



Thriller in Asilomar

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08/23/2016

Biggest Loser – EE Edition



PROJECT BACKGROUND

Background



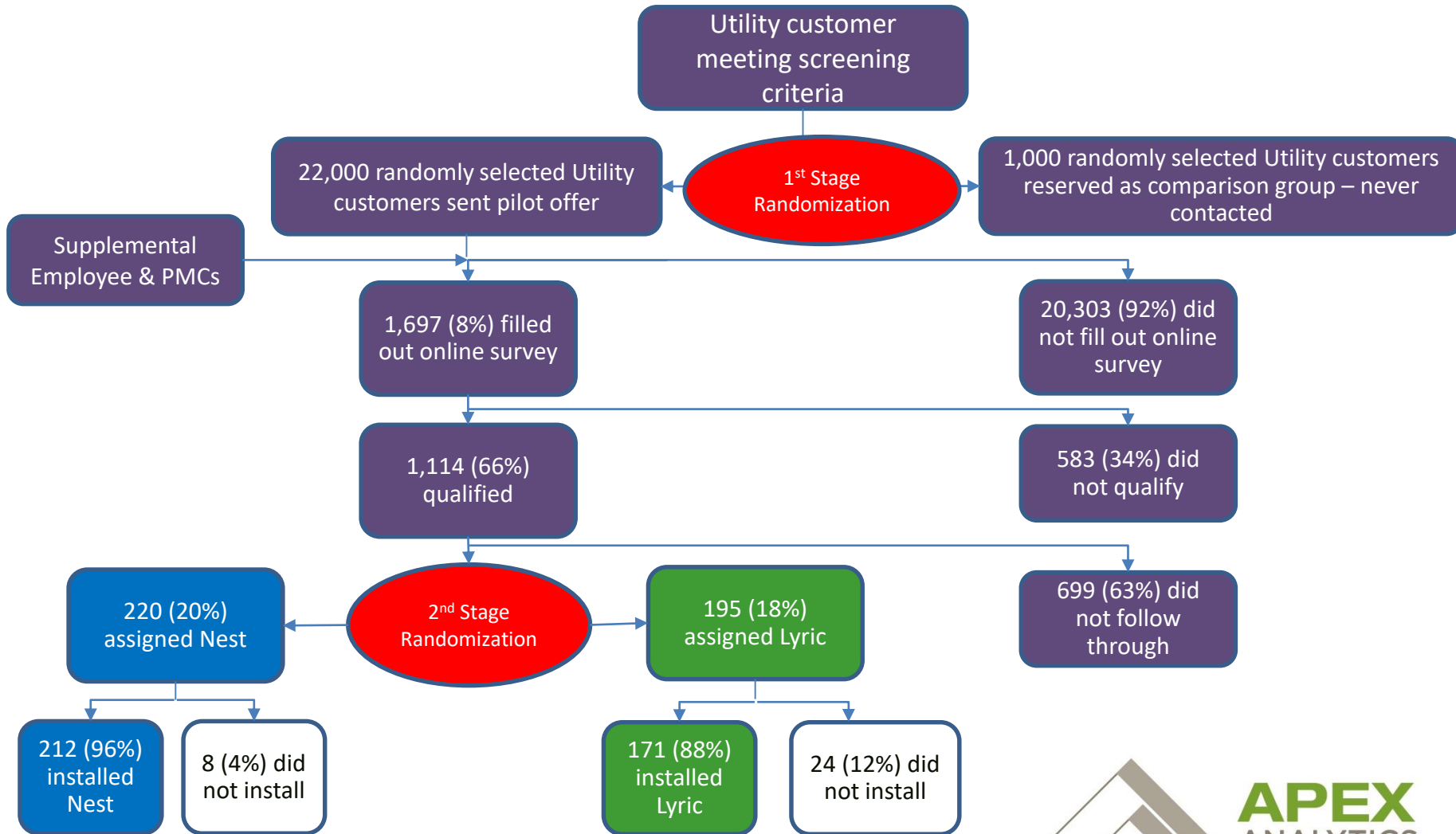
Thermostat Feature	Nest	Lyric
Occupancy Detection	Auto-Away	Geofencing
Early Warm-up	Early On	Adaptive Recovery
Furnace Filter Reminder	Filter Reminder	Smart Cues
Automated Programming	AutoSchedule	N/A
Energy Usage Tracking	Energy History	N/A
Energy Savings notification	Nest Leaf	N/A
Pre-Programmed Settings	N/A	Shortcuts
Alerts	Safety Temperatures	Smart Cues
Override settings for empty house	Away Mode	Away button
Indoor / outdoor temp & humidity to reach set point	Nest Sense	Fine Tune

Energy Trust Pilot Overview

Energy Trust Pilot Details	Smart Thermostat
Heating Season of Pilot	2014-2015
Home Heating System	Gas furnace
Thermostat(s)	Nest; Lyric
Recruitment	NW Natural Gas Customers*
Online bill pay customer	Yes
High-speed internet, Wi-Fi, email address	Yes
Apple or Android smartphone or tablet	Yes
Major home upgrades or remodel plans	None
Installation	Self-install
Participant Cost	\$19
Thermostat Cost	\$219
Customer Support	Manufacturer



