

Affordability of Water Services in the Inland Empire Phase I

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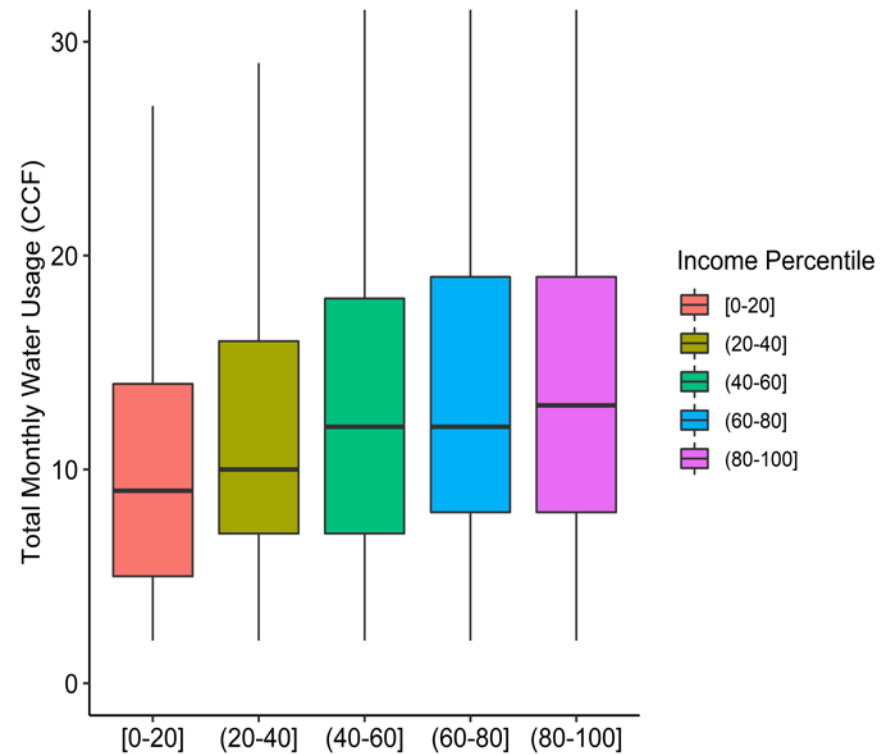


Figure 1. Inflation-adjusted Increase in average price of water (15 CCF³) for California Households



Source: American Water Works Association Data, 2007-2015

Water affordability generating increasing attention

- Water prices **↑** and income **↓**

Discretionary Income =

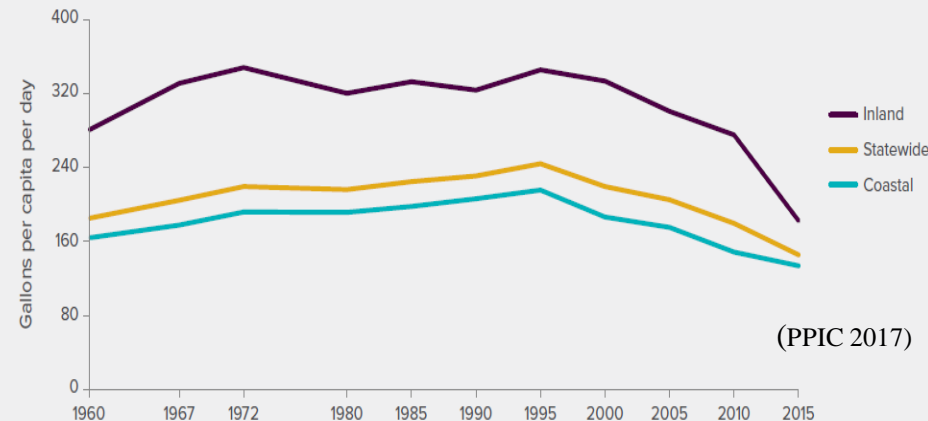
(Disposable) Income – water costs – costs for other essential needs

- As water costs rise => **discretionary income falls**
- Concerning for the > 13 million low-income Californians

Affordable?

- EPA Thresholds: 2% & 4.5%
- United Nations: 3% and 5%

PER CAPITA URBAN WATER USE HAS BEEN FALLING AND FELL STEEPLY DURING THE LATEST DROUGHT



(PPIC 2017)

SOURCE: Author calculations using data from the California Department of Water Resources, California Water Plan Update (various years).

