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Cost-effectiveness of pediatric bilateral cochlear implantation in Spain

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Acknowledgments – Disclaimer

Incremental cost-effectiveness ratio of bilateral CI

cost

Incremental cost
of the 2nd implant

two implants

one implant

Cost of the
1st implant

deaf

effectiveness

Utility of the
1st implant

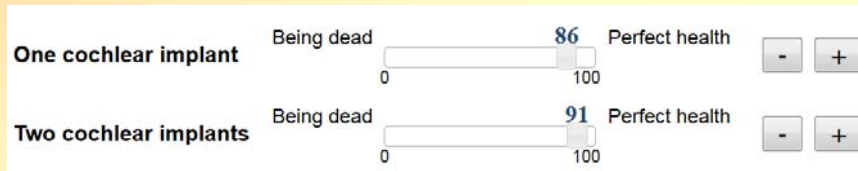Incremental utility
of the 2nd implant
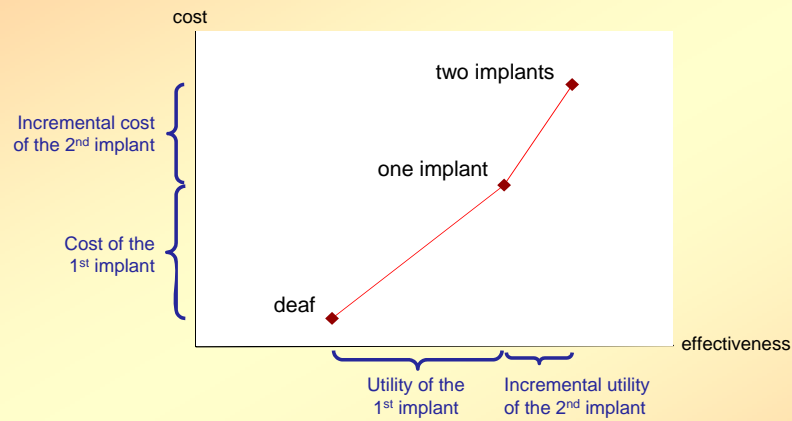
➢ Unilateral cochlear implantation (UCI) is clearly cost-effective.
➢ The cost-effectiveness of bilateral CI (BCI) is not that clear.

When is an intervention cost-effective?

◆ Incremental cost-effectiveness ratio (ICER)
   = Δ cost (in monetary units) / Δ effectiveness (in QALYs)

◆ QALY = quality-adjusted life year
   ➢ one year of life with perfect health,
   ➢ or two years with a quality of life of 0.5,
   ➢ or three years with a quality of life of 0.33, etc.

◆ Cost-effectiveness threshold (a.k.a. willingness to pay)
   ➢ USA: $ 50,000 - 100,000 / QALY
   ➢ UK: £ 20,000 - 30,000 / QALY
   ➢ Spain: € 30,000 - 35,000 / QALY

Our study for measuring the quality of life

◆ Visual analog scale (VAS)

	Being dead	86	Perfect health	-	+
One cochlear implant	0	100			
	Being dead	91	Perfect health	-	+
Two cochlear implants	0	100			

◆ Time trade-off (TTO)

I think that living for _____ years with **perfect audition** is equivalent to living for 20 years with **one CI**.

I think that living for _____ years with **two CIs** is equivalent to living for 20 years with **one CI**.

Come see our
poster at 4:30pm

Incremental QoL of bilateral CI

Study	Target	Informants	Method	Increase in quality of life
Summerfield et al. [2002]	adults	experts	TTO	0.031
Summerfield et al. [2006]	adults	bilaterally implanted patients	HUI-3	0.015 (initial) 0.030 (adjusted)
Bichey and Miyamoto [2008]	adults and children	bilaterally implanted patients (or their parents)	HUI-3	0.11
Lovett [unpublished]	children	parents of bilaterally implanted children	VAS	0.33
Lovett et al. [2010]	children	parents of unilaterally and bilaterally implanted children	VAS	0.04
			HUI-3	−0.003
Summerfield et al. [2010]	children	experts, students and parents of children with other disabilities	VAS	0.06
			TTO	0.05
Sparreboom et al. [2012]	children	bilaterally implanted children	HUI-3	0.04
Chen et al., 2014	adults	doctors, implanted adults	HUI-3	0.03
Härkönen et al. [2015]	adults	bilaterally implanted patients	15D	0.03
Artaso, Díez [2015]	children	general populations (students)	VAS	0.25
			TTO	0.10

