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Supplementary Materials for

Public Biobanks: Calculation and Recovery of Costs

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This PDF file includes:

Supplementary methods

Cost-estimate pricing tool

For each task, two indicators were attached:

- one reflecting the expertise required: A: high; B: medium; C: low (hourly wage in €).
- one reflecting the duration or the complexity of the task
    - 1: < 1 hour/low complexity
    - 2: 1 to 2 hours/medium complexity
    - 3: > 2 hours/high complexity

Then, the two indicators were multiplied to calculate the estimated cost of the task.

<u>Example 1: One expert is required for the task</u>
See Table S2, Liver tumor, Block 4, Biobank index 4.3: “Data generation”

Level of expertise: engineer = B
Medium complexity and time to perform = 2 hours

Calculation: B x 2 = 40 € x 2
Total = 80 €

<u>Example 2: Three experts are required for the task</u>
See Table S2, Liver tumor, Block 4, Biobank index 4.8: “Quality management, certification and accreditation, audit”

Levels of expertise: Senior investigator = A
Engineer = B
Technician = C
High complexity and time to perform = 3 hours

Calculation: (A x 3) + (B x 3) + (C x 3) = (80 € x 3) + (40 € x 3) + (30€ x 3)
Total = 450 €

Table S1: Expert group.

BBMRI: EU-US working group

Gabriele Anton	Helmholtz Center Munich, Germany
Joelle Benessiano	Bichat Hospital Biobank, Paris, France
Rachel Benkeser	National Cancer Institute/NIH, Rockville MD, USA.
Anna Beskow	Uppsala Biobank, Sweden.
Pascal Boucher	National Cancer Institute, Paris, France
Anne Cambon-Thomsen	Inserm, Toulouse, France
Bruno Clément	Inserm, Rennes, France.
Georges Dagher	Inserm, Paris, France
Aurélie Delavaud	Inserm, Paris, France
Robert Hewitt	ESBB Executive officer
Paul Hofman	Nice Tumor Biobank, Nice, France
Anu Jalanko	National Public Health Institute, Helsinki, Finland
Lukasz Kozera	Wroclaw Research Centre EIT+ Biobank, Wroclaw, Poland
Patrick Larcier	TcLand Expression, Nantes, France
Alain Latil	Laboratoires Pierre Fabre, France
Carine Malcus	Institut Mérieux, BioMérieux, Lyon, France
Andres Metspalu	Estonian Genome Centre, University of Tartu, Estonia
Barbara Parodi	IRCCS, AOU San Martino-IST, Genoa, Italy
Markus Pasterk	BBMRI-ERIC, Graz, Austria; IPRI, Lyon, France
Heli Salminen	Turku University, Finland
Sherry Sawyer	National Cancer Institute/NIH, Rockville MD, USA
Jim Vaught	National Cancer Institute/NIH, Rockville MD, USA
Martin Yuille	UK DNA Biobank, Manchester, UK
Kurt Zatloukal	Medical University Graz, Austria

Working group of the French "BIOBANQUES" infrastructure

Caroline Barau	PRB, AP-HP Henri Mondor, Créteil
Annick Barthelaix	CRB-CHU, Angers
Evelyne Begaud	Institut Pasteur, Paris
Joelle Benessiano	APHP Bichat, Paris
Nelly Besnard	CHU, Rennes
Chantal Bizet	Institut Pasteur, Paris
Gaëtane Blaizot	CRB-CHU, Caen
Oksana Boirau	CRB-LRB, AP-HP Lariboisière, Paris
Mireille Caralp	INSERM TRANSFERT, Paris
Gauthier Chassang	Inserm BIOBANQUES US013, Toulouse
Alain Chaunavel	CHU, Limoges
Bruno Clément	CHU, Inserm U991, Réseau CRBs Foie, Rennes
Laurent Coulbault	Service de biochimie, CHU, Caen

