

# Cost effectiveness of an electronic health record-based intervention to prevent weight regain

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SGIM Annual Meeting 2019



# Background

- Weight regain after intentional loss is common but largely unstudied
- Technology shows promise in lifestyle interventions
- Maintaining Activity and Nutrition through Technology-Assisted Innovation in Primary Care (MAINTAIN-pc)

*Among adults with recent intentional weight loss, the use of EHR-based coaching and tracking tools resulted in less weight regain at 24 months than tracking tools alone.*

# Current Objective

- Examine the cost effectiveness of two primary care-based interventions (*Tracking + Coaching* vs. *Tracking only*) intended to help patients avoid weight regain



# Brief recap of MAINTAIN-pc

- 194 participants were randomized to two groups
  - Eligibility: BMI  $\geq$  25 kg/m<sup>2</sup> and intentional weight loss ( $\geq$ 5%) in the past 2 years
- Both groups had access to EHR tools
  - Flowsheets for tracking weight, diet, physical activity
  - Surveys, weekly reminders to complete tracking
- For Tracking + Coaching, participants received regular communications from health coaches
  - Year 1: weekly, biweekly, and then monthly (19 contacts)
  - Year 2: quarterly (4 contacts)
- Primary outcome: weight change at 24 months

# Tracking tool and main results

## EHR-based flowsheet

[Add New Data](#)

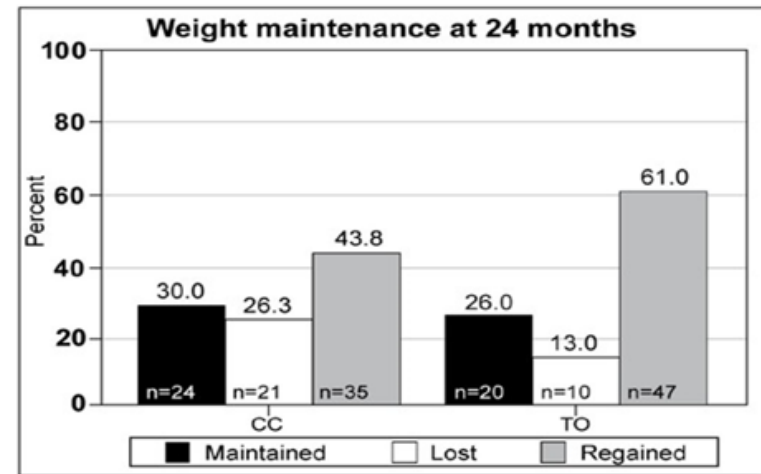
**Chart**

View Dates as Columns  
 View Dates as Rows

From  to  - or -  latest values [Apply](#)

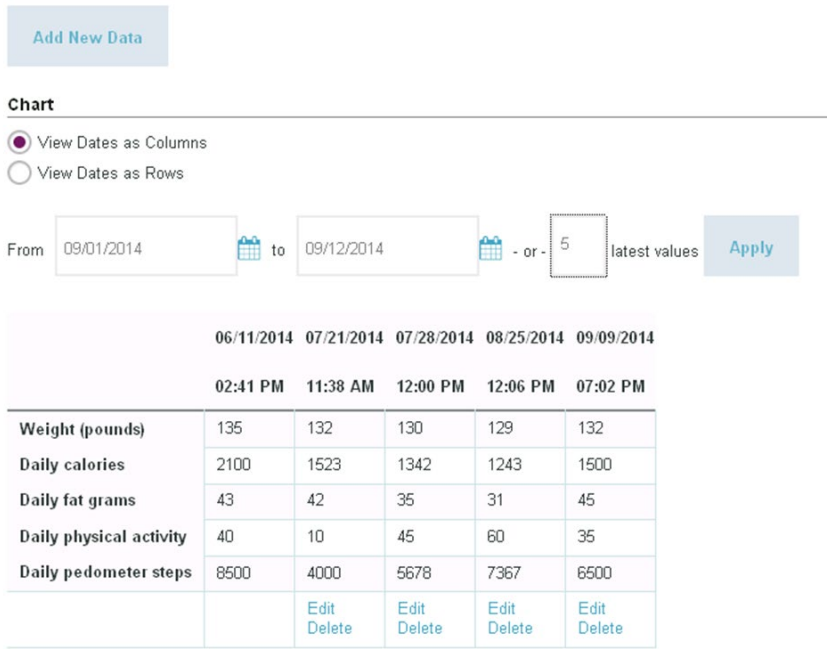
	06/11/2014	07/21/2014	07/28/2014	08/25/2014	09/09/2014
	02:41 PM	11:38 AM	12:00 PM	12:06 PM	07:02 PM
Weight (pounds)	135	132	130	129	132
Daily calories	2100	1523	1342	1243	1500
Daily fat grams	43	42	35	31	45
Daily physical activity	40	10	45	60	35
Daily pedometer steps	8500	4000	5678	7367	6500
		<a href="#">Edit</a> <a href="#">Delete</a>	<a href="#">Edit</a> <a href="#">Delete</a>	<a href="#">Edit</a> <a href="#">Delete</a>	<a href="#">Edit</a> <a href="#">Delete</a>

## 24-month outcomes

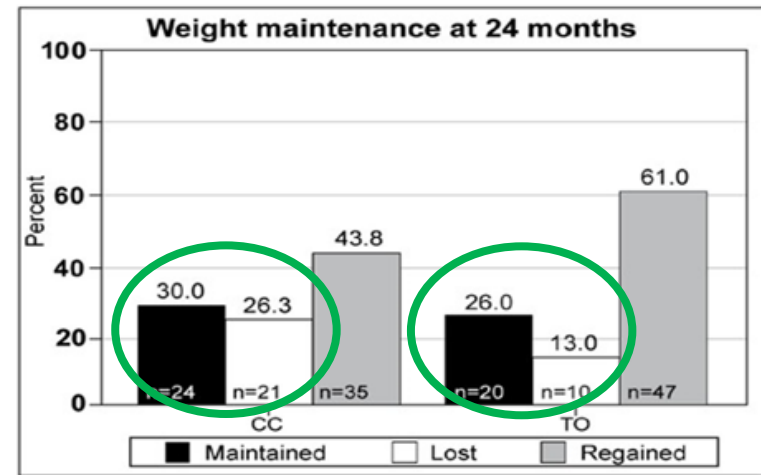


# Tracking tool and main results

## EHR-based flowsheet



## 24-month outcomes



# Cost effectiveness analysis

- Incremental cost effectiveness ratio (ICER):

$$ICER = \frac{Costs_{Coaching} - Costs_{TO}}{Benefits_{Coaching} - Benefits_{TO}}$$

