

ICD THERAPY FOR SUDDEN CARDIAC ARREST PREVENTION IS POTENTIALLY COST-EFFECTIVE IN THE 1.5 PRIMARY PREVENTION POPULATION IN COLOMBIA AN ECONOMIC EVALUATION OF THE IMPROVE SCA STUDY

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ICD THERAPY

A PRIMER

Sudden Cardiac Arrest (SCA): electrical problem of the heart that triggers ventricular fibrillation, preventing the heart to pump blood to the body. Requires immediate treatment.

Defibrillation is the most effective way to treat SCA.¹

- Defibrillation: electrical shock to the heart.
- Fast response is key for survival.

Two primary forms of defibrillation

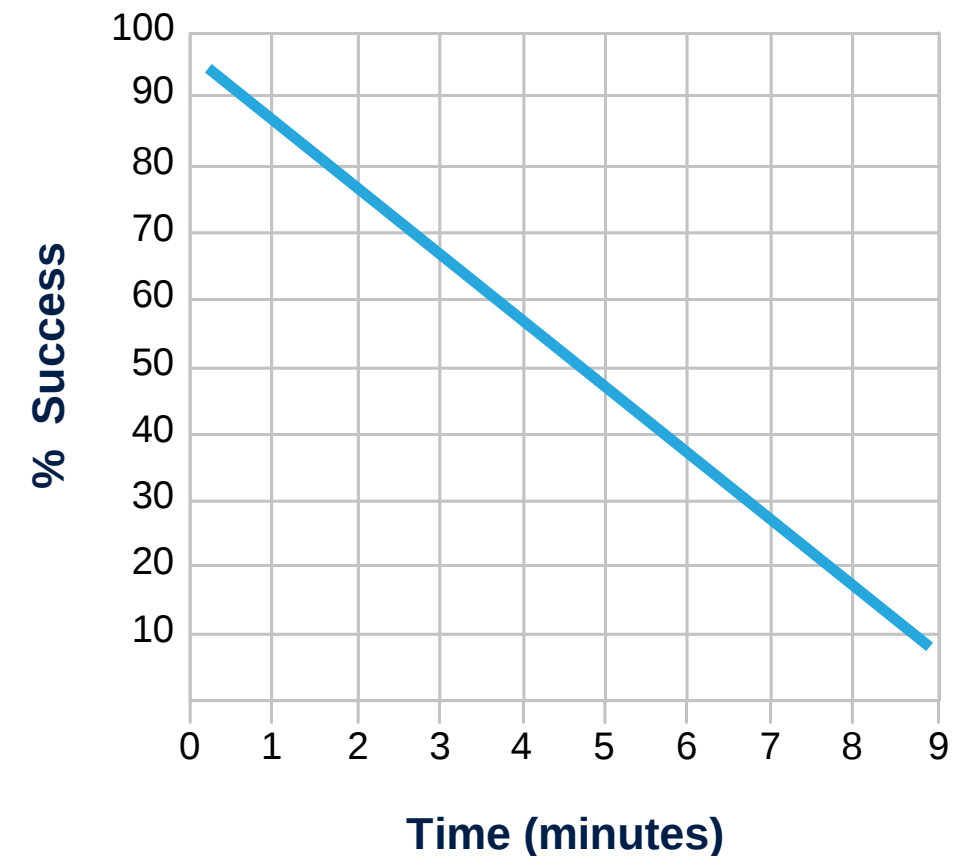
- Automatic external defibrillator (AED): as seen on TV!
- Implantable Cardioverter-Defibrillator (ICD): a cardiovascular implantable electronic device. 98% of people survive a lethal arrhythmia when treated with defibrillation.³

¹ Zipes DP, et al. *Circulation*. 1995;92:59-65.

² Boineau R. NHLBI-related Activities on the Treatment of Cardiac Arrest: Current Status and Future Directions. Institute of Medicine of the National Academies. March 12, 2014. Available at: <https://tinyurl.com/yylbwkgc>. Accessed April 26, 2019.

³ Glikson M, et al. *Lancet*. 2001;357:1107-1117.

