What Is Known About the Cost-Effectiveness of Nonpharmacological and Nonsurgical Treatments for Pain?

Role of Nonpharmacologic Approaches to Pain Management: A National Academies Workshop

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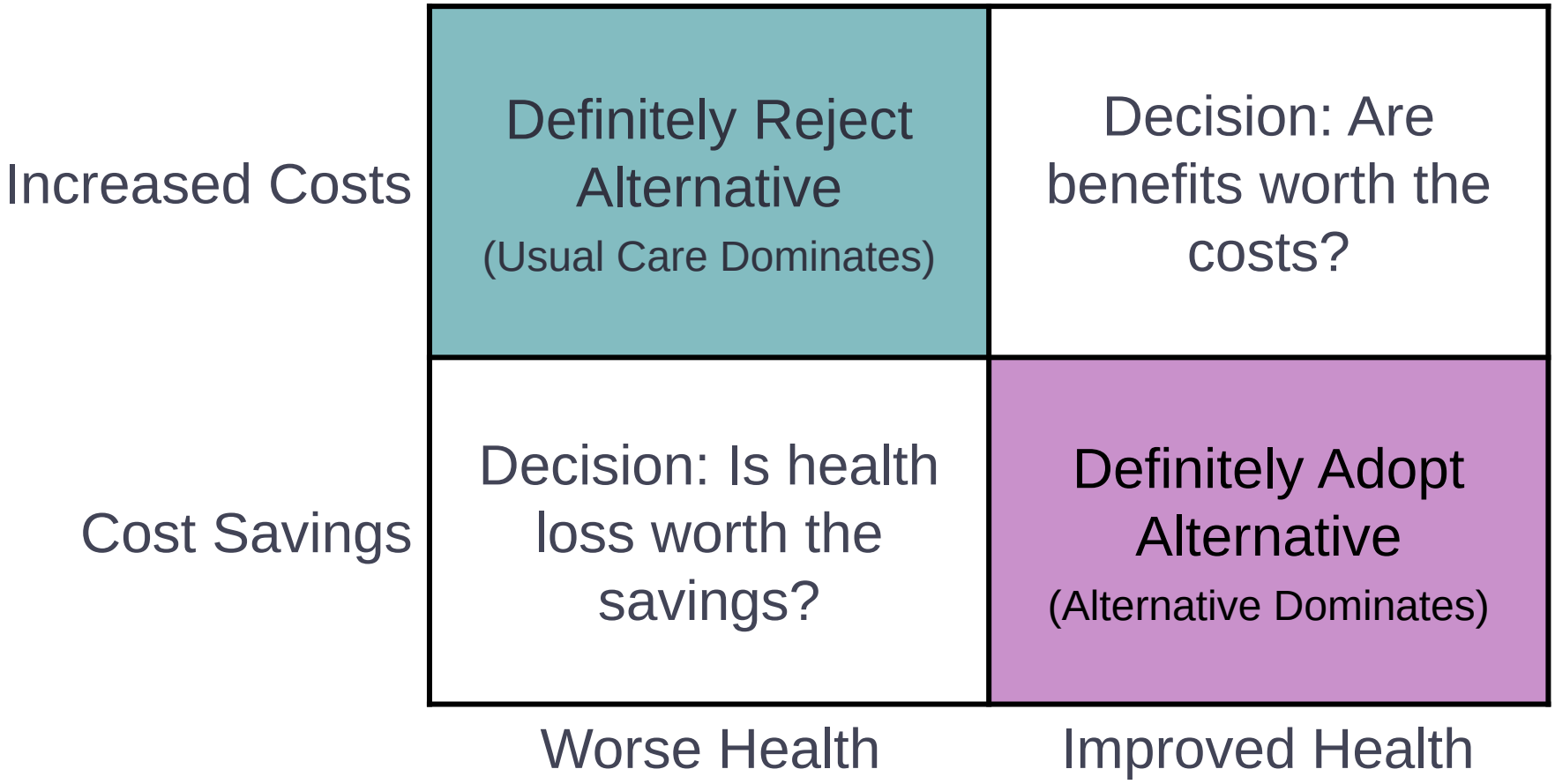
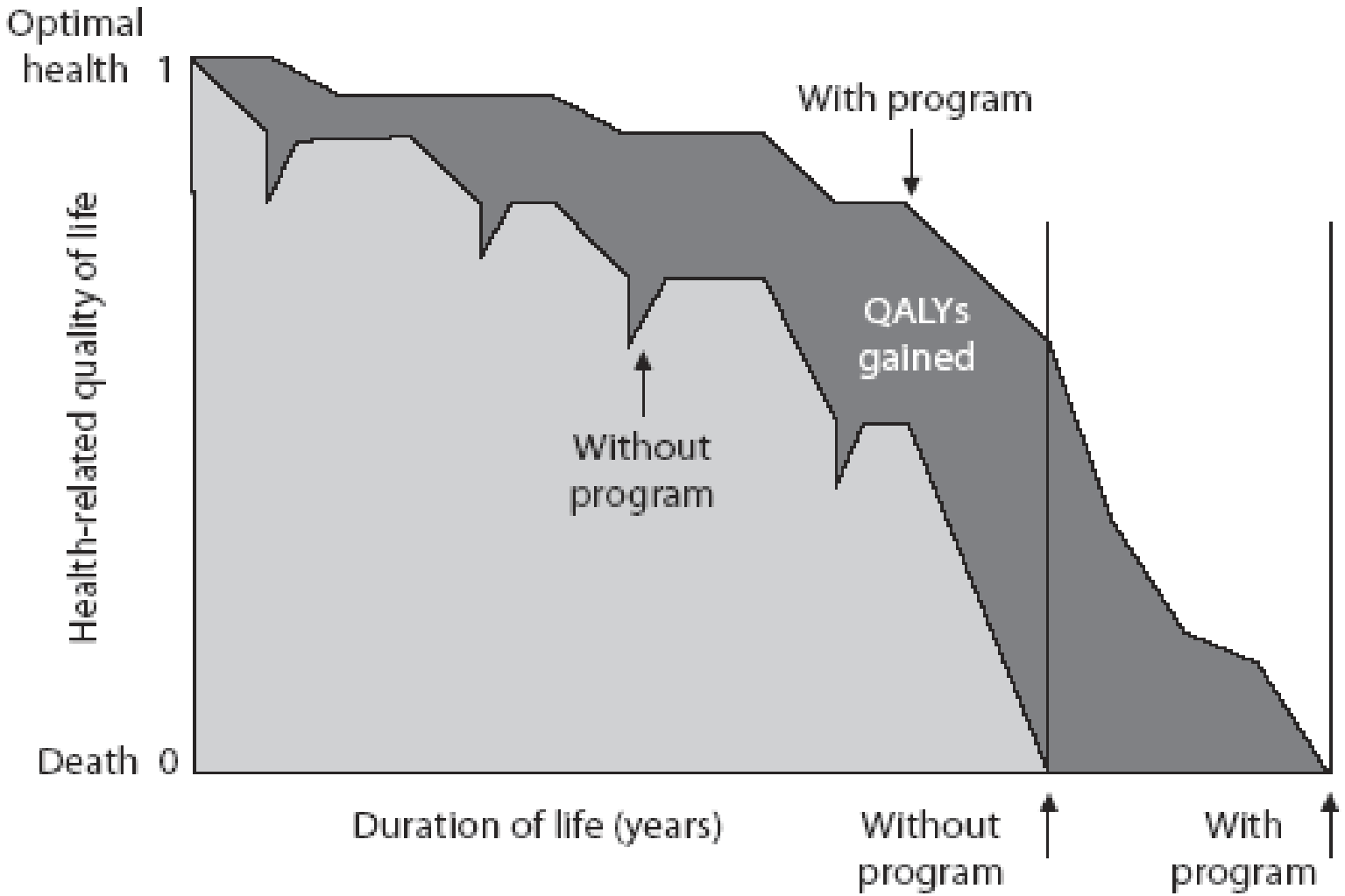
Overview