- Decision analytic model
- Societal perspective
- TreeAge Pro 2017 (TreeAge Software; Williamstown MA)

# Cost effectiveness analysis

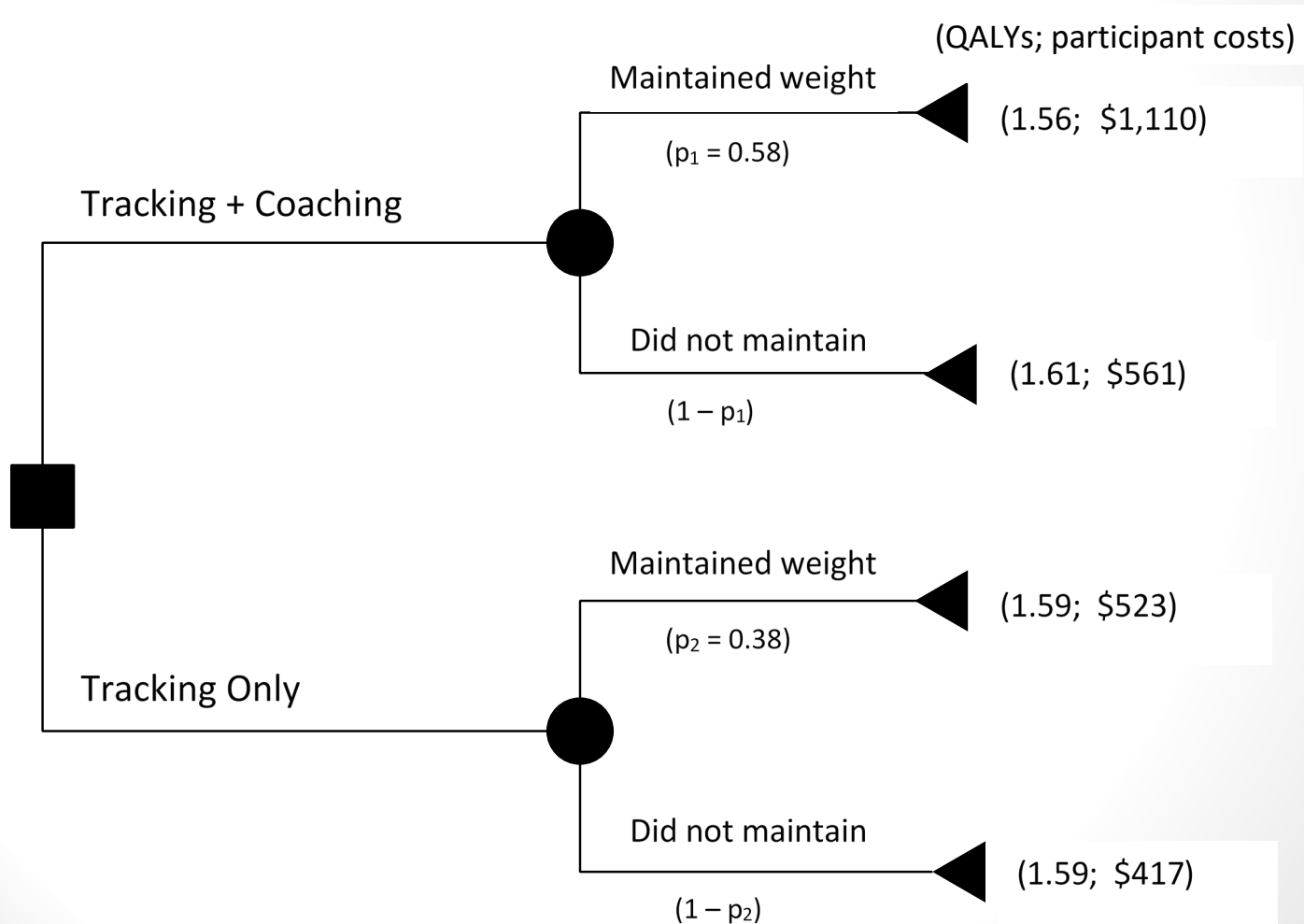
- Costs
  - Participant time devoted to tracking
  - Personnel (i.e., coaches)
- Benefits: quality-adjusted life years (QALYs) using SF-36 data at 0, 12, and 24 months
- Probabilities
  - Maintain/Lose/Regain, at 12 and 24 months



