



CHAPTER 3 –
**ACCESS TO CLEAN FUELS
AND TECHNOLOGIES FOR
COOKING**

MAIN MESSAGES

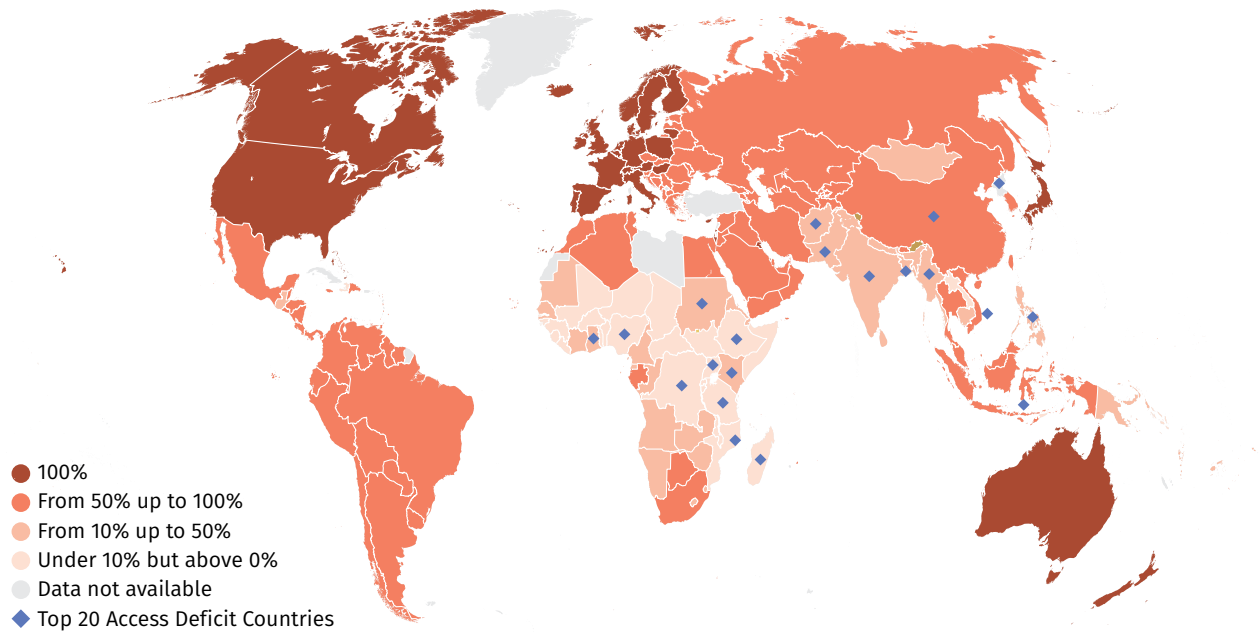
- **Global trend:** The share of the global population with access to clean cooking fuels and technologies¹ (hereinafter referred to as “access to clean cooking”) increased from 58% in 2014 to 59% in 2016. With an additional 84 million of the global population gaining access annually during 2014–16, the annual expansion of access marginally outpaced population growth. This resulted in a very slight decrease of some two million people in the absolute global deficit in access to clean cooking in 2014–16, still leaving the global access-deficit just short of 3 billion.
- **2030 target:** To reach universal access to clean cooking by 2030, the annual rate of clean cooking access between 2016 and 2030 needs to accelerate to 3 percentage points from an average annual growth rate of 0.5 percentage points that was seen in 2010–16. Owing to slow progress to date, as well as population growth in the access-deficit countries, the 2030 target is unlikely to be met. If the current trajectory of access gains persists, 2.3 billion of the global population will be without access to clean cooking in 2030 (IEA 2017).
- **Regional highlights:** In developing Asia, incremental access to clean cooking outpaced growth in population, although the speed of expansion slowed. In Sub-Saharan Africa, although there was a marginal improvement in the pace of access gains, the growth rate still remained at about 0.3 percentage points annually. Nevertheless, the region’s overall population grew four times as fast as the population with access to clean cooking.
- **Urban-rural distribution:** Access to clean cooking remains much higher in urban areas, where 83% have access, than in rural areas, where only 32% have access. The chasm between urban and rural access to clean cooking has marginally decreased (by 0.4 percentage points annually between 2014 and 2016).
- **Top 20 access-deficit countries:** The top 20 access-deficit countries, which cumulatively account for 83% of the global population without access, saw an average annualized growth in access of 0.9 percentage points in 2014–16. However, in only 9 out of the 20 countries did expansion of access outpace population growth. These positive outcomes were driven primarily by widespread dissemination of fuel-efficient stoves and cooking solutions based on liquefied petroleum gas (LPG) in India, Pakistan, Indonesia and Vietnam, all of which increased access by over 1 percentage point annually.
- **Policy implications:** Unfortunately, the rapid deployment of clean cooking fuels and technologies has not received adequate attention from policy makers, and it lags behind the rate of electrification. High entry costs for many clean cooking solutions, the lack of consumer awareness of their benefits, financing gaps for producers seeking to enter clean fuel and stove markets, and slow progress in

¹ The proportion of population with primary reliance on clean fuels and technology is calculated as the number of people using clean fuels and technologies for cooking, heating, and lighting divided by total population, expressed as percentage. “Clean” is defined by the emission rate targets and specific fuel recommendations (that is, against unprocessed coal and kerosene) included in the normative guidance World Health Organization guidelines for indoor air quality: household fuel combustion.

the development of cookstove models and fuel production solutions exacerbate the challenges to uptake of clean cooking solutions (World Bank 2015).