- Basics of cost-effectiveness analysis, including the tricky bits
- What the studies of individual interventions for different types of pain show
- What we can learn from modeling
- Summary and next steps

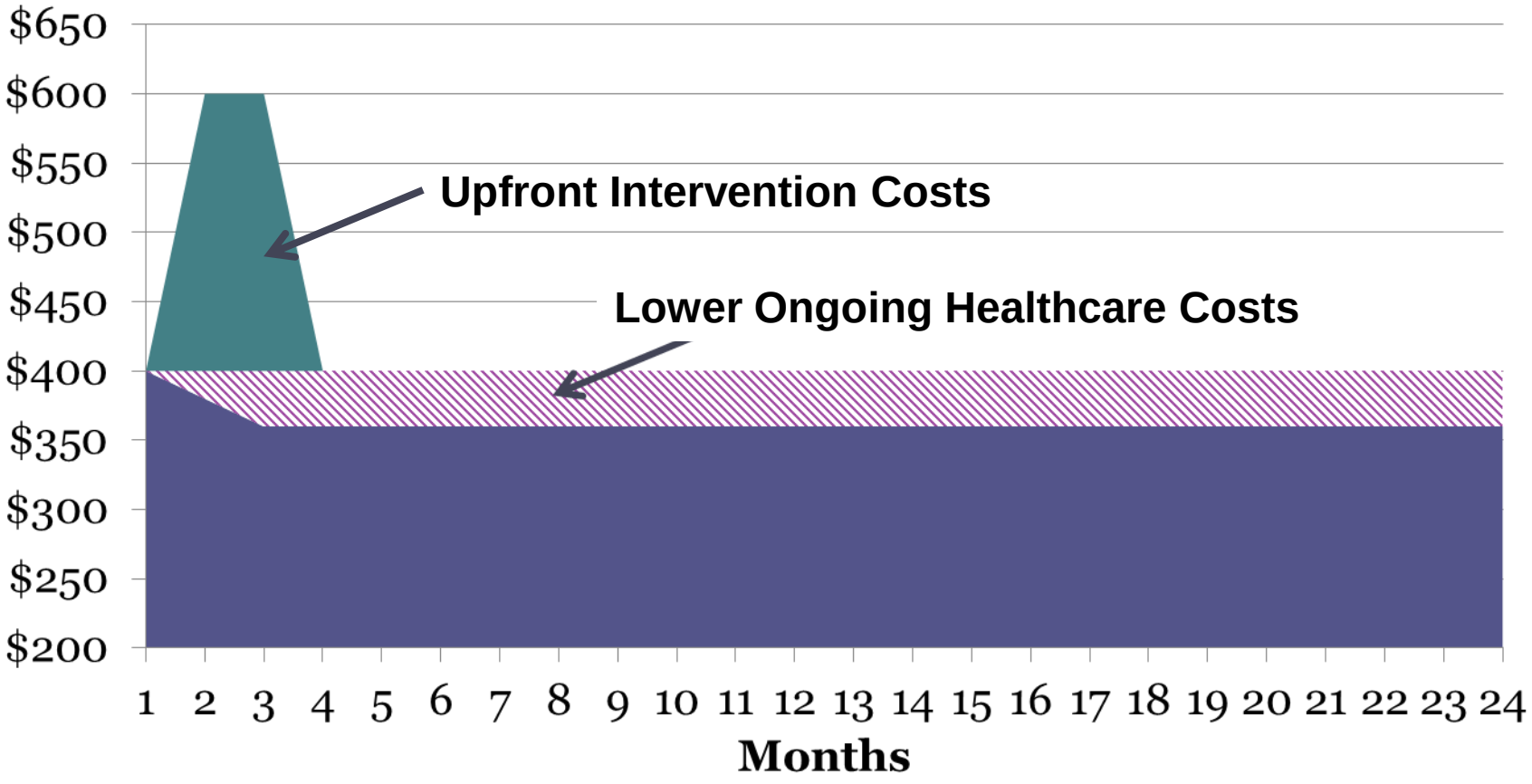
Cost-Effectiveness Decision Matrix



Quality-Adjusted Life-Years (QALYs)



Components of Healthcare Costs



Perspective: Costs to Whom?

- **Individual or Patient:** what the patient pays out of pocket
- **Third-party payer**: reimbursed healthcare costs
- **Hospital or provider group:** salary of provider, facility space, equipment
- **Employer**: productivity loss
- **Society**: all costs, no matter who pays

Transferability

- Economic outcomes are NOT generalizable across settings
  - Cannot do a meta-analysis and make broad statements about cost-effectiveness
- Human physiology and psychology more consistent and replicable across settings than are organizational structures and relative prices
- Goal of transferability: provide enough information that study results can be adapted to other settings – usually through modeling

Results of a Systematic Review

First Author	Inter-vention	Pain Condition	Per-spective	Results	Time
Brown	Musculoskel physician	Outpatient orthopedic	CUA-H	Cost saving	1 yr
Ratcliffe	Acupuncture	Low back pain	CUA-S	Cost saving	2 yrs
Korthols de Bos	Manual therapy	Back pain	CUA-S	Cost saving	1 yr
Herman	Naturopathic care	Chronic low back pain	CUA-S	Cost saving	6mo
Herman	Naturopathic care	Chronic low back pain	CUA-E	Cost saving	6mo
Kim	Acupuncture	Acute low back pain 60y	CUA-S	$3k/QALY	5 yrs
Witt	Acupuncture	Dysmenorrhea	CUA-S	$5k/QALY	3mo
UK BEAM	Manipulation + exercise	Back pain	CUA-P	$8k/QALY	1 yr

Perspective: E=Employer; H=Hospital; P=Payer; S=Societal; CUA=Cost-Utility Analysis; QALY = Quality-Adjusted Life-Year. Herman et al. *BMJ Open*. 2012.

