Valuing the benefits of water and sanitation interventions:
An economic perspective

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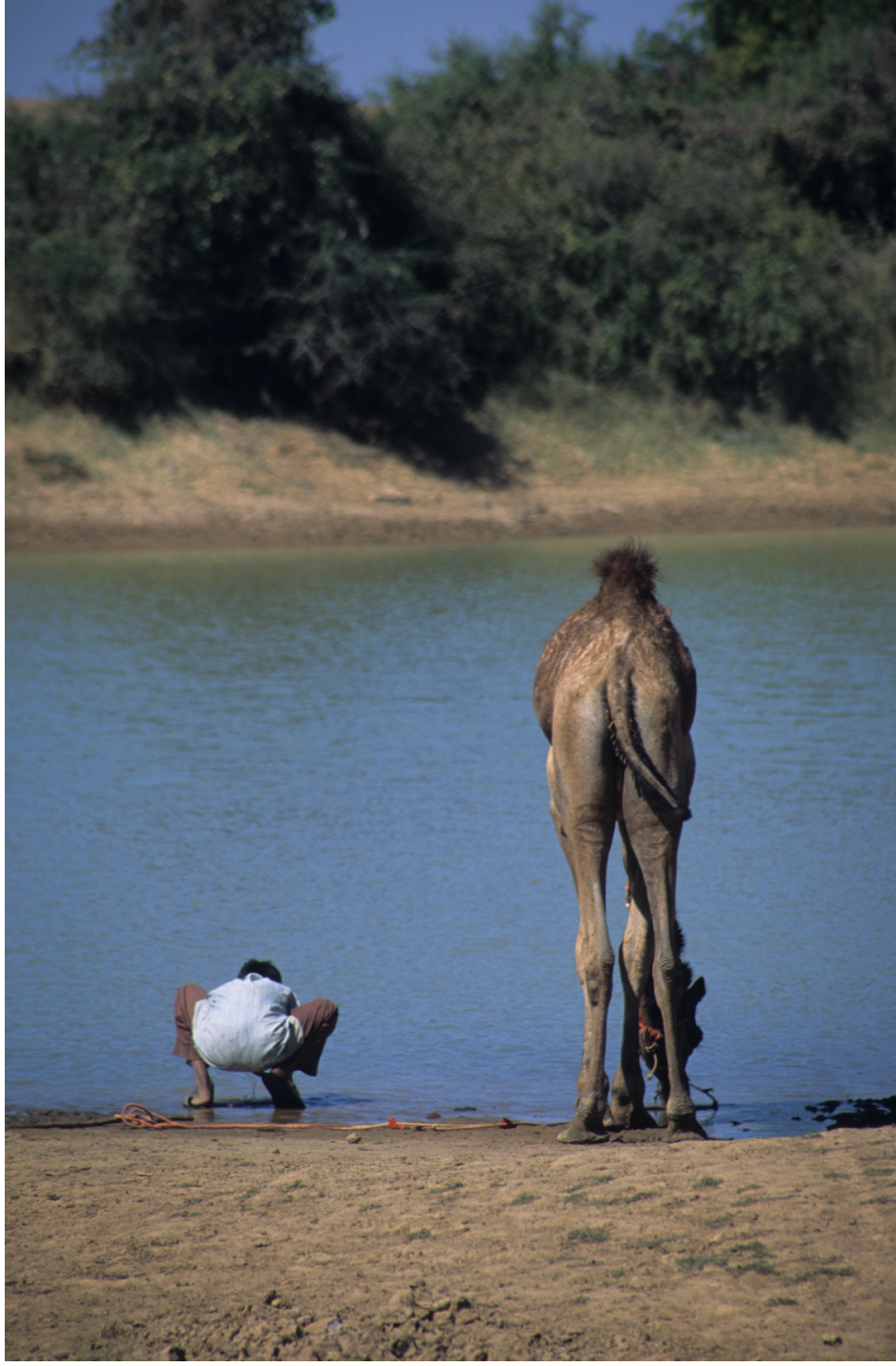


Economists' proposal:

Use changes in "human well-being" as a criterion to judge the wisdom (advisability) of adopting a policy, project, or regulation.

Can "human well-being" be defined and measured?

Changes in human well-being as a criterion for policy analysis?

	Possible to measure human well-being	Not possible to measure human well-being
Change in human well-being is an important criterion for judging the wisdom of a policy	Case 1	Case 2
Change in human well-being is NOT an important criterion for judging the wisdom of a policy	Case 3	Case 4

Economic conception of changes in well-being

Willingness to Pay (WTP)