STATE OF ACCESS TO CLEAN COOKING IN 2016

FIGURE 3.1 • Share of population with access to clean cooking in 2016 (%)



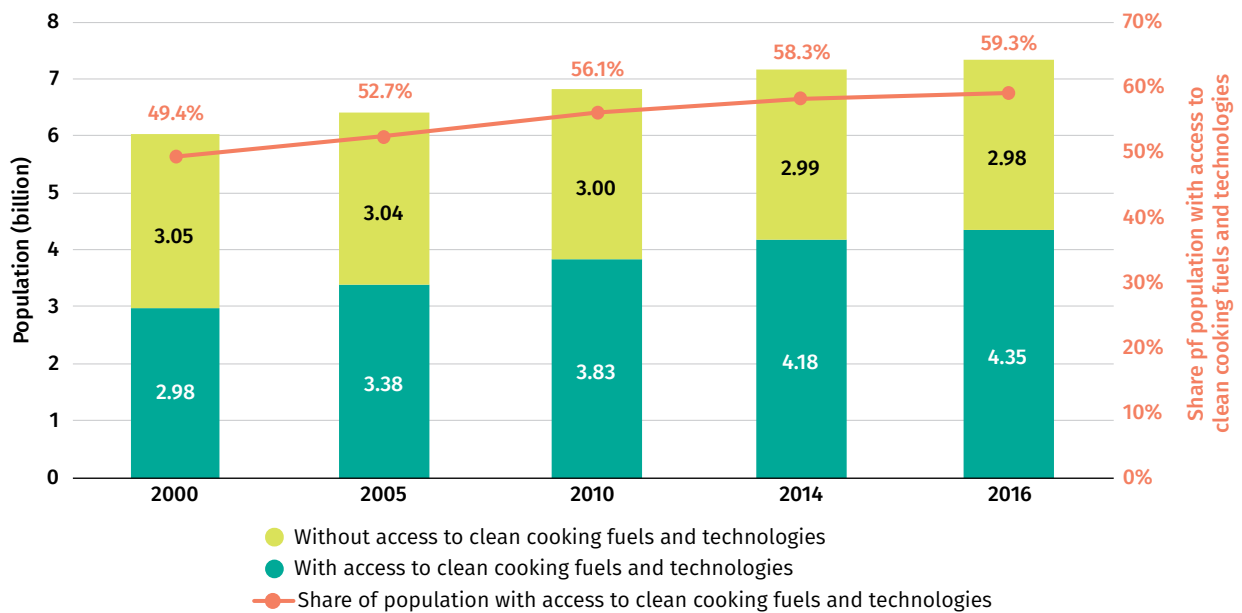
Source: World Health Organization. Population estimates based on the use UN population data

THE STORY IN PICTURES

GLOBAL TRENDS

The global rate of access to clean cooking has improved gradually reaching 59 % in 2016

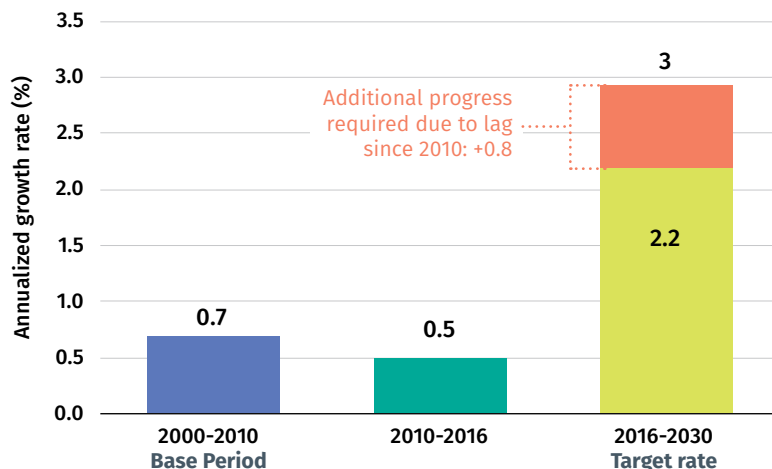
FIGURE 3.2 • Progress in clean cooking access from 2000 to 2016 (billions of people and share of population with access to clean cooking)



Source: World Health Organization. Population estimates based on the use UN population data

Continued deceleration of progress on clean cooking from 2010-2016 puts the 2030 universal target ever further out of reach

FIGURE 3.3 • Average annual increase in access rate to clean cooking (percentage points)

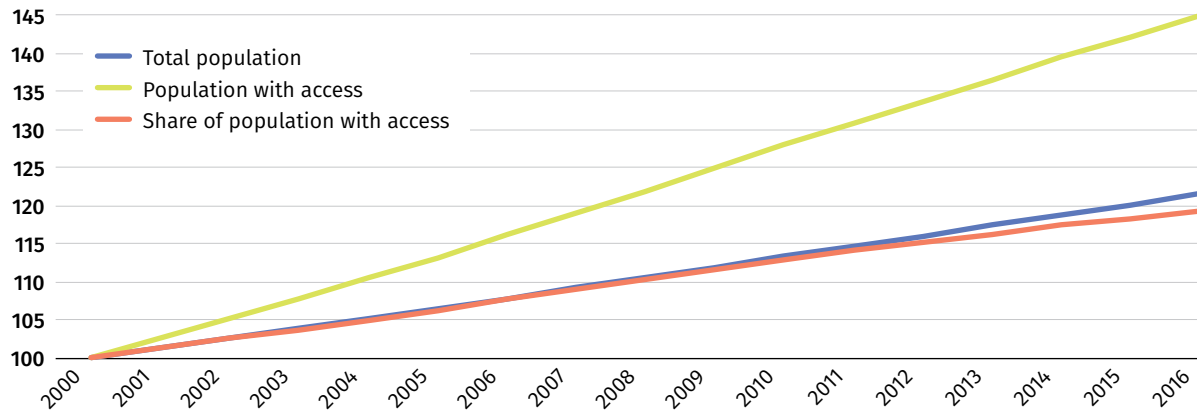


Source: World Health Organization. Population estimates based on the use UN population data

ACCESS AND POPULATION

Progress in population with access to clean cooking marginally outpaced population growth, marking a slight decrease in global clean cooking access-deficit

