A model of biobanking cost analysis

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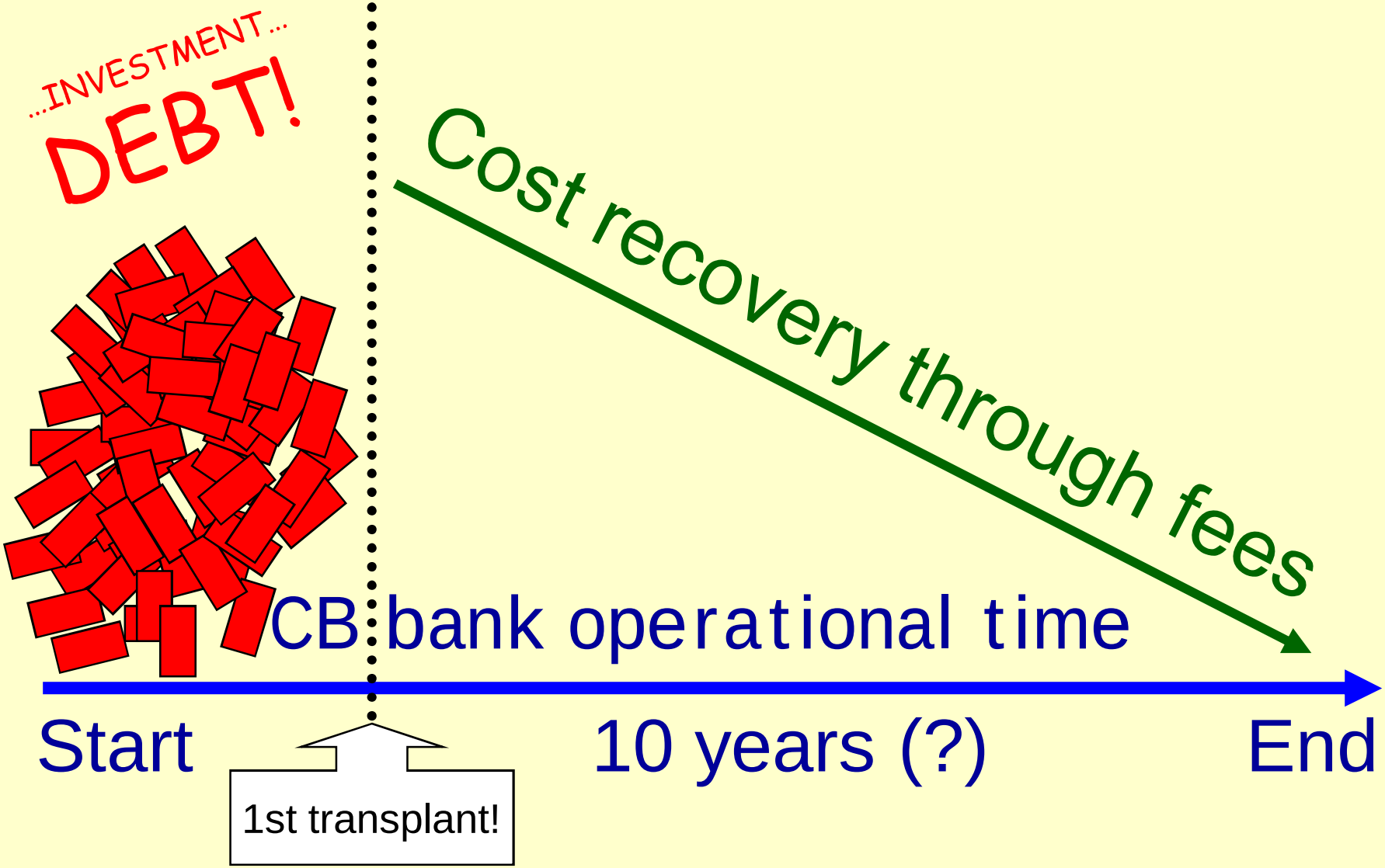
Cord Blood Banking cost model



Cost of umbilical cord blood units released for transplantation

TRANSFUSION 1999;39:645-650.

