# Do We Need More Frequent Data to Measure Health Out-of-Pocket Expenditures?

**Patrick Eozenou, Gil Shapira, and Asiyeh Abbasi**

**World Bank**

**Health, Nutrition and Population**

Advancing mobile phone surveys for reproductive, maternal, newborn, child, and adolescent health and nutrition (RMNCAH&N)

**February 11, 2025**

# Outline

1. Motivation: Why do we care about health out-of-pocket (OOP) expenditures?

2. Health OOP measurement and measurement issues.

3. High-Frequency Phone Surveys (Burkina, Ethiopia, Malawi, Nigeria, Uganda).

4. Characterization of health spending patterns (frequency, size, and composition).

5. Annualization approaches comparisons.

# Motivation

Why do we care about health out-of-pocket (OOP) expenditures?

# Motivation: Health Out-of-Pocket Spending

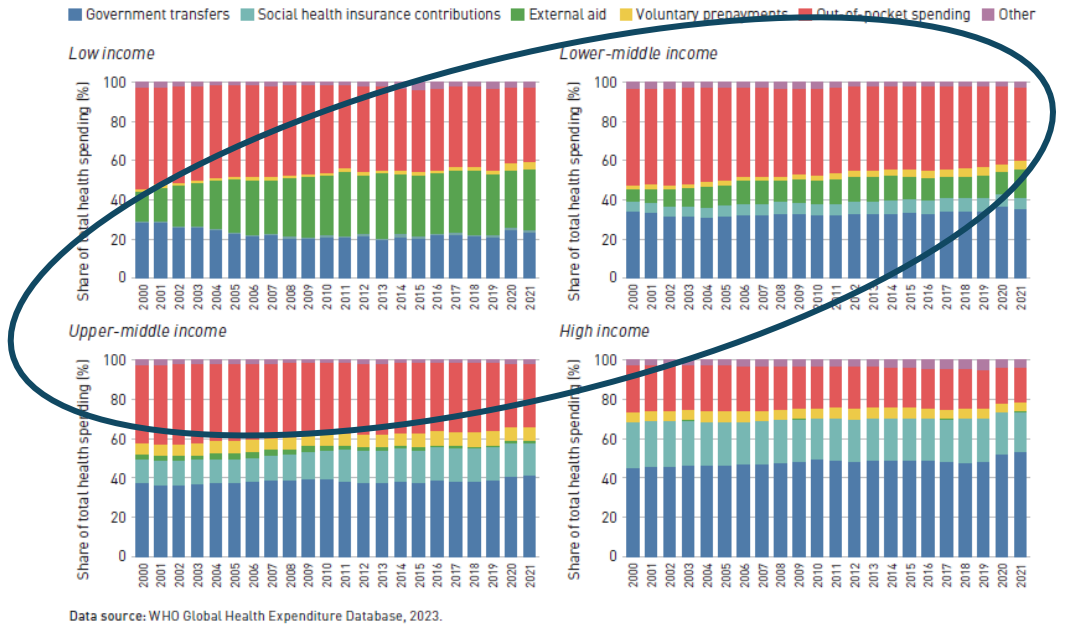
## Universal Health Coverage

- Universal Health Coverage (UHC) is a key part of the Sustainable Development Goals (SDGs) and is tracked by the World Health Organization (WHO) and the World Bank (SDG 3.8).
- **Universal health coverage (UHC) is the idea that everyone should have access to essential quality health services without suffering from financial hardship.**
- Financial hardship from health spending is typically measured by focusing on health out-of-pocket (OOP) expenditures:
  - Share of population spending more than a given spending threshold in proportion of total consumption.
  - Share of population pushed under the poverty line due to health OOP spending.

## Health Financing

- In addition to financial hardship, health OOP spending is also not an efficient way of financing health.
  - Akin to taxing the sick population.
  - Welfare gains related to risk pooling are not realized (ex-post payment).
  - Health is a public good with externalities, so private funding is usually insufficient to support adequate provision from a social perspective.


OOP funding still represents between 30%-40% of total health funding in low- and middle-income countries.



# Health OOP Measurement

# Health OOP spending measurement issues/concerns

- **Spending frequency**
  - Spending frequency may differ depending on health shock distributions, disease chronicity…
  - Spending frequency matters for policy design.
    - Insurance model (Ehrlich and Becker, 1972; Gill and Ilahi, 2000): Rarer/larger shocks influence the relative price of self vs market insurance.
- **Seasonality**
  - Seasonal disease burden will translate into seasonal health expenditure patterns.
  - Comparability between and within countries can be compromised.
- **Annualization**
  - Required to take seasonal effects into account, and to allow cross-country comparison when survey design are different, and recall periods expressed at different frequencies.

# High Frequency Phone Surveys

# High-Frequency Phone Surveys

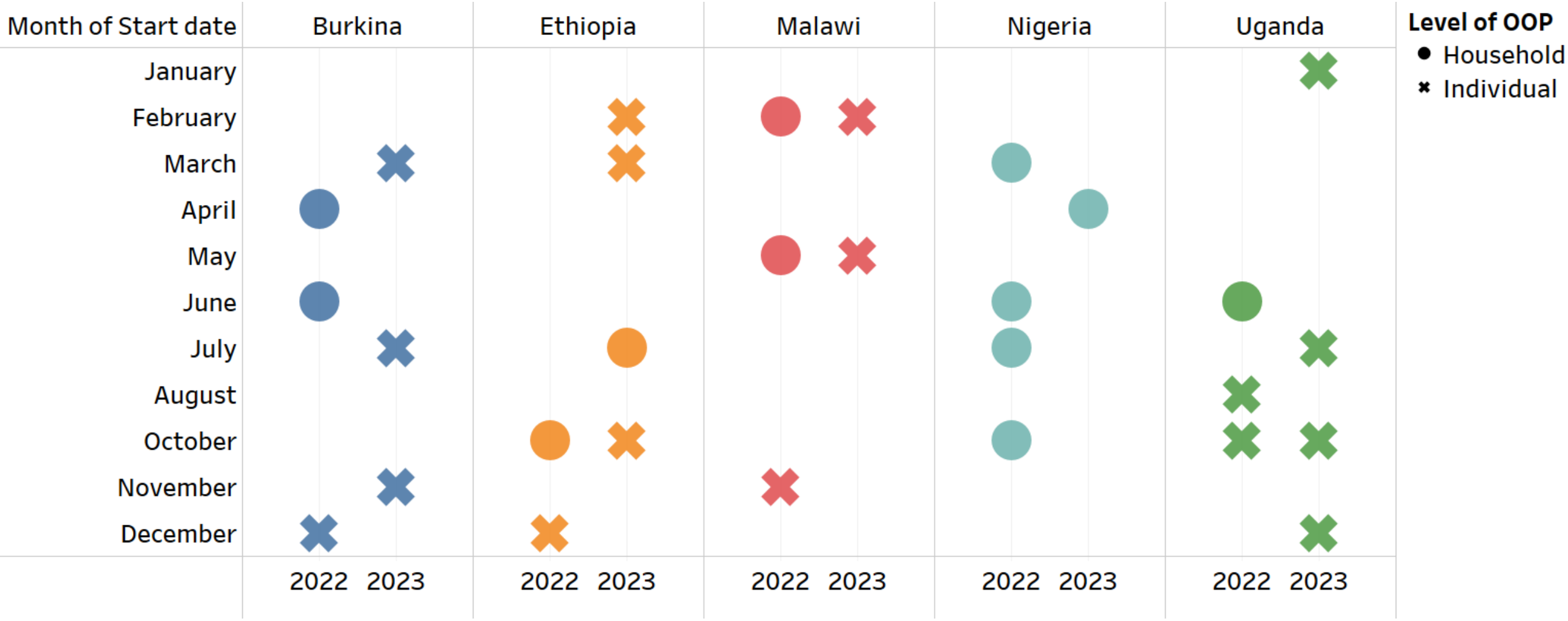
- The rollout of several rounds of (infra-annual) high-frequency phone surveys in developing countries during COVID-19 provided an opportunity to analyze:

  1. The **frequency of health spending** patterns across different countries.

  2. The **accuracy of naïve annualization methods**.

**→ Do we need more frequent data to measure health OOP spending?**

# Data Collection Schedule



# Health questionnaire

**Section 5f. Access to Health Services**

Instruction: read/don't read - 50/50

| 1. | 2. | 3. | 4. |
|---|---|---|---|
| Are you or any member of your household currently covered by any health insurance?<br><br>YES.1<br>NO..2 >> Q3 | Who pays for the health insurance (partially or fully) of the household members?<br><br>READ OPTIONS<br><br>SELECT ALL THAT APPLY<br><br>Employer - Government.....1<br>Employer - Non-Government Organization..2<br>Employer - Private business/company.....3<br>Community .....4<br>Private (individually acquired).....5<br>Other (Specify).....96 | Have you or any member of your household needed any health services (treatment or consultation) **in the past 4 weeks** whether there was illness or not?<br><br>YES ....1<br>NO ....2 >> NEXT SECTION | What type of service(s) or care did you or any member of your household need?<br><br>READ ALL OPTIONS/DO NOT READ OPTIONS<br><br>SELECT ALL THAT APPLY<br><br>COVID-19 related service (screening/diagnostic test, vaccination, treatment).....1<br>Family planning services.....2<br>Vaccination services (non-COVID).....3<br>Maternal health/ pregnancy care.....4<br>Non-COVID Health Care for Household Members Less Than 5 Years Old.....5<br>Non-COVID Health Care for Household Members 5 Years and Older.....6<br>Emergency(non-COVID).....7<br>Pharmacy / Chemist services.....8<br>Other (SPECIFY).....96 |
| | | | |

| 4b. | 5. | 6. | 7. |
|---|---|---|---|
| Who in the household needed the service? [LIST HOUSEHOLD MEMBER IDs FROM THE ROSTER FOR EACH SERIVCE] | Were you or the member of your household able to get [SERVICE] **in the past 4 weeks**?<br><br>**ASK THE QUESTION FOR EACH DIFFERENT SERVICE MARKED "YES" IN Q4**<br><br>YES ...1 >> Q7<br>NO ....2 | What was the main reason you or the member of your household were not able to get [SERVICE] **in the past 4 weeks?**<br><br>**ASK THE QUESTION FOR EACH SERVICE MARKED "YES" IN Q4**<br><br>**DO NOT READ OUT OPTIONS**<br><br>LACK OF MONEY .....1<br>NO MEDICAL PERSONNEL AVAILABLE.....2<br>TURNED AWAY BECAUSE FACILITY WAS FULL .....3<br>TURNED AWAY BECAUSE FACILITY WAS CLOSED.....4<br>HOSPITAL/CLINIC NOT HAVING ENOUGH SUPPLIES OR TESTS...5<br>HEALTH FACILITY IS TOO FAR.....6<br>FEAR OF CONTRACTING CORONAVIRUS.....7<br>LOCKDOWN/TRAVEL RESTRICTIONS.....8<br>LACK OF TRANSPORTATION.....9<br>OTHER (SPECIFY) .....96<br><br>>> NEXT SECTION | Where was [SERVICE] received?<br><br>**ASK THE QUESTION FOR EACH SERVICE MARKED "YES" IN Q4**<br><br>HOSPITAL.....1<br>CLINIC/HEALTH POST.....2<br>PHARMACY.....3<br>CHEMIST SHOP (DRUG SHOP).....4<br>MATERNITY HOME/ MATERNAL AND CHILD HEALTH POST.....5<br>CONSULTANT'S HOME.....6<br>PATIENT'S OME...7<br>TRADITIONAL HEALER'S HOME....8<br>FAITH BASED HOME .....9<br>OTHER(SPECIFY)...96 |
| Member ID \| Member ID \| Member ID | | | |

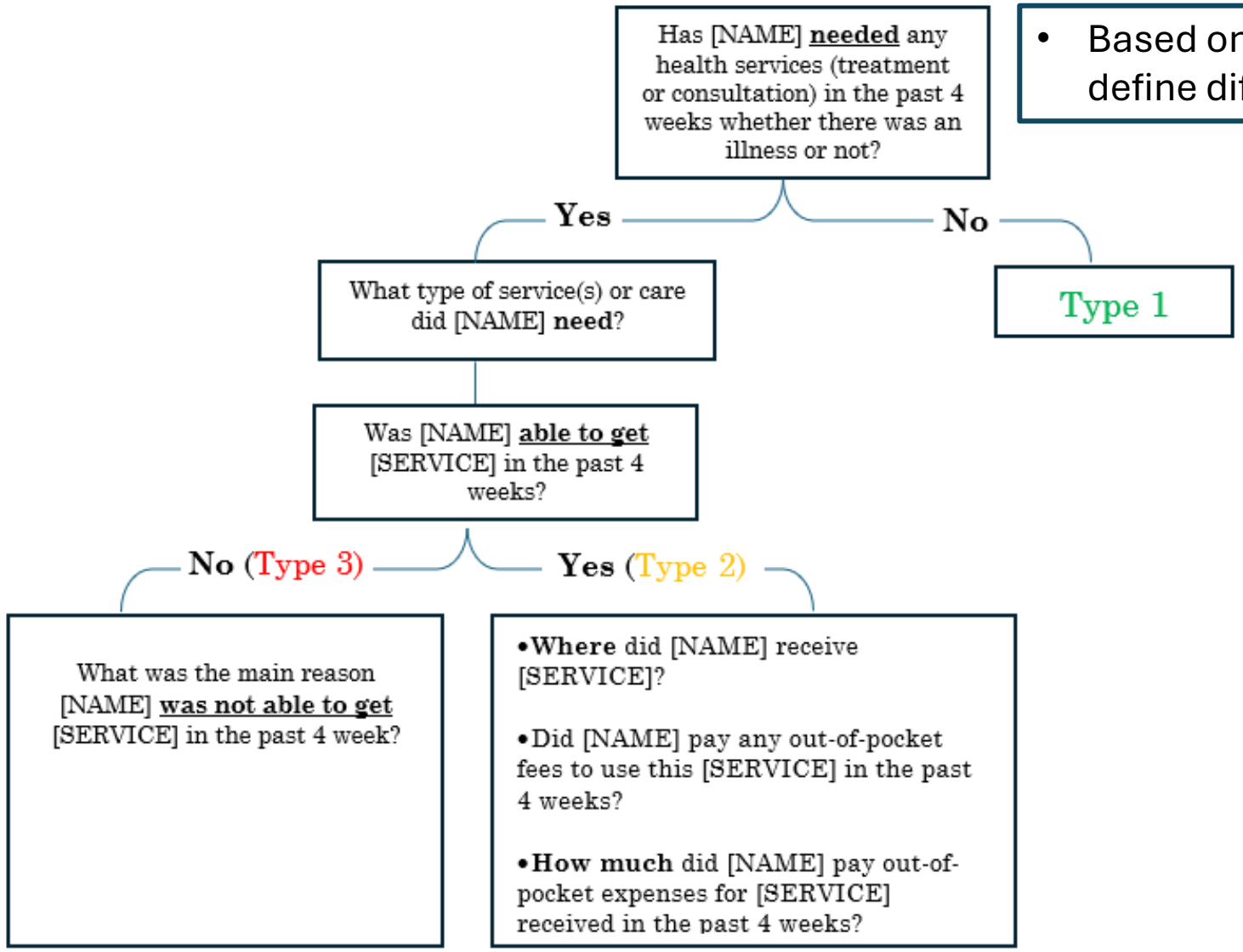
| 8. | 9. | | | | | | |
|---|---|---|---|---|---|---|---|
| Did you, or any member of your household, have to pay out of your own pocket fees to use this [SERVICE] **in the past 4 weeks?**<br><br>**ASK THE QUESTION FOR EACH SERVICE MARKED "YES" IN Q4**<br><br>YES.1<br>NO..2 >> Q10 | How much did your household pay out-of-pocket for [ITEM] for the [SERVICE] received in the past 4 weeks?<br><br>**ASK THE QUESTION FOR EACH SERVICE MARKED "YES" IN Q4**<br><br>**RECORD -9999 IF DON'T KNOW** | | | | | | |
| | Examination /Medical visits | Prescription drugs or drugs recommended by a health professional | Non-prescription drugs obtained over-the-counter (without health professional recommendation) | Emergency (ambulance) | Non-emergency Transport | Other expenses (Specify) |