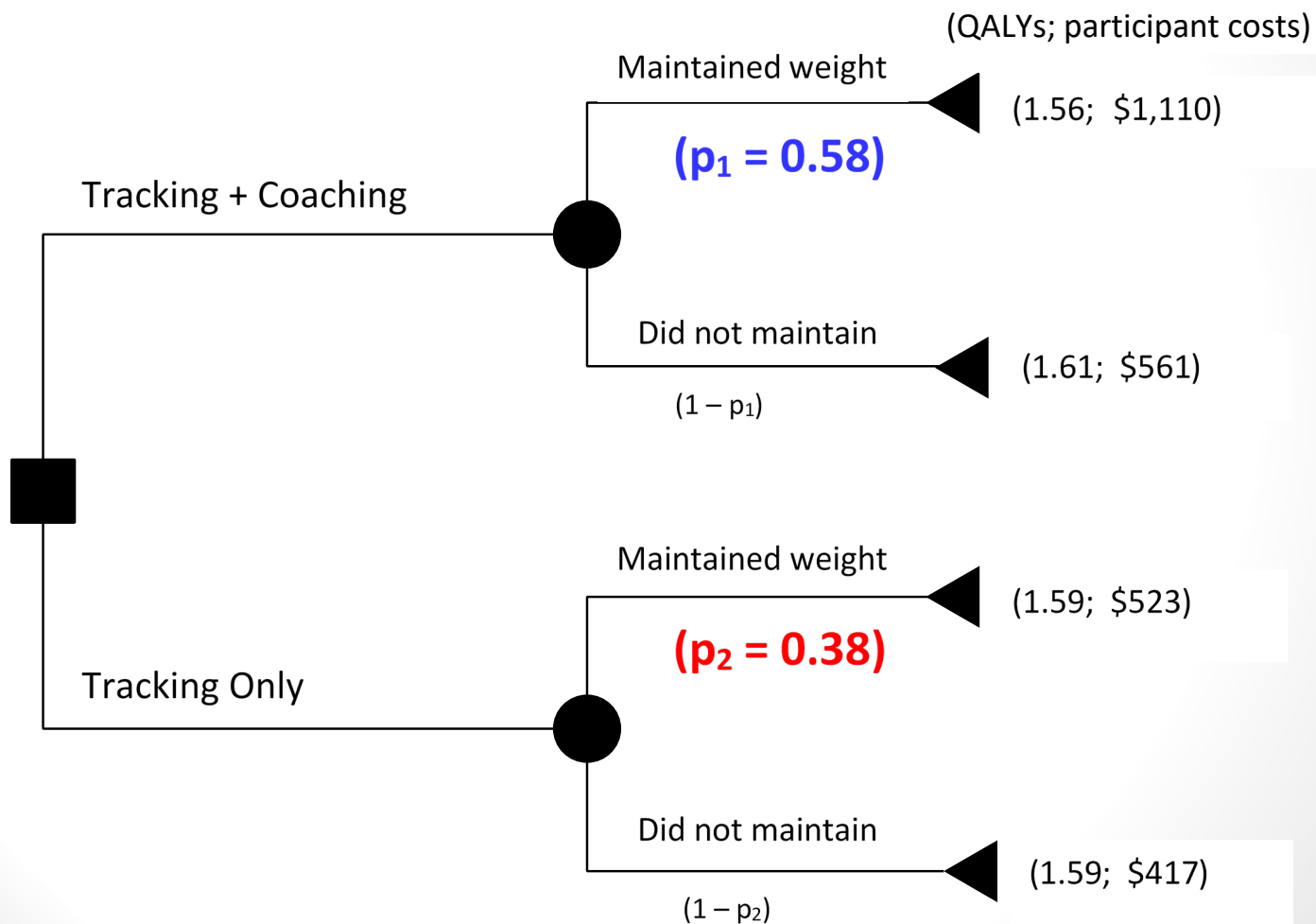
# Data (base case and ranges)

	Base Case		Range	
	Tracking+Coaching	Tracking Only	Tracking+Coaching	Tracking Only
<b>Probability of maintaining</b>	58%	38%	46%-70%	30%-46%
<b>Mean entries per participant</b>				
Weight	232	84	185-278	67-101
Calories	218	107	174-261	85-128
Fat	211	83	169-254	66-99
Activity	235	121	188-282	97-146
Pedometer	247	172	198-296	138-207
<b>Time per entry, minutes</b>				
Fat, calories	5		0-10	
Activity	3		0-6	
Weight, pedometer	1		0-2	
<b>Participant wage (hourly)</b>	\$20		\$16 - \$24	
<b>Annual salary (coaches)</b>	\$68,550	\$0	\$54,800 - \$82,300	N/A
<b>Mean utilities</b>				
Baseline	0.81	0.81	0.61-1.0	0.61-1.0
12 month	0.77	0.78	0.57-0.97	0.58-0.98
24 month	0.78	0.80	0.58-0.98	0.60-0.99

