ROADMAP FOR SUSTAINABLE HEALTHCARE

Micro-Simulation Models to Inform Health Policy

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CEIS Tor Vergata

A brief history of the project

Merging two initiatives for a better result

The OECD and ABBVIE initiatives

The OECD initiative

Started in 2011

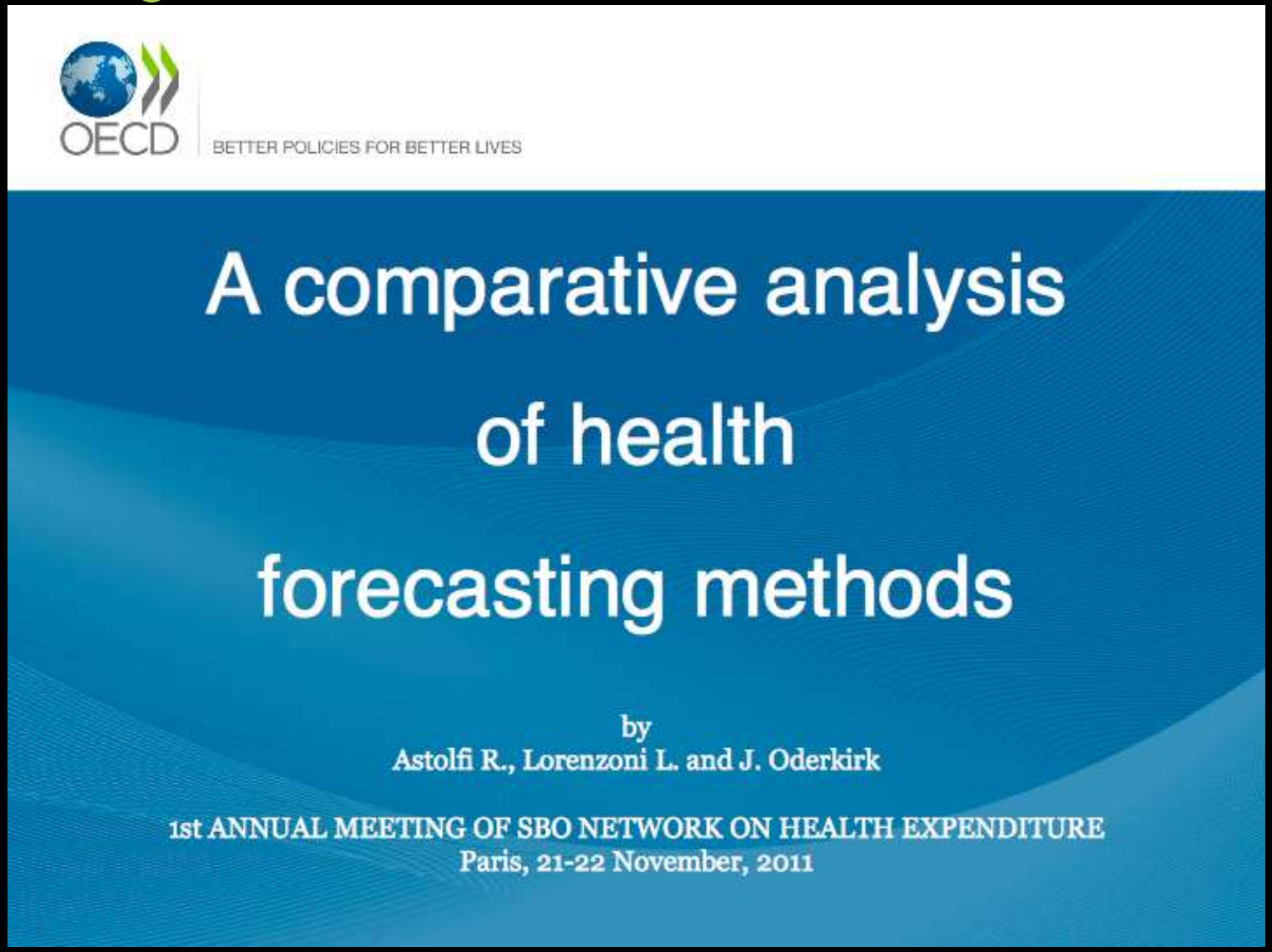
1st ANNUAL MEETING OF Senior Budget Official (SBO) NETWORK ON HEALTH EXPENDITURE

The ABBVIE initiative

Started in 2013

SUSTAINABLE HEALTHCARE INITIATIVE THE RECIPES FOR SUSTAINABLE HEALTHCARE

The OECD starting point



What they did: a careful analysis of the existing methodologies

	Congressional Budget Office (CBOLT)
	Centers for Medicare & Medicaid Services (Component)
	Centers for Medicare & Medicaid Services (GE)
	U.S. Department of Veterans Affairs
	FEM (Medicare RAND)
	The Future Elderly Model (CMS/RAND)
	Australian Institute of Health and Welfare (AIHW)
	National Centre for Social and Economic Modelling (NATSEM) Micro-Macro
	Australian Government, Productivity Commission
	Australian Government, The Treasury
	Statistics Canada /Population Health Model (POHEM)
	Parliamentary Budget Officer (PBO)
	Canadian Institute for Health Information (CIHI)
	Bureau for Economic Policy Analysis (CPB)
	Direction de la recherche, des études de l'évaluation et des stat.(DRESS)
	Sénat
	Ministy of Health/Università di Roma Tor Vergata
	Ragioneria Generale dello Stato
	HM treasury / Office for Budgetary Responsibility (OBR)
	National Heart Forum Microsimulation Model (Foresight)
	Ministry of Health and Social Affairs
	Ministry of Health and Treasury
	Office fédéral de la statistique (OFS)
	OECD
	European Union/Ageing Working Group

25 models

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10 countries

\+

OECD & EU

What they concluded

- The current tools are not satisfactory for the goals they have to achieve.
- Through the OECD, there is an opportunity for countries to benefit from the lessons learned from comparing forecasting methods across countries to develop and implement **an international decision-support platform**.
- Advantages include:
  - international comparability of expenditure forecast, through the standardisation of model structure, assumptions, and data;
  - the ability to test and compare the potential results of policy reforms;
  - the ability to address emerging global issues related to international movement of patients, personnel, services and capital.

What they planned to do

Multi-country Health Policy Micro simulation Modelling Meeting

9 July 2013, 9h30 Paris

Item:		
1.	9:30	**WELCOME AND INTRODUCTIONS** Mark Pearson (tbc) will welcome everyone
2.	10:00-11:30	**ROUNDTABLE OF CURRENT WORK AND MOTIVATION TO DEVELOP A MULTI-COUNTRY MODEL** *Document:* A summary from each participant of their current modelling projects and interest in a multi-country MSM Mark Pearson (tbc) will lead a roundtable enabling everyone to present 5-10 slides to summarise their current modelling work and the potential opportunities they see from developing a multi-country MSM
		Break
3.	12:00-1:00	**BRAINSTORMING SESSION: POLICY QUESTIONS** *Document:* Results of an e-mail exchange to bring forward suggested policy questions from each participant The Group will discuss and narrow down the policy questions of highest interest for a multi-country modelling effort in the short term (the initial project) and in the longer term (the broader vision)

		Lunch together at a restaurant in the neighbourhood
4.	3:00-5:15	**BRAINSTORMING SESSION: MODEL FEATURES** Given the policy questions we would like to address in the short and longer run: • What would be key outputs from the model? • What would be the essential design of the model? • What would be essential characteristics of modelled people/starting population? • What would be key parameters? • What are the necessary data sources? • Which countries would be the most interesting to include?
		Break
5.	5:30-6:30	**BUILDING A COLLABORATIVE PROJECT: KEY STEPS** The group will discuss the essential steps we would need to take to further develop toward a multi-country modelling project plan. Would we need to engage other partners and what partners would be the most helpful – policy, academic What sources of funding would be needed and from where?
		CLOSE OF MEETING

The Abbvie starting point: Lucy's perspective!

The Abbvie perspective and the ESG initiative

To develop and implement innovative projects and provide, through pilots, concrete evidence and long-term solutions to:

- inform policy makers through quantitative analysis
- improve efficiency of use of public resources and care delivery
- contribute to healthcare sustainability

Step one

Aim of the project

Aim of the project

We build a dynamic micro-simulation model of the health care sector in Europe (EU-13), to implement **"what if"** scenarios, mainly dealing with the role of (primary and secondary) prevention policies on health outcomes and health care expenditure.

Following OECD guidelines, potential questions that the model should be able to answer are the following:

- What may be future health expenditures if no action is taken?
- Which are the drivers of rising costs?
- In which sector of the health care system costs are rising the most?
- What will be in the short, medium and long-run the effects of prevention policies on expenditure and health outcomes?
- What will be the potential impact on health care expenditures of different medical technologies or innovations?