SCA Resuscitation Success vs. Time



Resuscitation from SCA is reduced ~10% each minute²

POPULATIONS AT RISK FOR SCA

IMPROVE SCA STUDY

Who benefits from ICD therapy?

Two historic forms of SCA prevention:

- **Secondary prevention:** survivors of prior SCA or other sustained ventricular tachycardia/fibrillation (VT/VF).
- **Primary prevention:** patients at risk for, but not yet had, episodes of sustained VT/VF or resuscitated SCA.
- Multiple randomized studies and structured meta-analyses have found that ICD therapy saves lives in both primary and secondary prevention populations (AVID, CASH, MADIT, MADIT-II, SCD-HeFT, etc.).

Improve SCA study

- Largest prospective study of patients at risk of SCA in emerging countries.
- **49%** adjusted relative risk reduction in mortality was observed in 1.5 primary prevention patients who received an ICD.¹

1.5 Primary Prevention

Primary prevention patients with one or more of the following criteria:



Non-sustained
ventricular
tachycardia



Frequent
premature
ventricular
contractions



Left
ventricular
ejection
fraction
< 25%



Pre-syncope or
syncope

¹ Zhang, S. Evaluating the Benefit of Primary Prevention ICD Therapy in Asia, South America, Eastern Europe, and Africa. Presented at APHRS, October 2018. THU-LBO-06.

OBJECTIVE

To evaluate the cost-effectiveness of ICD therapy compared to no ICD therapy among 1.5 primary prevention patients in Colombia.

- Global effectiveness inputs from Improve SCA study.
- Local costs and baseline mortality rates.
- Colombian health care system (payer) perspective.