Results of a Systematic Review

First Author	Inter-vention	Pain Condition	Per-spective	Results	Time
Ratcliffe	Acupuncture	Low back pain	CUA-P	$9k/QALY	2 yrs
Williams	Osteopathy	Subacute back pain	CUA-P	$9k/QALY	6mo
UK BEAM	Manipulation	Back pain	CUA-P	$11k/QALY	1 yr
Holling-hurst	Massage + Exercise	Chronic or recurrent back pain	CUA-P	$12k/QALY	1 yr
Holling-hurst	Alexander technique	Chronic or recurrent back pain	CUA-P	$12k/QALY	1 yr
Holling-hurst	Alexander + Exercise	Chronic or recurrent back pain	CUA-P	$13k/QALY	1 yr
Witt	Acupuncture	Chronic low back pain	CUA-S	$16k/QALY	3mo
Witt	Acupuncture	Headache	CUA-S	$18k/QALY	3mo

Perspective: E=Employer; H=Hospital; P=Payer; S=Societal; CUA=Cost-Utility Analysis; QALY = Quality-Adjusted Life-Year. Herman et al. *BMJ Open*. 2012.

Results of a Systematic Review

First Author	Inter-vention	Pain Condition	Per-spective	Results	Time
UK BEAM	Exercise	Back pain	CUA-P	$19k/QALY	1 yr
Witt	Acupuncture	Chronic neck pain	CUA-S	$19k/QALY	3mo
Vickers	Acupuncture	Chronic headache	CUA-S	$20k/QALY	1 yr
Vickers	Acupuncture	Chronic headache	CUA-P	$21k/QALY	1 yr
Reinhold	Acupuncture	Chronic hip or knee OA	CUA-S	$28k/QALY	3mo
Black	Glucosamine	Knee osteoarthritis	CUA-P	$59k/QALY	23yr
Haas*	Chiropractic	Acute low back pain	CEA-P	$21/pain mm	1 yr
Haas*	Chiropractic	Chronic low back pain	CEA-P	$1/pain mm	1 yr
Holling-hurst	Massage	Chronic or recurrent back pain	CUA-P	Dominated	1 yr

Perspective: E=Employer; H=Hospital; P=Payer; S=Societal; CUA=Cost-Utility Analysis; QALY = Quality-Adjusted Life-Year. Herman et al. *BMJ Open*. 2012. *US-based.

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Perspective: E=Employer; H=Hospital; P=Payer; S=Societal; CUA=Cost-Utility Analysis; QALY = Quality-Adjusted Life-Year. Herman et al. *BMJ Open*. 2012. *US-based.

What We Can Learn From These Studies

- Nonpharmacologic interventions can be cost-effective or even cost saving for pain
- Most lowest cost interventions used the societal perspective – i.e., included reductions in productivity loss
- Some studies' costs would be lower if healthcare cost reductions captured over a longer period
- Only one US-based study (2 results)

Additional Studies Found

First Author	Inter-vention	Pain Condition	Per-spective	Results	Time
Aboagye	Medical yoga	Low back pain	CUA-S	Cost saving	1 yr
Aboagye	Exercise	Low back pain	CUA-S	Cost saving	1 yr
Chuang	Yoga	Chronic low back pain	CUA-S	Cost saving	1 yr
Herman*	MBSR	Chronic low back pain	CUA-S	Cost saving	1 yr
Korthals de Bos	Manual therapy	Neck pain	CUA-S	Cost saving	1 yr
Lewis	Manual therapy	Neck pain	CUA-S	Cost saving	1 yr
Richard-son	Exercise class	Knee osteoarthritis	CUA-S	Cost saving	1.5yr
Aboagye	Medical yoga	Low back pain	CUA-P	Cost saving	1 yr
Aboagye	Exercise	Low back pain	CUA-P	Cost saving	1 yr

Perspective: E=Employer; H=Hospital; P=Payer; S=Societal; CUA=Cost-Utility Analysis; QALY = Quality-Adjusted Life-Year.; MBSR = Mindfulness-based stress reduction. *US-based.

Additional Studies Found

First Author	Inter-vention	Pain Condition	Per-spective	Results	Time
Cochrane	Water therapy	Knee osteoarthritis	CUA-P	Cost saving	23y
Critchley	Pain mangmt	Chronic low back pain	CUA-P	Cost saving	1.5yr
Herman*	MBSR	Chronic low back pain	CUA-P	Cost saving	1 yr
Herman*	Any CIH	Chronic musculo-skeletal pain (VA)	CUA-P	Cost saving	1 yr
Jessep	Exercise vs PT	Chronic knee pain	CUA-P	Cost saving	1 yr
Mahrer*	Integrative	Pediatric pain clinic	Costs-H	Cost saving	1 yr
Mahrer*	Integrative	Pediatric pain clinic	Costs-P	Cost saving	1 yr
Herman*	Group CBT-P	Chronic low back pain	CUA-S	$3k/QALY	1 yr
Korthals de Bos	PT + Exercise	Neck pain	CUA-S	$4k/QALY	1 yr
Lamb	Group CBT-P	Subacute/chronic LBP	CUA-P	$4k/QALY	1 yr

Perspective: E=Employer; H=Hospital; P=Payer; S=Societal; CUA=Cost-Utility Analysis; QALY = Quality-Adjusted Life-Year.; CIH = Complementary and integrative health. *US-based.

Additional Studies Found

First Author	Inter-vention	Pain Condition	Per-spective	Results	Time
Lewis	Manual therapy	Neck pain	CUA-P	$6k/QALY	6mo
White-hurst	Acupuncture	Knee osteoarthritis	CUA-P	$10k/QALY	1 yr
Stamuli	Acupuncture	Severe irritable bowel	CUA-P	$11k/QALY	1 yr
Johnson	Exercise+CBT	Chronic low back pain	CUA-P	$12k/QALY	1.3yr
Herman*	Group CBT-P	Chronic low back pain	CUA-P	$12k/QALY	1 yr
Lewis	Diathermy	Neck pain	CUA-S	$14k/QALY	6mo
Chuang	Yoga	Chronic low back pain	CUA-P	$29k/QALY	1 yr
Lewis	Diathermy	Neck pain	CUA-P	$33k/QALY	6mo
Stamuli	Acupuncture	Irritable bowel	CUA-P	$106k/ QALY	1 yr

Perspective: E=Employer; H=Hospital; P=Payer; S=Societal; CUA=Cost-Utility Analysis; QALY = Quality-Adjusted Life-Year.; CBT-P = Cognitive behavioral therapy for pain. *US-based.

