Webinar
Día Internacional de lucha contra el Cáncer Infantil 2022

Cost-effectiveness in Pediatric Cancer

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International Day of the Fight Against Childhood Cancer

Objective of presentation

- Introduction to the terminology and concepts of Cost-Effectiveness analysis.
- How to Interpret a Cost-Effectiveness Analysis.
- Present Case Study on Cost-Effectiveness of Treating Childhood Cancer in Developing Countries.

Contenido:

1. Introduction.

2. What is Cost-Effectiveness?

3. Why do a Cost-Effectiveness analysis.

4. Elements that are analyzed when evaluating the Cost-Effectiveness of a program or intervention?

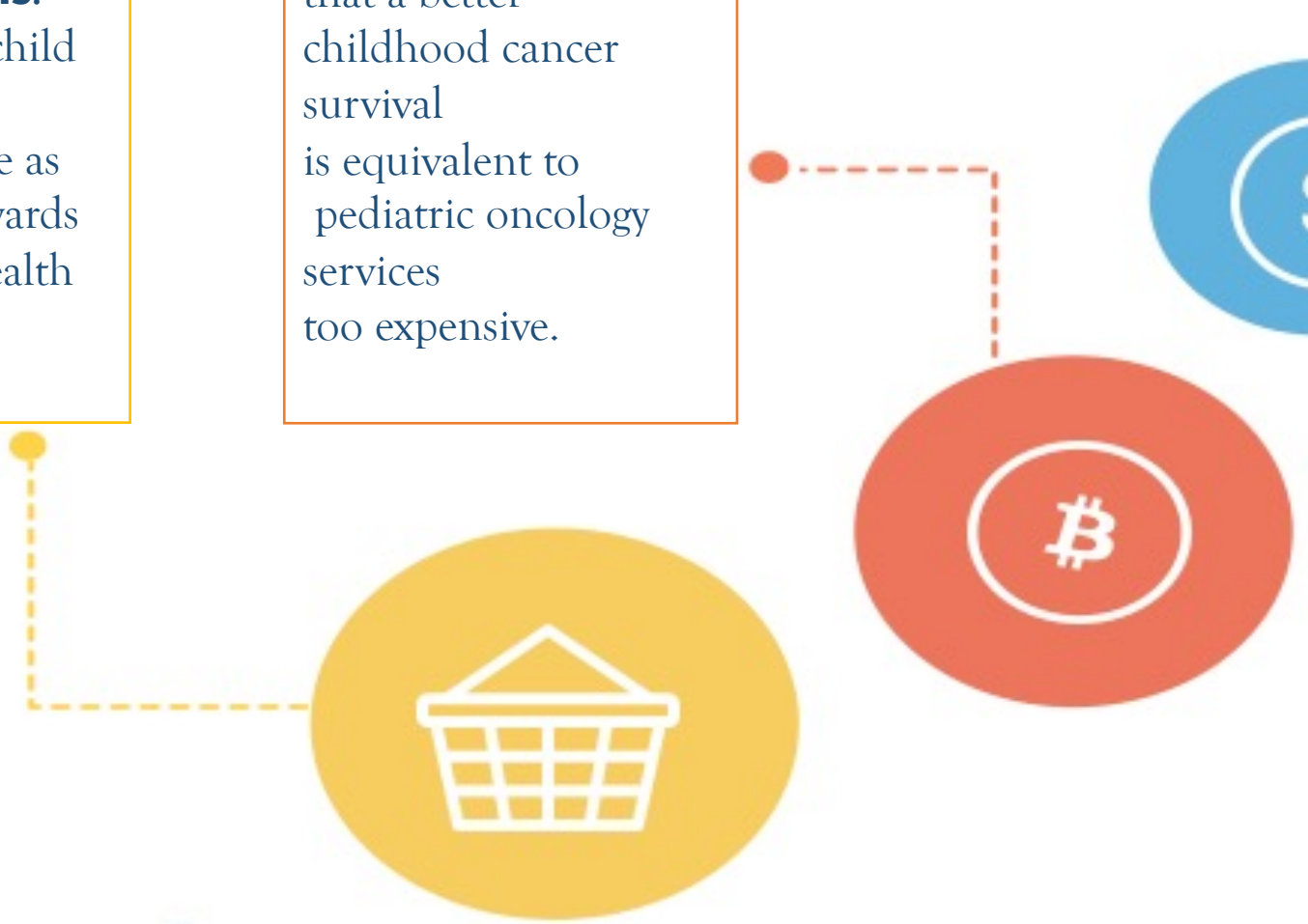
5. What makes something profitable?

6. Case Study: "Cost–Effectiveness of Childhood Cancer Treatment in El Salvador, Central America: A Report from the Childhood Cancer Task Force 2030."

1. Introduction:

United Nations 2030 Agenda for Sustainable Development Goals: Include a package of child cancer services in guaranteed health care as an important step towards achieving universal health coverage

Identificar Barreras: Wrong Perception that a better childhood cancer survival is equivalent to pediatric oncology services too expensive.



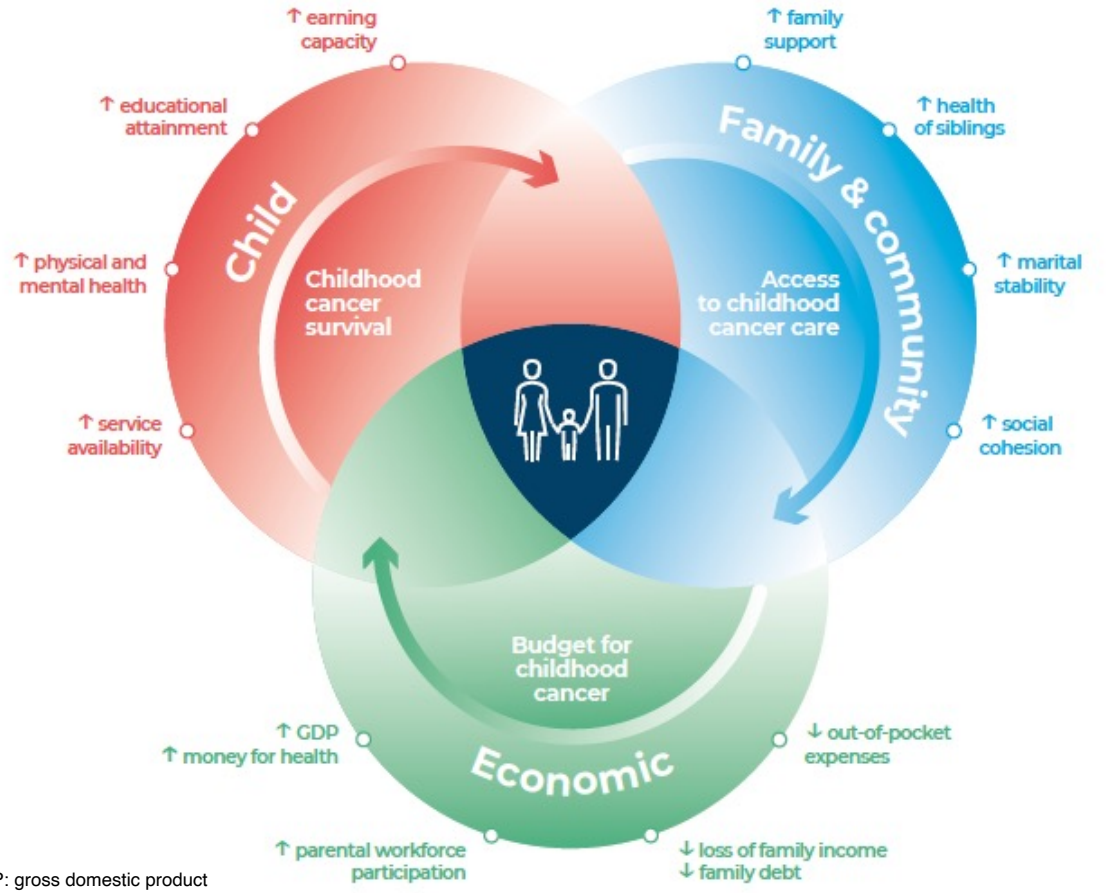
Evidence of Cost-Effective Intervention of Childhood Cancer: Avoiding 6.2 million deaths in children with cancer between the period 2020-2050. This equates to producing a return of $3 for every $1 invested.