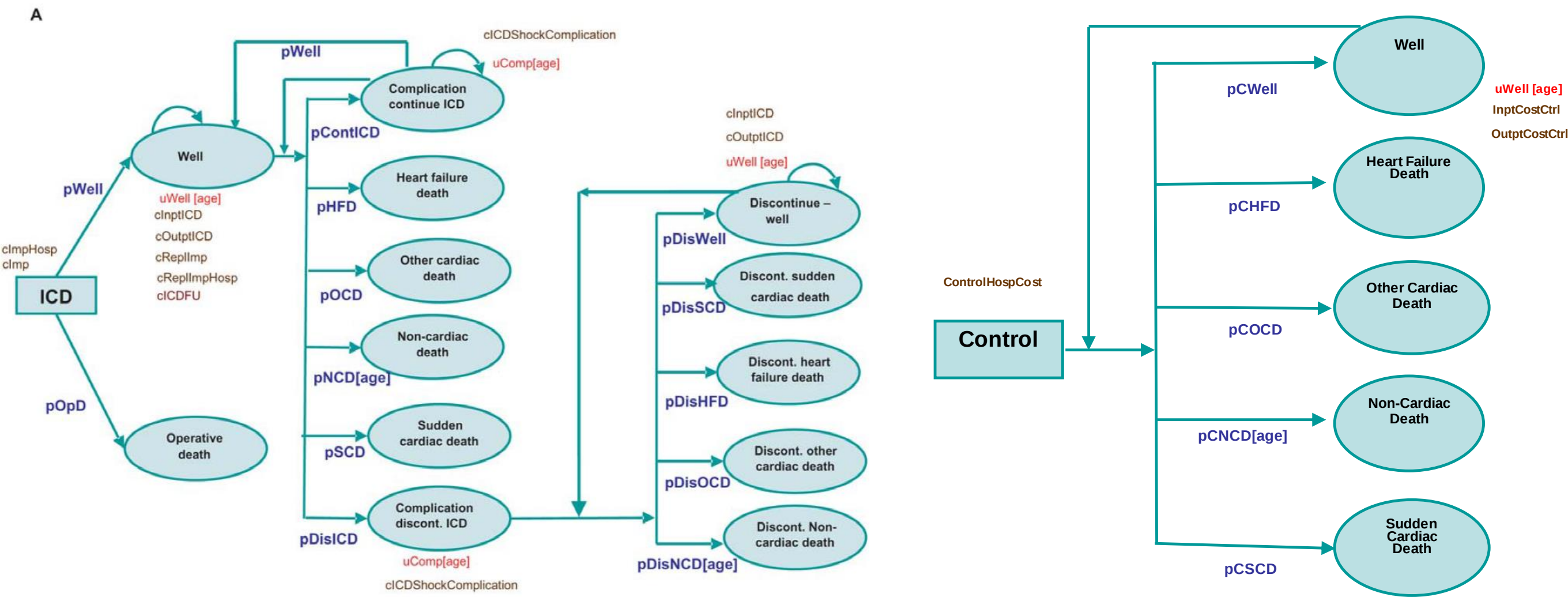
METHODS

- Markov model of costs, quality of life, and survival of ICD therapy, compared to no ICD therapy
 - Calculate differential lifetime costs, life-years saved, and QALYs saved.
- Local payer perspective, following local guidelines for cost-effectiveness analysis.
- Determination of cost-effectiveness (per local guidelines)
 - ICER less than 1x GDP per capita: **cost-effective**.
 - ICER between 1x and 3x GDP per capita: **potentially cost-effective**.
 - ICER more than 3x GDP per capita: **not cost-effective**.
- Conduct sensitivity analyses:
 - One-way (deterministic).
 - Probabilistic.

MARKOV MODEL STRUCTURE

ICD therapy

No ICD therapy



Cowie et al. (2009) "Lifetime cost-effectiveness of prophylactic implantation of a cardioverter defibrillator in patients with reduced left ventricular systolic function: results of Markov modelling in a European population" *Europace* 11(6).

INPUTS

■ Local

- ICD device costs.
- ICD implant/replacement/removal costs.
- ICD complication costs.
- ICD follow-up costs.
- Long-term inpatient and outpatient costs.
- Life tables (general mortality rates by age and gender).
- Discount rates.

■ Global

- ICD effectiveness (Improve SCA study).
- ICD complication rates.
- ICD Inappropriate Shock Rates.
- Device Longevity.
- Quality of life for ICD, non-ICD patients (Latin America-specific).

Key costs	Value (Million COP\$)
ICD device cost	20.58
ICD procedure cost	2.16
ICD removal cost	1.47
Lead replacement	4.52
Inappropriate shock	2.49
Infection (initial)	25.90

Key inputs	Value
Age at implant	60.2
Male	77.6%
Discount rates	5%
Timeframe	420 months

RESULTS

BASE CASE SCENARIO

	Discounted (5%)		Undiscounted	
	ICD therapy	No ICD therapy	ICD therapy	No ICD therapy
Costs (Million COP\$)	132.9	79.0	170.8	100.0
Cost difference (Million COP\$)	53.9		70.7	
Life-years saved	7.36	5.97	9.72	7.56
Life-years difference	1.38		2.16	
QALY saved	6.20	5.04	8.19	6.38
QALY difference	1.15		1.80	
ICER (COP\$ per QALY saved)	46,729,029		39,200,166	