Françoise Crevel	INSERM TRANSFERT, Paris
Georges Dagher	Inserm BIOBANQUES US013, Paris
Maha David	Inserm BIOBANQUES US013, Paris
Mireille Desille	CRB Santé, CHU, Rennes
Sébastien Dubleumortier	Institut Gustave Roussy, Villejuif
Nathalie Dufay	Hospices Civil, NEUROBIOTEC, Lyon
Anne Favel	CIRM-CF, Inra, Marseille
Françoise Galateau-Salle	Mesobank, TCBN, CHU, Caen
Thibaut Godjo	Inserm UMR U1122; IGE -PCV and CRB IGE-PCV, Nancy
Delphine Haye	AP-HP Henri Mondor, Paris
Yves-Edouard Herpe	Biobanque de Picardie, Amiens
Paul Hofman	Hôpital Pasteur, Nice
Raquel Hurtado-Ortiz	Institut Pasteur, Paris
Tiphaine de Jouvencel	Inserm BIOBANQUES US013, Paris
Simon Lefranc	Institut Gustave Roussy, Villejuif
Laurence Liang	Inserm BIOBANQUES US013, Paris
Philippe Lorimier	CHU, Grenoble
Carine Malcus	Institut Mérieux, BioMérieux, Lyon, France
Nicolas Morzol	CHU, Montpellier
Pascal Mossuz	CHU, Grenoble
Yves Rayer	CHU, Rennes
Florence Valence	CIRM, Inra, Rennes
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Table S2. Calculation grid for biobanks.

Example of cost calculation from task complexity and expertise required in French biobanks

Blocks	Biobank Index	Tasks	Liver tumor[1]				Lung tumor[2]				Biological fluids[3]		
			Level of expertise	Complexity and/or time to perform	Tissue fragment	DNA cells	Level of expertise	Complexity and/or time to perform	Tissue fragment	DNA cells	Level of expertise	Complexity and/or time to perform	DNA Cells supernatants
Block 1 Pre-banking data	1.1	Clinical data from GP	A C	2 2	220	220	A C	2 2	220	220	A C	2 2	220
	1.2	Questionnaire and survey	A C	1 1	110	110	A C	1 1	110	110	A C	1 1	110
	1.3	Imaging	A C	1 1	110	110	A C	1 1	110	110	-	-	-
	1.4	Histopathology and cytology	A C	1 1	110	110	A B	1 1	120	120	-	-	-
	1.5	Serological tests	B C	1 1	70	70	B C	1 1	70	70	B C	1 1	70
	1.6	Communication, information to donors and informed consent	A B	1 1	120	120	A B	1 1	120	120	A B	1 1	120
	1.7	Recording, processing and data management (e.g. LIMS)	A B C	2 2 1	270	270	A B C	2 1 1	230	230	B C	1 2	100
	1.8	Storage and updating clinical data	C	1	30	30	B	1	40	40	C	1	30
	1.9	Data release	C	1	30	30	B	1	40	40	C	1	30
	1.10	Monitoring, audit	B	1	40	40	B	1	40	40	B	1	40
		Sub-total block 1			**1 110**	**1 110**			**1 100**	**1 100**			**720**
Block 2 Biological specimens	2.1	Collect, transport, reception	A B C	1 1 1	150	150	A B C	1 1 1	150	150	B C	1 1	70
	2.2	Accrual	C	1	30	30	C	1	30	30	C	1	30
	2.3	Processing of samples	C	1/2	30	60	C/B	2	60	80	C	1	30
	2.4	Storage	C	1	30	30	C	1	30	30	C	1	30
	2.5	Distribution and transport	C	1	30	30	C	1	30	30	C	1	30
	2.6	Despatch management	C	1	30	30	C	1	30	30	C	1	30
	2.7	Quality control	C	1	30	60	B	1	40	40	C	1	30
	2.8	Monitoring/Audit	B	1	40	40	B	1	40	40	B	1	40
		Sub-total block 2			**370**	**430**			**410**	**430**			**290**
Block 3 Data related to biological specimens	3.1	Recording, storage and data management	B C	1 1	70	70	B C	1 1	70	70	B C	1 1	70
	3.2	Data analysis and linking	C	1	30	30	B	1	40	40	C	1	30
	3.3	Quality control and computer system engineering	C	1	30	30	B	1	40	40	C	1	30
	3.4	Despatch management	B C	1 1	70	70	B	1	40	40	B C	1 1	70
	3.5	Monitoring, audit	B	1	40	40	B	1	40	40	B	1	40