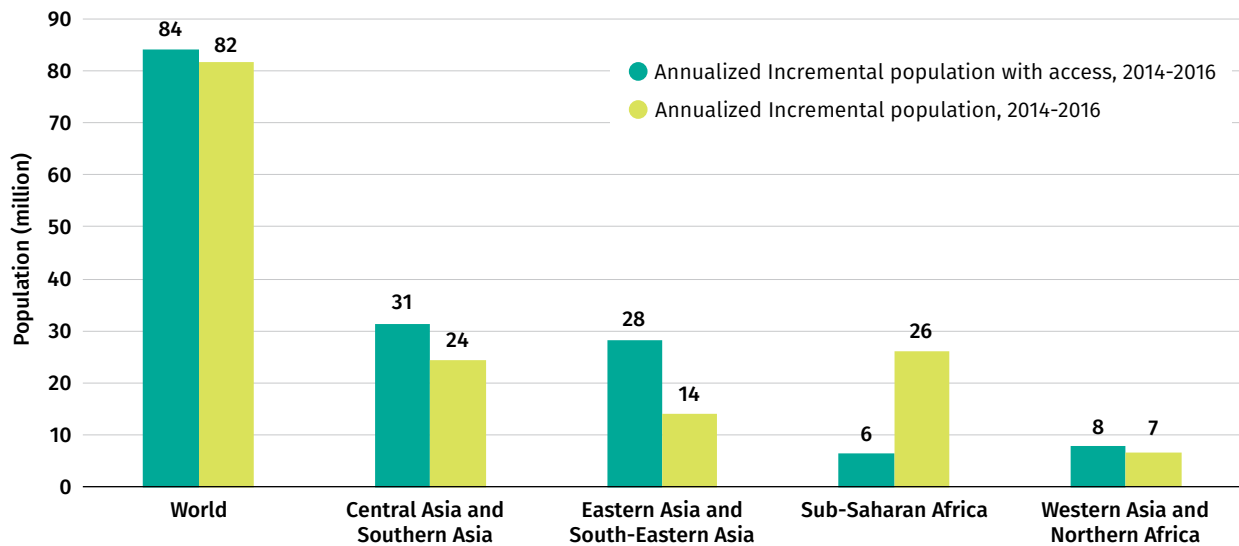
FIGURE 3.4 • Clean cooking access and population growth from 2000 to 2016, (index, 2000 = 100)



Source: World Health Organization. Population estimates based on the use UN population data

Access to clean cooking outpaced population growth in every region except for Sub-Saharan Africa

FIGURE 3.5 • Annual incremental access and population growth, by region, 2014-2016

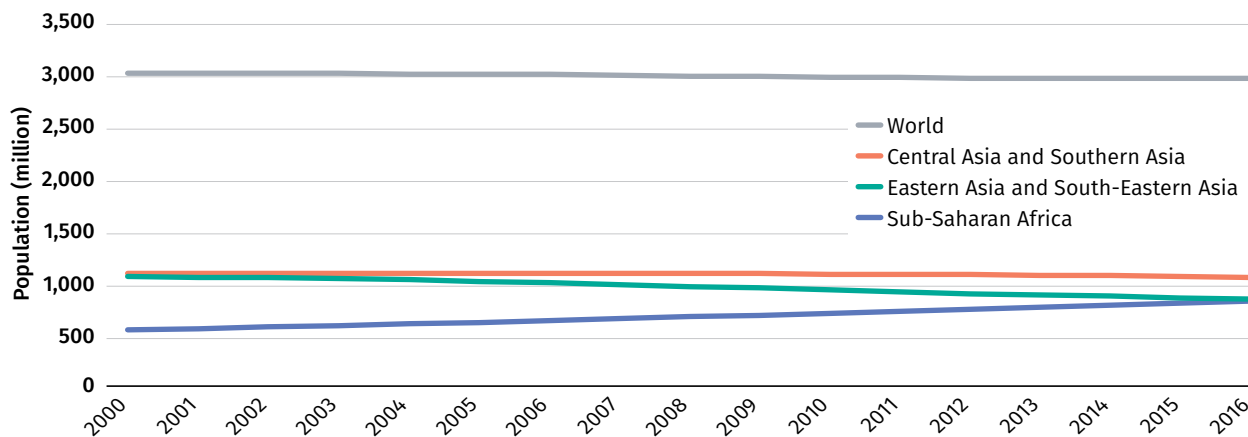


Source: World Health Organization. Population estimates based on the use UN population data

THE ACCESS DEFICIT

Population lacking access to clean cooking has plateaued at just under 3 billion, while the absolute size of the deficit continues to grow in some regions

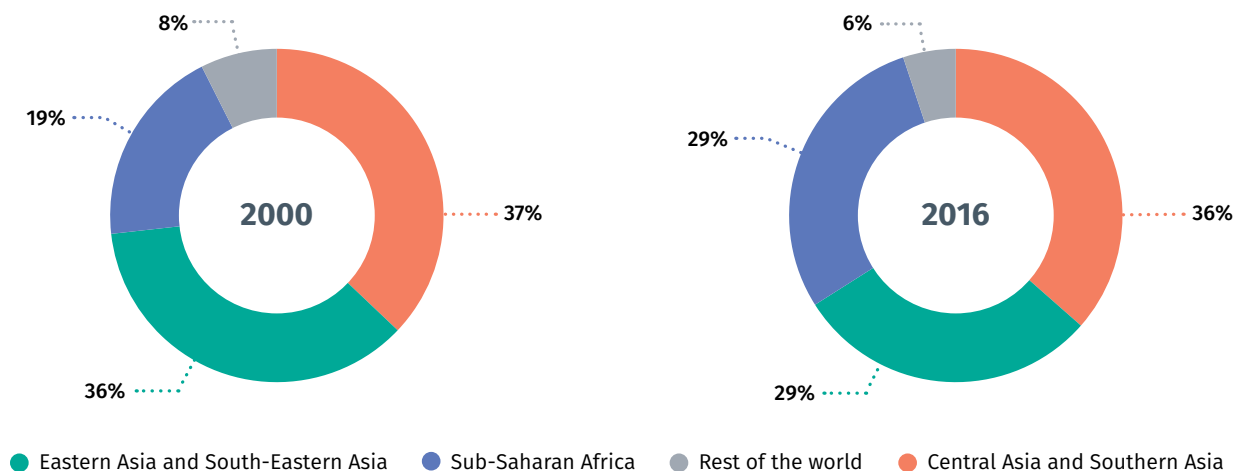
FIGURE 3.6 • Evolution of the access-deficit (millions of people), 1990-2016



Source: World Health Organization. Population estimates based on the use UN population data

While the global access-deficit has remained at around 3 billion since 2000, Sub-Saharan Africa's deficit has not kept up with population growth, rising from 585 million in 2000 to just over 860 million in 2016