The benefits of such initiative

- To compare countries in terms of the forecasted burden of NCDs and the distribution of that burden across SES groups.
- To provide a platform to be used to uncover policies and practices (solely and in combination) that are universally cost-effective and those that are effective only in settings where other economic and social policies and cultural norms are already in place.
- To permit countries lacking micro-simulation modelling capacity to benefit from a valid and comparable decision-support tool.
- To produce a multi-risk factor, multi-disease model capable of assessing policies to improve chronic care delivery and thus assessing the trade-offs between primary prevention, secondary prevention and treatment alternatives.

Step two

Project partners

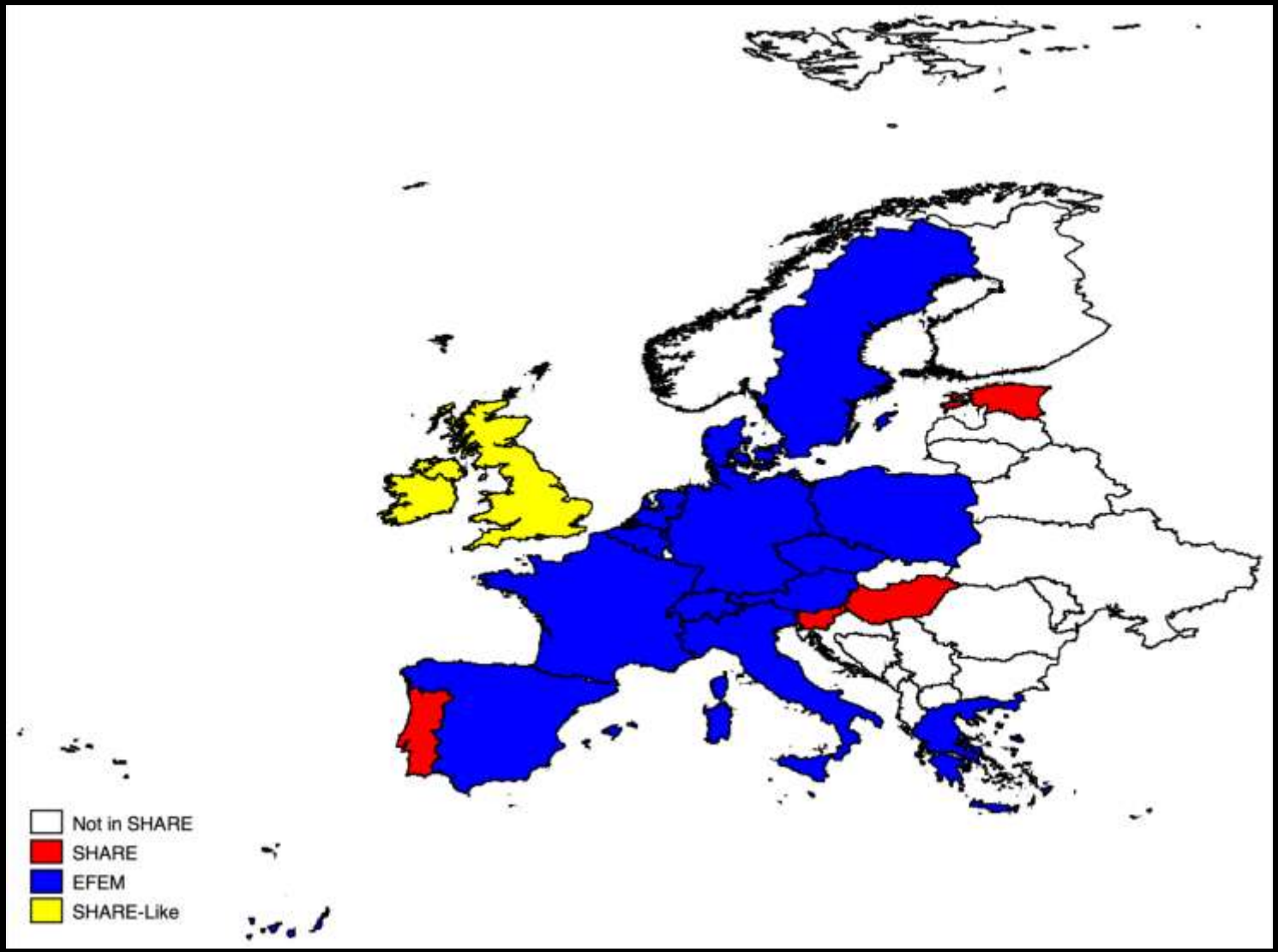
Project partners

THE PROJECT HAS GAINED FROM THE COLLABORATION OF SEVERAL WELL KNOW INTERNATIONAL RESEARCH INSTITUTIONS

CEIS Tor Vergata of the University of Rome Tor Vergata is leading the project and has received intellectual and professional support from the following organizations:

- Dir. for Employment, Labour and Social Affairs – **OECD**
- Schaeffer Center at **University of Southern California**
- Center for Health Policy (CHP) at **Stanford University**

Countries included in the model



FEM collaborations within the OECD initiative

At present, besides US and E-FEM, FEM-like models are under developed also in:

- Japan
- Mexico
- Singapore
- Quebec

Will join the club:

- China
- India
- Australia

Step three

The E-FEM model structure and the data

What is a Micro-simulation Model?

Microsimulation is a tool for modelling real life events by simulating the actions of the individual units which are part of the system where the events occur.

They are characterized by:

- Large scale complex quantitative models
- Focus on individuals or households
- Starts with large micro-data sets
- Mirror the heterogeneity in the population

E-FEM: Europe Future Elderly Model

- Current version of E-FEM is fully based on the public US-FEM rev.59.
- It aims to mimic US-FEM in predicting the health status and the future costs of the European elderly using real rather than synthetic cohorts, modeling individual behavior and using individual level data.
- It models representative cohorts of people aged 50 and older exploiting the Survey of Health, Ageing and Retirement in Europe (SHARE).
- Ensures comparability across Europe

An overview of the data used

1. SHARE → Base data
2. ECHP → Historical trends
3. Gateway to Global Aging Data (USC) → Harmonized data
4. Eurostat/United Nations → Population projections
5. Human Mortality Database (HMD) → Mortality data
6. Costs by age and sex → Ministry of health, SiSSI and OECD
7. Costs by function → OECD

