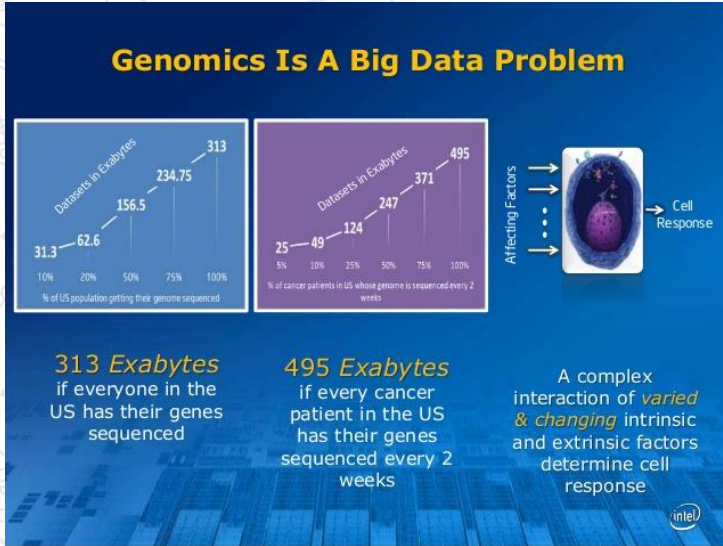


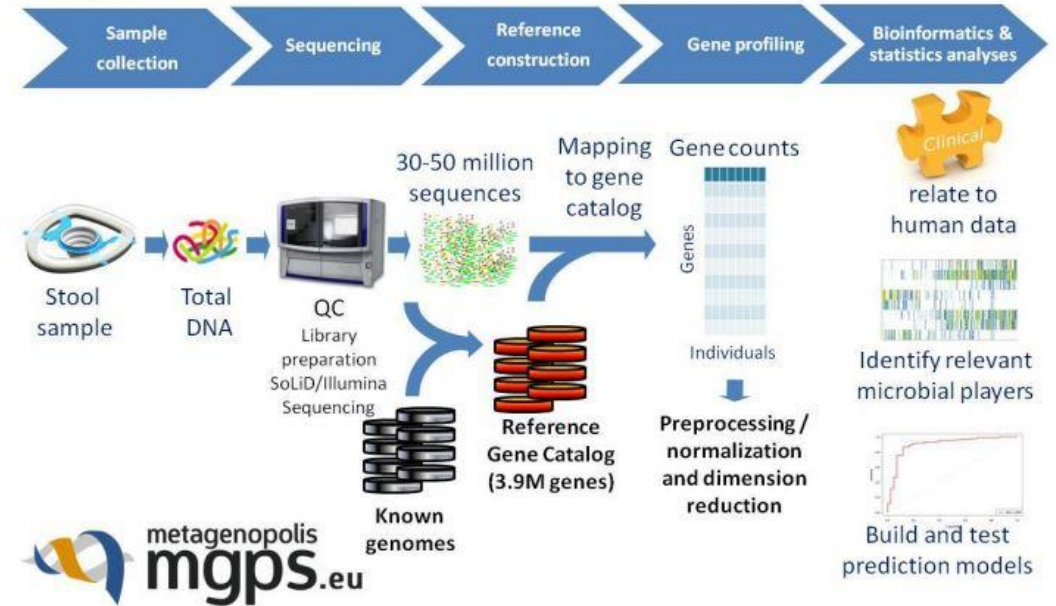
The background features a complex network diagram with various nodes and connecting lines. A prominent, thick black line forms a large, irregular loop on the left side. Other thinner lines and nodes are scattered across the upper and right portions of the image, creating a sense of interconnectedness and data flow.

