

Cost effectiveness of implantable cardioverter defibrillator therapy (ICD) versus drug therapy in 1.5 primary prevention of sudden cardiac arrest in China: an analysis using the Improve SCA study

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Objectives

- The Improve SCA study has identified a cohort of patients called 1.5 primary prevention (1.5PP) based on PP population with the presence of certain risk factors, and the results showed a 49% relative risk reduction in all-cause mortality among those ICD implanted 1.5PP patients.
- In this study, we assessed the cost-effectiveness of ICD therapy compared to drug therapy among 1.5PP patients from the Chinese payer perspective.

Methods

Model construction

- A decision tree together with a Markov model was constructed to simulate different choice of treatment and potential health states of patients after treatment with ICD therapy and drug therapy, respectively. (Figure 1).
- The model consists of two branches at the decision node, representing the choice between two treatment strategies for 1.5PP of sudden cardiac arrest (SCA): implantable cardioverter defibrillator combined with drug therapy and drug therapy alone.
- Both treatment strategy branches contain a Markov node, including following health states: sudden cardiac death, non-sudden cardiac death, non-cardiac death, unknown death and living with primary disease. The treatment strategy of ICD combined with drug therapy additionally includes operative death, ICD-related complications—continue ICD, and ICD-related complications—discontinue ICD.

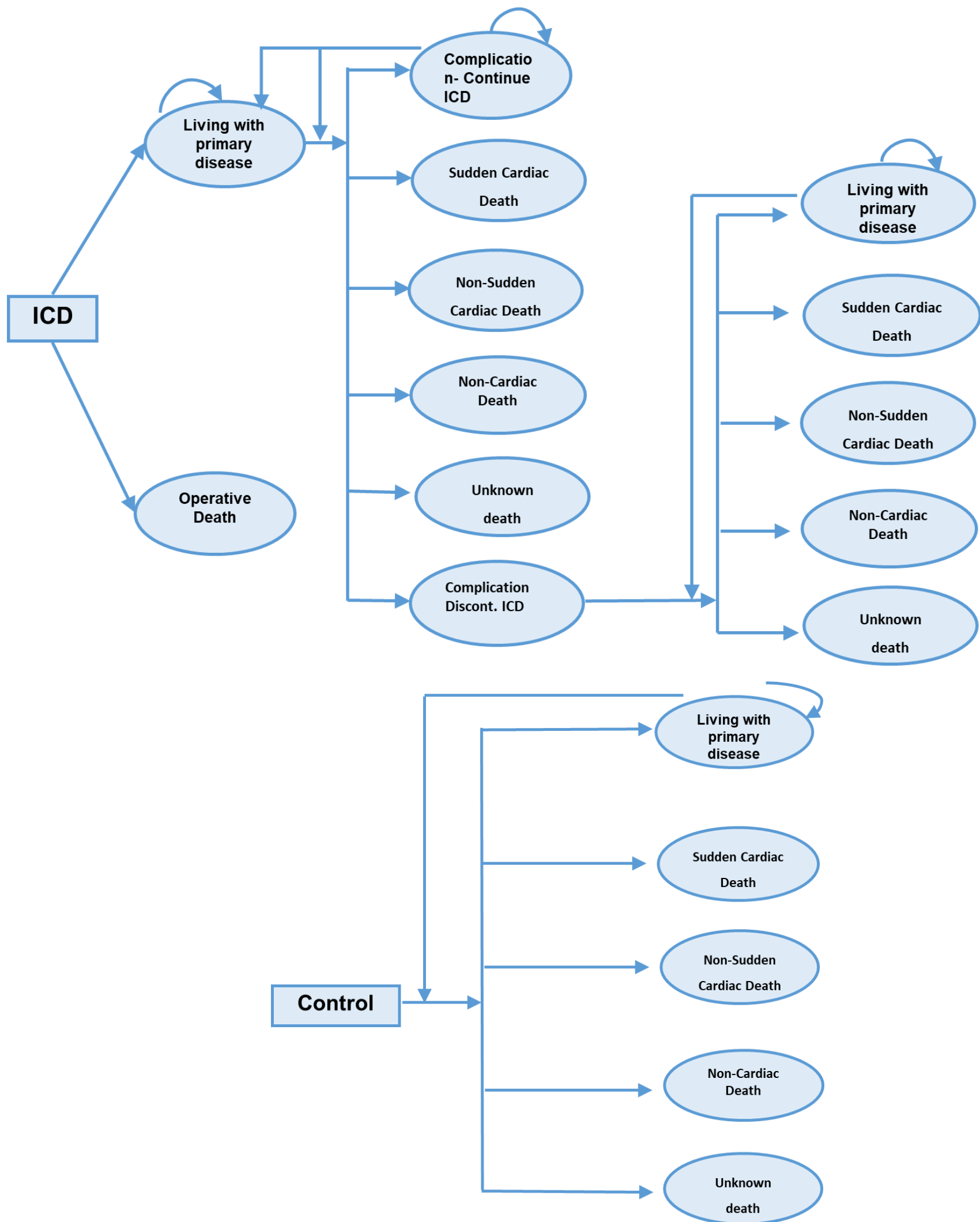


Fig 1. Markov model

Transition probability

- The transition probabilities among different health states and the treatment related complication rates were derived from literatures(Table 1).