G. Sirchia, P. Rebulla, S. Tibaldi, and L. Lecchi

TABLE 1. Principal characteristics of Models A, B, and C

Characteristic	INVENTORY →	Model 1,500	5,000	10,000
Number of banks		7	2	1
Target inventory (number of UCB units/bank)		1,500	5,000	10,000
Total frozen inventory implemented in the 1st through 3rd years		10,500	10,000	10,000
Number of UCB units released (and replaced) annually per bank in the 4th through 10th years		40	140	280
Total number of UCB units released (and replaced) annually in the 4th through 10th years		280	280	280
Number of liquid nitrogen tanks per bank		3	10	20
Total number of liquid nitrogen tanks		21	20	20
Number of staff per bank in the 1st through 3rd years		2	6	8
Number of staff per bank In the 4th through 10th years		2	4	6
Total number of staff in the 1st through 3rd years		14	12	8
Total number of staff in the 4th through 10th years		14	8	6

Cost of umbilical cord blood units released for transplantation

G. Sirchia, P. Rebulla, S. Tibaldi, and L. Lecchi

TRANSFUSION 1999;39:645-650.

TABLE 5. Cost (US $) of one UCB unit released for transplantation in the 4th through 10th years in Models A, B, and C

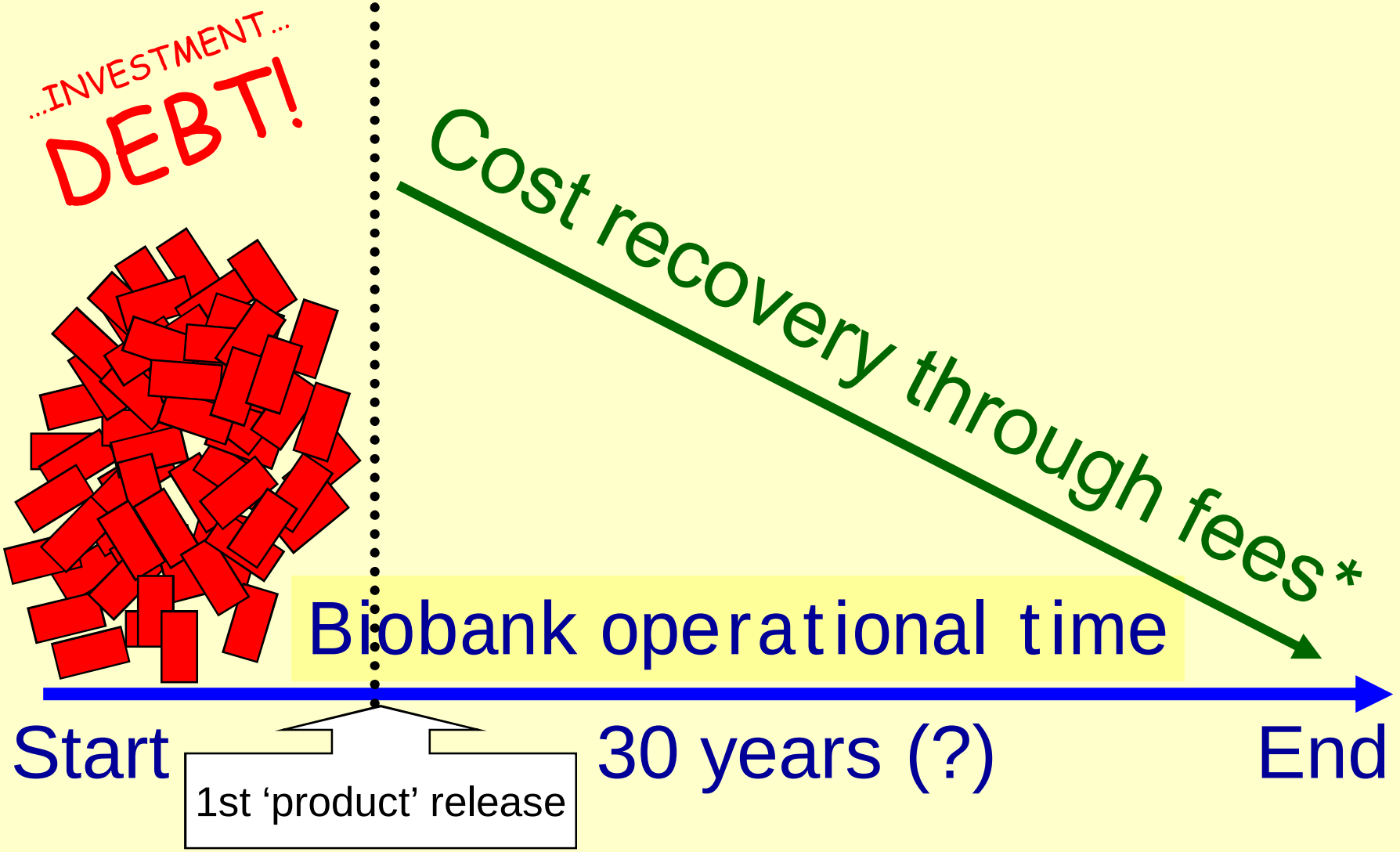
	Model		
INVENTORY →	1,500	5,000	10,000
Total costs in the 1st through 3rd years (see Table 4)	1,462,706	4,656,118	8,644,957
Compound interest in the 1st through 3rd year at annual rate of 6.75%	206,501	657,339	1,220,474
Total investment (principal and interest) at the end of the 3rd year	1,669,207	5,313,457	9,865,431
Amount at the end of the 10th year (value in previous row plus annual compound interest at 6.75% rate)	2,636,850	8,393,679	15,584,442
Fraction of investment to be recovered annually in the 4th through 10th years (value in previous row divided by 7)	376,693	1,199,097	2,226,349
Annual costs in the 4th through 10th years (see Table 4)	225,729	574,147	1,022,206
Total annual costs in the 4th through 10 years	602,422	1,773,244	3,248,555
Number of UCB units released annually per bank in the 4th through 10th years	40	140	280
Cost per UCB unit released	15,061	12,666	11,602