Reducing Gaps

Table 5. Three-part strategy for the progressive realization of universal health coverage

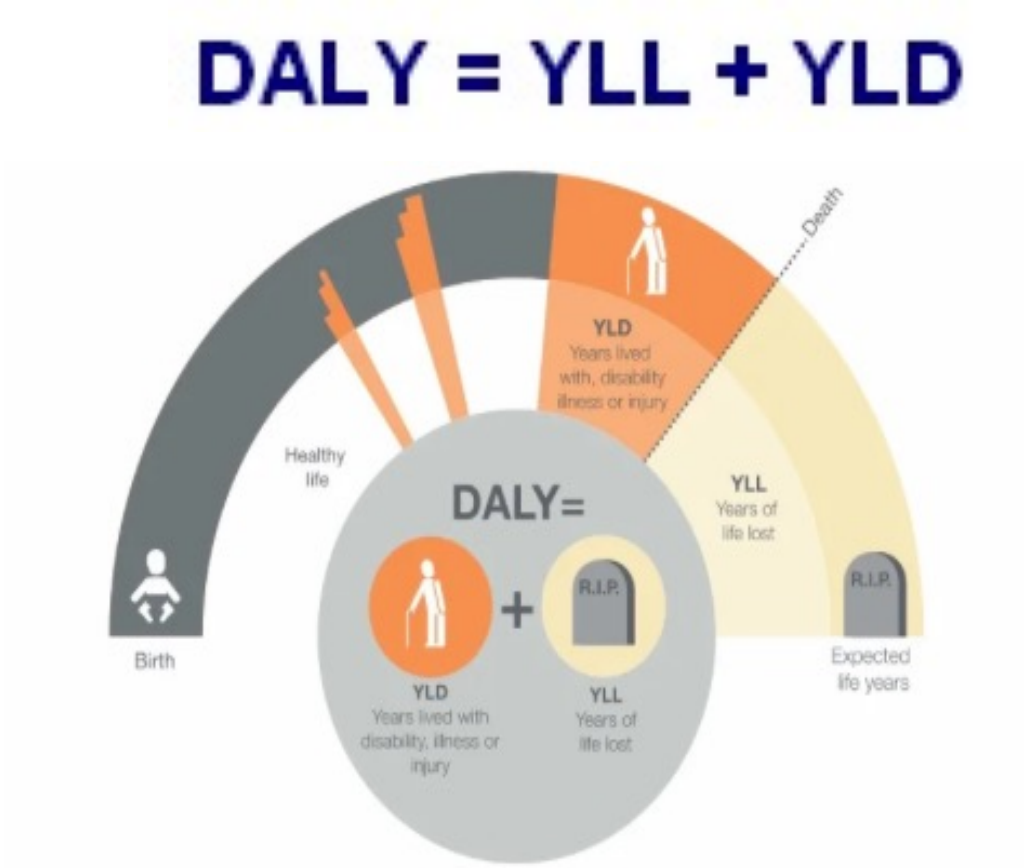
Categorize services into priority classes, according to cost-effectiveness, priority for the most disadvantaged, and protection against financial risks.
Expand coverage of high-priority services for all. Eliminate out-of-pocket payments while increasing mandatory progressive payments with pooling funds.
Ensure that disadvantaged people are not left behind (including low-income groups and rural populations).

Figure 14. Economic and social value of investing in the cancer and other NCD prevention and control interventions



GDP: gross domestic product
Source: Adapted from WHO 2018 (45).

2. What is Cost-Effectiveness Analysis?



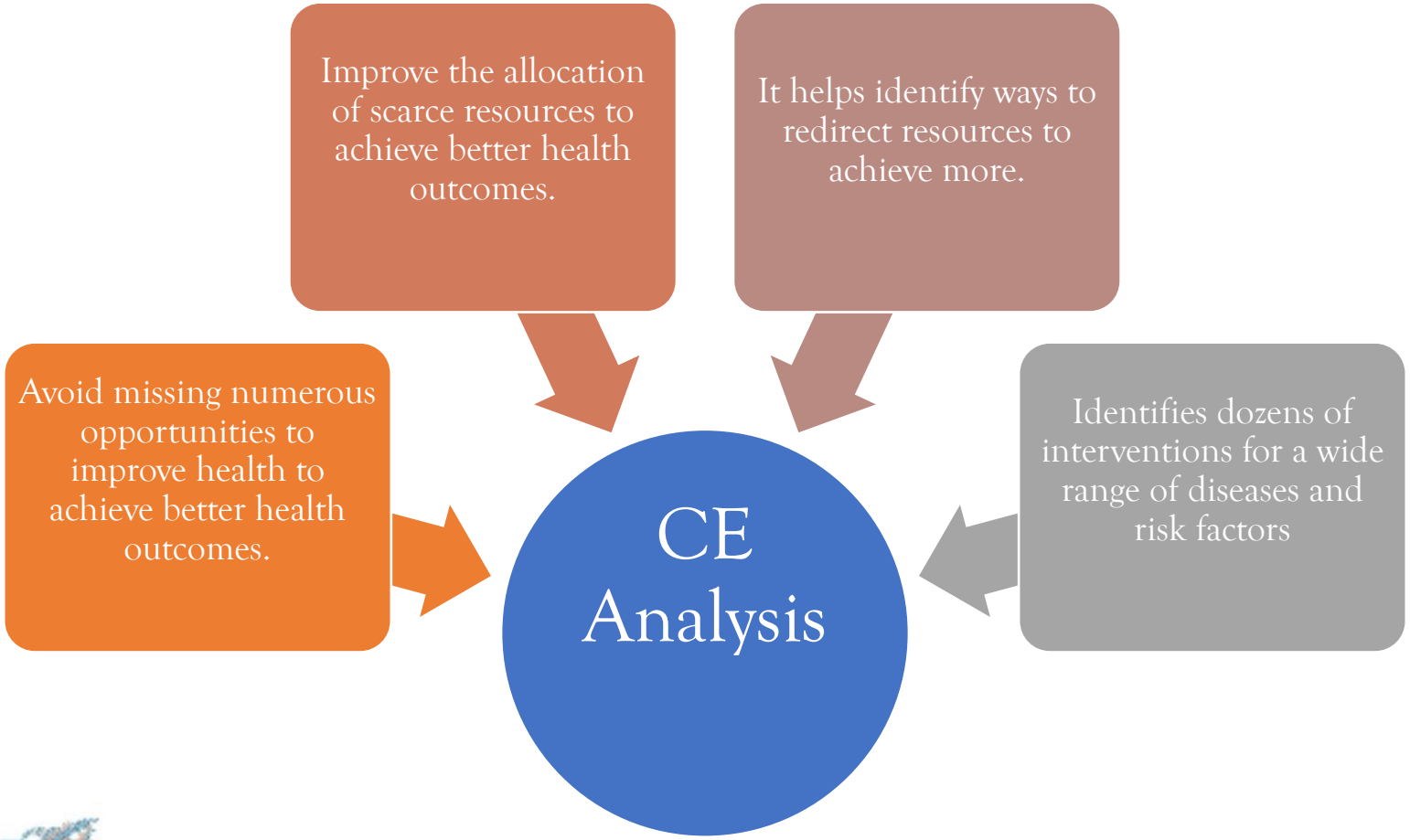
Health Intervention:

Cost-effectiveness ratio:

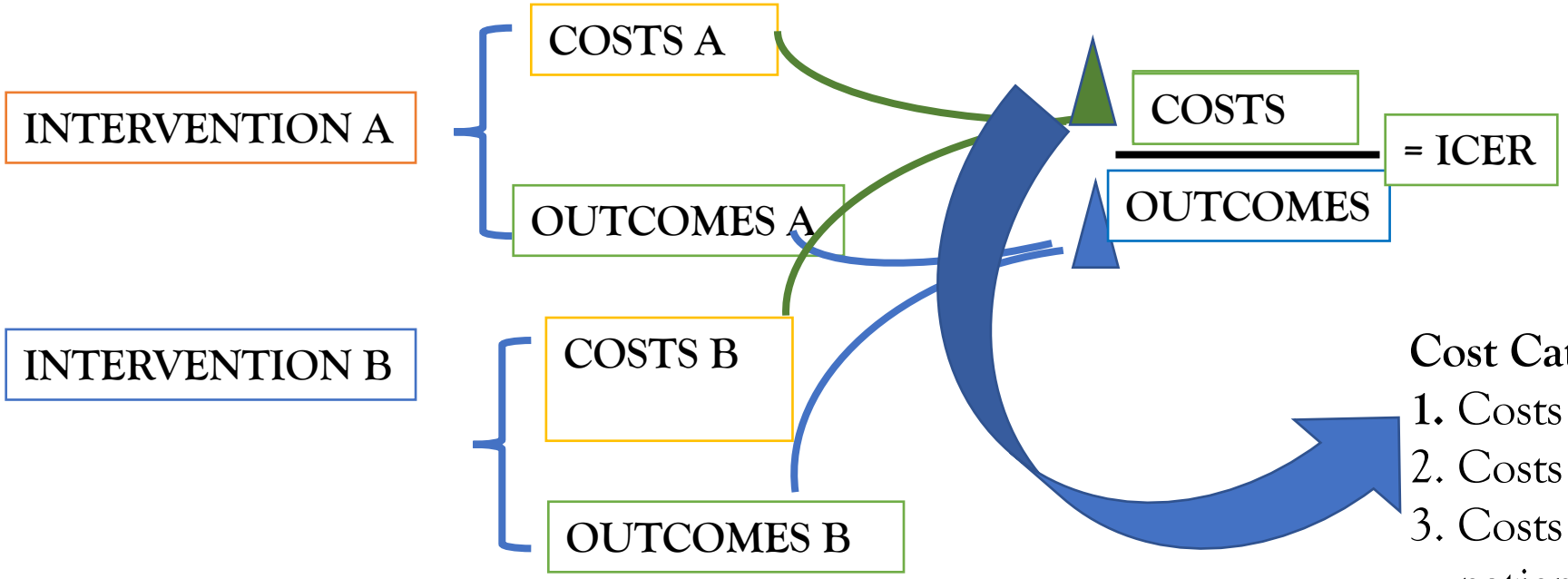
Average cost-effectiveness:

Incremental cost-effectiveness:

3. Why run a Cost-Effectiveness analysis



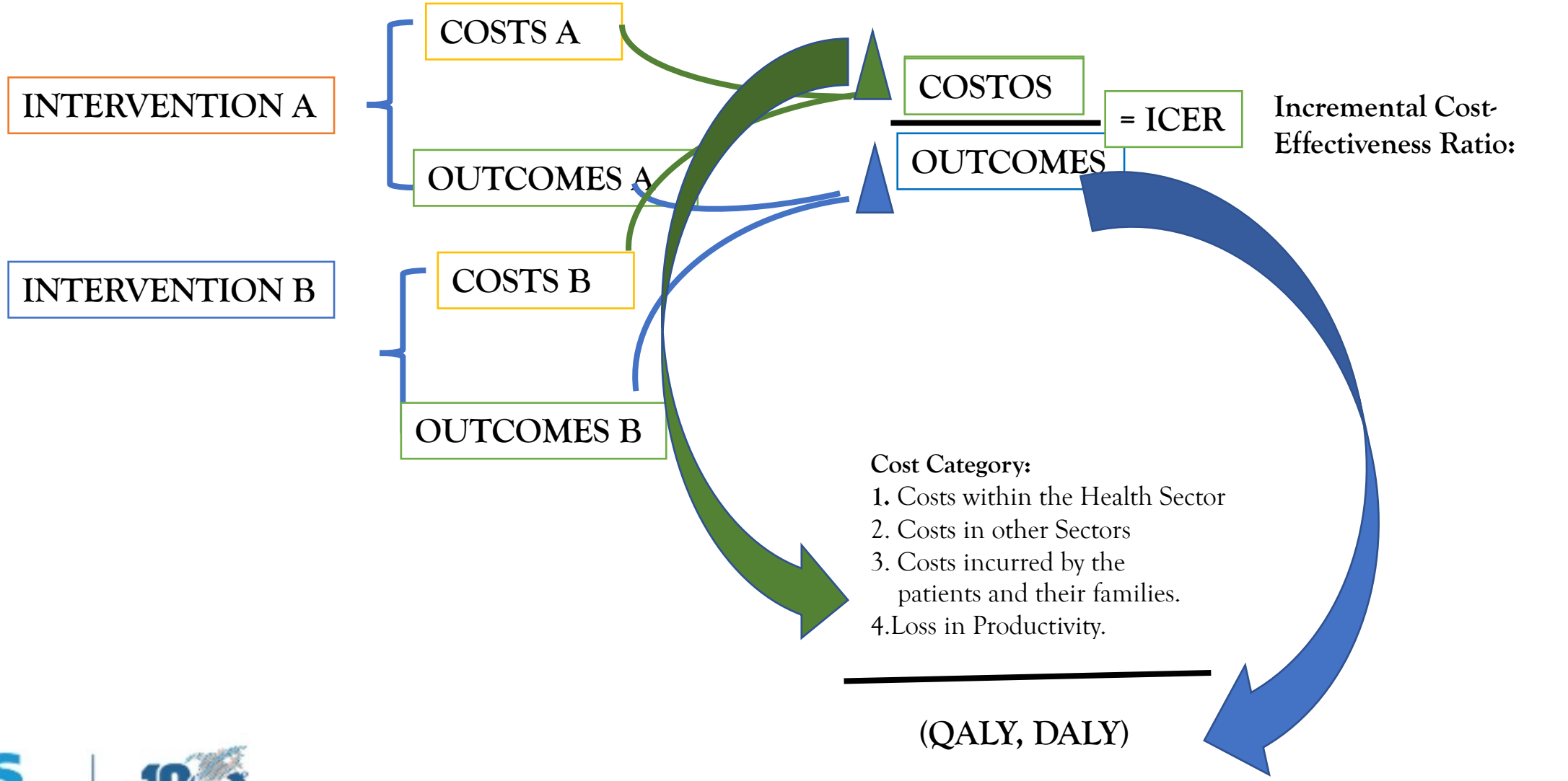
4. Elements that are analyzed when evaluating the Cost-Effectiveness of a program or intervention?