What We Can Learn From These Studies

- Nonpharmacologic interventions can be cost-effective and even more are cost saving for pain
- Many lowest cost interventions used the societal perspective – i.e., included reductions in productivity loss
- Only three US-based studies (7 results)
- Can't generalize beyond these broad statements
  - **Can say more with modeling**

Results from Two Models Built for Chronic Low Back Pain

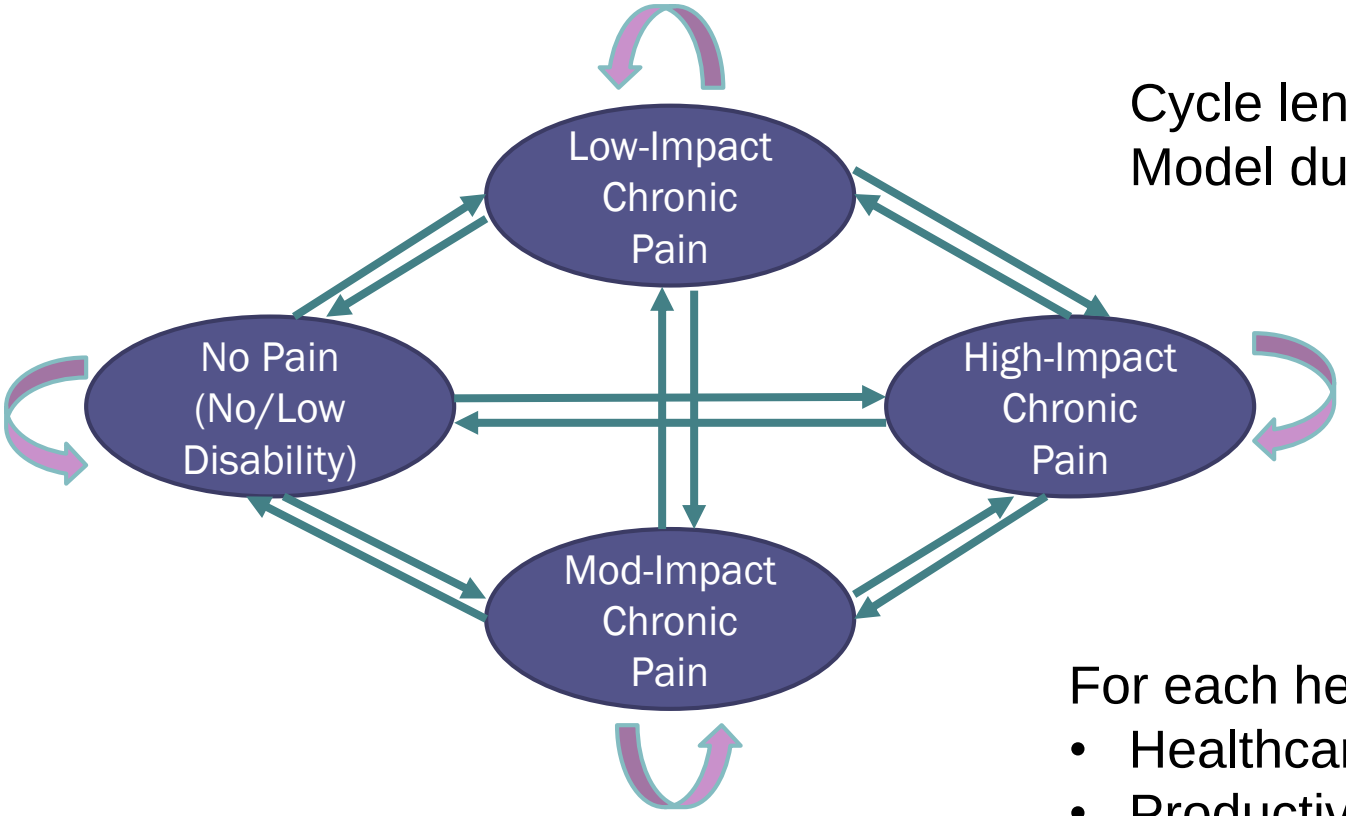
Institute for Clinical and Economic Review

- Cognitive and Mind-Body Therapies for CLBP
- Markov model (6-month cycles over 5 years)
  - Health states = Chronic pain & Pain improved
  - Perspective of the healthcare system

Results	Incr. Costs	Incr. QALY	$/QALY	Decisions
Acupuncture	$891	0.0165	$53,933	Intermediate value*
CBT	$1549	0.0165	$93,799	Intermediate value*
MBSR	$330	0.0165	$19,975	High-value*
Yoga	$65	0.0165	$3,929	High-value*
Tai chi	$225	0.0061	$36,759	Not enough evidence

*"[S]trength of evidence appears adequate to support coverage…" 2016US$

Markov Model for Chronic Low-Back Pain



Cycle length = 6 weeks
Model duration = 1 year

For each health state:

- Healthcare cost
- Productivity cost
- Health-related QoL value

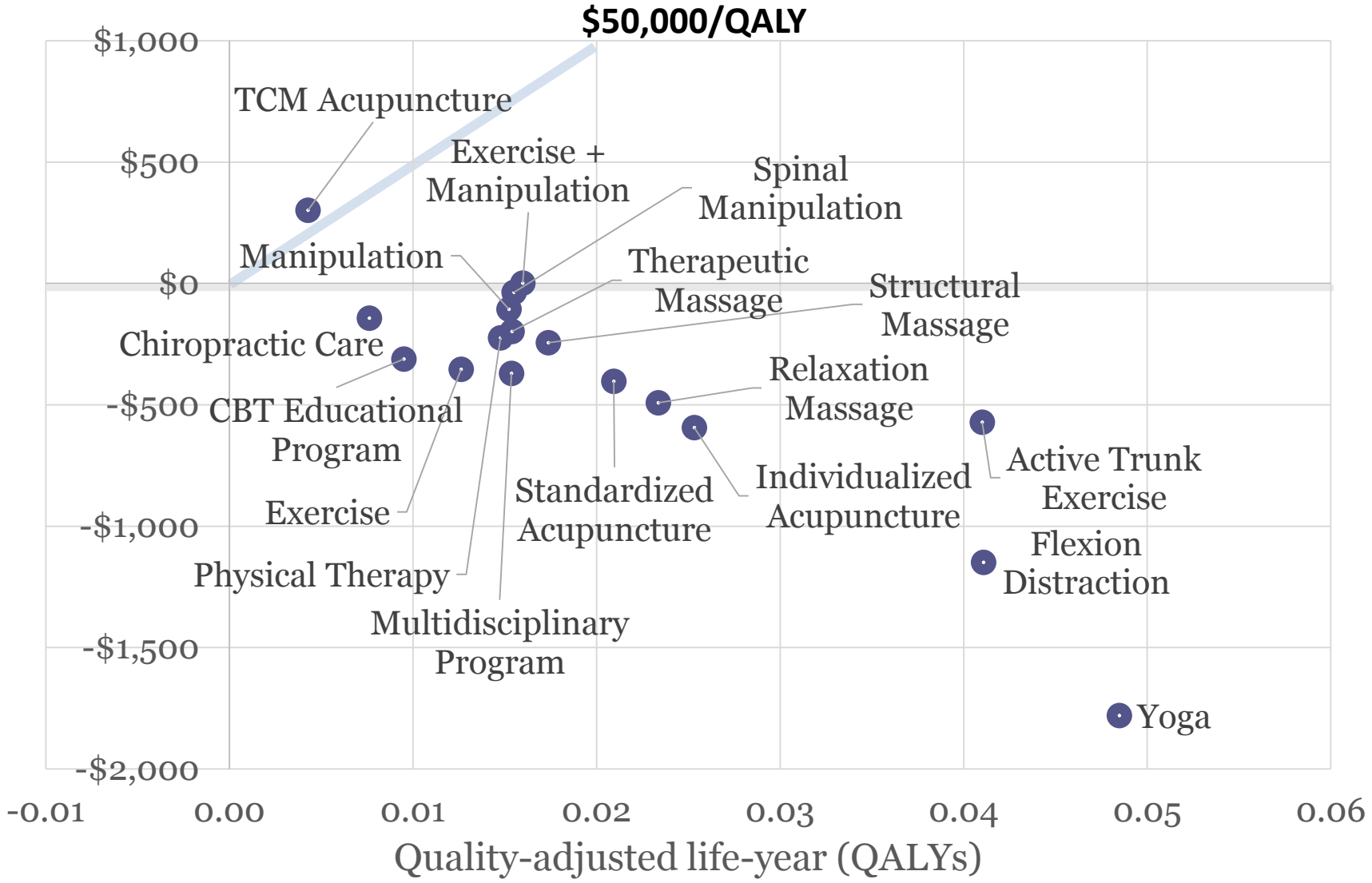
Cost and Utility Estimates

per 6-week cycle by health state, M (SE)

Health states	Back-related healthcare costs	Productivity loss (absenteeism)	Utilities (health-related quality of life)
No pain (No/low disability)	$ --	$3 ($3)	0.806 (0.004)
Low-impact chronic pain	$265 ($38)	$31 ($10)	0.763 (0.003)
Moderate-impact chronic pain	$496 ($56)	$48 ($6)	0.704 (0.006)
High-impact chronic pain	$690 ($54)	$291 ($34)	0.610 (0.007)

Relative Cost-Effectiveness

(Typical Chronic Low Back Pain Population; Societal Costs)



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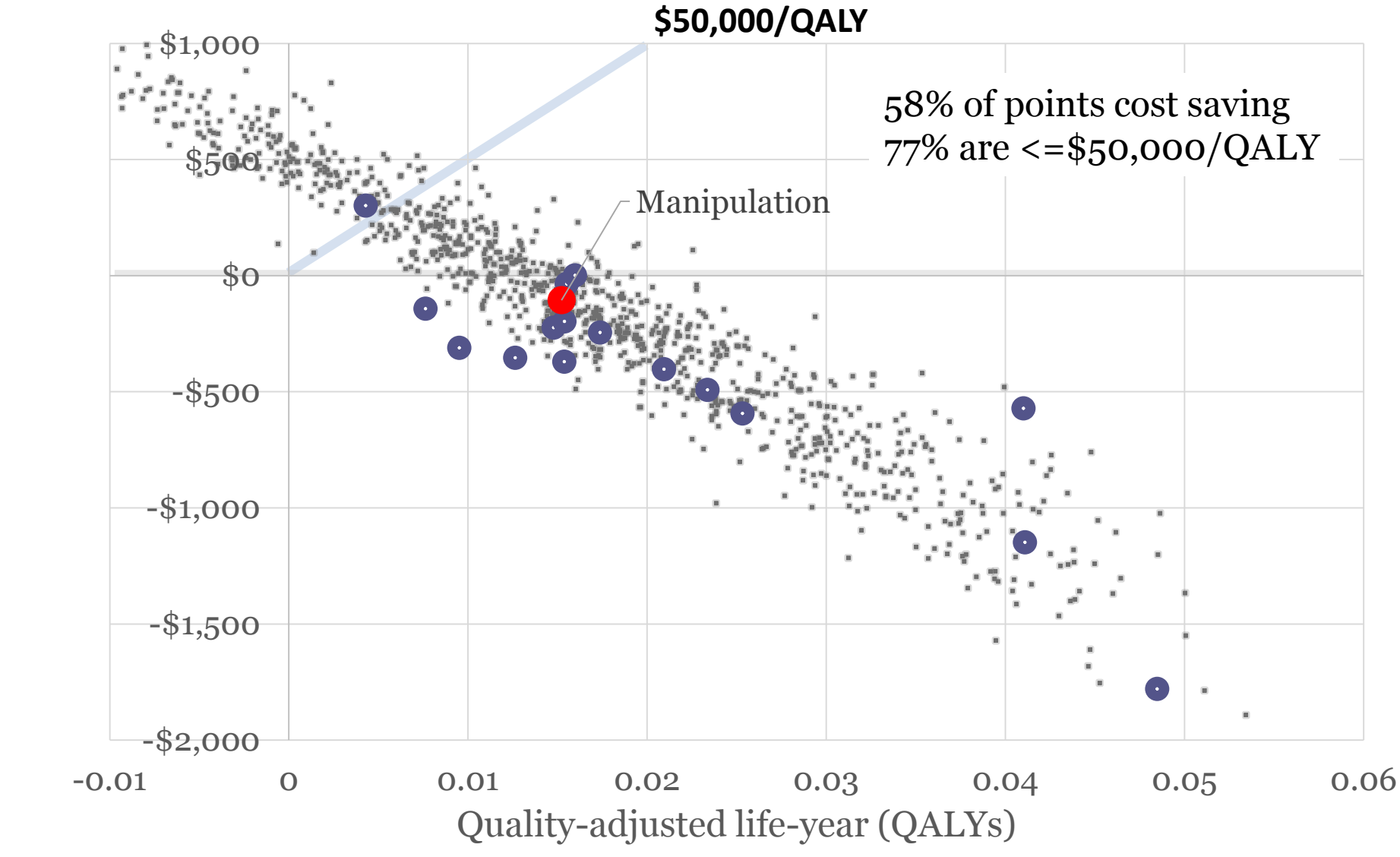
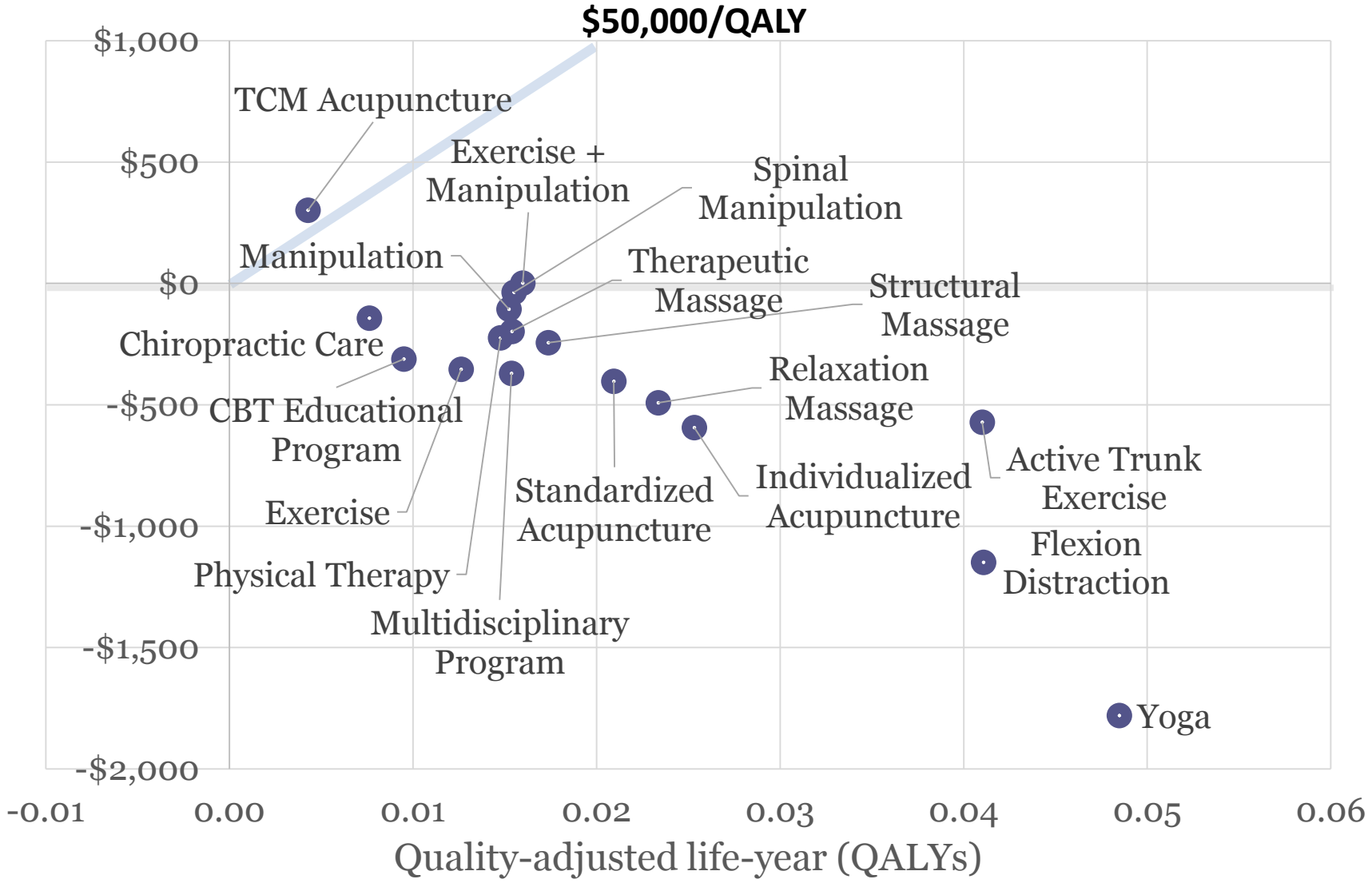


