AirQ Calculations made

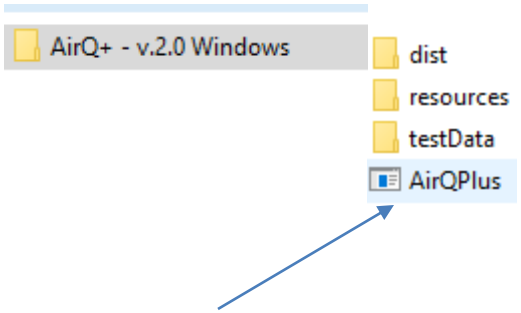
Abera Kumie

AIRQ downloading

- Use the link:

https://www.euro.who.int/en/health-topics/environment-and-health/air-quality/activities/airq-software-tool-for-health-risk-assessment-of-air-pollution

- You have to get this folder



There vis also AirQ+ v2.2

Install this

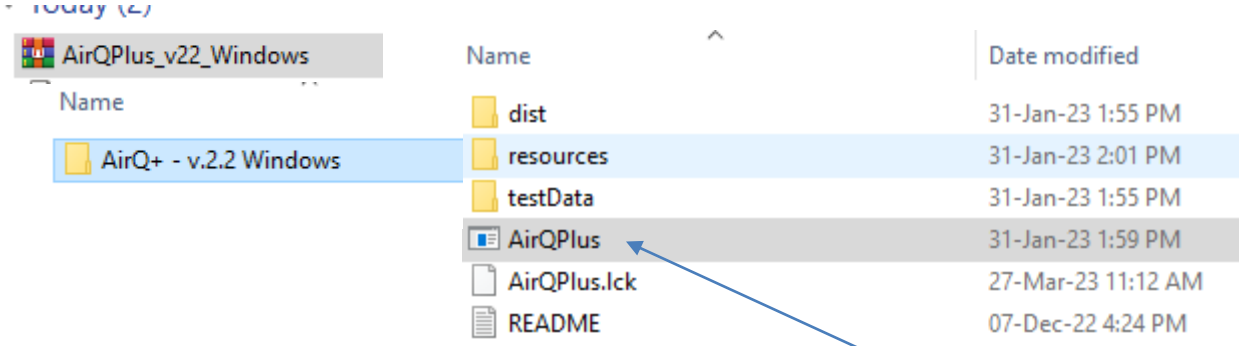
https://www.who.int/europe/tools-and-toolkits/airq---software-tool-for-health-risk-assessment-of-air-pollution

Download

Download AirQ+ 2.2 software - Windows (Zip file, 80 MB / EN, FR, DE and RU)

Download AirQ+ 2.2 software - Linux (Zip file, 80 MB / EN, FR, DE and RU)

Download AirQ+ 2.2 software - Macintosh (Zip file, 80 MB / EN, FR, DE and RU)



Install by double Clicking

Installed

Next task

- You have to find input data for Kampala

- Data input for Addis Ababa (Example we have used for our PM paper (The data was 2017-2020, 3 years)
  - Data for the Year 2020
  - Total pop 4,800000 (from reports)
  - Pop at risk >30 yrs old 1632000 (adult population, about 34%)
  - Number of adult death excluding accidents 11539 (for adult population > 30 years old) (From Addis A Cemetry data)
  - Incidence of adult death per 100,000
  - (advised all digits must be used;

