DEMAND FOR DRUGS FOR CHILDHOOD MALARIA IN RURAL MOZAMBIQUE

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Outline

• Introduction: Context & Objectives.

• Methods: Study design & Model specification.
  – Wealth Indicator in low-income countries.

• Results: Outcomes and Demand.

• Discussion and conclusions.
Introduction: context

• Malaria: infectious disease transmitted by mosquitoes.

• Treatment: Artemisinin-based Combination therapy (ACT). High quality but fairly expensive.

• Market failures for ACTs:
  – Supply: limited availability and unknown quality.
  – Demand: lack of information and low access.
Introduction: objectives

1. Estimate willingness-to-pay (WTP) for ACTs in children.

2. Quantify financial gaps to improve market for ACTs.

Introduction: Manhiça
Methods: study design

• Survey carried out (N=399) assessing WTP among children with malaria.

• Date: 15\textsuperscript{th} Feb – 11\textsuperscript{th} Apr 2012 (high malaria season).

• Wealth indicator: Multiple correspondence analysis.

• Merging: WTP, Outpatient visits and DSS data.
Methods: bidding game

WTP for anti-malarial drugs ACTs

Starting bid:
- Age range 1: 0.60 USD
- Age range 2: 1.20 USD
- Age range 3: 1.80 USD
- Age range 4: 2.40 USD

Yes

Second bid:
- Age range 1: 1.66 USD
- Age range 2: 3.32 USD
- Age range 3: 4.98 USD
- Age range 4: 6.64 USD

Yes

Max WTP

No

Max WTP

Why?

Age range 1: 0.36 USD
Age range 2: 0.73 USD
Age range 3: 1.09 USD
Age range 4: 1.45 USD

Max WTP
Methods: specification

• **Dependent variable:** Willingness-to-pay (WTP)
  - Hypothetical WTP: Highest hypothetical value to pay.
  - Stated WTP: Max. value willing to pay.

• **Regression analysis:**
  - Count data: coefficients expressed as *incidence rate ratios* (IRR).
  - OLS: log transforming depending variable.

\[
\ln WTP_i(E(WTP|x)) = \beta_0 + \beta_1 \text{Age}_i + \beta_2 \text{Malaria}_i + \beta_3 \text{Other outpatients}_i + \beta_4 \text{HHMembers}_i + \\
+ \beta_5 \text{Gender}_i + \beta_6 \text{Wealth}_i + \beta_7 \text{Head occupation}_i + \beta_8 \text{Head education}_i + \beta_9 \text{Region}_i + \\
+ \beta_{10} \text{Interviewed}_i + \beta_{11} \text{Malariasiblings}_i + \beta_{12} \text{Other outpatients siblings}_i
\]
Methods: study design

*Reshaping basetmr and constructing n_agre in order to locate the current agregado of individual

```stata
use basetmr, replace
local creation = creation[1]
keep perm_id date_birth region family ini_date exit_date
gen str n_agre = region + "-" + family
drop region family
sort perm_id ini_date
by perm_id: gen t=_n
sum t
local max = r(max)
reshape wide ini_date exit_date n_agre, i(perm_id) j(t)
forvalues k=1/`max' {
    replace exit_date`k' = `creation' if ini_date`k' != . & exit_date`k' == .
}
tempfile intervals
save `intervals', replace
*Catching current n_agre from basetmr (to Malmarket database):
use WTP_Sergi, replace
merge m:1 perm_id using `intervals', keepusing(n_agre ini_date exit_date) keep(master)
gen str n_agre = ""
forvalues k=1/`max' {
    replace n_agre = n_agre`k' if ini_date`k' <= date_interview & date_interview <= exit_date`k'
}
forvalues k=1/`max' {
    drop ini_date`k' exit_date`k' n_agre`k'
}
drop _merge
```
Wealth Index using MCA

- **Multiple Correspondence Analysis (MCA):**
  - Preferred to Principal Component Analysis (PCA). MCA allows for categorical variables.
  - Data reduction technique to generate a set of uncorrelated principal components.
  - 1st dimension usually used to define a wealth index, but other dimensions may imply other socio-economic indicators.
  - Usually allows a graphical representation for different indicators.
  - Stata uses similar commands for both methodologies:

```
*PRINCIPAL COMPONENT ANALYSIS:
pca t_const kitchen bath fuel divhouse water waterloc electric
predict score, score
xtile ses = score, nq(3)

*MULTIPLE CORRESPONDENCE ANALYSIS:
mca t_const kitchen bath fuel divhouse water waterloc electric
estat coordinates, norm(principal)
predict score, norm(principal)
xtile ses = score, nq(3)
mcaplot, overlay legend(off) xline(0) yline(0) scale(.8) msize(0.5)
```
MCA graphical representation