Recruitment and Sampling



Primary Research Questions

- Feedback from staff and participants to understand:
 - Installation and operational issues
 - Usage
 - Satisfaction and comfort
- Quantify annual natural gas savings in gas furnace heated single family homes.
- Identify savings variations between:
 - Lyric/Nest thermostats and
 - Across demographic & household characteristics



EVALUATION METHODS

Process Evaluation

- Program and implementation staff interviews
- Two Participant web surveys:
 - Mid- and post-heating season
 - Installation challenges
 - Satisfaction, usage, home comfort
 - High response rates (1st survey = 83%, 2nd survey = 90%)



Impact Evaluation

- Billing analysis
 - 383 participants
 - 1,172 intention-to-treat
 - 846 randomized
 - 3,597 matched comparison
- Controlled for weather (HDD), pre-post usage, and treatment group (Nest vs. Lyric)



"The energy company are replacing our old letterbox for a more efficient one."

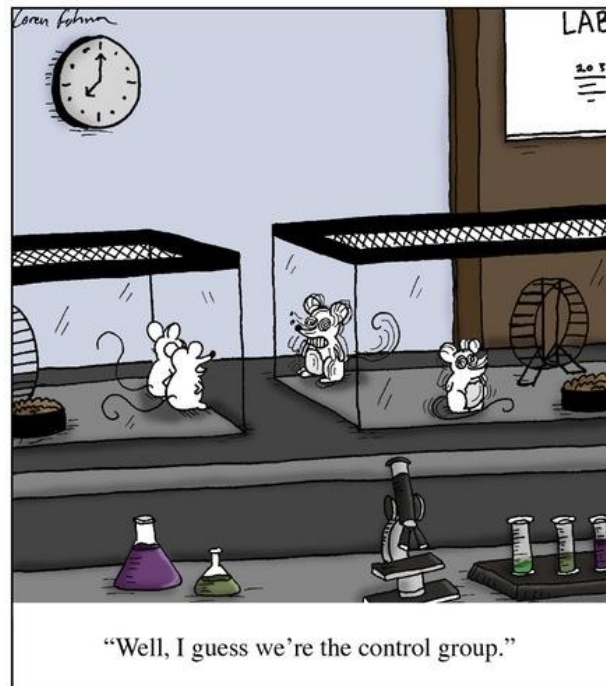


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Billing Analysis

Addressed potential sample bias via three unique analysis:

- Treatment vs randomized comparison group
- Intention-to-treat vs randomized comparison group
- Treatment vs matched comparison group