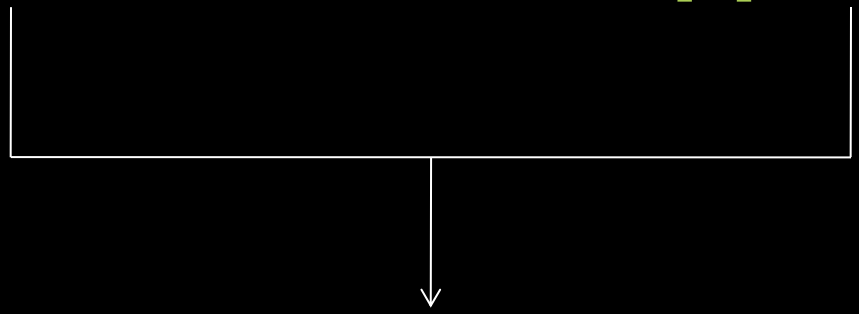
Modeling approach

Do-nothing scenario

Risk factors and disease prevalence/incidence in the absence of interventions

Intervention scenario

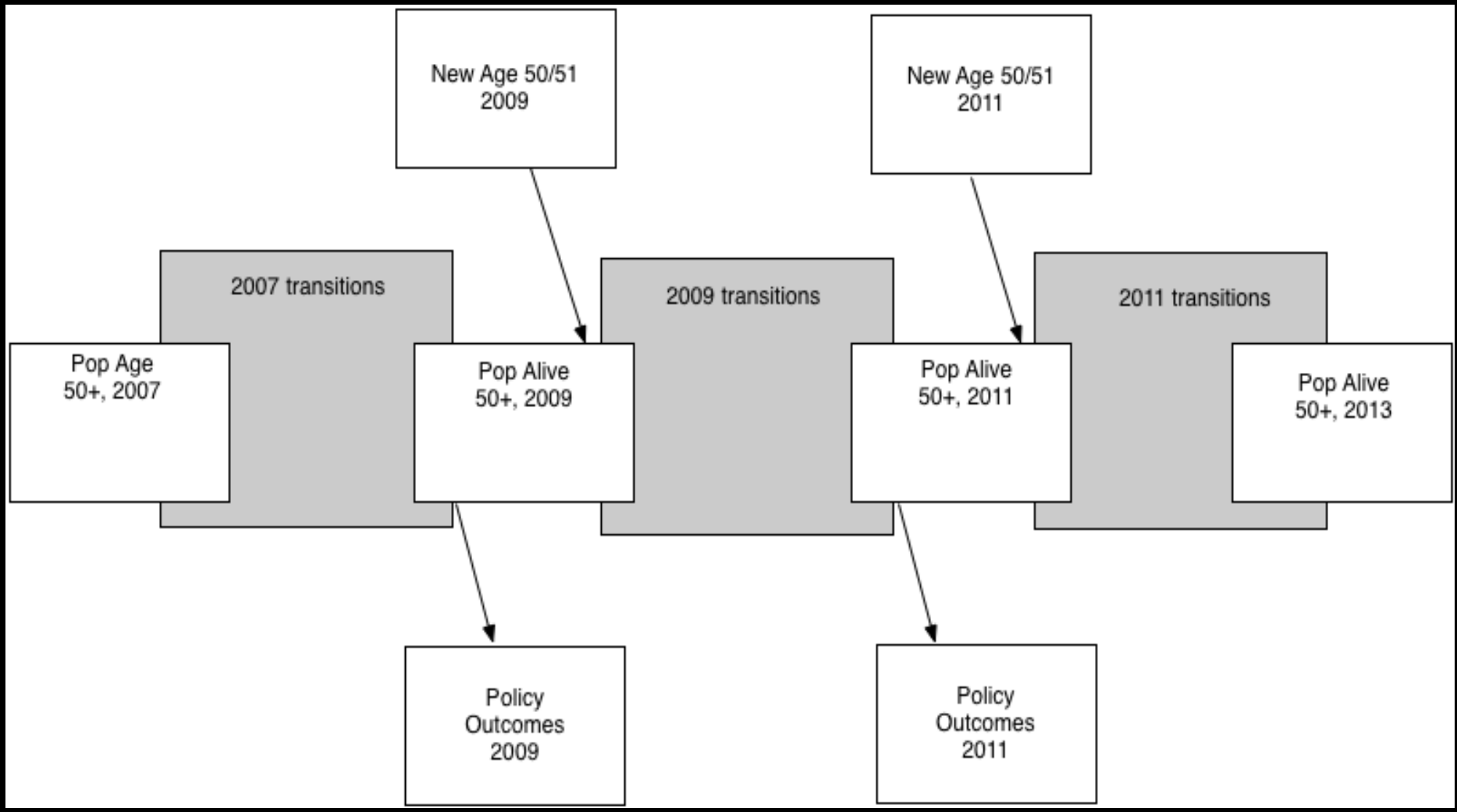
Evaluation of the epidemiological impact of the intervention at the population level



Policy outcome

Health gains and cost changes generated by the intervention

Modeling approach: an overview of the model structure



An overview of the variables modeled

Economic Outcomes	Health Outcomes	Other Outcomes
Employment status	Death	Income Tax Revenue (TBA)
Earnings	Heart diseases	Soc. Security Revenue (TBA)
Demographics	Stroke	Social Security Outlays (TBA)
Medical Expenses	Cancer	Retirement and pension (TBA)
Wealth	Cancer by ICD9 categories (TBA)	Productivity (TBA)
Med. Expenses by type (TBA)	Hypertension	
Health Insurance (TBA)	Diabetes	
Disability insurance (TBA)	Lung Diseases	
	Pain	
	BMI	
	Smoking status	
	ADL status	
	IADL Status	
	Life Expectancy	
	Disease free Life Expectancy	
	QALYs	
TBA = To Be Added	Arthritis (TBA)	
	Osteoporosis (TBA)	
	Parkinson (TBA)	

In how many ways we can use this model

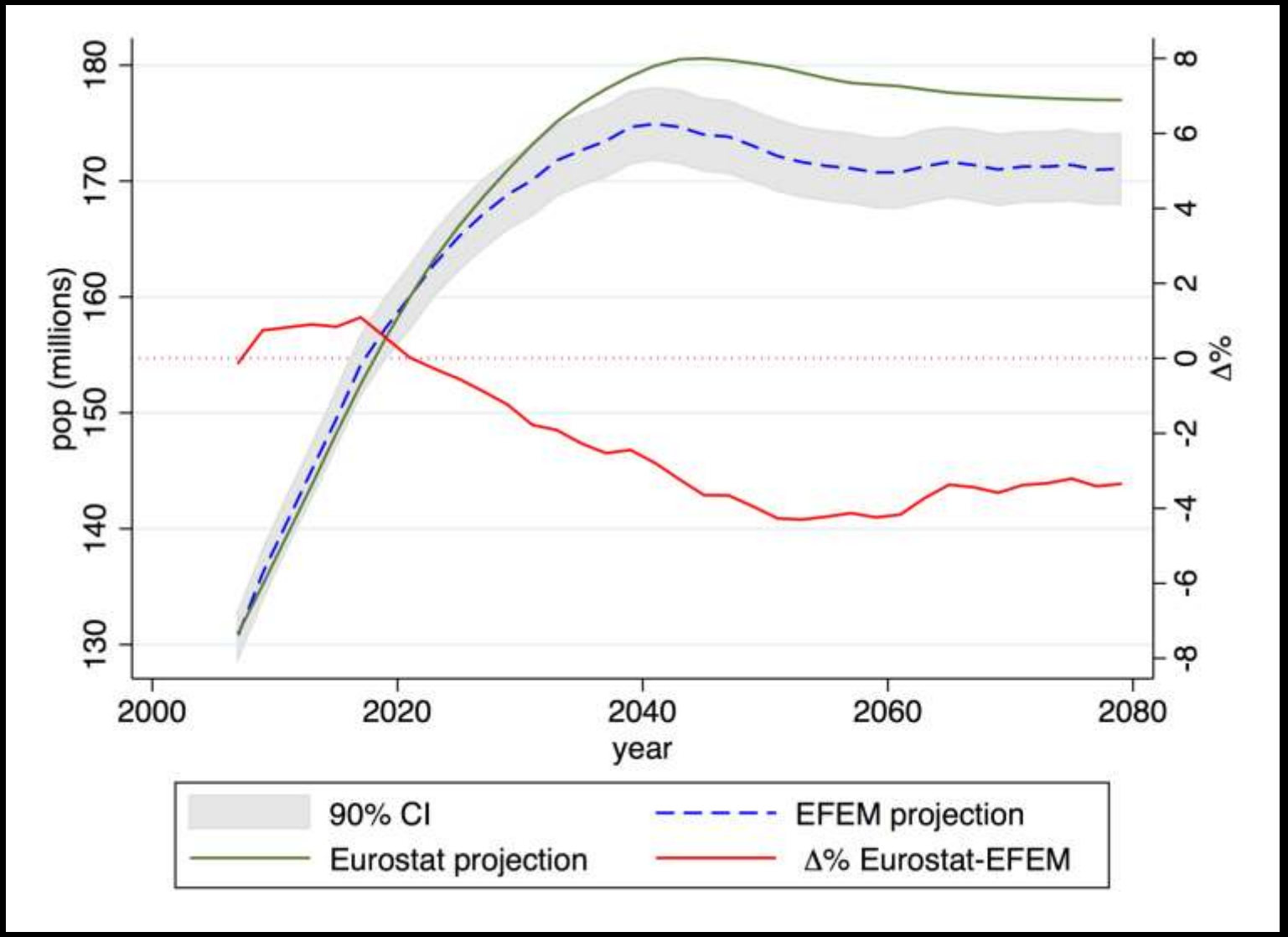
- Forecasting status quo (do nothing) scenarios
- Policy impact evaluation of health care reforms and interventions
- HTA
- Measuring disease burden
- Economic analysis and inequality in access

