Health impact of Government of India's Jal Jeevan Mission

A simulation of diarrhoea deaths and DALYs averted

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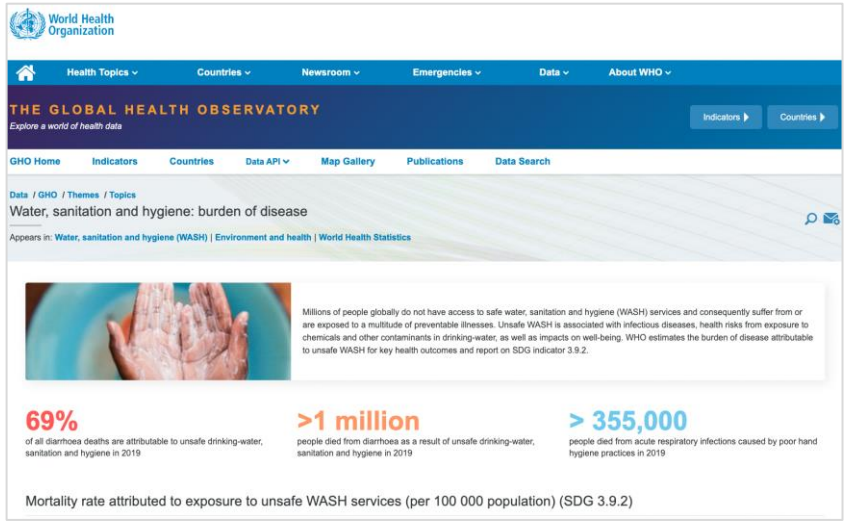
World Health Organization

Background: SDG indicator 3.9.2

Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

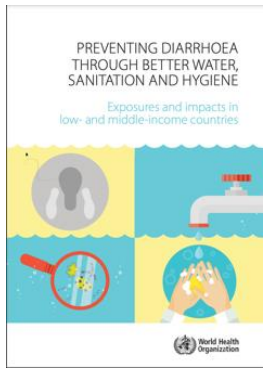
Indicator 3.9.2: Mortality rate attributed to unsafe water, sanitation, hygiene

Access data via Global Health Observatory portal



Read summary reports on the WHO website here

2012



2016

2019

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Background: burden of disease attributable to unsafe WASH: 2019 India estimates

SDG 3.9.2: Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene: **36.4 deaths/100,000 population**

Disease	Deaths	DALYs
Diarrhoea	**445 638**	**15 769 606**
Acute respiratory infections	**51 740**	**2 251 918**
Intestinal nematode infections	126	341 899
Protein-energy malnutrition (only U5)	234	59 843
TOTAL	**497 738**	**18 423 266**

Source: WHO 2023

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Estimating health gains from JJM: methods

Scenario 1:

Jal Jeevan Mission

How many diarrhoea deaths and DALYs over the programme period, with delivery of the Government of India's mission to provide all households in rural India with safe and adequate drinking-water through individual household tap connections?

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Scenario 2:

Business as usual

How many diarrhoea deaths and DALYs over the programme period, without this additional investment?