- Need of service (whether there was illness or not) in the past 4 weeks.
- Information collected at individual/service level.
- Reasons for foregoing health care.
- Health OOP spending by spending category (exams, prescription/non-prescription drugs, transport…).

# Health Spending Characteristics

Frequency, size, and composition

# Spending types

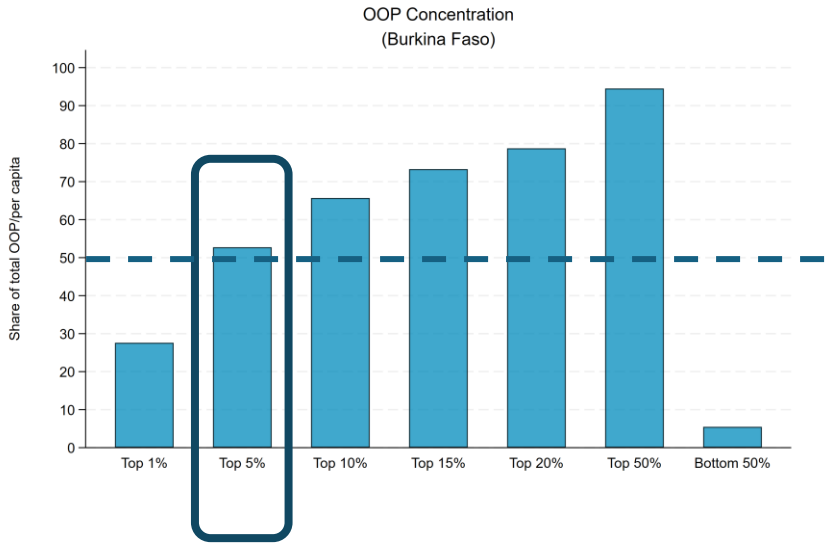


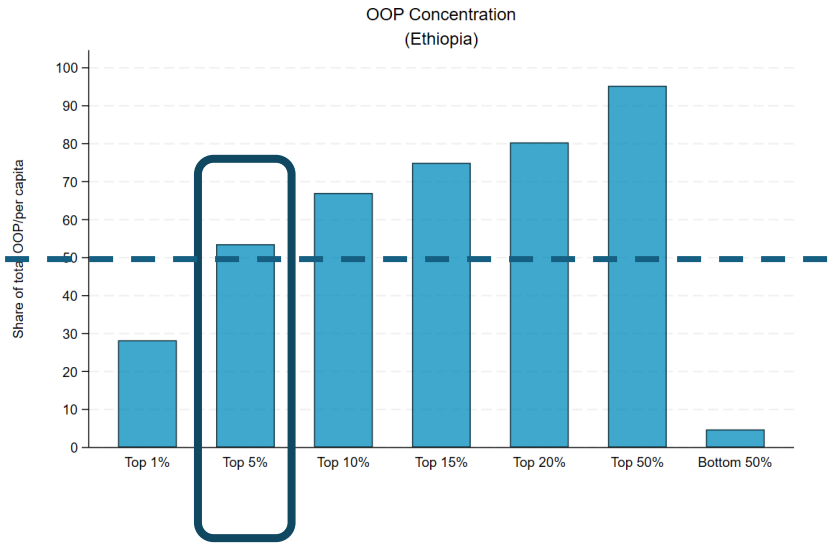

- Based on response patterns across survey rounds, we define different types of health spenders.

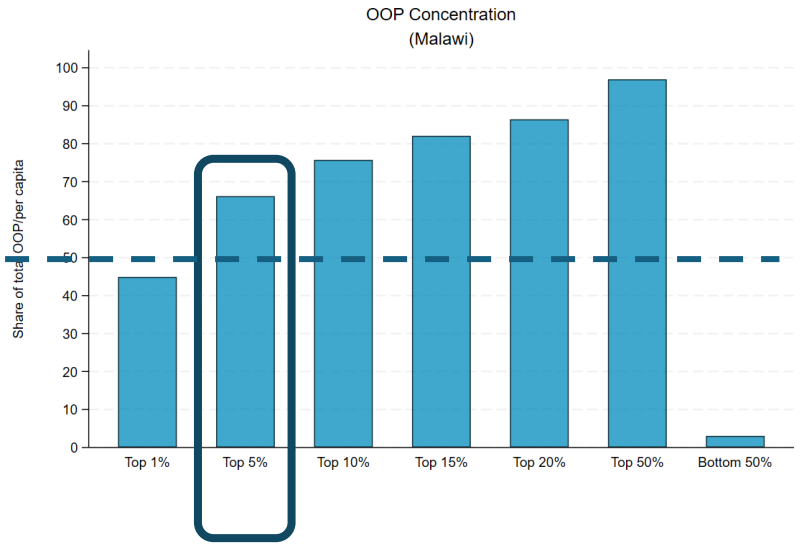
| Type of access in each round |
|---|
| Type 1: No reported need |
| Type 2: Reported need and use |
| Type 3: Reported need without use |

