

Validation Impact & Data Insights

The California Water Loss Technical Assistance Program



W S O

CAVANAUGH
Stewardship Through Innovation

The California Water Loss Technical Assistance Program

Impact & Insights

- **Context** – *water loss and validation*
- **Water Loss TAP** – *goals & approach*
- **Level 1 Validated Dataset** –
 - *progress*
 - *the data!*
 - *qualifications*
- **Considerations for Water Loss Regulation**

SB555 & Level 1 Validation

Goals: quality and consistency

1. Review audit methodology and input determinations
2. Verify Data Validity Grade selections

Guidance manual: Water Research Foundation 4639



Level 1 Water Audit Validation

Project Number: 4639 • **Date Available:** November 2016

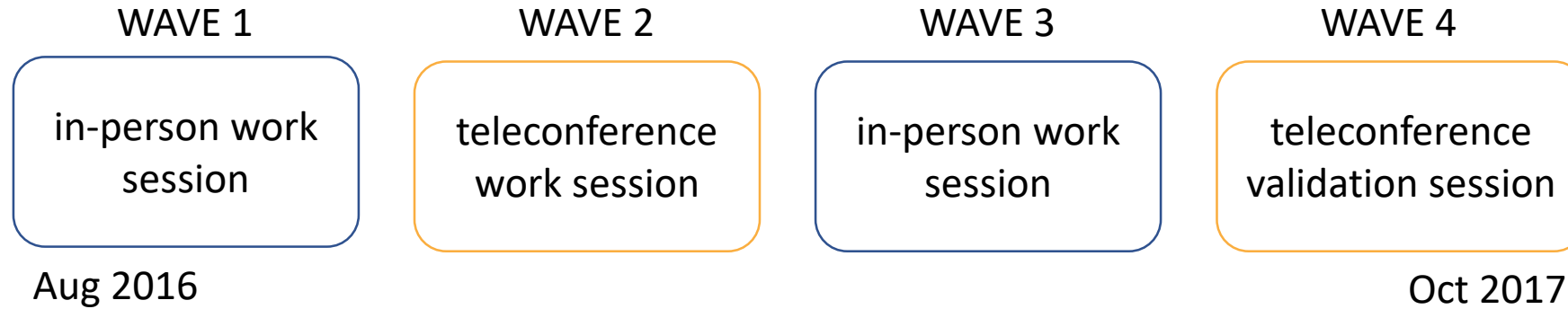
Principal Investigators: Lucy Andrews, Kate Gasner, and Reinhard Sturm, Water Systems Optimization; George Kunkel, Kunkel Water Efficiency Consulting; Will Jernigan and Steve Cavanaugh, Cavanaugh

Water Loss TAP

1. **Teach** water auditing and water loss control best-practice methods
2. **Level 1 validate** retail urban water supplier water audits submitted from across the state to DWR in 2017 submittal cycle

Standardize Data Validity Grade criteria application in CA

Water Loss TAP Phases



- progressive learning model
- value of practice rounds in Wave 2
- two tracks to accommodate different experiences

Water Audit Progress

- 1. **Largest number** of water audits compiled to date*
- 2. More water loss **education**... than ever before!?*
- 3. **Consistency** across submissions*
- 4. **Most scrutiny** on water audit inputs and results*