Step Four

Some simulation results

Reliability of the estimates

Simulation results: Population projections EFEM vs EUROSTAT

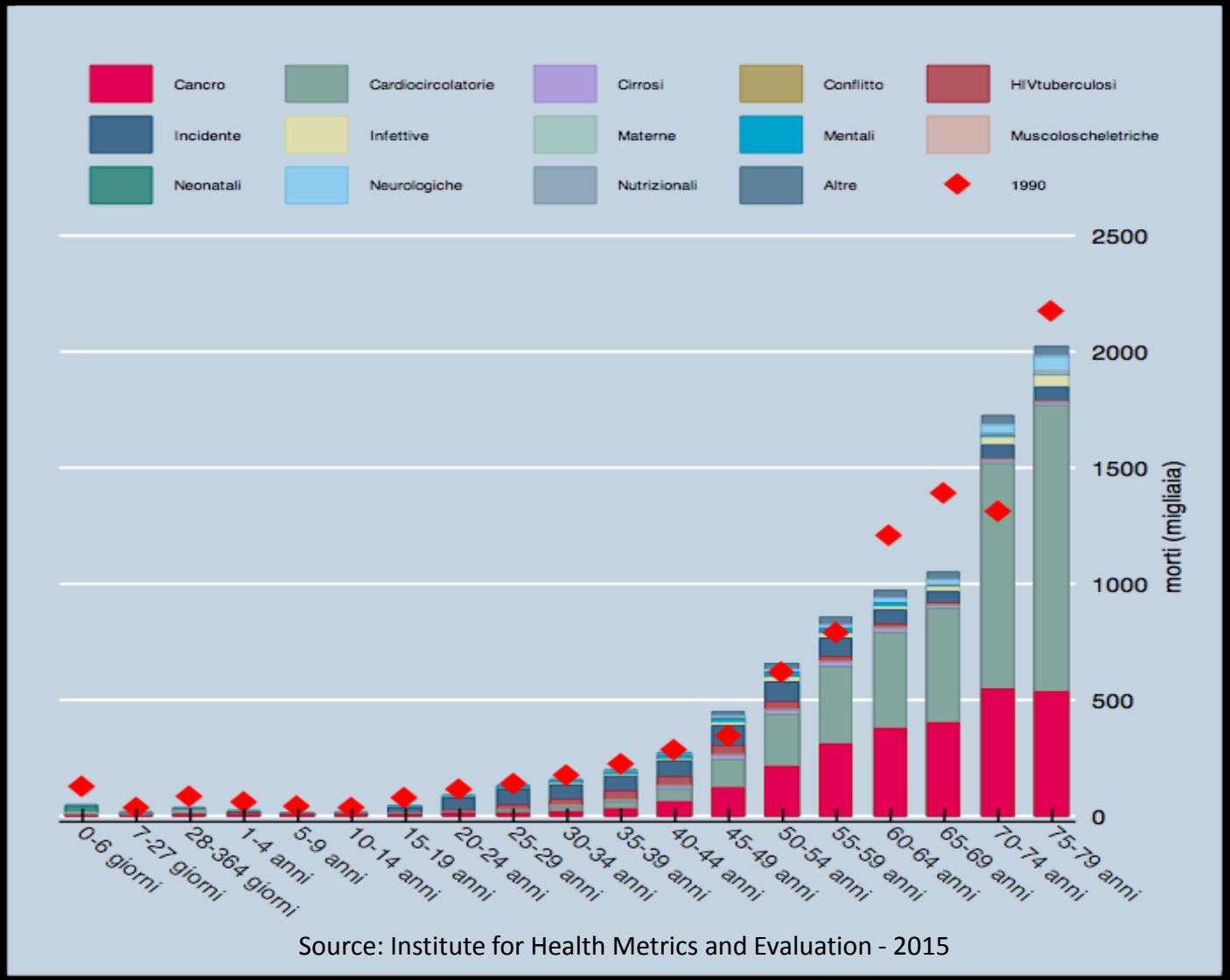


Simulation 1

Forecasting *status quo* (do nothing) scenarios

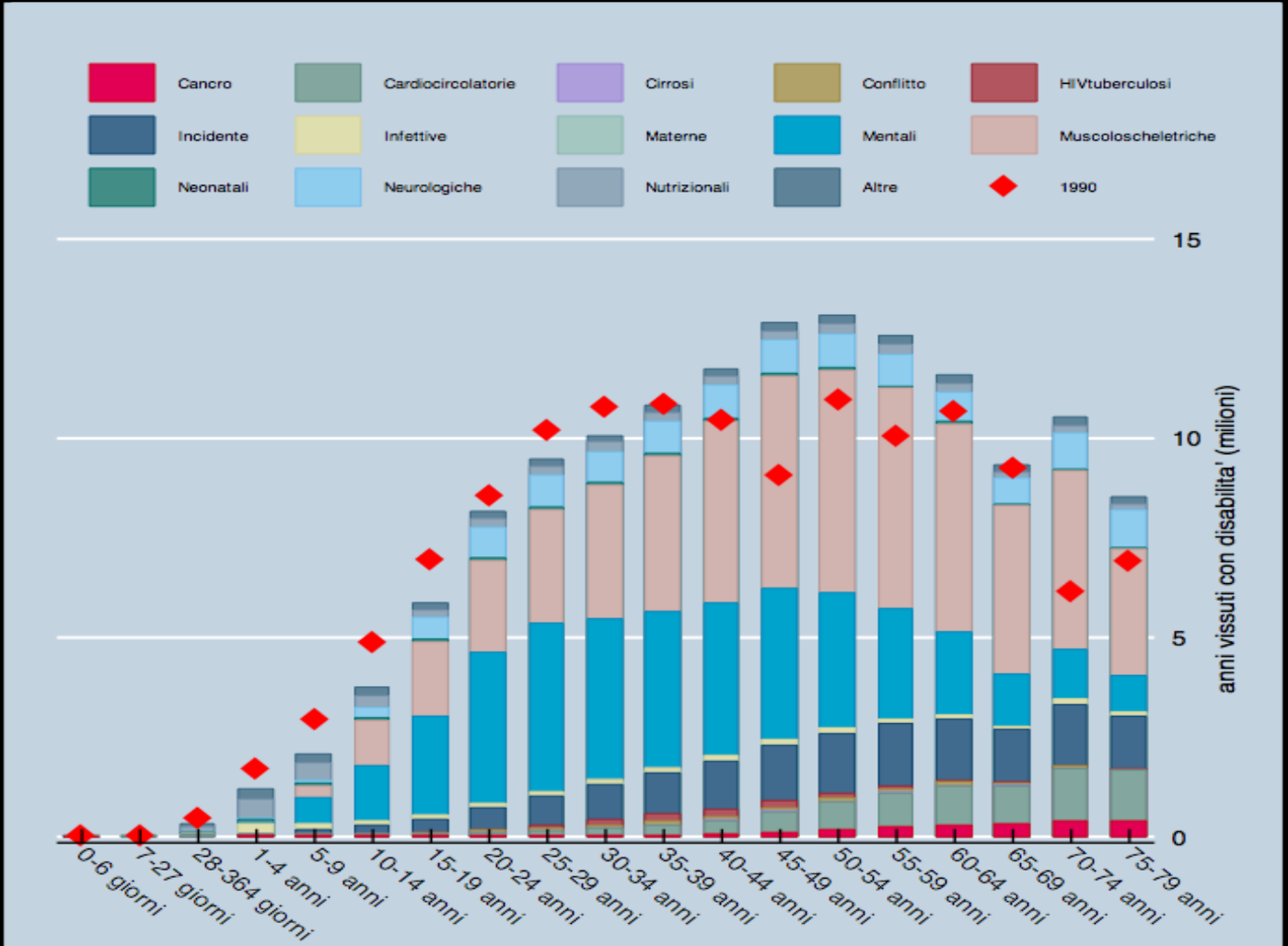
The increasing role of disabilities under the hypothesis of « not doing enough »