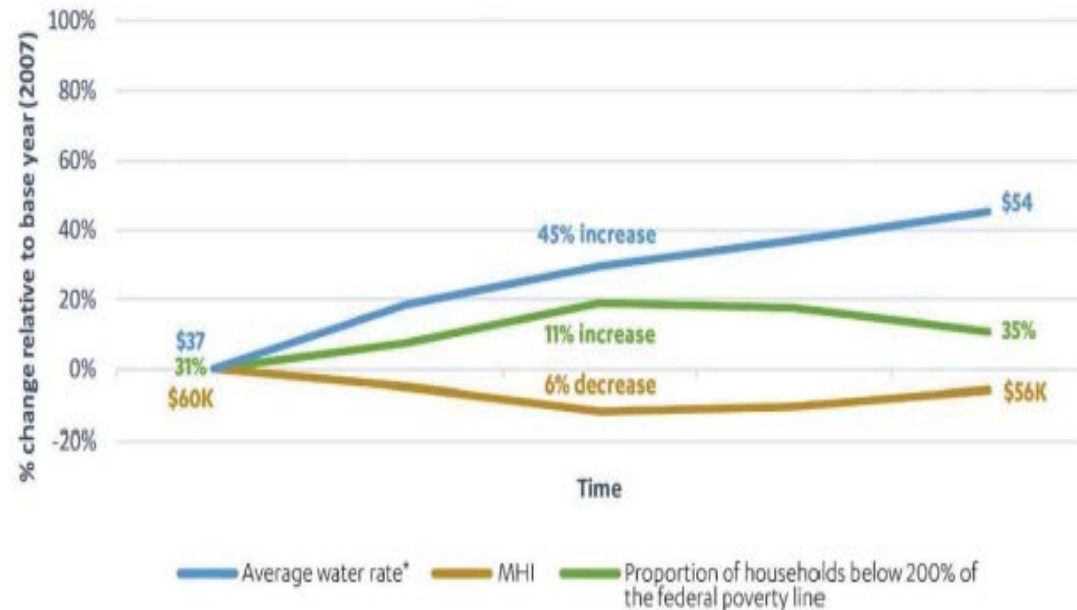
NOTES: The figure shows "applied" water delivered to homes and businesses. "Net" water use—i.e., the volume consumed by people or plants, embodied in manufactured goods, evaporated, or discharged to saline waters—is lower. The totals exclude water used by power plants and groundwater recharge projects and water lost during conveyance. Except for 2015 (a severe drought year), the estimates are for normal or "normalized" rainfall years (i.e., adjusted to levels that would have been used in a year of normal rainfall). Estimates are for water years (October to September). Inland areas tend to have higher per capita use because of higher temperatures and larger landscaped areas.

Water Rates and Income in California (SWRCB 2019)

Figure 2. Large Water Systems with High Percentages of Low-Income Households That Could be Eligible for Rate Assistance



Changes in water rates relative to median household income and the proportion of low income households since 2007



*This average derived from 4 regions in the AWWA California Water Rate Survey 2015.

Note: Calculated using Census data and system water boundaries. The percentages shown above represent the proportion of residential customers served by the system who have incomes under 200% of the Federal Poverty Level.

Human Right to Water Legislation

AB 685 (Eng, 2012). Human right to safe, clean, affordable and accessible drinking water

- 1st state to recognize the human right to safe, clean, affordable, and accessible water for human consumption, cooking, and sanitary purposes

SB 200 (Monning, 2019) Safe and Affordable Drinking Water Fund

- Helps local water systems provide safe and reliable drinking water
- Cost = ~ \$130 million allocated from Cap and Trade Funds

AB 401 (Dodd, 2015). Low-Income Water Rate Assistance Act

- Consideration of a state-wide Low-Income Water Bill Assistance (W-LIRA) Program
- Eligibility – 200% of FPL ~\$49K (similar to CARE program)
- Benefit Type – 20, 35, and 50% discount depending on cost of 12 CCFs
 - Similar to California Alternative Rates for Energy (CARE)
- Benefits Distribution – Perhaps county-level (e.g., Calfresh and EBT?)
- Collection – Progressive
- Cost = ~ \$600 annually (lots of uncertainty)

Objectives / Outline

- Evaluate how expenditures on water and sewer services within EMWD service area compare with the income that its residents have to spend on water and other essential services
- Highlight how “water affordability measures” are influenced by...
 - what sort of water services are being considered
 - what measure of income is being used
- Illustrate how expenditures on water compare to expenditures on other essential needs that households confront
- Reflect on our definition of *discretionary income* and ask:

What role can changing water costs play in increasing well-being among low-income households?

Water Expenditure Ratio (*WER*)

Basic metric: For a particular household “i”, we want to estimate the amount of money they spend on *water services* relative to the amount of money they have to spend overall...

$$\text{Water Expenditure Ratio (WER)}_i = \frac{\text{Household}_i \text{ Expenditures on Water Services}}{\text{Household}_i \text{ Income}} \times 100$$

Two Questions Arise:

1. What sort of water services do we want to consider?
2. What sort of income do we want to use...and what can we reasonably measure?

Question 1: What sort of water services do we want to consider (i.e., what goes in the numerator)?

1. Basic Needs (Essential water required for cooking and hygiene)
 - 35.66 gpcd (Mack and Wrase, 2017; Gleick 1996; Falkenmark 1991)
 - Close to the 6 CCF per household (for household of 4) specified in OEHHA
2. Indoor Water Use
 - (a) Efficient water use: 55 gpcd (SWRCB 2018; ACWA 2018)
 - Close to Teodoro's suggestion of 50 gpcd
 - (b) Winter time water use (often a proxy)
3. Full Water Budget Use (Efficient indoor and outdoor)
4. Overall Water Use (What we actually observe people using / choosing)
 - ⇒ Multiply above by relevant water prices to get water expenditures
 - ⇒ Include sewer services in all

Question 2: What sort of income do we want to use...and what can we reasonably measure? (i.e., *what goes in the denominator*)?

Issue 1: Difficult to get individual household level income data

Solution 1: Use Median Household income within “area”

- Often use state, county, or city-level median income
- EMWD Median income (2018): \$68,400

Issue 2: Income can vary significantly within an “area” depending on size of area

Solution 2: Define MHI by a smaller geographic area that better “summarizes” income for a household in a particular area

- Define by a US Census Block Group => better represents income
- EMWD has 240 Census Blocks (2018): [\$22,210 to \$119,464]

Issue 3: What about low-income households? Does MHI at Census Block Group represent their challenges clearly?