FIGURE 3.7 • Share of the regions in the global access deficit, 2000 and 2016

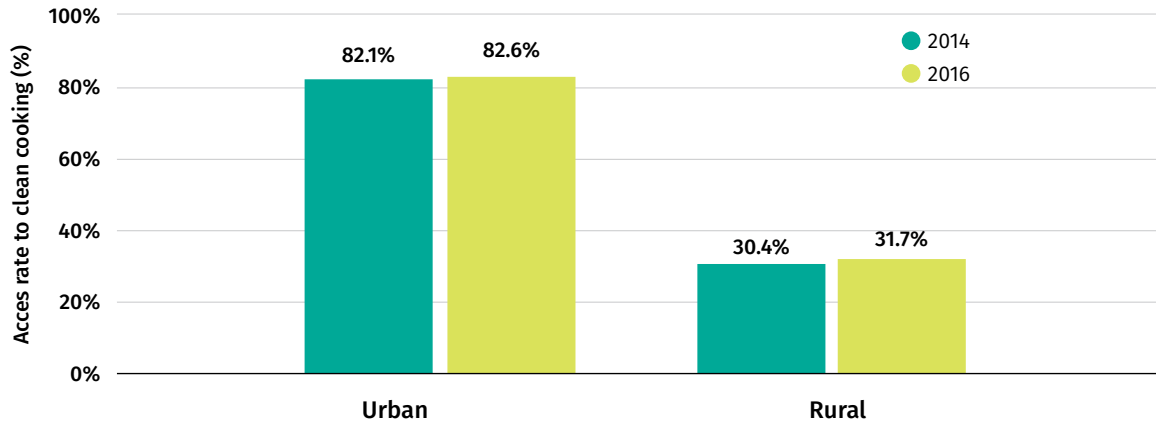


Source: World Health Organization. Population estimates based on the use UN population data

URBAN-RURAL DIVIDE

Access gains was faster in rural areas compared to urban areas

FIGURE 3.8 • Share of population with clean cooking access in urban and rural areas, 2014 and 2016

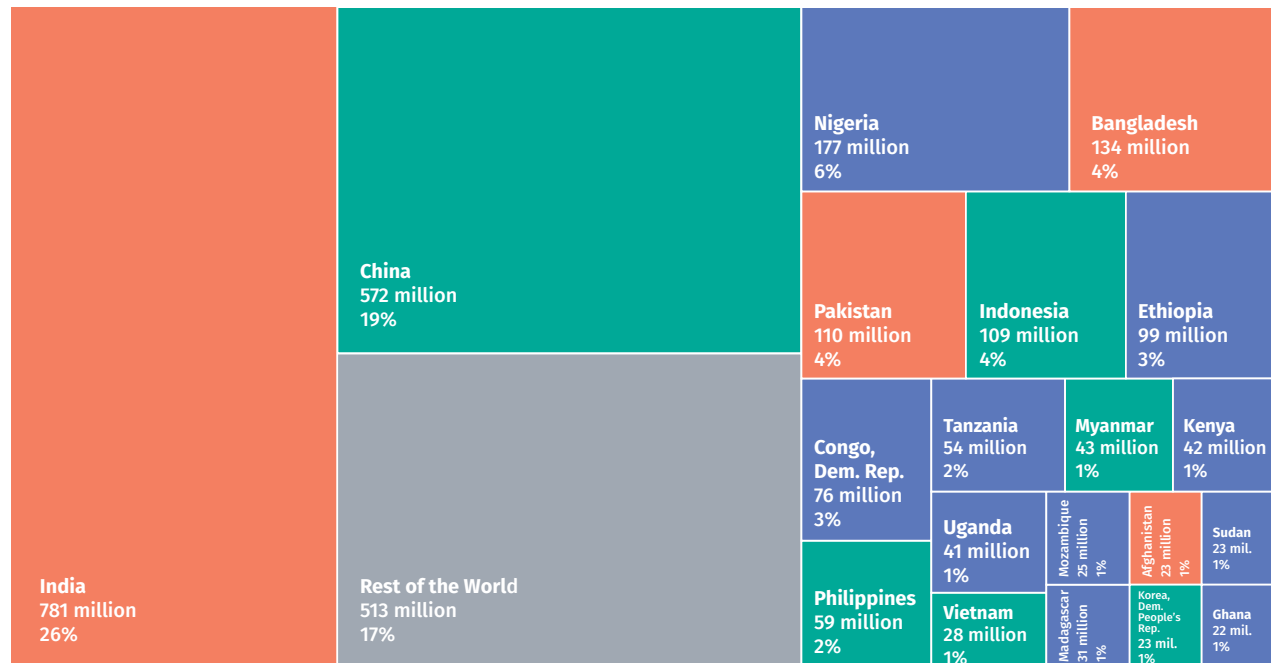


Source: World Health Organization. Population estimates based on the use UN population data

COUNTRY TRENDS

The top 20 access-deficit countries accounted for 83% of the global access-deficit, and India alone accounted for 26% in 2016

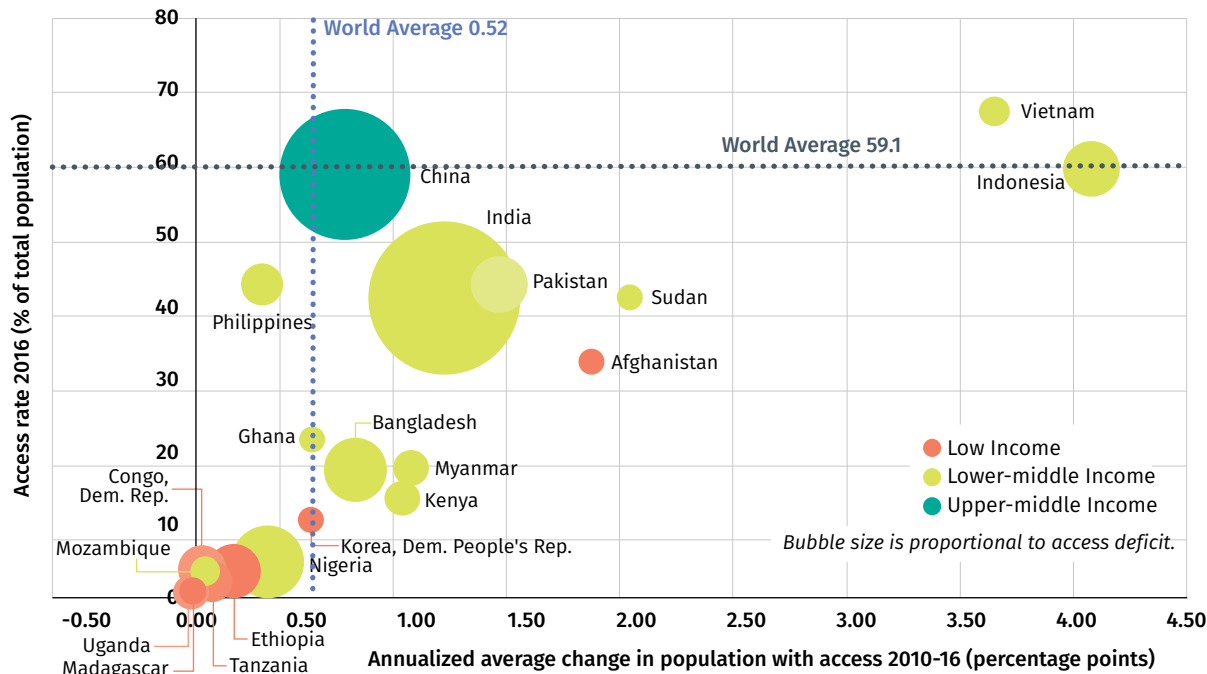
FIGURE 3.9 • Share of the 20 largest access deficit countries in the population without access to clean cooking, 2016