Next task

- Pls with AIRQ+: Open and follow the procedures

Input Mortality data in Addis Ababa

Addis Ababab Mortality Burail Surveillance							Remark
	2017	2018	2019	2020	Total	Annual av	Burail raw data
All causes of Mortality (all age groups)	12,719	12,458	11,256	14,126	50,559	12639.75	Burail raw data
All causes of Mortality >30 years	10,443	10,401	9,689	12,408	42,941	10735.25	Burail raw data
All mortality except accidents and injury	11828.67	11585.94	10468.08	13137	47,020	11754.97	Data generated
Mortality due to accident/injury at 7% of all mortalities	890.33	872.06	787.92	988.8	3,539	884.7825	Data generated
The proportion of mortality >30 years from the total (%)	82%	83%	86%	88%	85%		Data generated
The proportion of mortality >30 years from the total (%) due to accidents	731.01	728.07	678.23	868.56	3,006	751.4675	Data generated
Number deaths >30yrs old excluding accidents	9,712	9,673	9,011	**11,539**	39,935	9983.783	Data generated
Popu in Addis	4,200,000	4,400,000	4,600,000	4,800,000	18,000,000	4500000	Data generated
Population > 30yrs old at 34% of the total pop	1428000	1496000	1564000	1632000	6,120,000	1530000	Data generated

Data for calculation	
Year 2020	
Total pop 4,800000	4800000
Pop at risk >30 yrs old 1632000 (adult population)	1632000
Number of adult death excluding accident 11539 (for adult population > 30 years old)	11539
Incidence of adult death per 100,000 (advised all digits must be used; (11539/1632000)	707.0465686

Procedures in AirQ+

- W calculate the attributable deaths to air pollution
- It calculates the difference of premature deaths at the current level MINUS at the cut off (35, 25µg/$m^{3;}$, 15µg/$m^{3;}$, 10 µg/m^3 annual guideline values Interim, and set guideline of 2005)
- Do the calculation for each BAM annual concentration mean :
  - TASH BAM: 42.4;
  - US EMbasy 24.07 µg/m^3
  - International School: 34.7 µg/m^3
- The procedure is straightforward
- Examples are in slides
- Download the calculator and enter the inputs

Input Data for Addis Ababa

Data for calculation	
Year 2020	
Total pop 4,800000 (UN Pop Data)	4800000
Pop at risk >30 yrs old 1632000 (Addis Ababa Census: 34% of total pop)	1632000
Adult death excluding accident 11539 (34% of the 2020 burial mortality Minus 7% of accidents)	11539
Incidence of adult death per 100,000	707.0465686

Impact Assessment: Long-term Effects (Ambient)

Analysis Name: Impact Assessment - TASH BAM (PM2.5)

Pollutant: PM2.5

Pollution Concentration

(•) Input Mean Value ( ) Input Air Quality Data

Mean Value (µg/m^3): 42.44

TASH BAM Concentration

Location

Location: TASH BAM

Total Population: 4809000

Recent population in Addis A

Year: 2020

Area Size (km^2):