Status quo → status quo + quality of life improving policy

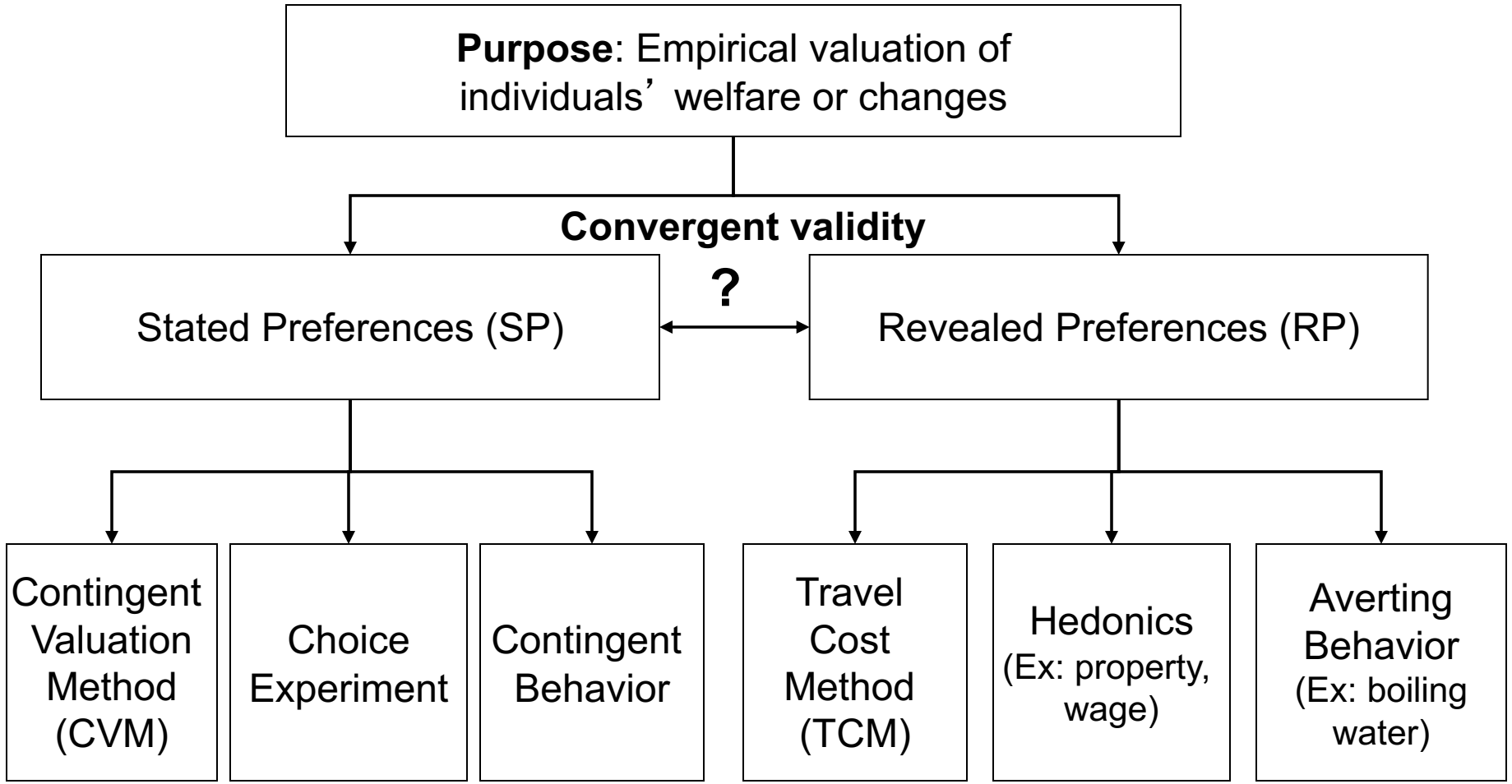
Willingness to Accept (WTA)

Status quo → status quo + quality of life decreasing policy

Common benefits associated with water and sanitation interventions

- Health related benefits
  - Morbidity
  - Mortality
- Non-health related benefits
  - Reduced coping costs (e.g., collection, storage, and treatment of water)
  - Aesthetic improvements (e.g., improved social standing, convenience, reduced anxiety, etc.)
  - Other (e.g., school attendance, economic growth, etc.)

A Taxonomy of Nonmarket Valuation Methods (the toolkit)



Health-related benefits: Morbidity reduction

Cost of Illness (COI)

- Private benefits → Private COI
  - Pain and suffering (acute and chronic)
  - Privately-borne cost of treatment and diagnosis (out-of-pocket costs)
  - Lost time/productivity of individual and caregivers (opportunity costs)
- Public benefits → Public COI
  - Wages
  - Medication
  - Facilities
  - Travel

Health-related benefits: Mortality reduction

Value of mortality risk reduction

(Non-economic) Approaches

1. Gross Output Method: Present value of expected future labor earnings
2. Net Output Method: Present value of expected future labor earnings minus expenditure on personal consumption
3. Life Insurance Method: Value for which person insures their life
4. Political Derivation Method: Impute the value of life from past political decisions that involve saving lives

These approaches do not reflect individual preferences

Health-related benefits: Mortality reduction

Value of mortality risk reduction

Economists' approach:

"How much do individuals require as ex ante compensation to voluntarily accept a small additional risk of death?" (WTA)

OR

"How much would individuals be willing to pay for a small reduction mortality risk?" (WTP)

Health-related benefits: Mortality reduction

Value of mortality risk reduction

- Approaches
  - Stated preference (ask people)
  - Revealed preference (observe their behavior)
- May vary with…
  - Age
  - Income
  - Baseline risk
  - Impact on others
  - Nature of mortality risk (cancer, occupational risk, car crash, natural disaster)

What's an African Life Worth?