Source: World Health Organization. Population estimates based on the use UN population data

About half of the top 20 access-deficit countries are expanding access to clean cooking more rapidly than the global average, though many of the others are making little, if any progress

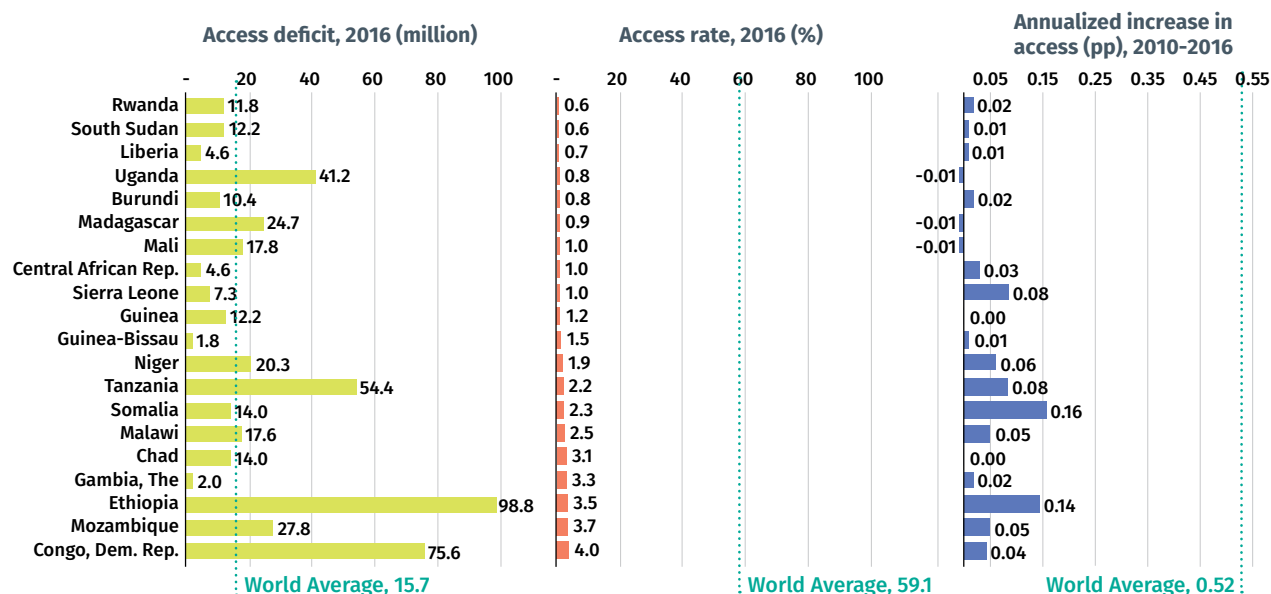
FIGURE 3.10 • The 20 countries with the largest clean cooking access-deficit over the 2010-2016 period



Source: World Health Organization. Population estimates based on the use UN population data

Four out of the world’s 20 lowest-access countries did not see any increase in access to clean cooking over 2010 - 2016

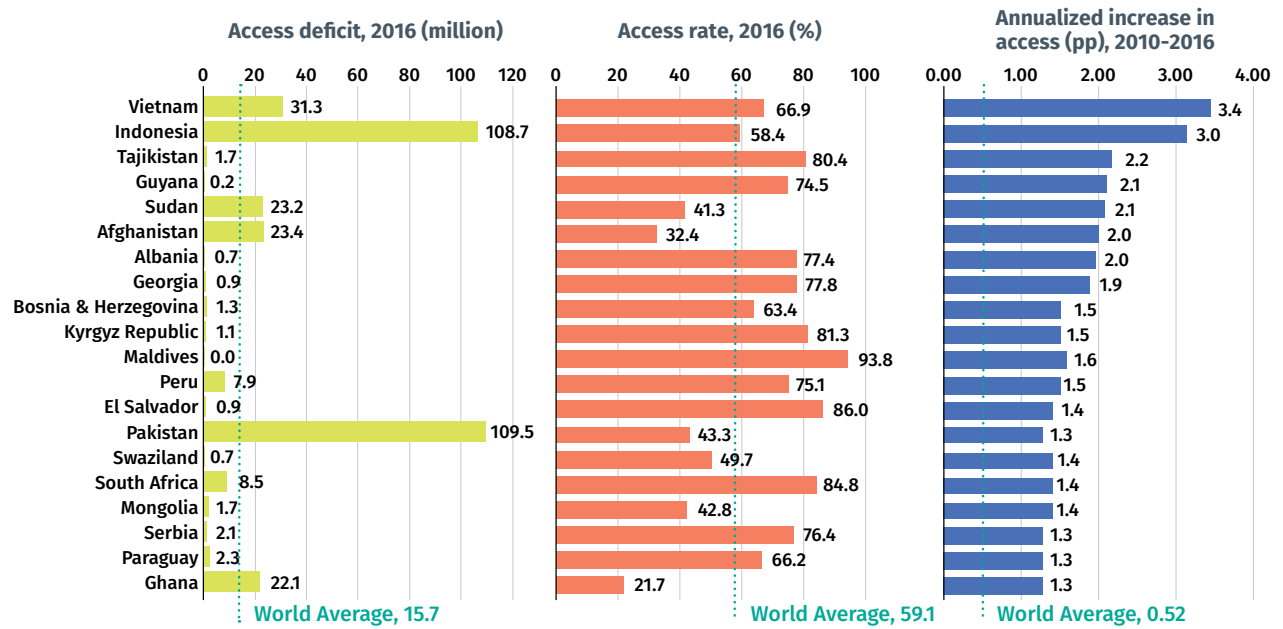
FIGURE 3.11 • The 20 countries with lowest access to clean cooking over the 2010-2016 tracking period