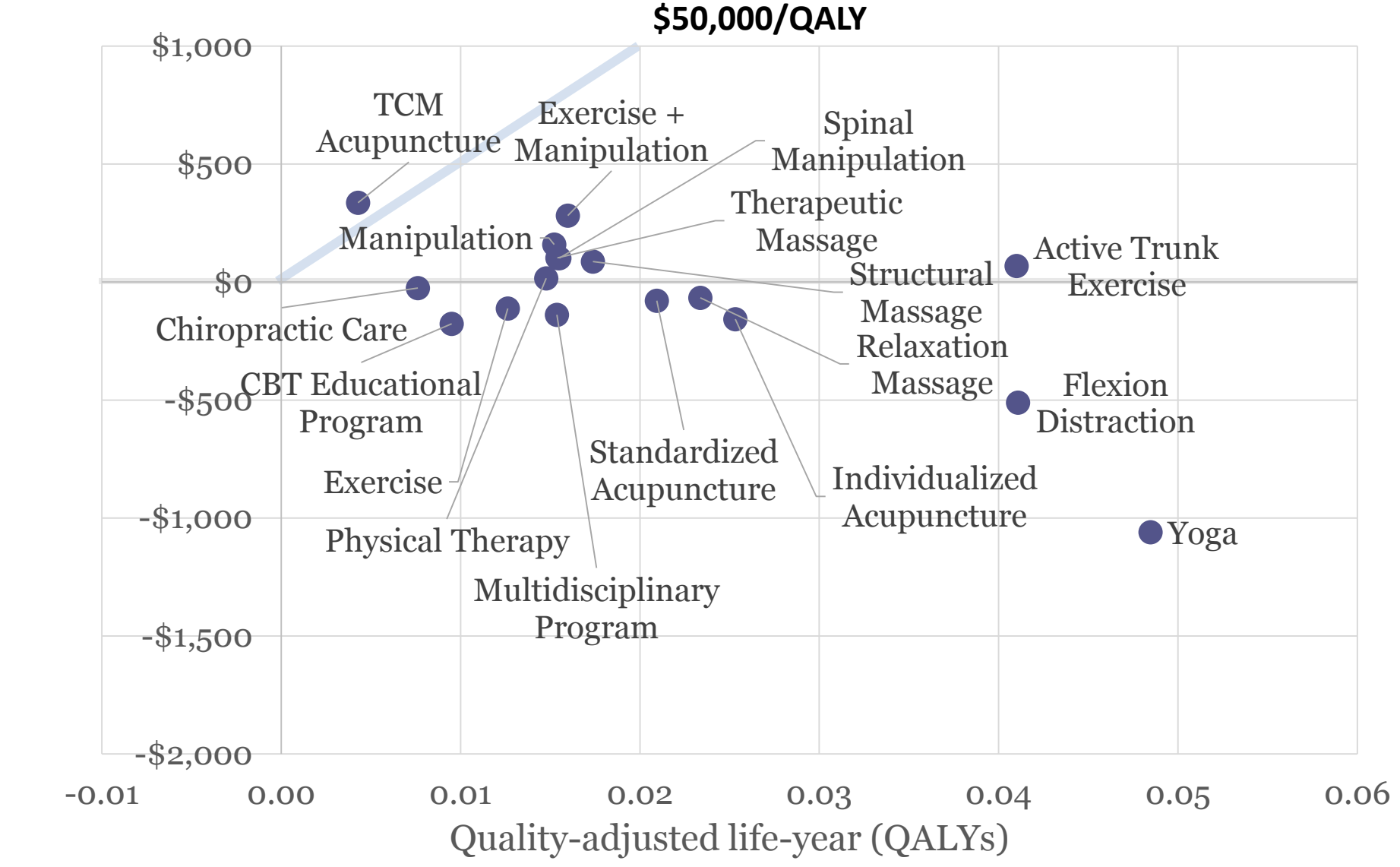
Relative Cost-Effectiveness

(Typical Chronic Low Back Pain Population; Societal Costs)