The future prospect: **Number of death** (x 1000) in Europe in 2010



Source: Institute for Health Metrics and Evaluation - 2015

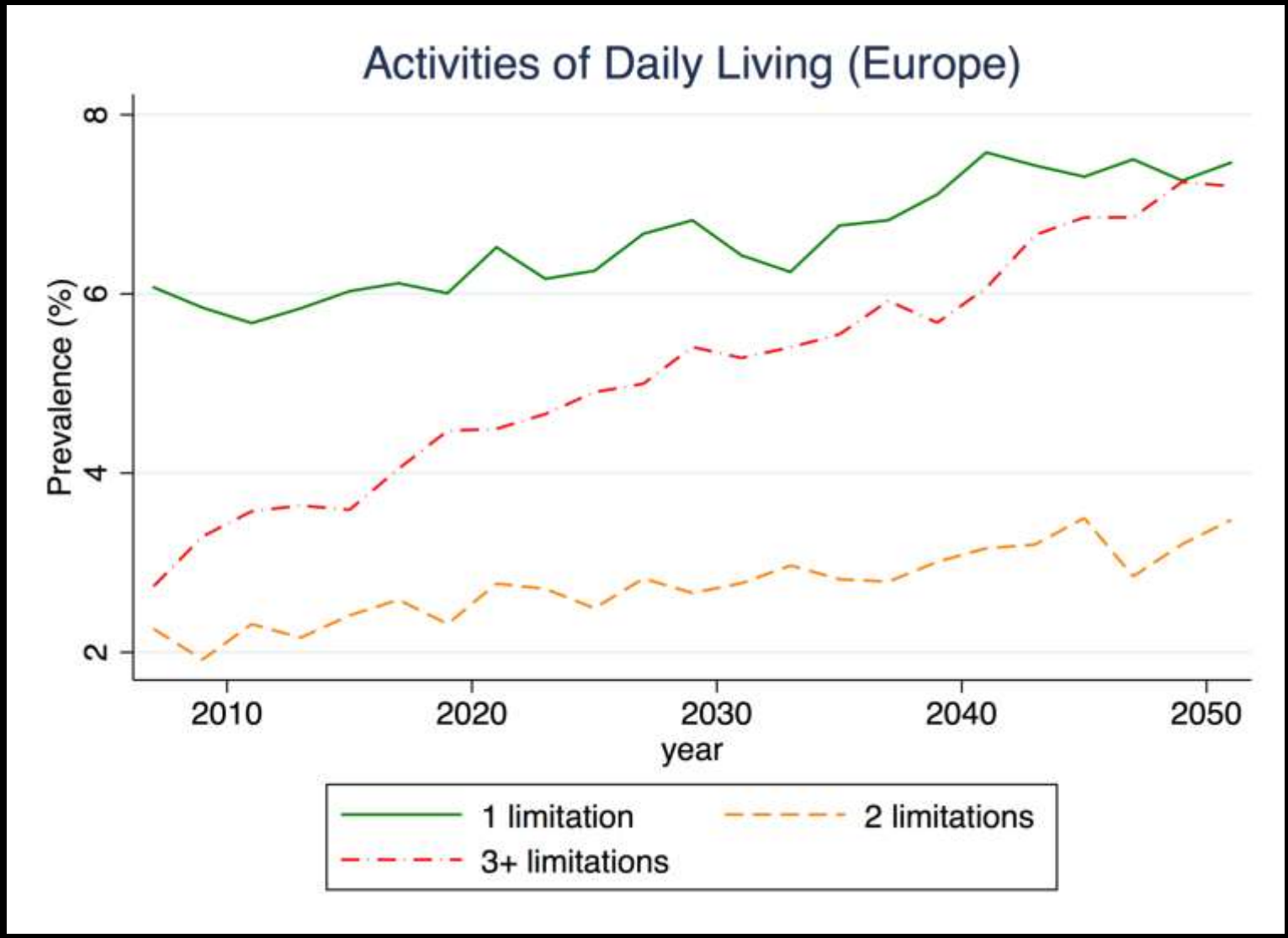
The future prospect: number of **Years Lived with Disabilities (YLD)** in Europe in 2010 (x 1.000.000)



Source: Institute for Health Metrics and Evaluation - 2015

Simulation results: changes in ADL prevalences with no policy

- walking
- bathing
- dressing
- toileting
- brushing teeth
- eating



Simulation results: changes in ADL prevalences with no policy

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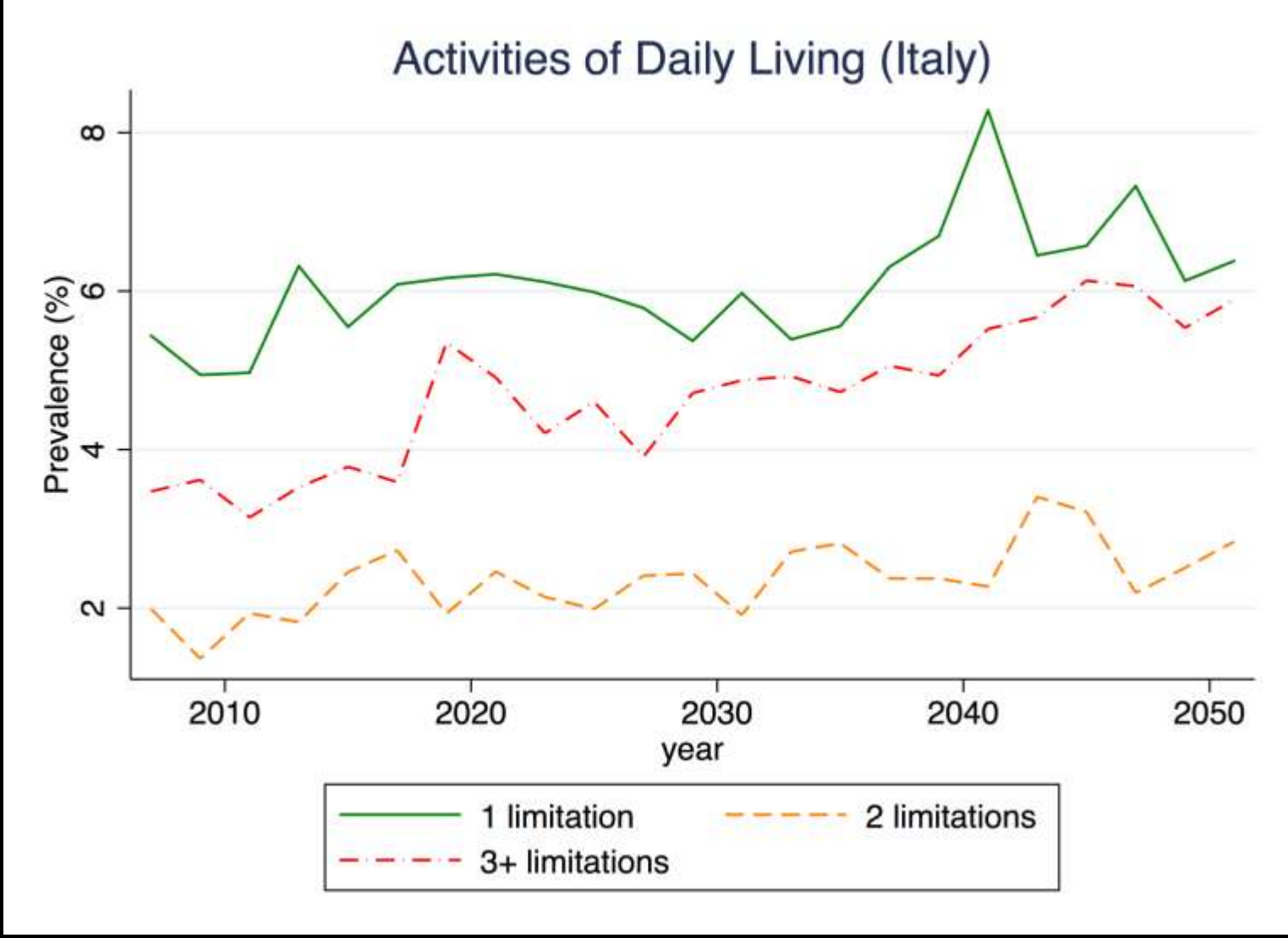
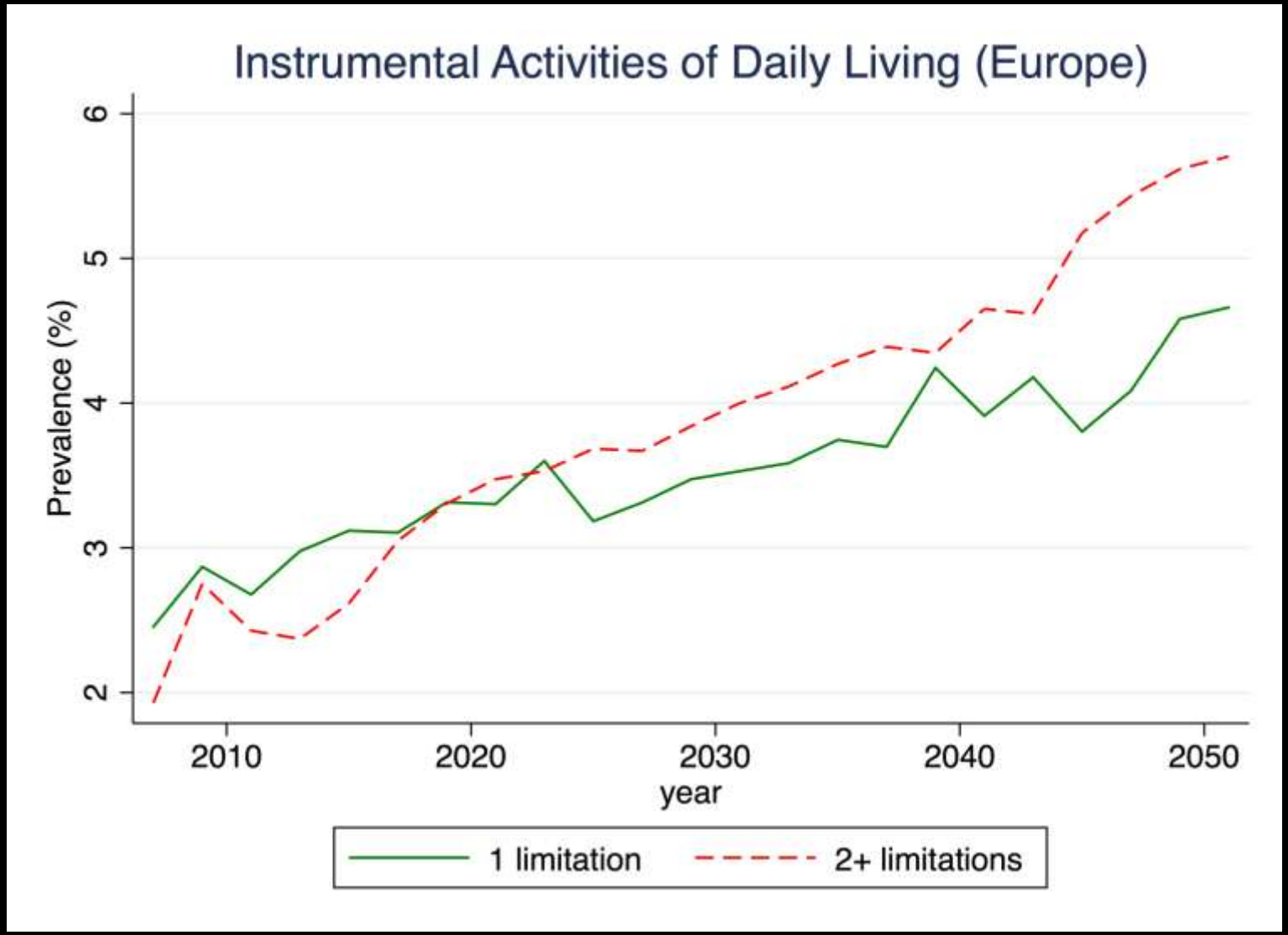