Table1. Transition probability inputs

Indicator Description	Initial Value	Standard Error	Source
ICD Group			
Operative Death Rate	0.0002	0.00002	1
ICD-Related Complications - Continue ICD	0.0034	0.0002	1
ICD-Related Complications - discontinue ICD	0.0001	0.00007	1
Sudden Cardiac Death	0.0007	0.0003	2
Unknown death	0.0013	0.0003	2
Non-sudden Cardiac Death	0.0014	0.0004	2
Non-Cardiac Death	0.0005	0.0003	2
Complications			
Infection	0.02440	0.00488	1
Lead dislodgement	0.01800	0.01260	1
Drug Therapy Group			
Sudden Cardiac Death	0.0028	0.0005	2
Unknown death	0.0014	0.0004	2
Non-sudden cardiac Death	0.0021	0.0004	2
Non-Cardiac Death	0.0010	0.0004	2

Utility data

- The utility of different states after treatment were obtained from the literature (Table 2).

Table2. Utility inputs

Indicator Description	Initial Value	Standard Error	Data Source
QALY Values for Each State:			
Annual utility of living with primary illness	0.8683	0.036	3
ICD Complication State	0.7685	0.036	3
Utility of Death State	0	0	Assumption

Cost data

- The study was conducted from the perspective of the China’s healthcare system. Only direct medical costs were assessed. The cost data were obtained from KOL surveys and tender price listed by government (Table 3).

Table3. Cost data inputs

Indicator Description	Initial Value (CNY)	Data Source
Total Inpatient Costs of Initial ICD Implantation	130,577	KOL surveys
Total Inpatient Costs of ICD Replacement	110,577	KOL surveys
ICD Complication Treatment Costs (Inappropriate Electric Shocks)	670	KOL surveys
ICD Follow-up Costs	133	KOL surveys
Costs of ICD Infection Treatment (total removal)	200,000	KOL surveys
Follow-up Inpatient Costs per Month (for both treatment strategies)	1917	KOL surveys
Follow-up Outpatient Costs per Month (for both treatment strategies)	644	Estimated from clinical guidelines and tender price listed by government

Results

Base case analysis

- In the base-case analysis, treatment with ICD was associated with total cost of \$68,313 and 7.92 QALYs, whereas treatment with drug therapy was associated with a total cost of \$31,258 and 6.09 QALYs.
- In comparison to the drug therapy group, the ICD therapy group was associated with better health outcomes (with a difference of 1.83 QALYs). The ICER was \$20,239/QALY.
- Therefore, ICD therapy is a cost-effective strategy compared to drug therapy for the 1.5PP patients. (Table 4)

Table 4 Base case results

Arm	Key results		ICER
	Total Costs (\$)	QALYs gained	
ICD group	68,313	7.92	--
Drug Therapy group	31,258	6.09	Comparator
Incremental	37,055	1.83	\$ 20,239/QALY

One-way sensitivity analyses

- One-way sensitivity analysis found the model to be robust on every assumption. The factors that most strongly influenced the model outcomes were age, followed by conventional mortality, and replacement period (Figure 2).