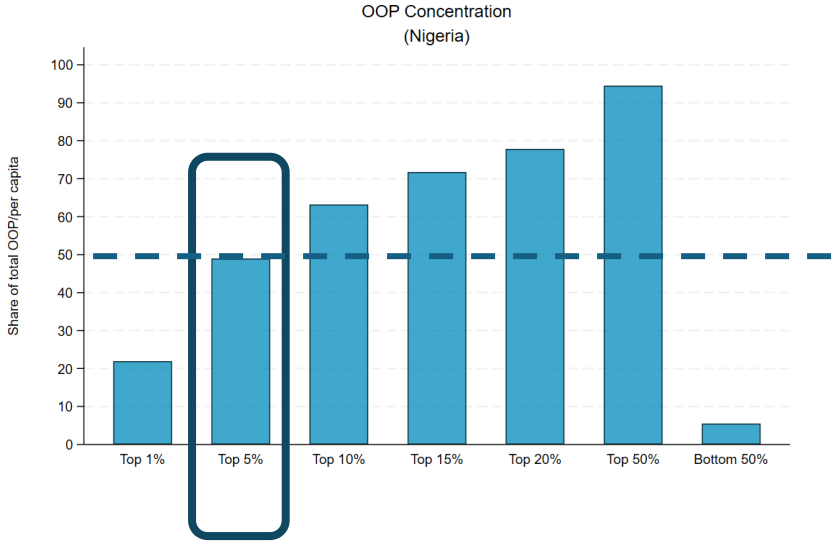
| Type of spenders in all rounds |
|---|
| |
| **Frequent spender:** Spent if needed (Type 2 in two or more) [other rounds can be Type 1 or 3] |
| **Rare spender:** Spent if needed (Type 2 in only one round) [other rounds can be Type 1 or 3] |
| **Never spenders (with or without need)** (Type 1 or Type 3 in all rounds) |