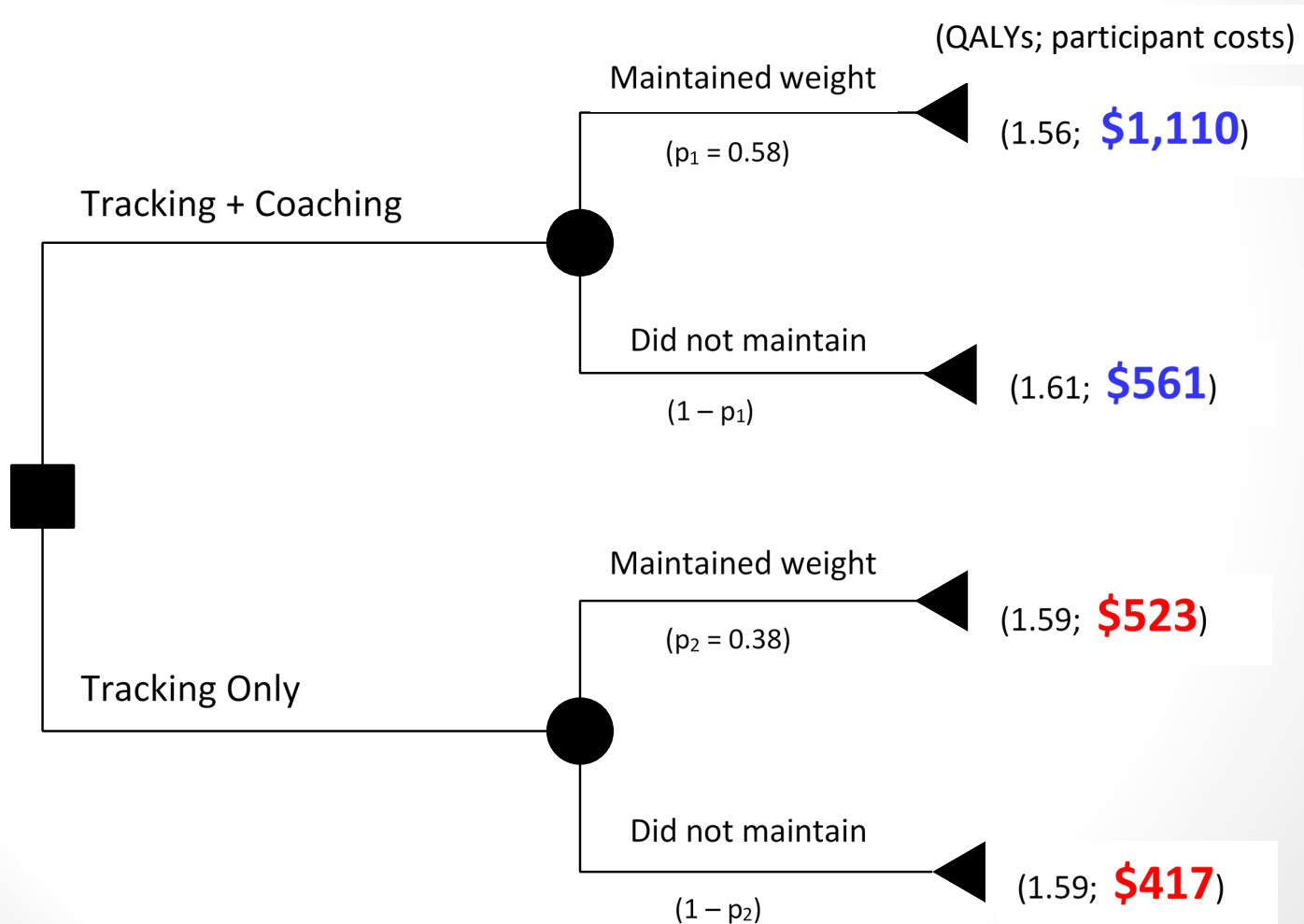
# Tree – Base case



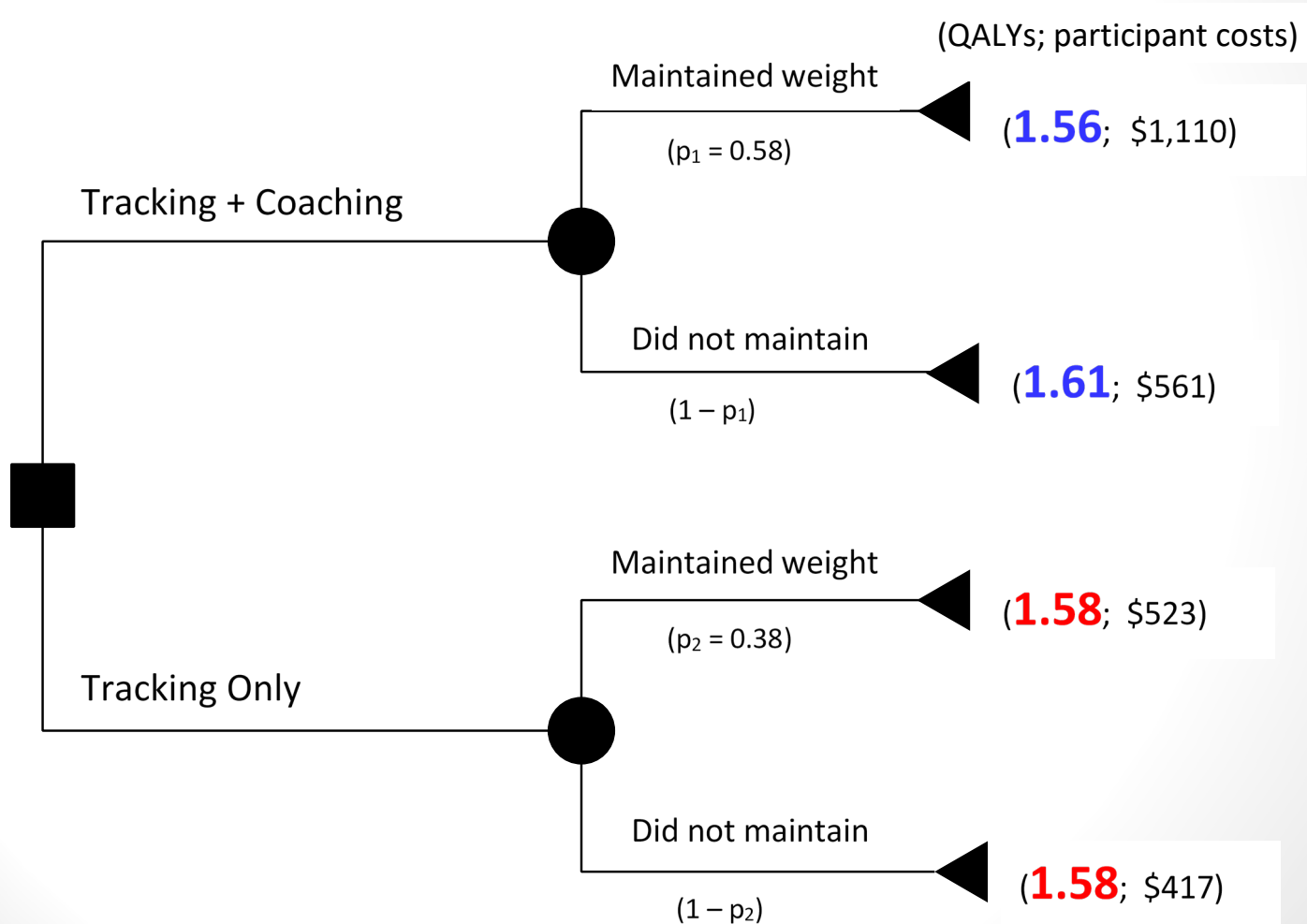
# Tree – Base case



# Tree – Base case



# Tree – Base case



# ICER – Base case and PSA

## Base-Case (Societal Perspective)

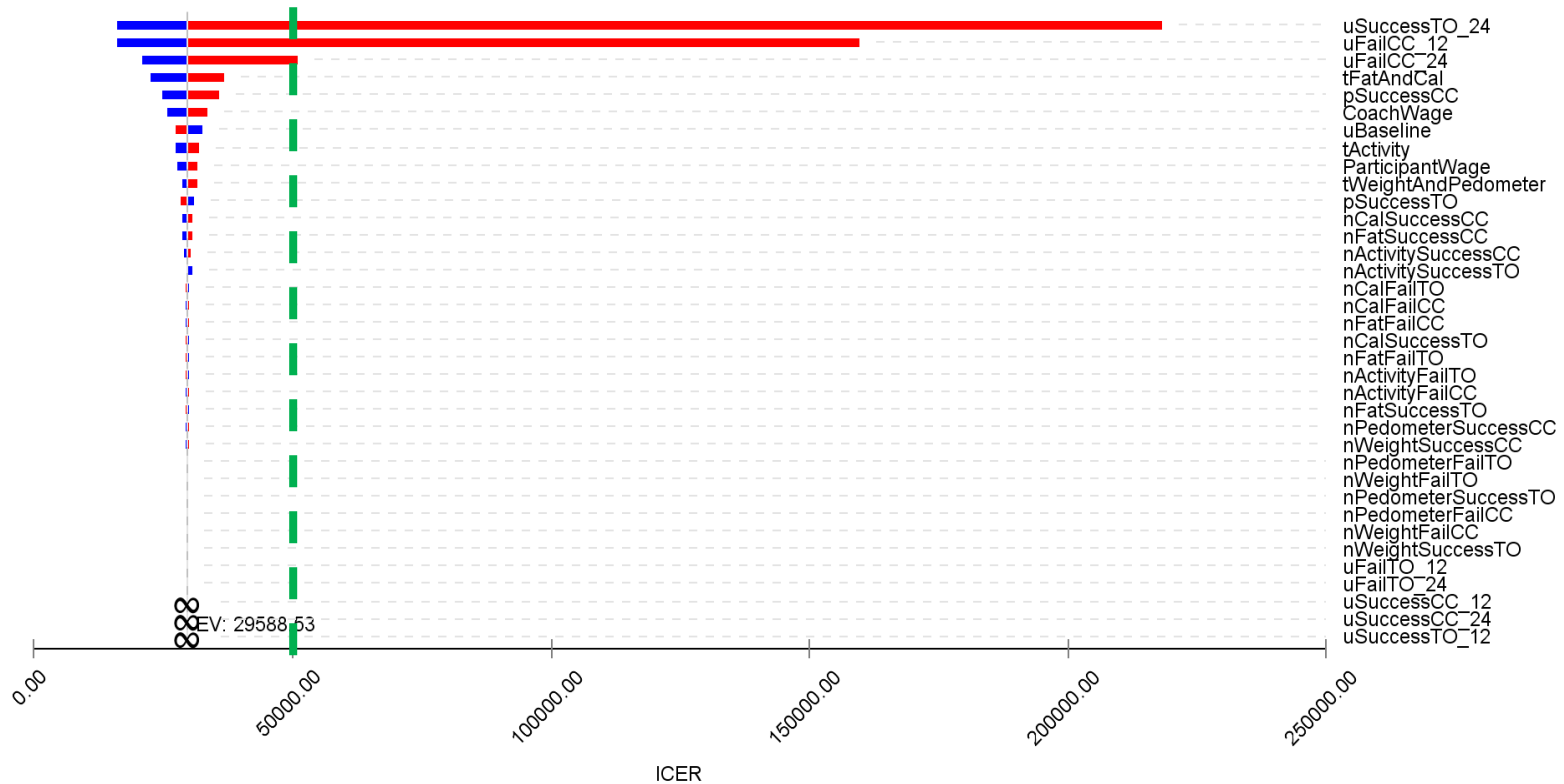
Strategy	Cost	Incr Cost	Eff	Incr Eff	ICER
Tracking only	35198.2	0	123.11	0	0
Coaching	135363.9	100165.8	126.50	3.39	29,589