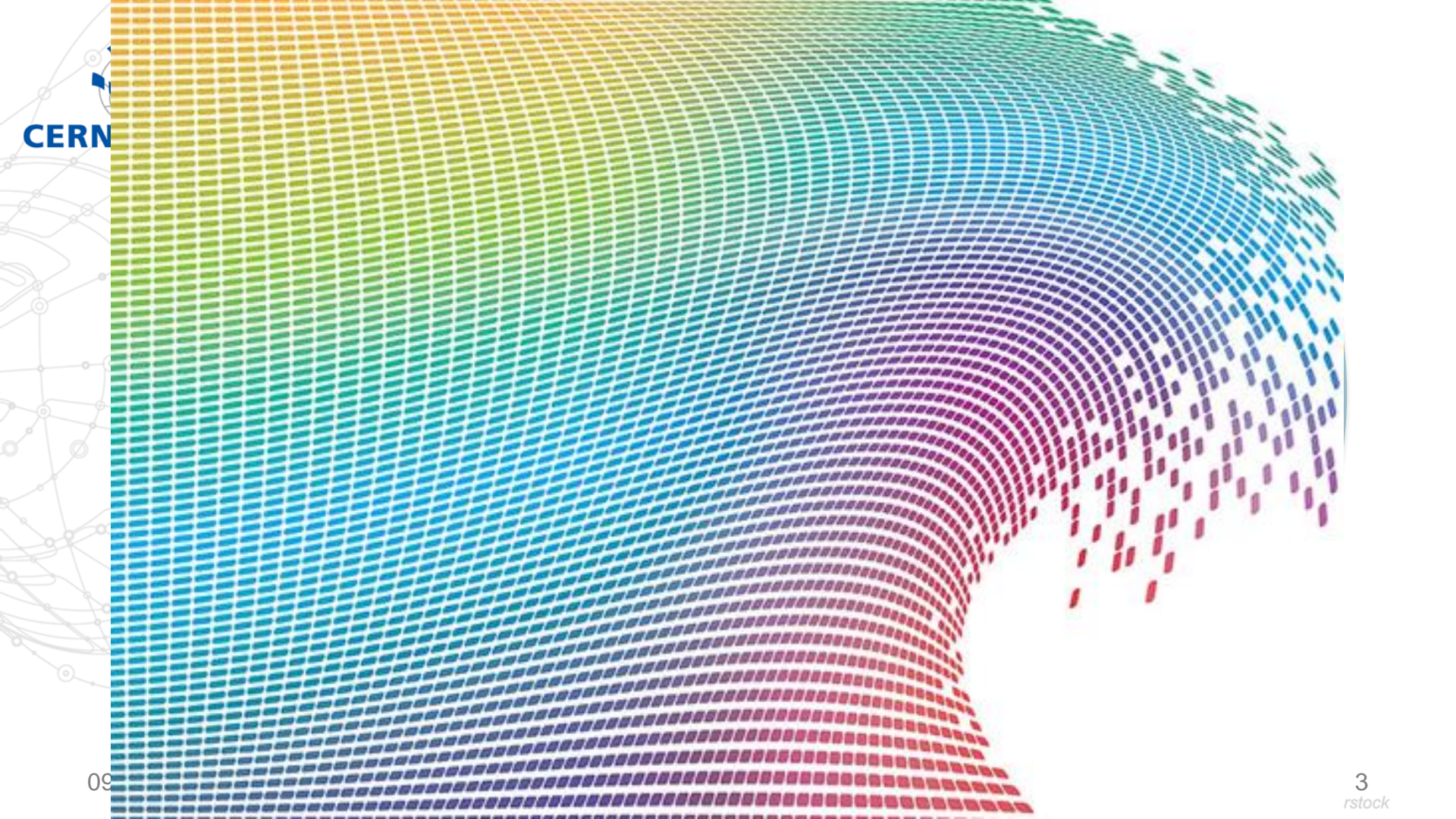
# Genomics bigdata geneROOT

*Background image: Shutterstock*



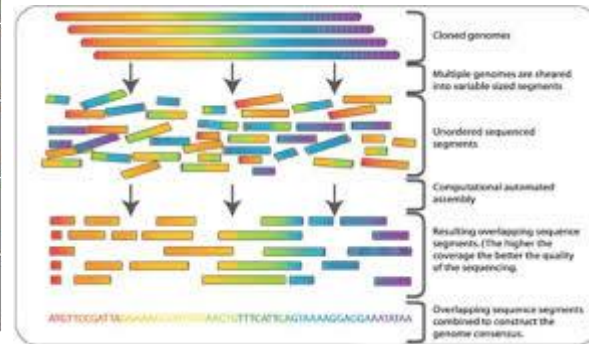
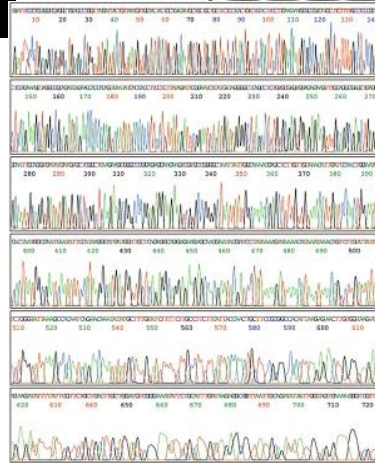
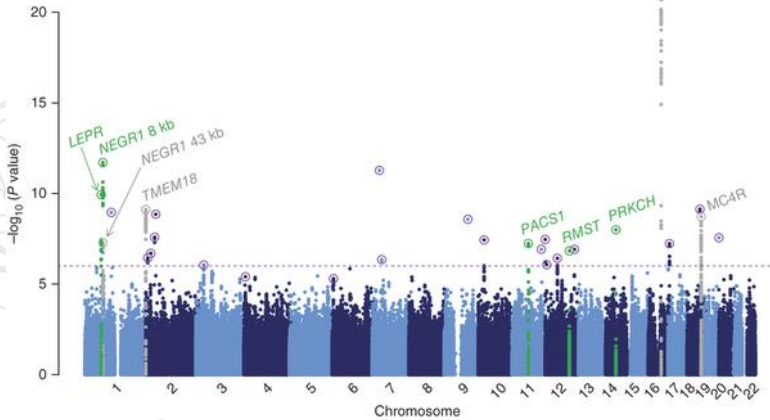
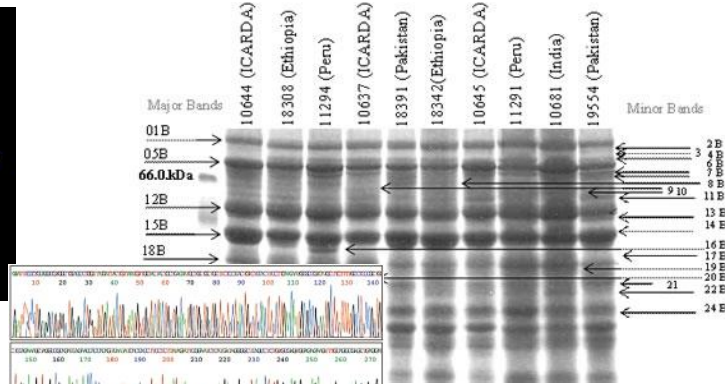