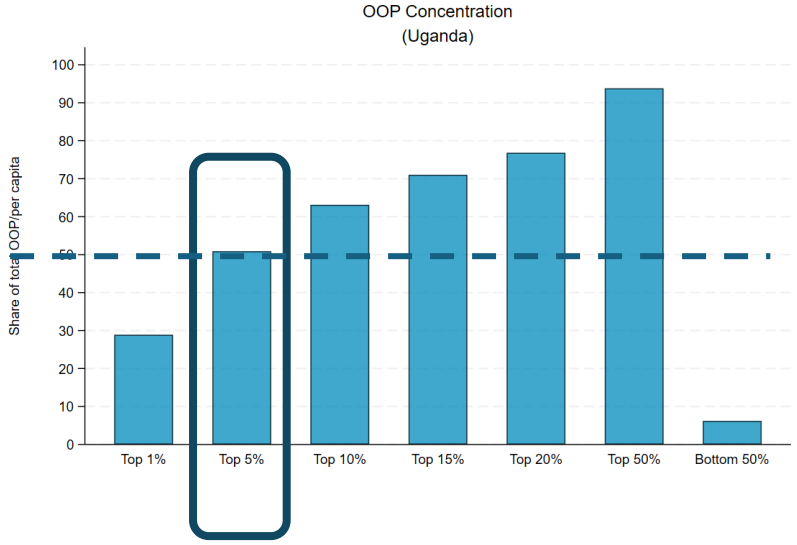
# Health OOP Concentration



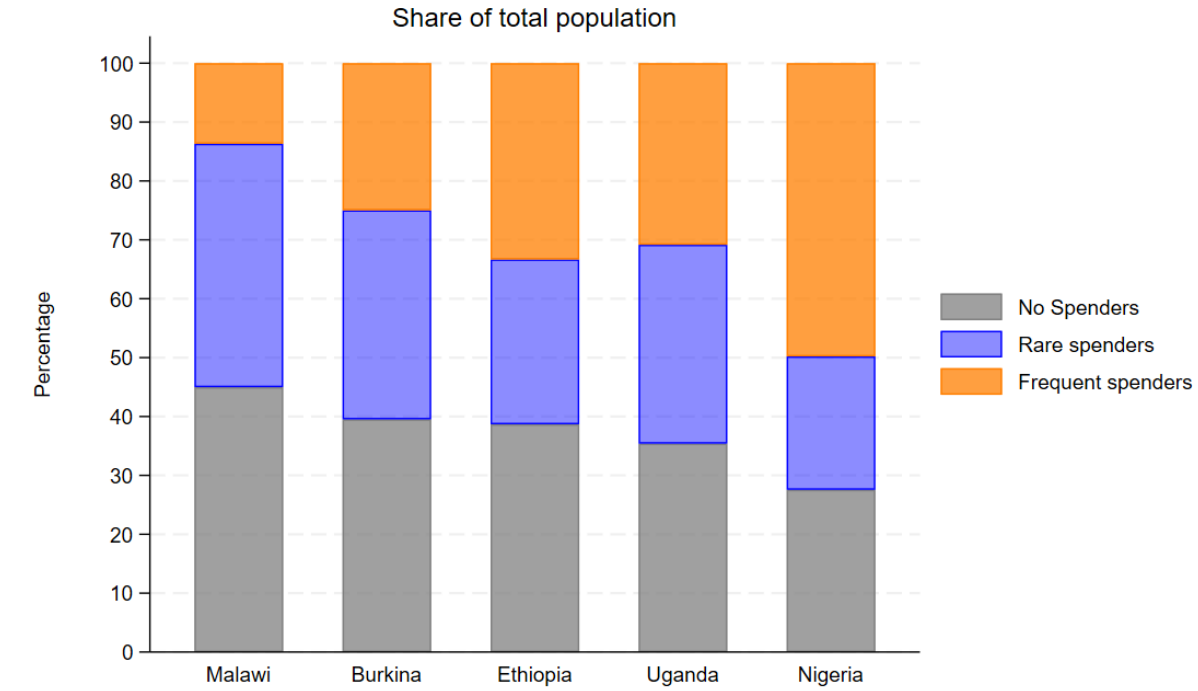



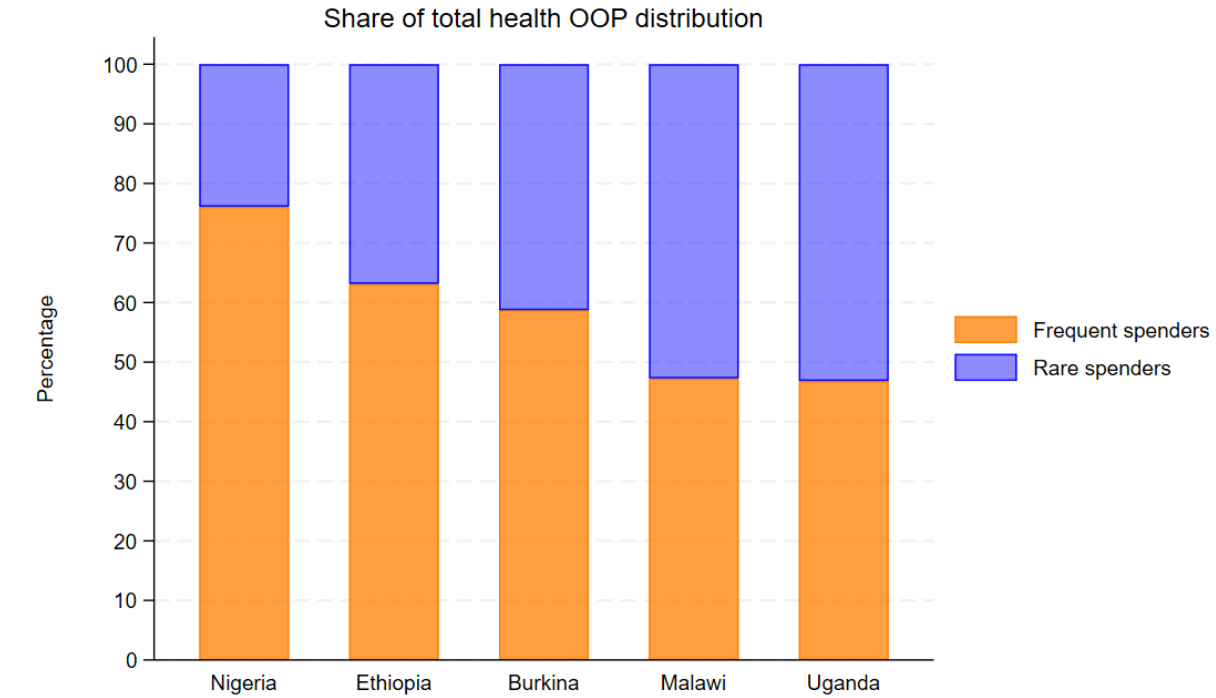




- Health OOP is heavily concentrated.
- In all 5 countries, the top 5% spenders account for at least 50% of total OOP (average per capita at household level).

# Health OOP Concentration by Spender Type




Source: World Bank High Frequency Phone Surveys (2022-2023.)

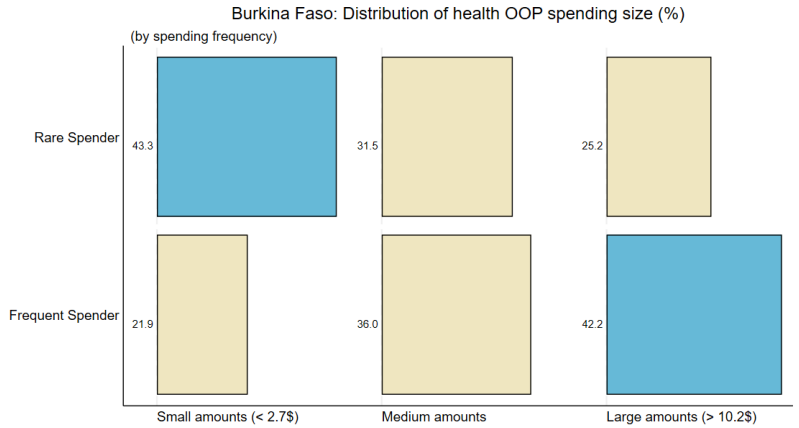



Source: World Bank High Frequency Phone Surveys (2022-2023.)

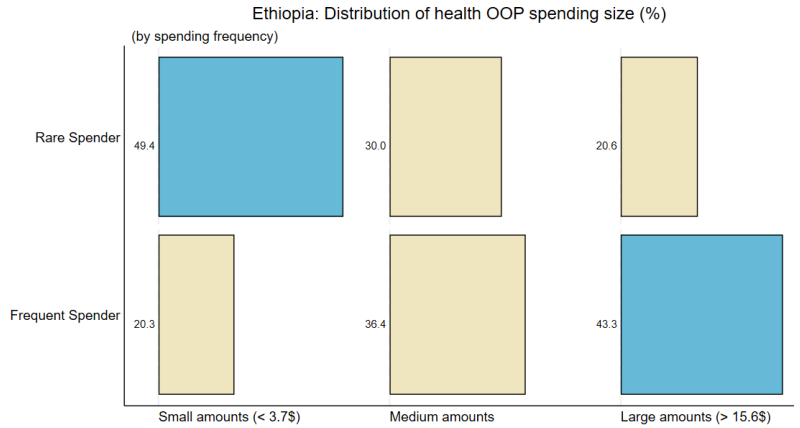
- **Frequent spending on health is not a rare event.**
- Households with at least one frequent spender member account for ~12% of the population in Malawi and for 50% of the population in Nigeria.

- Households with frequent spenders represent over 75% of all spenders in Nigeria and almost 50% in Malawi and Uganda.

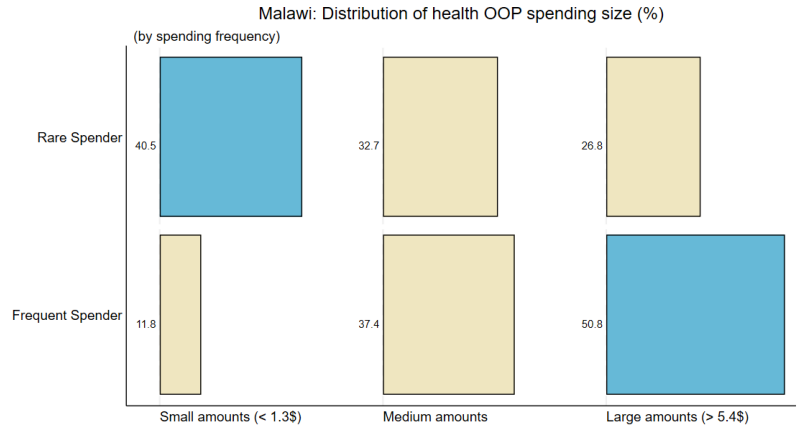
# Health OOP Frequency and Spending Size



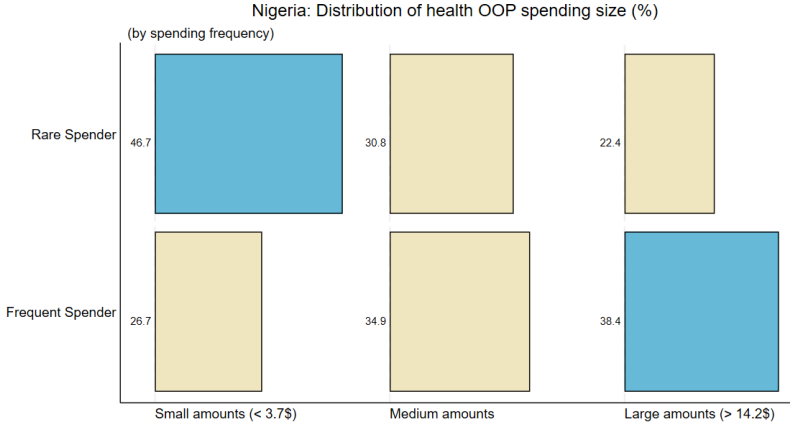

*Source:* Burkina Faso High Frequency Phone Survey (2022-23).
*Note:* Annualized health expenditure distribution estimated from panel data.
The categories for small/medium/large amounts are based on splitting the per capita annual distribution around the 33rd (2.7$) and 66th (10.2$) percentiles.