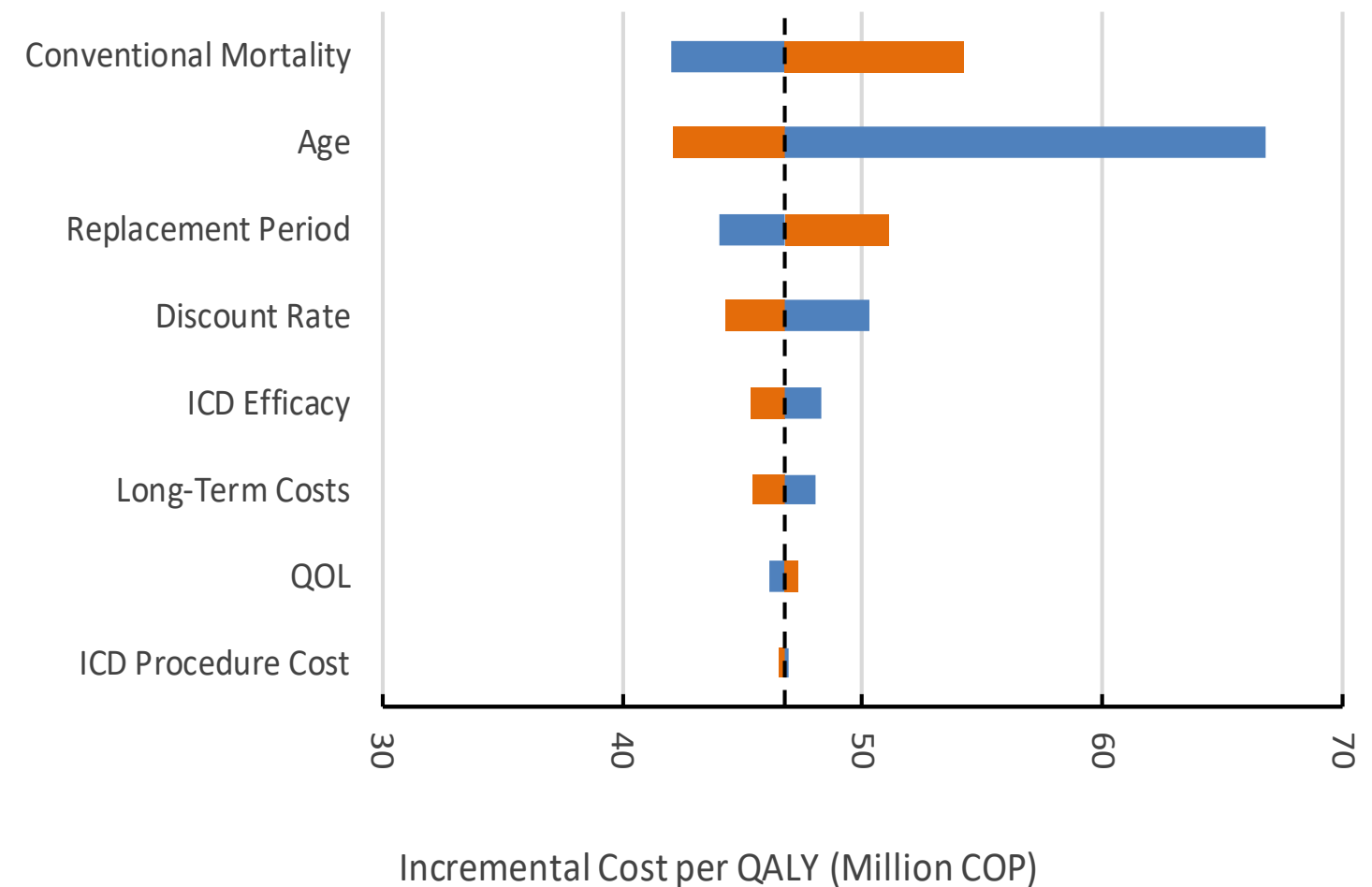
ICD therapy is *potentially* cost-effective, at WTP threshold of COP\$ 58,903,902 (3xGDP per capita).

RESULTS

ONE-WAY SENSITIVITY ANALYSIS

Results of estimating the Markov model with plausible high and low values of some model inputs.

- Cost-effectiveness of ICD therapy is more responsive to conventional mortality, age at implant.
- Results are not responsive to changes in local costs.
- Only high value for age at implant makes ICD therapy not cost-effective.