## Probabilistic sensitivity analysis

Coaching preferred 64.9% of the time

# One-way sensitivity analyses

Tornado Diagram - ICER  
Tracking + Coaching vs. Tracking Only



# ICER – Base case and PSA

## Base-Case (Societal Perspective)

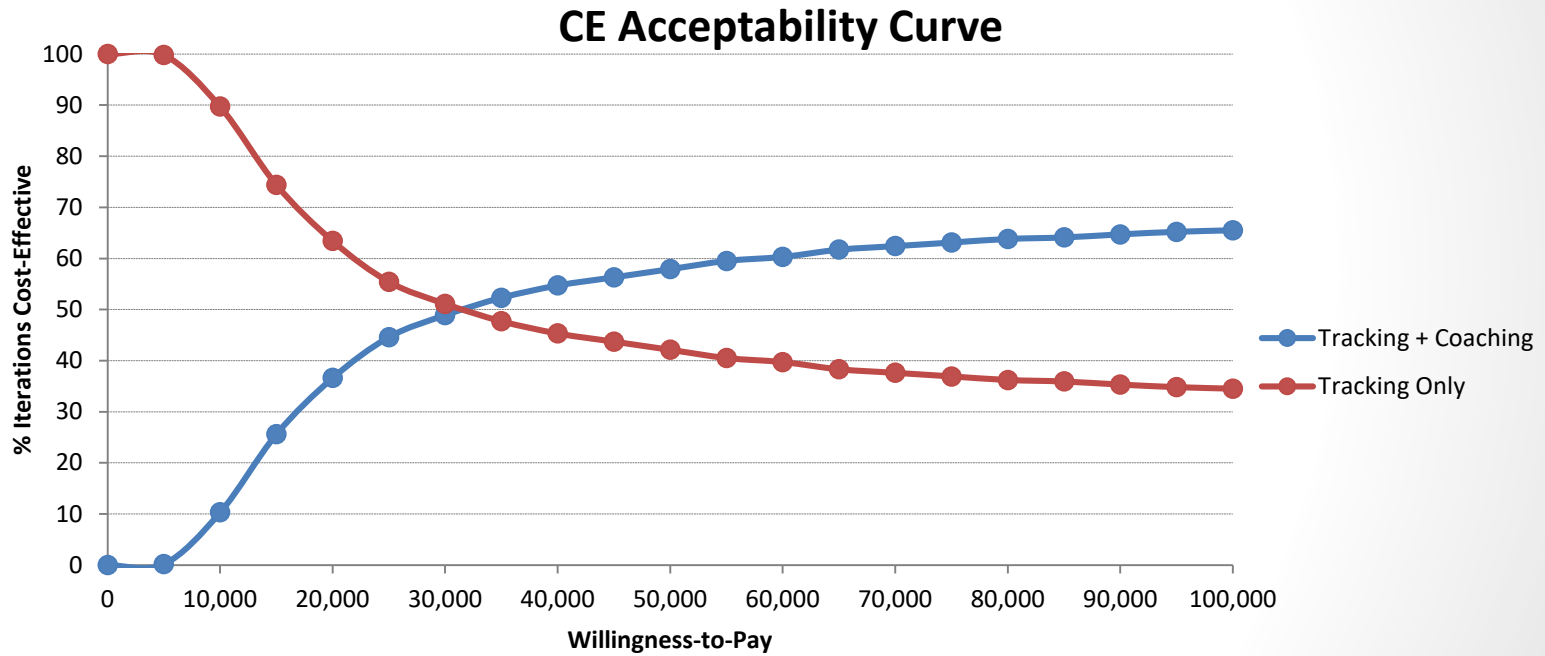
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## Probabilistic sensitivity analysis