Largest CA Dataset to Date

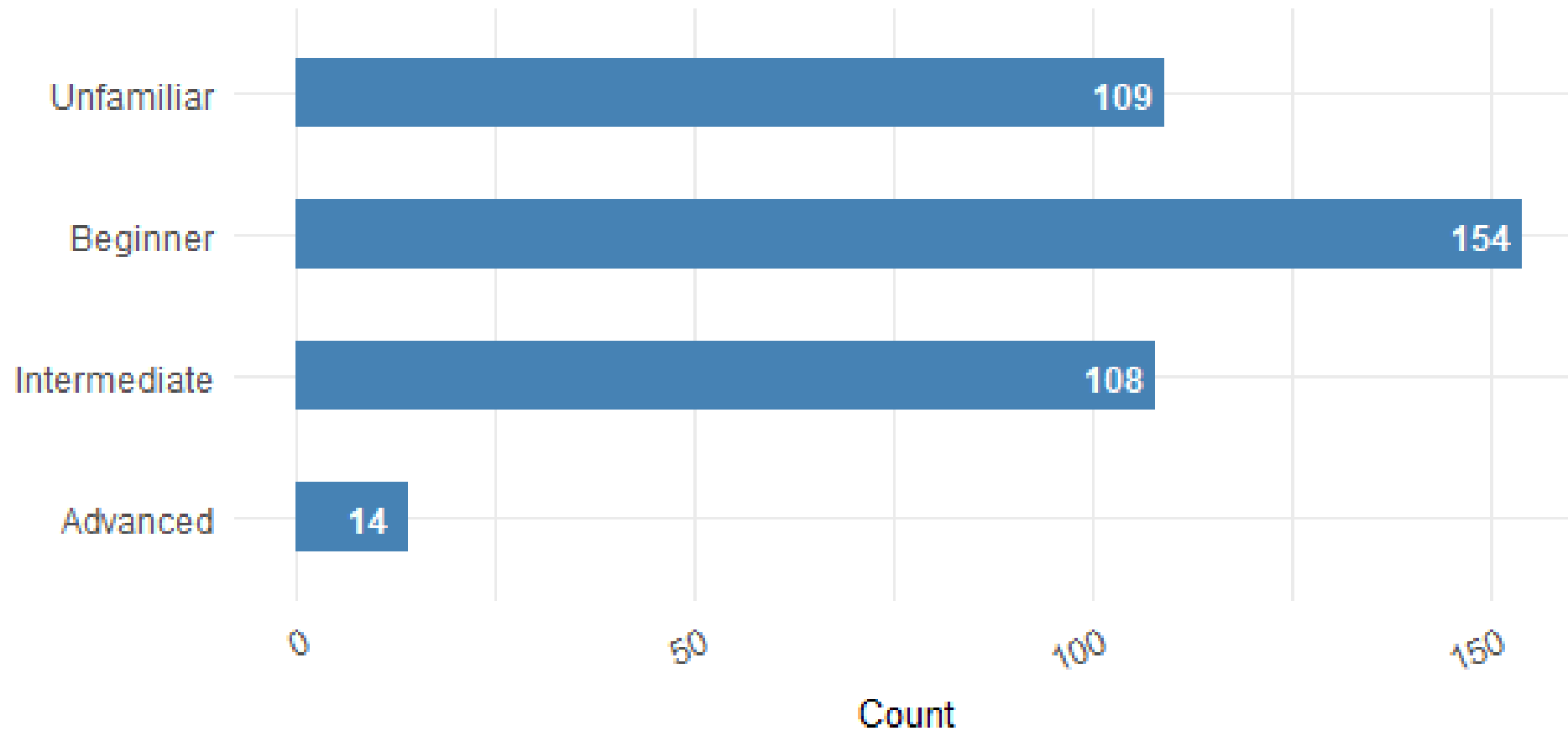
291 water audits previously
submitted with UWMP **2016**

385 Urban Retail Water Suppliers **2017**
equipped to submit to DWR

405 *Level 1 Validations Complete*

Varying Experience to Start

Count of Wave 4 Audit Variations by Stated Experience



Participation in the TAP

1,500+ people participated

73 workshops taught

“We not only achieved our goal of completing a water audit, we learned a lot along the way and the experience was enjoyable.”

“The whole process brought to light the areas in which our District could improve and how the interaction between departments affects the water loss analysis.”