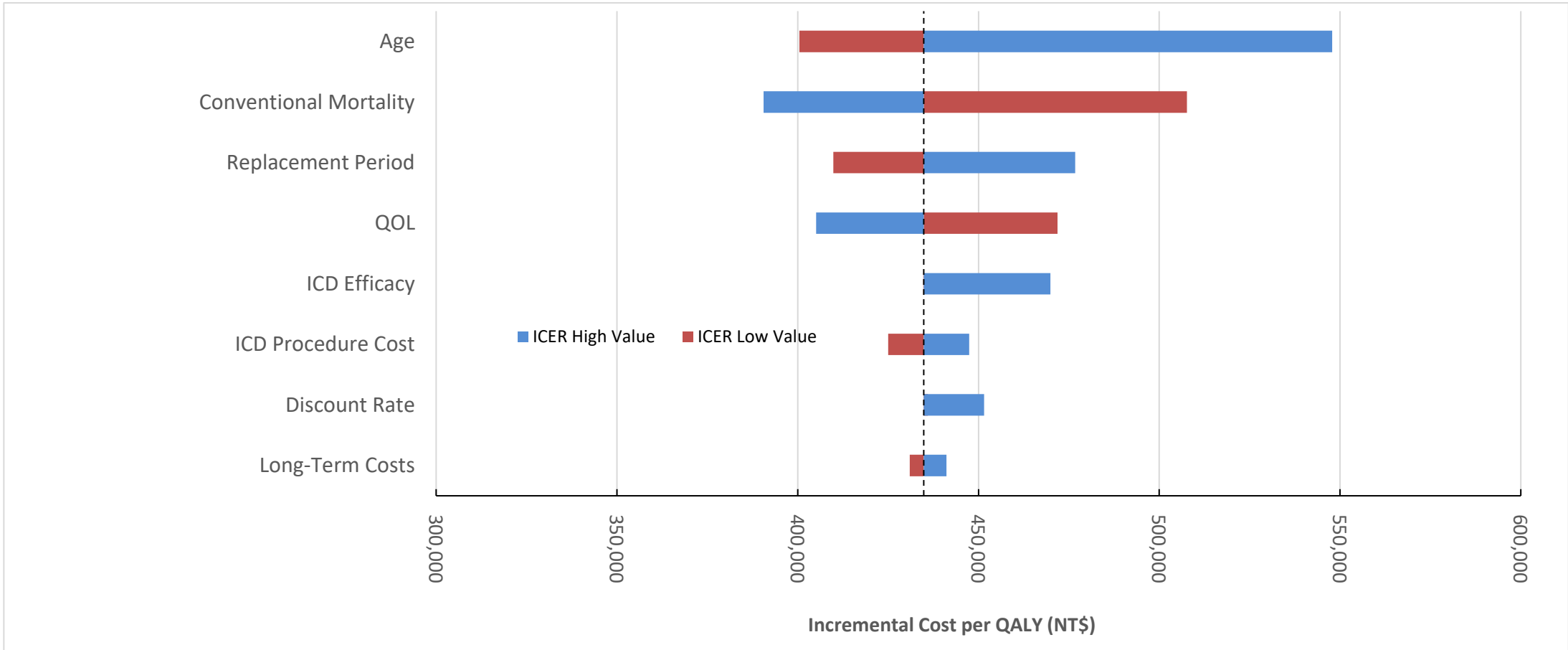


Fig 2: one-way sensitivity analysis

Probability sensitivity analysis

- When considering the threshold of three times GDP per capita in China, there is an 86.3% probability that ICD is cost-effective compared to drug therapy for 1.5 PP of SCA (Figure 3).

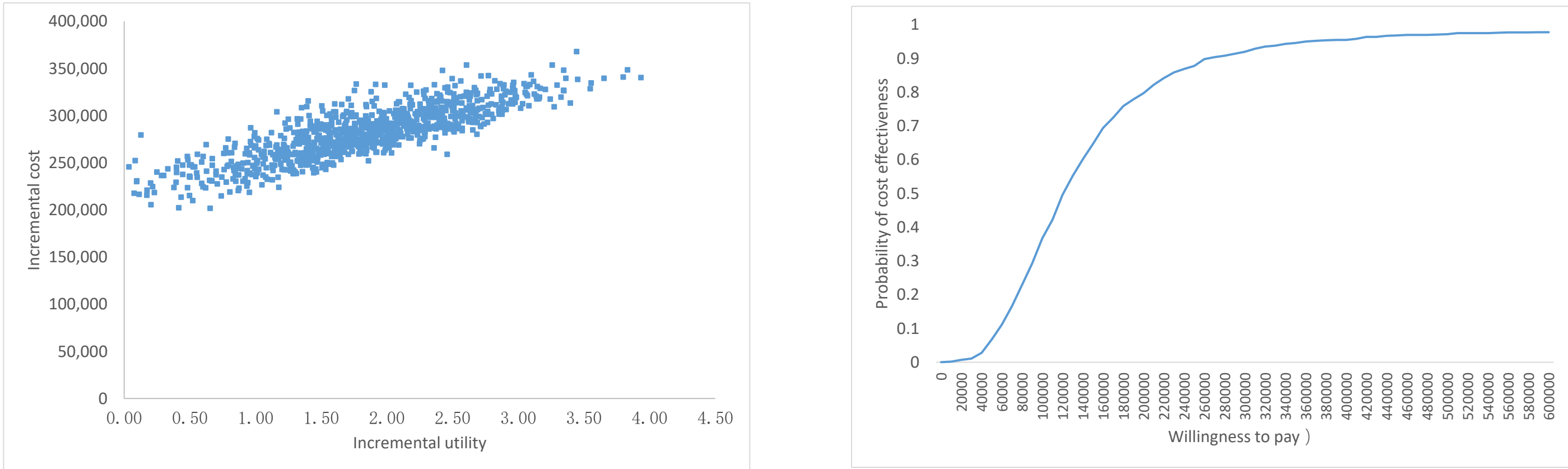


Figure 3. Probability sensitivity analysis

Conclusion

- Compared to drug therapy, ICD therapy is cost-effective in the 1.5PP population in China.
- Considering the prominent economic value of ICD, better reimbursement coverage from the perspective of China’s health system should be given to the therapy.

References

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