Simulation results: changes in IADL prevalences with no policy

- cooking
- driving
- using the telephone or computer
- shopping
- keeping track of finances
- managing medication



Simulation results: changes in IADL prevalences with no policy

- cooking
- driving
- using the telephone or computer
- shopping
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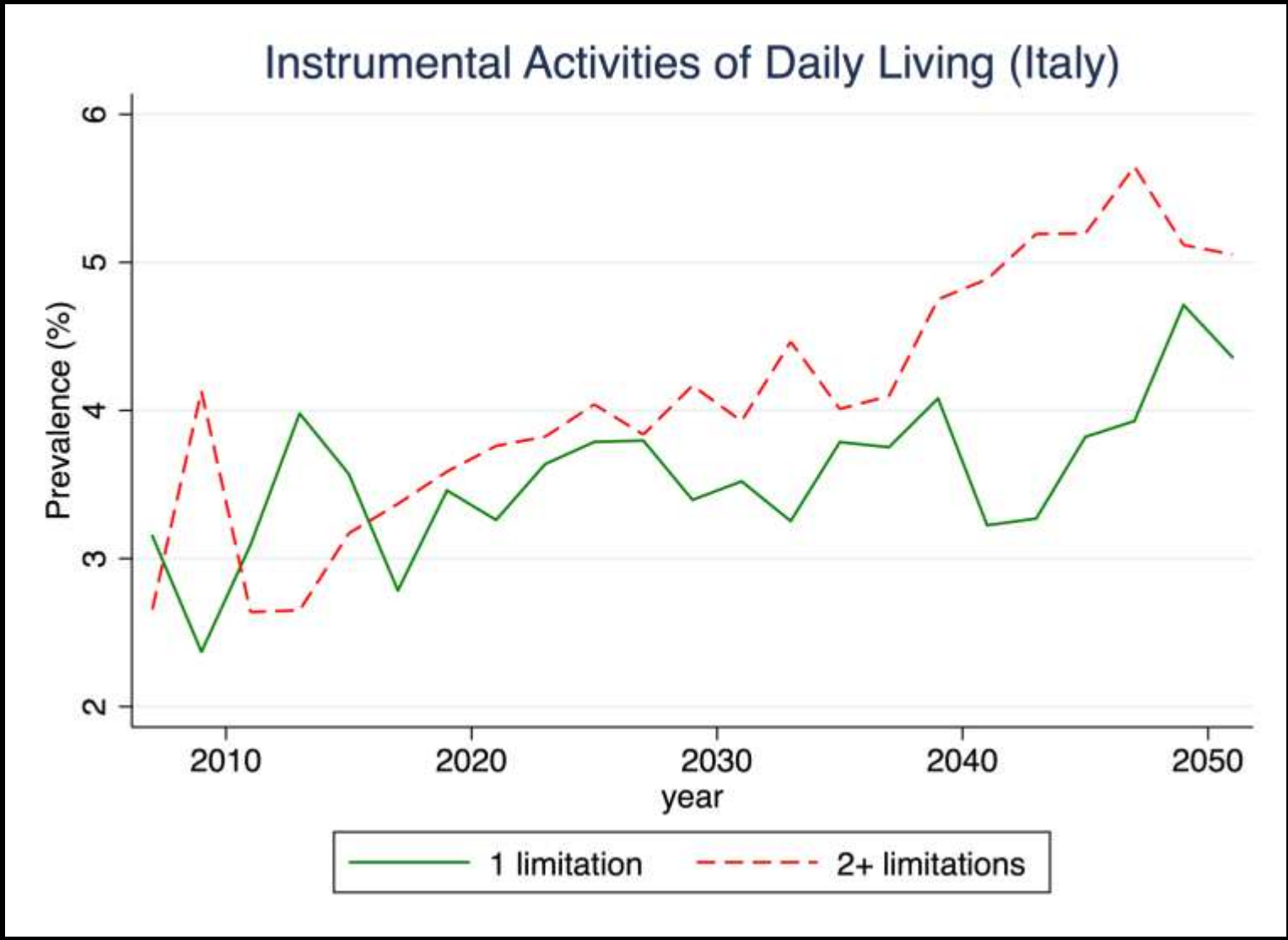
- managing medication