Mean cost and reimbursements (euro) per cord blood bank in Italy and average activity data in 2008

Mean total cost per bank	**580,553**
Staff no. (partially part-time)	***6***
Labor cost 2008	**225,388**
LN cost	**131,912**
Transplant reimbursement fees (euro)	**171,889**
Searches reimbursement fees	**16,971**
Charity funds (euro)	**9,033**
No. of allo unrel units collected in 2008	***610***
No. of allo unrel units banked in 2008	***172***
No. of units distributed for transplant in 2008	***10***

Data kindly contributed from 9 Italian CB banks to CNS survey - 2008

A generic biobank cost model



consider also economic return due to 'impact'

Full cost recovery from users is a barrier to accessibility (and research!)

Ontario Biospecimen Platform:
Key Enabling Features

- **Biosample Costs**
  - 100% cost recovery from users is a barrier to accessibility
  - Rule of thumb: subsidization of 75% of costs (25% issued)
  - Biospecimen minimal cost to end user (commercial procsssing and DNA extraction $100.00CDN per extraction versus ~$10.00 to $20.00CDN not for profit biobank)
- **Access**
  - Bank' model: ownership/custodianship remains with depositor
  - Transparent model and processes
  - Clear access policies easily available on web

Ontario Biospecimen Platform

Slide shown by Cassandra Lo Franco at P3G 2010

A questionnaire on costs by the BBMRI

- Biobanking and
- Bio-
- Molecular Resources
- Research
- Infrastructure

BBMRI

BBMRI
Biobanking and Biomolecular Resources Research Infrastructure

BBMRI Supplementary Questionnaire
Enquiry on biobank costs and funding

This questionnaire is meant to make an inventory of European biobanks for the Biobanking and Biomolecular Resources Research Infrastructure (BBMRI). The aim of this supplement is to have a rough estimation of the structural costs of a biobank in terms of personnel and equipment and an estimation of the funding received to cover these costs. If possible, please complete the questionnaire electronically. Should you have any questions or comments, it will be a pleasure to assist you (*our coordinates are at the end of the form*).

Note: This supplement is confidential and will only be used for planning purposes within BBMRI.

S1. GENERAL INFORMATION

S1.1 Name of the biobank

What is the name of the biobank?

Complete name: _____

Acronym (if applicable): _____

S1.2 Web Site

What is the Web address where information on the biobank is made available?

Web site address _____

S1.3 Contact

Please specify contact details for website users that wish to obtain further information.

Name: _____

Institution: _____

Address: _____

Telephone: _____

Email: _____

Role with respect to the biobank: _____

BBMRI

S2. ESTIMATED COSTS OF THE BIOBANK (EURO)

S2.1 Human Resources

Please specify the costs in € of personnel currently implicated in the collection, preparation and storage of biological material, in research and IT.

Personnel	Total salary (costs per year)	FTE (Full Time Equivalent)	Total number of employees	Training costs
Researchers / MDs	€			€
Engineers / technicians	€			€
Quality managers	€			€
Administration	€			€

S2.2 Cost of equipment at initial investment

Please specify the costs in € of your equipment at initial investment.