MCA coordinate plot

coordinates in standard normalization
### Results

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>(54.9%)</td>
</tr>
<tr>
<td>Girls</td>
<td>(45.1%)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>0-2 years</td>
<td>(19.8%)</td>
</tr>
<tr>
<td>2-5 years</td>
<td>(24.1%)</td>
</tr>
<tr>
<td>5-12 years</td>
<td>(50.1%)</td>
</tr>
<tr>
<td>+12 years</td>
<td>(8.0%)</td>
</tr>
<tr>
<td><strong>Head occupation</strong></td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>(33.8%)</td>
</tr>
<tr>
<td>Manufacture &amp; Mining</td>
<td>(39.1%)</td>
</tr>
<tr>
<td>Sales &amp; services</td>
<td>(27.1%)</td>
</tr>
<tr>
<td><strong>Head education</strong></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>(19.7%)</td>
</tr>
<tr>
<td>Literate</td>
<td>(2.6%)</td>
</tr>
<tr>
<td>Primary school</td>
<td>(67.2%)</td>
</tr>
<tr>
<td>High /higher school</td>
<td>(10.4%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean (S.D.)</th>
<th>Median (Min – Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothetical WTP</td>
<td>399</td>
<td>4.17 (1.93)</td>
<td>5.53 (0 – 8.60)</td>
</tr>
<tr>
<td>Stated WTP</td>
<td>399</td>
<td>0.94 (1.22)</td>
<td>0.65 (0 – 8.60)</td>
</tr>
<tr>
<td>High subsidy</td>
<td>399</td>
<td>3.80 (1.85)</td>
<td>3.96 (0 – 7.57)</td>
</tr>
<tr>
<td>Median subsidy</td>
<td>399</td>
<td>0.96 (0.78)</td>
<td>1.02 (0 – 2.74)</td>
</tr>
<tr>
<td>Low subsidy</td>
<td>399</td>
<td>0.46 (0.48)</td>
<td>0.24 (0 – 1.66)</td>
</tr>
</tbody>
</table>
Results: WTP outcomes
<table>
<thead>
<tr>
<th>Variables</th>
<th>Poisson (N=380)</th>
<th>Negative Binomial (N=380)</th>
<th>OLS (N=380)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-5 years (base: 0-2 years)</td>
<td>1.582 (0.301)**</td>
<td>1.572 (0.325)**</td>
<td>0.098 (0.074)</td>
</tr>
<tr>
<td>5-12 years</td>
<td>1.584 (0.287)**</td>
<td>1.558 (0.305)**</td>
<td>0.113 (0.069)</td>
</tr>
<tr>
<td>≥ 12 years</td>
<td>1.148 (0.320)</td>
<td>1.146 (0.346)</td>
<td>0.019 (0.108)</td>
</tr>
<tr>
<td># EPISODES OF MALARIA</td>
<td>0.899 (0.046)**</td>
<td>0.902 (0.051)*</td>
<td>-0.035 (0.021)*</td>
</tr>
<tr>
<td># OTHER OUTPATIENT VISITS</td>
<td>1.008 (0.037)</td>
<td>1.007 (0.041)</td>
<td>-0.007 (0.015)</td>
</tr>
<tr>
<td>GENDER (base: male)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.130 (0.124)</td>
<td>1.124 (0.136)</td>
<td>0.038 (0.047)</td>
</tr>
<tr>
<td>WEALTH STATUS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2 (poor) (base: T1, the most poor)</td>
<td>0.743 (0.109)**</td>
<td>0.744 (0.121)*</td>
<td>-0.115 (0.063)*</td>
</tr>
<tr>
<td>T3 (least poor)</td>
<td>0.966 (0.135)</td>
<td>0.952 (0.148)</td>
<td>-0.034 (0.064)</td>
</tr>
<tr>
<td>HEAD OCCUPATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing &amp; mining</td>
<td>1.292 (0.193)*</td>
<td>1.303 (0.215)</td>
<td>0.118 (0.062)*</td>
</tr>
<tr>
<td>Sales &amp; other services</td>
<td>1.409 (0.227)**</td>
<td>1.421 (0.255)**</td>
<td>0.144 (0.070)**</td>
</tr>
<tr>
<td>HEAD EDUCATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literate (base: no education)</td>
<td>1.085 (0.369)</td>
<td>1.058 (0.408)</td>
<td>0.042 (0.155)</td>
</tr>
<tr>
<td>Primary school</td>
<td>0.946 (0.162)</td>
<td>0.941 (0.177)</td>
<td>-0.049 (0.700)</td>
</tr>
<tr>
<td>High school</td>
<td>0.906 (0.238)</td>
<td>0.906 (0.262)</td>
<td>-0.040 (0.111)</td>
</tr>
<tr>
<td>Higher education</td>
<td>1.106 (0.378)</td>
<td>0.953 (0.395)</td>
<td>-0.122 (0.169)</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>0.720 (0.219)</td>
<td>0.733 (0.247)</td>
<td>0.505 (0.125)**</td>
</tr>
<tr>
<td>Alpha</td>
<td></td>
<td>-0.214 (0.334)**</td>
<td>-</td>
</tr>
<tr>
<td>LR Chi-squared</td>
<td>41.25</td>
<td>32.81</td>
<td>-</td>
</tr>
<tr>
<td>F statistic</td>
<td></td>
<td>-</td>
<td>1.28</td>
</tr>
</tbody>
</table>
Results: demand
Discussion/Conclusion

1. Mean WTP=0.94 USD/treat episode. Lower WTP than for prevention (WTP=2.97 USD/bednet).

2. Important gap between ACT price and WTP. Financial need: subsidy of at least 0.46 USD/episode.

3. Significant WTP determinants: age, number of malaria episodes, wealth and household head occupation.

4. Need to improve market demand.
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