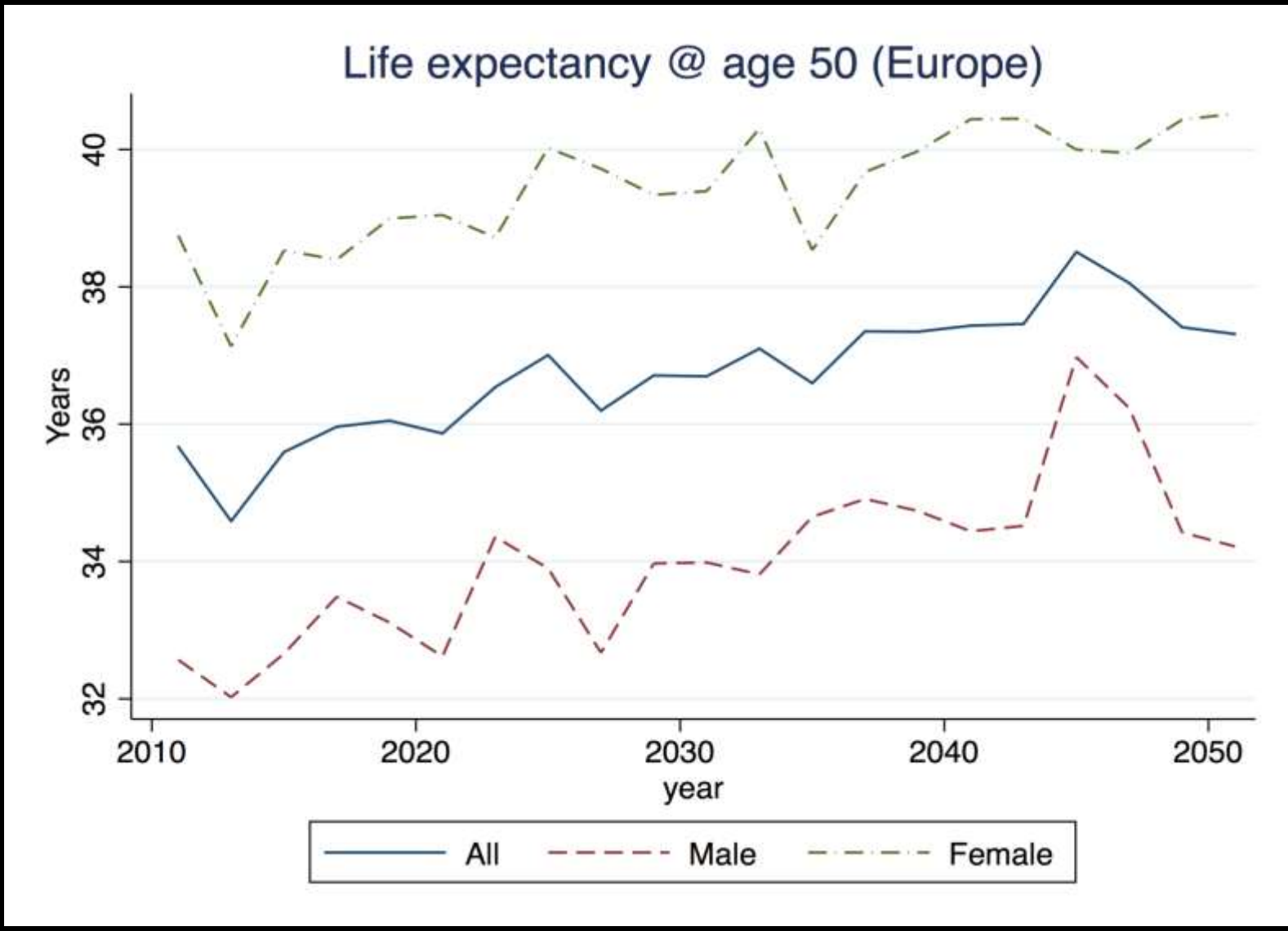
Simulation 2

Forecasting *status quo* (do nothing) scenarios

Life Expectancy, Disability Free Life Expectancy and QALYs

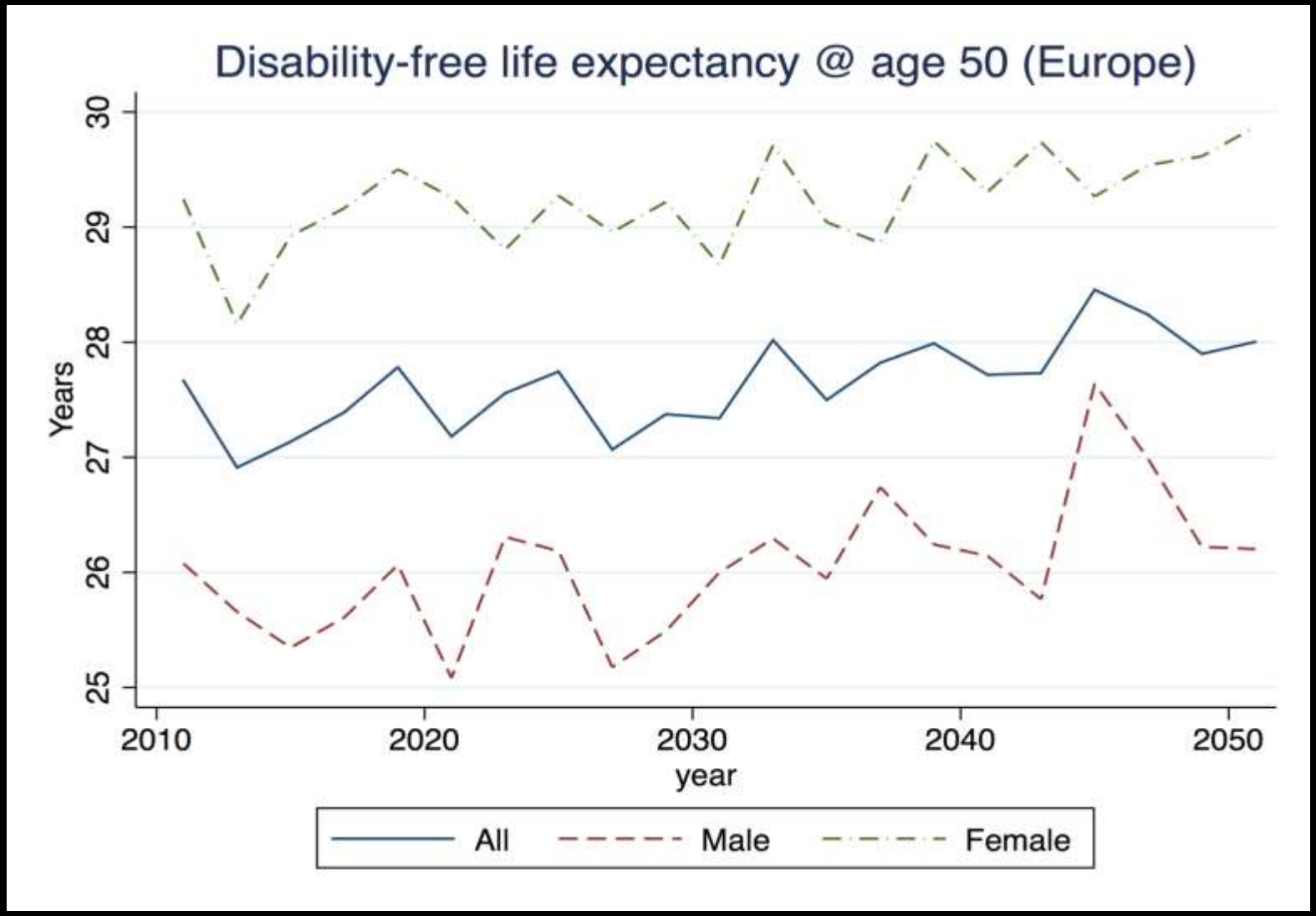
Simulation results: life expectancy with no policy

Coherent with: MOPACT Work Package 'Health and Well-being' (WP5)

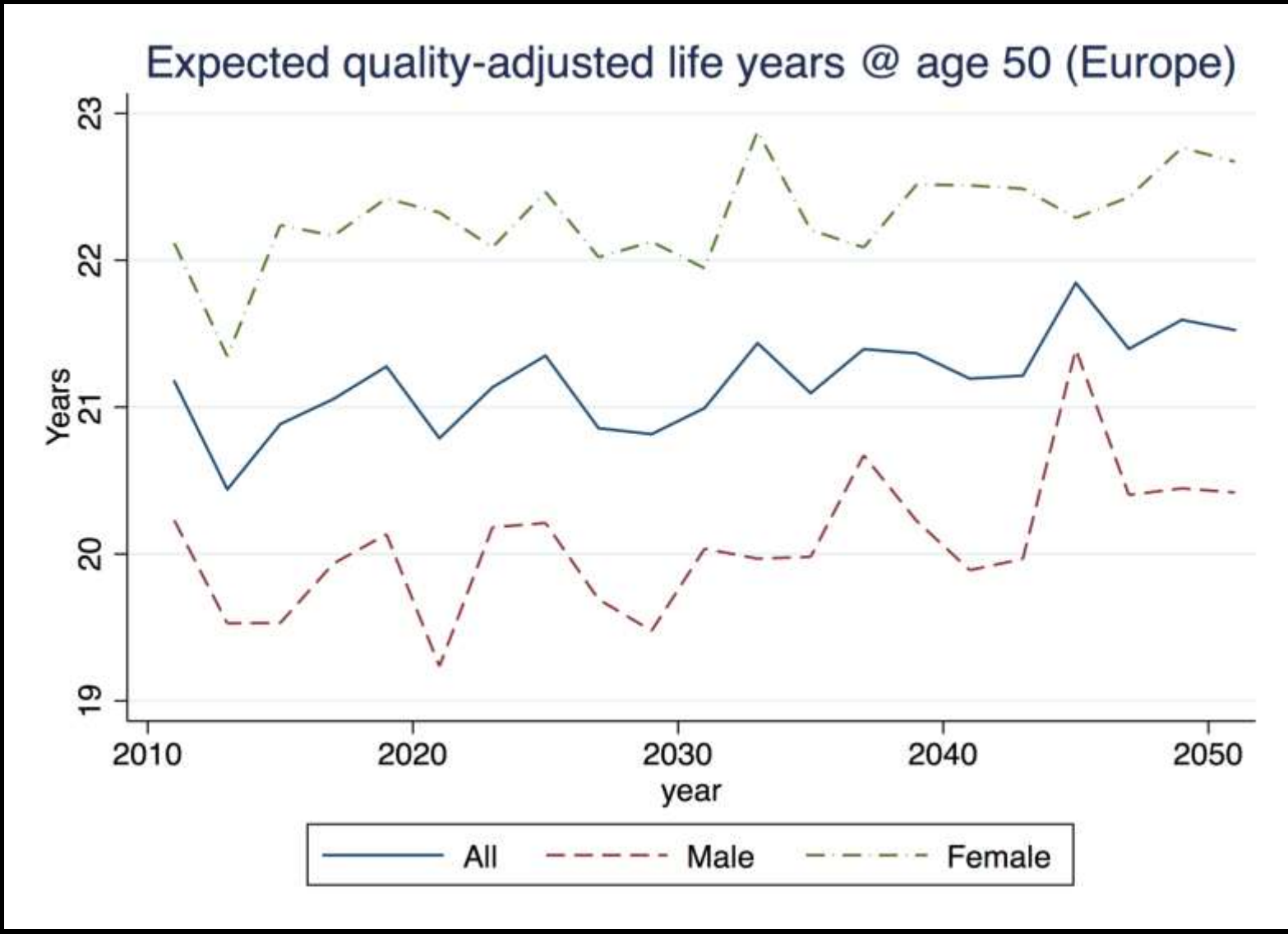


Simulation results: disability free life expectancy with no policy

Coherent with: MOPACT Work Package 'Health and Well-being' (WP5)