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Deaths and DALYs averted

JJM health impact

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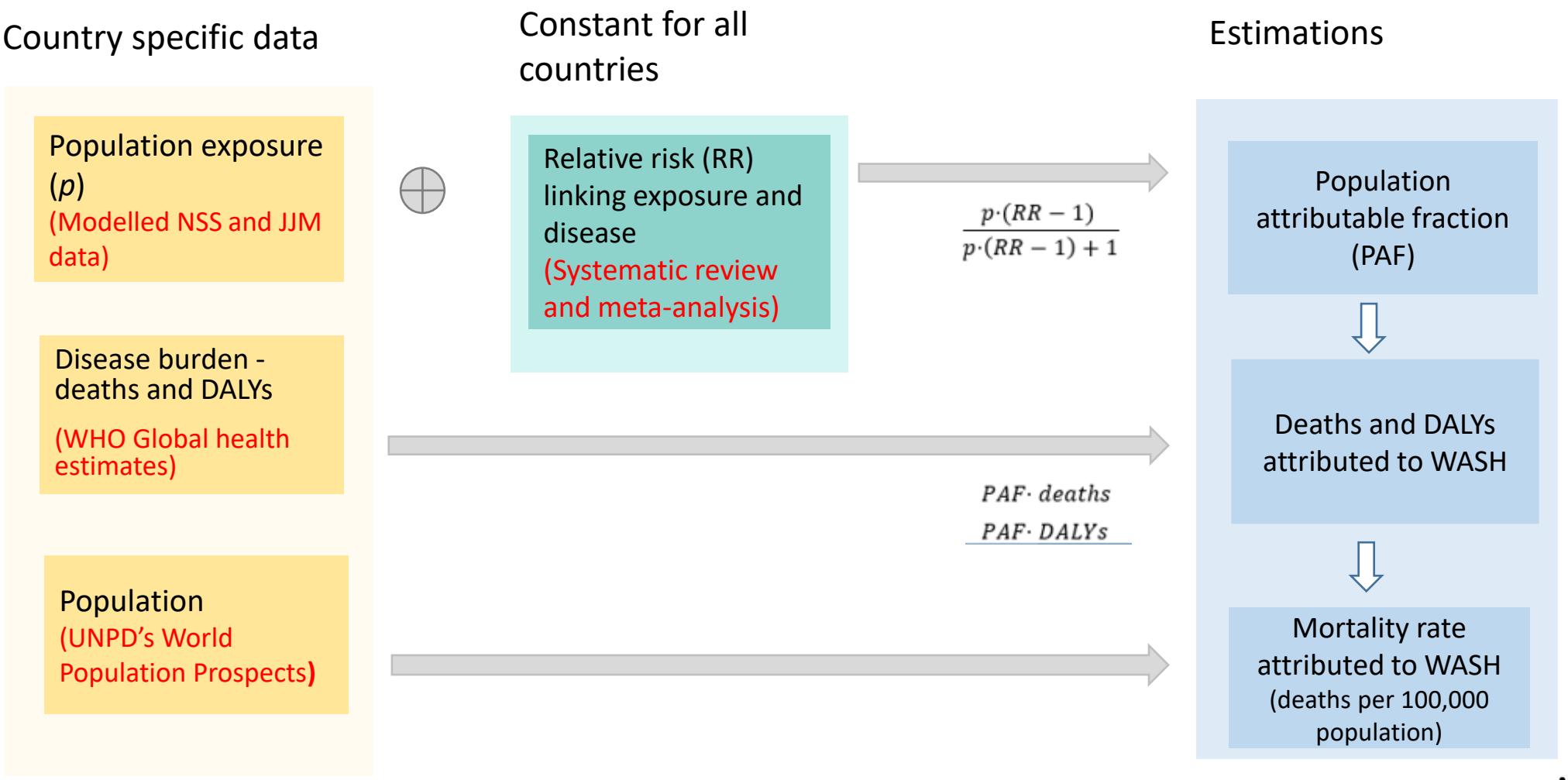
Data sources



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Drinking-water exposures

Baseline

Calculated using a combination of data from the 2018 NSS and data routinely collected by the JJM.

Calculated from the data collected in the 2018 NSS. Urban and rural areas, and national.

SERVICE LEVEL	DEFINITION
SAFELY MANAGED	Drinking water from an improved source that is accessible on premises, available when needed and free from faecal and priority chemical contamination
BASIC	Drinking water from an improved source, provided collection time is not more than 30 minutes for a round trip, including queuing
LIMITED	Drinking water from an improved source, for which collection time exceeds 30 minutes for a round trip, including queuing
UNIMPROVED	Drinking water from an unprotected dug well or unprotected spring
SURFACE WATER	Drinking water directly from a river, dam, lake, pond, stream, canal or irrigation canal

Programme period

Scenario 1

Projected linearly on the assumption that the JJM will result in 100% coverage of safely managed drinking-water services.

Scenario 2

Projected based on the historical change rate of 0.5% per year published by the JMP (WHO/UNICEF, 2021).