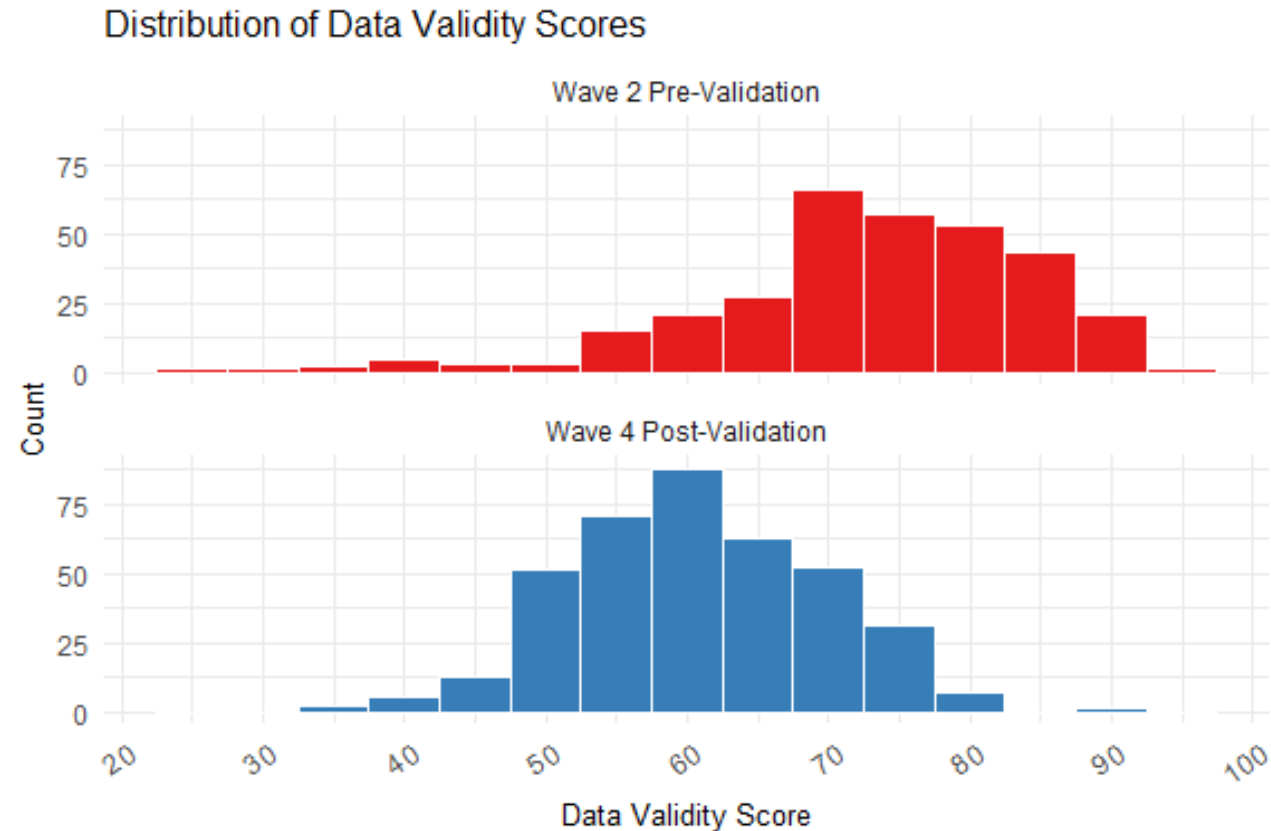
“Very comprehensive and surprisingly high level of person-to-person communication.”

Consistency

- recent reporting timeframe: either CY2016 or FY16-17
- data validity grade interpretation and assignment
 - eliminated arbitrary adjustments
 - updated unbilled unmetered authorized consumption estimates
 - insisted on some level of customer meter inaccuracy

Scrutiny

- supporting documentation
- each input and data validity grade verified
- discussion!