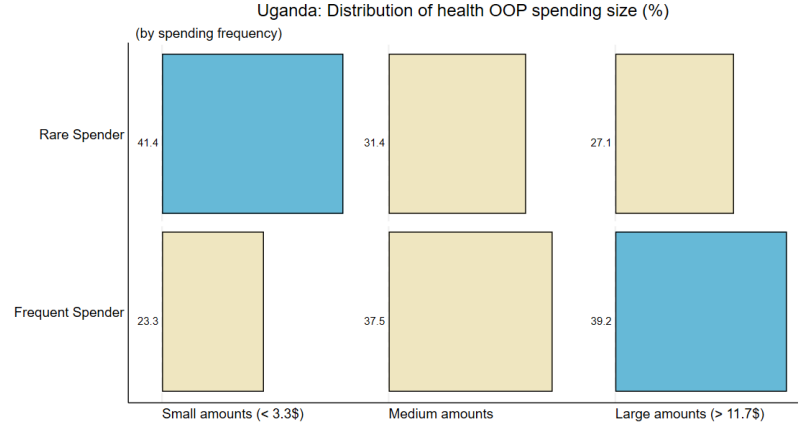

*Source:* Ethiopia High Frequency Phone Survey (2022-23).
*Note:* Annualized health expenditure distribution estimated from panel data.
The categories for small/medium/large amounts are based on splitting the per capita annual distribution around the 33rd (3.7$) and 66th (15.6$) percentiles.




*Source:* Malawi High Frequency Phone Survey (2022-23).
*Note:* Annualized health expenditure distribution estimated from panel data.
The categories for small/medium/large amounts are based on splitting the per capita annual distribution around the 33rd (1.3$) and 66th (5.4$) percentiles.



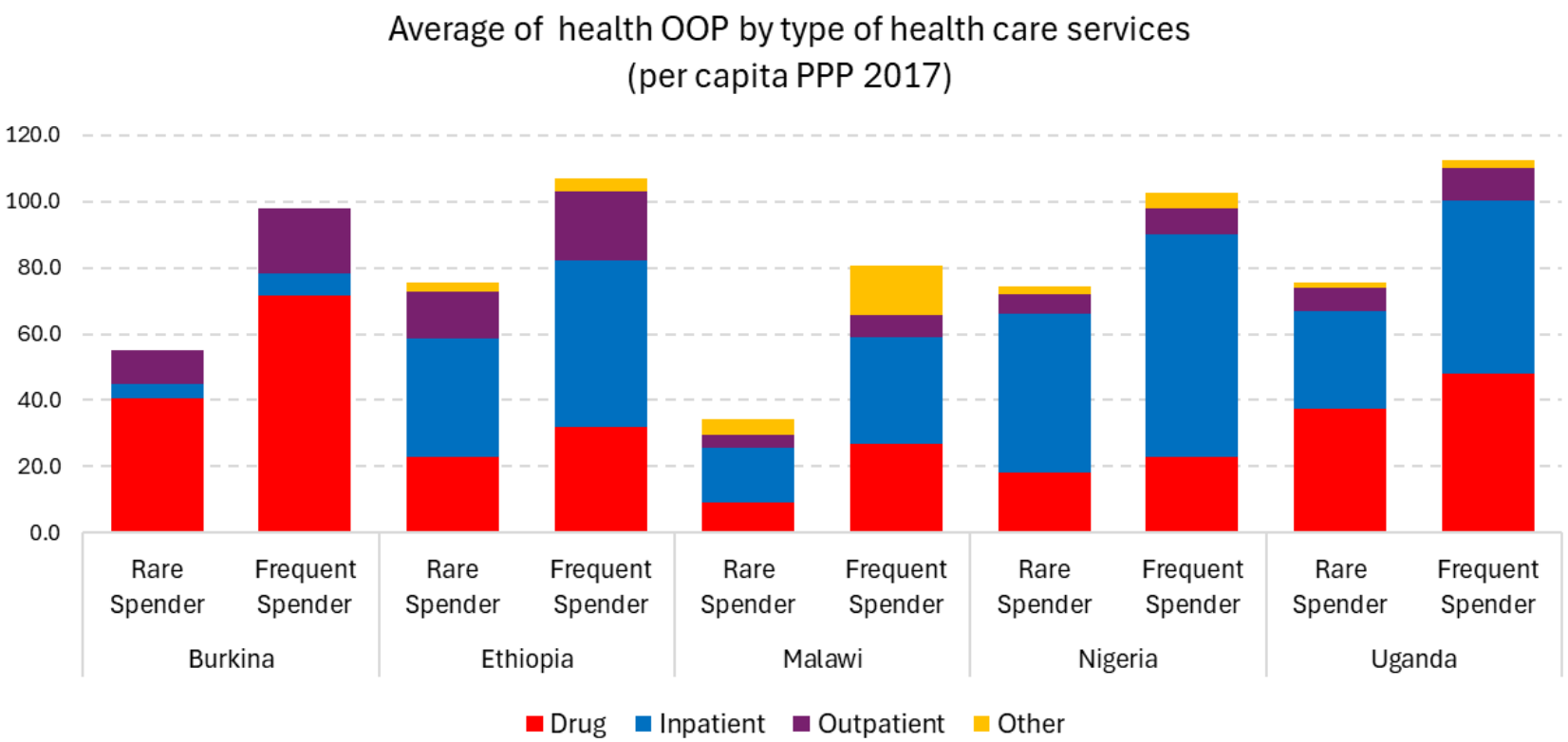

*Source:* Nigeria High Frequency Phone Survey (2022-23).
*Note:* Annualized health expenditure distribution estimated from panel data.
The categories for small/medium/large amounts are based on splitting the per capita annual distribution around the 33rd (3.7$) and 66th (14.2$) percentiles.




*Source:* Uganda High Frequency Phone Survey (2022-23).
*Note:* Annualized health expenditure distribution estimated from panel data.
The categories for small/medium/large amounts are based on splitting the per capita annual distribution around the 33rd (3.3$) and 66th (11.7$) percentiles.

- Frequent spenders are more likely to spend larger amounts on health, and rare spenders are more likely to spend lower amounts.

# Health OOP Frequency and Composition



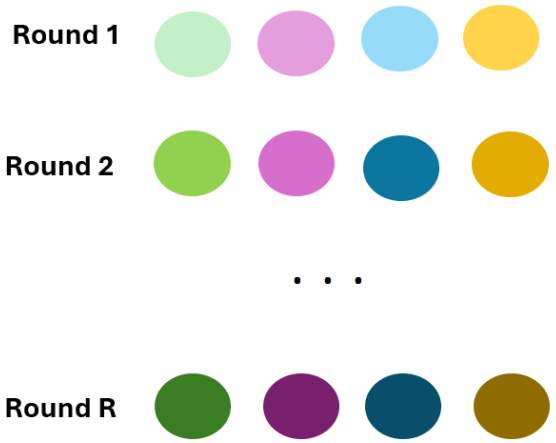

- Spending on **drugs**, and on **inpatient care** represent the majority of health OOP spending in all 5 countries covered in this study.