Equipment	Total cost	Total number	Year of investment	Maintenance of equipment per year
Nitrogen tanks	€			€
Freezers	€			€
Security devices, robots	€			€
IT equipment	€			€

BBMRI

S2.3 Cost of sample handling per year

Please specify the estimated cost of chemicals and products for sample handling and cell derivative preparation:

Total cost: _____ €

S2.4 Cost for future investment (5 years prospective)

Please specify the estimated cost of future investments within the next five years.

Total cost for:

Personnel (new positions to be created): _____ €

High-cost equipment (to be acquired): _____ €

S2.5 Operating expenses per year

Please specify your operating expenses per year.

Total cost for:

Gases: _____ €

Office cost (administration, electricity, etc.): _____ €

Transport and dissemination (incoming and outbound transport, distribution costs, etc.): _____ €

Other costs (Software, scientific engagement…): _____ €

BBMRI

S2.6 Building costs per year

Please specify your building costs per year.

Size of biobank: _____ m^2

Total cost for: Rent: _____ €

Loans: _____ €

Others: _____ €

S2.7 Transformation costs per year

Please specify your estimated cost of the transformation of the biological resources in the biobank (per year).

Total cost: _____ €

S2.8 Network costs

For dispersed biobanks, please specify the cost of creating and the cost of maintaining this network per year.

☐ Not applicable

Total cost of network creation: _____ €

Total cost of network maintenance: _____ € per year

S2.9 Cost of research programs

Please specify the estimated cost of research programs using collections of the biobank per year.

For case-related studies:	Estimated total cost:	_____ €	Number of research projects:
For population based studies:	Estimated total cost:	_____ €	Number of research projects:
For research on biobank techniques and services:	Estimated total cost:	_____ €	Number of research projects:

BBMRI

S2.10 Estimated impact of ELSI

Please specify the cost of compliance to regulatory aspects. Total cost: _____ €

Please comment briefly on the impact of ELSI in terms of costs and benefits:

_____

ELSI: Ethical, Legal and Social Issues

BBMRI

S3. Funding of structural costs

S3.1 Funding

Please specify how your biobank obtains funding of the structural costs.

✓	Type of funder	Amount	Percentage of total cost
☐	Funding by the host institution	€	%
☐	Direct public funds	€	%
☐	Direct private funds	€	%
☐	Indirect funding by research grants	€	%
☐	Cost recovery	€	%
☐	Other:	€	%

S3.2 Cost recovery

In case of cost recovery, who are the users of the biobank? ☐ Not applicable

yes no

☐ ☐ Public institutions
☐ ☐ Private non-profit institutions
☐ ☐ Private profit institutions

In case of deficit, please comment:

BBMRI

S3.3 Funding scheme

Please describe in a few sentences the funding scheme of the biobank.

S4. COMMENTS

Please feel free to give us any further information.

AUTHORIZATION FROM CONTRIBUTORS

I agree and understand that the information collected in this form will be processed and stored by BBMRI and will be used for planning purposes. At any time, I can ask that my data are updated, corrected or withdrawn by contacting the BBMRI coordinator Kurt Zatloukal (kurt.zatloukal@meduni-graz.at).

I obtained all the authorizations pertaining to sensitive information disclosed in the questionnaire, prior to filling the form.

Yes *No*

☐ ☐

Examples...

S2.1 Human Resources

Please specify the costs in € of personnel currently implicated in the collection, preparation and storage of biological material, in research and IT.

For administration: 3 half-time employee => FTE = 3 * 0,5 = 1,5
Total Salary = FTE * Salary per year : = 1.5*46000 = 69000 €

Personnel	Total salary (costs per year)	FTE (Full Time Equivalent)	Total number of employees	Training costs
Researchers / MDs	140 000 €	2	2	10 000 €
Engineers / technicians	175 000 €	2.5	3	15 000 €
Quality managers	50 000 €	1	1	0 €
Administration	**69 000 €**	**1.5**	**3**	**3000 €**

Training cost per year for all 3 administrative employees.

Examples...

S2.2 Cost of equipment at initial investment

Please specify the costs in € of your equipment at initial investment.