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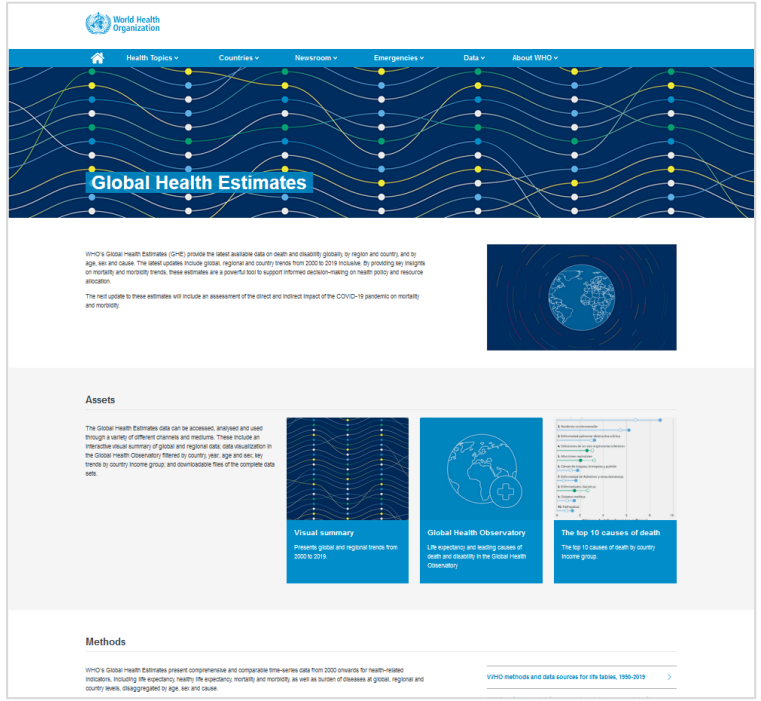
Total diarrhoeal disease burden

- **Diarrhoea deaths and DALYs:** Total number of diarrhoea deaths and DALYs in **India** in 2018 were extracted from the **WHO Global Health Estimates**, which reports cause-specific mortality and disease burden by country for 2000-2019 (https://www.who.int/data/global-health-estimates).
- **Projections:** For both scenarios, annual diarrhoea deaths and DALYs were calculated using the 2018 ratio of diarrhoea deaths and DALYs to total population and applying it to annual population figures over the programme period.



Population

- 26th round of the UN Population Division's revision of the World's Population Prospects (UNPD, 2019).

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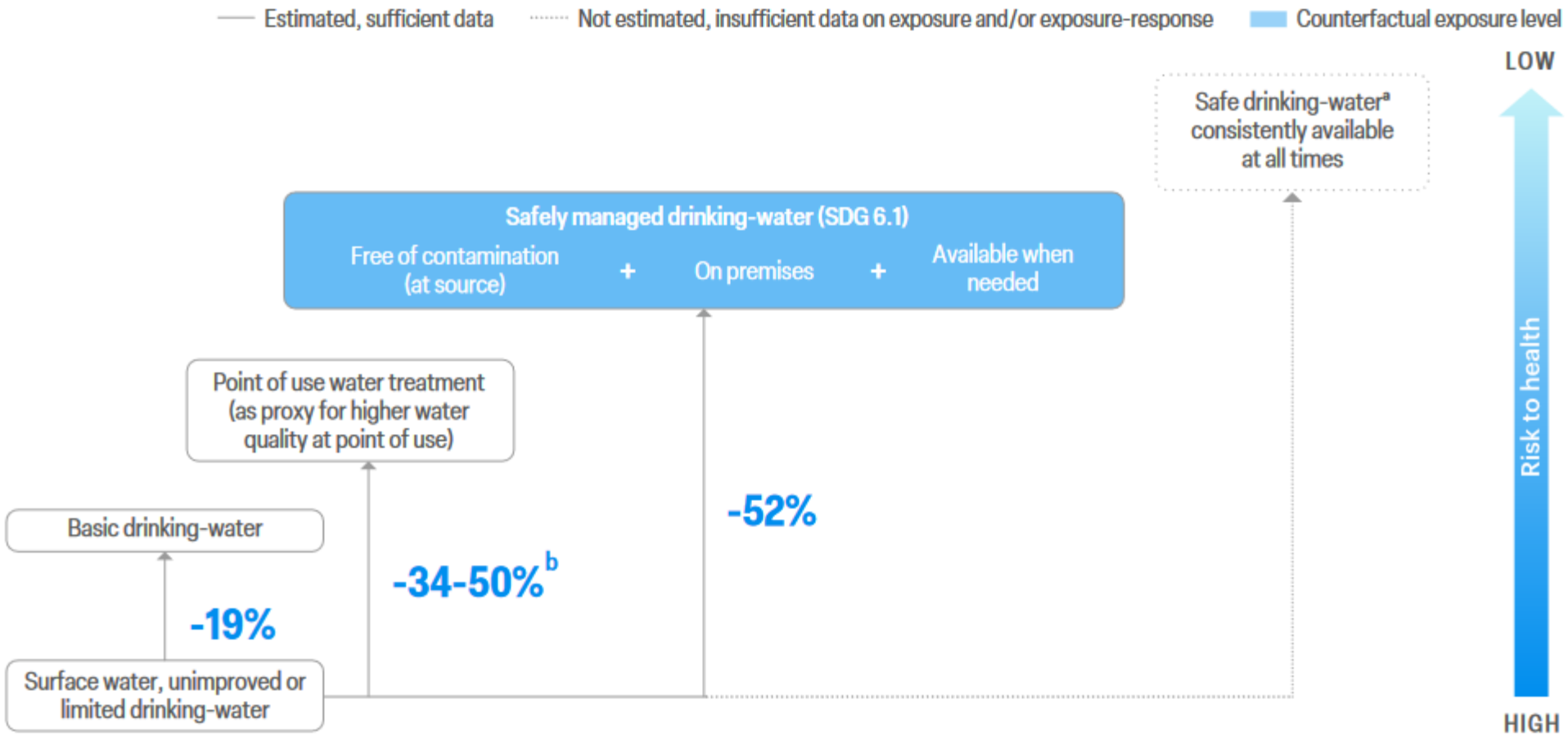
Exposure-response
Impact of drinking water interventions on diarrhoea



