Economic Impact of Hepatitis C: Highlights of Cost-Effectiveness Modeling

Presented at: Viral Hepatitis Action Coalition Bi-annual Meeting
Atlanta, GA
May 15, 2013

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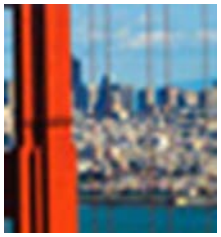
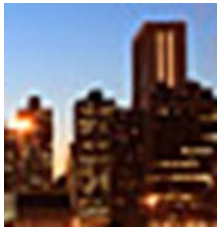
Overview

- Cost-effectiveness review
- AIM paper
- Other published cost-effectiveness studies
- Scenario modifications
- New results
- Implications and questions








Cost-effectiveness Review

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- A comparison of the relative costs and outcomes of two or more policy alternatives
- Incremental cost-effectiveness ratio
  - $\frac{(Cost\ _{Intervention} - Cost\ _{Baseline})}{(QALY_{Intervention} - QALY_{Intervention})}$
- Price or cost per each additional unit of benefit (QALY) provided by the intervention
- Cost-effectiveness provides information about value
- Financing is a separate and independent issue

Source of Benefits

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- Testing → Awareness →Antiviral Tx → SVR → No HCV Complications

- No Testing → No Awareness → No Antiviral Tx → HCV Complications → High costs and death

- Testing costs money, and the benefits of testing are hard to achieve

Cost-Effectiveness Studies: CDC

- Rein, et al (2012)[1]
  - What is the cost effectiveness of a one time HCV antibody test of all individuals born during 1945 to 1965 compared to risk-based testing?
  - Assuming pegylated interferon and ribavirin (PR) treatment only for risk-based and birth cohort
  - Assuming direct acting antiviral (DAA) treatment (such as Telaprevir or Boceprevir added to PegIFN + Ribavirin) for birth cohort testing only
- Assumed intervention increased testing from 18.5% to 91% of the birth cohort
- Assumed 44% initiated treatment

Cost-Effectiveness Studies: CDC

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Δ Variable	PegIFN + Riba	PegIFN + Riba + PI
Discounted QALYs	348,800	532,200
Costs	$5.5 billion	$19.0 billion
Deaths Averted	82,000	121,200
ICER	$15,700	$35,700

Cost-Effectiveness Studies: Others

- At least 5 other studies of the cost-effectiveness of HCV testing (4/5 roughly comparable)
  - McGarry, et al (2012)
  - Coffin, et al (2012)
  - McEwan, et al (2013)
  - Eckman, et al (2013)
    - Evaluated population testing not BC testing
  - Liu, et al (2013)

Cost-Effectiveness Studies: Differences

- Size of target population
- Percentage tested by risk-based testing
- Percentage tested by birth-cohort testing
- Staging/timing of intervention
- Percentage diagnosed that initiate treatment
- SVR in base case and intervention
- Cost of clinical management of untreated but diagnosed HCV
- Cost of antiviral treatment
- Prevalence (Eckman only)

Comparison of Aggregate Results

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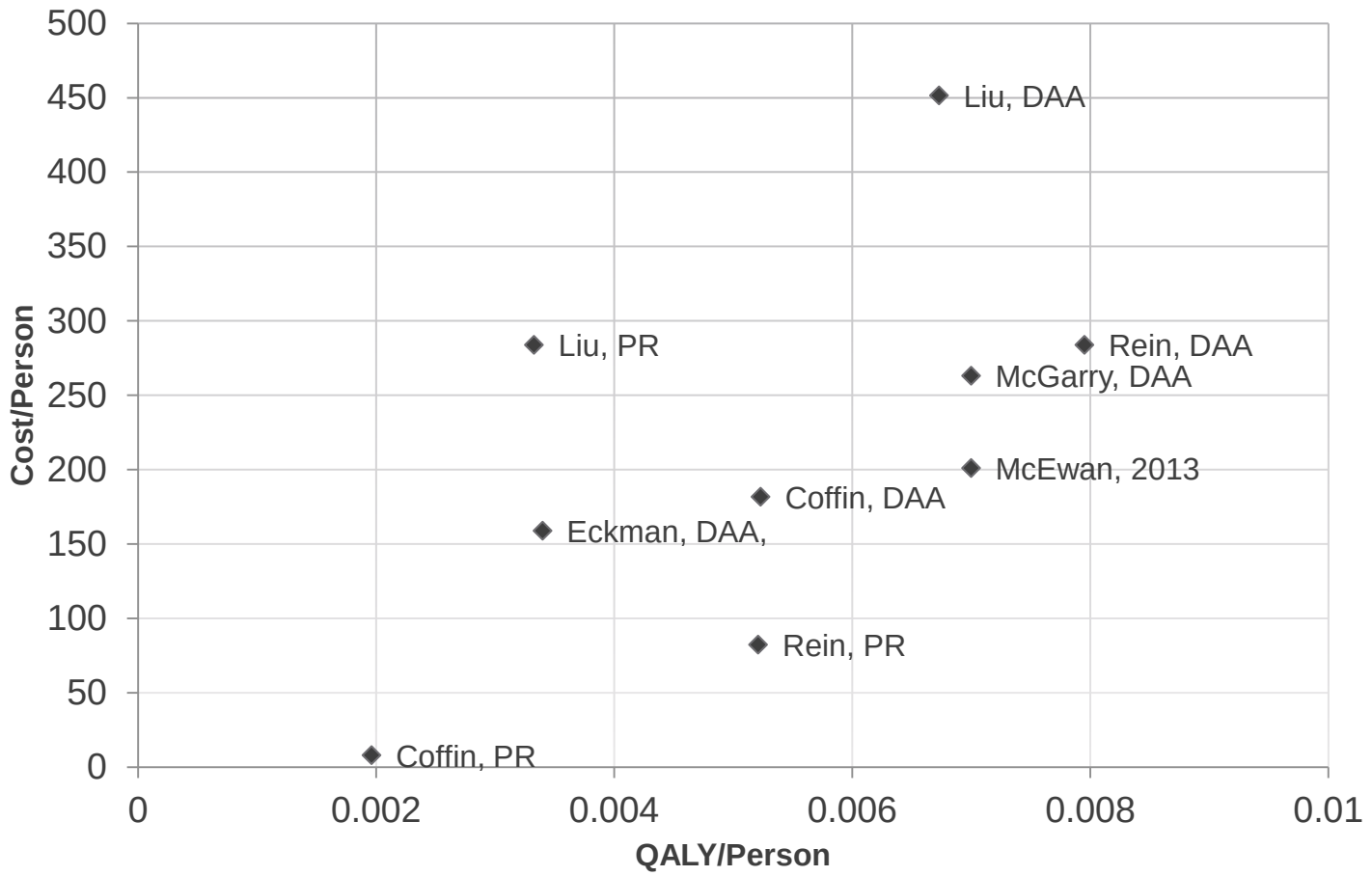
Study	Treatment	QALYs	Costs ($b)	ICER
Rein, et al (2012)	PR	348,800	5.5	$15,700
Rein, et al (2012)	DAA	532,200	19.0	$35,700
McGarry, et al (2012)	DAA	710,845	26.7	$37,720
Coffin, et al (2012)	PR	213,883	0.9	$4,438
Coffin, et al (2012)	DAA	570,222	19.8	$34,794
Liu, et al (2013)	PR	277,782	23.7	$85,319
Liu, et al (2013)	DAA	562,023	37.7	$68,980
McEwan, et al (2013)	DAA	466,034	13.3	$28,602
Eckman, et al (2013)	DAA	856,986	40.0	$47,276