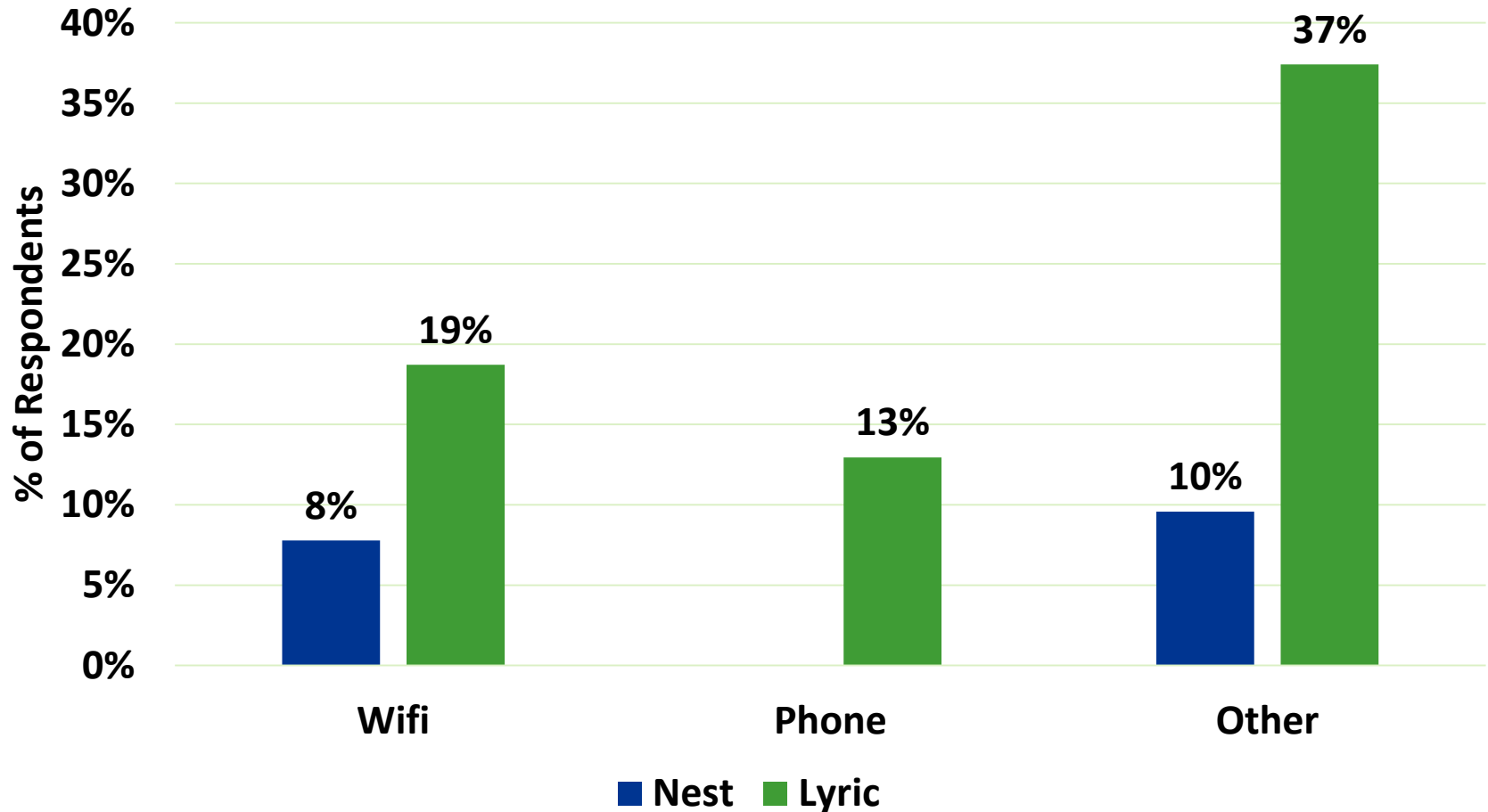
FINDINGS

Attrition

Reason for Return	Nest	Lyric	Total
Customer complaints	-	5	5
Installation problem – thermostat functions	1	6	7
Installation problem – defective thermostat	1	7	8
Post-installation problem – thermostat failed	3	3	6
Post-installation problem – unknown	2	1	3
Shipping problem	1	2	3
Total	8	24	32

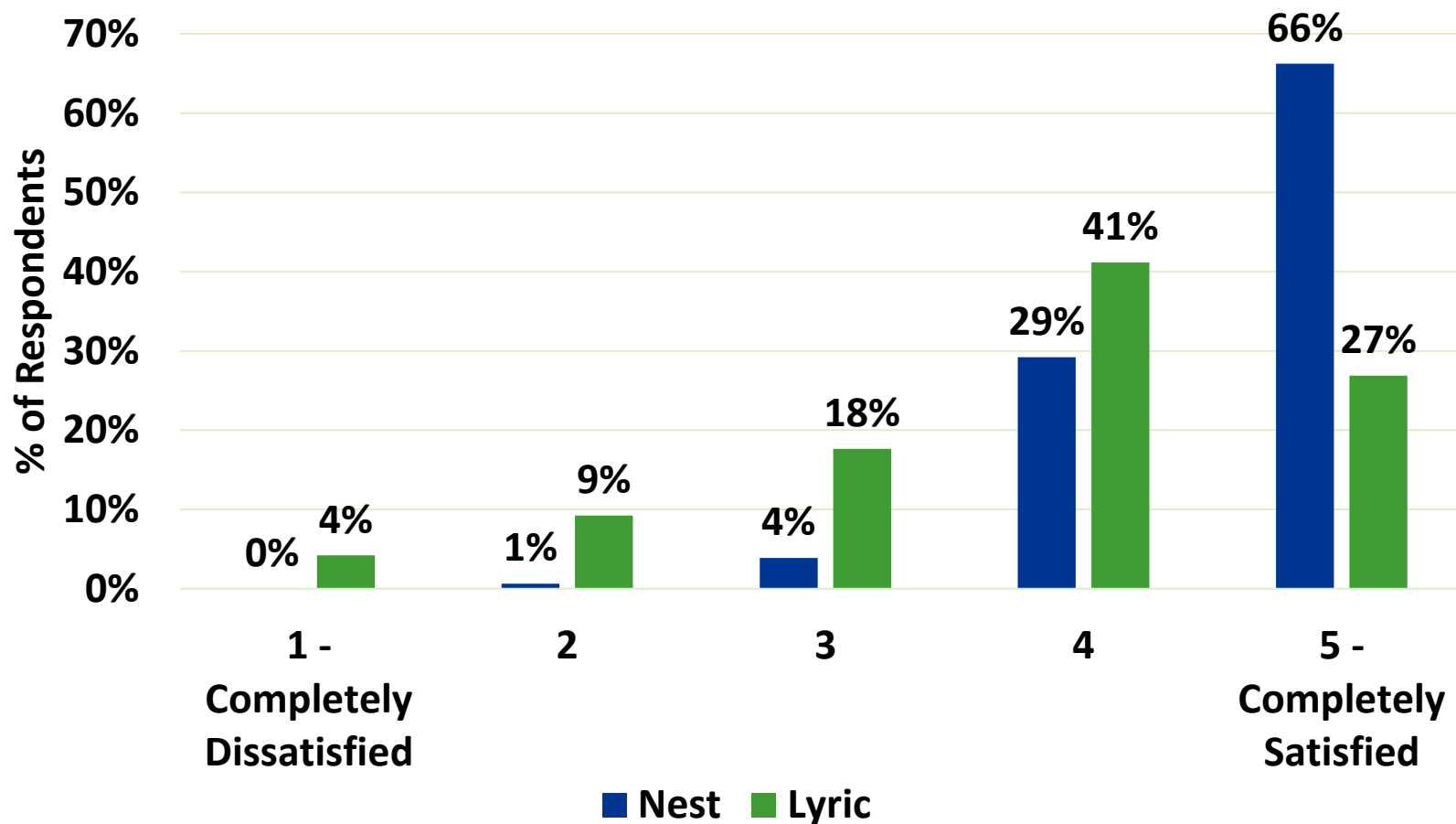
→ **3x** as many Lyric thermostats dropped out of pilot

