(Child drinking water, n.d.)

IMPROVING HEALTH IN ETHIOPIA

Interventions on malnutition, air pollution and water, sanitation and hygiene

Executive summary

The three major health risk factors in Ethiopia, malnutrition, air pollution and low access to sanitation, cause countless deaths and impairments in the population. The following policy brief offers recommendations on evidence-based interventions that the Ministry of Health can implement to improve the health and life of the Ethiopian population.

TUM
Technische Universität München

SUSTAINABLE DEVELOPMENT G⚙ALS

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The National Health System

With a population of 112 million people, Ethiopia is the second largest country in Africa (United Nations DESA, 2019). Only 20% of the households lie in the urban area; most of the population lives in dislocated rural areas (Britannica, 2022).

The budget
In 2019 Ethiopia's **annual GDP per capita** was **944 US$** (classified as a low-income country) (The World Bank, 2022a).
In future years, public spending should focus on the economically disadvantaged population, since "the poorest 20% of the population receive **less than 4% of the total share of public spending on health**" (Hailu, Gebreyes, and Norheim, 2021).

The impact of Covid-19 on the health sector
Due to the pandemic, more resources have been moved towards the treatment of Covid-19 patients and away from health care services for the prevention and treatment of other diseases. Vaccinations for polio and measles have been suspended in 2020. Also the treatment of malnutrition has decreased due to a shift in attention to Covid-19 patients or due to fear of infection during health visits (Unicef, 2019).

The National Health System

Physicians: 0.1 per 1000 people (2016)
- lack of specialized personnel in health facilities (The World Bank, 2022b).

Hospital beds: 0.3 per 1000 people (2016)
- mostly in urban areas: rural population lacks access to hospital services (The World Bank, 2022c; Hailu, Gebreyes, and Norheim, 2021).

HSTPII: The Health Sector Transformation Plan (2019/20-2024/25)

In February 2021, the Ministry of Health of Ethiopia published the second Health Sector Transformation Plan.
Its main goals were:
- "**universal health coverage**,
- protecting populations during **health emergencies**,
- transforming **woredas** [administrative districts at sub-regional level] and
- improving the health system's responsiveness." (Ethiopian Ministry of Health, 2021)

Global Burden of Disease Project

The GBD quantifies the most important health trends of a country. In Ethiopia, the risk factors, which cause the most death and disability combined (DALYs) are **malnutrition**, **air pollution** and **WASH** (unsafe water sanitation and hygiene) (Murray *et al*., 2020) (**Figure 1**).

A reduction of these risk factors means a step towards the achievement of various Sustainable Development Goals: **SDG 2, SDG 3, SDG 6, SDG 7, SDG 11 and SDG 12** (United Nations DESA 2022; Elder and Zusman, 2016; World Health Organization, 2022).

> **Randomized controlled studies**:
> "A study in which the participants are divided by chance into separate groups that compare different treatments or other interventions" (National Cancer Institute, 2019).
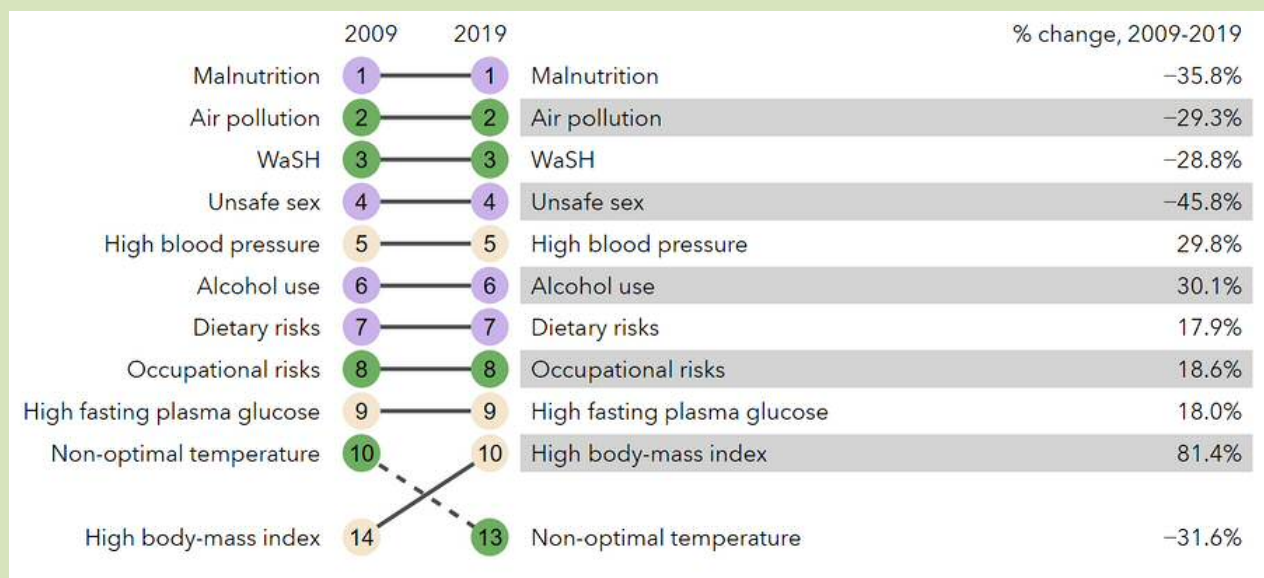
The objective

