STA 199 · FINAL PROJECT · MEAN GIRLS

JMP WASH Data

Access to water, sanitation, hygiene, and menstrual health products

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Introduction to the dataset

The WHO/UNICEF Joint Monitoring Programme (JMP) compiles national household surveys, censuses and government reports into country-level estimates for **2000–2024**. We focus on 2024 and on six variables.

Variable	What it measures
Income group	Low, lower middle, upper middle, high
Location	Rural or urban population
Basic sanitation %	Improved toilet not shared with other households
Basic hygiene %	Handwashing facility with soap and water at home
Basic drinking water %	Improved source, 30 min or less round trip
Menstrual material use %	Women and girls 15–49 who menstruated in the past year



Source: WHO/UNICEF JMP household WASH data by country, 2025 release

RESEARCH QUESTION

How does access to basic water, sanitation, hygiene and menstrual materials differ between rural and urban areas, and across country income groups?

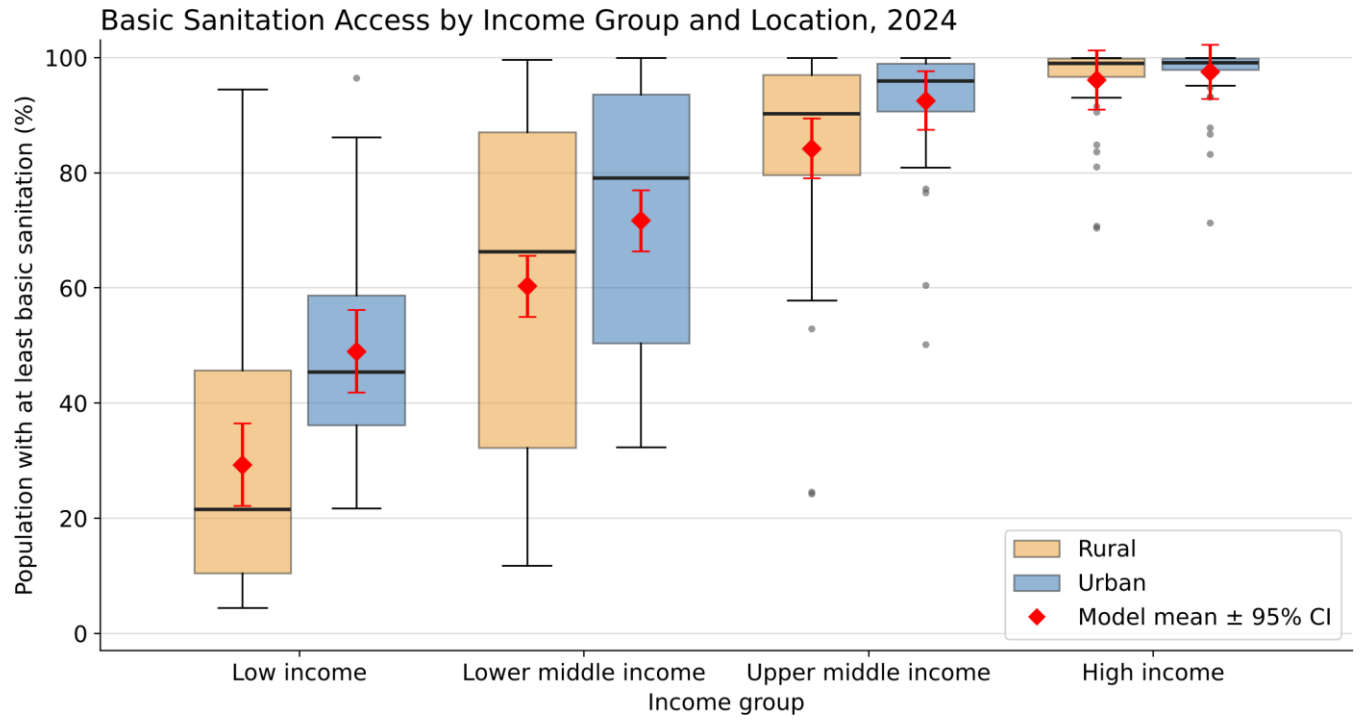
Hypothesis 1

Rural populations have lower access than urban populations.

Hypothesis 2

Lower-income countries have lower access, and larger rural–urban gaps.

