risks

Moving forward- WHO Global Platform on Air Quality and Health

- In 2011, WHO launched its *WHO Urban Air Quality Database* with data from over more than 1100 cities
- WHO is currently expanding its outdoor air pollution database to include rural areas--building upon the methods used for IHME's GBD to assess exposure to OAP housed within the WHO Global Platform
- WHO will be combining OAP data with data from other sectors (e.g. household energy) to evaluate the linkages between OAP and other sectors, associated disease burden and the effectiveness of interventions at improving air quality and on health



MOVING FORWARD: SURVEY HARMONIZATION PROCESS & RESULTS FROM PRELIMINARY CONSULTATIONS



Moving Forward: Enhancing top-down monitoring

WHO, World Bank and Global Alliance for Clean Cookstoves will be hosting a meeting in September 2015 to enhance the tools for top-down measurement of household energy use with various omnibus surveying agencies (e.g. DHS, MICS), country statistical offices & other relevant agencies/stakeholders

Moving forward– survey harmonization process:

Enhance current questionnaires to :

- Improve fuel classifications (e.g. solid vs. clean---kerosene?)
 - Account for all fuels/stoves used for heating, lighting and cooking
 - Assess duration of use for device/technology
 - Assess fuel supply, cost and other factors of sustained adoption
 - Allow for analysis in relation to gender and wealth quintile
- **Harmonize tools across agencies**
 - Look at **feasibility and practicality of survey expansion and implementation** (piloting questions, resources, accounting for geographic variability)
 - **Availability of tools and building capacity** for implementation (e.g. Implementation of WHO guidelines for indoor air quality)
 - Improving data turnaround/reporting for energy



Results of first survey harmonization consultation

Proposed list of core questions:

- **Primary cooking fuel** (include processed and unprocessed biomass)
- **Secondary/other fuels & technologies used for cooking** (proposed to use a “check all that apply” or “ranking” system)
- **Heating energy source**
(proposed to use a “check all that apply” or “ranking” system)
- **Primary lighting energy source**
- **Type of cookstove** (manufactured, artisanal, self-made)
- **Characteristics of main cookstove** (check all that apply of portable, fixed, fixed with chimney, no of pots)



Results of first survey harmonization consultation (cont'd)

Secondary Questions and/or modules

1. Kerosene device
2. Fuel(s) cost
3. Availability of fuel
4. Availability of stove
5. Lighting fuel & technology
6. Time spent collecting and/or purchasing fuel
7. Stove life & maintenance
8. Health outcomes (e.g. self-reported prevalence, burns/injuries, poisonings)



Sample core questions (1 of 6)

1. What is the primary or main cooking fuel or energy source?–

Will need to consider how natural gas, gasoline, other liquid fuels (e.g. ethanol) are handled

- Wood Processed biomass Kerosene Biogas
- Charcoal Crop waste LPG
- Solar Coal Dung
- Electricity Other, please specify_____

Sample core questions (2 of 6)

2. What is your secondary cooking fuel or energy source?

- Wood
- Processed biomass
- Kerosene
- Biogas
- Charcoal
- Crop waste
- LPG
- Solar
- Coal
- Dung
- Electricity
- Other, please specify _____



Sample core questions (3 of 6)

3. What other fuels or energy sources are used for cooking? (check all that apply)

- | | | |
|--|--|-------------------------------------|
| <input type="checkbox"/> Wood | <input type="checkbox"/> Processed biomass | <input type="checkbox"/> Kerosene |
| <input type="checkbox"/> Biogas | <input type="checkbox"/> Charcoal | <input type="checkbox"/> Crop waste |
| <input type="checkbox"/> LPG | <input type="checkbox"/> Solar | <input type="checkbox"/> Coal |
| <input type="checkbox"/> Dung | <input type="checkbox"/> Electricity | |
| <input type="checkbox"/> Other, please specify _____ | <input type="checkbox"/> No other fuels used | |

Sample core questions (4 of 6)

4. Tell me about the primary or main cookstove used in this home. Which of these describes this stove? (check one item for each row)

- a. Manufactured Artisanal Self-made Open fire [if open fire, skip to question 5]
- b. Fixed position Portable
- c. No chimney Has a chimney
- d. One-pot stove More than one pot can be used at a time
- e. Wick (*for kerosene stoves only*) Pressurized (*for kerosene stoves only*)



Sample core questions (5 of 6)

5. What is your primary heating fuel?

- Same as primary cooking fuel Wood Coal
- Fuel oil District or central heating Kerosene
- LPG Solar Electricity Natural gas
- Other, please specify _____



Sample core questions (6 of 6)

6. What is your primary source of energy for lighting?

- Electricity
- Kerosene (wick)
- Kerosene (pressurized)
- Candles
- Wood
- Solar (Lantern or other)
- Oil Lamp
- Dung
- Grass/Crop waste
- Other, please specify _____



Supplemental Questions

1. What is your secondary source of energy for lighting?
2. What is your secondary source of energy for heating?
3. In the past 7 days, how much time was spent collecting or purchasing fuel?
4. In the past 7 days, how much money was spent on fuel?
5. What was the cost of the primary stove?
6. How long has the primary stove been in use?
7. Does the primary stove meet all of the household cooking needs?



Supplemental Questions (cont'd)

8. How long does it take you to prepare the primary stove for cooking a meal?
9. Tell me about the secondary cookstove used in this home. Which of these describes this stove? (check one item for each row)
- a. Manufactured Artisanal Self-made Open fire [if open fire, skip to question XX]
- b. Fixed position Portable
- c. No chimney Has a chimney
- d. One-pot stove More than one pot can be used at a time

Online Resources

- WHO's Household Energy Databases
(http://www.who.int/indoorair/health_impacts/databases/en/)
- WHO's Global Health Observatory
(<http://apps.who.int/gho/data/node.main.122?lang=en>)
- WHO Guidelines for indoor air quality: household fuel combustion
(<http://www.who.int/indoorair/guidelines/hhfc/en/>)

**THANK YOU AND ANY
QUESTIONS?**

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