Solution 3: Use 20 Percentile Income Level by Block Group (Teodoro, 2018)

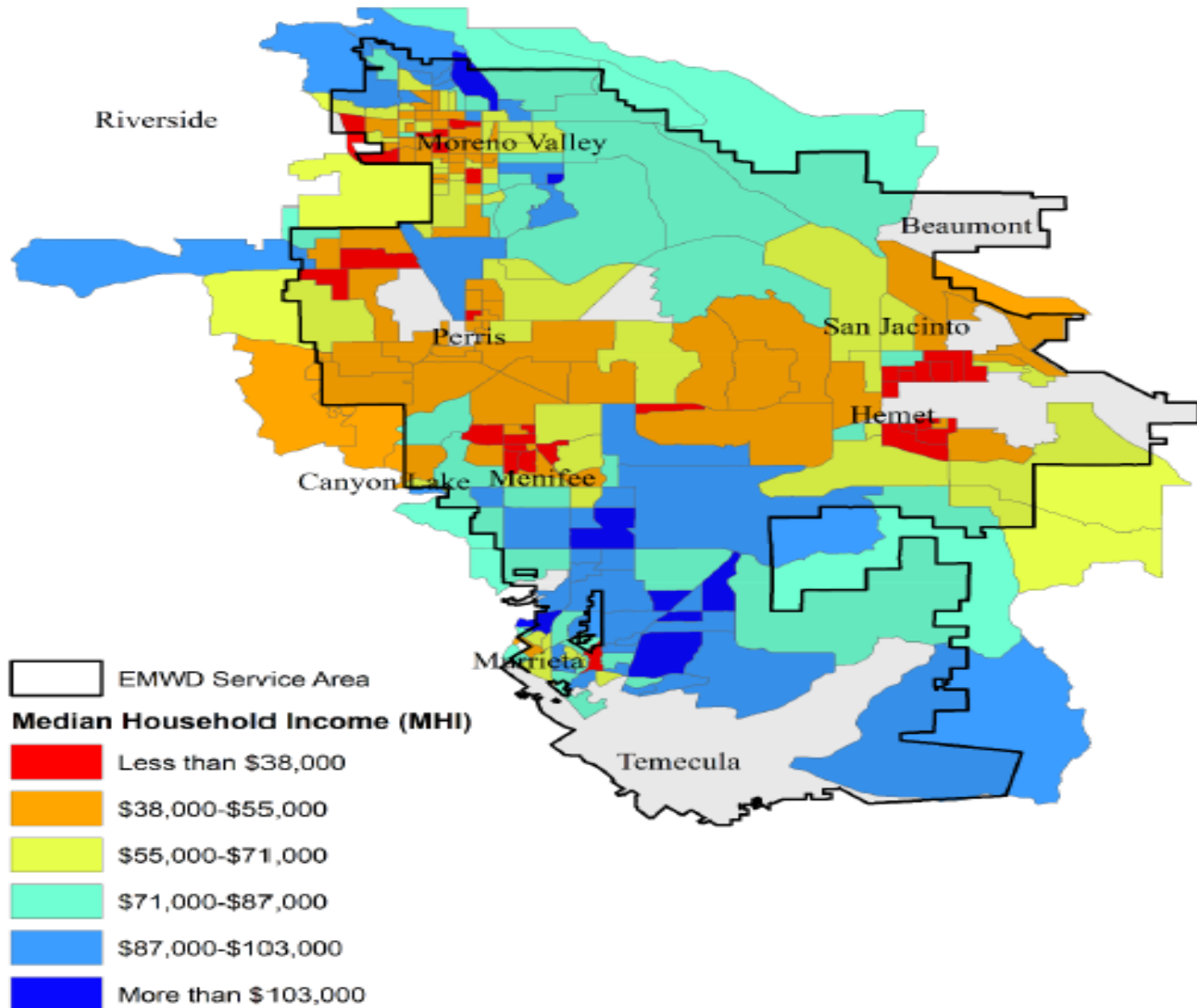
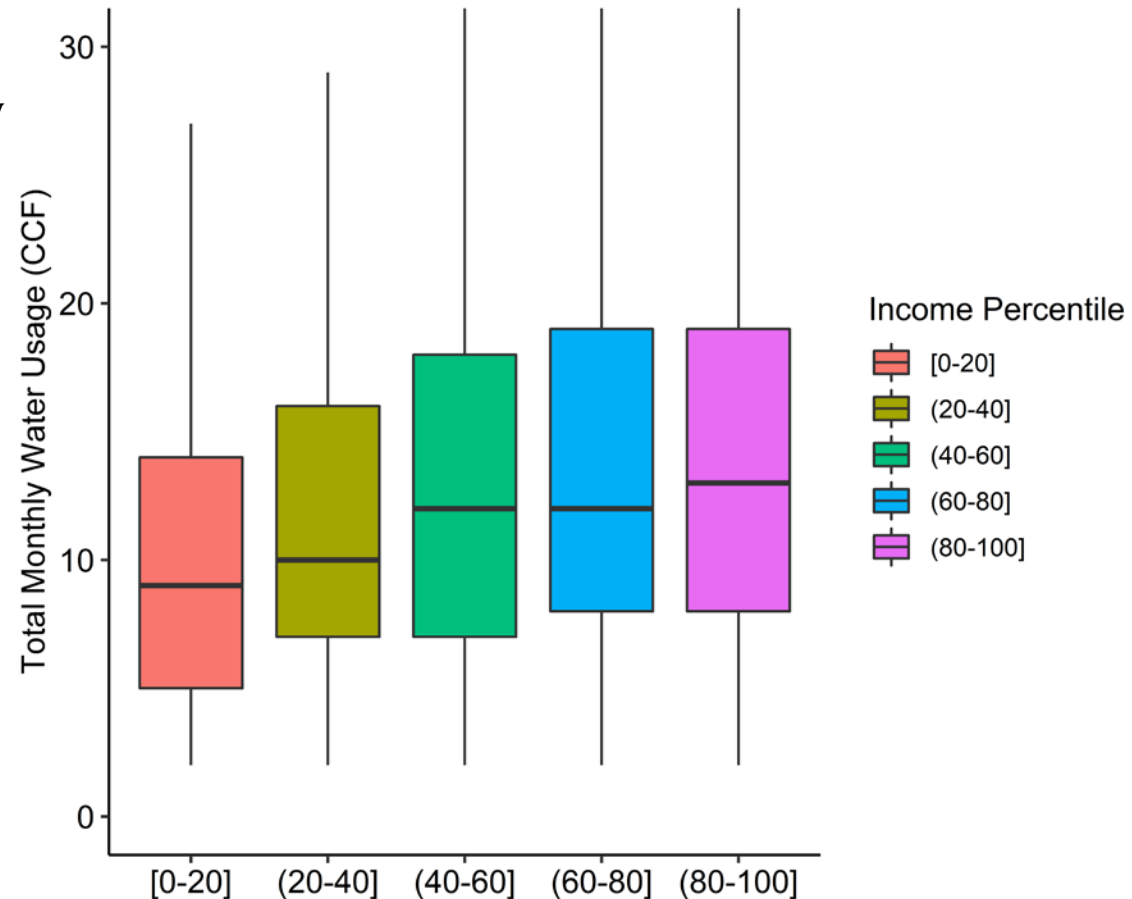