This policy brief proposes policy interventions for the reduction of said risks. The recommendations rely on **18 systematic** and 2 literary **reviews**.

A systematic review summarizes and interprets previously published papers on a specific topic (Uman, 2011).

When sufficient literature was provided, reviews with randomized-controlled studies (**RCTs**) were preferred. The recommendations are only based on findings with medium or high certainty of evidence.

Figure 1: Top 10 risks leading to total number of DALYs in 2019 and percentage change 2009-2019, all ages combined (IHME, 2015)

	2009	2019		% change, 2009-2019
Malnutrition	1	1	Malnutrition	−35.8%
Air pollution	2	2	Air pollution	−29.3%
WaSH	3	3	WaSH	−28.8%
Unsafe sex	4	4	Unsafe sex	−45.8%
High blood pressure	5	5	High blood pressure	29.8%
Alcohol use	6	6	Alcohol use	30.1%
Dietary risks	7	7	Dietary risks	17.9%
Occupational risks	8	8	Occupational risks	18.6%
High fasting plasma glucose	9	9	High fasting plasma glucose	18.0%
Non-optimal temperature	10	10	High body-mass index	81.4%
High body-mass index	14	13	Non-optimal temperature	−31.6%

Malnutrition

Now more than ever

In Ethiopia, 38% of children under 5 years are stunted (Unicef, 2017). This number is expected to increase due to the indirect effects of the Covid-19 pandemic, the recent **desert locust invasion** and **climate change**. With the pandemic and the closure of schools, one million children have no access to school meals. The admission of severely malnourished children increased by an average of 20% from January to February 2020 (base year 2019) in the regions where the locust invasion caused more damages (Khodr, 2020).

The most affected population groups

In rural areas, child malnutrition is more prevalent than in urban areas; specifically, in the regions Tigray and Amhara. Boys are generally more subject to malnutrition than girls. Evidence shows that for children living with women who have a lower education level, malnutrition is higher (Mohammed *et al*.,2020).

Far reaching consequences

Malnutrition can lead to both short-term and long-term health consequences for the children

Malnutrition also bears **economic consequences**: the health status of future generations is tied with great financial costs to the health system. Poor health in the population leads to reduced work productivity and reduced economic growth (Alderman, Hoddinott and Kinsey, 2006; Getahun *et al*., 2017; de Onis and Branca, 2016).

Policy recommendations for the reduction of malnutrition

1. **Assure adoption of universal infant and young child feeding (IYCF)** recommendations of WHO and UNICEF

To improve the children's nutritional status, the WHO recommends:

- **early breastfeeding:** UNICEF reports that in Ethiopia, the early initiation of breastfeeding resulted in a 20% decrease of newborn deaths (Khodr, 2020)
- **dietary diversity, meal frequency and complementary feeding:** 90% of children in Ethiopia had a suboptimal diet quality (Mohammed *et al*., 2020)
- **micronutrients supplementation** (Mohammed *et al*., 2020).

Short-term health consequences	Long-term health consequences
- high child morbidity and mortality - poor physical, development (Smith and Haddad, 2014)	- poor educational performance - chronic diseases during adulthood: obesity, cardiovascular morbidity, and mortality (Alderman, Hoddinott and Kinsey, 2006)

2. Distribute high-protein nutritional supplements to treat severe malnutrition: standard and oleic RUFT

Standard ready-to-use therapeutic food (RUFT) and oleic RUFT was found to reduce **wasting** and increase weight gain compared to the non-milk-based RUFT and F100 (therapeutic milk products) in children under 5 years of age (Das *et al*., 2020)

> **WHO classifications of malnutrition relevant for Ethiopia:**
>
> **Undernutrition**:
> - Stunting: Low height for age
> - Underweight: low weight for age
> - Wasting: low weight for height
>
> **Micronutrient deficiencies**:
> - Lack of important vitamins and minerals
>
> (World Health Organization, 2021)

3. Distribute micronutrients to children and mothers: vitamin A and iron folic acid supplementation

In Ethiopia vitamin A led to a 23% reduction in child mortality and iron folic acid to a 27% reduction in anemia for pregnant women (Khodr, 2020).