Comparison of Per Person Results



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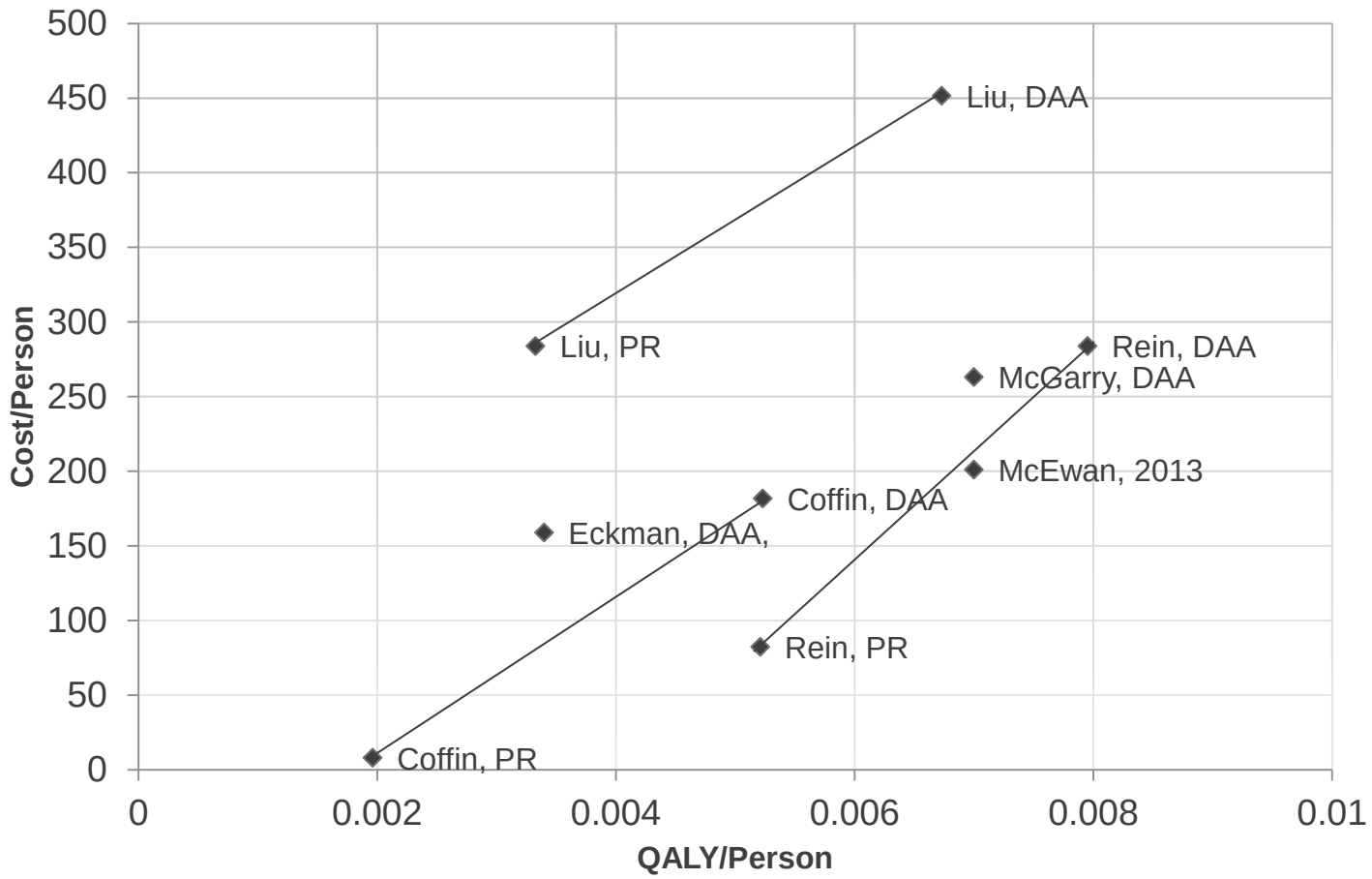