Cost Category:

1. Costs within the Health Sector
2. Costs in other Sectors
3. Costs incurred by the patients and their families.
4. Loss in Productivity.

4. Elements that are analyzed when evaluating the Cost-Effectiveness of a program or intervention?



4. Elements that are analyzed when evaluating the Cost-Effectiveness of a program or intervention?

INTERVENCION A

INTERVENTION B

COSTS A

OUTCOMES A

COSTS B

OUTCOMES B

COSTOS

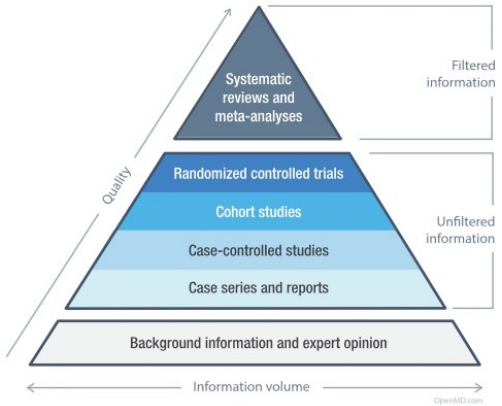
EFECTOS

= ICER

Incremental Cost-Effectiveness Ratio:

(QALY, DALY)

Cost Category:
1. Costs within the Health Sector
2. Costs in other Sectors
3. Costs incurred by the patients and their families.
4.Loss in Productivity..



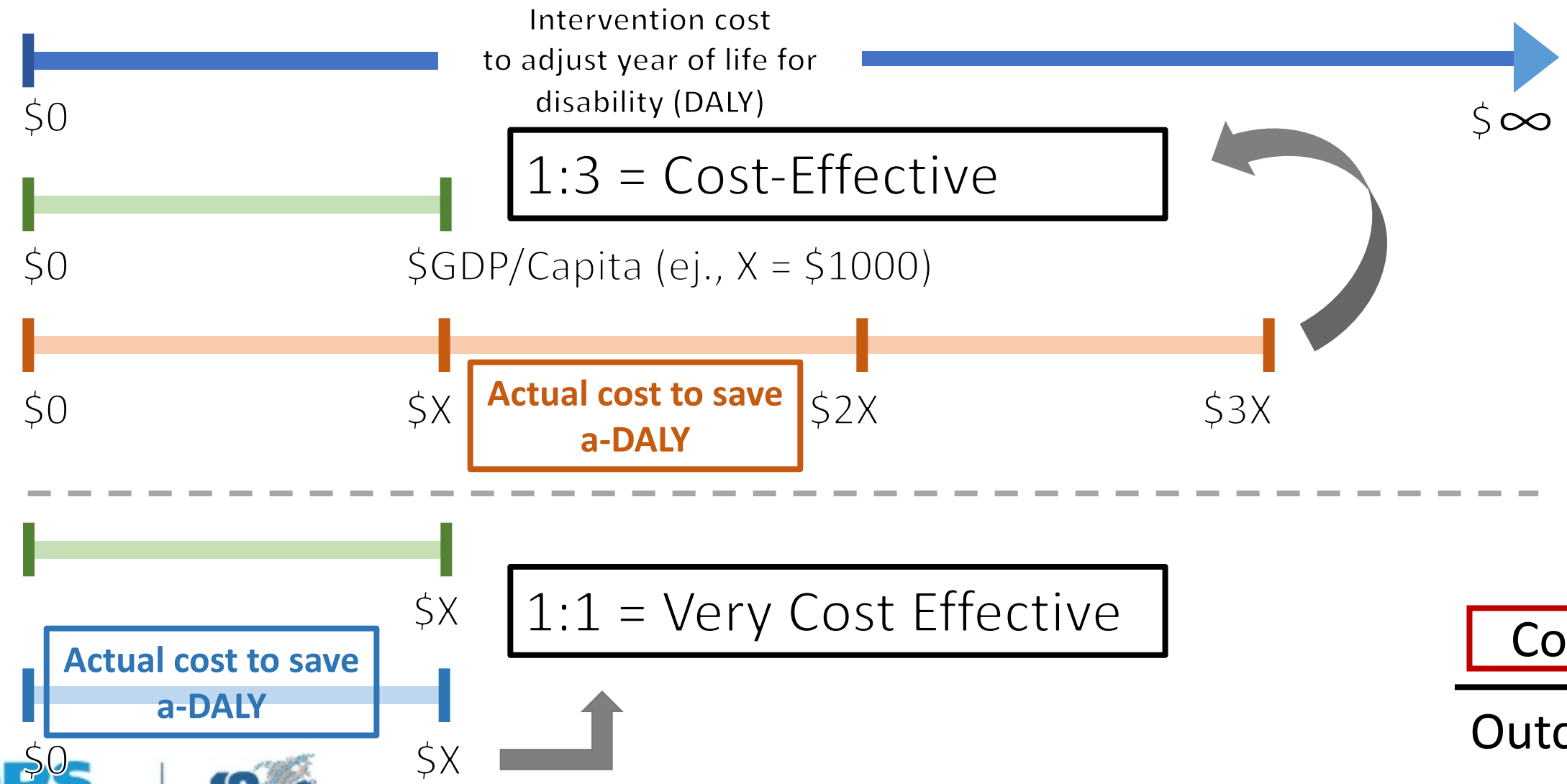
Evidence of Effectivenes

Outcome:
Relative Risk (RR)
Odds Ratio
Example: Mortality : 10% > 5-year survival

Assessment of Results in Health Interventions

Utility (QALY, DALY)

5. What makes something Cost-Effective?



$$\frac{\text{Cost}}{\text{Outcome}}$$

Acharya et al. World Health Organization, 2003

5. What makes something Cost-Effective?

- **Cost-effectiveness threshold recommendations for low- and middle-income countries (WHO 2001)**
-

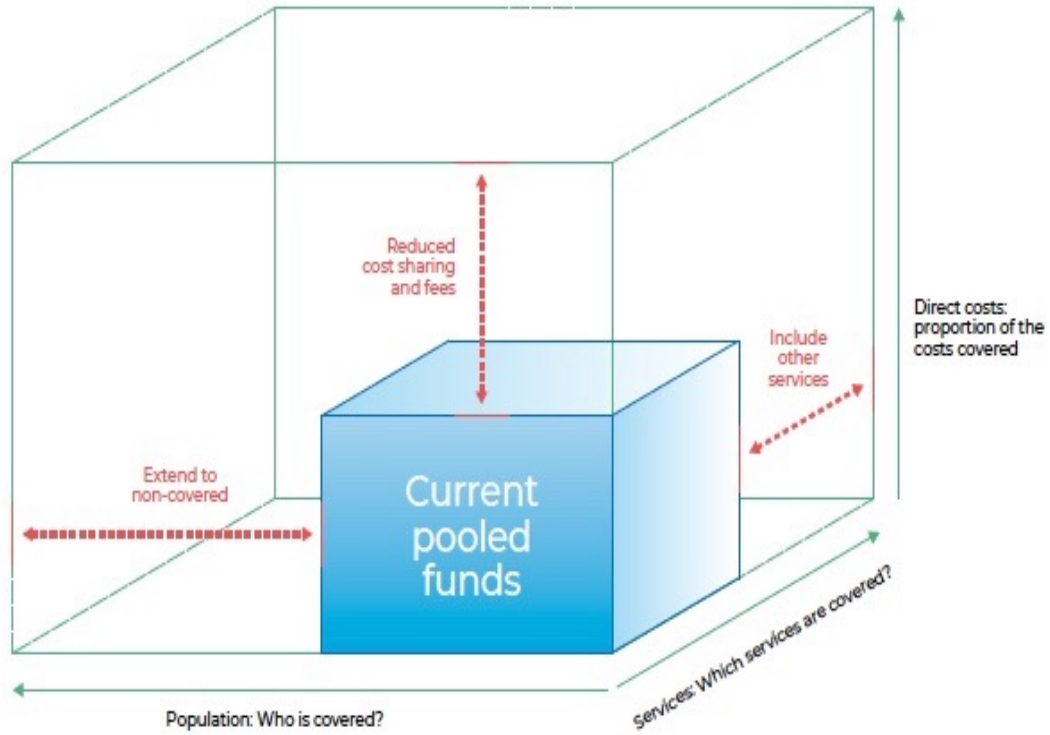
✓ICER < 1 GDP per capita: very cost-effective intervention.