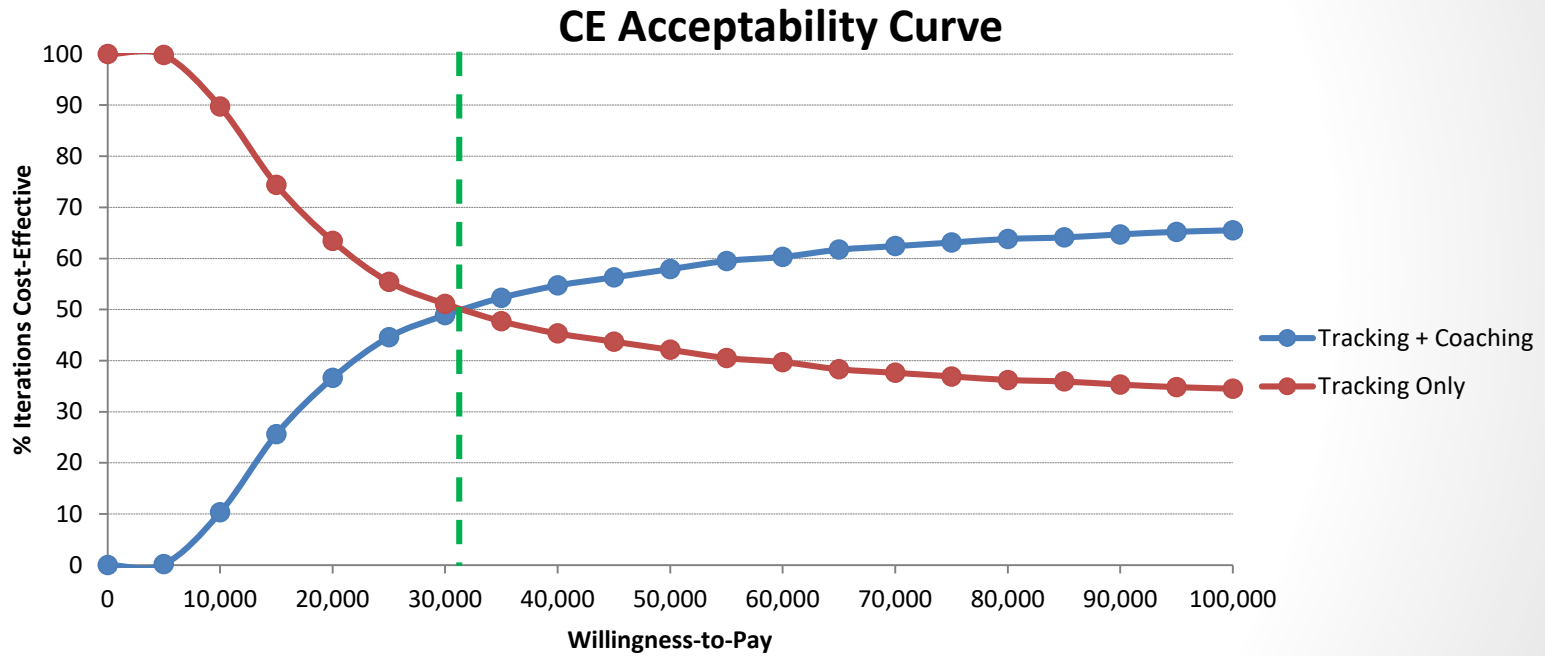
Coaching preferred **64.9%** of the time



# Acceptability Curve



# Acceptability Curve



# Why the unusual QALY values?

- Participant preferences are not (only) correlated with weight change
  - SF-36 is a generic measure of HRQL
  - Adaptation to a health state
- But also...
  - By design, coaching support DID DECREASE over time
  - Aligning expectations: at baseline, most participants indicated a desire to lose more weight

# Limitations

- Preference for “maintenance health states” as opposed to health states related to weight loss are complex
- Several sources of uncertainty
- Missing outcomes data (weight change)
- For tracking data, what do “zeroes” really mean?