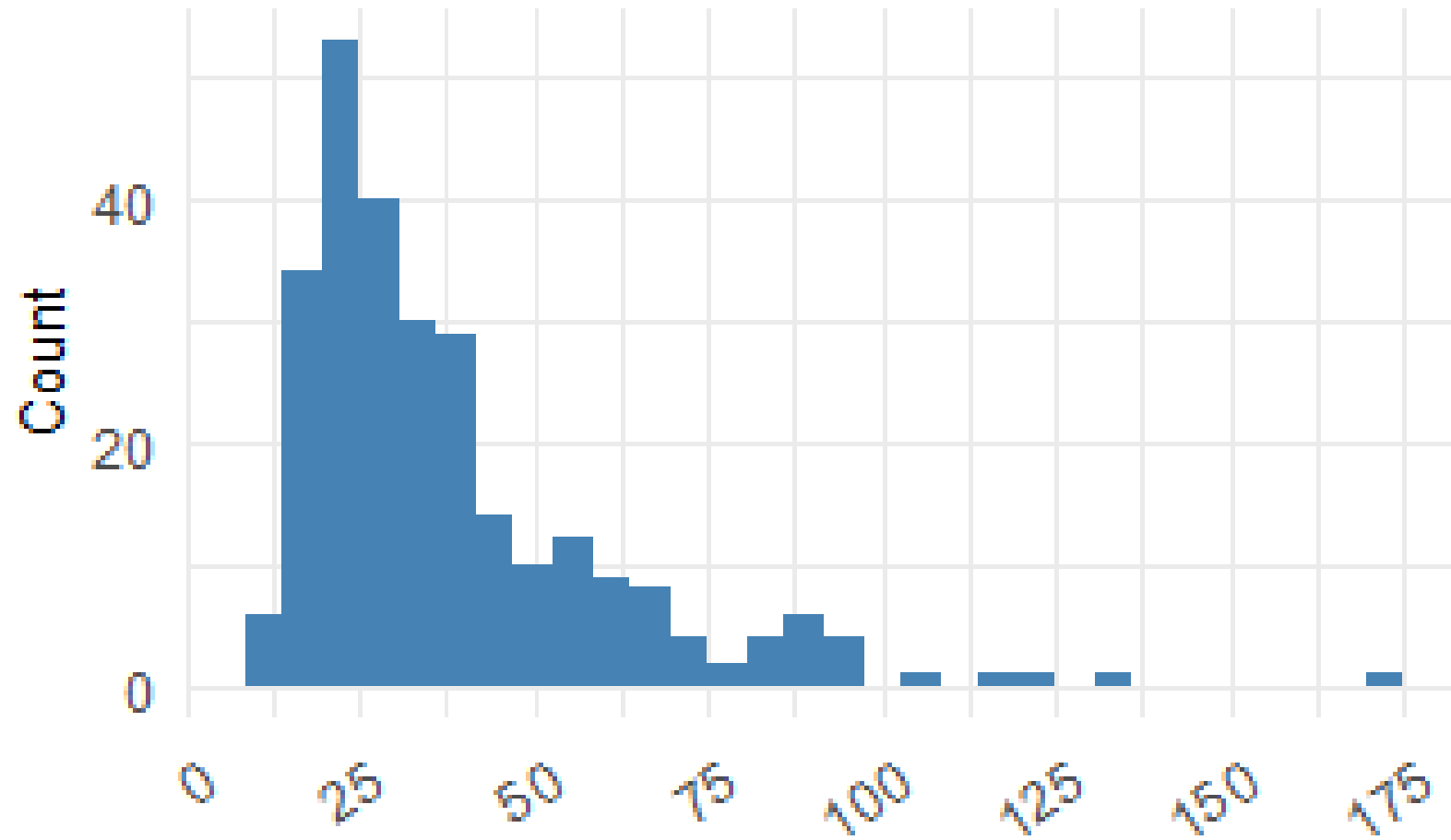
The Data – All Results

All Audits - Key Performance Indicators Summary (N = 385)

Key Performance Indicator	Median	Mean	Min	Max	
<i>Volumetric</i>	Water Losses per Service Connection per Day (gal)	34.1	42.7	-43.0	507.0
	Apparent Losses per Service Connection per Day (gal)	8.1	10.9	0.5	193.0
	Real Losses per Service Connection per Day (gal)	24.9	33.1	-49.5	505.3
	Real Losses per Service Connection per Day per PSI	0.3	0.5	-0.8	10.1
	Infrastructure Leakage Index (ILI)	1.4	2.1	-3.6	42.2
<i>Financial</i>	Annual Cost of Apparent Losses	\$148,968	\$450,012	\$1,824	\$21,609,19
	Annual Cost of Real Losses	\$152,432	\$520,918	-\$165,244	\$38,936,07
	Non-Revenue Water as a % of Total Operating Cost	3.4%	4.2%	-0.8%	68.2%
Data Validity Score	60	61	36	89	

Distribution of Results

Real Losses per Conn. per Day



“Typical” California Utility!?

Leakage depends on pressure and infrastructure.

Cost-effective leakage management incorporates the value of water.

California Ranges for Leakage Management Parameters:

Mains: **21** miles to **7,372** miles

Serv. conns: **210** conns to **737,583** conns

Pressure: **42** PSI to **158** PSI

Prod. cost: **\$18 / AF** to **\$3,756 / AF**

Water Audit Results - Qualifications

1. **Common Data Challenges** and persistence of error
2. **DVG** do not communicate **accuracy**
3. **Low leakage** results – impressive or suspicious?
4. **Replicability** of audit results

Common Data Challenges

CA water suppliers are still refining water audit data

Source meter accuracy

- Meters aren't accessible
- Meters are owned by another agency
- Volumetric testing feasibility isn't known

Billing data pro-rating (supply and sales volumes not aligned)

Customer meter inaccuracy (test data not available)

Pressure (field data not available and/or representative; many inputs are guesses)

12 audits still reported negative leakage after L1 validation

Data Validity Grade Qualifications

Billed Metered Authorized Consumption

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- Manual meter reading
- Customer meter replacement upon failure
- Period internal auditing of billing data