Our Markov model

Our Markov model

Our Markov model

Our Markov model
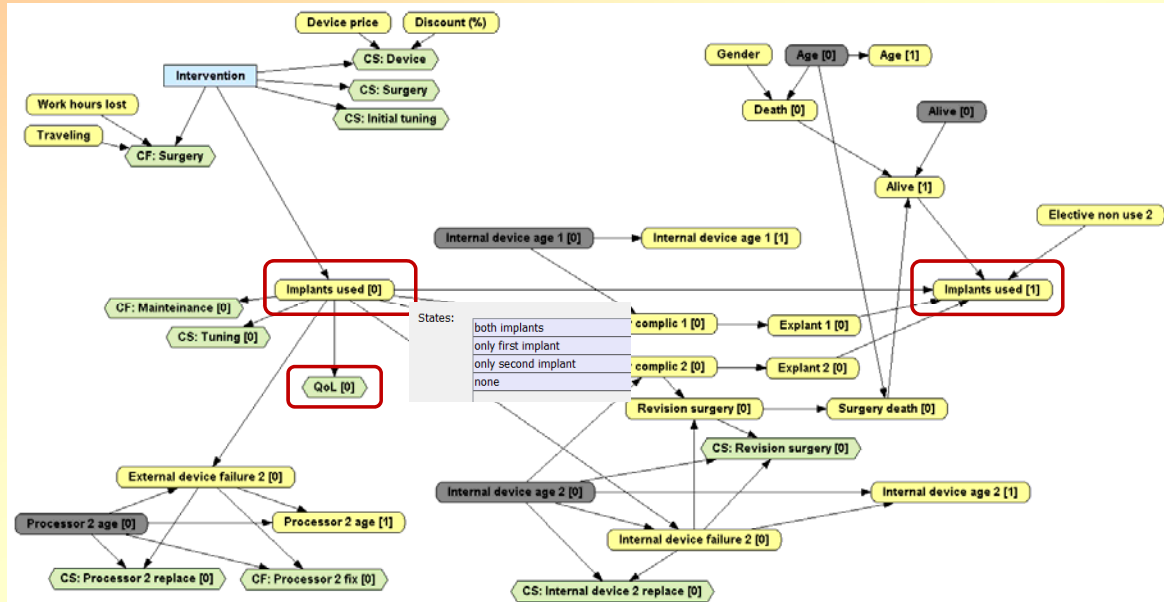
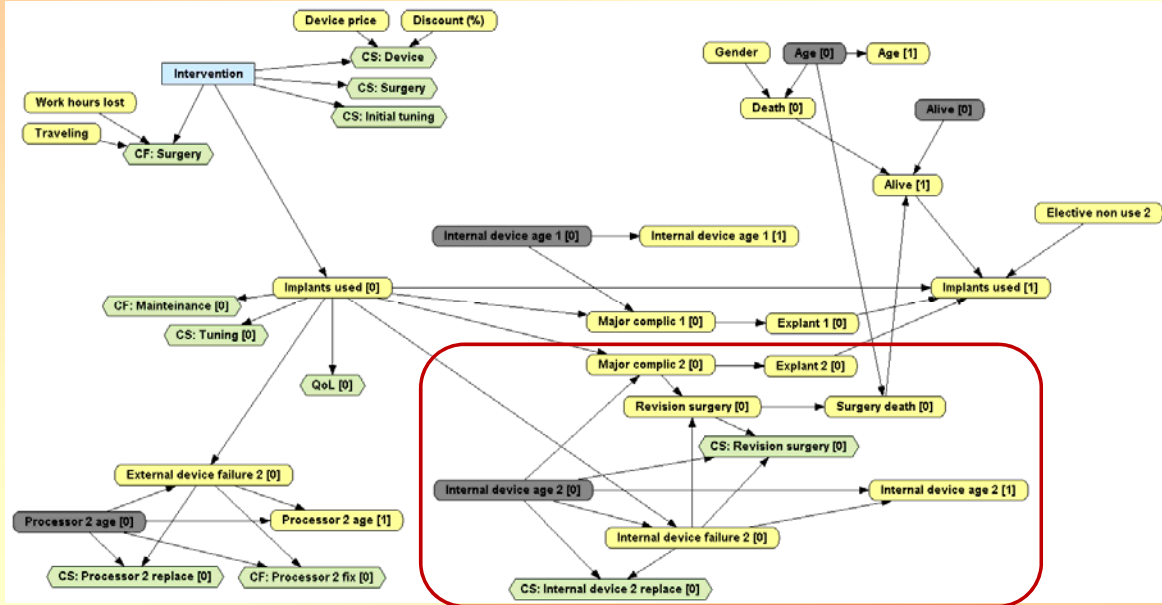