Installation Issues



➔ **3x** as many Lyric experiences installation issues

Overall Satisfaction

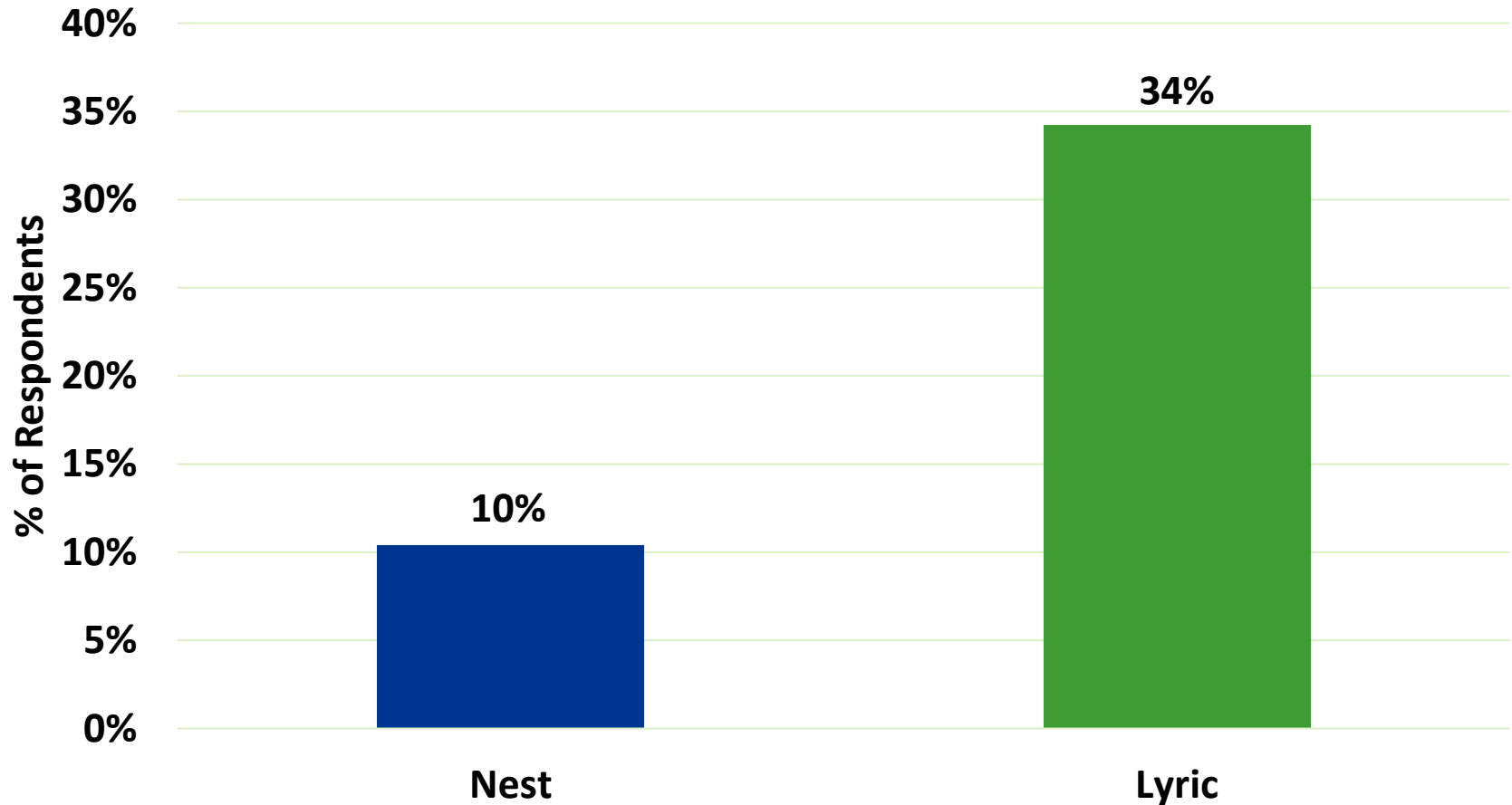


Lyric also showed lower overall satisfaction



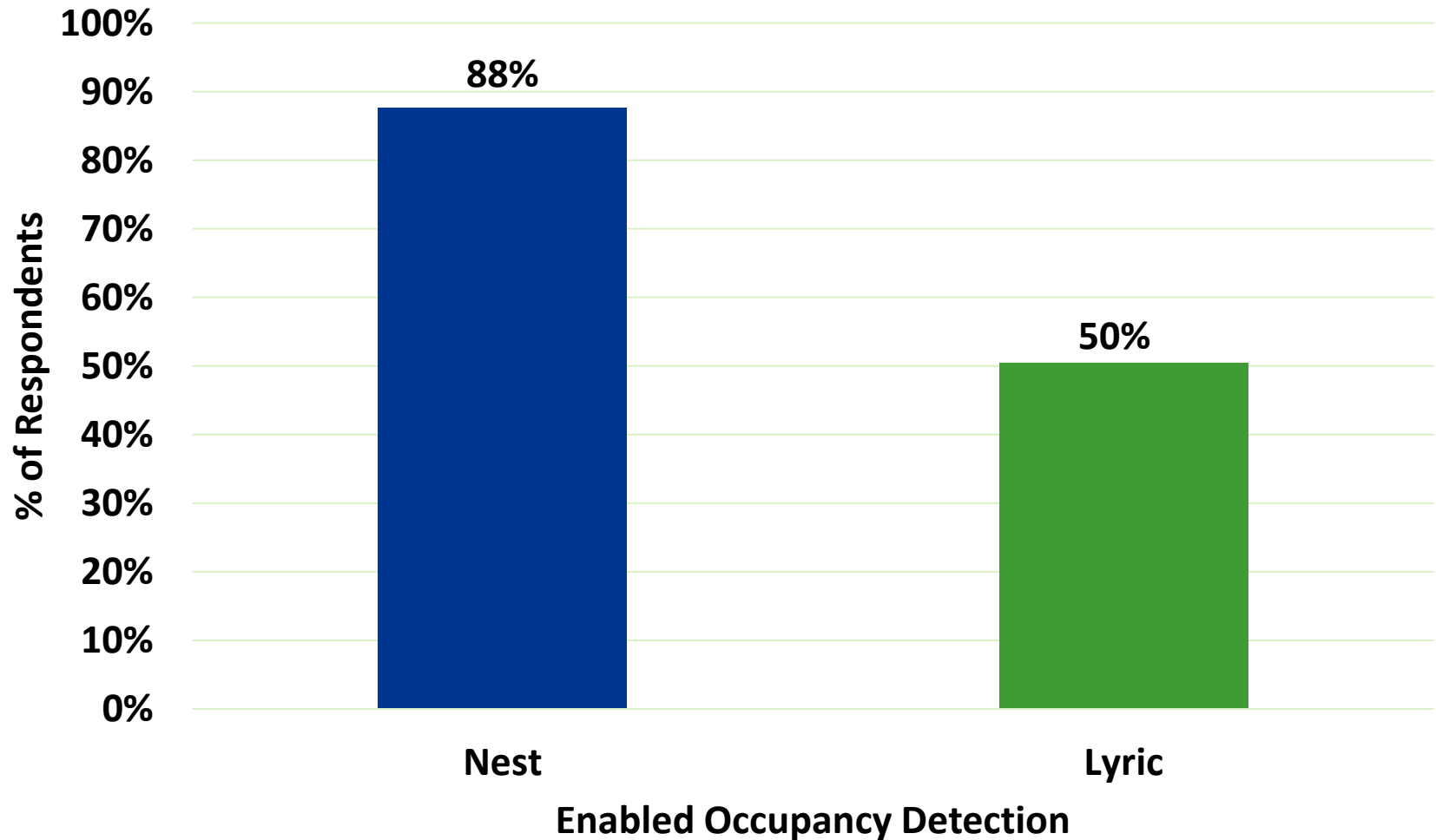
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Would have Returned