		Sub-total block 3			**240**	**240**			**230**	**230**			**240**
Block 4 Expertise	**4.1**	Project management, advisory, study design	A	3	240	240	A	3	240	240	A	3	240
	4.2	Recruitment	A	3	240	240	A	3	240	240	A	3	240
	4.3	Data generation	B	2	80	80	-	-	0	0	B	2	80
	4.4	Data analysis and statistics	A B	1 1	120	80	-	-	0	0	A B	1 1	120
	4.5	SOPs and support	B	2	80	120	B	2	80	80	B	2	80
	4.6	Processing	C	1	30	60	C	1/2	30	60	C	1	30
	4.7	Storage	C	1	30	30	C	1	30	30	C	1	30
	4.8	Quality management, certification and accreditation, audit	A B C	3 3 3	450	450	A B C	3 3 3	450	450	A B C	3 3 3	450
	4.9	Education and training	B C	2 2	140	140	A B C	1 1 2	180	180	B C	2 2	140
	4.10	Communication and public engagement	A	2	160	160	A	2	160	160	A	2	160
		Sub-total block 4			**1 570**	**1 600**			**1 530**	**1 560**			**1 570**
Block 5 Administration and management	**5.1**	Financial and administrative management	A B	3 3	360	360	A B	3 3	360	360	A B	3 3	360
	5.2	Scientific management and strategy	A	3	240	240	A	3	240	240	A	3	240
	5.3	Loads and running charges	values		200	200	values		200	200	values		200
	5.4	Maintenance of equipment and consumables	values		200	300	values		200	300	values		200
	5.5	Internal R&D	A B	2 3	280	280	A B	2 3	280	280	A B	2 3	280
	5.6	Investments	values		200	300	values		200	300	values		200
	5.7	Ethics and regulatory issues	A B	1	120	120	A B	1 1	120	120	A B	1 1	120
	5.8	Partnership development, business development, contracts, networking (flat rate contribution)	A B	2 1	200	200	A	3	240	240	A B	2 1	200
		Sub-total block 5			**1 800**	**2 000**			**1 840**	**2 040**			**1 800**

Cost calculation was performed independently in the following French biobanks (1): Rennes (M. Desille, N. Besnard, and B. Turlin); (2): Nice (M. K Washetine, V Hofman, E Selva, and C Bonnetaud); (3) Lyon (N. Dufay; M.T. Zabot), Créteil (C. Barau; D. Haye), Nancy (S. Visvikis-Siest). For each task, two indicators were attached, one reflecting the required expertise (A: high; B: medium; C: low) and the other the duration and/or the complexity of the task (1: < 1h/low complexity; 2: 1h-2h/medium complexity; 3: >2h/high complexity). The cost per hour was 80 € for A level, 40 € for B and 30 € for C level. For blocks 2 and 3 the cost was calculated per sample. For blocks 1, 4 and 5 the cost was calculated per patient's file. An average of 5 tissue samples were prepared for each patient; thus, the cost for each block was divided by 5 to reach an average cost per sample. For biological fluids, an average of 10 aliquots were prepared for each patient; thus the final cost was divided by 10 to reach an average cost per sample. The cost estimation was checked by evaluating the annual cost of each blocks divided by the amount of collected samples per year.

Final estimation of the cost per sample

Liver carcinoma:	**whole tissue**	**(1110/5) + 370 + 240 + (1570/5) + (1800/5)**	**= 1506 €**
Liver carcinoma:	**DNA, cells**	**(1110/5) + 430 + 240 + (1600/5) + (2000/5)**	**= 1612 €**
Lung carcinoma:	**whole tissue**	**(1100/5) + 410 + 230 + (1530/5) + (1840/5)**	**= 1534 €**
Lung carcinoma:	**DNA, cells**	**(1100/5) + 430 + 230 + (1560/5) + (2040/5)**	**= 1580 €**

Biological fluids:	**DNA, cells, supernatants**	**720 + 290 + 240 + 1570 + 1800 = 4620 € / 10**	**= 462 €**

Example of cost calculation from task complexity and expertise required in UK, Polish, Austrian, Italian and German biobanks.