Figure 1. Median household income distribution in the EMWD service area (2017).²³

Data

- 2011-2018 Household-level monthly billing for single family residential customers (SFR) in EMWD
=> ~ 138,000 SFR accounts
- Total, indoor, outdoor, and excessive water consumption
 - Indoor / Outdoor Budgets
 - Landscape & household size
- Water tiered-based rates
- Monthly sewer costs
- Other Fees on Bill
- MHI by Census Block Group

=> *Unique: HH-level data*



**Table A1. Average monthly bill (\$) in the EMWD service area for water and sewer services³⁰
 (% change annually in parentheses)**

Bill Year	Basic Needs Water Cost ³¹	Indoor Budget Cost ³²	Within Budget Cost ³³	Sewer Cost	Overall Water Use Cost ³⁴	Average Water Use (CCF) ³⁵
2011	\$6.22 (-)	\$22.18 (-)	\$37.69 (-)	\$22.90 (-)	\$42.88 (-)	14.94 (-)
2012	\$6.33 (1.79%)	\$22.54 (1.60%)	\$39.82 (5.65%)	\$23.48 (2.54%)	\$44.64 (4.12%)	15.61 (4.48%)
2013	\$6.52 (3.02%)	\$22.84 (1.33%)	\$39.69 (-0.33%)	\$23.39 (-0.41%)	\$44.88 (0.54%)	15.31 (-1.95%)
2014	\$8.77 (34.50%)	\$23.55 (3.09%)	\$40.76 (2.68%)	\$23.20 (-0.81%)	\$45.45 (1.28%)	15.04 (-1.74%)
2015	\$9.31 (6.14%)	\$25.46 (8.12%)	\$37.55 (-7.88%)	\$24.37 (5.07%)	\$41.93 (-7.76%)	12.58 (-16.38%)
2016	\$9.88 (6.09%)	\$26.75 (5.09%)	\$37.90 (0.94%)	\$26.65 (9.36%)	\$43.19 (3.01%)	12.28 (-2.38%)
2017	\$9.92 (0.38%)	\$27.52 (2.87%)	\$40.07 (5.74%)	\$26.56 (-0.34%)	\$43.18 (-0.03%)	12.74 (3.79%)
2018	\$10.04 (1.20%)	\$17.55 (-36.23%)	\$40.65 (1.31%)	\$26.99 (1.60%)	\$45.27 (4.75%)	13.07 (2.57%)
Overall Change from 2011 to 2018	\$3.82 (61.34%)	-\$4.63 (-20.88%)	\$2.91 (7.71%)	\$4.09 (17.86%)	\$2.35 (5.49%)	-1.87 (-12.53%)
Average Annual Change	\$0.55 (8.76%)	-\$0.66 (-2.98%)	\$0.42 (1.10%)	\$0.58 (2.55%)	\$0.34 (0.78%)	-0.27 (-1.79%)

What's happened with water costs in EMWD?

Notes:

2011\$ (CPI/BLS)

Basic Needs: 35.66 gpcd

Indoor budget: actual use ≤ indoor budget of 55 gpcd

Within budget: actual use ≤ overall budget

“Overall” does not include sewer costs

Table A2. Annual changes in inflation and water budget costs relative to 2011 (2011 base)³⁶

Bill Year	Inflation Rate	Fixed Budget in 2011 ³⁷	Percent in Budget ³⁸
2011	--	--	80.84%
2012	2.03%	2.30%	86.87%
2013	1.13%	3.33%	83.99%
2014	1.31%	5.37%	87.58%
2015	0.58%	3.20%	93.33%
2016	1.48%	2.29%	94.69%
2017	2.74%	-0.73%	92.79%
2018	3.93%	2.21%	87.20%
Overall Change from 2011 to 2018	13.93%	19.32% (\$6.17)	7.87%
Average Annual Change	1.99%	2.76% (\$0.88)	1.12%

What's happened with water rates in EMWD?