Source: Adapted from Wolf et al. 2022: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(22)00937-0/fulltext

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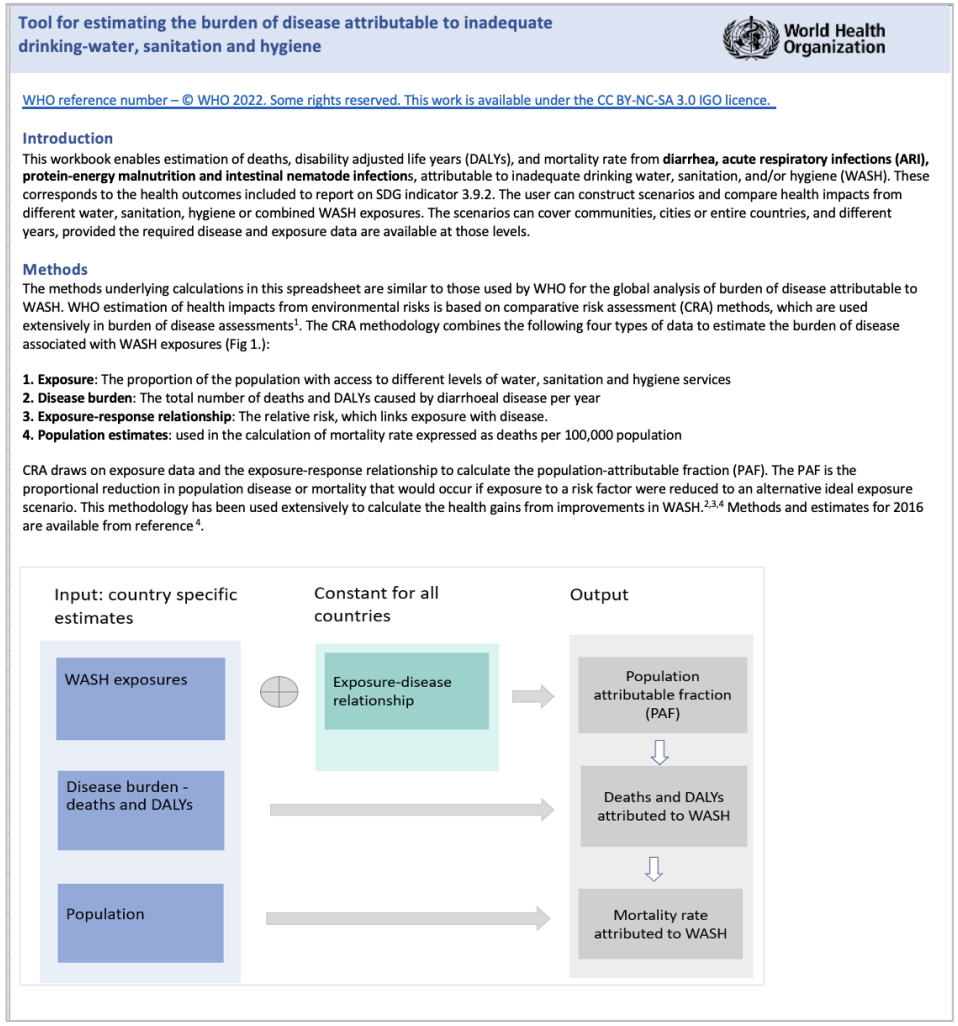
Country tool