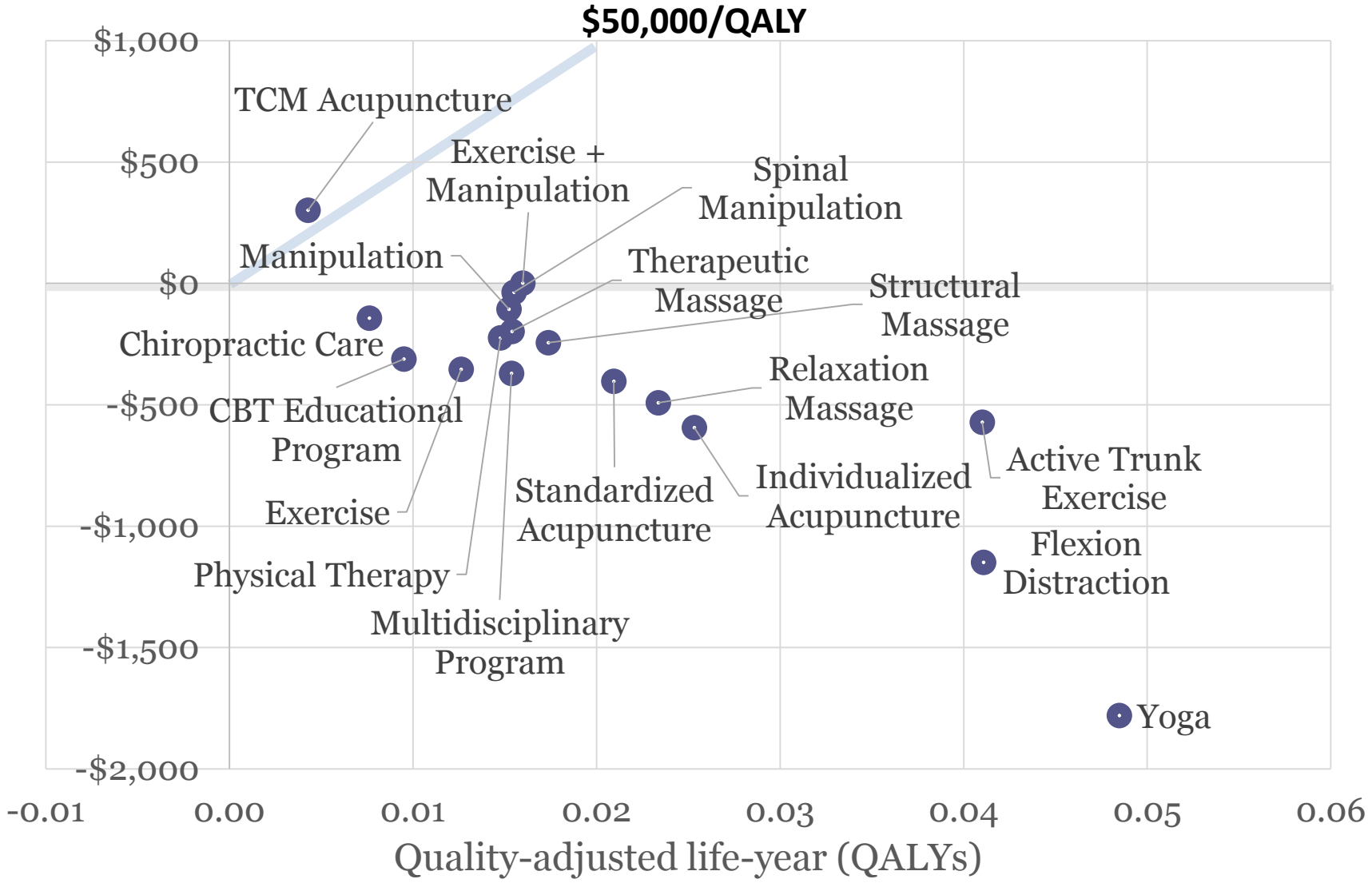
Relative Cost-Effectiveness

(Typical Chronic Low Back Pain Population; Payer Costs)