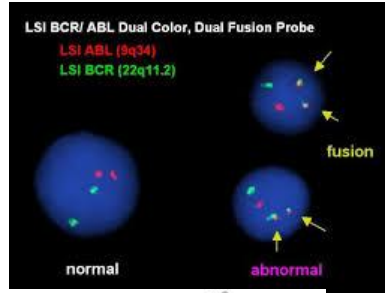
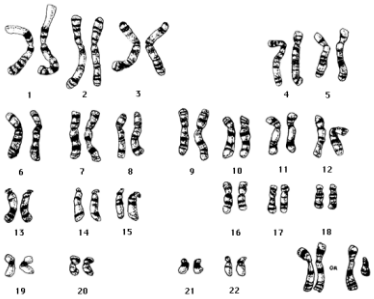
## Quantitative metagenomics



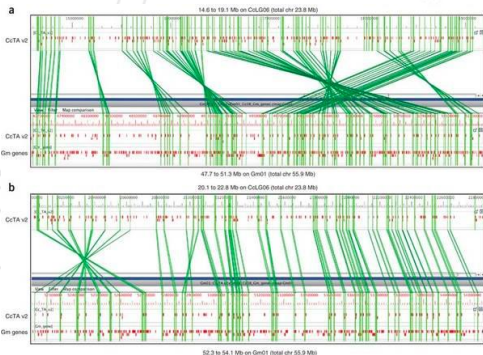
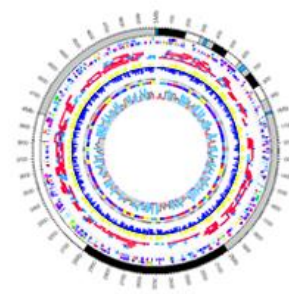
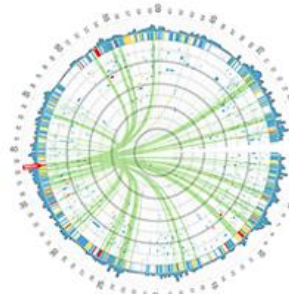
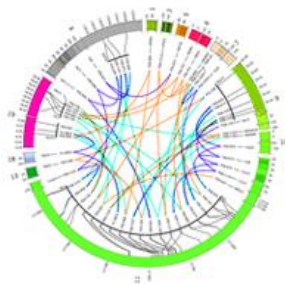