Source: World Health Organization. Population estimates based on the use UN population data

All of the 20 fastest-moving countries² gained access over twice as fast as the global average during 2010-2016

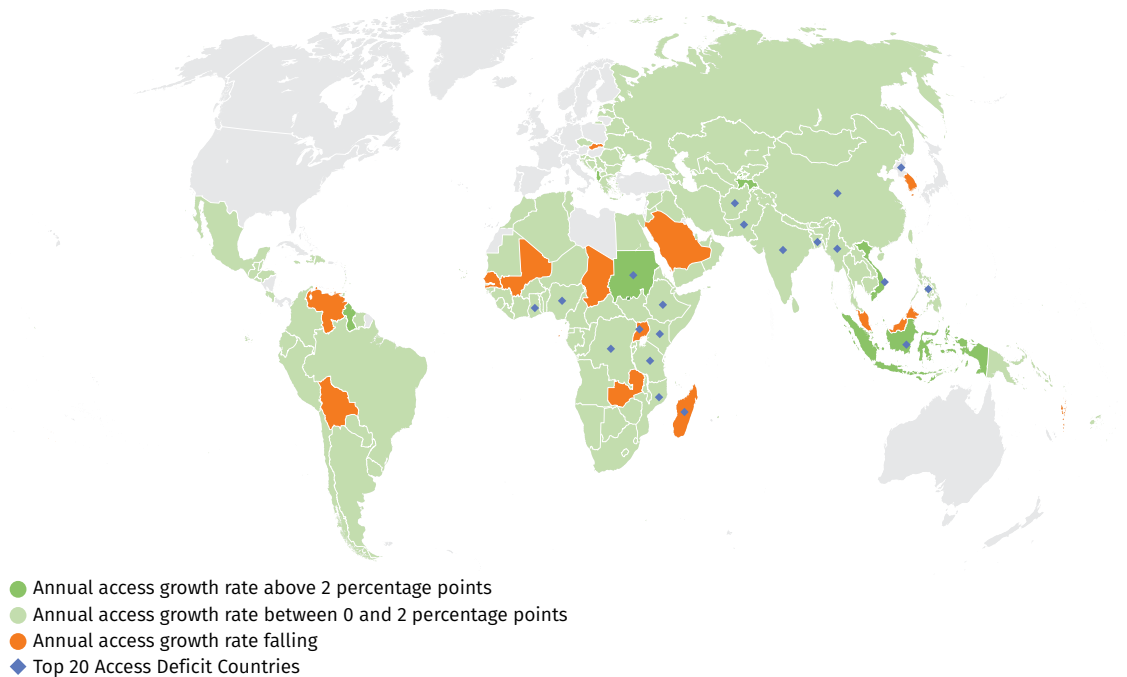
FIGURE 3.12 • The 20 fastest moving countries over the 2010-2016 tracking period



Source: World Health Organization. Population estimates based on the use UN population data

Since 2010, only 7 countries expanded their access to clean cooking at over 2 percentage points annually, and as many as 15 countries saw a decline in access rate from 2010 to 2016

FIGURE 3.13 • Annual increase in clean cooking access rate in 2010-2016 (pp) in access-deficit countries



Source: World Health Organization. Population estimates based on the use UN population data

² Countries with the highest annual increase over the 2010-2016 period

POLICY IMPLICATIONS

Sustainable Development Goal (SDG) 7 calls for universal access by 2030 to affordable, reliable, and modern energy services, including clean fuels and technologies (hereinafter known as “access to clean cooking”). Clean fuels and technologies are also critical for achieving the goals set by other SDGs that pertain to poverty alleviation, good health, gender equality, and climate action. Thus, providing households with universal access to clean cooking is of vital importance in the 153 countries that are still experiencing access-deficit around the world.

Tracking household energy use, including primary and supplementary fuels and technologies for cooking, heating, and lighting, is nevertheless a complex exercise. To improve data collection, the World Health Organization (WHO) in cooperation with Global Alliance for Clean Cookstoves and the World Bank has worked with national surveying agencies, researchers, countries, and other stakeholder groups to enhance and harmonize national-level survey data collection on energy access. This complements the World Bank’s Multi-Tier Framework, which endeavors to capture more detailed information on the cooking system and to distinguish between the various tiers of access on the spectrum of traditional to modern energy services. Further assessment of impacts on health, environment, climate, gender, and livelihood would be crucial to understanding the full burden of traditional fuels and technologies and to fully capture the interactions between the technologies, cooking environment and user’s experience.

In 2016, global access to clean cooking reached 59% from 58 % in 2014. The pace of access gains in 2014–16 was 0.5 percentage points annually and has been declining consistently year on year since 2010. Clean cooking access was provided to an additional 84 million annually in 2014–16, marginally outpacing population growth of 83 million annually. As a result, the absolute access-deficit decreased slightly from 2.986 billion people in 2014 to 2.983 billion in 2016.

At the current annual rate of progress, the world is not on track to meet the 2030 target of universal access to clean cooking. In order to meet the target, the annual growth rate needs to accelerate from 0.5 to 3 percentage points annually for the period 2016–30. In the absence of such acceleration, it is estimated that 2.3 billion people will remain without access to clean cooking in 2030, as projected by the New Policies Scenario of the International Energy Agency (IEA). This shortfall will leave one in three people in India, and a little less than one in two people in Sub-Saharan Africa without access to clean cooking in 2030.

GEOGRAPHIC VARIATIONS

The disparity in access to clean cooking across global regions is particularly stark. The global access-deficit of about 3 billion people is heavily concentrated in three geographic regions: 1.08 billion live in Central Asia and Southern Asia; 881 million live in Eastern Asia and Southeastern Asia; and 862 million live in Sub-Saharan Africa. Compared to 2014, Asian regions decreased their access-deficit by 17 million annually, but this progress was largely offset by a 20 million annual increase in the population without access to clean cooking in Sub-Saharan Africa.