# Annualization

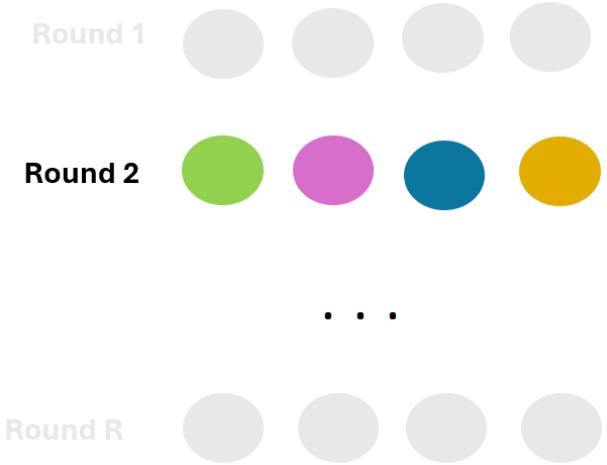
Comparing different approaches

# Annualization Comparisons

## (i) Panel data approach (Benchmark)

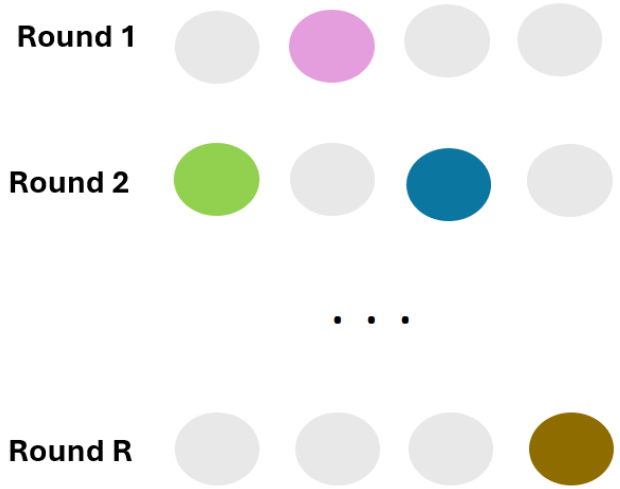



## (ii) Round-specific cross-sectional estimation




Not included in analysis

## (iii) Pooled cross-sectional estimation with non-repeated households




Not included in analysis

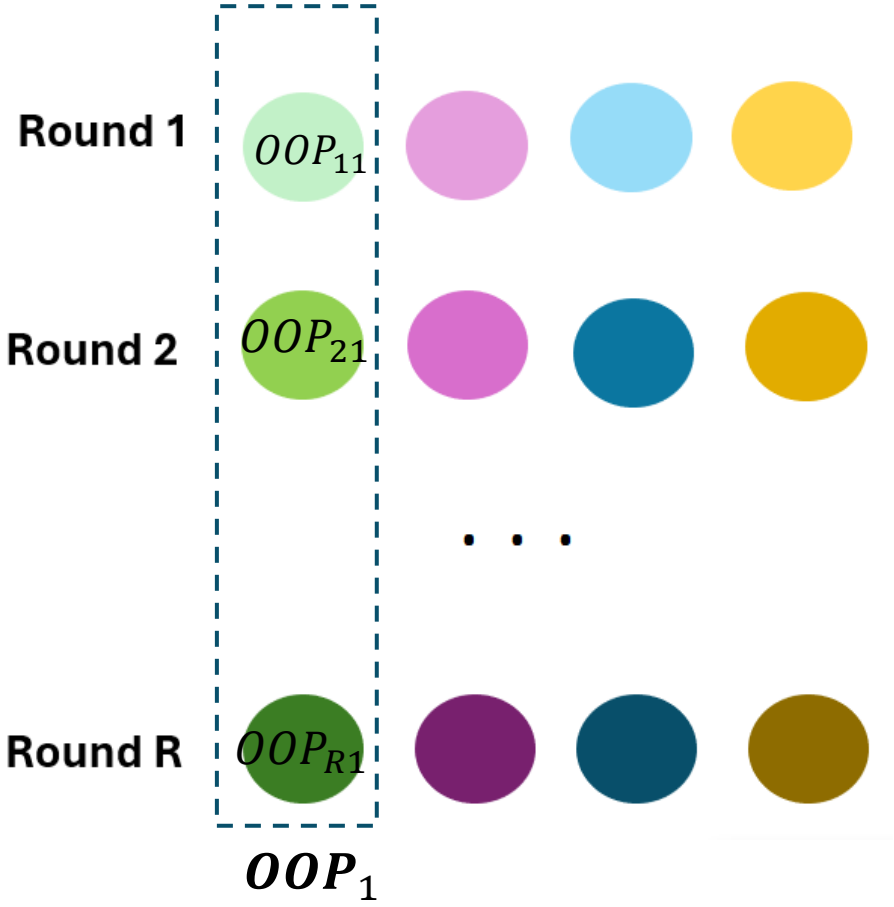
# Annualization Comparisons

**(i) Panel data approach:**

$$OOP^{Panel} = \frac{1}{\sum_{j=1}^{N} w_j} \sum_{j=1}^{N} w_j OOP_j$$

$$OOP_j = \frac{12}{R} \sum_{r=1}^{R} OOP_{rj,}$$

Under the **panel approach** (benchmark), we first sum health spending across survey rounds, and we annualize the average spending amount/capita/round.

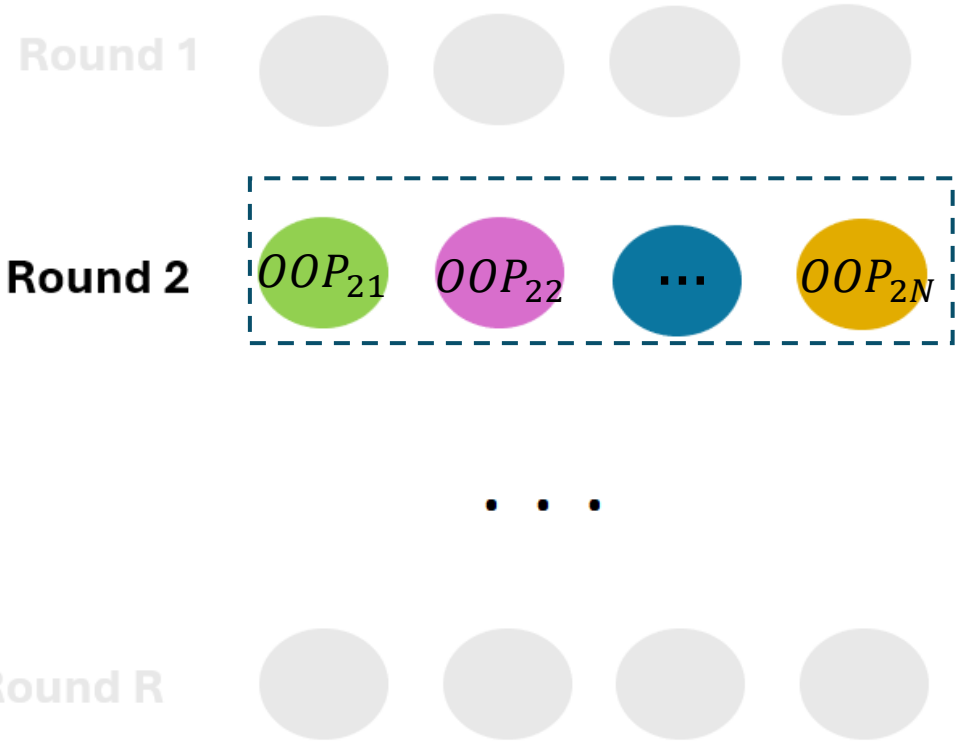


# Annualization Comparisons

**(ii) Round-specific cross-sectional estimation:**

$$OOP_r^S = \frac{12}{\sum_{j=1}^{N_r} w_{rj}} \sum_{j=1}^{N_r} w_{rj}\, OOP_{rj}$$

Under the **round-specific CS approach**, we treat each round of data collection as an independent sample, and we annualize the health spending amounts.