Notes:

2011\$ (CPI/BLS)

Fixed Budget: Fixed water use based on “representative” household in 2011:

- 3 household members
- 3000 sq ft landscape
- Conversion Factor = 0.8
- ET = 3.93

% in Budget: % of households at or below total budget allocation based on water use in July of each year

How do WERs vary over time and type of water service?

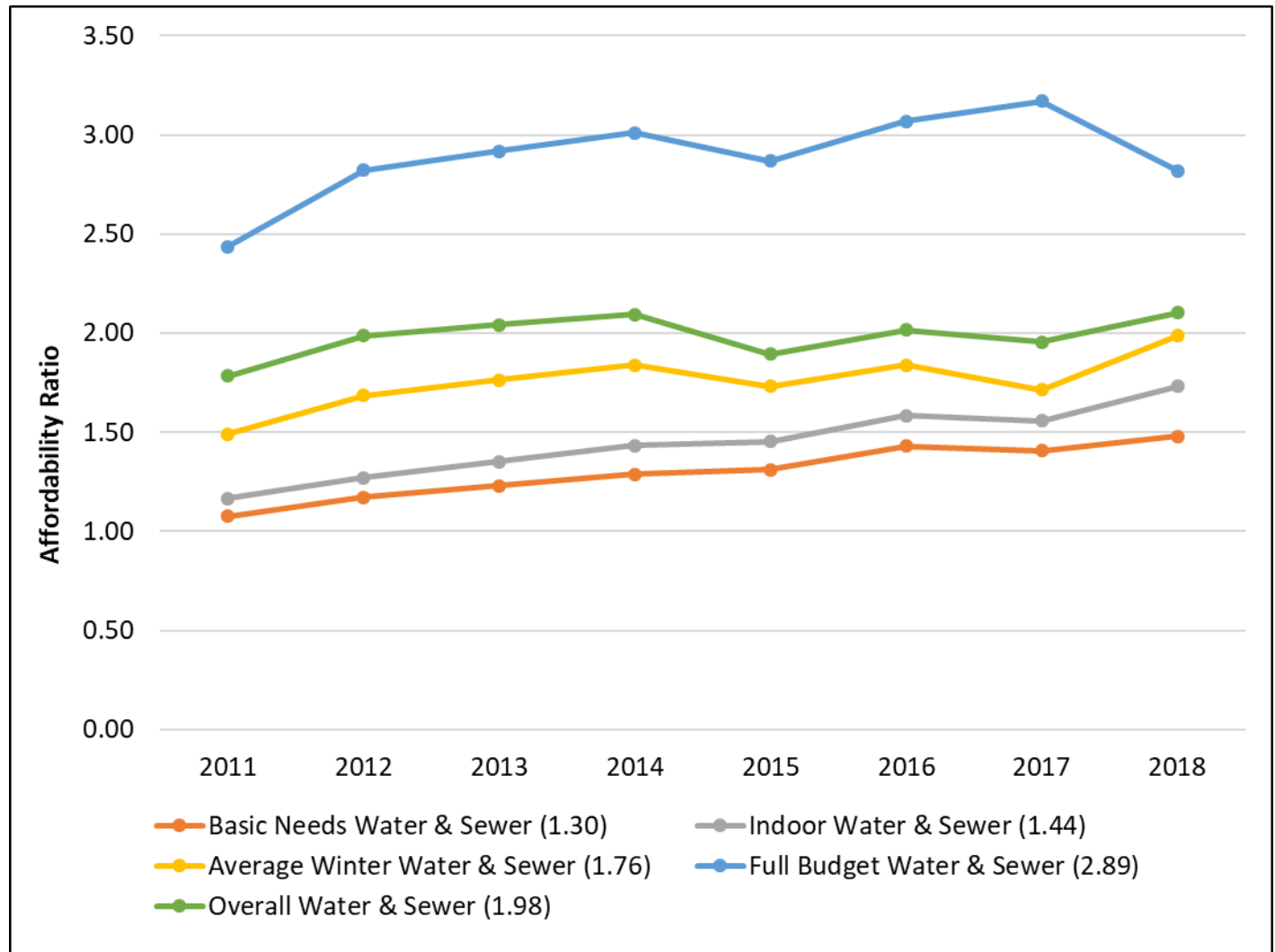
Table 1. Water expenditure ratio for different types of water services from 2011 to 2018 in EMWD¹

Year	Total Number of Households	Basic Needs Water & Sewer	Indoor Water & Sewer	Full Budget Water & Sewer	Overall Water & Sewer
2011	126,174	0.85 (0.29)	0.92 (0.32)	1.85 (1.40)	1.37 (0.71)
2012	127,101	0.90 (0.31)	0.98 (0.34)	2.09 (1.68)	1.49 (0.77)
2013	128,537	0.93 (0.36)	1.02 (0.41)	2.12 (1.74)	1.50 (0.80)
2014	130,264	0.95 (0.41)	1.06 (0.47)	2.15 (1.80)	1.51 (0.84)
2015	131,932	1.00 (0.40)	1.11 (0.46)	2.11 (1.74)	1.42 (0.77)
2016	133,944	1.10 (0.45)	1.22 (0.51)	2.27 (1.98)	1.52 (0.84)
2017	136,018	1.09 (0.43)	1.21 (0.49)	2.35 (1.90)	1.48 (0.76)
2018	138,380	1.11 (0.47)	1.29 (0.57)	2.10 (1.29)	1.58 (0.81)

*Numbers in parenthesis indicate the standard deviations. The median income is measured by US Census ACS at the block group level.