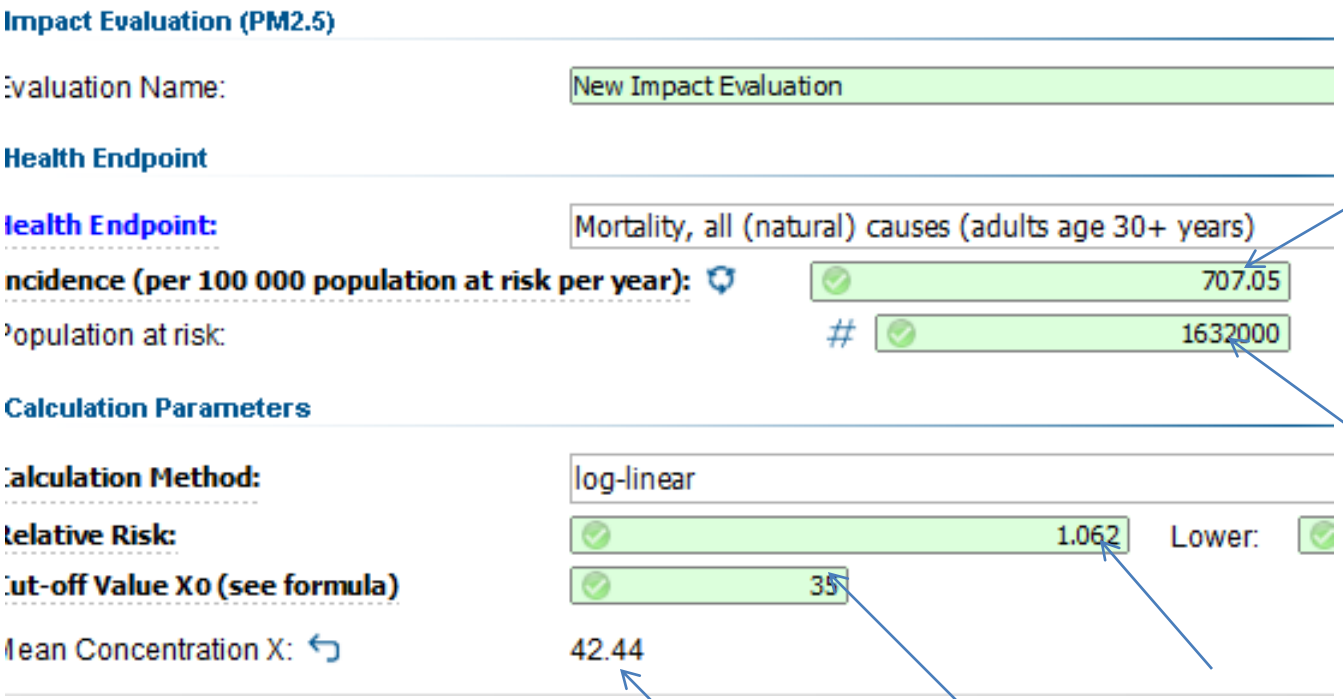
Latitude:

Longitude:

Source of Air Quality Data and Comments

Source of measured air pollution data:
Number of stations used:
Location:
Type of stations:
Responsible agency/unit:

Create new Impact Evaluation | Create new Life Table Evaluation



11539 adult deaths (above 30 yrs old divided by 1632000 per 100000

Adult populatio n ≥ 30yrs

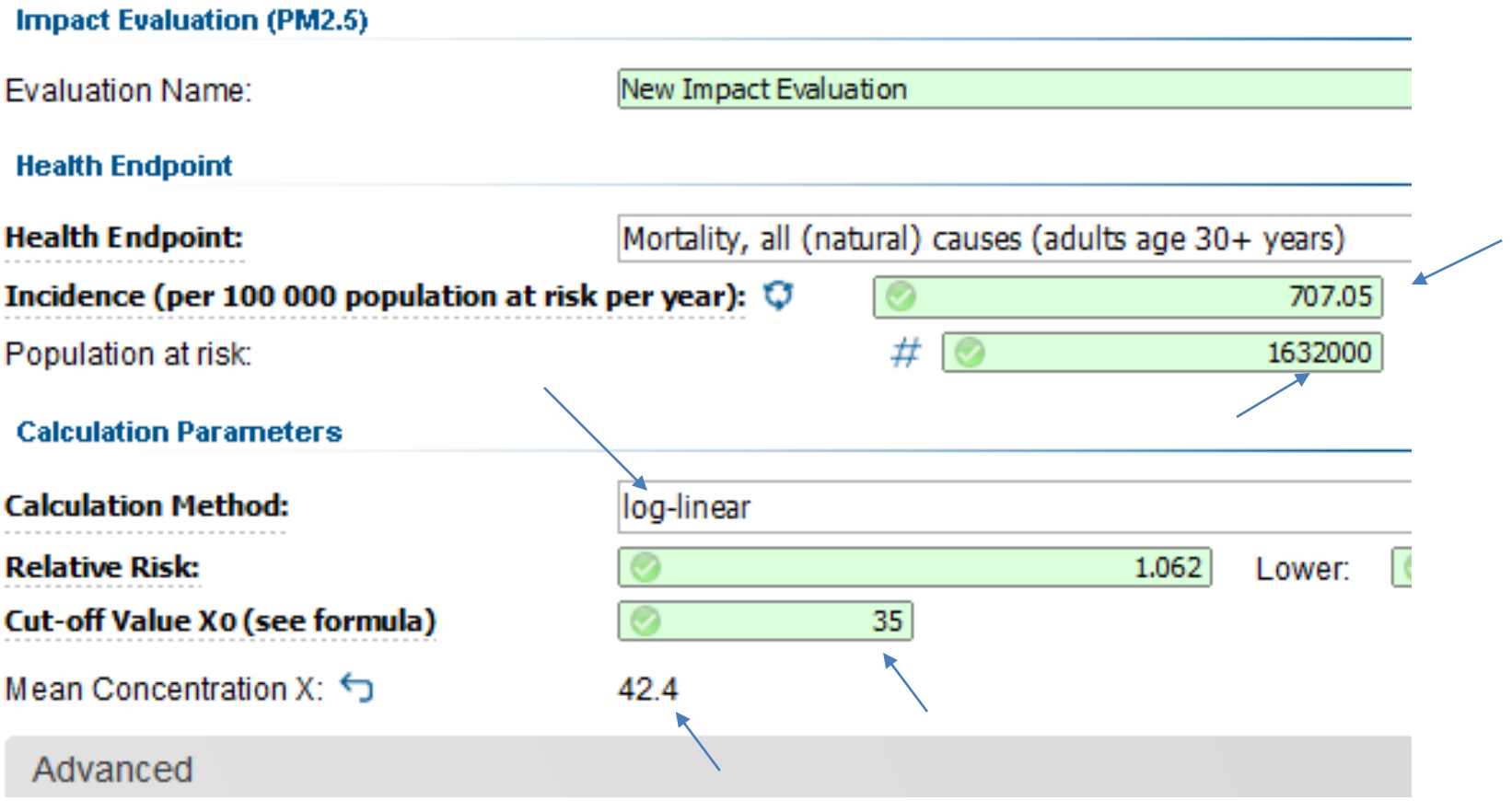
TASH Annual level

Cut off

Calculate

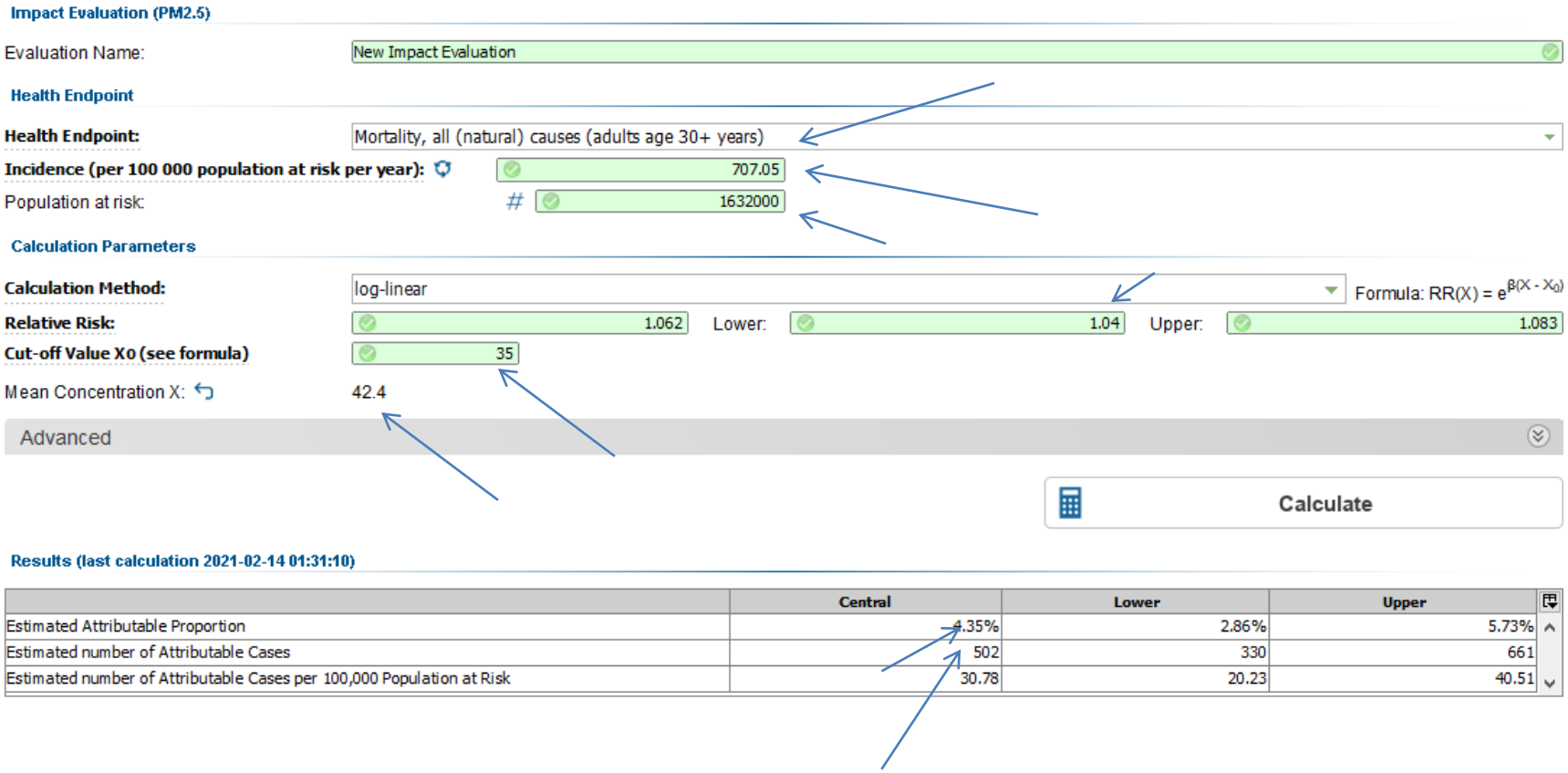
Results (last calculation 2021-02-14 01:23:00)

	Central	Lower	Upper
Estimated Attributable Proportion	4.35%	2.86%	5.73%
Estimated number of Attributable Cases	502	330	661
Estimated number of Attributable Cases per 100,000 Population at Risk	30.78	20.23	40.51