Regional disparity in access can be attributed to several factors, including proactive policies, which in turn facilitate adoption of such fuels and technologies in households. On the other hand, uptake of clean cooking solutions can be limited because of issues of affordability, low awareness and willingness to pay for clean cooking

solutions, easy access to free and traditional fuels, last-mile distribution constraints, and cultural, technical, and environmental factors.

Sub-Saharan Africa saw an increase in access to clean cooking of 0.3 percentage points annually during 2014–16. The slow progress in the uptake of clean cooking solutions in most of the 48 countries in the region is of grave concern. However, Ghana’s success with clean cookstoves and use of clean cooking fuels like LPG, led to an annual increase of close to 1.1 percentage points in its clean cooking access in 2014–16. Uptake of LPG was supported through subsidies from 1990 to 2013, but the improvement in access seen in the recent past is due to Ghana’s economic growth. Several programs provide encouraging examples for other countries to emulate: the Ghana Alliance for Clean Cookstoves and Fuels (GHACCO), a stakeholder platform to help convene the clean cooking sector, that has a target to reach 4 million households by 2020; the government’s efforts to improve safety, availability, and reliability of LPG for cooking; and local efforts to sensitize households on the merits of clean cooking.

Central Asia and Southern Asia gained access by over 1 percentage point annually during 2014–16, with India and Pakistan emerging as regional leaders. India’s expansion of access to clean cooking by over 1 percentage point annually—reaching 41.3% in 2016 from 39.2% in 2014—was supported by policies for increasing clean cooking among the poor. Particularly noteworthy is India’s targeted subsidization of LPG stoves and refills for women living below the poverty line through the Pradhan Mantri Ujjwala Yojana (PMUY program). The PMUY program has already provided over 35 million new clean cooking connections to poor households since 2016. This noteworthy scale-up is further complemented by the Give It Up campaign in India. This campaign aims to motivate LPG users who can afford to pay the market price for LPG to voluntarily surrender their LPG subsidy so it can be extended to the poor.

A clean cooking access gain of 0.8 percentage points in Eastern Asia and Southeastern Asia was driven by expansion in China, Indonesia, and Vietnam, with the region expanding its share of access to clean cooking from 59% in 2014 to 60% in 2016. In China, residential biomass use has been declining 6% per year since 2010, largely replaced by natural gas, LPG, biogas, and electricity demand—especially in urban areas driven by policy efforts targeting clean cooking (WHO 2016). Vietnam has made remarkable access gains of over 3 percentage points annually since 2010, mainly driven by nongovernmental organizations with some support from the government in the form of price stabilization for LPG.

It is pertinent to note that countries like China, India, Pakistan, Indonesia, and Vietnam—all of which except China are lower-middle-income countries—have been able to make progress despite their large and growing populations. This progress has been enabled by the growth in per capita income that has helped lower their primary reliance on inefficient solid biomass stoves. However, the lag in progress in low-income countries, some of which have seen a decline in access, indicates that these countries are unable to benefit from advances in clean cooking fuels and technologies. Therefore, they may not be able to leapfrog and replicate, in the short term, what other countries have accomplished. For such countries, the low-emission stoves serve as an important transitional solution—with some benefits for health and livelihoods—until they can graduate to the cleanest solutions.

The factors driving regional disparities also influence urban and rural access to clean cooking. In every region of the world, a significantly higher fraction of the urban population has access to clean cooking compared to the rural population. In 2016, 68% of the rural population relied primarily on traditional fuels for cooking, whereas only 17% of the urban population was exposed to traditional fuels. The disparity in rural-urban population access is most pronounced in Eastern Asia and Southeastern Asia where urban access is 85% and rural access is 15%. In Sub-Saharan Africa, overall access, while low at 13%, has a smaller disparity of 25% between rural and urban distribution of access to clean cooking.

The IEA's New Policies Scenario predicts the urban penetration of clean fuels will reach 95% in 2030; primary reliance on traditional fuels and technology for cooking will predominantly become a rural issue. Of the population without access, 1.8 billion people will be in rural areas and remain reliant on the traditional use of biomass. For achieving universal access to clean cooking, different tailored approaches need to be adopted for rural and urban contexts. Although deployment of LPG, natural gas, and electricity for cooking is the most viable solution in urban areas with high population density, diffusion of cleaner low-emission biomass cookstoves may serve as a transitional solution for very poor and remote rural areas with lower population density.

COUNTRY ANALYSIS

Top 20 access-deficit countries

Universal access to clean cooking in the top 20 access-deficit countries accounted for 83% or 2.47 billion of the global clean cooking access- deficit in 2016. Nine of the 20 countries are in Sub-Saharan Africa, 6 in Eastern Asia and Southeastern Asia, 4 in Central Asia and Southern Asia, and 1 in Western Asia and Northern Africa. In 2014–16, several clean cooking access-deficit countries embarked upon unique journeys to fulfill the targets under SDG 7.

In 2016, 90% of the top 20 access-deficit countries increased their share of access to clean cooking; Vietnam and Indonesia led the group with gains of over 3 percentage points annually. The top 20 access-deficit countries progressed faster than the global average, increasing access by close to 1 percentage point. Eight of 20 countries have been annually increasing access to clean cooking by 1 or more percentage points since 2010. However, in only 9 countries did access expansion outpace population growth. Uganda and Madagascar not only failed to make any improvements in access to clean cooking but their access rates also actually declined since 2010.

Countries with the lowest clean cooking access rate

The 20 countries with the lowest rates of access to clean cooking saw a marginal growth of a little over 0.3 percentage points annually in their combined access rate from 2014 to 2016, although only 16 of these countries showed actual individual increase. The progress in clean cooking access has remained constantly poor in these countries since 2010, with declining access rates in Chad, Madagascar, Mali, and Uganda, and cumulative progress for the group lingering at about 0.3 percentage points annually.

Fastest-moving countries

The 20 fastest-moving countries added 21 million annually to the population with access to clean cooking in 2014–16. These countries made access gains of 1.6 percentage points annually during 201–16, over 1 percentage point higher than the global average growth rate of 0.5 percentage points. Access growth rates in these 20 countries have consistently outpaced the global average by over 1 percentage point since 2010.