✓1 GDP per capita < ICER < 3 GDP per capita: cost-effective intervention.

✓3 GDP per capita < ICER: non-cost-effective intervention.

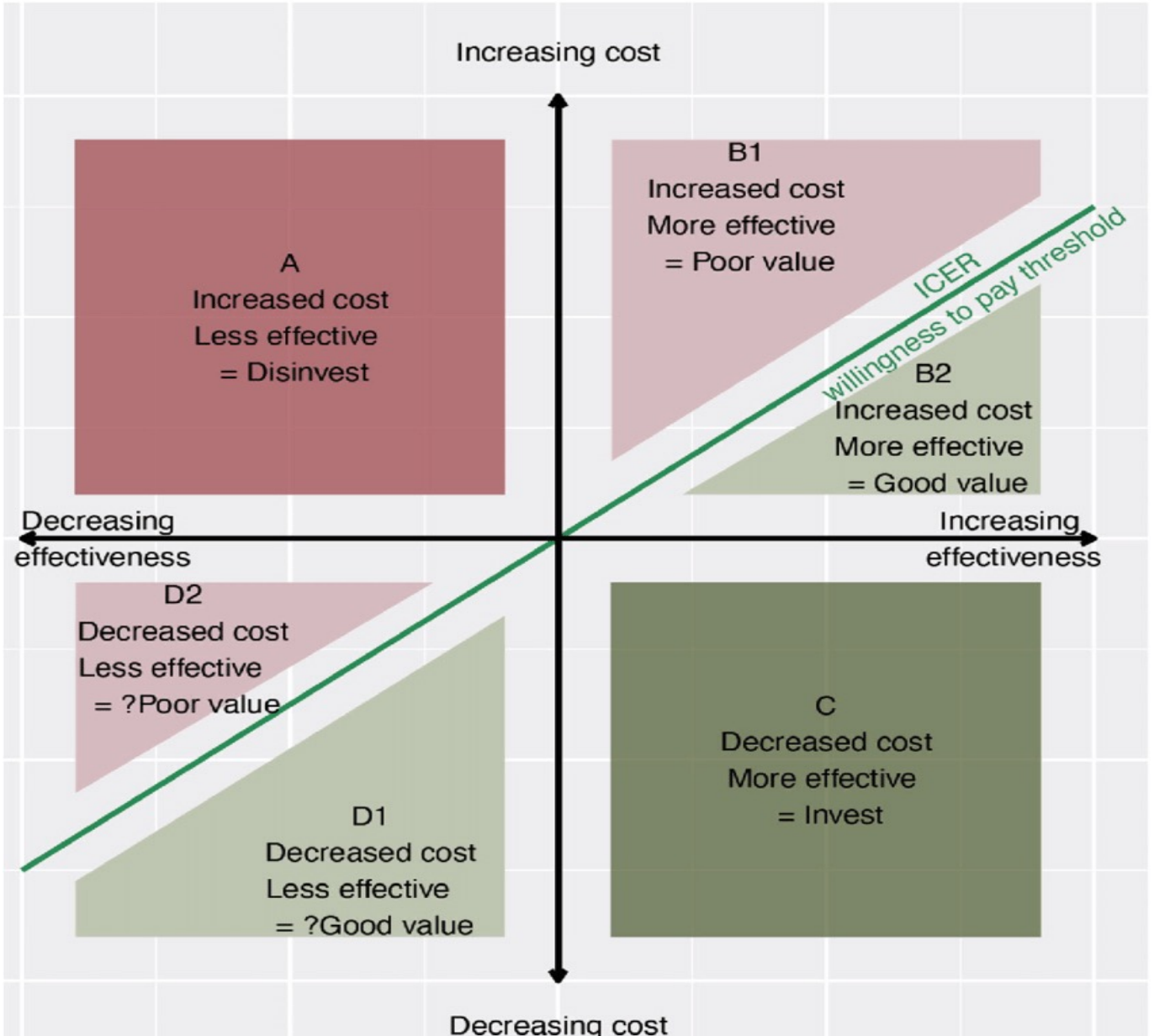
This recommendation is widely used in Latin American countries.

Figure 29. Three dimensions of UHC



Source: WHO 2010 *(147)*.

5. What makes something Cost-Effective?



6. Case Study: "Cost–Effectiveness of Childhood Cancer Treatment in El Salvador, Central America: A Report of the Childhood Cancer Task Force 2030."

Original Article

The Cost and Cost-Effectiveness of Childhood Cancer Treatment in El Salvador, Central America: A Report From the Childhood Cancer 2030 Network

Soad Fuentes-Alabi, MD, MPH[1]; Nickhill Bhakta, MD, MPH[2]; Roberto Franklin Vasquez, MD[1]; Sumit Gupta, MD, PhD, FRCPC [3,4]; and Susan E. Horton, BA, MA, PhD[5]

BACKGROUND: Although previous studies have examined the cost of treating individual childhood cancers in low-income and middle-income countries, to the authors' knowledge none has examined the overall cost and cost-effectiveness of operating a childhood cancer treatment center. Herein, the authors examined the cost and sources of financing of a pediatric cancer unit in Hospital Nacional de Ninos Benjamin Bloom in El Salvador, and make estimates of cost-effectiveness. **METHODS:** Administrative data regarding costs and volumes of inputs were obtained for 2016 for the pediatric cancer unit. Similar cost and volume data were obtained for shared medical services provided centrally (eg, blood bank). Costs of central nonmedical support services (eg, utilities) were obtained from hospital data and attributed by inpatient share. Administrative data also were used for sources of financing. Cost-effectiveness was estimated based on the number of new patients diagnosed annually and survival rates. **RESULTS:** The pediatric cancer unit cost $5.2 million to operate in 2016 (treating 90 outpatients per day and experiencing 1385 inpatient stays per year). Approximately three-quarters of the cost (74.7%) was attributed to 4 items: personnel (21.6%), pathological diagnosis (11.5%), pharmacy (chemotherapy, supportive care medications, and nutrition; 31.8%), and blood products (9.8%). Funding sources included government (52.5%), charitable foundations (44.2%), and a social security contribution scheme (3.4%). Based on 181 new patients per year and a 5-year survival rate of 48.5%, the cost per disability-adjusted life-year averted was $1624, which is under the threshold considered to be very cost effective. **CONCLUSIONS:** Treating childhood cancer in a specialized unit in low-income and middle-income countries can be done cost-effectively. Strong support from charitable foundations aids with affordability. ***Cancer* 2018;124:391-7**. © *2017 American Cancer Society*.

KEYWORDS: cancer, cost-effectiveness, economic evaluation, oncologic services, pediatric hospitals.

