Note sul progetto DARE (DigitAl lifelong pRevEntion)

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Main motivations

- Observations:
  - **Challenges** to guarantee the sustainability of the healthcare system.
    - → increasing ageing, augmented impact of noncommunicable diseases (NCD), see for instance https://www.who.int/en/news-room/fact-sheets/detail/noncommunicable-diseases, i.e., cancers, cardiovascular, chronic respiratory diseases, diabetes.
  - Many NHSs (including the Italian one) have typically a prevailing symptom-focused model and a limited vision in terms of preventive and community approaches.

- ➔ Our NHS must shift drastically **from diagnosis and treatment toward prevention and community approach**.

Opportunities

- Massive digital transformations, with multiple processes of integrating digital technology and data into all areas of everyday life, including health.
  - ➔ DARE will **enhance the tools and knowledge** that allow us to exploit the potential of data to define, monitor, and even predict health trajectories for the sake of health promotion and prevention.
- ➔ **Digital prevention** = health promotion and prevention actions enabled by digital technologies, which have the potential to significantly improve the speed and accuracy of key public health functions such as forecasting, surveillance, early detection of and response to acute and chronic/complex diseases and, more generally, for health-related conditions through the lifespan.

- How? **Working with both health data and health-related data** (citizen-generated data), such as sociodemographic data, telecommunications data, and weather data.
  - These data might also include personal data that are not directly health-related (e.g., location data, customer shopping data, or social data collected through smartphones or self- tracking devices).

Consortium

- Coordinated by the University of Bologna (PI prof. Lorenzo Chiari)
- 28 partners:
  - 8 universities (UNIBO, UCSC, UNIPA, UNIBA, UNIPR, UNIPD, UNIROMA2, UKE)
  - 1 public research entity (**INFN**)
  - 13 hospitals and local health authorities (IOR, IRCCS AOUBO, FPG, AUSL Romagna, IRCCS GPII BA, ASL BA, ROMA1, AOUP, PTV, IRCCS ISNB, UPMCI, AOUPCT, MCHGVM)
  - 1 environmental agency (ARPA)
  - 4 private companies or PPP (BI-REX, EXP, ENG, LEI)
  - 1 not-for- profit organization (GIMBE)

Organization

- **Duration: 48 months**
- Hub and 3 Spokes
  - Hub: coordinated by Unibo, it will be set up in the form of a **non-profit foundation**, with the initial involvement of 16 partners (INFN included, more on this later).
  - Spoke 1: Enabling Factors and Technologies for Lifelong Digital Prevention → North
    - The solution provider
  - Spoke 2: Community-based Digital Primary Prevention → South
    - Target: general population
  - Spoke 3: Digitally-enabled Secondary and Tertiary Prevention → Center
    - Target: patients
- 40 pilot studies, mostly based on spokes 2 and 3.