How do water expenditures trend over time for SFR households in the 20th percentile (PCTL) of income?

MI in 20th Percentile = \$46,986



Basic Needs Measure (2018)

- 35.66 gpcd
- $WER_{AVG}=1.11\%$
- 5 SFR (~0.04%) accounts > EPA Threshold
- Decreases with income

=> *District can identify vulnerable households*

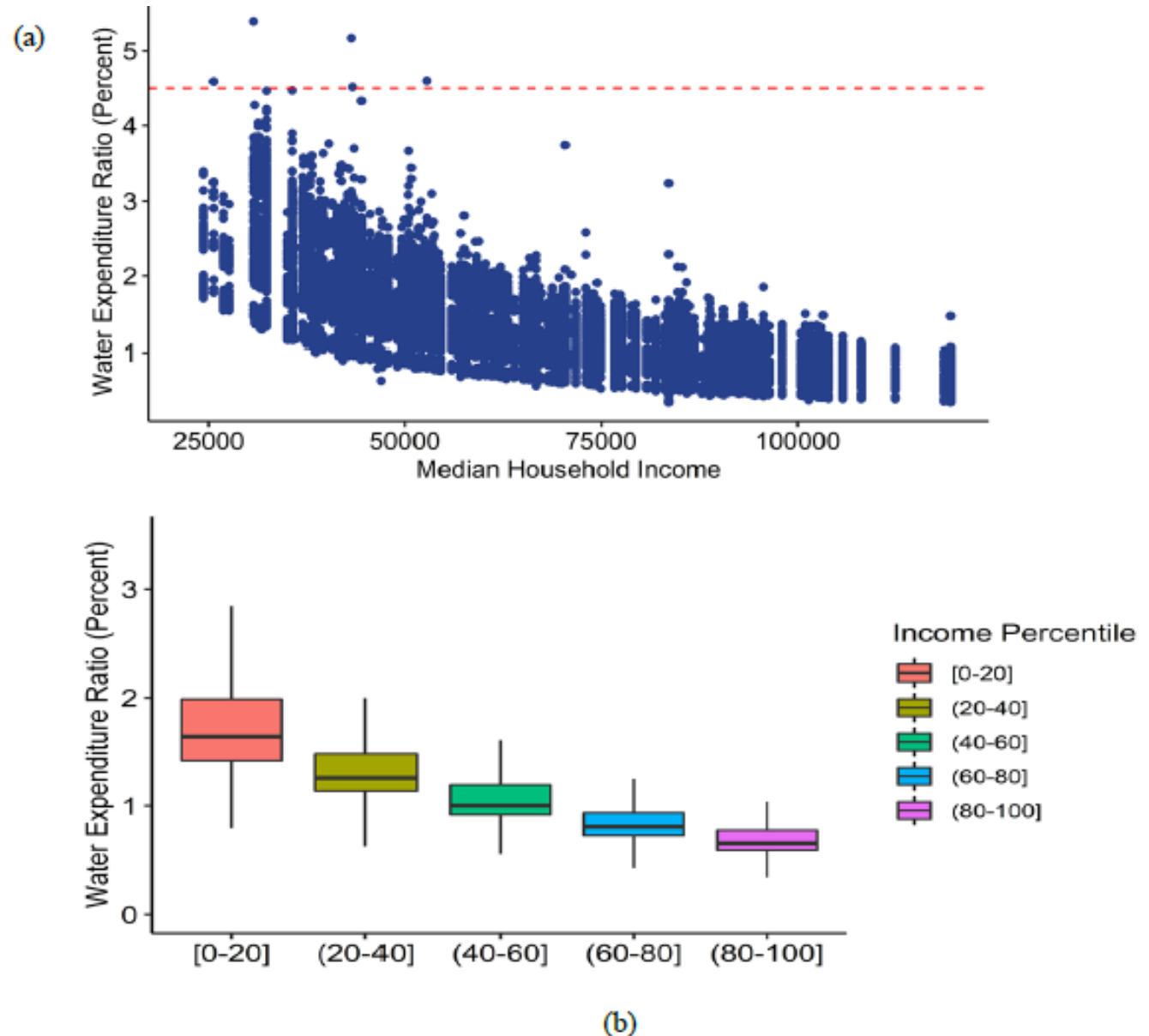


Figure 3. Water expenditure ratio for *basic needs* water by income level in 2018²⁵

