

Entering the Era of the Large-Scale Biobanking Sciences – Experiences from the launch of **BBMRI.se**

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BBMRI.se

**The BioBanking & Molecular Resource
Infrastructure of Sweden**

The setting for biobanking in Sweden

- A. Samples available and identifiable on PIN
- B. Accessory information retrievable
- C. Complete case ascertainment:
 - Medical Birth Registry; Malformation Registry; Cancer Registry; Patient Registry
- D. Socialised medicine with laboratories serving defined catchment area populations
- E. Broad consent to biobanking for research purposes is administered throughout the health care system (About 3 million consents/year collected when samples for clinical diagnosis are taken)

Respecting Integrity:
*UNIFORM INFORMATION AND
CONSENT PROCEDURE FOR
ROUTINE CLINICAL CARE: Agreed for
all 25 counties in Sweden*

Leaflet with written information is distributed (mandatory)

Physician/nurse asks if the patient has read and gives his/her consent.

If the patient says No- Form asking for the specific type of No is handed out. All “No-forms” forwarded to the Regional Biobank Registry.

It is not possible to send a sample for pathological or microbiological analysis without certifying either of three alternatives: Patient gave consent/Patient is not conscious/Patient said No and a No-form was sent to the Regional Biobank Registry.

Retraction of consent

Can be done at any time, also for all previously stored samples (even for 100 year old samples).

Send a “No-Form” specifying the type of No to the Regional Biobank Registry (RBR).

RBR will locate where samples are stored and ensure that they are destroyed/not used for purposes for which the consent has been retracted.

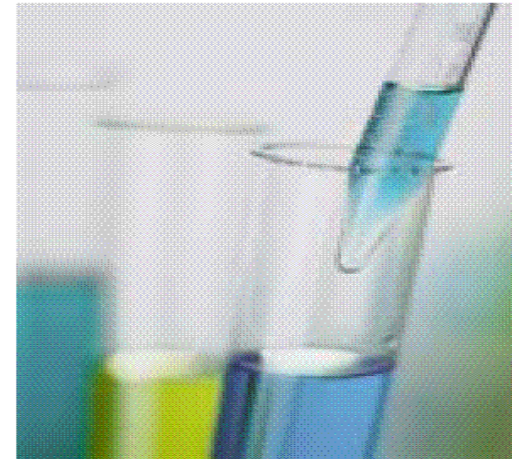
Clearly defined and simple possibility to retract consent addresses some of the ethical problems in longitudinal studies

Broad consent to research is administrated throughout the health- care system

Only 0.2% of patients decline storage and use for "medical research".

Till dig som lämnar prov

Som patient behöver du ofta lämna prover, till exempel blodprov eller vävnadsprov. Prover tas också vid de hälsokontroller som landstinget erbjuder. Vissa prover sparas rutinmässigt i en så kallad biobank. En biobank är en samling prover – blodprov, cellprov eller andra vävnadsprover – som tas i vården och sparas längre tid än två månader och som kan härledas till en viss person.



Mer information

Vill du ha mer information kan du fråga din läkare eller vända dig till Regionalt biobanksregister,

Sweden is well prepared for building a national biobanking infrastructure

- **Established national biobanking network**
 - Large National Biobanking Program in 2002-2007: All medical universities in Sweden network of population cohorts & disease-based biobanks. Goal of joint standards of quality, documentation and ethics.
- **Established international coordination roles**
 - FP6 IP "Molecular Tools" program; high-throughput molecular analysis techniques (Ulf Landegren - Uppsala)
 - Informatics WP5 of FP6 Coordinated Action PHOEBE on harmonization of biobanks (Jan-Eric Litton - KI)
 - FP6 Network of Excellence CCPRB and FP7 EURO COURSE on quality standards for biobanks (Joakim Dillner - KI)
 - **FP7 BBMRI** (WP4 Landegren – Uppsala; WP5 Litton – KI)

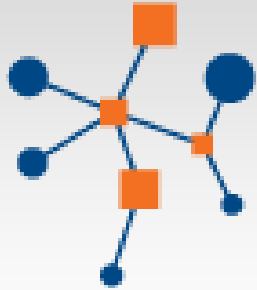
The Swedish National Biobanking Program

Joint national programme of the medical universities in Sweden (2002-2007). Total budget 6M Euro. Comprehensive participation of major Swedish biobanks (www.biobanks.se)