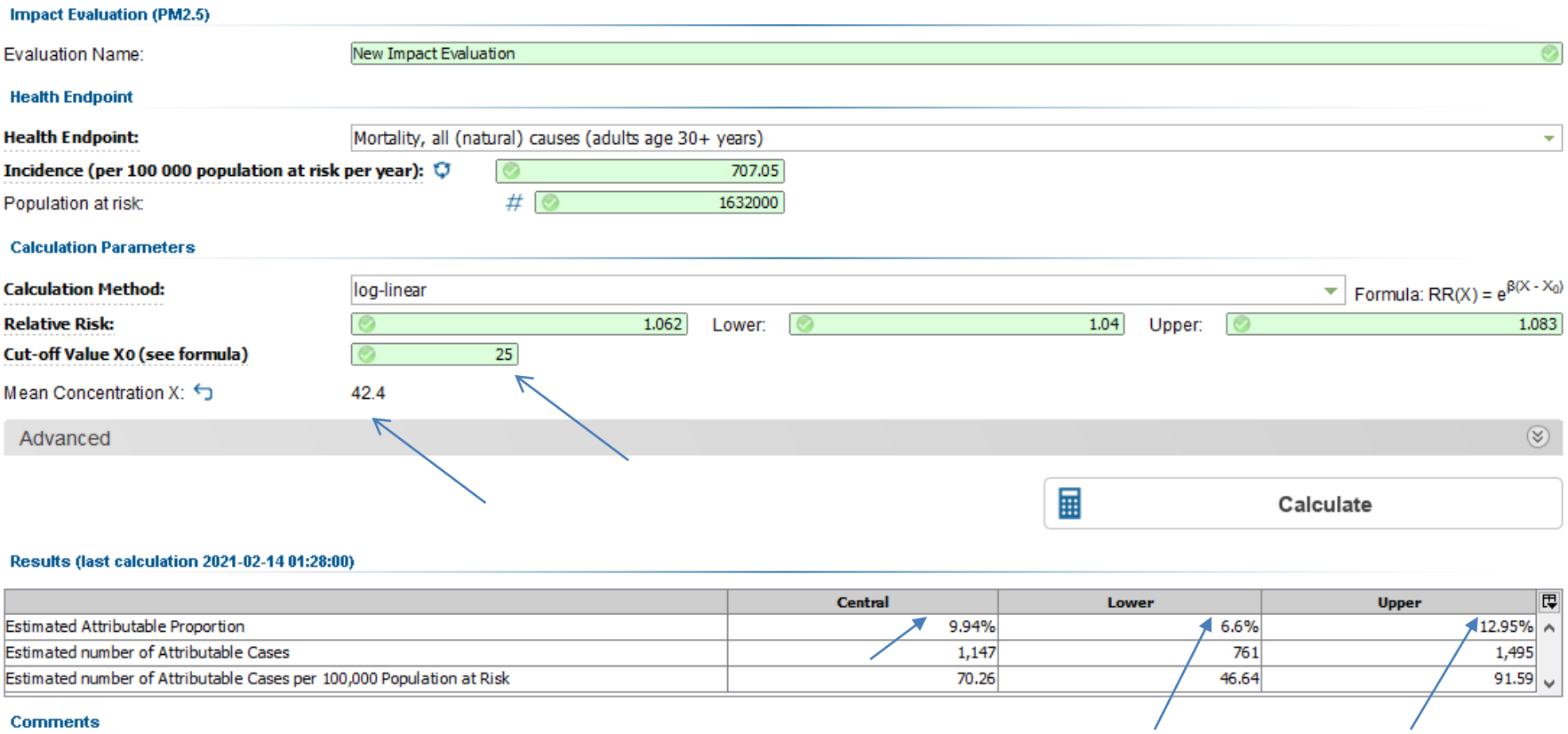


Incidence of adult mortality = 11539 adult deaths in 2020 * 1632000) / 100000

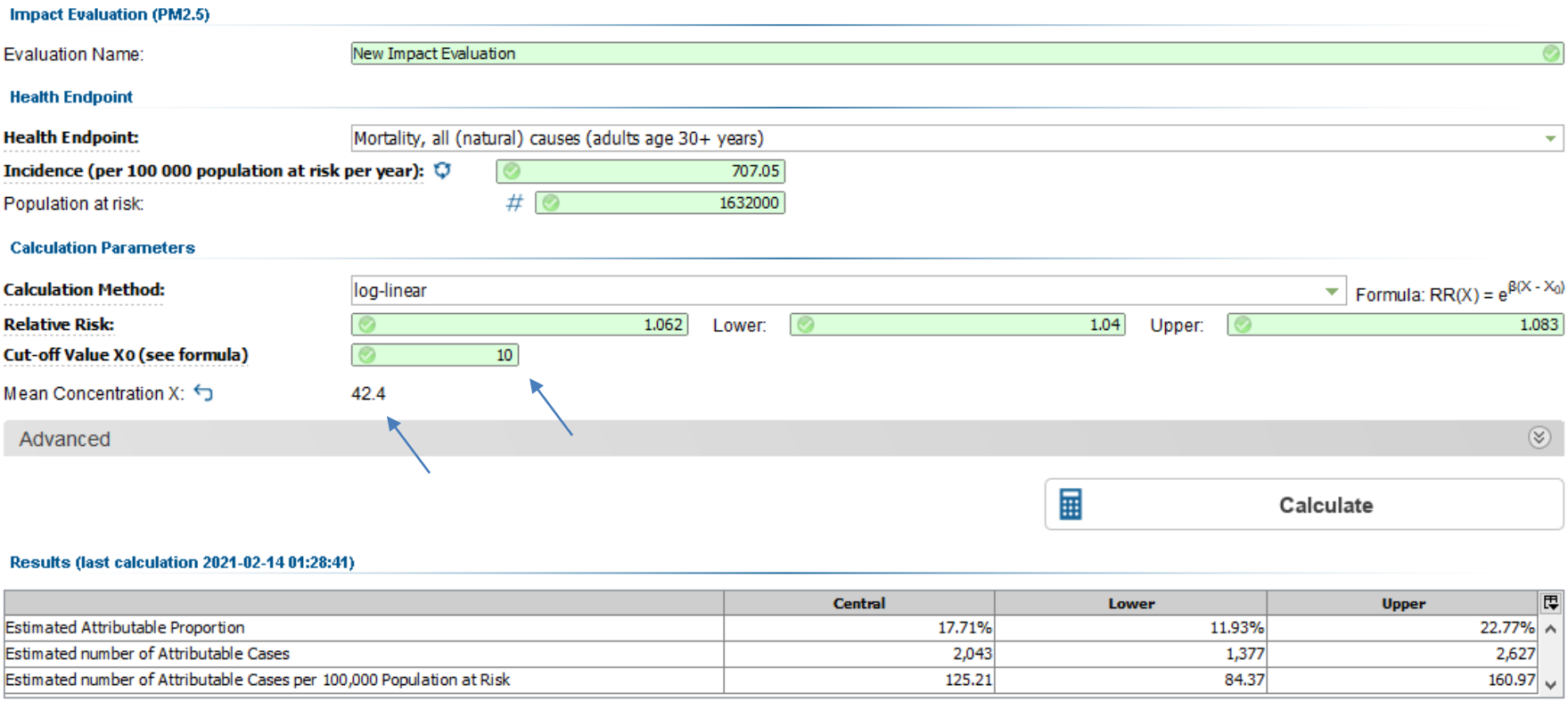
Comparing 42.4 µg/m³at 35 cut off



Comparing 42.4 µg/m³at 25 cut off



Comparing 42.4 µg/m³at 10 cut off



	Central	Lower	Upper
Estimated Attributable Proportion	17.71%	11.93%	22.77%
Estimated number of Attributable Cases	2,043	1,377	2,627
Estimated number of Attributable Cases per 100,000 Population at Risk	125.21	84.37	160.97

Do same calculations for

- TASH BAM: Annual means 42.4 Vs 35, 25, 15, 10
- US Embassy 24.07 µg/m^3 Vs 35, 25, 15, 10
- Int School: 34.7 µg/m^3 Vs 35, 25, 15, 10

- Document data

Final results Vs WHO 2005 guidelines

Table 3: Estimated attributable deaths to the long-term exposure of PM air pollution in 2020

BAM location	Annual mean PM2.5 concentration, µg/m³ (2017-2020)	Attributable deaths with 95CI # (%) WHO annual Interim 1 (35µg/m³) # (95%CI)	%	WHO annual Interim 2 (25µg/m³) # (95%CI)	%	WHO annual Interim 3 (15µg/m³) # (95%CI)	%	WHO annual Mean (10µg/m³) # (95%CI)	%
"TASH"	42.4	502 (330-661)	4.35	1147 (761-1495)	9.94	1753 (1176-2265)	15.2	2043 (1377-2627)	17.71
School	34.7	0	0	654 (431, 859)	5.67	1290 (858-16770)	11.18	1598 (1065-2063)	13.8
US Embassy	24.07	0	0	0	0	613 (403-805)	5.31	936 (620-1225)	8.12

Table 0.1. Recommended AQG levels and interim targets

Pollutant	Averaging time	Interim target 1	2	3	4	AQG level
$PM_{2.5}$, µg/m³	Annual	35	25	15	10	5
	24-hour[a]	75	50	37.5	25	15

Recalculate using 2021 WHO guide

Write the results in the Manuscript

- Pls refer: Our Published article

- https://journals.lww.com/environepidem/Fulltext/2021/06000/Fine_particulate_pollution_concentration_in_Addis.10.aspx

- Advise: first write the description separately in a draft form;
- You can then insert in the MS as needed

https://journals.lww.com/environepidem/Fulltext/2021/06000/Fine_particulate_pollution_concentration_in_Addis.