CERN

# The problem



# Everyday practice



**Global Alliance**  
for Genomics & Health

# What are we doing?

- **Profiling existing bigdata solutions (Hadoop, SPARK, ROOT, MicrosoftR)**
- **Rethinking the UX of statistical suite thought for large collaborations in complex data governance scenarios**
- **Inviting the problem holding community to take ownership early on.**

**Thank you for your attention**

**Any questions?**



# Large scale data workflows for medical applications

> **9<sup>th</sup> Dec 2016**

CERN openlab  
Technical Workshop 2016

Marco Manca, MD

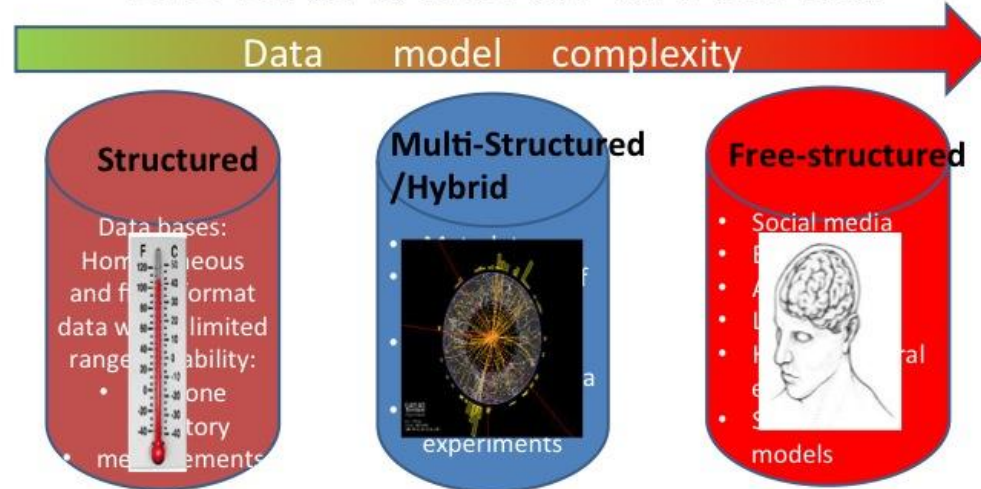




The background features a complex network diagram with various nodes and connecting lines. A prominent, thick black line forms a large, irregular loop on the left side, while other thinner lines and nodes are scattered across the upper and right portions of the frame. The overall aesthetic is technical and digital.

# **Epidemiological Study - Medical Use case**

## BIG DATA: not all the same:



- Data model fixed
- Small parametric space to represent the data
- Prevalent deduction based analysis

- Data model evolving with data
- Variable parametric space
- Data driven induction and deduction

- Data model evolving with experience
- morphing parametric space
- Analogy based induction and deduction