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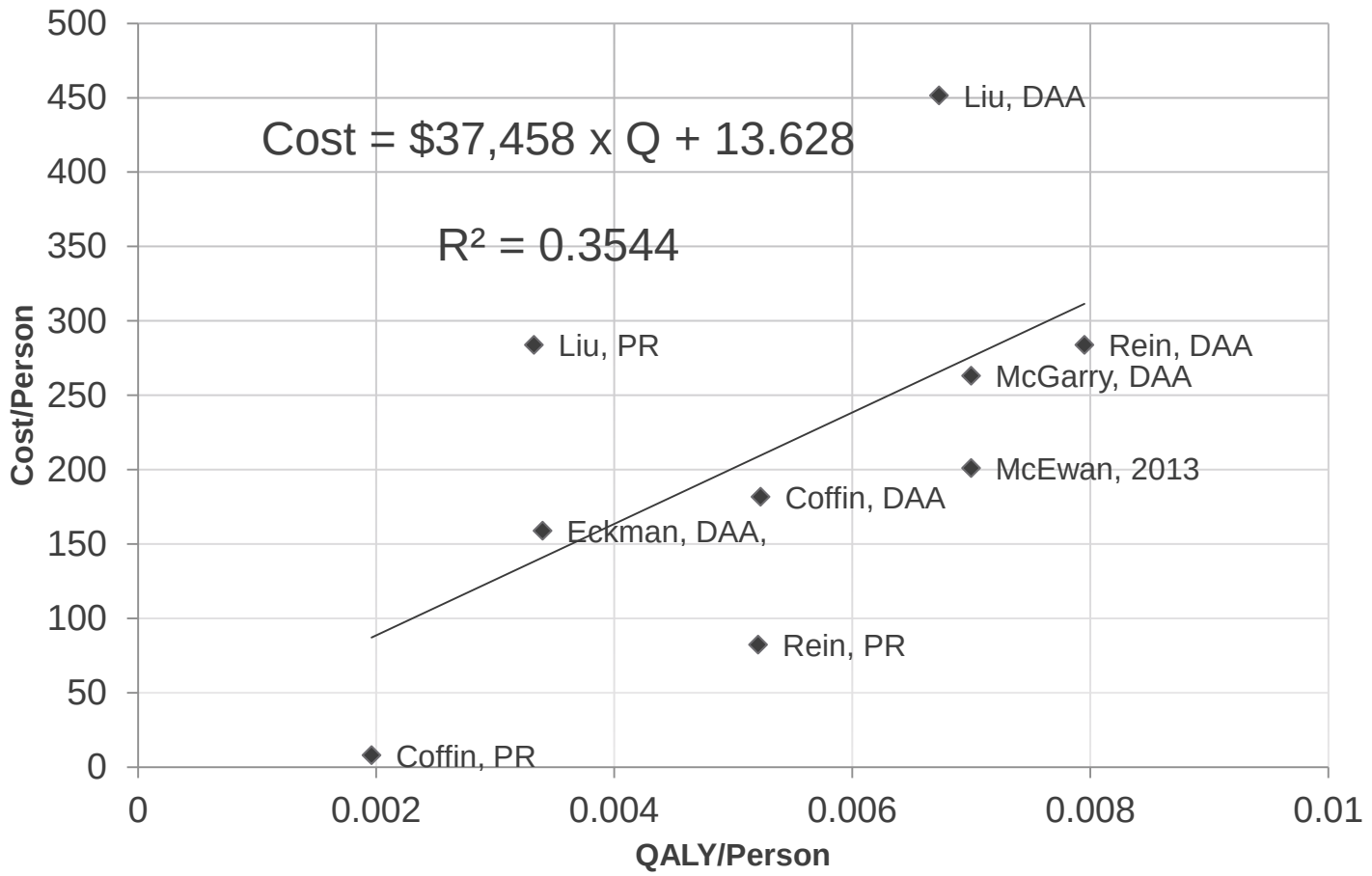


Study Consensus

- Birth Cohort test and treat strategies are cost effective
- First Derivative of the line that describes the points
- Cost = $37,458 x QALY + $13.6
  - ΔC/ΔQ = $37,458
- Mean = $39,834