Blocks	Biobank Index	Tasks	Manchester biobank UK [1]			Wroclaw biobank Poland [2]			Genome Austria Tissue Bank Austria [3]				CRB-IST, Genoa Italy [4]			KORA Biobank, Helmholtz Center Munich Germany [5]		
			Level of expertise	Complexity and/or time to perform	DNA from blood	Level of expertise	Complexity and/or time to perform	blood	Level of expertise	Complexity and/or time to perform	FFPE	Cryo-preserved tissue	Level of expertise	Complexity and/or time to perform	Tumor tissue	Level of expertise	Complexity and/or time to perform	DNA from blood
Block 1 Pre-banking data	1.1	Clinical data from GP	A C	2 2	190	A C	0.75 0.25	18	A	1-6	60-360	60-360	A C	2 2	200	A C	0.2 0.1	19
	1.2	Questionnaire and survey	A C	1 1	95											A B	0.1 0.3	20
	1.3	Imaging	A C	1 1	95								A C	1 1	100			
	1.4	Histopathology and cytology	A C	1 1	95				A B	0.5 0.5-2	Covered by clinical routine	250	A C	1 1	100	B C	3 1	150
	1.5	Serological tests	B C	1 1	70	B C	0.25 0.25	3.75					B C	1 1	55			
	1.6	Communication, information to donors and informed consent	A B	1 1	105	A B	0.25 0.25	7.75	B	2	95	95	A B	1 1	115	A B	0.1 0.3	20
	1.7	Recording, processing and data management (e.g. LIMS)	A B C	2 2 1	225				A	0.1/0.5	6	30	A B C	1 2 1	170	A B	0.3 0.3	36
	1.8	Storage and updating clinical data	C	1	15				B	0.5	12	12	C	1	20	B	0.1	4
	1.9	Data release	C	1	15	C	0.75	4.5					C	1	20	B	0.1	4
	1.10	Monitoring, audit	B	1	25								B	1	35	B	0.1	4
		Sub-total block1			**930**			**34**			**173 473**	**447 747**			**815**			**257** per proband
Block 2 Biological specimens	2.1	Collect, transport, reception	B C	1 1	40	B	0.25	2.25	B	1	Covered by clinical routine	36	B C	2 1	90	B C	0.3 0.3	21
	2.2	Accrual							A	0.5		30	C	1	20			
	2.3	Processing of samples	B	1	25	B	1	9	A	0.1/0.5	6	30	B	1	35	B	0.2	8
	2.4	Storage	-	-	-	B	0.15	1.35	C	0.3	7.2	7.2	C	1	20			
	2.5	Distribution and transport	C	1	15				C	0.2/0.3	4.8	7.2	C	1	20	C	0.1	3
	2.6	Despatch management	C	1	15				B	0.2/0.3	7.2	10.8	C	1	20	C	0.1	3
	2.7	Quality control	C	1	15				A/B	0.5	25	25	B	1	35	B	0.1	4
	2.8	Monitoring/Audit	B	1	25								B	1	35	B	0.1	4
	2.9	Others							courier		7	250						
		Sub-total block 2			**135**			**12.6**			**57.2**	**396.2**			**275**			**43** per proband
Block 3 Data related to biological specimens	3.1	Recording, storage and data management	C	1	15	C	0.15	0.9	B	0.5	12	12	B C	1 1	55	A B	0.3 0.3	36
	3.2	Data analysis and linking											B	1	35			
	3.3	Quality control and computer system engineering											C	1	20	A	0.1	8
	3.4	Despatch management	C	1	15	B			B	0.3	7.2	7.2	C	1	20	C	0.1	3
	3.5	Monitoring, audit	B	1	25	B	0.25	2.25					B	1	35	B	0.1	4
		Sub-total block 3			**55**			**3.15**			**19.2**	**19.2**			**165**			**51** per proband