Background- Centro Medico Ayúdame a Vivir (FAV) / National Children's Hospital Benjamín Bloom (HNNBB). El Salvador, C.A.

•The child population of El Salvador under the age of 15 is 2,060,193 (1).

•El Salvador The total population of life expectancy at birth is 73 (2)

The GDP per capita of El Salvador of $4219 in 2015 (2)

• HNNBB is the only tertiary referral hospital for children.

•It has 300 beds with 1,350 employees and 300,000 patient visits annually.

•The Department of Pediatric Oncology (DPO) is one of the 30 departmental subspecialties.

•El DPO receives an average of 181 per year.

•The department treats children up to 14 years of age, with an average age at diagnosis of six years.

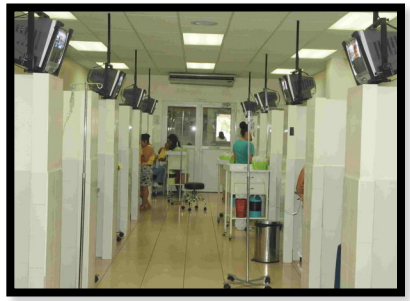
HOSPITAL NACIONAL DE NIÑOS "BENJAMÍN BLOOM"

(1) Digestyc ES-2007Census -2014 Projection
(2) Basic Internal Product World Bank Data 2015
(3)

Background- Centro Medico Ayúdame a Vivir (FAV) / National Children's Hospital Benjamín Bloom (HNNBB). El Salvador, C.A.

•The DPO has 24 inpatient beds and includes an outpatient clinic that receives more than 30,000 patient visits annually.
•

•The pediatric oncology program is mainly funded by the Ministry of Health through National Children's Hospital Benjamin Bloom and Foundation 'Ayudame a Vivir' non-profit entity. Other national and international partners or collaborators include: ASAPAC (Association of Parents of Children with Cancer), ISSS (Social Security Institute of El Salvador) and mainly the St. Jude Children's Research Hospital in Memphis, Tennessee, USA.



Justification for a Cost-Effectiveness Analysis of the National Program of Childhood Cancer El Salvador

•Previous studies have examined the cost of treating individual childhood cancers in low- and middle-income countries. However, none have looked at the overall cost and cost-effectiveness of operating a childhood cancer treatment center.

•Therefore, the cost and funding sources of a pediatric cancer unit at the Benjamin Bloom National Children's Hospital in El Salvador and Centro Medico Ayudame a Vivir were examined and cost-effectiveness estimates were made.

Methodology:

- Since the budget has financial backing from different sources, we use a ratio of (65:20) for medical/non-medical costs.
- For inpatient "hospitalization" costs, we used the WHO-CHOICE11 value for El Salvador for 2008, updated to 2016 using the U.S. Consumer Price Index.
- For Intensive Care Unit (ICU) beds we multiply this value by 3.5, the cost-per-day ratio for the ICU compared to the regular hospital bed in the El Salvador government fee structure.
- The number of inpatients and outpatients per year, the number of new cases of childhood cancer per year, and the estimated survival rates were taken from the Morbi-Mortality Information System (SIMMOW) and Medical Support System (SAM).
- Five-year survival rates were obtained from the Registry, using new case data for 2012-16.
- We compared treatment costs in 2016 with five-year survival data up to 2016, using a prevalence rather than incidence estimate.

Data Collection Sheet:

	SOURCE OF FUNDING OF CHILDHOOD CANCER TREATMENT IN EL SALVADOR						
				Unit Price			
RESOURCES		Quantity	Proportion Time	HNNBB	FAV/ St. JCHRH	ASAPAC	ISSS
Personnel	**Personnel**						
HNNBB has hired 2 Ped Oncologist (2 hrs per day each one)	Oncologist	4	8hrsd/44hrsw	$ 350.00	$ 2,500.00	$ -	$ -
FAV has hired 4 ped	Other MDs Pedia	2	hrsd/44hrsw/20HR	$ -	$ 1,200.00	$ -	$ -
20 nurses hired by H	Nursing	40	8hrsd/44hrsw	$ 500.00	$ 500.00	$ -	$ -
	Pharmacist	3	8hrsd/44hrsw		$ 500.00	$ -	$ -
	Radiation oncolo	4	10CH/30 ADhrsw	$ -	$ -	$ -	$ 2,500.00
1 Gral Surgeon hired by HNNBB and 1 by FAV part time	General surgeon	2	44HRSW/22HRSW	$ 1,800.00	$ 500.00	$ -	$ -
	Orthopedic surge	1	40hrs w	$ 3,000.00	$ -	$ -	$ -
	Neurosurgeon	4	44HRSW	$ 2,000.00	$ -	$ -	$ -
	Pathologist	3	40hrs w	$ 2,000.00	$ -	$ -	$ -
	Laboratory Techr	2	20hrs w	$ -	$ 500.00	$ -	$ -
	Hematologist	1	20hrs w	$ -	$ 1,200.00	$ -	$ -
Room and Board							
	Floor ward (daily	43		$ 300.00	$ 300.00		
	ICU (daily occupa	4		$ 1,000.00			
	Local housing (da	5		$ 60.00	$ -	$ 60.00	$ -
	Petit Cash per month			$ -	$ 320.16	$ 300.00	$ -
Outpatient Clinic							
	Number of Patier	90 per day		$ -	$ 370.33	$ -	$ -
Pharmacy							
	Chemotherapeut	13,170		$ -	$ 600,000.00	$ -	$ -
	Supportive care medications (annually)			$ -	$ 1,050,000.00	$ -	$ -
	Nutrition, medical supplemental			$ 4,800.00	$ -	$ -	$ -
Pathology							
	Diagnosic consumables (annually)			$ 100,000.00	$ -	$ -	$ -
	Routine lab consumables (annually)			$ 500,000.00	$ -	$ -	$ -

Methodology:

TABLE 1. Variables and Sources Included in the Cost-Effectiveness Model

Variables	Values	Sources
Discount rate	0.03 (0, 0.06)	WHO-CHOICE
El Salvador life expectancy, 2015 (latest available)	73	World Bank
Mean age at diagnosis	6	HNNBB-provided data
Duration of disability (length of therapy)	2	Assumed length of therapy
Disability weight during therapy	0.288	GBD 2016[14]
Utility score at age 24 y using MEPS[a]	0.826	Yeh 2016[15]
Utility score at age 35 y using MEPS[a]	0.81	Yeh 2016[15]
Utility score at age 24 y using CCSS survivors[b]	0.779	Yeh 2016[15]
Utility score at age 35 y using CCSS survivors[b]	0.766	Yeh 2016[15]
No. of new incident cases	181	HNNBB-provided data
Proportion of patients with 5-y overall survival	0.49	HNNBB-provided data
El Salvador GDP per capita 2015 (latest available)	4219	World Bank

Abbreviations: CCSS, Childhood Cancer Survivor Study; GBD, Global Burden of Disease; GDP, gross domestic product; HNNBB, Hospital Nacional de Ninos Benjamin Bloom; MEPS, Medical Expenditures Panel Survey; WHO, World Health Organization.