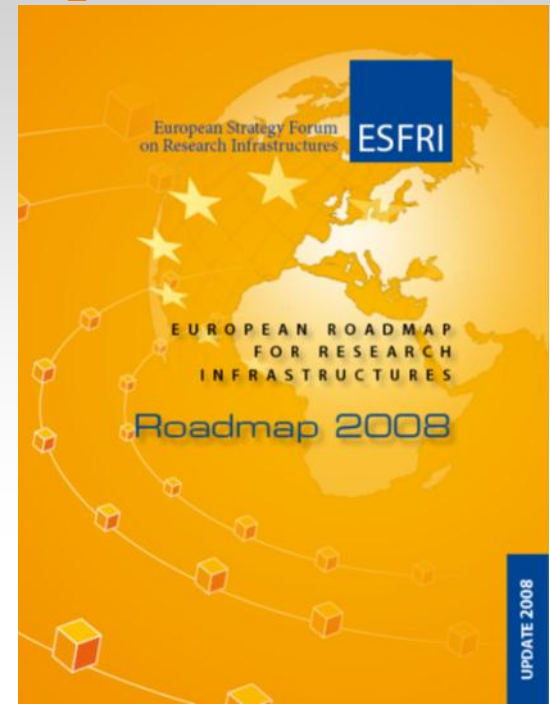
AIM: Promote Accessibility and Quality: All participating biobanks committed themselves to work using **common quality standards** and to provide **access to samples** after prioritisation on scientific grounds only.

Method: Strategic Initiatives – initiated and supported pilot **excellence projects at each university**. E.g. KI Biobank; Uppsala fresh frozen tissue biobank; TwinGene Biobank; Malmö Biobank Consortium; Swedish Multigeneration Register expansion.

ESFRI established the European BBMRI in 2008



BBMRI
Biobanking and
Biomolecular
Resources Research
Infrastructure



- ❖ **Network structure: International state-of-the-art centers cooperate with national centers, who in turn cooperate with regional centers**
- ❖ **International comparability, context and perspective**

2009: Swedish Science Council call for applications for “infrastructures outlined in the ESFRI roadmap”

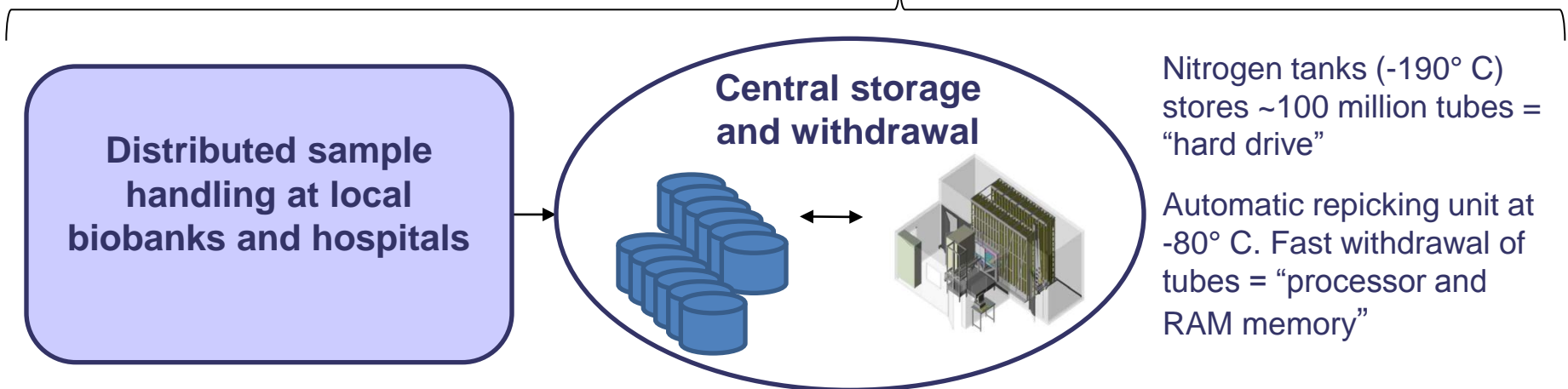
- *Building on experiences from BBMRI-PP and from the Swedish National Biobanking Program.**
- *Positioned as the Swedish hub of BBMRI – BBMRI.se**
- *Funded by the Swedish Research Council- 15 M euro for the first 5 years + regional co-financing.**
- *Structure similar as BBMRI – but in addition also operation of a national, large-scale biobanking facility**



BBMRI.SE – a unified Swedish infrastructure for biobanking

WP1 – Project management

WP2 & WP3	WP4	WP5	WP6	WP7	WP8
Collection: Input	Analysis: Output	IT	Physical Facility	Ethics	Financing
Coordinate & harmonize sample / data collection from populations & hospitals	Optimize interface to analysis resources	Enforce a unifying national IT platform	Create an efficient national, large scale sample handling facility	Provide national expertise and forum to address ethical issues	Ensure long-term financing