CONCLUSIONS

Lack of access to clean cooking disproportionately impacts women compared to men. In many countries, gender roles dictate that women and girls act as the primary procurers and users of cooking fuel, resulting in a gender disparity in exposure to traditional household air pollution and the drudgery of traditional cooking practices. In this context, governments should ensure that policies and programs to promote clean cooking are well-informed by gender considerations. Universal access to modern energy cooking services is predicated on a multi-sectoral approach, from technological development, to awareness raising and behavior change campaign, to private sector development and financing. It is critical to unite all forces and seek guidance from all stakeholders, particularly women, to shift the needle on universal access.

Although an increasing number of countries are beginning to show acceleration in access to clean cooking, the world has shown slow progress and challenges remain, notably in rural areas.

On the demand side, barriers persist because of the prevalence of fuel and stove stacking—when households use a combination of modern and traditional cooking solutions instead of completely transitioning to modern options. Full adoption is further impeded by the lack of affordability of clean solutions; consumer preferences; and poor understanding of the health and environmental benefits and time savings of clean cooking. Cooking practices are entrenched in household culture, and mere access to clean energy fuels and technology does not ensure their use. Therefore, messaging that highlights the benefits in terms of cleanliness, convenience, durability, ease of use and fuel processing, availability and affordability of fuel, and cultural appropriateness must be devised.

Ensuring maximum benefits from the energy transition requires renewed focus on scaling up cooking solutions that are clean for health, as defined by the WHO Guidelines for indoor air quality: household fuel combustion. Maximum benefits can be ensured only if all energy household uses (cooking, heating, and lighting) transition to exclusive use of clean fuels and technologies. During the process of shifting to exclusive use of clean cooking fuels and technologies, transitional options that can provide some health and environmental benefits should be promoted. For example, high-performing biomass stoves can be a transitional or interim solution where infrastructure barriers prevent access to the cleanest options (such as electricity, LPG, and ethanol fuels). Although factors beyond the fuel and technology used for cooking (for example, ventilation, time spent cooking, and so on) can also play an important role in determining the ultimate health impact, certain fuels and technologies are always clean for health at the point of use, including LPG, electricity, natural gas, ethanol, biogas, and solar. In order to ensure that these transitional fuels and technologies are as clean as possible, the performance of these options should be verified with laboratory and field-testing.

A poor enabling environment with policies that limit sector growth, and the lack of cross-sectoral coordination prevent countries from accelerating the adoption of clean cooking solutions. Where clean cooking fuels and technologies are reliably and affordably available, they should be scaled up with the help of enabling government policies and investment that supports enterprise growth. Therefore, equally important is the role of governments—potentially supported by the international community—in increasing investments and overcoming barriers to lift liquidity constraints, improve the access to clean alternatives, crowd in private investments, and increase the reliability of clean fuel delivery and availability. Mainstreaming clean cooking solutions will help accelerate diffusion and shift the needle on universal clean cooking access. In countries with a high reliance on the traditional inefficient cookstove and fuel combinations, the government needs to translate global commitments into concrete, implementable domestic policies and plans that increase access to clean and modern cooking

energy. Those that have already taken laudable steps toward national plans must accelerate the implementation of such plans.

With over 40% of the global population continuing to face the health risks and the environmental and climate impacts of cooking fuels and technologies, there is a pressing need for multi-sectoral action to expedite the diffusion of clean cooking solutions. WHO estimates that exposure to traditional cooking fuels causes some 4 million premature deaths each year, and 54% of them are women and children (WHO 2016). Furthermore, emissions from traditional cookstoves and fuels also slow progress on gender, environment, and climate goals. It is therefore imperative to identify synergies where clean and modern household energy could be mainstreamed or incorporated into other programs and policies, including those concerning mitigation of climate change, sanitation improvement, and maternal and child health programs.

METHODOLOGY

Data sources

WHO's Household Energy Database, which collects nationally representative household survey data from various sources (table 3A.1) was used as input for the model. The database contained 1112 surveys collected from 161 countries (including high-income countries) between 1970 and 2016. The countries provided for cooking are only those with underlying data, so there are no estimates for Lebanon, Libya, and Turkey.

TABLE A3.1 • Overview of data sources for clean fuels and technologies

Name	Entity	Number of countries	Distribution of data sources	Question
Census	National statistical agencies	194	17.45%	What is the main source of cooking fuel in your household?
Demographic and Health Survey (DHS)	Funded by USAID; implemented by ICF International	194	17.45%	What type of fuel does your household mainly use for cooking?
Living Standard Measurement Survey, income expenditure survey, or other national surveys	National statistical agencies, supported by the World Bank	39	3.51%	Which is the main source of energy for cooking?
Multi-indicator cluster survey	UNICEF	127	11.42%	What type of fuel does your household mainly use for cooking?
World Health Survey	WHO	49	4.41%	
Survey on global AGEING (SAGE)³	WHO	6	0.54%	
National Survey		369	33.18%	
Other		134	12.05%	

Population data from United Nations Population Division was used.

³ The WHO SAGE is a national survey related to aging which includes a question on household fuel use. SAGE is "Survey on global AGEING". <http://www.who.int/healthinfo/sage/en/>

Estimating missing values

As household surveys are conducted irregularly, a multilevel nonparametric modeling approach developed by the WHO was adopted to estimate missing values in between surveys.⁴

For clean cooking fuels, only the model estimates are used because of large variances in survey results.

Multilevel nonparametric modeling takes into account the hierarchical structure of the data: survey points are correlated within countries, which are then clustered within regions. Time is the only explanatory variable; no covariates are used. Regional groupings are based on WHO regions.⁵

Calculating the annual growth rate

The annual increase in the access rate is calculated as the difference between the access rate in year 2 and that in year 1, divided by the number of years to annualize the value:

$$(\text{Access Rate Year 2} - \text{Access Rate Year 1}) / (\text{Year 2} - \text{Year 1})$$

This approach takes population growth into account by working with the final national access rate.

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⁴ Ongoing work, will be made available on the WHO website in 2018

⁵ WHO regions are African Region, Region of the Americas, South-East Asia Region, European Region, Eastern Mediterranean Region, and Western Pacific Region.