Equipment	Total cost	Total number	Year of investment	Maintenance of equipment per year
Nitrogen tanks	**45 000 €**	**3**	**2001**	**3000 €**
Freezers	80 000 €	8	2002	12 000 €
Security devices, robots	€			€
IT equipment	€			€

Total cost of the 3 tanks = 3*15000 = 45000 € ----- maintenance for 3 tanks = 3000

S2.3 Cost of sample handling per year

Please specify the estimated cost of chemicals and products for sample handling and cell derivative preparation:

Total cost: **10 000 €**

This includes the price of chemical solutions, products ... necessary for sample handling.
It excludes cell derivatives preparation (DNA, RNA, protein...) Cf. S2.7.

S2.4 Cost for future investment (5 years prospective)

Please specify the estimated cost of future investments within the next five years.

Total cost for:

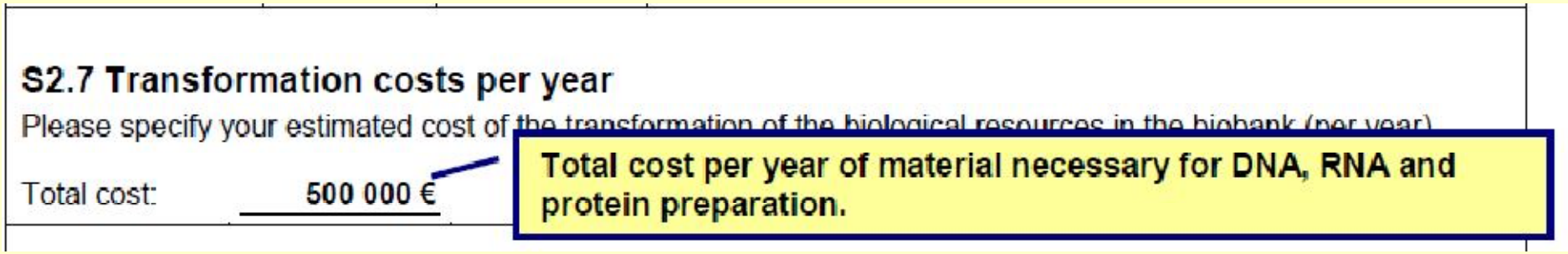
1 administrative employee = 46000 * 5 yrs = 230 000 €

Personnel (new positions to be created): **230 000 €**

High-cost equipment (to be acquired): **30 000 €**

2 nitrogene tanks to be aquiered = 2* 15000 = 30 000 €

Examples...


S2.7 Transformation costs per year
Please specify your estimated cost of the transformation of the biological resources in the biobank (per year)
Total cost:
500 000 €
Total cost per year of material necessary for DNA, RNA and protein preparation.

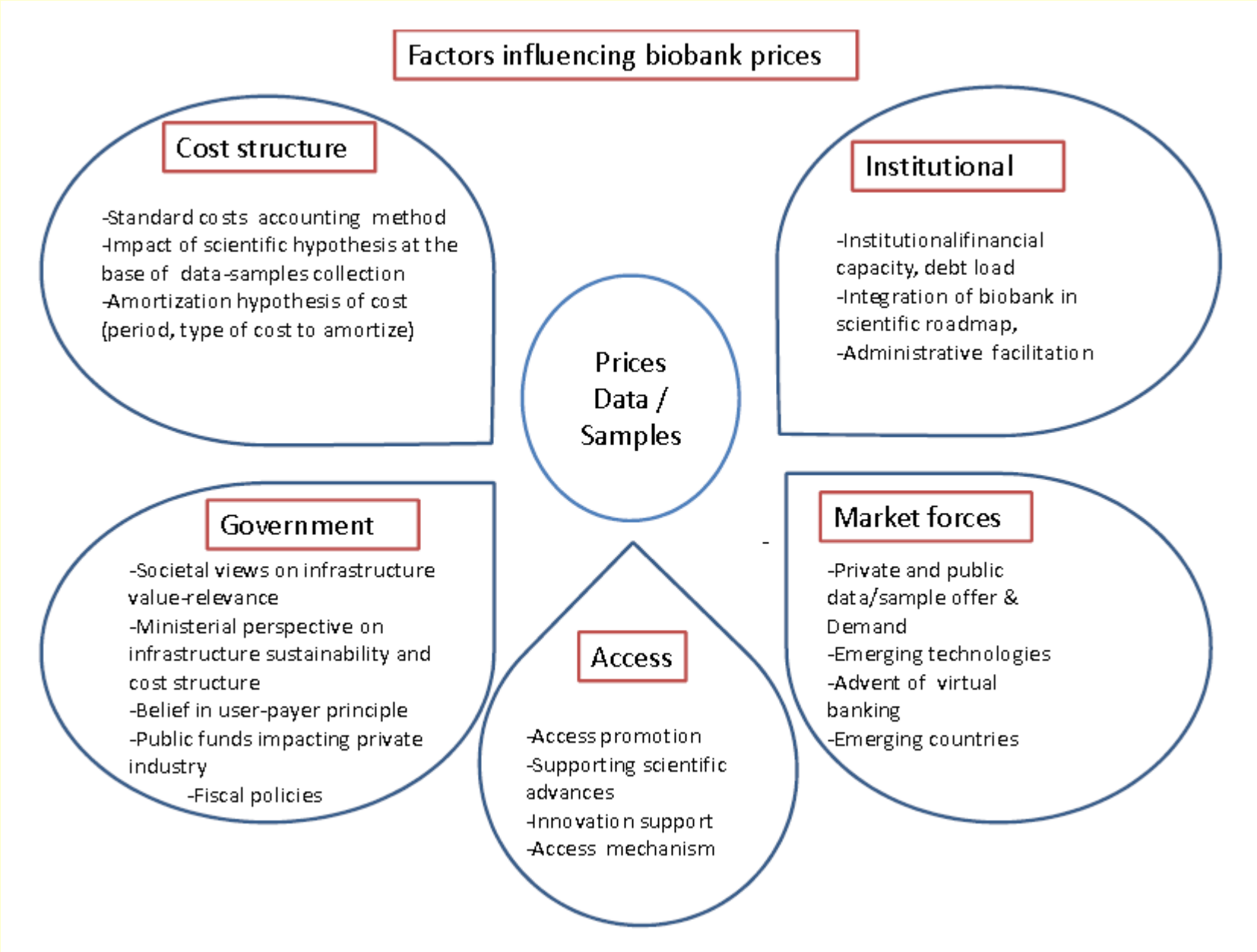
Examples...