Tool for estimating the burden of disease attributable to inadequate drinking-water, sanitation and hygiene

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Introduction

This workbook enables estimation of deaths, disability adjusted life years (DALYs), and mortality rate from **diarrhea, acute respiratory infections (ARI), protein-energy malnutrition and intestinal nematode infections**, attributable to inadequate drinking water, sanitation, and/or hygiene (WASH). These corresponds to the health outcomes included to report on SDG indicator 3.9.2. The user can construct scenarios and compare health impacts from different water, sanitation, hygiene or combined WASH exposures. The scenarios can cover communities, cities or entire countries, and different years, provided the required disease and exposure data are available at those levels.

Methods

The methods underlying calculations in this spreadsheet are similar to those used by WHO for the global analysis of burden of disease attributable to WASH. WHO estimation of health impacts from environmental risks is based on comparative risk assessment (CRA) methods, which are used extensively in burden of disease assessments[1]. The CRA methodology combines the following four types of data to estimate the burden of disease associated with WASH exposures (Fig 1.):

1. **Exposure**: The proportion of the population with access to different levels of water, sanitation and hygiene services
2. **Disease burden**: The total number of deaths and DALYs caused by diarrhoeal disease per year
3. **Exposure-response relationship**: The relative risk, which links exposure with disease.
4. **Population estimates**: used in the calculation of mortality rate expressed as deaths per 100,000 population

CRA draws on exposure data and the exposure-response relationship to calculate the population-attributable fraction (PAF). The PAF is the proportional reduction in population disease or mortality that would occur if exposure to a risk factor were reduced to an alternative ideal exposure scenario. This methodology has been used extensively to calculate the health gains from improvements in WASH.[2,3,4] Methods and estimates for 2016 are available from reference [4].

- Automatically produces country-specific calculation of burden of disease tailored to user choices
- Enables simulation of alternative scenario(s), drawing from user-inputted data
- Compares scenario estimates

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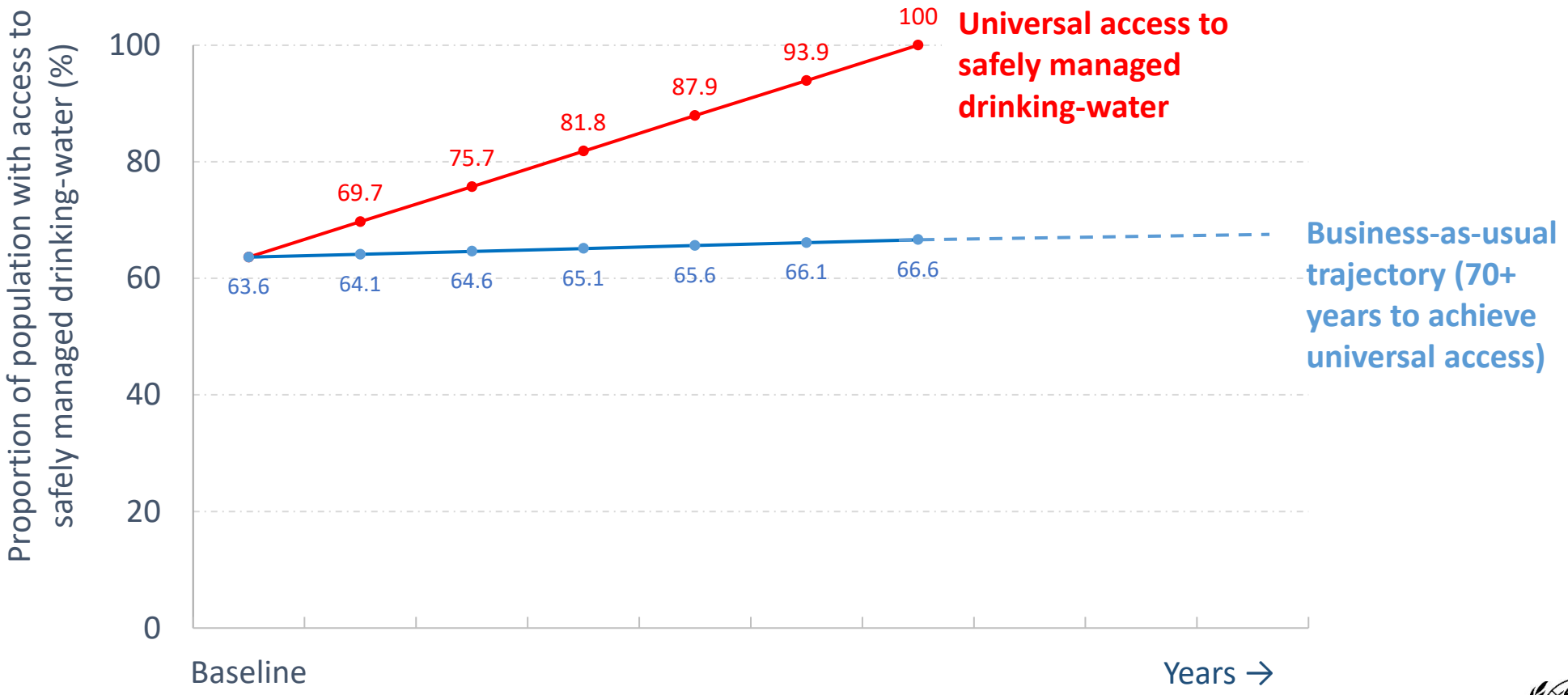
Results