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- AMR or AMI piloting
- Proactive customer meter testing
- Informed meter replacement
- Routine auditing of billing data with third party review

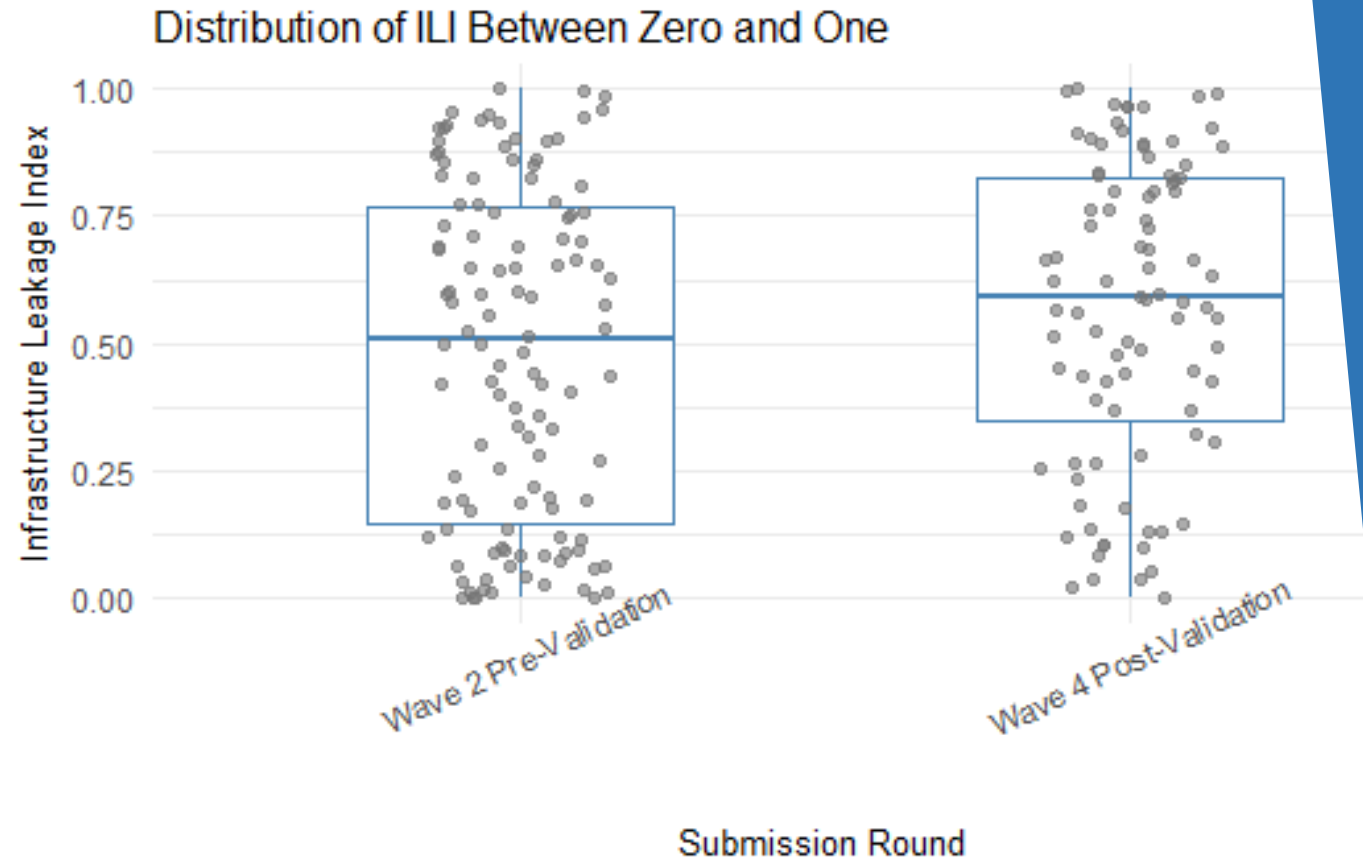
higher grade = adoption of best practices (but no guarantee of data input accuracy)

resist the temptation that a high Data Validity grade always means better audit information!