Sanitation: the rural gap is widest in low-income countries



Model: sanitation % ~ income × location

Low income: rural 29% vs. urban 49%, a 20-point gap

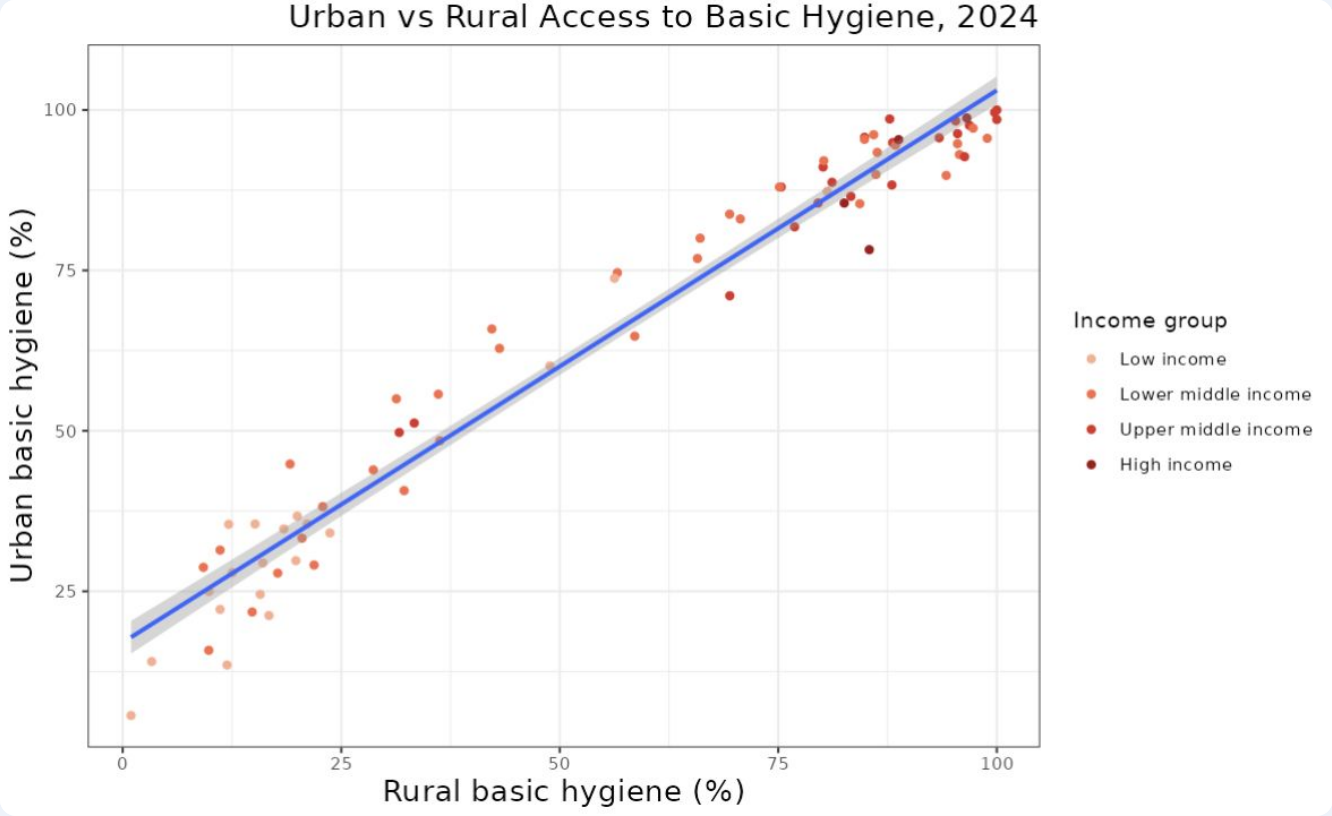
High income: rural 96% vs. urban 98%, nearly closed (interaction −18.3, p = 0.004)

Urban exceeds rural in 114 of 160 countries

$R^2 = 0.58$

2024 data from 172 countries.