[a] MEPS provides utility weights generalizable to the US general population.[16]

[b] CCSS provides utility weights for late effects for those who received treatment for cancer in childhood.[17]

Results

TABLE 2. Annual Costs of Operating a Pediatric Oncology Department by Major Cost Category

Input	Quantity	Annual Cost, US$	Percentage of Total Cost
Personnel			
Medical[a]	65 FTE	840.6	
Nonmedical[b]	20 FTE	280.6	
Subtotal: personnel		1121.2	21.6
Hoteling			
General ward[c]	3.63/d (average)	61.9	
ICU	0.92/d (average)	57.3	
Local housing and per diem for families	5 families/d	116.9	
Subtotal: hoteling		236.1	4.5
Subtotal: outpatient clinic[d]		135.1	2.6
Subtotal: other services (training, laboratory information)		69.4	1.3
Shared hospital medical services			
Pathology		600.0	
Pharmacy		1654.8	
Radiation		51.9	
Imaging		71.2	
Surgery (operating room)		130.0	
Blood services		510.6	
Subtotal: shared hospital medical services		3018.5	58.1
Subtotal: utilities[e]		78.3	1.5
Subtotal: central administration cost[e]		537.6	10.3
Total		5195.8	100.0

Abbreviations: FTE, full-time equivalent; ICU, intensive care unit.

[a] Includes oncologists (4 FTE), pediatricians (3 FTE), radiation oncologists (4 FTE), pharmacists (4 FTE), nurses (40 FTE), a general surgeon (1 FTE), an orthopedic surgeon (1 FTE), neurosurgeons (4 FTE), pathologists (2 FTE), laboratory technicians (2 FTE), and a pain specialist (1 FTE).

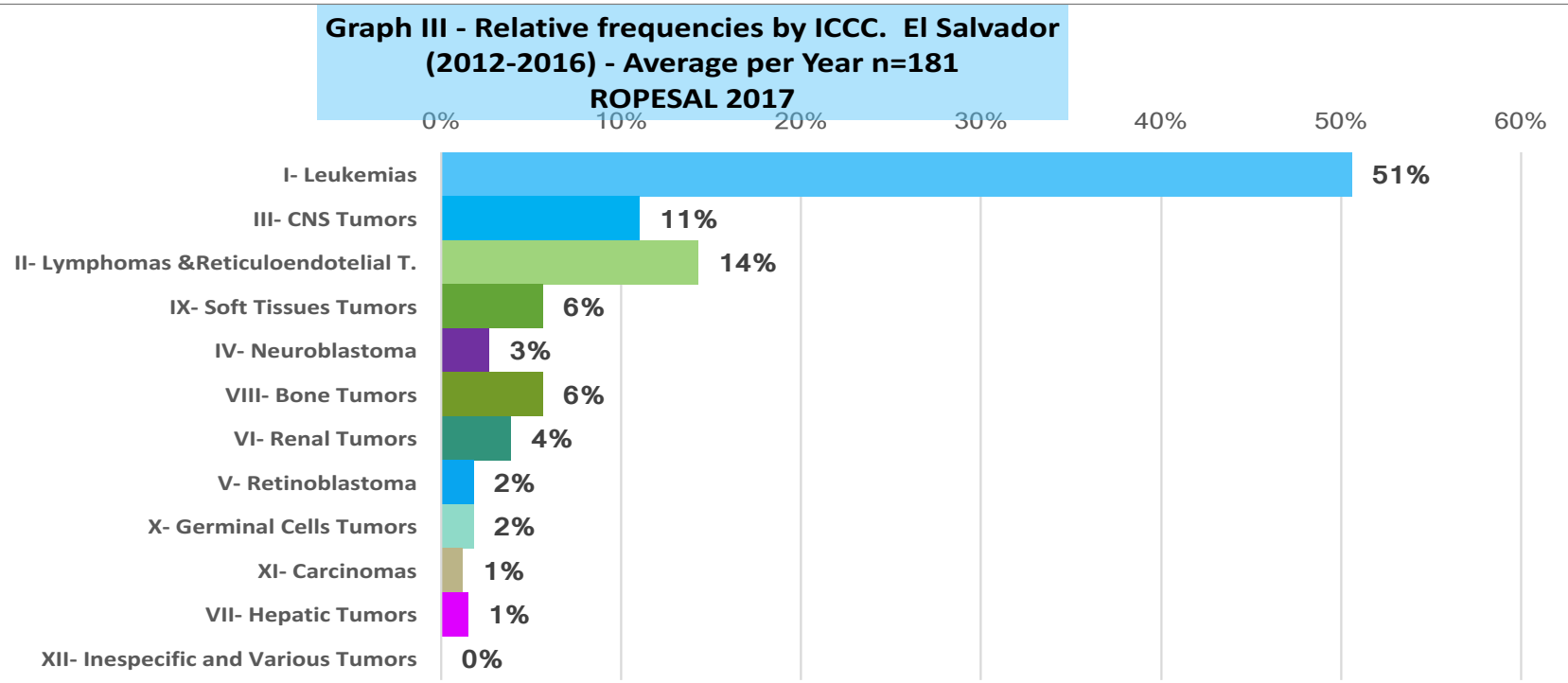
[b] Includes a departmental registrar (1 FTE), a cancer registrar (1 FTE), oncological psychiatrists (2 FTE), social workers (2 FTE), an ambulance driver (1 FTE), secretarial support (3 FTE), managers (3 FTE), warehouse personnel (2 FTE), an accountant (1 FTE), and data entry personnel (3 FTE).

[c] Includes cost of cleaning, maintenance, laundry, food for patients, etc. Costs of cooks (3 FTE), maintenance personnel (7 FTE), and security personnel (2 FTE) are incorporated here.

[d] Includes space cost for outpatient clinic; treatment costs for outpatients are included under various treatment headings.

[e] Includes the unit's share of central utilities and purchasing and contracting administration costs, weighted by cancer unit share of Hospital Nacional de Ninos Benjamin Bloom total inpatient stays (11.2%).