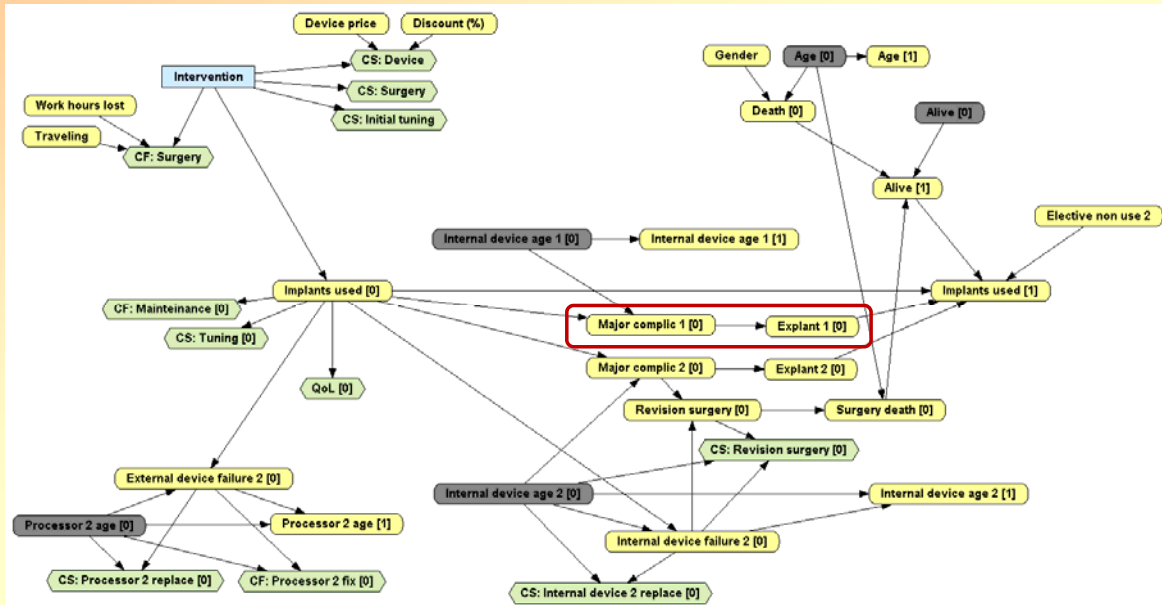# Our Markov model
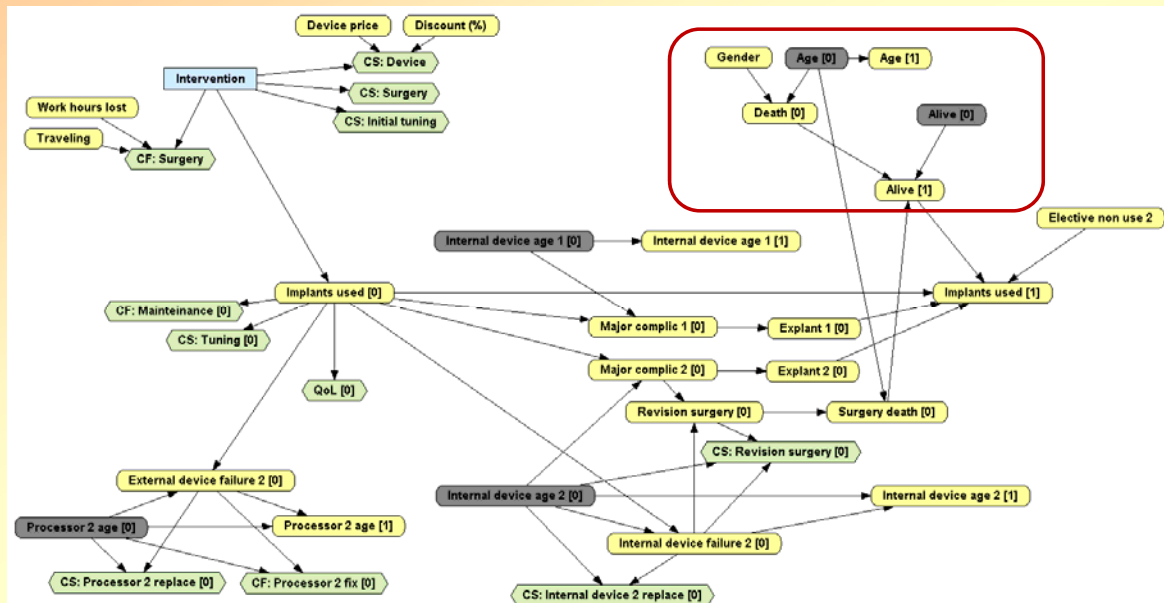
Our Markov model