RESULTS

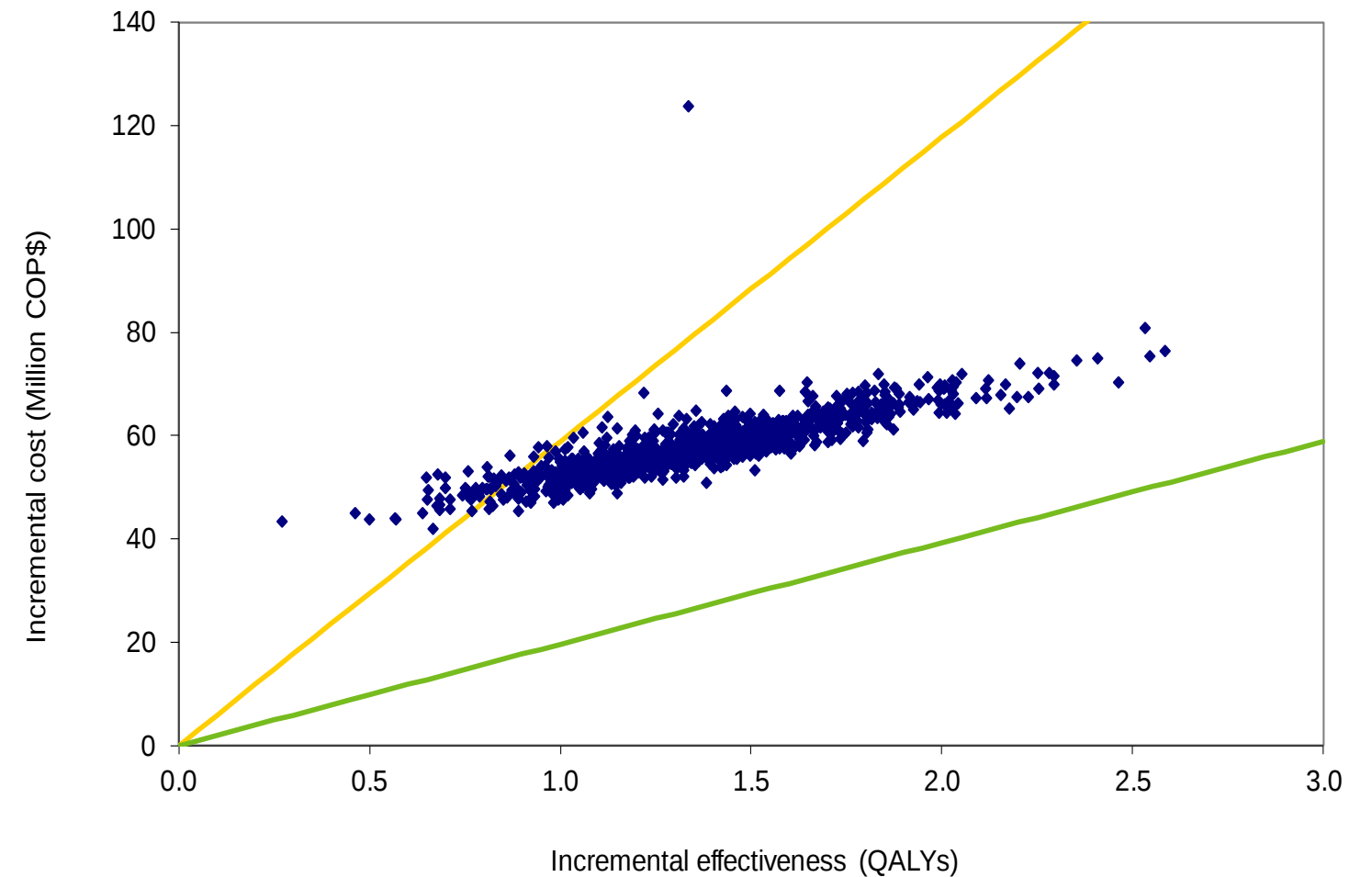
PROBABILISTIC SENSITIVITY ANALYSIS

Randomly draw values of some inputs, and run iterations of the Markov model.

Mean ICER: COP\$ 42,513,954.

[32,708,833 – 64,304,419] 95% Credible Interval.

- 94.7 percent of simulations result in ICERs less than 3x GDP per capita.
- No simulation resulted in ICERs less than 1x GDP per capita.



DISCUSSION

Compared to no ICD therapy, ICD therapy is potentially cost effective in the 1.5 primary prevention population in Colombia.

- In general, sensitivity analyses confirm base case results.
- Importance of local inputs, guidelines
 - Potentially cost-effective: Colombian guidelines are stricter than WHO guidelines.
 - Results from similar geographies (Brazil, Mexico) show different levels of cost-effectiveness.
- Results are not intended to limit ICD therapy to 1.5 primary prevention patients, instead to be used to focus resources on patients who may benefit the most from it.

THANK YOU

Q&A

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