# Annualization Comparisons

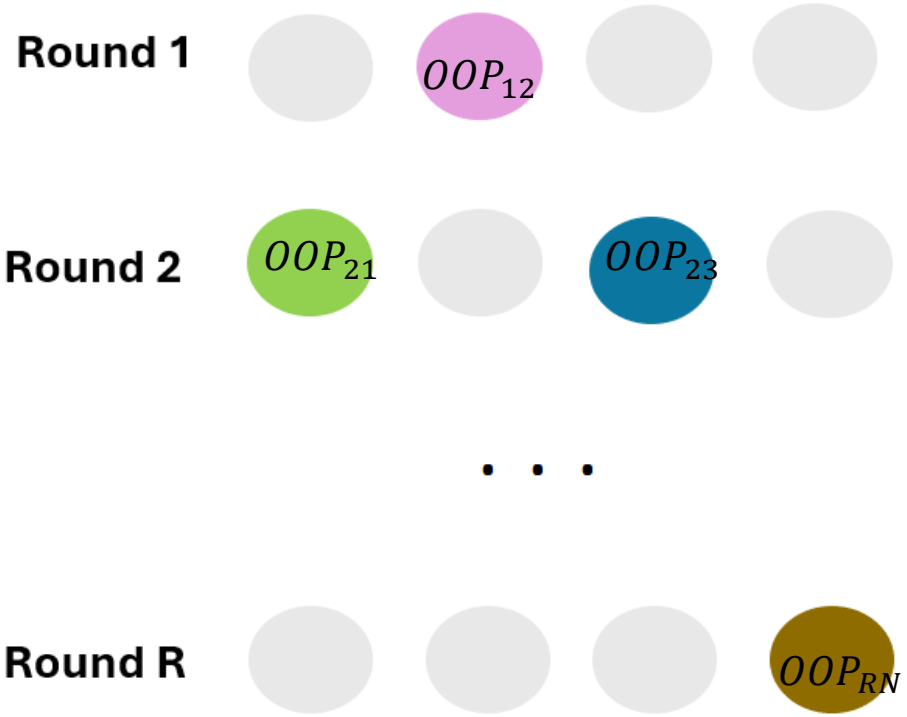
**(iii) Pooled cross-sectional estimation with non-repeated households:**

$$OOP_{Non-repeat}^{Pooled} = \frac{12}{\sum_{r=1}^{R}\sum_{j=1}^{\bar{N}_r} w_{rj}} \sum_{r=1}^{R}\sum_{j=1}^{\bar{N}_r} w_{rj}\, OOP_{rj}$$

Under the **pooled CS approach**, we also construct a cross-sectional dataset, but we select a subset of households from the panel data to appear only once.

Households are randomly distributed in specific cross sections such that:

- (1) each household is selected only once, and
- (2) the sample is distributed across all rounds of the panel.



# Annualization Comparisons

| | | # of statistically significant differences (Independent cross-section (ii) vs panel estimates (i)) | | |
|---|---|---|---|---|
| | Total # of comparisons (n) | OOP per capita (population estimate) | OOP per capita (spenders only) | Share of drug spending |
| *Total* | *19* | *7* | *19* | *10* |
| Burkina | 4 | 1 | 4 | 4 |
| Ethiopia | 5 | 0 | 5 | 1 |
| Malawi | 3 | 2 | 3 | 2 |
| Nigeria | 4 | 2 | 4 | 2 |
| Uganda | 3 | 2 | 3 | 1 |
| RMSE as % mean* | | 175.2 | 6898.4 | 34.2 |
| Average of MAE** | | 53.2 | 94.7 | 13.7 |
| Average of MAPE*** | | 111.2 | 121.4 | 151.8 |

*RMSE (Root Mean Squared Error): $\sqrt{\frac{1}{n}\sum_{i=1}^{n}(OOP_{panel(i)} - OOP_{Cross\ (ii)})^2}$. To compute RMSE as % mean, the RMSE divided by average of OOP from Panel.

**MAE (Mean Absolute Error): $\frac{1}{K}\sum_{k=1}^{K}|OOP(i)_k - OOP(ii)_k|$

*** MAPE (Mean Absolute Percentage Error): $\frac{100}{K}\sum_{k=1}^{K}\frac{|OOP(i)_k - OOP(ii)_k|}{OOP(i)_k}$

- We systematically compare whether our variables of interest differ between the single cross-sectional approach and the panel estimate across all comparisons.
- If we focus on **average OOP per capita across the entire population**, a naïve annualization based on a single cross-section is statistically different from the analog amount estimated using infra-annual panel data about 37% of the time.
- The difference in estimation is larger if we are interested in **average OOP spending per capita among the spenders only**.
- The estimation of **OOP composition** also differs over half of the time.

# Annualization Comparisons

| # of statistically significant differences (Pooled cross-section (iii) vs panel estimates (i)) | | | | |
|---|---|---|---|---|
| | Total # of comparisons (n) | OOP per capita (population estimate) | OOP per capita (spenders only) | Share of drug spending |
| *Total* | *100* | *3* | *100* | *9* |
| Burkina | 20 | 0 | 20 | 2 |
| Ethiopia | 20 | 0 | 20 | 0 |
| Malawi | 20 | 3 | 20 | 1 |
| Nigeria | 20 | 0 | 20 | 5 |
| Uganda | 20 | 0 | 20 | 1 |
| RMSE as % mean* | | 25.4 | 6591.8 | 6.2 |
| Average of MAE** | | 48.4 | 86.2 | 12.5 |
| Average of MAPE*** | | 106.5 | 112.0 | 128.2 |

*RMSE (Root Mean Squared Error): $\sqrt{\frac{1}{n}\sum_{i=1}^{n}(OOP_{panel(i)} - OOP_{Cross\ (ii)})^2}$. To compute RMSE as % mean, the RMSE divided by average of OOP from Panel.

**MAE (Mean Absolute Error): $\frac{1}{K}\sum_{k=1}^{K}|OOP(i)_k - OOP(ii)_k|$

*** MAPE (Mean Absolute Percentage Error): $\frac{100}{K}\sum_{k=1}^{K}\frac{|OOP(i)_k - OOP(ii)_k|}{OOP(i)_k}$

- Comparing **seasonally-adjusted cross-sections** with panel data produces closer estimates of **average OOP per capita for the entire population**.
- Comparisons of **OOP composition** (share of drugs) also remain within reasonable bounds and differ less than 10% of the time.
- **Average OOP per capita among the spenders only** remain however systematically different.

# Conclusion

# Discussion/Conclusion

Collecting high frequency data (infra-annual) on health expenditure seems to matter for at least two reasons:

## Measurement

More reliable population-level estimation of health OOP annual volume and composition (especially if we want to estimate average spending among the spenders).

## Policy

More granular characterization of health spenders.

- Across the 5 countries covered in this study, total health OOP spending is heavily concentrated with frequent spenders accounting for a large proportion of health OOP expenditure, because they spend more often and because they spend more.
- Allows better targeting for health insurance schemes and for benefit package design.
- Optimal risk sharing strategies will depend on the frequency and the size of the risk distribution.

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- Allows better targeting for health insurance schemes and for benefit package design.
- Optimal risk sharing strategies will depend on the frequency and the size of the risk distribution.

## Survey Design

- Conducting high-frequency data collection at country level should also consider:
  - Data collection costs
  - Sampling frame/attrition
  - Mode effects (phone surveys)
  - Possibility to integrate high frequency data with larger/lower frequency datasets