Our Markov model

Our Markov model

Who pays for the costs of CI in Spain?

◆ Initial costs (assessment + device + surgery): the health <u>system</u>

◆ Failure of the internal components
  ➢ first 10 years: <u>manufacturer's</u> warranty
  ➢ after the 10th year: health care <u>system</u>

◆ Failure of the external processor
  ➢ first 2 years: <u>manufacturer's</u> warranty
  ➢ 3rd to 7th year: <u>user</u> or his/her family (usually repaired)
  ➢ after the 7th year: if fails, replaced by the health <u>system</u>

◆ Microphone: if fails after the 4th year, replaced by the health <u>system</u>

◆ Coil: if fails after one year of use, replaced by the health <u>system</u>

◆ Cables and batteries: paid by the <u>user</u> or his/her family.

Results: ICERs

◆ Simultaneous bilateral vs. unilateral: € 12,133 / QALY

◆ Sequential bilateral vs. unilateral: € 13,232 / QALY

◆ Simultaneous, if the health system
  covered the repairs and supplies € 17,262 / QALY

◆ Sequential, if the health system
  covered the repairs and supplies € 18,362 / QALY

◆ In all cases, clearly below the threshold (€30,000-35,000/QALY).

◆ The effectiveness decreases with the age of implantation
 and the time between implantations.

Study	Country	Source of utilities	Population	ICER
Summerfield et al. [2002]	UK	own data	adults	£61.734/QALY
Summerfield et al. [2003]	UK	Summerfield et al., 2002	adults	£100.000/QALY
Summerfield et al. [2006]	UK	own data	adults	£102.500/QALY
Cochlear Europe Ltd. [submitted to NICE]	UK	projection of data	adults	£32,909/QALY
			children	£39,049/QALY
Bond et al. [2007, 2009]	UK	Summerfield et al., 2006	adults	£49,559/QALY
			children	£40,410/QALY
L-Pedraza Gómez et al. [2007]	Spain	Summerfield et al., 2002	adults	€53,018/QALY
			children	€44,199/QALY
Bichey and Miyamoto [2008]	USA	own data	adults and children	$2,187/QALY
Summerfield et al. [2010]	UK	own data	children	£21,768/QALY
Chen et al. [2014]	Canada	own data	adults	$55,020/QALY
Martín-Pérez, Díez [2015]	Spain	own data	children	€12,133/QALY