➔ **ONE-THIRD** Lyric users would have returned thermostat if not in study

Occupancy Detection

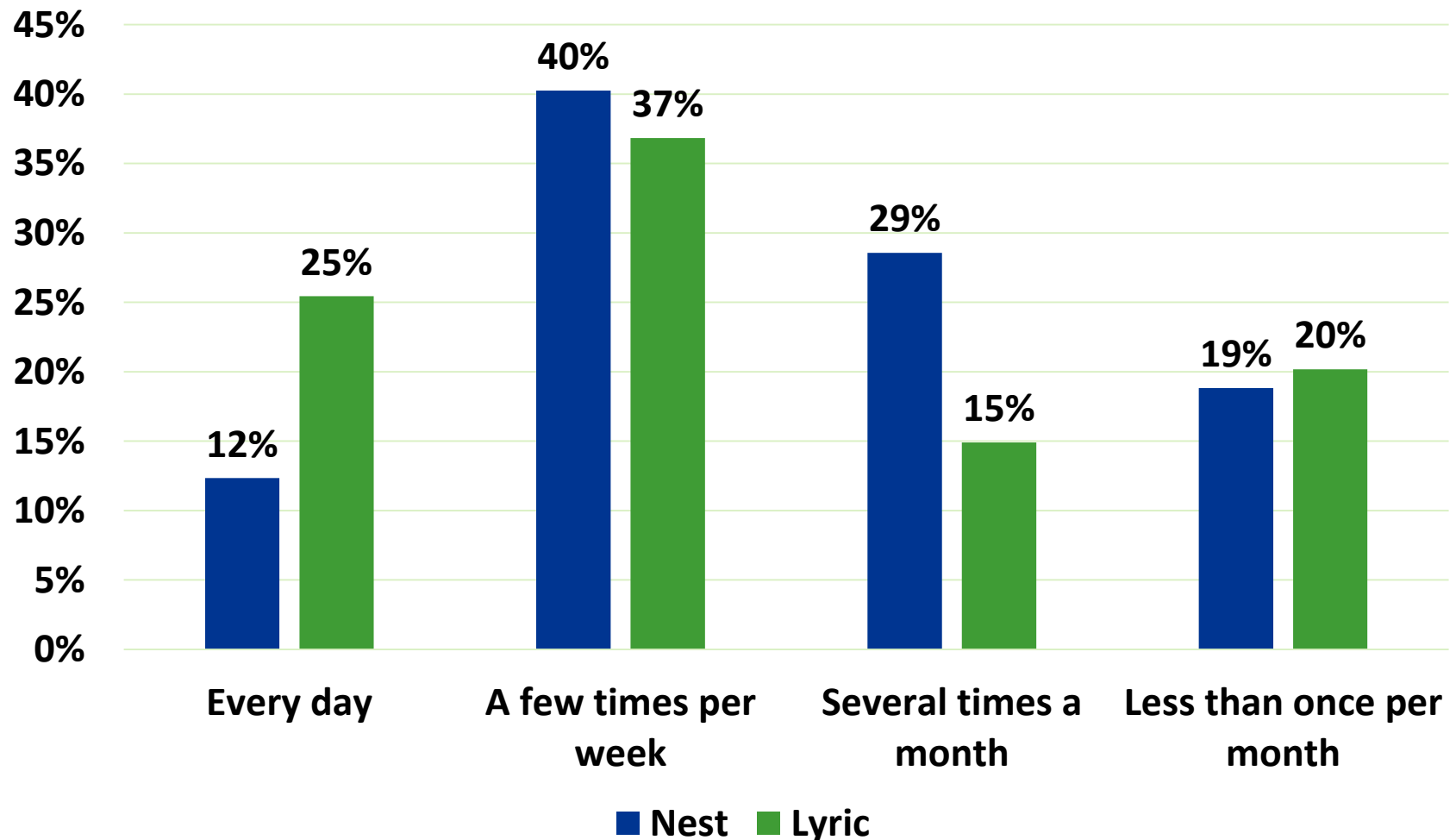


➔ Half of Lyric users had not enabled geofencing!