# Strengths and closing

- Offers the first benchmarks (ICERs) for weight maintenance interventions
- Despite uncertainty in participant data, Tracking + Coaching provided cost effective support for avoiding weight regain
- Participant preferences raise the possibility that increasing coaching support (number of contacts, duration) might be warranted
- Variability in the ICERs is NOT related to the costs of health coaches

# Co-authors

- Heather Tomko, BS
- Kathleen M. McTigue, MD, MS, MPH
- Jonathan Arnold, MD, MSE
- Gary S. Fischer, MD
- Bethany Barone Gibbs, PhD
- Rachel Hess, MD, MS
- Kimberly Huber, MPH
- Laurey R. Simkin-Silverman, PhD
- Dana Tudorascu, PhD
- Molly B. Conroy, MD, MPH (Principal Investigator)

# Acknowledgments

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MAINTAIN-pc coaches: Lacey Funair, MS; Cindy Murphy, RN; and Sharon Stover, RN

MAINTAIN-pc research staff: Tracey Murray, BS; Maribel Cedillo, MS; and Janet Thieret

Thank you

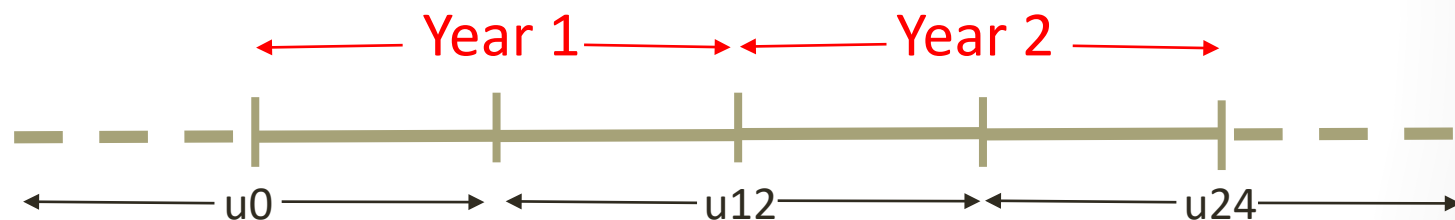


# Extra slides

# QALYs (based on SF-36)

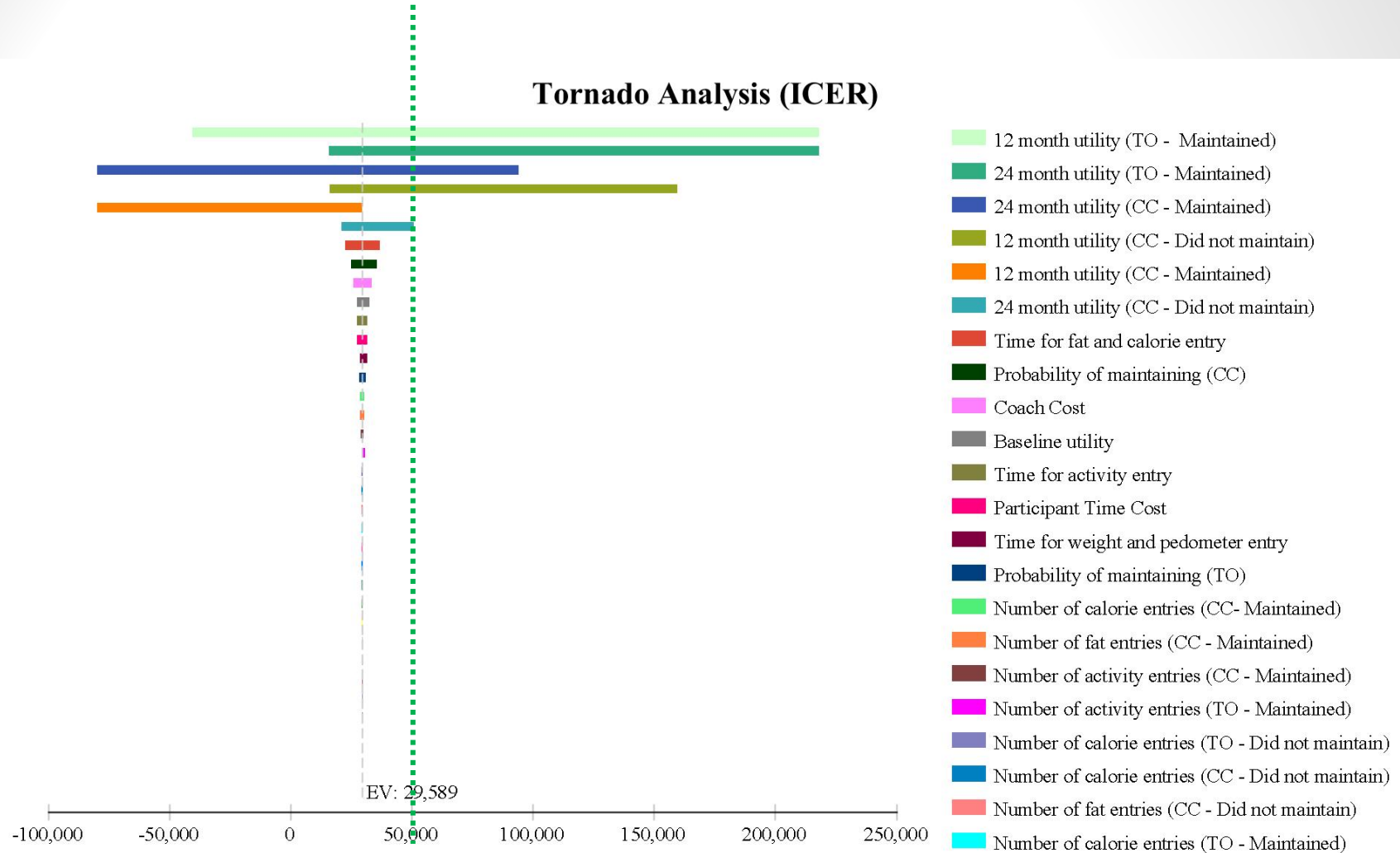
- Measured at enrollment, 12 months, and 24 months