4. Use of iron-containing cookware

The distribution of iron-containing cookware was found to increase Hemoglobin in 37,5% and iron status in 50% of treated children, compared to children eating from aluminum pots. This intervention is also more cost-effective than iron supplementation interventions (Alves, Saleh and Alafoè, 2019).

5. Favor home-based therapy

Home-based therapy was proved to increase recovery rates and decrease wasting among children with severe acute malnutrition compared to inpatient and rehabilitation care. Home-based therapy is also more cost-effective (Das *et al*., 2020).

6. Establish more decentralized health posts

In rural areas, mothers and children have to travel long distances to reach the health sites. Decentralized health posts improved accessibility and decreased the number of children without proper care (Akparibo, Booth and Lee, 2017).

7. Combining WASH and nutrition interventions for tackling stunting and wasting

For children in their first 1000 days of life, the combination of WASH and nutrition interventions led to a decrease in stunting and wasting (Bekele, Rawstone and Rahman, 2020). The health strategy against malnutrition should thus follow a wholistic approach.

Air Pollution

Ambient air pollution
Only in the capital Addis Ababa, **17.7% of the annual deaths** in 2020 can be traced back to the city's air pollution level. Ethiopia does not meet the WHO air quality guidelines about the annual average concentration of the atmospheric particulate matter PM2.5 (Kumie *et al*., 2021).

In the urban area, the ambient air pollution comes from burning of refuse, vehicles and industry (Kumie *et al*., 2021). With a steadily increasing industrialization, Ethiopia's ambient air pollution is expected to worsen (Murray *et al*. 2020; Global Burden of Disease, 2022).

Household air pollution
In the rural area, household air pollution is more prominent. "**97% of the households in rural areas**" use a traditional three-stone stove "Sost-gulicha". It is used with solid biomass fuels, like "wood, animal dung, and crops residues" as primary energy sources (Quansah *et al*. 2017).

With the burning of biomass fuels and scarce ventilation, numerous **health damaging gases** can be produced in households. These include carbon monoxide (CO), fine particulate matter (PM) and nitrogen oxides (NOx) (Quansah *et al*. 2017).

The most affected population groups
In the capital Addis Ababa, people from lower socioeconomic status report that there are no green areas in the disadvantaged city districts they live in (Flanagan *et al*. 2021).
In rural areas, interventions are specifically needed for protecting women, young girls and elderly people. This population group is overexposed to indoor air pollution, spending most of their time indoors or cooking: **In Ethiopia, women are often subject to pollutants up to 4 hours daily** (Tefera *et al*. 2016).

Health consequences
Air pollution can worsen already existing health issues and it has been linked to "**respiratory tract infection**, exacerbation of inflammatory lung conditions, cardiac events, asthma [...] and low birth weight" (Quansah *et al*. 2017).

Furthermore, air pollution has a direct effect on climate change, thus concerning the entire world population (Flanagan *et al*. 2021).

Policy recommendations for the reduction of ambient and household air pollution.

Ambient air measures

1. **Introduce green areas and vegetation – reduce excessive construction**

Green Areas can reduce both air pollution and decrease the city's temperature. In Addis Ababa, in 30 years the constructed area has increased around 16%. As a result, the city's surface temperature has increased 3-8°C (Flanagan *et al*. 2021).

2. **Prevent open burning of refuse**

"Over 50% of the urban population practice open burning". A regular collection of solid waste by the municipal solid waste management system, the education of the communities regarding waste disposal and the enforcement of waste recycling system can reduce the burning of refuse (Hirpe and Yeom, 2021).

Ambient + household air measures

3. **Monitor ambient and household air pollution**

The coordination among Ethiopian ministries to enforce air pollution standards is insufficient. Allocating resources and clear responsibilities to trained experts can improve coordination (Tefera *et al*. 2016).

Systematic monitoring of air pollution is only practiced in Addis Ababa. **Monitoring sites** should be placed in urban and **rural areas**. (Thomas *et al*. 2015).

4. **Tackle ambient and household air pollution together**

Research has shown that the effect of stand-alone interventions on the peoples' health is not significant because of various pollution sources like neighboring homes, refuse burning and transportation (Pope *et al*. 2021). Indoors and outdoors air pollution should be addressed together.