Block 4 Expertise	**4.1**	Project management, advisory, study design	A	3	240	A	0.5	11	B	2	48	48	A	2	160	A	2	160
	4.2	Recruitment	A	3	240	A	1	22					B	2	70	C	2	60
	4.3	Data generation	B	2	25	B	0.5	4.5					B	2	70			
	4.4	Data analysis and statistics	B	3	120	B	0.5	4.5					B	2	70	A	1	80
	4.5	SOPs and support	B	2	50	B	0.25	2.25					B	2	70	A	1	80
	4.6	Processing	C	1	15								C	1	20	B	2	80
	4.7	Storage	C	1	15								C	1	20	C	1	30
	4.8	Quality management, certification and accreditation, audit	A B C	3 3 3	335								A B C	2 3 3	325			
	4.9	Education and training	B C	2 2	80								B	2	70			
	4.10	Communication and public engagement	A	2	160	A	0.1	2.2					B	2	70	A	1	80
		Sub-total block 4			**1 280**			**46.45**			**48**	**48**			**945**			**570** per proband
Block 5 Administration and management	**5.1**	Financial and administrative management	A B	3 3	315	A B	3 3	93	C	3	72	72	A B	2 2	230	A	1	80
	5.2	Scientific management and strategy	A	3	240	A	1	22					A	3	240	A	1	80
	5.3	Loads and running charges	values		200	values		10					values		200	values		10
	5.4	Maintenance of equipment and consumables	values		200	values		10			7	105	values		200	values		5
	5.5	Internal R&D	A B	2 3	235								A B	1 2	150			
	5.6	Investments	values		1000*	values		3					values		300	values		25
	5.7	Ethics and regulatory issues	A	1	80	A	0.25	5.5	A C	6	252	252	A	2	160	A	1	80
	5.8	Partnership development, business development, contracts, networking	A	3	240								A	3	240			
		Sub-total block 5			**2 510**			**143.5**			**331**	**429**			**1720**			**280** per proband

For each task, two indicators were attached, one reflecting the required expertise (A: high; B: medium; C: low) and the other the duration and/or the complexity of the task (1: < 1h/low complexity; 2: 1h-2h/medium complexity; 3: >2h/high complexity).

(1)Manchester biobank (M. Yuille): The cost per hour was 80 € for A level, 25 € for B and 15 € for C level; (*) depreciation is 20% of capital investment per year. For each task, the cost was calculated for 10 patients. Thus, the cost average was 490 € / sample.

(2)Wroclaw biobank (L. Kozera): The cost per hour was 22 € for A level, 9 € for B and 6 € for C level. For each task, the cost was calculated per patient. Thus, the cost average was 239 € / sample.

(3)Genome Austria Tissue Bank (K. Zatloukal): The cost per hour was 60 € for A level, 36 € for B and 24 € for C level. For each task, the cost was calculated per sample in batches of 10 samples. Thus, the cost average was 628 € and 1639 € per FFPE and cryopreserved tissue sample, respectively.

(4)CRB-IST Genoa (B. Parodi): The cost per hour was 80 € for A level, 35 € for B and 20 € for C level. For blocks 2 and 3, the cost was calculated per sample. For blocks 1, 4 and 5, the cost was calculated per patient file with an average of 4 samples prepared for each patient; thus the cost for each sample was divided by four to reach an average cost per sample. The estimation of the cost per lung carcinoma tissue block was: (815/4) + 275 + 165 + (945/4) + (1720/4) = 1310 € per sample.

(5)Helmholtz Center Munich (G. Anton): Data are from KORA, a population-based cohort; a survey was performed in average every 4 years, with around 2500 probands. The cost per hour was 80 € for A level, 40 € for B and 30 € for C level. One proband provides in average 4 samples (DNA, plasma, urine, serum). The estimation of the total cost was 1201/4 = 30.25 € per sample.