The Science of Biobanking - optimal storage and use of valuable samples

Biobank deposit

- **Input**
 - Ensure valuable biological samples optimally stored
- Ethics
- Quality control
- Sample handling and processing
- Data gathering
- Links to registers

Storage

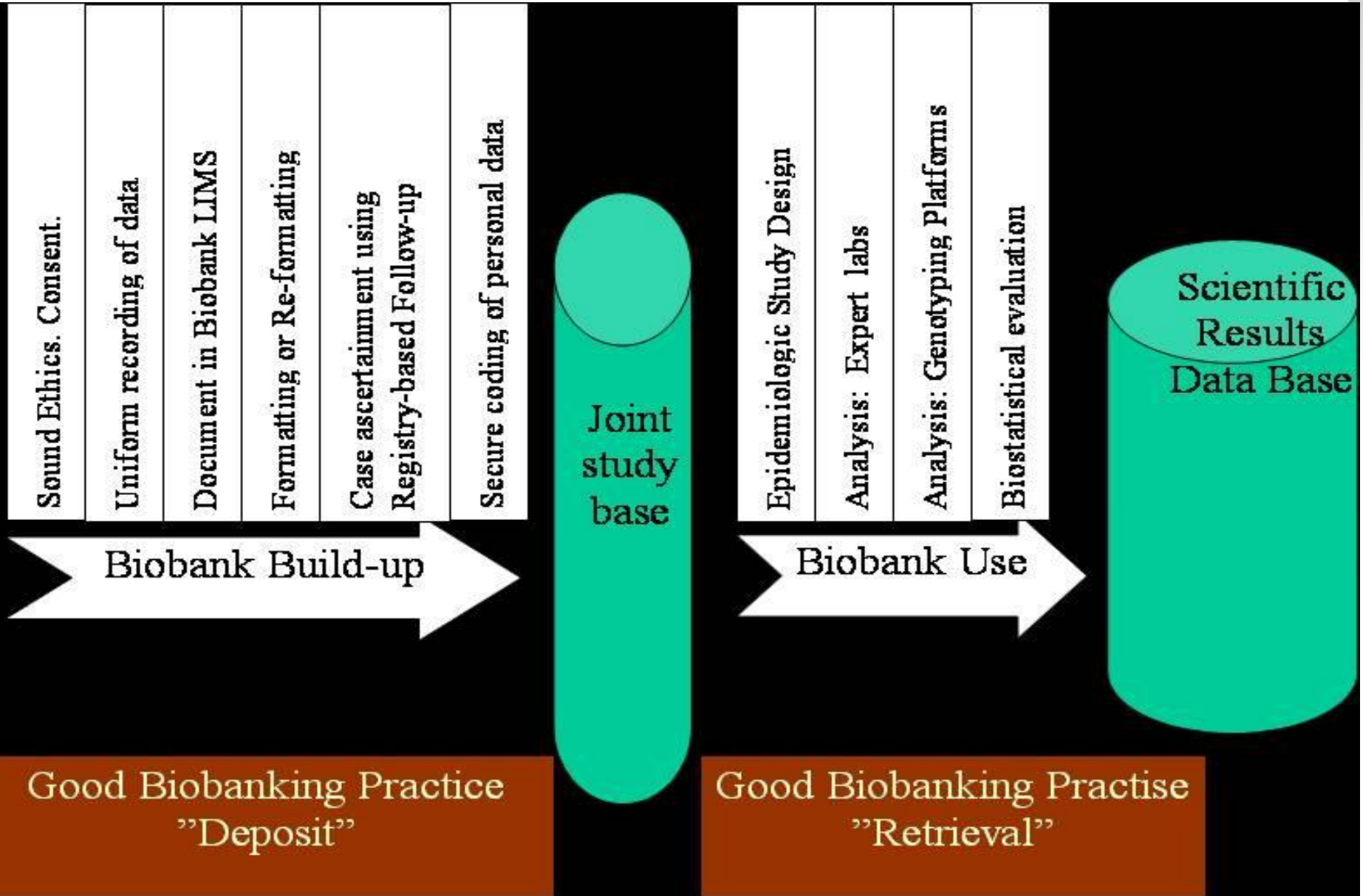


IT
Database

Biobank use

- **Output**
 - Ensure biological samples are optimally used
- Ethics
- Platforms for high throughput sample analysis
- Data handling
- Biostatistics