Assessing the impact/ effect of the current level of $PM_{2.5}$ concentration

We used the WHO AirQ+ tool[8,18] to calculate the attributable deaths to the exposure levels of the three BAMs separately. We employed averaged concentrations over a three-year period from our BAM-1022 and the US-Embassy BAM-1020 on embassy premises, while an average for two years was available for the BAM-1020 at the international school site. The total population of Addis Ababa in 2020 was taken from UN population data sources (4.8 mln).[10] We considered that 34% of the total population was adult of 30 years old and above. (Addis Ababa Health Bureau personal communication). The annual mortality for the year 2020 was taken from Addis Ababa Mortality Surveillance Program[19] A 7% of the incidence of injury was taken from published articles addressing the mortality surveillance program.[20,21] We used the three WHO annual interim target options and the WHO annual mean air quality guideline as cut-off reference values to estimate the excess deaths because of $PM_{2.5}$ pollution as measured by the three BAMs separately.[22]

Assessing the impact/effect of the current level of $PM_{2.5}$ concentration

We used the WHO AirQ+ tool[8,18] to calculate the attributable deaths to the exposure levels of the three BAMs separately. We employed averaged concentrations over a 3-year period from our BAM-1022 and the US-Embassy BAM-1020 on embassy premises, while an average for 2 years was available for the BAM-1020 at the international school site. The total population of Addis Ababa in 2020 was taken from UN population data sources (4.8 mln).[10] We considered that 34% of the total population was adult of 30 years old and above (Addis Ababa Health Bureau, personal communication, February 2, 2021). The annual mortality for the year 2020 was taken from Addis Ababa Mortality Surveillance Program.[19] A 7% of the incidence of injury was taken from published articles addressing the mortality surveillance program.[20,21] We used the three WHO annual interim target options and the WHO annual mean air quality guideline as cut-off reference values to estimate the excess deaths because of $PM_{2.5}$ pollution as measured by the three BAMs separately.[3]

WHO global air quality guidelines, 2021

WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. Executive summary

Table 0.1. Recommended AQG levels and interim targets

Pollutant	Averaging time	Interim target				AQG level
		1	2	3	4	
$PM_{2.5}$, μg/m³	Annual	35	25	15	10	5
	24-hour[a]	75	50	37.5	25	15
PM_{10}, μg/m³	Annual	70	50	30	20	15
	24-hour[a]	150	100	75	50	45
O_3, μg/m³	Peak season[b]	100	70	–	–	60
	8-hour[a]	160	120	–	–	100
NO_2, μg/m³	Annual	40	30	20	–	10
	24-hour[a]	120	50	–	–	25
SO_2, μg/m³	24-hour[a]	125	50	–	–	40
CO, mg/m³	24-hour[a]	7	–	–	–	4

[a] 99th percentile (i.e. 3–4 exceedance days per year).
[b] Average of daily maximum 8-hour mean O_3 concentration in the six consecutive months with the highest six-month running-average O_3 concentration.

https://apps.who.int/iris/handle/10665/345329

Uncertainties

- Population number: Local govt reports vs UN report
- Small number of deaths calculated at WHO cut off Vs no of existing deaths: war, diseases
- Using WHO 2021 guidelines Vs 2005
- Mortality data certainty / valid sources
- One (3 in Addis) station monitoring Vs spatial coverage
- How to use satellite based data Vs validity Vs ground monitoring

END