What crocodile-infested rivers and hovercrafts tell us about how people value their own safety.

BY ALICIA P.Q. WITTMEYER | DECEMBER 9, 2013, 5:18 PM

Table 1. Summary of international studies reviewed

Study	Type	Country	Per Capita GDP	Reported VSL
Developing Countries				
Jeuland et al. (2008)	CV/SP	Beira, Mozambique	504	11,700
Kremer et al. (2009)	RP	Kenya (Rural)	892	500
Maskery et al. (2008)	CV/SP	Bangladesh (Rural)	896	12,075
Simon, Cropper, Alberini and Arora (1999)	WR	India	2,084	263,575
Shanmugam (2000)	WR	India (Chennai)	2,084	910,000
Shanmugam (2001)	WR	India (Chennai)	2,084	1,885,000
Bhattacharya, Alberini, and Cropper (2007)	CV/SP	India (Delhi)	2,084	9,068
Shanmugam (1997)	WR	India (Chennai)	2,084	877,500
Guo and Hammitt (2009)*	WR	China (Urban)	4,547	52,650
Hammitt and Zhou (2006)	CV/SP	China (Urban & Rural)	4,547	78,163
Wang and Mullahy (2006)	CV/SP	China (Chonging)	4,547	28,470
Vassanandumrongdee and Matsuoko (2005)	CV/SP	Thailand (Bangkok)	5,558	1,072,500
Vassanandumrongdee and Matsuoko (2005)	CV/SP	Thailand (Bangkok)	5,558	1,105,000
Gibson et al. (2007)	CV/SP	Thailand (Rural)	5,558	182,000
Melhuish, Ross, Goodge et al (2005)*	CV/SP	Malaysia	8,154	397,800
Hammitt and Ibarraran (2006)	WR	Mexico City	8,857	209,950
Ortuaz, Cifuentes, Williams (2000)*	CV/SP	Chile (Santiago)	9,329	2,067,000
Ortuaz, Cifuentes, Williams (2000)*	CV/SP	Chile (Santiago)	9,329	421,850
Giergiczny (2008)*	WR	Poland	10,644	1,202,500
Kim and Fishback (1999)*	WR	South Korea	17,098	650,000
Liu, Hammitt, Liu (1997)	WR	Taiwan	20,811	422,500
Liu and Hammitt (1999)*	WR	Taiwan	20,811	455,000
Sibert and Wei (1998)*	WR	Hong Kong	25,600	1,105,000
Industrialized Countries				
Meng and Smith (1999) **	WR	Canada	26,505	3,380,000
Baranzini and Ferro Luzzi (2001) **	WR	Switzerland	27,571	4,842,500
Lott and Manning (2000) **	WR	US	30,225	2,346,570
Dreyfus and Viscusi (1995) **	RP	US	30,225	3,598,075
Blomquist et al (1996) **	RP	US	30,225	4,536,703
Gayer et al (2000) **	RP	US	30,225	3,637,184
Jenkins et al (2001) **	RP	US	30,225	1,916,366

*Not included in references for this paper. Cited in Hammitt and Robinson (2011).
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  - School attendance

Non-health related benefits:

Coping costs

Direct costs (out-of-pocket expenditure)

- Alternative sources (bottled water, vended water, self-supply, etc.)

Non-health related benefits:

Coping costs

Direct costs (out-of-pocket expenditure)

- Alternative sources (bottled water, vended water, self-supply, etc.)
- Treatment (filtration, chlorination, boiling)

Non-health related benefits: Coping costs

Direct costs (out-of-pocket expenditure)

- Alternative sources (bottled water, vended water, self-supply, etc.)
- Treatment (filtration, chlorination, boiling)
- Storage (capital costs and maintenance)

Indirect costs

- Collection time (travel and waiting) → Opportunity cost of time

Non-health related benefits:

Valuing time savings

Step 1: Estimate time savings from an intervention ($T_{savings}$)

- Number of trips
- Transport mode
- Queue time

Non-health related benefits:
Valuing time savings

Step 1: Estimate time savings from an intervention ($T_{savings}$)

Step 2: Estimate the opportunity cost of time (P_{time})

- Travel choices/behavior
- Water source choice
- Challenges
  - Multi-use trips
  - Heterogeneity (e.g., income, who collects, etc.)

Nairobi City Water & Sewerage Company Ltd.
Improving Reliability
Mathare Mashimoni - Aqtap Water Dispenser

Non-health related benefits:
Valuing time savings

Step 1: Estimate time savings from an intervention ($T_{savings}$)

Step 2: Estimate the opportunity cost of time (P_{time})

- Travel choices
- Water source choice
- Challenges
  - Multi-use trips
  - Heterogeneity (e.g., income, who collects, etc.)

Step 3: Multiply and aggregate

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  - **School attendance**

Challenges and limitations

- Perceived benefits (private)
- Externalities (social)
- Financial vs. economic analysis
- Willingness to pay is bounded by ability to pay

Thank you

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