## MAINTAIN-pc study period

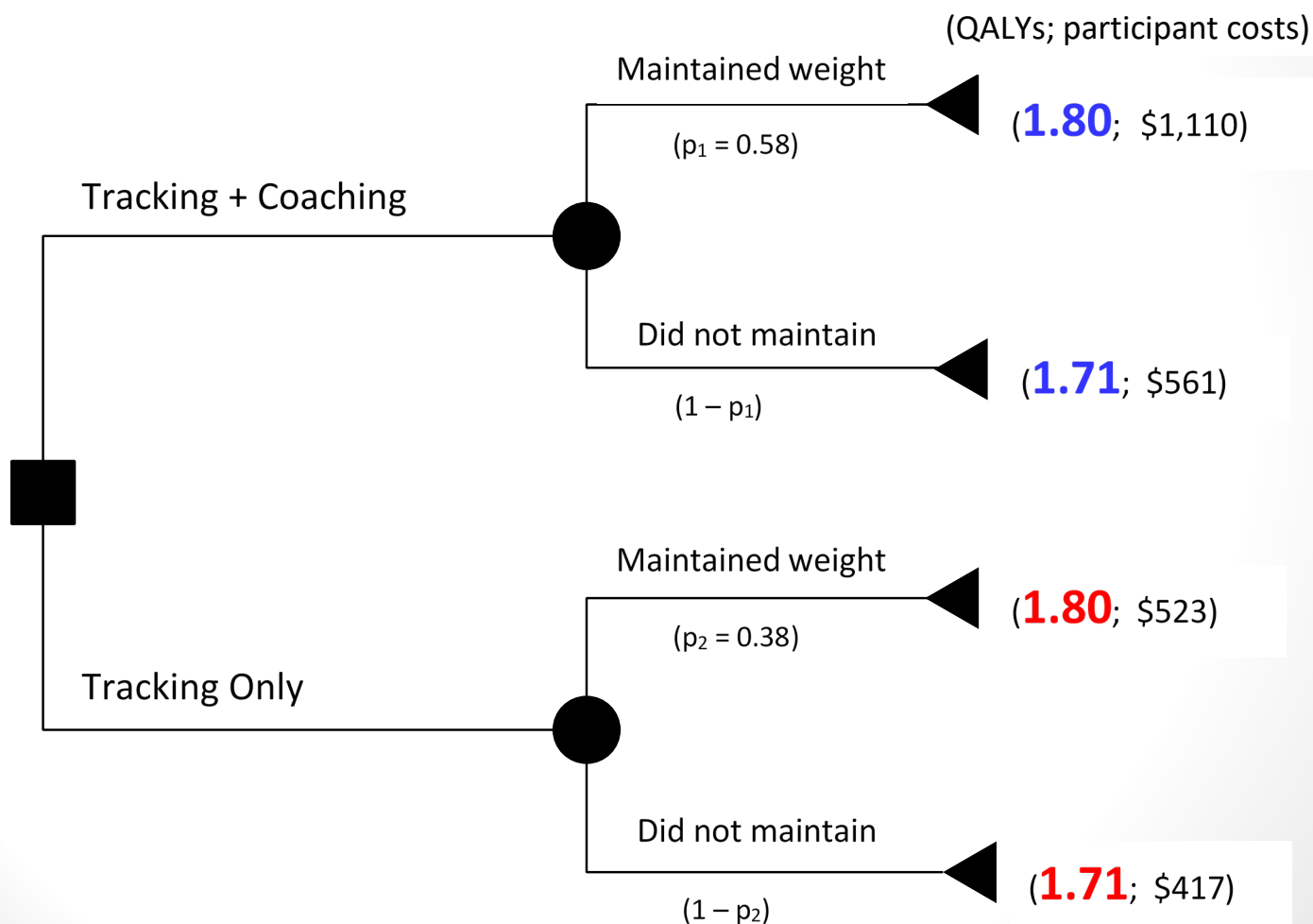


# One-way sensitivity analyses

**Tornado Analysis (ICER)**



# Aside – a comparison using published utilities



Source: Dennett et al. (2008)

# Results: Participant characteristics

Characteristic	Total (n=194)	Coaching (n=98)	Tracking (n=96)
Age, mean (SD)	53.3 (12.3)	53.1 (12.1)	53.4 (12.5)
Female sex, n (%)	139 (74)	65 (68)	74 (79)
White, n (%)	166 (88)	85 (90)	81 (86)
Latino, n (%)	7 (4)	4 (4)	3 (3)
Married, n (%)	129 (69)	63 (67)	66 (70)
Education post HS, n (%)	180 (95)	92 (97)	88 (94)
Smoker, n (%)	5 (3)	3 (3)	2 (2)
Moderate physical activity, n (%)	181 (96)	91 (96)	90 (96)

# Unadjusted weight Results

		Change from baseline, months						
		Baseline	6 months	12 months	24 months			
<b>Weight, kg (Mean ± SD)</b>								
	n		n		n		n	
CC	98	88.2 ± 18.7	91	-1.0 ± 5.4	86	0.7 ± 7.0	80	1.9 ± 7.9
TO	96	83.3 ± 19.2	87	0.9 ± 4.2	84	1.9 ± 5.6	77	4.9 ± 7.2
Mean Δ (95% CI)		5.0 (-0.4, 10.3)		-1.9 (-3.4, -0.5)		-1.3 (-3.2, 0.7)		-3.0 (-5.4, -0.6)
P-value		0.0696		<b>0.0082</b>		0.1969		<b>0.0134</b>

# Unadjusted Weight results

			Change from baseline, months					
		Baseline	6 months		12 months		24 months	
<b>% weight change (Median, Q1, Q3)</b>								
	--	--						
CC	--	--	91	-1.1 (-4.8, 2.8)	86	1.7 (-4.7, 5.5)	80	2.0 (-3.0, 7.9)
TO	--	--	87	0.7 (-2.2, 4.3)	84	2.4 (-1.7, 6.2)	77	5.8 (1.2, 10.6)
P-value	--	--	91	<b>0.0110</b>		0.3073		<b>0.0146</b>

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Fat	211	83	169-254	66-99
Activity	235	121	188-282	97-146
Pedometer	247	172	198-296	138-207
<b>Did not maintain</b>				
Weight	89	106	71-108	85-128
Calories	110	81	88-131	65-97
Fat	102	62	82-123	50-74
Activity	134	98	107-161	78-117
Pedometer	132	136	106-159	109-163
<b>Time per entry, minutes</b>				
Fat, calories	5		0-10	
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Weight, pedometer	1		0-2	
<b>Participant Wage (hourly)</b>	\$20		\$16 - \$24	
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<b>Utilities, average</b>				
<b>Maintained weight</b>				
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