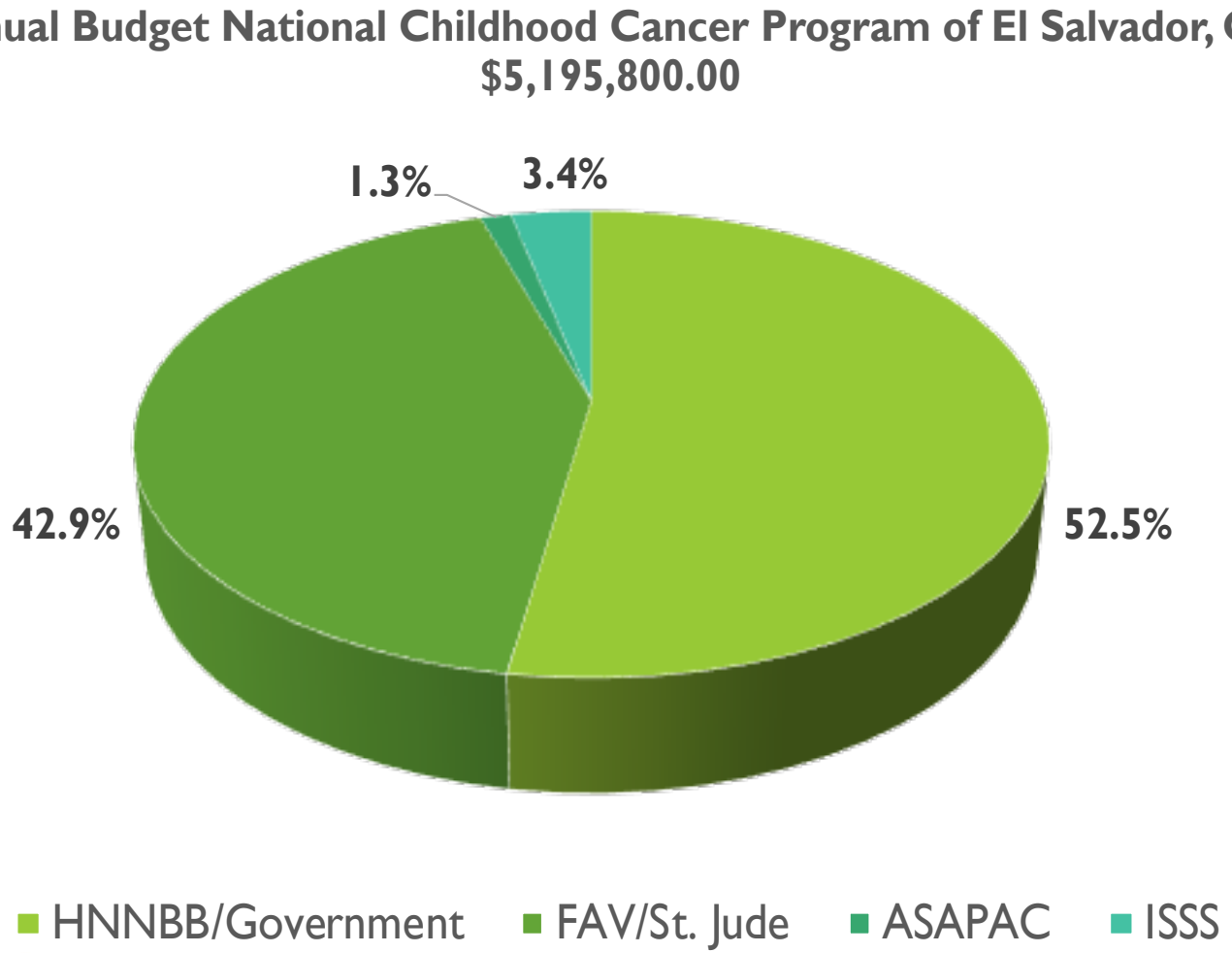
Results



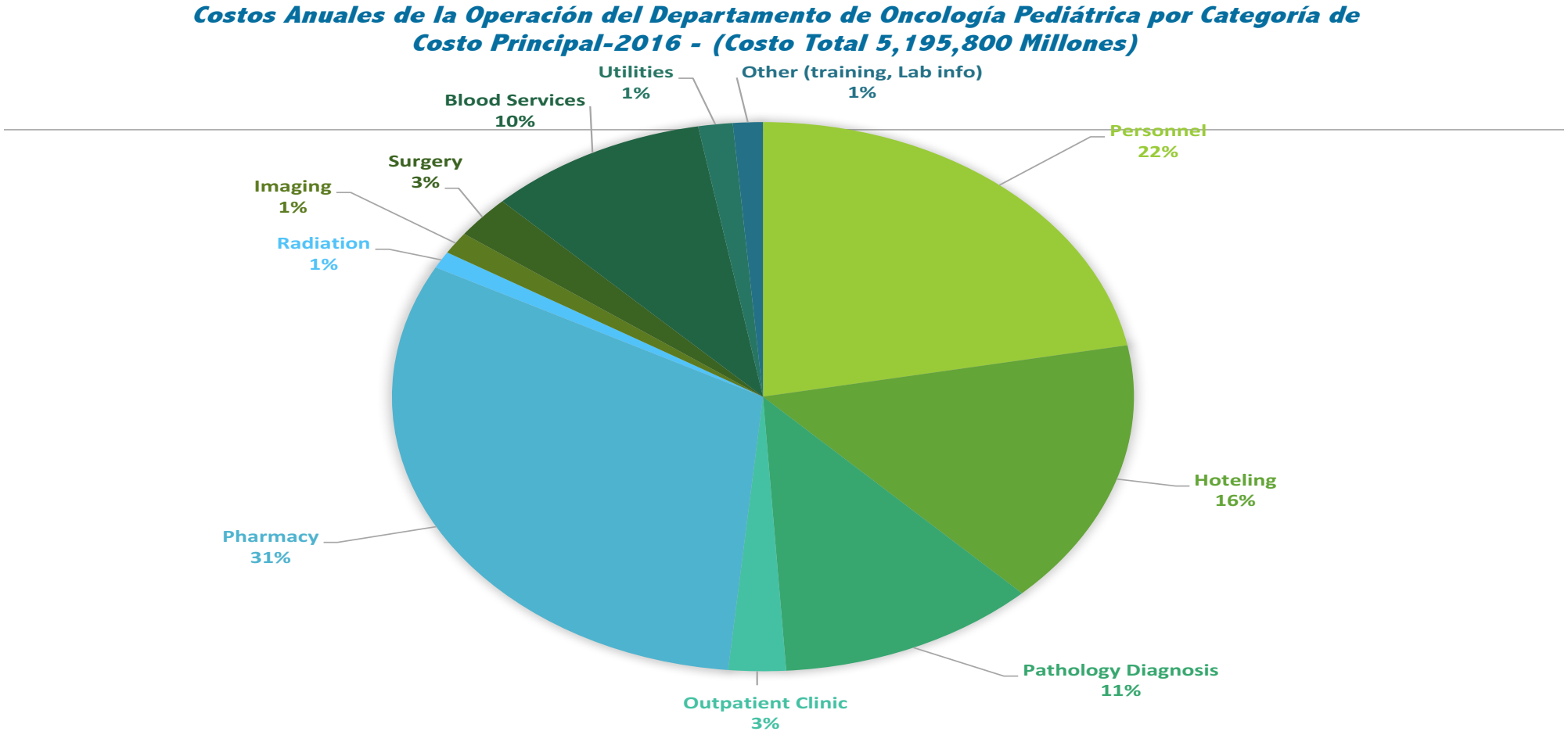
The five-year overall survival for the entire cohort was 48.5% +/- 5.6%.

Of the entire cohort, only one patient abandoned therapy.

Results


Annual Budget National Childhood Cancer Program of El Salvador, C.A
$5,195,800.00
1.3%
3.4%
42.9%
52.5%
HNNBB/Government
FAV/St. Jude
ASAPAC
ISSS

Results


Costos Anuales de la Operación del Departamento de Oncología Pediátrica por Categoría de Costo Principal-2016 - (Costo Total 5,195,800 Millones)
Utilities 1%
Other (training, Lab info) 1%
Blood Services 10%
Personnel 22%
Surgery 3%
Imaging 1%
Radiation 1%
Hoteling 16%
Pharmacy 31%
Pathology Diagnosis 11%
Outpatient Clinic 3%

Results

TABLE 3. Cost per DALY Averted, Base Case and Sensitivity Analysis

Scenarios of LE[a] and Late Effect Morbidity	Discounting		
	0%	3%	6%
Base case (normal LE, no utility adjustment for late effect morbidity)	$878	$1624	$2857
Normal LE plus utility adjustment for late effect morbidity	$936	$1643	$2866
10% reduction in LE plus utility adjustment for late effect morbidity	$1038	$1681	$2885
20% reduction in LE plus utility adjustment for late effect morbidity	$1186	$1747	$2923
30% reduction in LE plus utility adjustment for late effect morbidity	$1382	$1851	$2995

Abbreviations: DALY, disability-adjusted life-year; LE, life expectancy.
[a]Decrements in LE.[15,30]

Acknowledgment

cure all Americas

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IAEA

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SIOP
INTERNATIONAL SOCIETY OF PAEDIATRIC ONCOLOGY

SLAOP
Sociedad Latinoamericana de Oncología Pediátrica

Childhood Cancer International

SECRETARÍA EJECUTIVA COMISCA

Caribbean Public Health Agency
CARPHA

FHACI

FUNDACIÓN AYÚDAME A VIVIR

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OPS
Organización Panamericana de la Salud | Organización Mundial de la Salud

OPS 120

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THANKS.-

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