Probabilistic sensitivity analysis
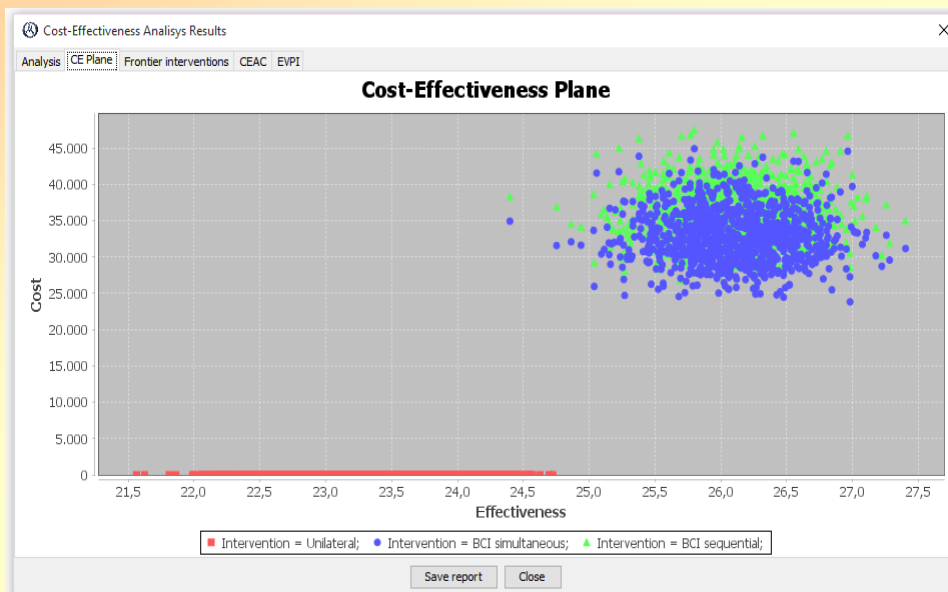
Probabilistic sensitivity analysis
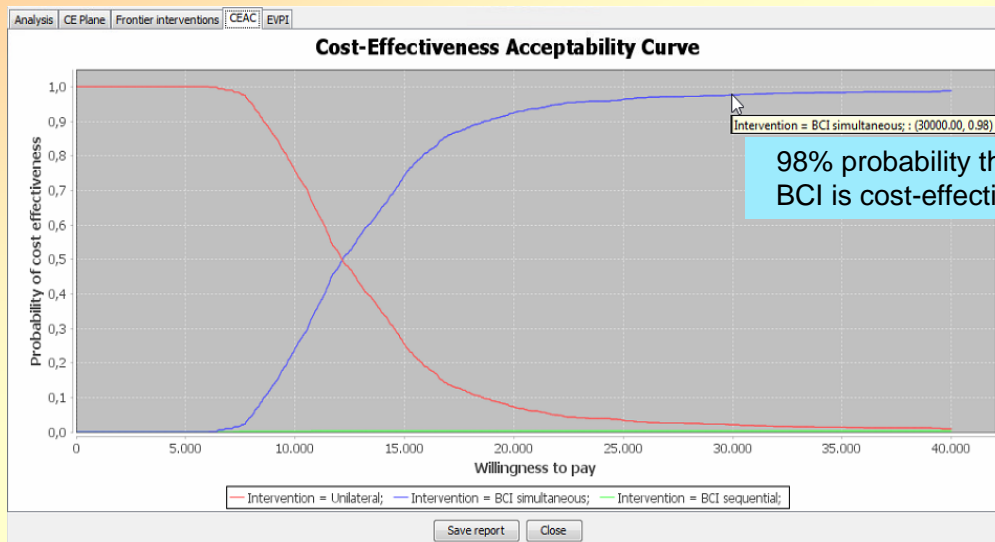
Future work

◆ Make all the details <u>available</u> on a web page:
  - ➢ the raw data collected during the quality of life survey,
  - ➢ the analysis of those data,
  - ➢ the Markov model, and
  - ➢ a stable version of the software, with a user manual,

  so that everyone can reproduce the results of our study,

  because research needs to be reproducible to be credible.

◆ Analyze the cost-effectiveness of BCI for <u>adults</u> (and <u>SSD</u>).

◆ Adapt the model to <u>other countries</u>.

If you wish to know more details about this study
or adapt it to your country
please write to:
cochlear-implant@cisiad.uned.es*.*

Thank you very much!