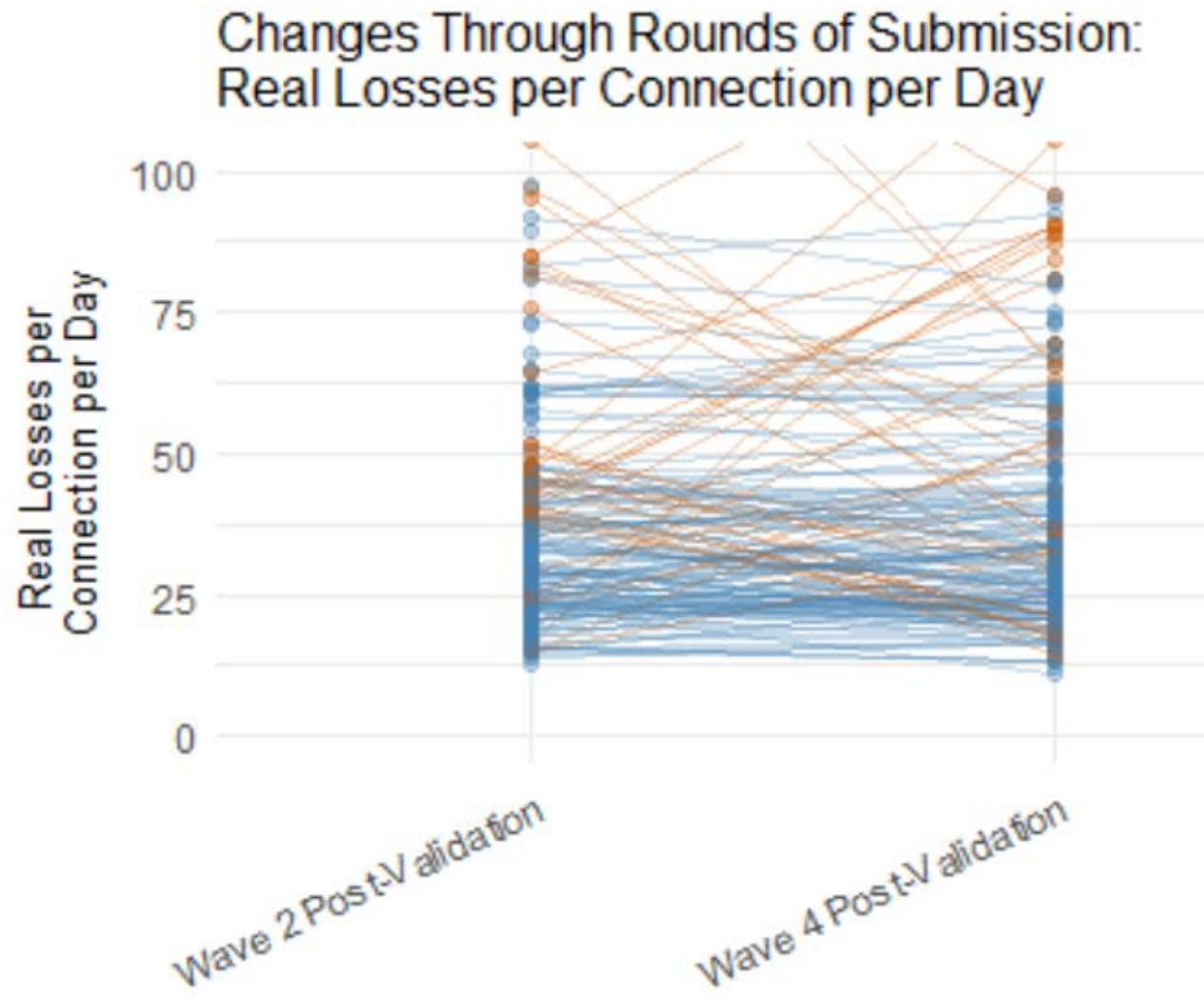
Low Leakage Results

Do very low leakage audits indicate impressive performance or suspicious data?

- *fewer audits with $ILI < 1$ after validation*
- *acknowledge non-zero leakage for all systems*
- *acknowledge CA is special?*
- *difficulty in distinction between performance and inaccuracy*



Replicability of Results



- 305 suppliers participated in W2 and W4, providing consecutive water audits
- 43 (14%) showed a change in the real loss performance indicator greater than **15 gal/conn/day**

Water Loss Regulation Considerations

given Year 1 Data

- Year to year consistency
- Low leakage performance handling
- Role of Data Validity Grades?
- Allocation of total Water Loss into Apparent and Real Loss
- Transition from improvement to maintenance?

Thank you!

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