S2.9 Cost of research programs

Please specify the estimated cost of research programs using collections of the biobank per year.

For case-related studies:	Estimated total cost:	660 000 €	Number of research projects: **3**
For population based studies:	Estimated total cost:	0 €	Number of research projects: **0**
For research on biobank techniques and services:	Estimated total cost:	100 000 €	Number of research projects: **1**

Total cost of all 3 related case studies



Denis Bilodeau: slide presented at P3G meeting, Montreal, CA, 27 April 2010

- Definition of prices for biobanking ‘products’
- What is ‘a product’?
  - *–whatever you can ‘sell’*
  - *–whatever has a ‘fee’*

COSTS
Labor
Materials
…….
Overhead

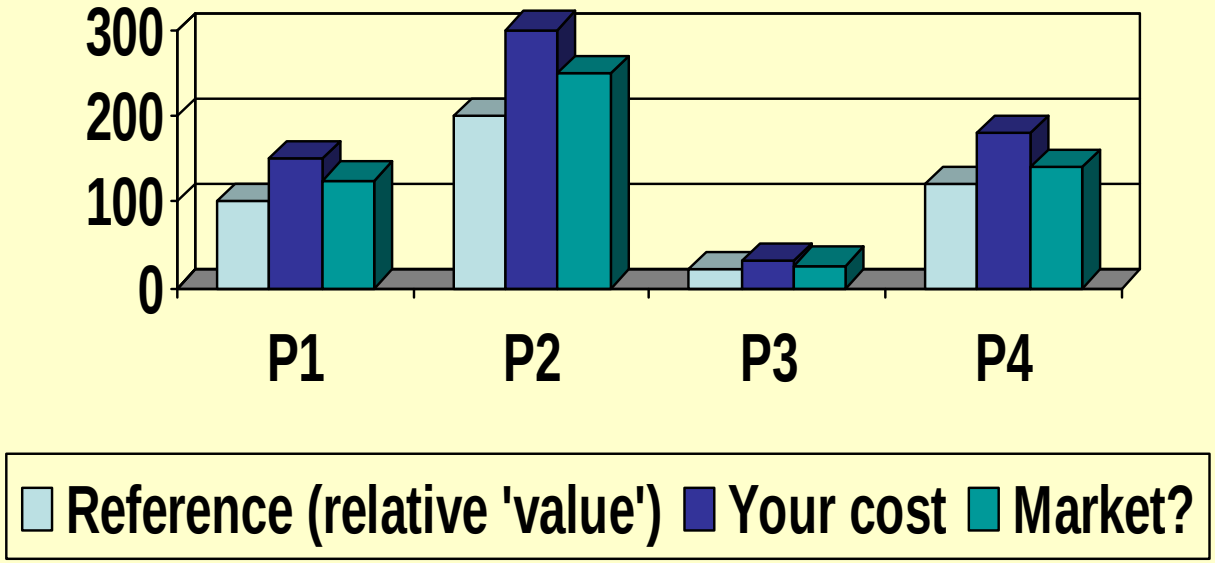
RECOVERY
No. product 1 x fee 1 = subTotal 1
No. product 2 x fee 2 = subTotal 2
No. product Y x fee Y = subTotal 3
TOTAL = ……..