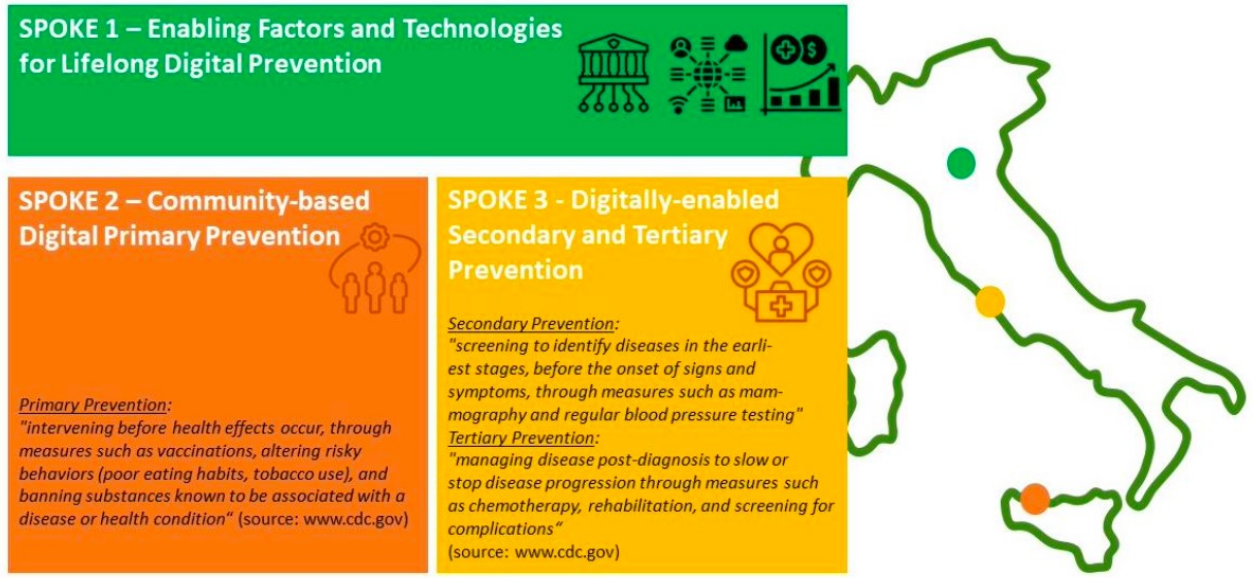
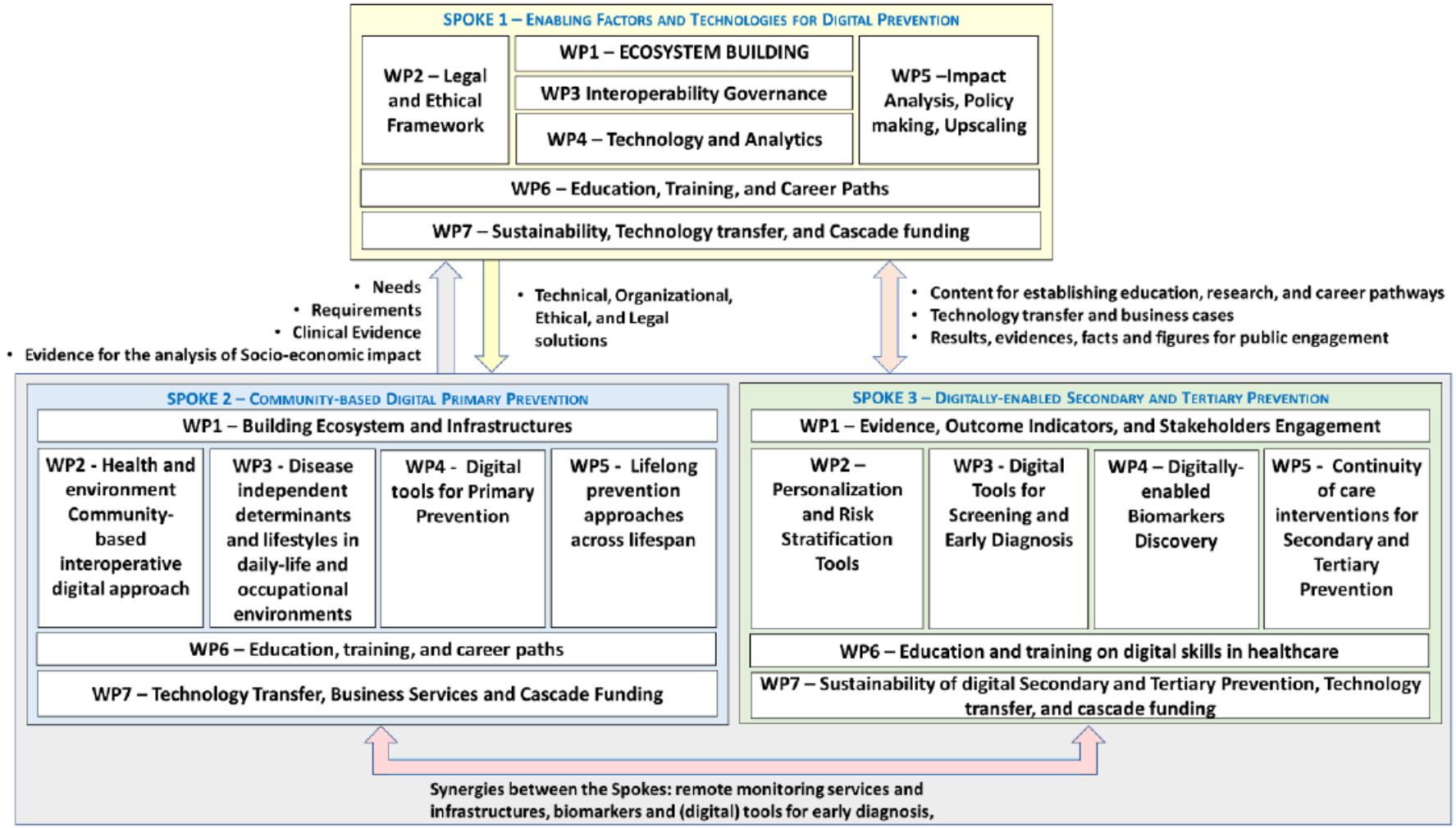