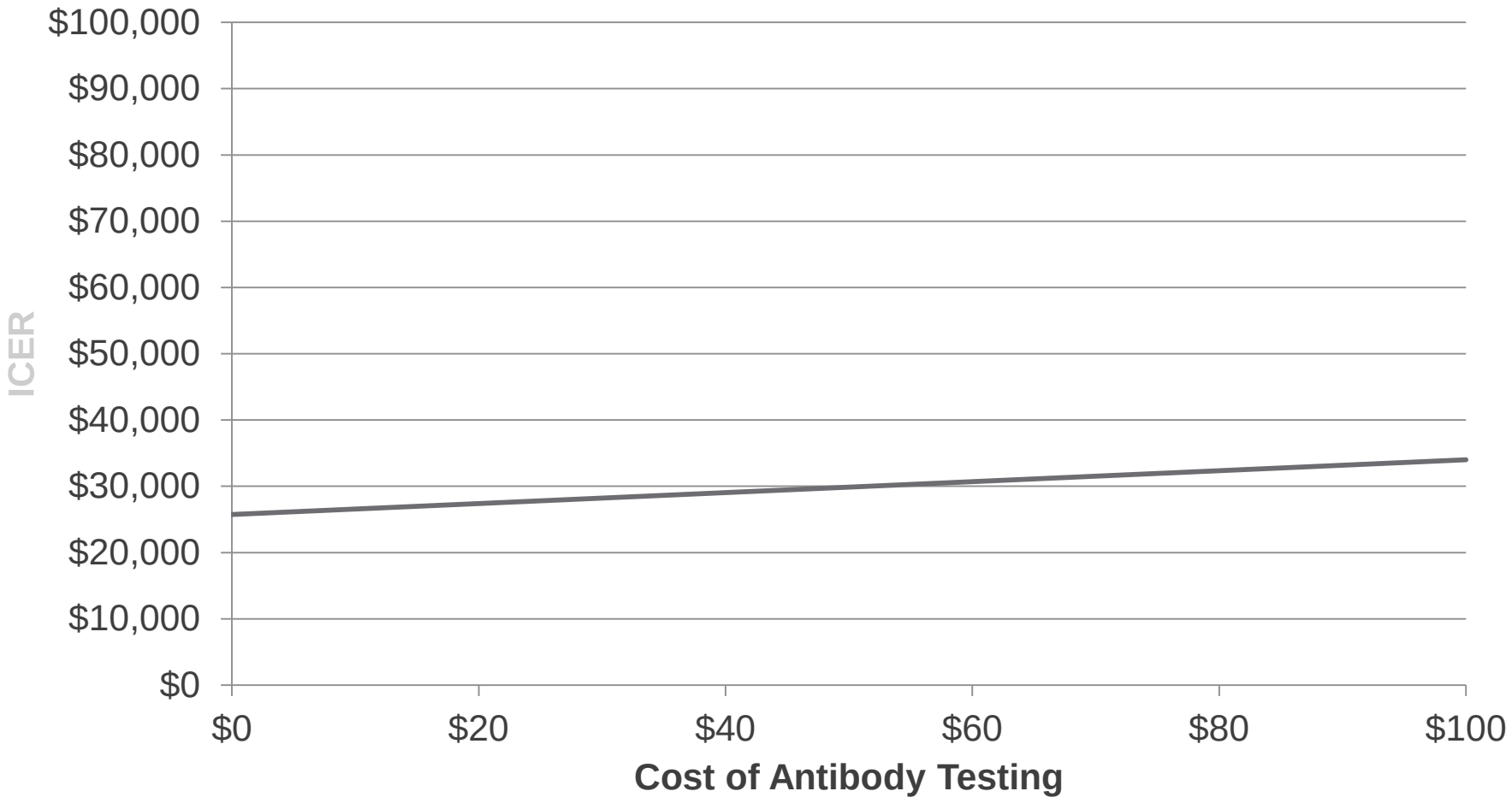
Specific Factors that Alter that Conclusion

- What if testing costs more?
- What if treatment costs increase/decrease?
- What if effectiveness of treatment increases?
- What if treatment uptake is limited?
- What if HCV results in a lower percentage of ESLD?