Increased access to safely managed drinking-water services under JJM and Business-as-usual scenarios



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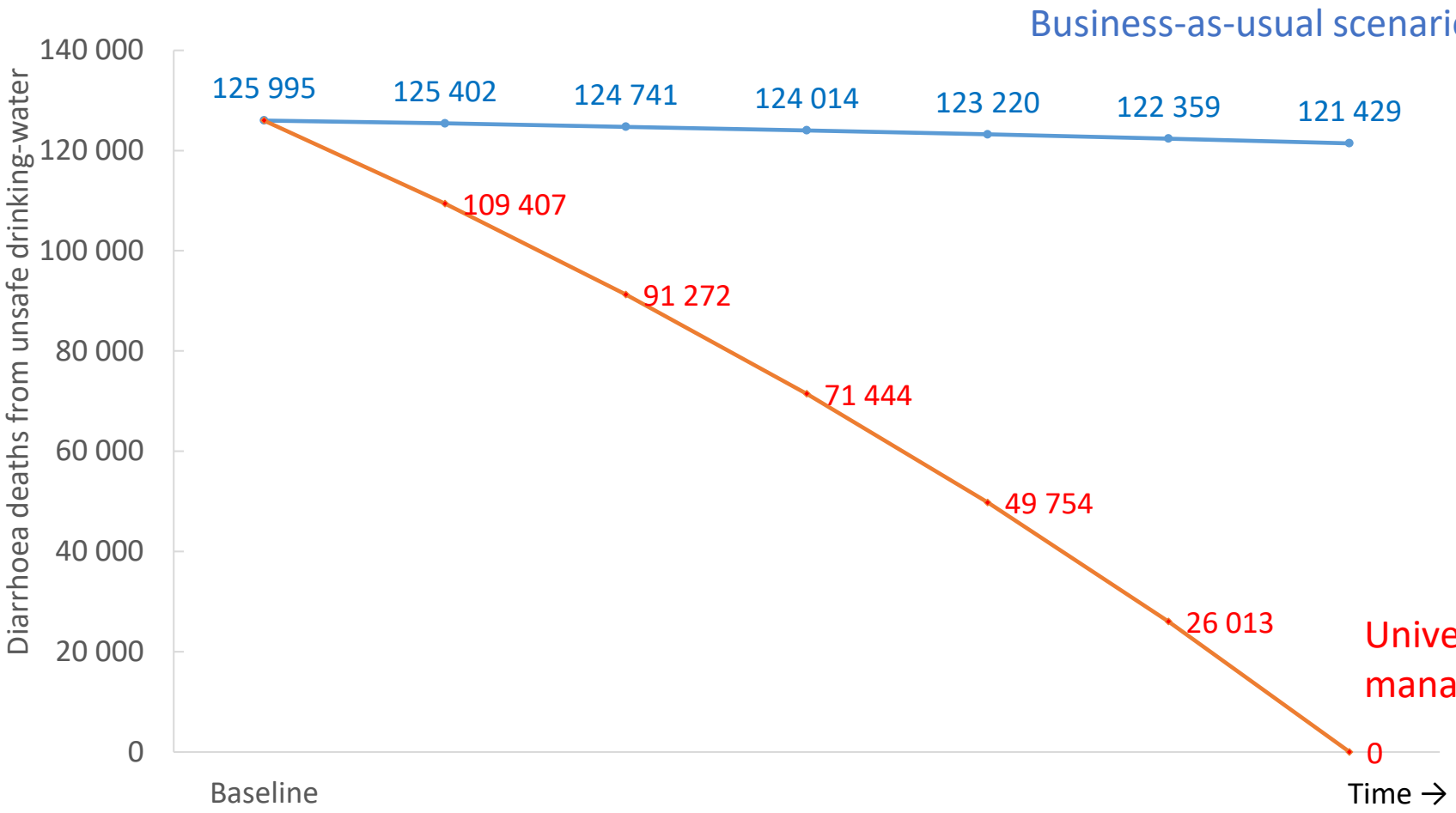
Results