Figure 3- Logical and geographical organization of the 3 spokes

The 3 spokes in some detail



Objectives vs. Spokes

- **Obj 1**: Lowering and breaking down barriers for adopting […] digitally enabled solutions for prevention. Co-create a personalized prevention roadmap for future healthcare incorporating digital solutions along the entire prevention path.
  - → **Spoke 1**, focusing on methods and acts as a Solution Provider for other spokes.
- **Obj 2**: Create a multifunction advanced integrated surveillance system, powered by an interoperable innovative digital infrastructure, for community-based primary preventive interventions on cancer, cardiovascular diseases, developmental disorders, and communicable diseases. Improve the preparedness response during environmental emergencies or disasters. For targeted interventions, provide risk assessment based on lifestyles, health determinants, environment pollution, and genomic profiling, both in daily life and occupational settings. Develop digital tools for interconnection and prevention across the lifespan.
  - → **Spoke 2**, focusing on Digital Health applications for the primary prevention of the general population, selected communities, and target groups.
- **Obj 3**: Adopt digital-enabled solutions for secondary and tertiary prevention, including subjects of all ages, with a focus on a) design, development, and implementation of digital models of the human body; b) testing AI and identifying digital biomarkers to predict the risk of complications and treatment efficacy in a variety of diseases; c) leverage digital platforms which integrate data registries, wearable sensor and IoT technologies, decision support systems, and home/mobile apps.
  - → **Spoke 3**, focusing on Digital Health applications for early diagnosis and targeting patients' health needs.

Funding

- Pre-negotiation: ~128 M€
- **Post-negotiation: ~124 M€ (about -3%)**
  - Reduction of ~4.064 M€
  - -1.5M€ in the open calls in Spoke 1, -1.5M€ in the open calls in Spoke 2, -1M€ in the open calls in Spoke3, -~64 K€ from the hub.
- The INFN budget did not change with the negotiation (3.5 M€).

n.	Partner	TOT costi	Open Call	TOT	Quota SUD calcolata in proposta da GEA	% quota sud sul tot
1	UNIBO	17,011,900.00 €	7,662,402.00 €	24,674,302.00 €	6,000,000.00 €	24%
2	UCSC	3,498,200.00 €	- €	3,498,200.00 €	- €	0%
3	UNIPA	12,168,900.00 €	6,500,000.00 €	18,668,900.00 €	18,668,900.00 €	100%
4	UNIBA	9,499,800.00 €	- €	9,499,800.00 €	9,499,800.00 €	100%
5	UNIPR	5,000,000.00 €	- €	5,000,000.00 €	- €	0%
6	UNIPD	8,033,800.00 €	- €	8,033,800.00 €	- €	0%
7	UNIROMA2	8,988,400.00 €	4,000,000.00 €	12,988,400.00 €	3,500,000.00 €	27%
8	UNIKORE	2,500,000.00 €	- €	2,500,000.00 €	2,500,000.00 €	100%
9	INFN	3,500,000.00 €	- €	3,500,000.00 €	805,000.00 €	23%
10	IOR	4,139,648.00 €	- €	4,139,648.00 €	- €	0%
11	IRCCS AOU BO	3,473,751.00 €	- €	3,473,751.00 €	- €	0%
12	FPG	1,996,800.00 €	- €	1,996,800.00 €	- €	0%
13	ASL Romagna	2,121,085.00 €	- €	2,121,085.00 €	- €	0%
14	ITGPII	1,676,688.00 €	- €	1,676,688.00 €	1,676,688.00 €	100%
15	ASLBA	2,670,160.00 €	- €	2,670,160.00 €	2,670,160.00 €	100%
16	ASL ROMA1	991,384.00 €	- €	991,384.00 €	- €	0%
17	AUOP	1,251,840.00 €	- €	1,251,840.00 €	- €	0%
18	PTV	1,236,192.00 €	- €	1,236,192.00 €	- €	0%
19	IRCCS ISBN	1,665,472.00 €	- €	1,665,472.00 €	- €	0%
20	UPMC	2,042,400.00 €	- €	2,042,400.00 €	2,042,400.00 €	100%
21	ARPA SICILIA	1,963,600.00 €	- €	1,963,600.00 €	1,963,600.00 €	100%
22	BI-REX	6,276,113.00 €	- €	6,276,113.00 €	- €	0%
23	EXPRIVIA	2,379,584.00 €	- €	2,379,584.00 €	2,379,584.00 €	100%
24	ENG	1,989,696.00 €	- €	1,989,696.00 €	600,624.00 €	30%
25	LEI	295,936.00 €	- €	295,936.00 €	- €	0%
26	GIMBE	953,600.00 €	- €	953,600.00 €	- €	0%
27	AOUPCT	1,680,360.00 €	- €	1,680,360.00 €	1,680,360.00 €	100%
28	MCHGVM	2,579,616.00 €	- €	2,579,616.00 €	- €	0%
29	HUB	648,673.29 €	- €	648,673.29 €	- €	0%
TOT		112,293,598.29 €	18,162,402.00 €	130,456,000.29 €	53,987,116.00 €	

Budget post-negotiation

Critical mass

- Project level:

Spoke	UNIBO	UCSC	UNIPA	UNIBA	UNIPR	UNIPD	UNIROMA2	UKE	INFN	IOR	IRCCS AOU BO	FPG	AUSL Romagna	IRCCS GPII BA	ASL BA	ROMA1	AOUP	PTV	IRCCS ISNB	UPMCI	ARPA	BI-REX	EXP	ENG	LEI	GIMBE	AOUPCT	MCHGVM	Total*	Gender	
																														M	F
Spoke 1	23	5	5	9	8		9		6	2					2							3	3	5	2	2			84	54	30
Spoke 2	13	2	21			12		7		2	3	4	3			2				4	4	4		3	2	2	3	2	93	58	35
Spoke 3				12	4	8	12			7	5	2	3	2	2		3	2	4			2	5					2	75	54	21
Total*	36	7	26	21	12	20	21	7	6	11	8	6	3*	2	4	2	3	2	4	4	4	9	8	8	4	4	3	4	**249***	**163**	**86**

- INFN level (PM/year):
  - @CNAF: D.Salomoni (1), C.Vistoli (1), B.Martelli (3), A.Chierici (3)
  - @Bari: G.Donvito (1), S.Nicotri (2)

Funding @ INFN

- Everything is in spoke 1.
- **Personnel**: 5 new TD contracts, technologists, all on computing, medium level (€4125/month).
  - 1 TD @ Bari
  - 4 TD @ CNAF
- **Hardware**: ~2.3 M€ (details TBD)
  - ~526 k€ @ Bari
  - ~1760 k€ @ CNAF

SPOKE 1			
Personale dipendente/strutturato			
Livello	n.	PM tot	costo
ALTO	4	32	220,000.00 €
MEDIO	1	8	33,000.00 €
BASSO	1	4	14,500.00 €
TOT	6	44	267,500.00 €
Nuovo Personale (da attivare)			
Livello	n.	PM tot	costo
ALTO			- €
MEDIO	5	180	742,500.00 €
BASSO			- €
PhD	0	0	- €
TOT	5	180	742,500.00 €
TOT Personale			1,010,000.00 €
Indiretti			202,000.00 €
Strumenti/attrezzature/Licenze			2,288,000.00 €
Fabbricati/Terreni			- €
Altri costi (materiali, forniture, …)			- €
Open Call			- €
			- €
TOT Incluse Open Call			3,500,000.00 €

Activities @ INFN (all in Spoke 1)

- WP2: **Legal and Ethical Framework** (WP leader: M. Ratti, unibo)
  - Overcome the barrier to compliance with legal, ethical, and data protection requirements. WP2 will analyze the legal and regulatory landscape in which the pilots in spoke 2 and spoke 3 intend to operate. This connects clearly with the INFN DataCloud WP7 on Legal Compliance and Integrated Management Systems.
- WP3: **Interoperability Governance** (here we are WP leader – Barbara Martelli)
  - Enable different information systems, devices, and applications, to access, exchange, integrate, and use data within and between the stakeholders involved in spoke 2 and spoke 3 pilots. This connects directly with some of our activities in the Health Big Data project.
- WP4: **Technology and Analytics** (WP leader: S. Mellone, unibo)
  - Identify, develop, adapt, and personalize the enabling technologies. This includes for instance HPC, Big Data, Cloud and Edge computing, data mining, wearable sensors, IoT.
- WP6: **Education, Training, and Career Paths** (WP leader: A. Montanari, unibo)
  - Address the lack of qualified personnel and improve the level of digital skills in the context of health prevention. This includes for instance development and delivery of post-graduate courses, including roles such as Data Stewards and Data Custodians.

In practice, with DARE…

- Strong synergy with ICSC – the National Center for HPC, Big Data and Quantum.
  - Especially in relation to the Spoke 8 there ("in-silico medicine and omics data"). Several key names are both in ICSC/Spoke 8 and in DARE.
- Extend the scope of the infrastructure and services to be provisioned by ICSC + TeRABIT (what we internally call "DataCloud", i.e. the evolution of INFN Cloud) to add more Cloud-based resources (HPC & HTC).
  - Key exploitation and expansion of the ISO-certified INFN Cloud EPIC region already used by several projects for the secure management of sensitive data.
    - Currently ISO 27001, 27017, 27018 certification at CNAF, already planned to be extended to Bari and Catania in the context of ICSC/TeRABIT.
  - But we'll likely also add computing and storage resources to the general (non-ISO) INFN DataCloud infrastructure.

Next steps

- Governance: creation of the “Fondazione DARE”.
  - Scheduled for this Monday, 14/11/2022, in Bologna.
- Still no dates for a general assembly or a WP leaders’ meeting.

- If you want to read the DARE proposal, go to https://l.infn.it/dare-proposal (you need to authenticate with your INFN AAI account).