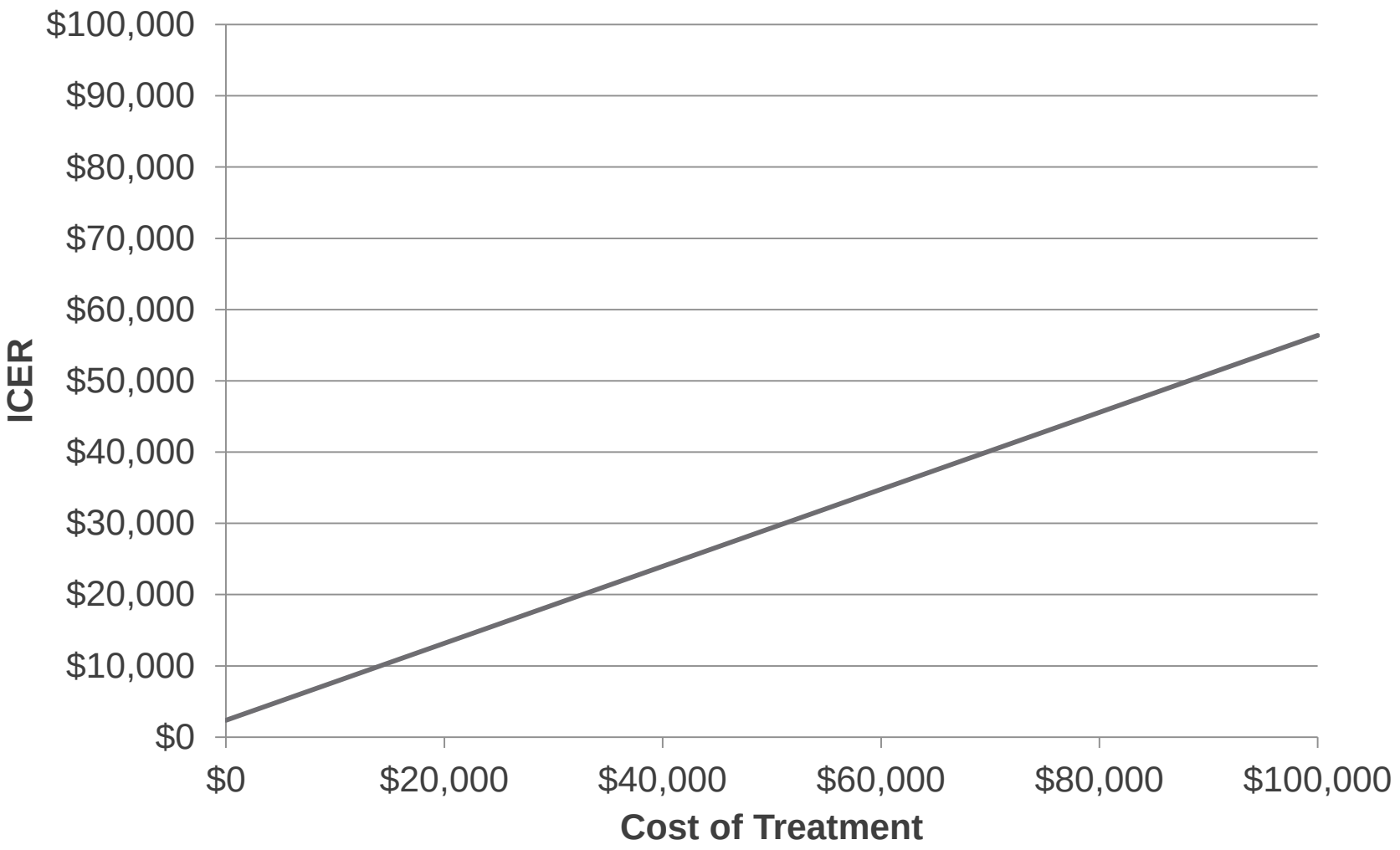
Rein, et al Model Modifications

- Altered comparator
- Leaving all other variables in the model constant, changed treatment in the comparator to match the intervention.
  - ICER $28,500 (compared to $35,700)
    - Difference in costs (numerator shrinks)
    - Incremental benefits of intervention decrease also (-48,000 deaths)
    - Nearly identical results to McEwan