- Problem *(FIAT 500 vs Ferrari P40)*:
  - Bank distributes 3 types of products
    - 1,000 products type A (minimum labor)
    - 3,500 products type B (average labor, medium material cost)
    - 87,000 products type C (high labor, high material cost)
  - Bank costs 1,000,000 euro/year
- How should I define 'prices'?
  - 1,000,000 euro : 91,500 'products' = 10.92 euro/product?
  - Can you imagine 'customers' paying an 'average' price (eg VW Golf) when buying products of different values (FIAT 500 vs Ferrari)?

➔We need to define product 'relative weights'

From cost to prices

- **How should I 'distribute' my costs to different products** (P1, P2, P3, P4)?
- **Identify a rationale:** (a) intrinsic value? (b) market request? (c) procurement difficulty? (d) processing costs? .....



Karolinska Institutet

Postal address	Visiting address	Telephone	Fax	Web
PO Box 281 Karolinska Institutet SE-171 77 Stockholm Org.nummer 202100 2973	Nobels väg 12A	08-524 838 40	08-31 49 75	http://ki.se/kibichbank

New prices of Biobank services from May 20th 2008

KI Biobank provides guidance and tools for study planning as well as procedures for collection of samples in prospective studies. Such tools can also be used for integration of completed sample collections.

To ensure the quality of the samples, the overall logistic setup for each study is documented in a Study Information Plan (SIP). The information in the SIP describes the IT-communication for transferring information between the organisations involved in each study, as well as the flow of biological samples. A quality management system, including a list of instructions, regulates all processes at KI Biobank.

The below prices of performed services for our customers is based on time for sample processing, cost for consumables and an overhead cost covering the basic running costs of the lab. In large studies we negotiate a project-specific price.

Biobank studies

Planning and documentation of Biobank studies	New prices from May 2008
Study logistics documentation	
Referrals	
Extra bar code labels	
Sample processing (all costs in SEK/sample/donor if not otherwise specif	
Registration and processing of serum/plasma/CSF/urine	
Buffy coat	
Consumables for aliquots	
Registration only	
Blood on filter paper	
DNA-extraction (includes quality assurance & quantification using the A260/7 tio)	
Whole blood and buffy coat	
Saliva	
DNA normalisation	

1 Euro = about 10 sek (9.57)

Postal address	Visiting address	Telephone	Fax	Web
PO Box 281 Karolinska Institutet SE-171 77 Stockholm Org.nummer 202100 2973	Nobels väg 12A	08-524 836 40	08-31 49 75	http://ki.se/kibiobank

Sample storage	
DNA	
Other samples in low temperature freezers - 80°C	
year 1	
per year from year 2	
Samples in liquid nitrogen	
per rack (external tenants)	
year 1	
per year from year 2	
Withdrawal of samples	
Transfer of DNA from 96 tubes to a 96-well plate	
Transfer between plates	
Withdrawal of other samples	
External customers	
DNA-extraction from whole blood	
DNA-extraction from saliva	

1 Euro = about 10 sek (9.57)

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Biobank studies

Planning and documentation of Biobank studies	New prices from May 2008
Study logistics documentation	450 SEK/hour
Referrals	10 SEK/referral
Extra bar code labels	0,85 SEK/label
Sample processing (all costs in SEK/sample/donor if not otherwise specified)	
Registration and processing of serum/plasma/CSF/urine	1-2 tubes: 85 SEK
	3-4 tubes: 70 SEK
	> 4 tubes: the price is negotiable
Buffy coat	100 SEK
Consumables for aliquots	5 SEK/aliquot
Registration only	25 SEK
Blood on filter paper	45 SEK
DNA-extraction (includes quality assurance & quantification using the A260/280 ratio)	
Whole blood and buffy coat	150 SEK
Saliva	150 SEK
DNA normalisation	15 SEK