Household air measures

5. **Move away from solid fuels to clean fuels: Liquid Petroleum Gas**

A systematic review on fuels used for cooking, found that, compared to other liquid fuels, only Liquefied Petroleum Gas (LPG) led to **PM2.5 levels** that are within the **WHO guidelines** (Pope *et al*. 2021).

6. **Replace traditional cookstoves with improved sustainable cookstoves**

Improved cookstoves can reduce various respiratory symptoms, like "dry cough, chest tightness [and] difficulty breathing" (Quansah *et al*., 2016).

Traditional cooking stoves should be collected to **avoid their continued use**.

New improved cookstoves should be distributed (Thomas *et al*. 2015). They should reflect the needs and preferences of the households, i.e. functioning with clean fuels and including three burners to allow cooking with multiple pots.

Water, Sanitation and Hygiene: WASH

In the last 20 years, Ethiopia recorded a significant progress in the improvement of WASH. Through the ONE WASH national program (2015-2019) the access to drinking water increased to 69% in 2019. Still, **31% of the population remains without access to safe water** (EPHI, 2021).

Regarding sanitation, the country reports that open defecation has decreased from 81.9% in 2000 to 28.5% in 2019 (CSR and ORC, 2001; EPHI, 2021). Nevertheless, **only 7% of the present facilities meet the hygienic standards** (Novotný and Mamo, 2022; Unicef, 2018).
Figure 2 compares Ethiopia with other low income countries, regarding the share of urban population using at least basic sanitation services in 2020 (Our World in Data, 2022).

The WASH strategy of the Health Sector Transformation Plan of Ethiopia (HSTP II) relied on the distribution of **subsidies** for the construction of sanitation facilities and on an intervention strategy called **Community-Led Total Sanitation (CLTS)** (Ethiopian Ministry of Health, 2013). This approach aims to mobilize the targeted community to work together on sanitation accessibility. CLTS successfully increased the latrine coverage throughout the country. There is limited evidence supporting a positive influence of the CLTS approach on health outcomes. Nonetheless, sanitary facilities should be improved, since access to sanitation is a **human right**. (Venkataramanan *et al.*, 2018; Kanda, Ncube and Voyi, 2021).

The most affected population
Poor access to WASH disproportionately affects the rural population. Half of the households in urban areas have access to water on their buildings, compared to only 7% of **rural households**. 28% of rural households "travel 30 minutes or longer" to collect drinking water (EPHI, 2021).

Women are also a risk population for low access to WASH. The households that are headed by women have generally worse sanitation conditions due to "socioeconomic, [...] cultural, [...] and traditional gender roles factors (Novotný and Mamo, 2022). Furthermore, practicing **open defecation** can endanger the **safety** of women who are then exposed to abusive behavior during a vulnerable situation (Venkataramanan *et al.*, 2018).

Health consequences
Low WASH standards can cause diarrheal diseases, which is the second cause of death and disability in Ethiopia (Vos *et al.*, 2020).
The waterborne infections like diarrhea and parasitic infections can in turn lead to stunting. In the case of continuous exposure to these infections, children can develop a condition of **chronic inflammation**, which brings various medical conditions, including chronic malabsorption and other intestinal diseases (Gizaw and Worku, 2019). WASH and Malnutrition interventions should thus be addressed together.

Policy recommendations for the improvement of WASH

Drinking water measures

1. Implement Point of Use Water Treatment (PoUWT)

PoUWT eliminates harmful pathogens in the water supply by treating the water the moment it arrives at the end user, i.e. the household. The systematic review of Wolf found that PoUWT can decrease "diarrhea risk up to 50% compared to untreated water" through the filtration technologies of solar treatment and chlorination (Wolf *et al*., 2022).

2. PoUWT for intermittent water supply sources

The water supply of many rural households is intermittent due to scarce water sources or damaged pipelines. This increases pathogens in the water. PoUWT should be especially introduced in households with intermittent water supply (Wolf *et al*., 2022).

Sanitation measures

The CLTS approach is one way to achieve improved sanitation. It consists of **three phases**:

- pre-triggering: preparation for the intervention
- triggering: intervention roll out
- post-triggering: after the intervention (Venkataramanan *et al*., 2018).

Pre-triggering:

3. CLTS on selected communities

CLTS should be implemented in rural communities with a maximum population of 3000 people. The targeted communities should lie near villages where CLTS was already implemented and far from sites where the Ethiopian national sanitation policy distributed subsidies (Venkataramanan *et al*., 2018).

4. Coordination and planning between CLTS and national sanitation policy

Various studies report that the national sanitation policy interfered with the CLTS roll-out and its results, since it "led to a focus on rapid latrine construction rather than behavior change" and diminished the effect of a community-led improvement of sanitation (Venkataramanan *et al*., 2018). The national sanitation policy should thus only target communities that are not suited for CLTS.