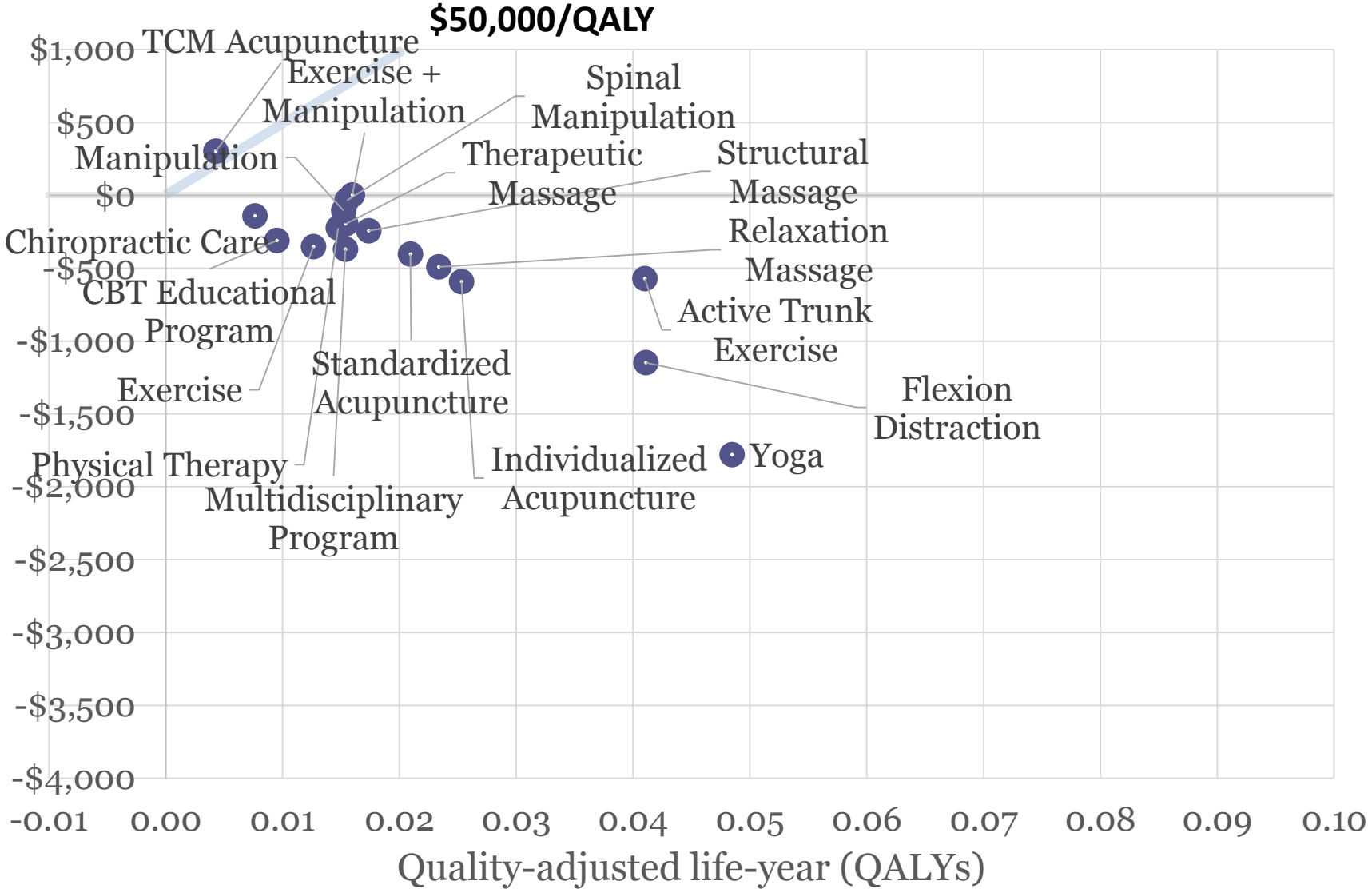
Relative Cost-Effectiveness

(Typical Chronic Low Back Pain Population; Societal Costs)



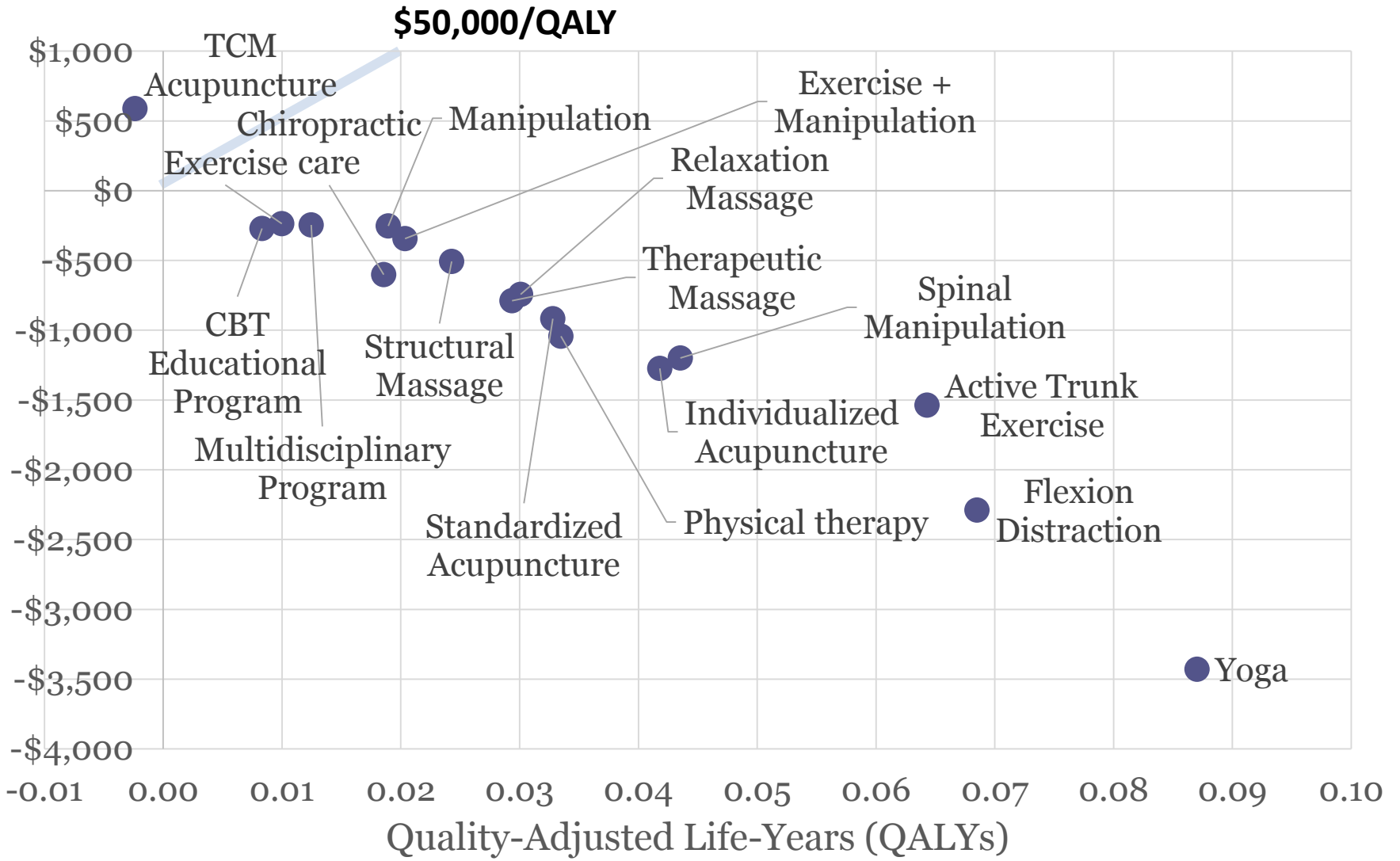
Relative Cost-Effectiveness

(Typical Chronic Low Back Pain Population; Societal Costs)



Relative Cost-Effectiveness

(High-Impact Chronic Low Back Pain Population; Societal)



Summary

- Individual studies show therapies can be cost-effective and even cost saving in specific settings
- Modeling has shown that nonpharmacologic therapies are likely cost-effective and even cost saving in the US, especially:
  - From the societal perspective
  - Over a year
  - For those with high-impact chronic pain
- Effectiveness and cost-effectiveness of many nonpharmacologic interventions are similar
- Modeling can help us understand cost-effectiveness of interventions and to target future studies

Thank you!

We'd like to acknowledge those who generously shared their data: Dr. J. David Cassidy; Dr. Jerilyn Cambron; Dr. Ram Gudavalli; Dr. Mitch Haas at the University of Western States; Dr. Eric Hurwitz; Dr. Wolf E. Mehling; Drs. Daniel Cherkin, Karen Sherman, James E. Moore, and Michael Von Korff of Kaiser Permanente Washington Research Institute (formerly Group Health Research Institute); and the University of Warwick.

The RAND model presented here was supported by the National Center for Complementary and Integrative Health of the National Institutes of Health under award number: U19AT007912. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.