Example of cost calculation from task complexity and expertise required for collections of microorganisms.

Blocks	Biobank Index	Tasks	Class I & II			Class II (MOT) & III			GMO & plasmids		
			Level of expertise	Complexity and/or time to perform	Cost	Level of expertise	Complexity and/or time to perform	Cost	Level of expertise	Complexity and/or time to perform	Cost
Block 1 Pre-banking data	1.1	Clinical data from GP									
	1.2	Questionnaire and survey									
	1.3	Imaging									
	1.4	Histopathology and cytology									
	1.5	Serological tests									
	1.6	Communication, information to donors and informed consent									
	1.7	Recording, processing and data management (e.g. LIMS)									
	1.8	Storage and updating clinical data									
	1.9	Data release									
	1.10	Monitoring, audit									
		Sub-total block1									
Block 2 Biological specimens	2.1	Collect, transport, reception	A B	1 1	85	A B	1 3	141	A B	1 3	141
	2.2	Accrual	A	1	57	A	1	57	A	1	57
	2.3	Processing of samples	B C	5 2	140	B C	8 1	224	B C	7 2	196
	2.4	Storage	B	4	112	B	6	168	B	4	112
	2.5	Distribution and transport	C	1	21	C	1	21	C	1	21
	2.6	Despatch management	C	1	21	C	1	21	C	1	21
	2.7	Quality control	B	1	28	B	1	28	B	1	28
	2.8	Monitoring/Audit	B	2	56	B	2	56	B	2	56
		Sub-total block 2			**520**			**716**			**575**
Block 3 Data related to biological specimens	3.1	Recording, storage and data management	B	2	56	B	2	56	B	2	56
	3.2	Data analysis and linking									
	3.3	Quality control and computer system engineering									
	3.4	Despatch management									
	3.5	Monitoring, audit									
		Sub-total block 3			**56**			**56**			**56**
4 Ex p	4.1	Project management,	A	1	57	A	1	57	A	1	57

		advisory, study design									
	4.2	Recruitment									
	4.3	Data generation	B	2	56	B	2	56	B	2	56
	4.4	Data analysis and statistics	A	2	114	A	2	114	A	2	114
	4.5	SOPs and support	A	1	57	A	1	57	A	1	57
	4.6	Processing									
	4.7	Storage									
	4.8	Quality management, certification and accreditation, audit	A	1	57	A	1	57	A	1	57
	4.9	Education and training	A	1	57	A	1	57	A	1	57
	4.10	Communication and public engagement	A	2	114	A	2	114	A	2	114
		Sub-total block 4			**512**			**512**			**512**
Block 5 Administration and management	**5.1**	Financial and administrative management	A	2	114	A	2	114	A	2	114
	5.2	Scientific management and strategy	A	2	114	A	2	114	A	2	114
	5.3	Loads and running charges									
	5.4	Maintenance of equipment and consumables									
	5.5	Internal R&D	A	2	114	A	2	114	A	2	114
	5.6	Investments									
	5.7	Ethics and regulatory issues	A	2	114	A	2	114	A	2	114
	5.8	Partnership development, business development, contracts, networking (flat rate contribution)									
		Sub-total block 5			**456**			**456**			**456**

Cost calculation was performed at Institut Pasteur (C. Bizet, E. Bégaud and R. Hurtado-Ortiz) and INRA biological resources centers (A. Favel and F. Valence).
For each task, two indicators were attached, one reflecting the required expertise (A: high; B: medium; C: low) and the other the duration and/or the complexity of the task (1: < 1h/low complexity; 2: 1h-2h/medium complexity; 3: >2h/high complexity). *MOT: Toxin-producing microorganisms. GMO: Genetically Modified Organisms.*
The cost per hour was 57 € for A level, 28 € for B and 21 € for C level. The cost was calculated for 1 strain. The estimation of the total cost was: for Class I & class II microorganisms: 1544 €; Class II (MOT) and class III microorganisms: 1740 €; and GMO and plasmids: 1599 €.