Number of annual diarrhoea deaths from unsafe drinking-water under JJM and Business-as-usual scenarios



Reaching universal access to safely managed drinking-water services would result in almost 400,000 lives saved and 14 million DALYs averted.

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Estimating economic savings from DALYs averted

- The monetary value of a DALY can approximated based on a multiple of the GDP per capita of a country. The value of the multiple is derived from prior research.
- This approach was first described in the 2001 report of the WHO's Commission on Macroeconomics and Health which assign each life year a value of 3 x GDP per capita.
- Based on this approach, it was estimated that JJM could result in up to **US$101 billion** saved from the estimated DALYs averted.

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Estimating time saved on water collection

In 2018, about 42% of rural households, and 20% of urban households, collected water from off-premises supplies. Women bear the main burden of this carriage.

Collection of water in households without on-premises water

	Number of households (millions)			Proportion of households (%)		
	Rural	Urban	All	Rural	Urban	All
Households	178.4	92.7	271.1			
Households without on-premises water	74.8	18.1	92.9	**42%**	20%	34%
Households where women collect water	55.1	9.1	64.3	**31%**	10%	24%
Households where men collect water	14.4	6.1	20.6	8%	7%	8%
Households where girls collect water	2.0	0.3	2.3	1%	0%	1%
Households where boys collect water	1.4	0.5	1.8	1%	0%	1%
Households where hired labourers collect water	0.4	1.0	1.4	0%	1%	1%
Households where other people collect water	1.4	1.1	2.5	1%	1%	1%

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Estimating time saved on water collection

In 2018, 66.6 million hours were spent each day collecting water in households without on-premises water. The great majority of this happened in rural areas. About three quarters of this burden was borne by women.

Time spent collecting water from off premises

	Average time spent collecting water (minutes per household per day)			Total time spent collecting water (millions of hours per day)		
	Rural	Urban	All	Rural	Urban	All
Households without on-premises water	44.8	35.7	43.0	**55.8**	10.8	**66.6**
Households where women collect water	45.8	43.5	45.5	42.1	6.6	**48.7**
Households where men collect water	40.4	29.0	37.0	9.7	3.0	12.7
Households where girls collect water	51.3	44.4	50.4	1.8	0.2	2.0
Households where boys collect water	53.0	35.8	48.7	1.2	0.3	1.5
Households where hired labourers collect water	40.9	21.2	27.4	0.3	0.3	0.6
Households where other people collect water	34.1	18.3	27.1	0.8	0.3	1.1

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Key messages

- It is estimated that if the Jal Jeevan Mission provided safely managed drinking-water to all of India, this would result in averting almost 400,000 diarrhoeal disease deaths.
- With universal coverage of safely managed drinking water in India, almost 14 million DALYs (Disability Adjusted Life Years) from diarrhoeal disease are estimated to be averted, resulting in estimated cost savings of up to $101 billion.
- Providing tap connection to every household would result in significant time saved on water collection, especially among women.

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Thank you!

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