The Biobanking Research Process



BBMRI.SE: Eight work packages - similar structure as EU BBMRI

WP1 – Project management and coordination

Manages and coordinates BBMRI.SE through a decentralized organization – cooperating with EU BBMRI

WP2 – Swedish federation of population-based biobanks

Goal: coordinate and integrate existing and planned population cohorts in Sweden resulting in the world's largest federated database

Uses local research coordinators together with the LifeGene infrastructure to achieve goal

WP3 – Clinical biobanks

Goal: facilitate nation-wide consolidation, standardization and collection

Use project leaders to consolidate biobanks in clinical specialties: Clinical Microbiology, Pathology, Cytology, Chemistry/Pharmacology & national disease-specific biobanks

Example of a BBMRI.se project: Clinical Cytology Biobanking

Women of Sweden Cohort

The cervical screening program targets all women in Sweden between 23-60 years of age (~650.000 samples/year). Cervical cellular samples collected in a liquid preservative, ensuring stability of large amounts of high quality DNA, RNA, proteins and intact cells - even after many years of storage.

Systematic biobanking improves both clinical diagnostics for the participating women, evaluation of new screening tests and research on cervical cancer and other diseases that affect women.

BBMRI.se provides development of standardised automation solution, IT & QC system. National tenders for equipment and supplies. Ready-to-use, nationally standardised biobanking solution offered to collaborating cytology laboratories.

BBMRI.SE: Eight work packages - similar structure as EU BBMRI

WP4 – Biomolecular resources

Goal: ensure access to analysis expertise, quality analysis technologies and reagents for optimal use of sample collections

Reports on available Swedish analysis resources and protocols

Provides national expertise on analysis prior to sample collection

Builds high throughput analysis platforms optimised for biobank-based research (low-cost, High Throughput analysis of large batches of samples at low samples consumption. QC&QA, formatting is docked in with BBMRI)

WP5 – Databases & Biocomputing

Goal: enforce a unifying national IT-platform for the biobanking infrastructure, harmonize data and provide efficient, standardised case ascertainment by linkages to national health data registries.

Creates one national IT hub for population-based biobanks and one national hub for clinical biobanks

BBMRI.SE: Eight work packages - similar structure as EU BBMRI

WP6 – Physical Facility: Advancing large-scale technologies for sample pre-processing, storage and retrieval

Goal: provide a national large-scale, cost-efficient and high-quality biobanking infrastructure for sample deposit, storage and withdrawal

Build an automatic large-scale biobank facility and national centre of excellence to the mutual benefit of Sweden / Nordic countries / Europe.
Will drive down biobanking cost by a factor 5-20 *and* increase quality.

WP7 – Ethical and legal issues

Goal: promote coherent good ethics in biobanking & bb-based research

Provides national/EU expertise and forum to address ethical issues

WP8 – Funding and financing

Goal: Active stakeholder dialogue to ensure long-term sustainability of the Swedish biobanking infrastructure

Creating a BBMRI.se national network

- National profiling of competences, services and biobanking R&D

- Biobanking legal and ethical issues: Uppsala
- Sample management: Stockholm
- Molecular analyses platform: Uppsala
- Genealogy linkages: Umeå

- Regional BBMRI.se satellites improve nationwide utilization of BBMRI.se services

- **Deposit services: National biobanking projects**
- **Use services: National biobank-based studies**
- Improve interaction and collaboration with regional activities in the biobanking area.

BBMRI.SE has a detailed organization, implementation plan and budget

	2009	2010	2011	2012	2013	2014	Budget
WP1 - project management		Setup org	Manage and coordinate BBMRI.SE				7,2
WP2 - population biobanks		Hire 6 people	Local university coordinators enforces national platform				19,8
WP3 - clinical biobanks		Hire 5 people	One hospital PL in each biobanking clinical specialty drives national harmonization				16,2
WP4 – biomolecular resources		Hire 5 people	Develop and maintain analysis resource database. Provide national expertise				18,8
WP5 – databases & biocomputing		Hire 2 people	Develop IT hub for population and clinical bb				7,1
WP6 – national facility for large-scale biobanking		Build facility	Serve customers, increase degree of automatization and nationally spread fruit of developments				92,9
			▲ Bring in customers		Site is self-financing	▲	
WP7 – Ethical and legal issues		Hire 2 people	Provide national/EU expertise and forum to address ethical issues on biobanking				5,5
WP8 – funding and financing		Constant dialogue with potential financiers to fund successful parts of the Swedish biobanking infrastructure					
Total budget							178,1

How can we help?