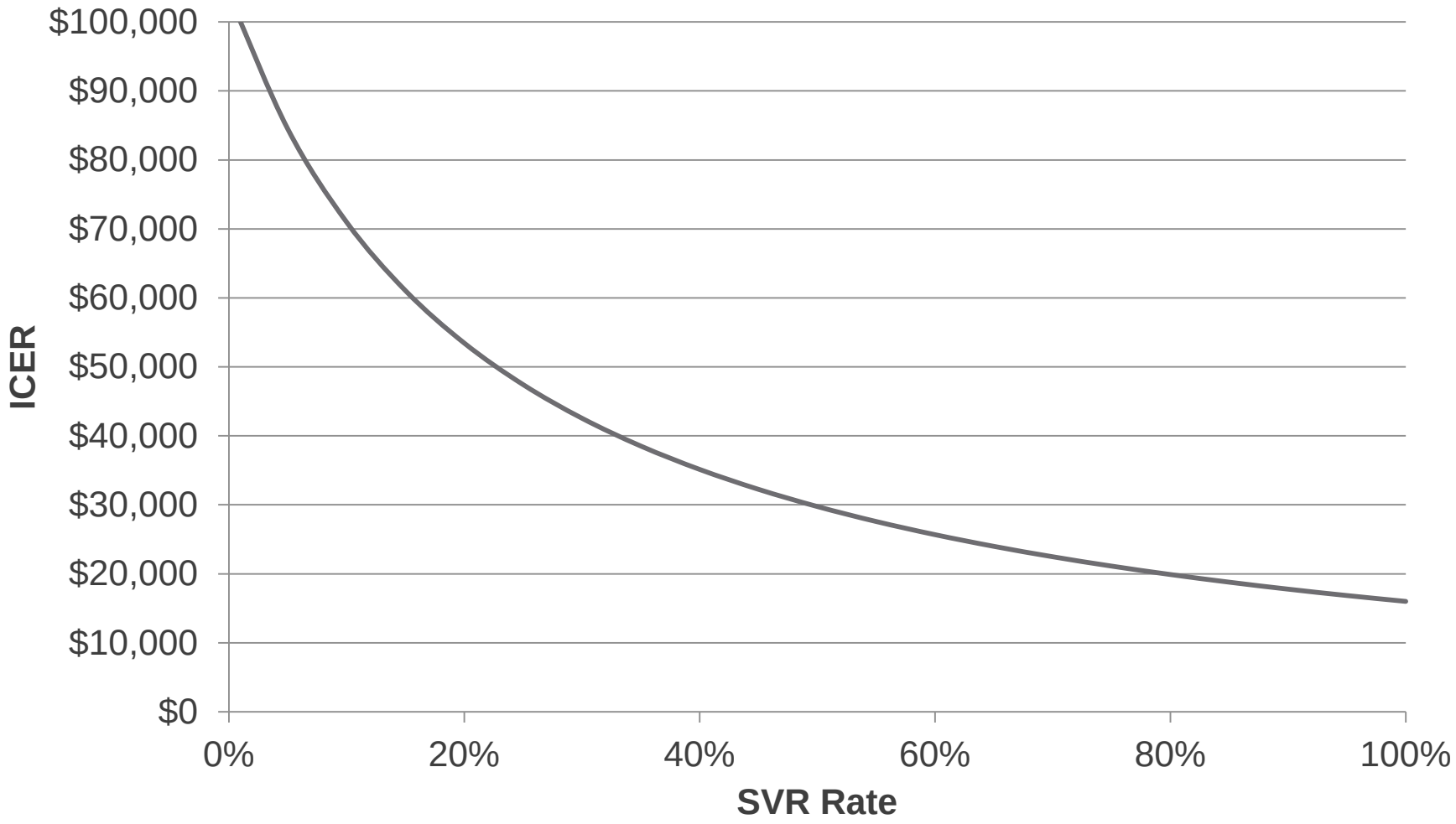
Testing Costs



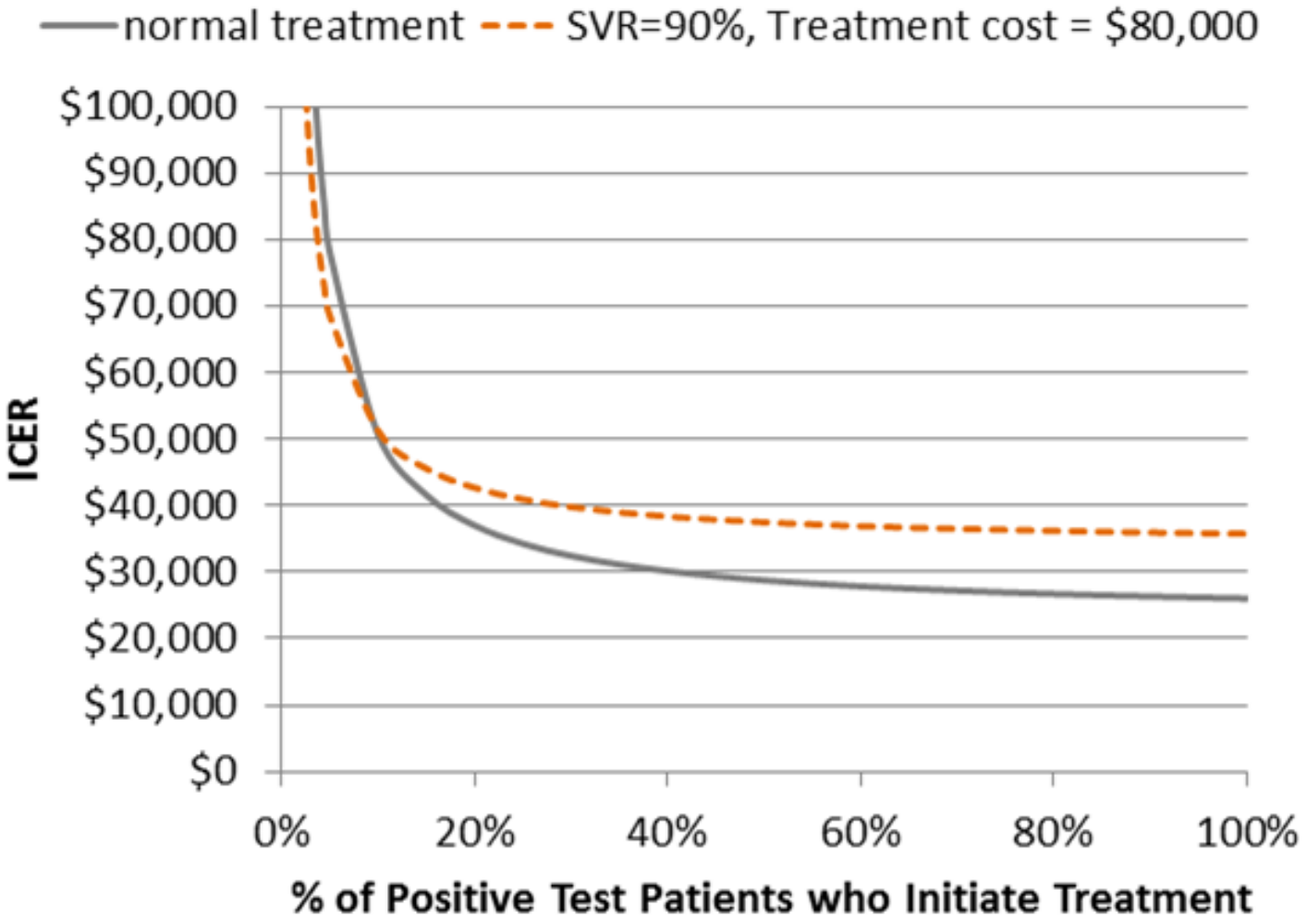
Treatment Costs



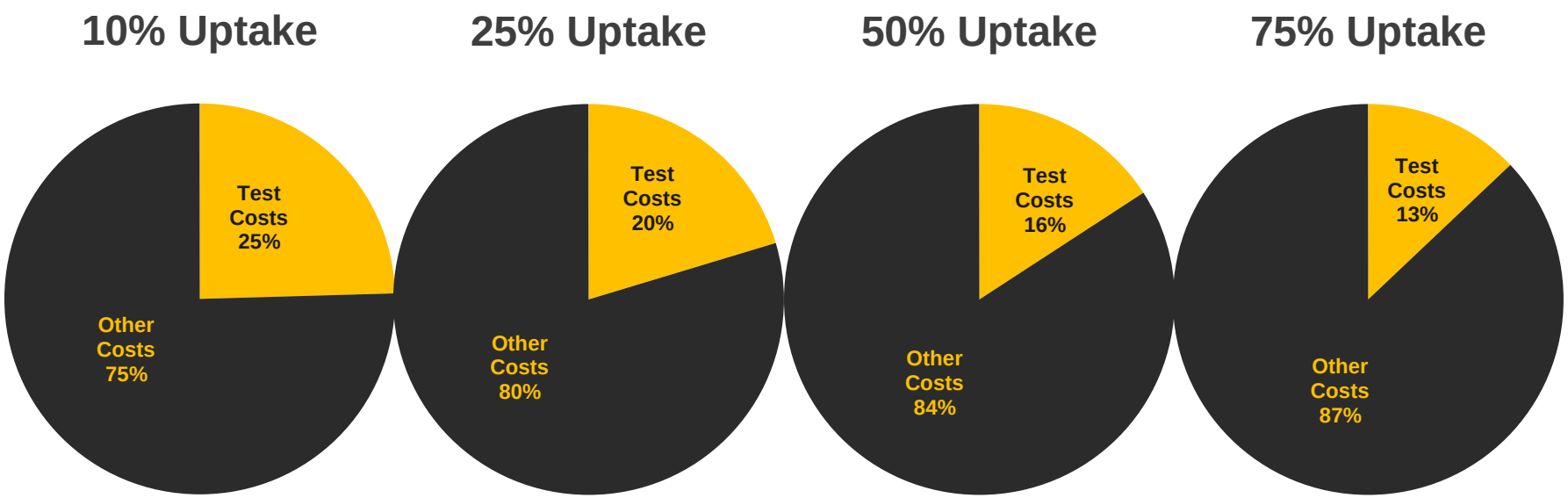
Treatment Effectiveness



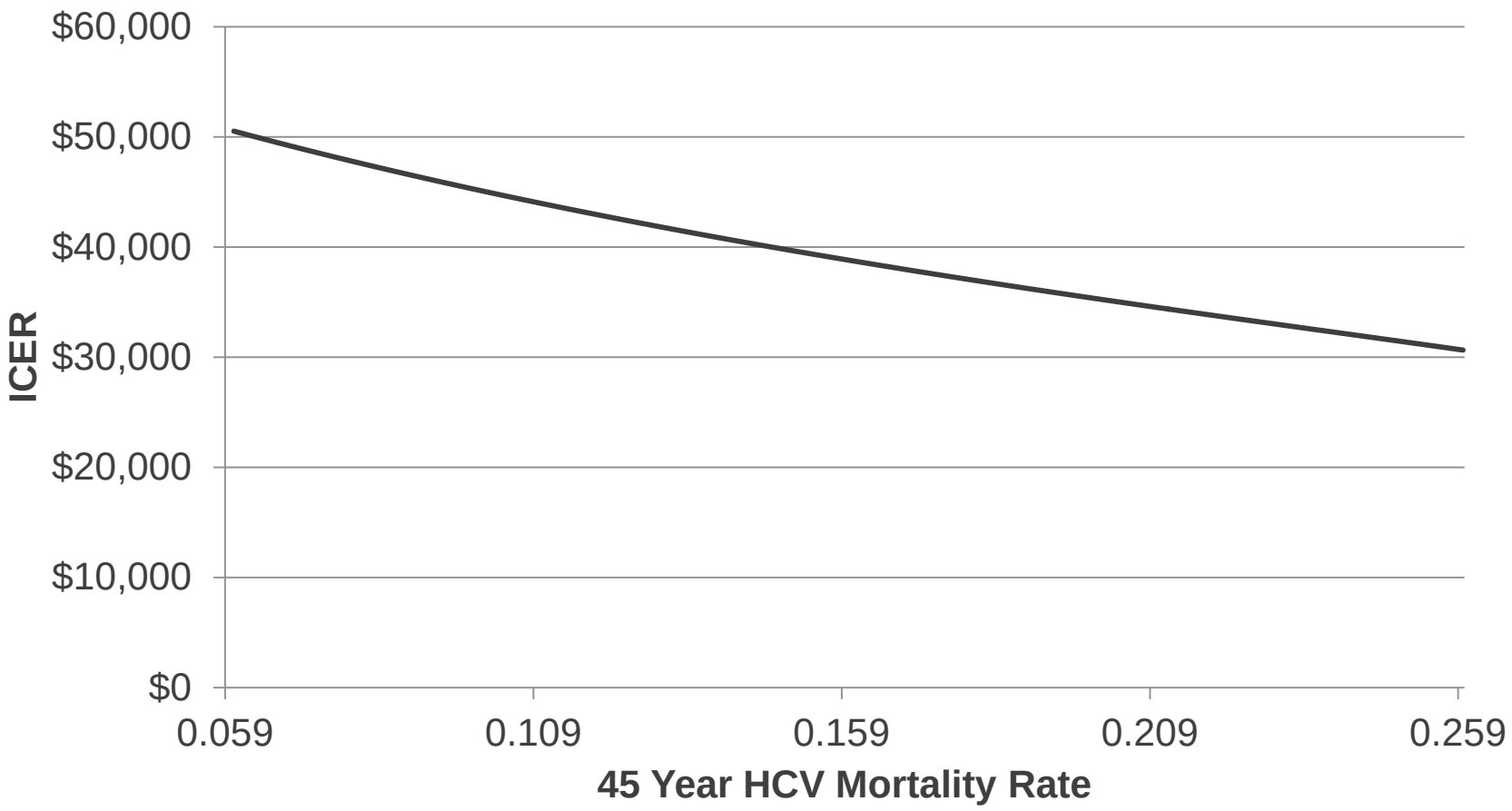
Treatment Uptake



Proportion of Intervention Costs from Testing Alone



45-year Death Rate



Remaining Questions

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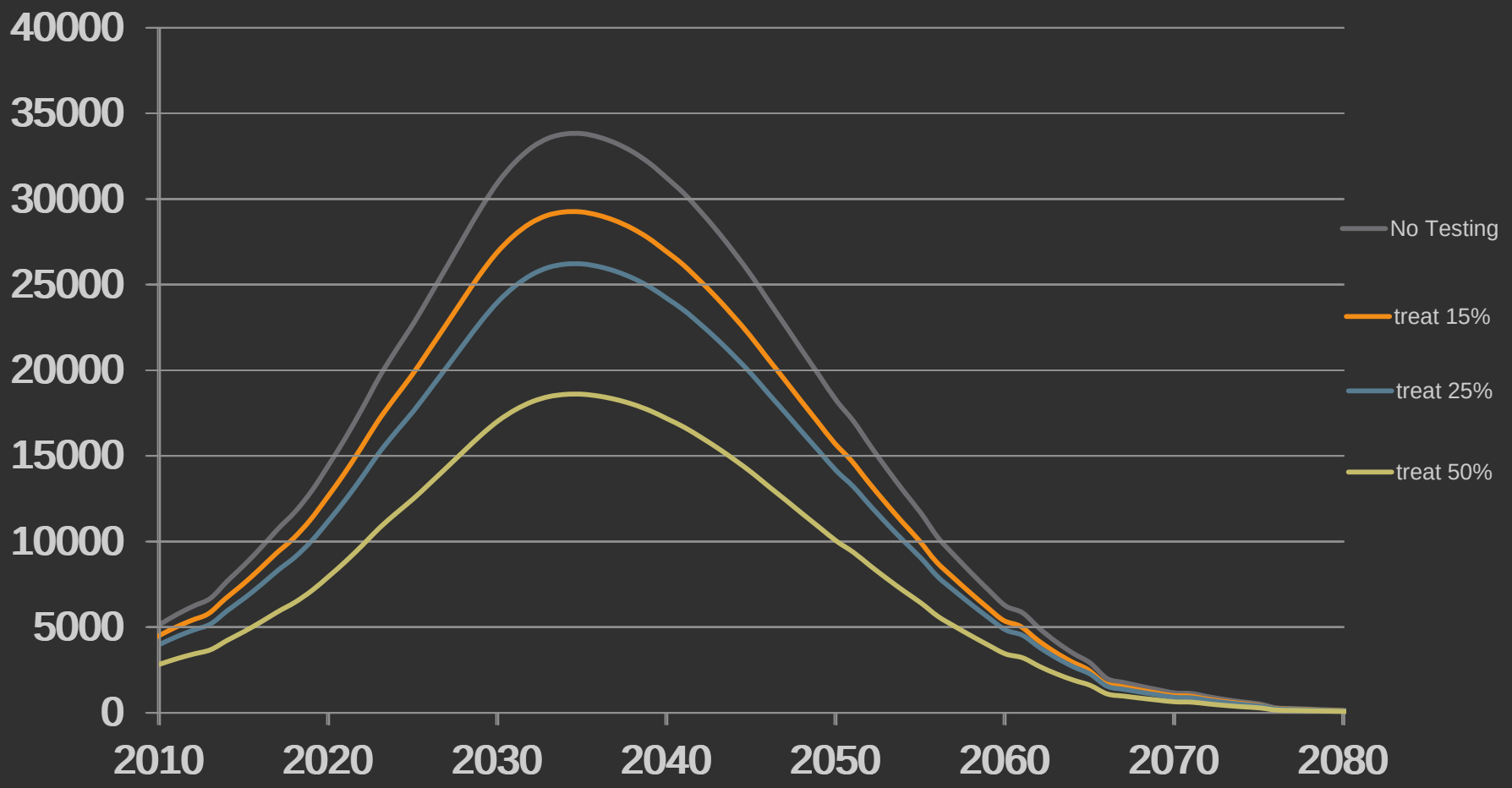
- Costs of untreated diagnoses?
- HCV and QALYs prior to ESLD?
- Testing implementation?
- Linkage to care?
- Additional benefits of treatment?
  - Treatment as prevention
  - Systemic effects of HCV
  - Life gained from averted transplants

Potential Impact



Key Findings

- Cost-effectiveness of birth-cohort testing is robust to a very wide range of variation in input parameters.
- Testing accounts for only a small percentage of the total intervention costs
  - Prevalence not large concerns
  - Treatment uptake potentially can be
- Birth-cohort testing is different than most testing policies
  - One time, inexpensive test