5. Focus on high-quality and durable sanitary facilities

In 2020, in Ethiopia "only 7% of [the sanitation facilities] were classified as safely managed". The focus of CLTS should be diverted from increasing area coverage of facilities to the construction of higher-quality and **more durable latrines**. If the maintenance of latrines is neglected, Ethiopia may risk a relapse into higher rates of open defecation (Novotný and Mamo, 2022).

Triggering:

6. Select skilled facilitators and adopt effective narratives

A skilled facilitator that proposes a successful narrative, can motivate a community to change behavior towards more hygienic practices. In a systematic review Novotný argues that both non-health motivations, like "**convenience, privacy** and **safety**" **and health motivations**, like the reduction in infections, should be adopted (Novotný and Mamo, 2022).

The narrative of shaming for lack of hygiene "has shown to be effective". It should nevertheless be avoided, since it may not generate a long-term behavior change (Venkataramanan *et al*., 2018).

7. Provide and teach technical skills

Venkataramanan reports that, in CLTS, active community members often requested technical support and **guidance** for the construction of high-quality latrines (Venkataramanan *et al*., 2018). Providing technical know-how can ensure the long-term maintenance and durability of latrines by the hands of the communities themselves.

Post-triggering:

8. Long-term follow-up periods

Specialists should set targets and periodically measure whether the coverage and quality of sanitation facilities continues to improve even after the triggering phase (Venkataramanan *et al*., 2018).

A long-term analysis of the intervention can shed light on the **possible effects of CLTS on health outcomes**, like open defecation, waterborne infections and stunting, as there is still limited evidence in literature (Venkataramanan *et al*., 2018).

> **Hygiene measures**

9. Complement WASH interventions with education on hygiene behavior

A review on school sanitation, found that the students' exposure to pathogens decreased only if the construction of latrines was combined with educational interventions on hygienic behavior (Igaki *et al*., 2021). Encouraging people to wash their hands with soap can lead to a **30% reduction in risk of diarrhea**, compared to not encouraging (Wolf *et al*., 2022)

Figure 2: (Our World in Data, 2022).
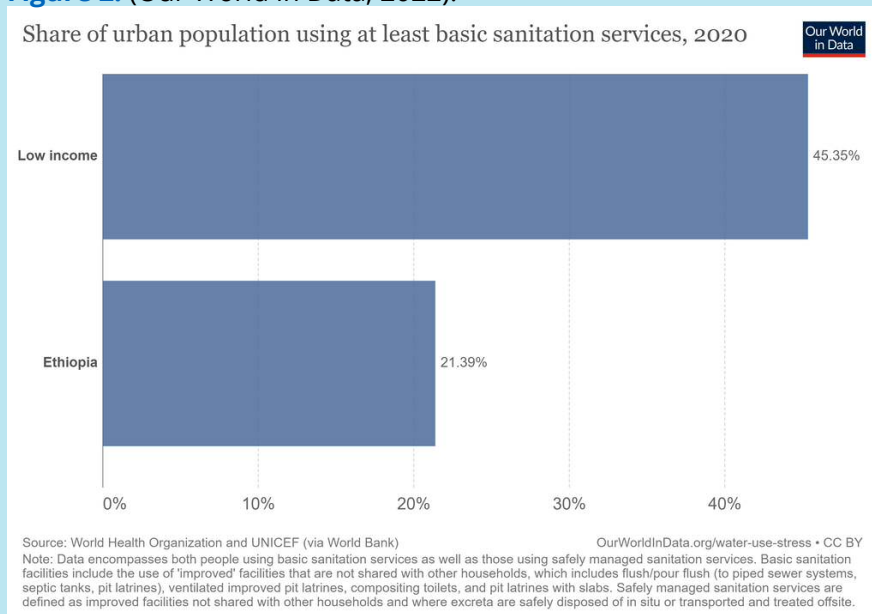
> **To improve the health status of the Ethiopian population on the short and long run, the Ministry of Health should consider implementing the proposed interventions on malnutrition, air pollution and improved WASH.**

Abbreviations:

CLTS Community-Led Total Sanitation

DALYs disability-adjusted life years

HSTPII The Health Sector Transformation Plan

PM2.5 particulate matter with a diameter of less than 2·5 μm

PoUWT Point of Use Water Treatment

RUFT Ready-to-use therapeutic food

WASH Water Sanitation and Hygiene

WHO World Health Organization

Technische Universität München

THE GLOBAL GOALS

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