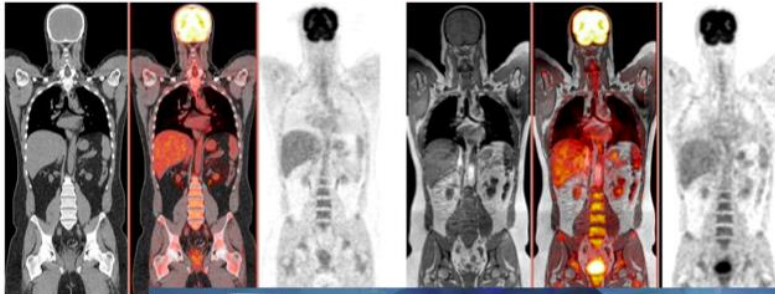
# Medical bigdata

## Augmented vision in the operating room

PET-CT

Credits: PINLab HUG

PET-MR

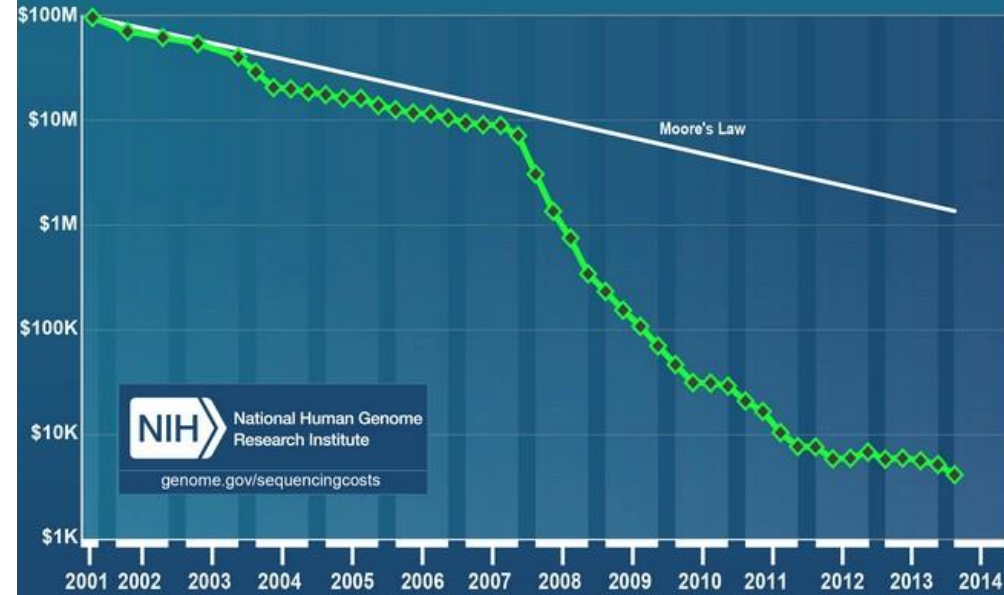


Hybrid surgical room

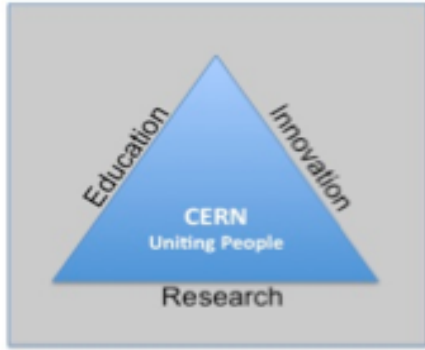
*Gemelli Hospital,*  
Rome (IT)



## Cost per Genome



# Why CERN



**PUSH BACK** the frontiers of knowledge  
**DEVELOP** new technologies for accelerators and detectors  
**TRAIN** the scientists and engineers of tomorrow  
**UNITE** people from different countries and cultures

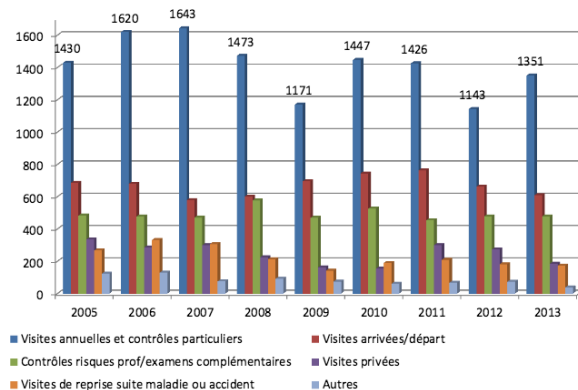
22 member States  
>600 Institutes and Universities use the facilities  
~2'400 employes  
BUT  
>11'000 visiting scientists from >120 Countries