➔ Nest auto-away on by default



Settings Adjustments

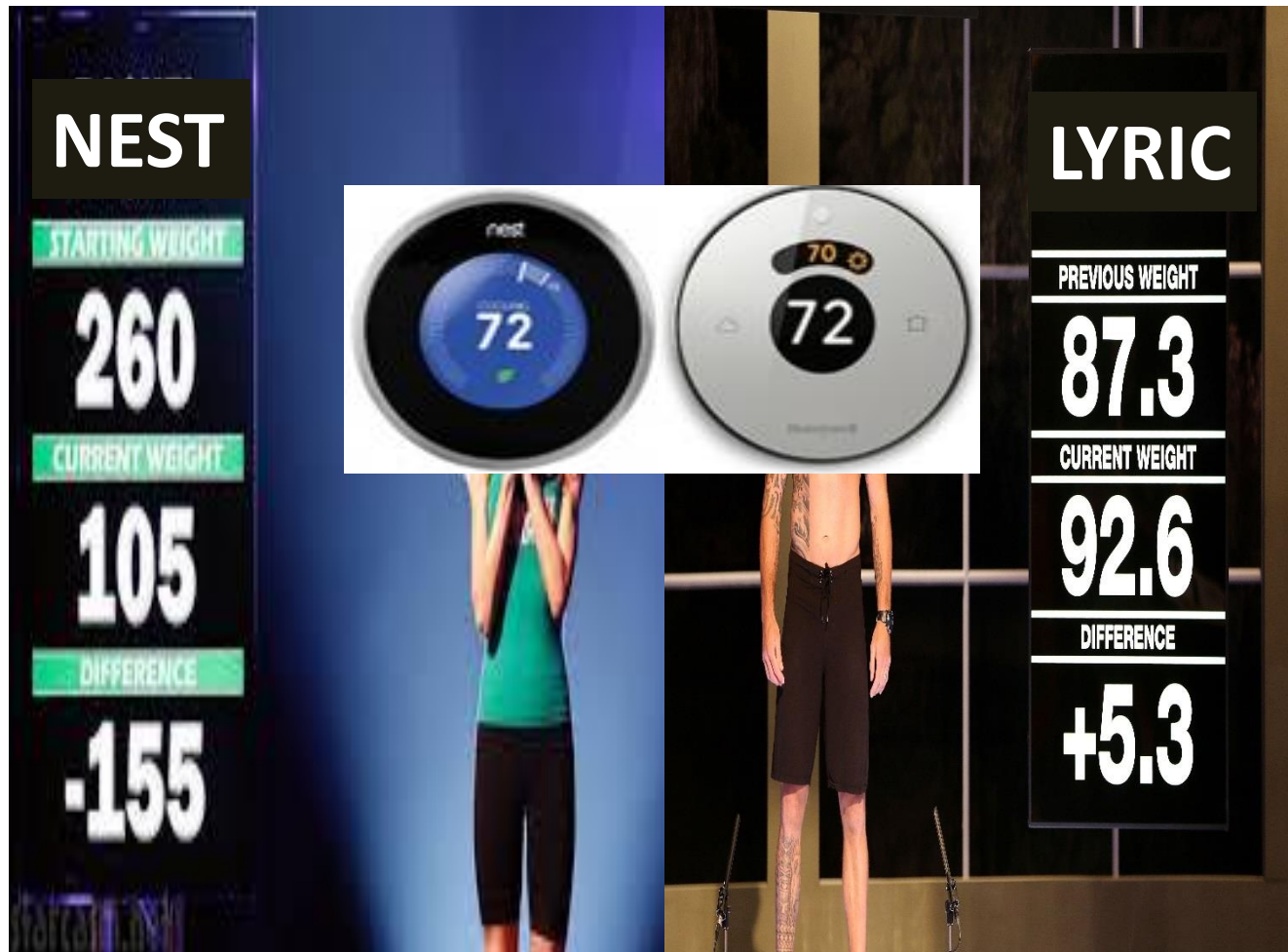


➔ **2x** Lyric continued to manually adjust daily



ENERGY SAVINGS

The Biggest Loser...



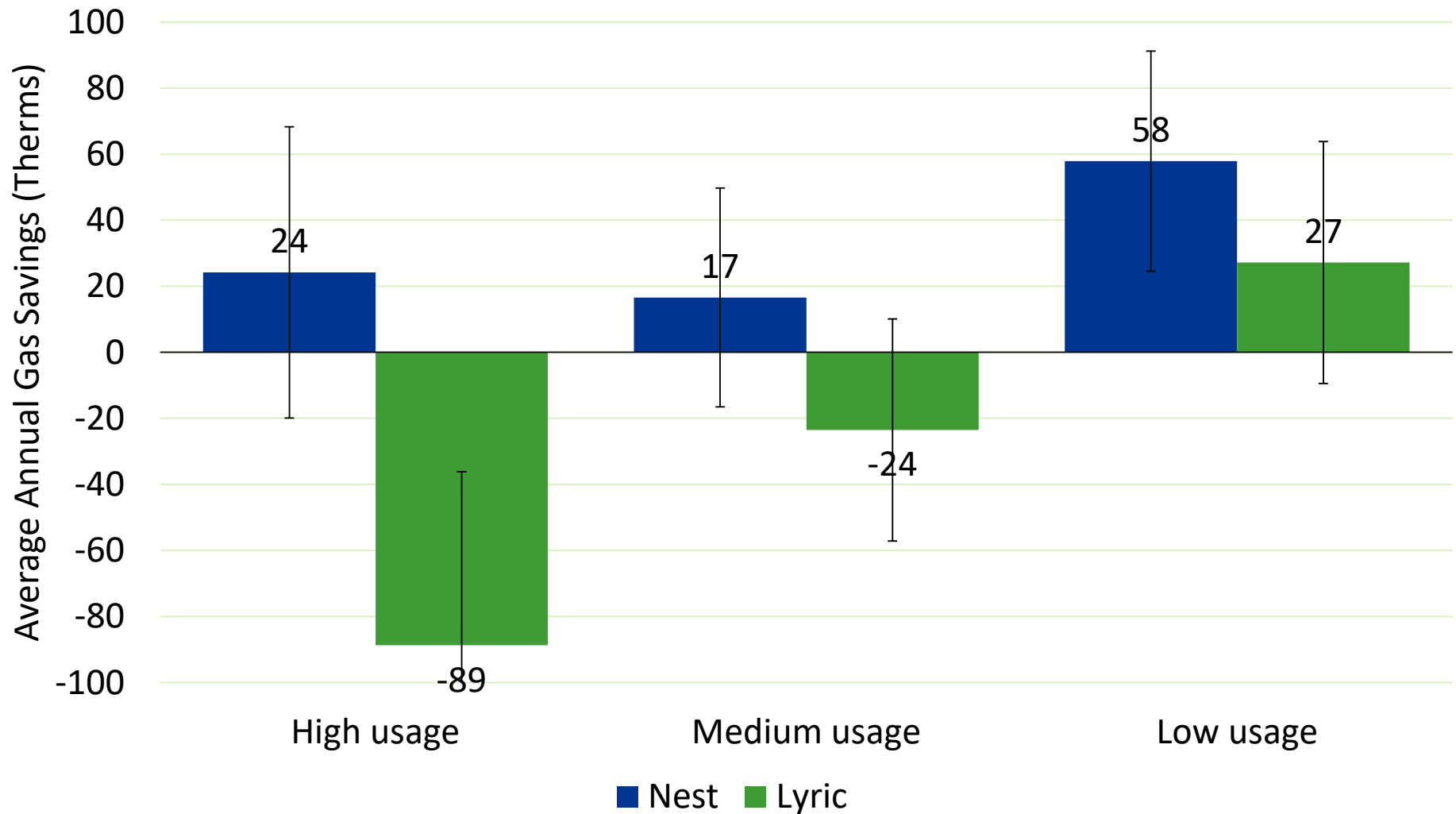
Billing Analysis Results

Billing Analysis Group	Thermostat	Annual Therm Savings	90% Conf. Interval	p-value	% Savings	% Heating Savings
Treatment vs Randomized Comparison Group	Nest	34	13, 55	0.018*	4.5%	6.0%
	Lyric	-29	-55, -3	0.071*	-3.7%	-4.9%