- Increasing treatment linearly increases benefits

Acknowledgements

- NORC: John Wittenborn, Operations Researcher
- CDC: Bryce Smith, John Ward, many others

- Funding disclosure: The work that contributed to this presentation was supported by the CDC Division of Viral Hepatitis and the CDC Foundation.

References (Temporal Order)

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Thank You!

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insight for informed decisions™

What do we not know?

- Implementation
  - Outreach
  - Electronic health record prompts, standing orders
- Prevalence detected
  - Does birth-cohort testing reach the right people?
- Health system capacity
- Treatment uptake
  - Health system utilization and linkages to care
- Incidence

BEST-C Testing Study

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- 3 clinical sites
  - New York City
  - Michigan
  - Birmingham Alabama
- Fully experimental designs to determine
  - Yield of birth cohort testing implementations
  - Cost of implementation
  - Linkage to care and treatment initiation
  - SVR

Treatment Business Case

- Do provider incentives exist to treat patients with hepatitis C?
- Two clinical implementation sites
- Direct observations of the resource and labor force requirements of hepatitis C treatment
- Comparisons to insurance reimbursements

Formative Research of Young Injecting Drug Users

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- Why do some drug users become infected by HCV while others do not?
- Computer assisted survey combined with HCV rapid test.
  - 5 hypotheses to explain risk of infection
- Two community areas
  - Suburban Milwaukee (Waukesha)
  - Suburban Chicago (Naperville)
- Respondent driven sampling
  - Representative of both occasional and heavy drug users

New Cost Effectiveness Results

- Updated with clinical evidence
  - Testing effectiveness
  - Linkage to treatment/actual utilization
  - SVR
  - Observed costs
- Medicare data analysis
  - Unit costs of HCV treatment and ESLD treatment
  - Estimates of morbidity from HCV in Medicare
  - Budgetary impact of birth cohort testing on Medicare