Visites médicales effectuées par les médecins

Année	Nbre de visites	Nbre de personnes vues
2012	2875	2764
2013	2910	2758

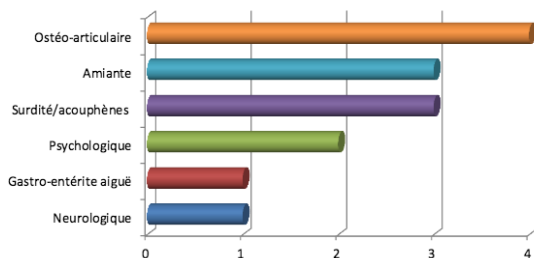
# Why CERN - 2

Détail des visites médicales effectuées

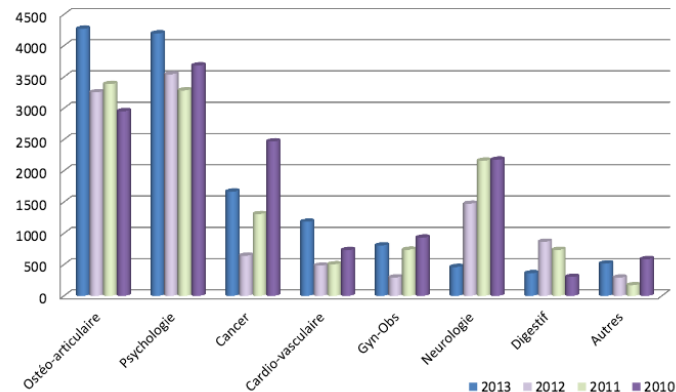


Maladies professionnelles les 10 dernières années (2004-2013)

Total = 14



Nombre de jours civils d'arr ts de travail par motif  
(Par ordre d croissant en 2013)



## The CERN Safety Policy

The means are:

**Continuous improvement** in Safety, through:

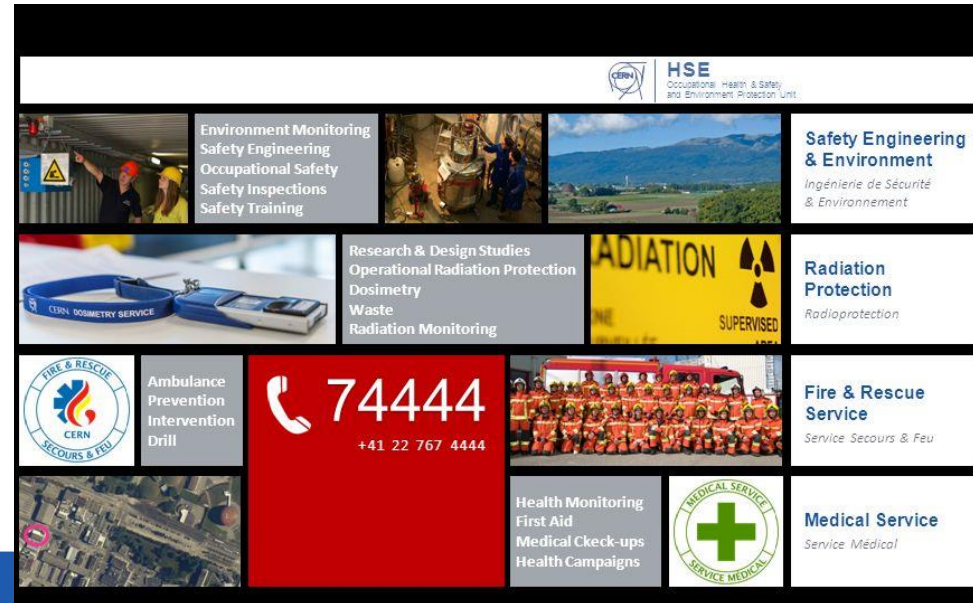
- risk assessment
- return of experience
- regulatory watch
- safety training
- safety management system

**Safety Rules**, as necessary for functioning, taking into account host states, EU- and international regulations

**Emergency Procedures** *new in Policy*

**Proactive communication** *new in Policy*

**Collaboration with host states** *new in Policy*



## Indicators for well-being in a community

Source: Social Cohesion Research and Early Warning Division, The Council of Europe



# Pathways and hysteresis

Recent evidences suggest that in healthcare the outcomes are heavily influenced by the pathways of care...





# A redefinition of the “individual”

N of you(s)