1 Euro = about 10 sek (9.57)

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Sample storage	
DNA	0
Other samples in low temperature freezers - 80°C	
year 1	Included in the cost of sample handling
per year from year 2	1 aliquot: 2 SEK/tube
	2-10 aliquots: 5 SEK/sample donor
	>10 aliquots: the price is negotiable
Samples in liquid nitrogen	
per rack (external tenants)	9000 SEK/year
year 1	0,50 SEK/tube/month
per year from year 2	5 SEK/tube
Withdrawal of samples	
Transfer of DNA from 96 tubes to a 96-well plate	1000 SEK/transfer
Transfer between plates	250 SEK/plate
Withdrawal of other samples	350 SEK/hour
External customers	
DNA-extraction from whole blood	215 SEK/sample/donor
DNA-extraction from saliva	215 SEK/sample/donor

1 Euro = about 10 sek (9.57)

Postal address	Visiting address	Telephone	Fax	Web
PO Box 281 Karolinska Institutet SE-171 77 Stockholm Org.nummer 202100 2973	Nobels väg 12A	08-524 836 40	08-31 49 75	http://ki.se/kibiobank

The Centre for Applied Genomics (TCAG)
Biobanking Facility
Price List

THE HOSPITAL FOR SICK CHILDREN
Molecular Genetics Laboratory
555 University Ave., Roy C. Hill Rm 3-421
Toronto, Ontario
Canada, M5G 1X8
CLIA ID No.: 99D1014032

Lab contact: Carol Ann Ryan
Tel: (416) 813-6364
Fax: (416) 813-7732
E-mail:carolann.ryan@sickkids.ca
www.tcag.ca/biobanking

Extraction - DNA	Source	Amount	Price
DNA	Blood (EDTA) fresh	5-10 ml /single tube	$25
DNA	Blood (EDTA) frozen	5-10 ml /single tube	$25
DNA	Buccal Brushes	2 /single tube	$25
DNA	Cultured cell pellet	5 150 million cells	$25
DNA	Saliva / Oragene	1 kit (~2ml)	$30
DNA	Saliva / Sponges	1 kit (6 sponges)	$30
DNA	Tissue (frozen/fresh)	50-150 mg	$40
DNA	Tissue (paraffin)	20 shavings	$40
Extraction - RNA			
RNA	Blood (EDTA <24h)	3 ml	$40
RNA	Blood (PaxGene <48h)	2.5 ml	$40
RNA	Cultured cell pellet	20-40 million cells	$40
RNA	Tissue (frozen/fresh)	10-50 mg	$40

……

The Centre for Applied Genomics (TCAG)
Biobanking Facility
Price List

Aliquoting DNA/RNA (1-5 aliquots)			$10
Biorepository storage - Yearly			
DNA (4°C)		single tube	$3
RNA (-80°C)		single tube	$10
Tissue (-80°C)		single tube	$10
Blood (-80°C)		single tube	$10
Mutation/Disease specific samples	DNA	5ug/sample	$75
Population Control DNA samples			
Plate (96 samples)		2ug/sample	$650
		per additional ug/sample	$0.25
Custom order (single tube)		2ug/sample	$12
		per additional ug/sample	$0.25
Other			
Whole Genome Amplification	DNA	5-10ul (>50ng/ul)	$50
First strand cDNA synthesis	RNA	2ug (5ul)	$30
DNA fingerprinting/Identity studies	DNA	10ul (>50ng/ul)	$75

Contact laboratory for more information

Prices are subjected to change without prior notice

Biobanking Form: 003
Revision date: Aug-2008

Exercise

- Determine annual cost of TTB *(Top Siena Biobank)*, which collects, processes, stores and distributes products A (serum), B (paraffin block), C (DNA), D (viable cryopreserved lymphocytes) prepared in 2 labs by 3 full time equivalent operators (2 full time and 2 part time)
- Prepare a price list for A, B, C, D products

Steps

- Collect cost of: labor, materials, services, amortization, overhead
  - other costs?
- Determine relative weights of products
- Resolve simple arythmetics:
  - C = total cost
  - N1, N2, N3 … Nn = quantities of each product
  - c1, c2, c3 … cn = (unknown) costs of each product
- **Equation:**
  - $cn = fnC/(N1f1 + N2f2 + N3f3 + \ldots + Nnfn)$