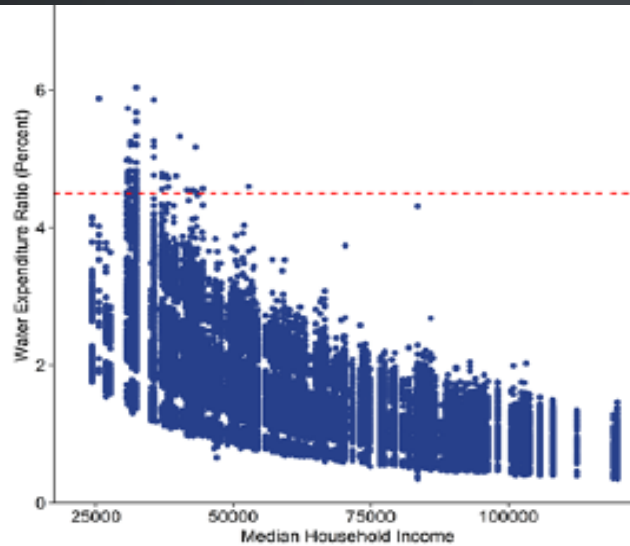
Alternative Indoor Measures

Efficient Indoor

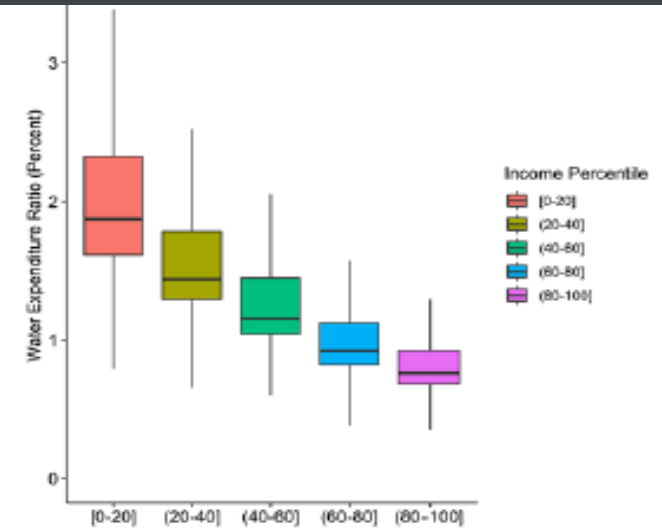
- 55 gpcd
- 69 SFR (~0.05%) accounts > 4.5%

Winter Usage

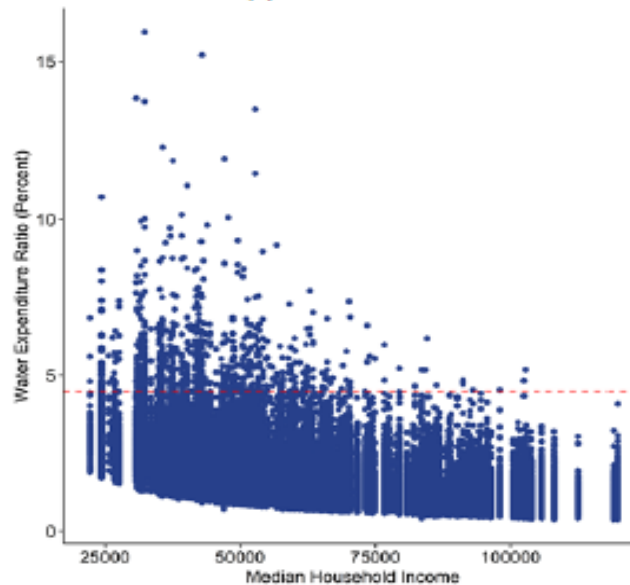
- Mostly indoor
- 788 (~0.6%) SFR accounts > 4.5%



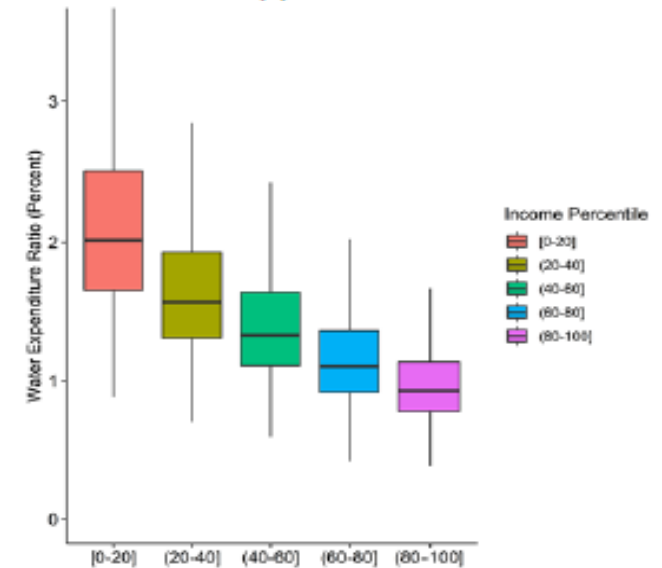
(a) 55 GPCD



(b) 55 GPCD



(c) winter



(d) winter

Figure 4. Water expenditure ratios for alternative indoor water use measures by income level in 2018²⁶