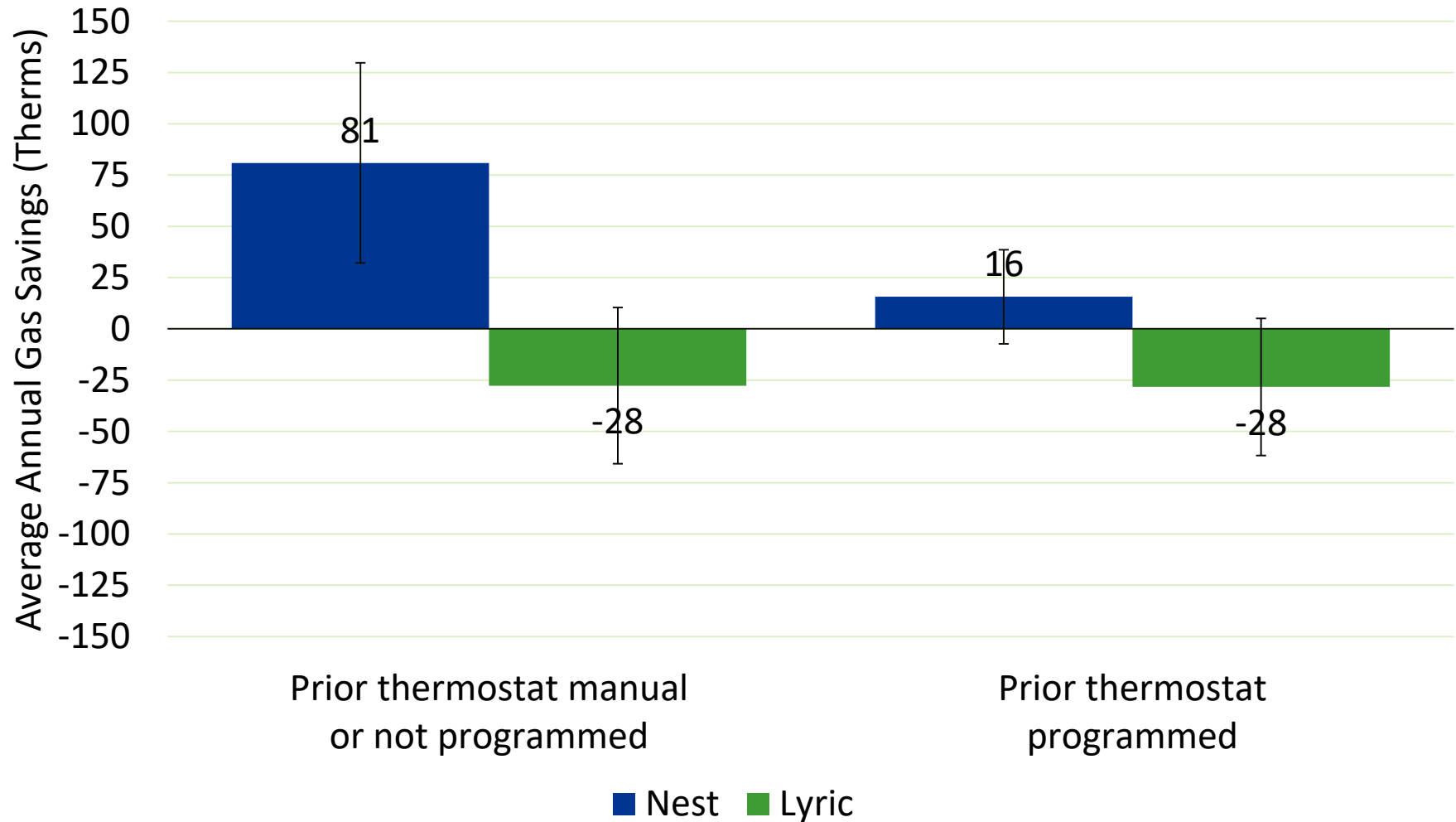
** Statistically significant at 90% confidence
Note heating savings – no cooling season data*



Subgroup Analysis



Subgroup Analysis



TO SUMMARIZE...

Conclusions

- Satisfaction was high, but varied by device
 - Nest considerably higher than Lyric for almost all rankings
 - Home comfort was exception, equally high
- Opt-in vs default energy settings are key
- Savings driven by behavior and usability/functionality/algorithms
- Nest generated savings while Lyric showed increased usage



Recommendations

- Cannot recommend Lyric
- Vetting new technology – is it possible?
- RCT is ideal, but quasi-experimental gave robust results
- TRMs should be sure to capture study nuances



One Final Note

Participant X:

*There's so much about the Lyric that **just leaves me scratching my head**. I'm really shocked at how utterly pathetic Honeywell's execution was on this thing. Anyway, we're going to stick it out for the duration of the study, but we can't wait for it to end so we can go back to our old, "dumb" thermostat!*



THANK YOU!