Input customer – New collection project

- 1) Large-scale services, subsidised by the Swedish Research Council, results in:
 - 1) Low costs to customer
 - 2) Standardised & internationally recognized format & quality.
- 2) National critical mass of competences & experiences in biobanking sciences assist with:
 - Study design for enrollment (WP2 or WP3)
 - Data collection tools (WP5; Lifegene)
 - Advise on optimising collection to suit analysis needs (WP4)
 - Study design for sample handling (WP6)
 - Ethical and legal issues (WP7)

The BBMRI Customer

- 1) Large study of national significance
- 2) PI agrees to make sample accessible
- 3) Uses standardised national format for sample handling and data management – provided by BBMRI.se

Requests: info@bbmri.se

How can we help?

Output customer – National biobank-based study

National critical mass of competences & experiences in biobanking sciences assist with:

- Study coordination services (WP2)
- Contacts with biobanks all over the country (one WP2/WP3 contact person per university city)
- Data collection tools (WP5; Lifegene)
- Advise on optimal analyses (WP4)
- Services with sample handling (WP6)
- Ethical and legal issues (WP7)

Key BBMRI.se Concepts

A large national/international organisation to manage biospecimens in Sweden.

- BBMRI.se unified formats in a) physical biobanking and b) data management enables valid use in nationwide & international studies.**
- Very large tenders will drive down purchasing cost of equipment and supplies, will make biobanking less expensive and further enlarge operations**

Customers will want to use BBMRI.se to ensure valid use, low cost and efficient management.

Input customers mostly in academia and health care - open access requirement

Key BBMRI.se Concepts

Leadership in the R&D in biobanking technology

- 1. Large scale of operations required to make automation cost-efficient**
- 2. 10% of budget of facility reserved for R&D in biobanking technology**
- 3. International networking ensures a) state-of-the-art benchmarking and b) possible launch of even larger scale collaborative projects with other large-scale biobanking platforms**

Biomedical industry in biobanking technology, automation technology, IT solutions et c can use BBMRI.se to develop/evaluate their products.

Key BBMRI.se Concepts

Biospecimen open access

All sample owners who deposit samples in BBMRI.se make commitment to make samples available at nominal fee for both academic and commercial customers.

Stakeholder dialogue

Stakeholder dialogue on possible future uses of samples - to ensure that samples will be collected that are optimally useful for later stakeholder use.

Key BBMRI.se Concepts

Expansion of services to encompass a "one-stop service" in biobank-based research.

- **BBMRI.se will not only provide sample management services, but for example also:**
- **Data collection and management services & Cohort follow-up services (i.e. registry linkages);**
- **Ethical and legal advice**
- **Tailored high-throughput sample analyses services**
- **Biostatistical analyses**
- **"Match-making" to available samples, phenotypical data and research analysis data**

BBMRI.SE will implement a much needed national, unifying biobanking infrastructure

- **National large scale automated facility with cost efficient sample deposit, storage and withdrawal**
- Nation-wide consolidation & standardization of collection of biospecimens from patient cohorts
- **Integrated with parallel international activities - makes resources internationally useful**
- Availability of comprehensive and high quality archives of patient biospecimens will make Sweden an attractive partner for efficient clinical research.

Registry infrastructure in the Nordic countries

All individuals are assigned, at birth, a unique Personal Identification Number (PIN)

The PIN is used to establish identity wherever required (tax collection; conscription; receipt of social benefits; admission to hospitals etc) and all health data registers and biobanks use the PIN

It is mandatory to report health events, in- and outpatient visits etc to nationwide registers

Population-based biobanking systems, storing e.g. all cervical smears and all serum samples from serological screening during Maternity Care.

Essentially similar in all Nordic countries, although some country-specific differences exist.



BBMRI Nordic -

Nordic Council of Ministers- funded Collaborative Network between the National Biobanking Infrastructures in the Nordic Countries, chaired by BBMRI.se

- Similar health care and health data registry infrastructure creates a Nordic competitive advantage for biobanking.
- A Nordic collaboration, that - within the European network - specifically works to exploit the Nordic advantages: enriching biobanks with registry data on exposures, phenotypes and endpoints + health-care-derived specimens
- Pilot joint Nordic biobank-based study demonstrating the advantages of a common infrastructure for biobanks:
Identifies all specimens and all data available for joint studies on a pilot disease.

The Era of the Large-Scale Biobanking Sciences

- The input scientist: Freely chooses among many biobanking facilities, also in other countries, to find the most cost-effective & high quality services.
- The output scientist: Has easy access to massive numbers of well-characterised, ready-to-use samples and rich accessory data from many countries – assembled by BBMRI networks.