Alternative Overall Measures

Budget-Based

- Simulated full budget
- 4000 (~3.2%) SFR accounts > 4.5%

Overall

- Actual usage
- 550 (~0.4%) SFR accounts > 4.5%

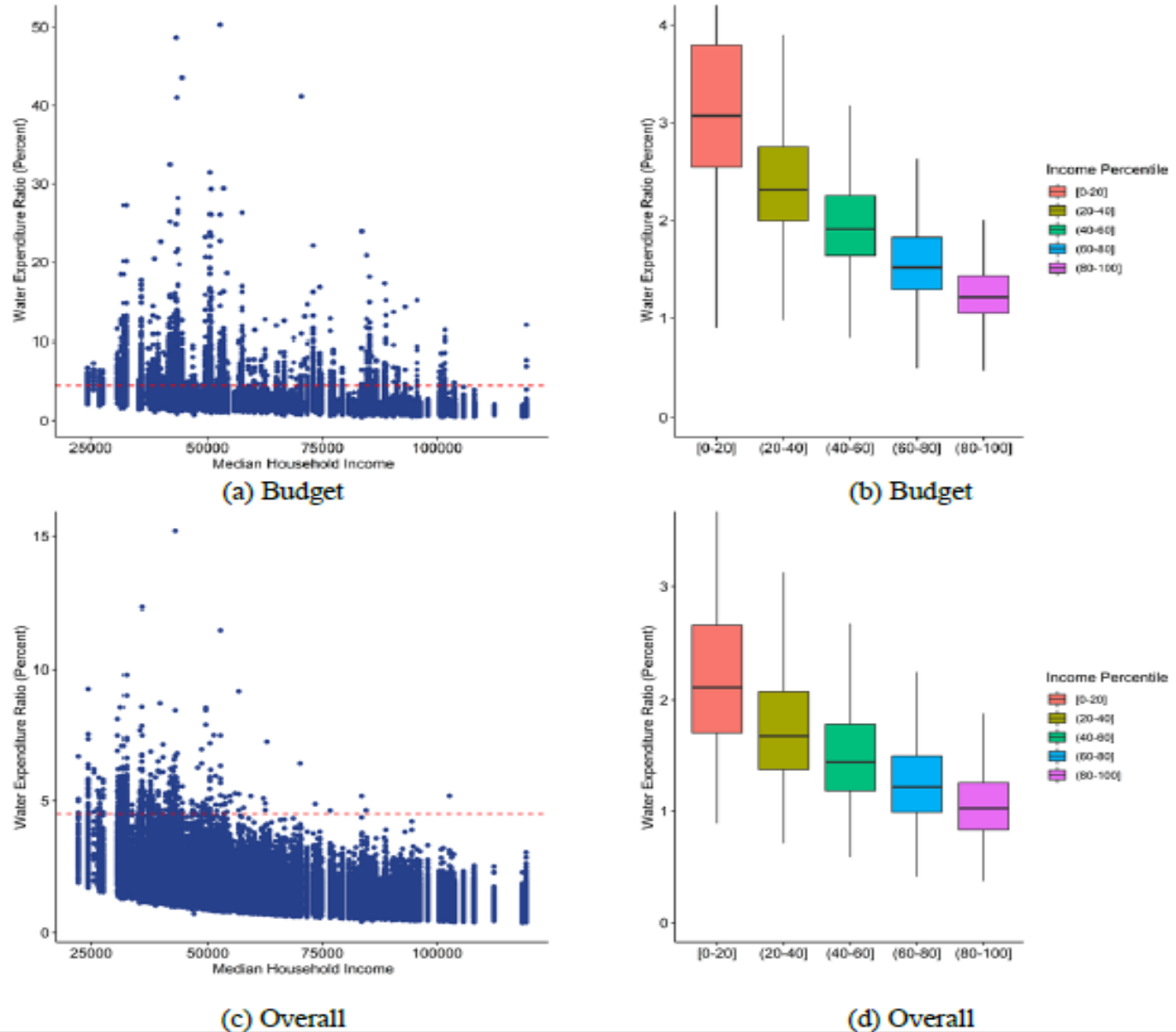


Figure 5. Water expenditure ratios for budget and overall use by income level in 2018²⁷

How do water expenditures in EMWD compare with expenditures on other essential services in region?

Table A3. Comparing essential needs cost as a percentage of income³⁹

Year	Food (LA ^b)	Housing (LA)	Transportation (LA)	Health care (LA)	Natural gas (West ^c)	Electricity (West)	Telephone services (West)	Water and other public services (West)	Water (EMWD)	Overall Water & Sewer (EMWD)
2011	10.33	29.55	12.70	3.58	0.58	1.67	1.71	0.91	0.88	1.73
2012	10.79	29.98	12.70	3.89	0.53	1.70	1.75	0.92	0.96	1.48
2013	10.59	30.12	12.13	4.03	0.53	1.76	1.81	0.96	0.97	1.50
2014	10.53	31.11	12.03	4.60	0.54	1.75	1.87	0.97	0.98	1.51
2015	10.53	31.11	12.03	4.60	0.47	1.63	1.79	0.93	0.89	1.42
2016	10.41	30.32	13.08	4.99	0.39	1.47	1.70	0.88	0.93	1.52
2017	11.41	31.82	12.74	5.17	0.40	1.48	1.70	0.90	0.91	1.48

Table 3. Comparing essential needs cost for various services as a percentage of income in 2017²¹

Food (LA)	Housing (LA)	Transportation (LA)	Health care (LA)	Natural gas (West)	Electricity (West)	Telephone services (West)	Water ²² (West)
11.41	31.82	12.74	5.17	0.40	1.48	1.70	0.90

LA~LA Metropolitan Statistical Area (MSA); West~AL, AZ, CA, Guam, HI, ID, NV, OR, WA

Conclusions / Caveats

- Water is a local issue
 - Difficult to draw conclusions for rest of region based on one study in one district
 - With Household level data => much more precise information / estimates
- Income measures matter
 - Illustrated how different MHI matter
 - But for low-income households, there may be payments received => imperfect measure
- To have substantive impact on societal well-being, want to consider full range of essential services and consider where change can have appreciable effects