Hygiene: urban vs rural hygiene access



Urban % = 17.01 + 0.86 × Rural %

Slope 0.86: each extra point of rural access goes with 0.86 points more urban access

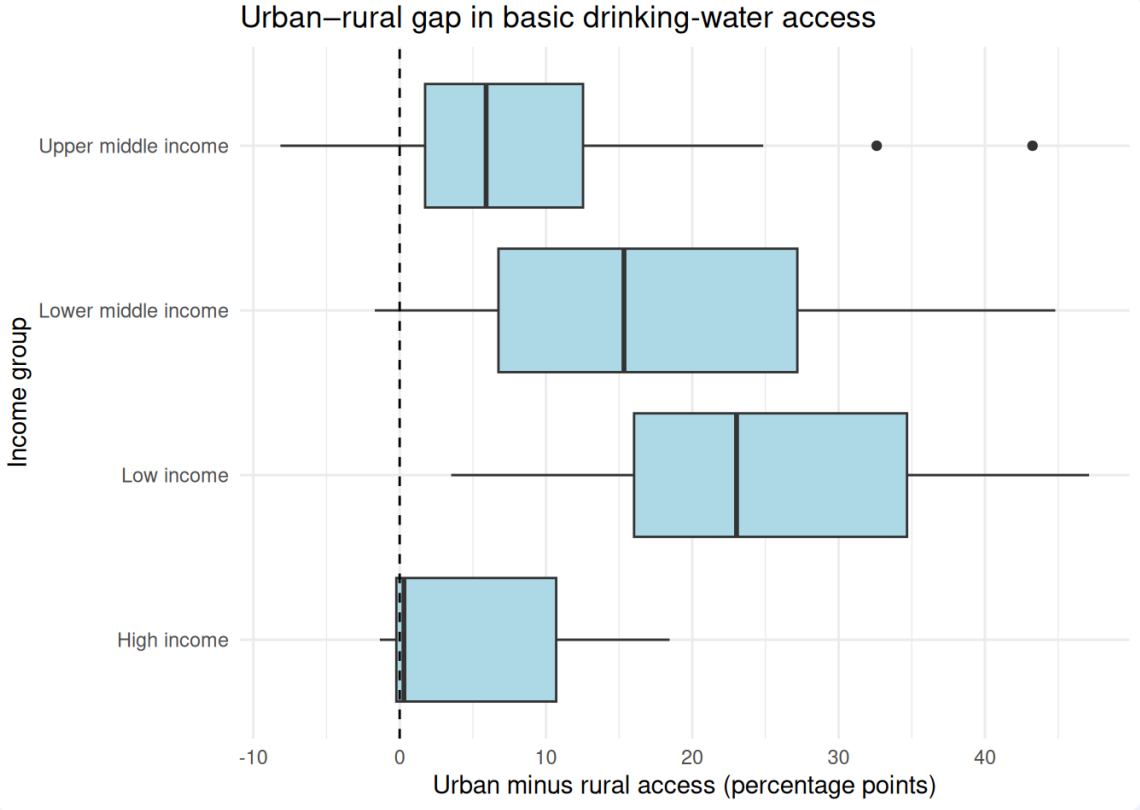
Gap narrows: rural 20% predicts urban 34%; rural 80% predicts urban 86%

Urban exceeds rural in 75 of 85 countries

$R^2 = 0.96$, $r = 0.98$

2024 data, 79 countries after removing 6 outliers ($|z| > 2$): Djibouti, Colombia, Mauritania, Cabo Verde, Kenya, Papua New Guinea

Water: the gap closes as income rises



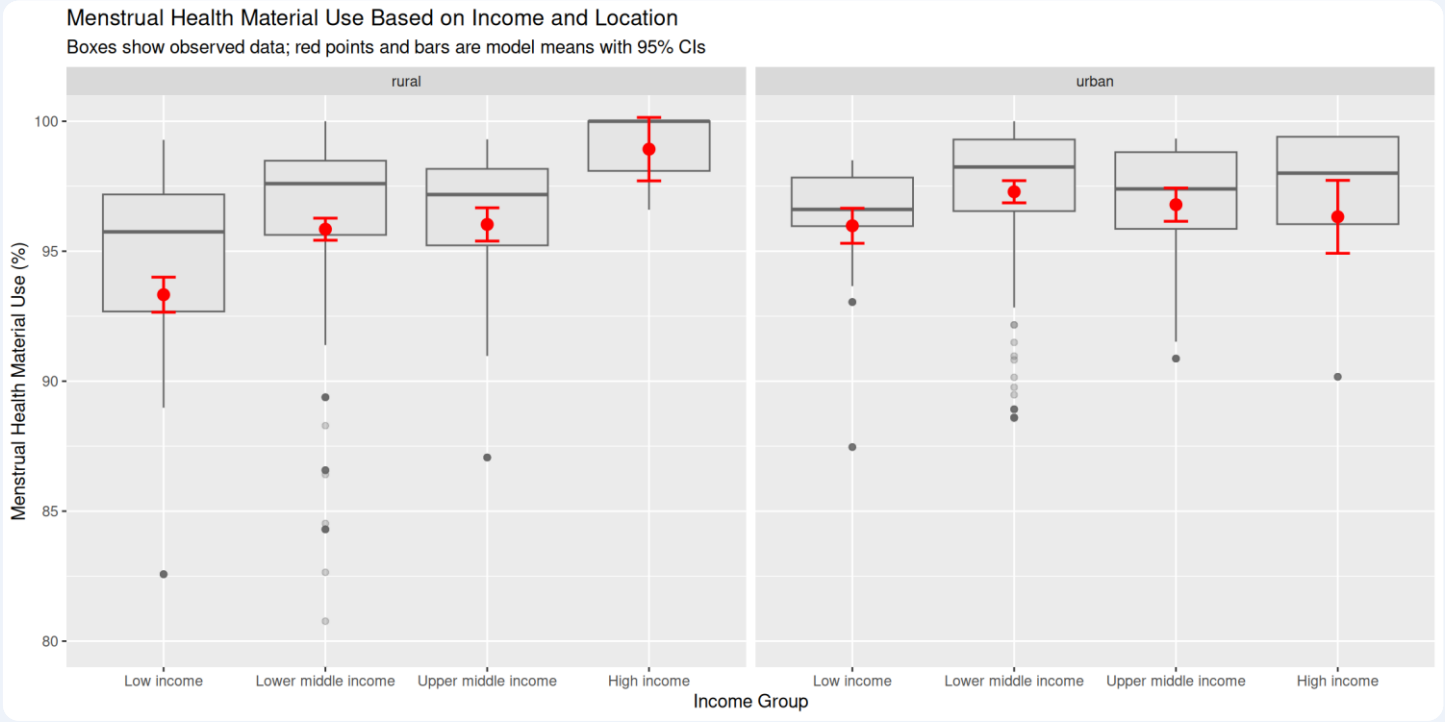
Model: gap ~ income group (baseline: high income)

Income group	Mean gap	Median
Low	25.8	23.0
Lower middle	18.3	15.4
Upper middle	8.6	5.9
High	4.6	0.3

Low (+ 21.1, $p < 0.001$) and lower middle (+ 13.7, $p = 0.002$) differ from high income; upper middle does not ($p = 0.37$). $R^2 = 0.30$

Gap = urban minus rural basic water access, in percentage points. 2024 data from 101 countries.

Menstrual health: income matters most in rural areas



Model: material use % ~ income × location

Rural: rises from 93.3% (low) to 98.9% (high income)

Urban: roughly flat, 96.0% to 97.3%

Use is above 90% in every group; R^2 = 0.09

66 countries with survey data.

Takeaways

01

Urban areas lead

Urban populations have better access to basic sanitation, hygiene and drinking water than rural ones in most countries.

02

Income affects this gap

Higher-income countries have more access overall and smaller rural–urban gaps; the gaps are widest in low-income countries.

03

Menstrual materials differ by geography

Use is above 90% everywhere, with no consistent rural–urban pattern; income matters mainly for rural women and girls.

Policy alternatives

Target rural areas

Direct sanitation and water funding to rural areas of low and lower-middle income countries, where gaps are largest.

Develop national hygiene programs

Rural and urban hygiene rise similarly, so handwashing programs that reach rural areas can increase national access.

Supply rural menstrual materials

Focus distribution on rural communities in low-income countries, the only group well below 95% use.

Conduct additional research

Test whether gaps come from income alone or from political and geographic factors such as geopolitical tensions or being landlocked.

Conclusion

Rural communities, especially in low-income countries, have the least access to basic sanitation, hygiene and water.

Correlation, not causation

Income is associated with access, but our data cannot show that income causes it.

Limitations

Only one year of data, not full country coverage, and national averages that don't show the full picture of inequality within countries.

Next steps

Track change from 2000 to 2024 and add regional and other variables.