Simulation results: QALYs with no policy



Simulation 3

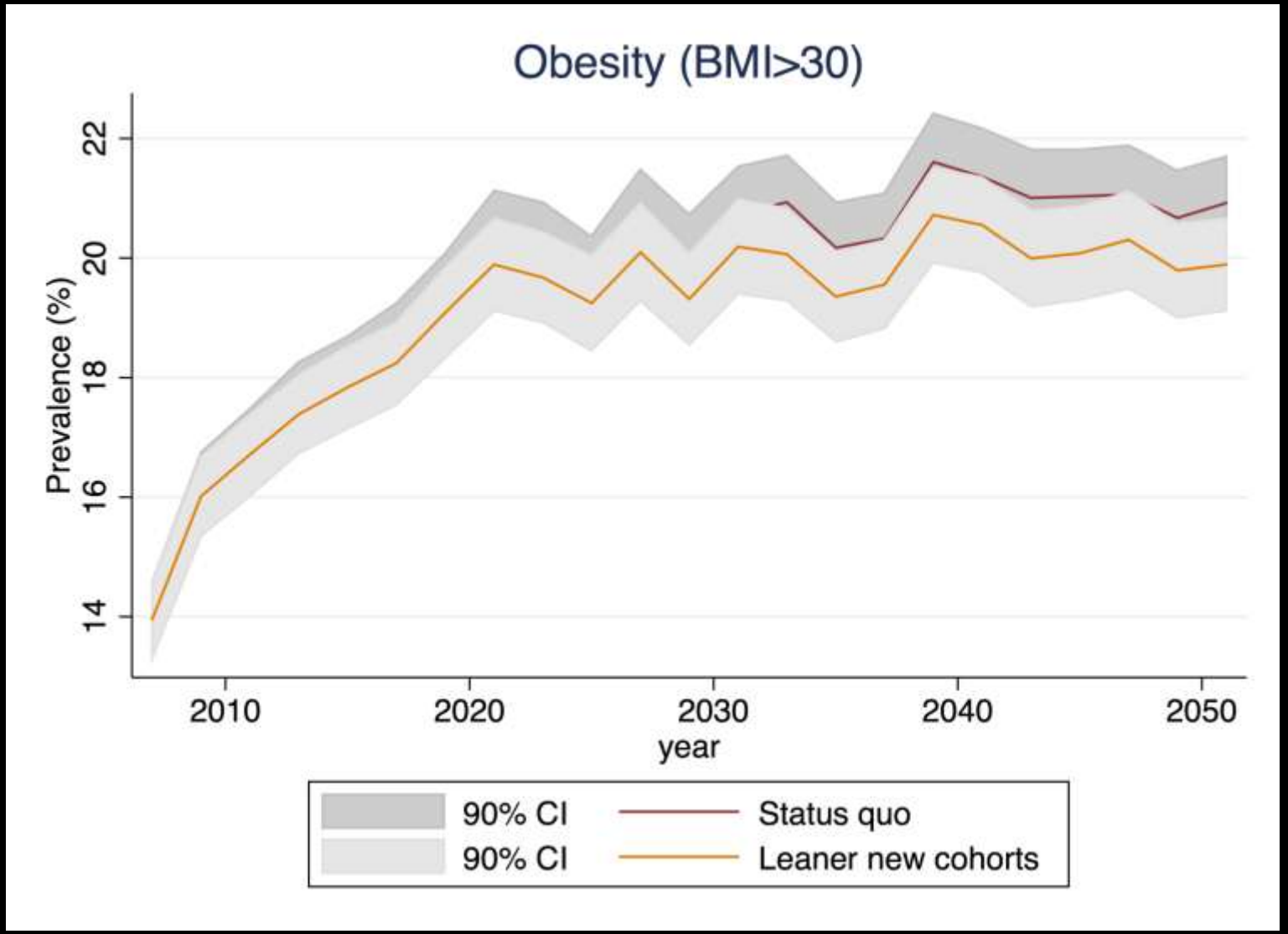
Policy impact evaluation of health care reforms and interventions

The role of life-style changes

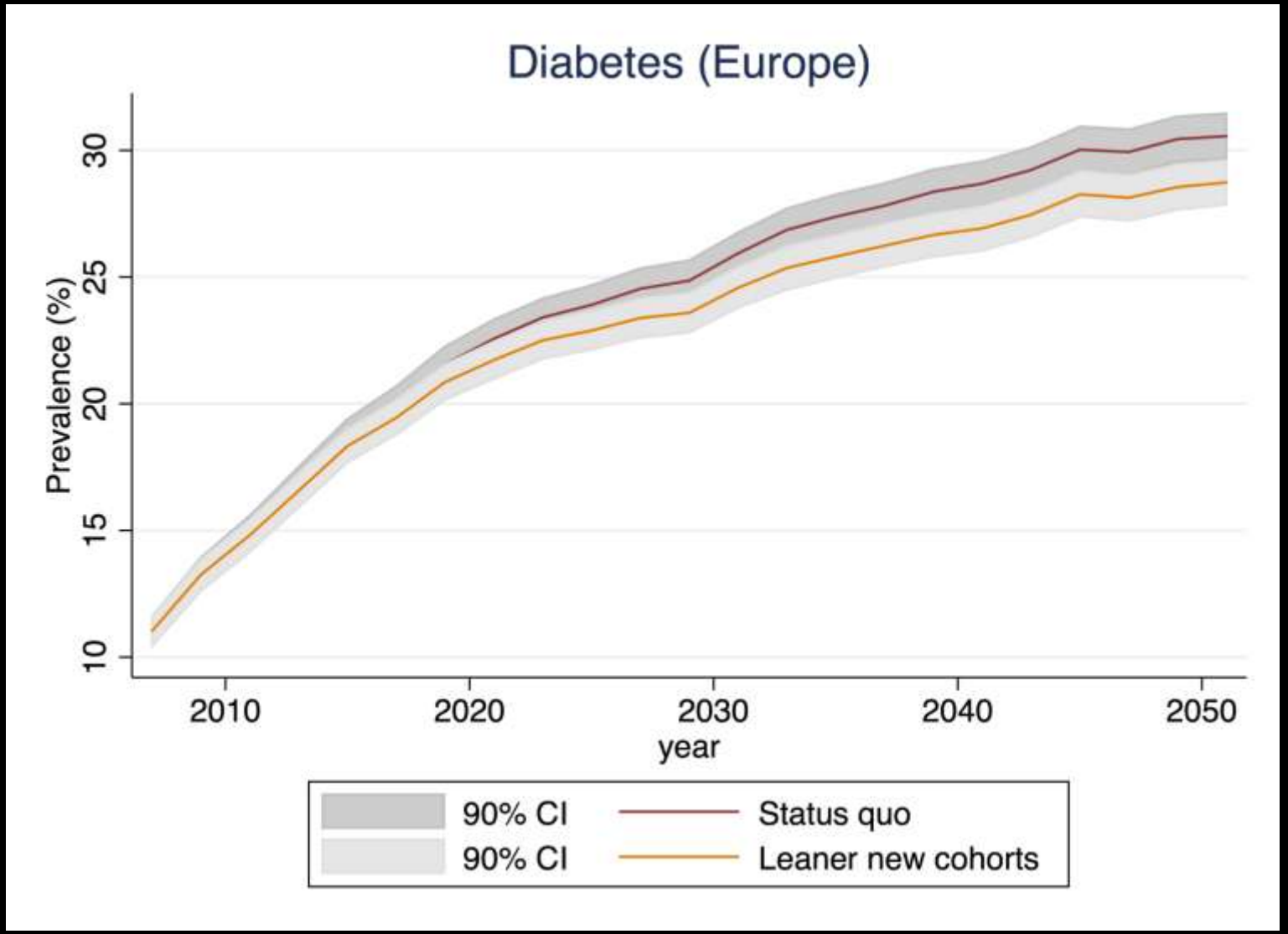
Simulation results: Changes in life style with new leaner cohorts

- Evaluation of the effects of changes in risk factor trends (BMI levels) on chronic conditions.
- This is implemented by altering the trend of incoming cohorts (50-51 year-olds) BMI classes.
- Target: 44% reduction in obese 1 ($30 < BMI \leq 35$), 54% reduction in $35 < BMI \leq 40$, and 58% reduction in obese 3 ($BMI > 40$).

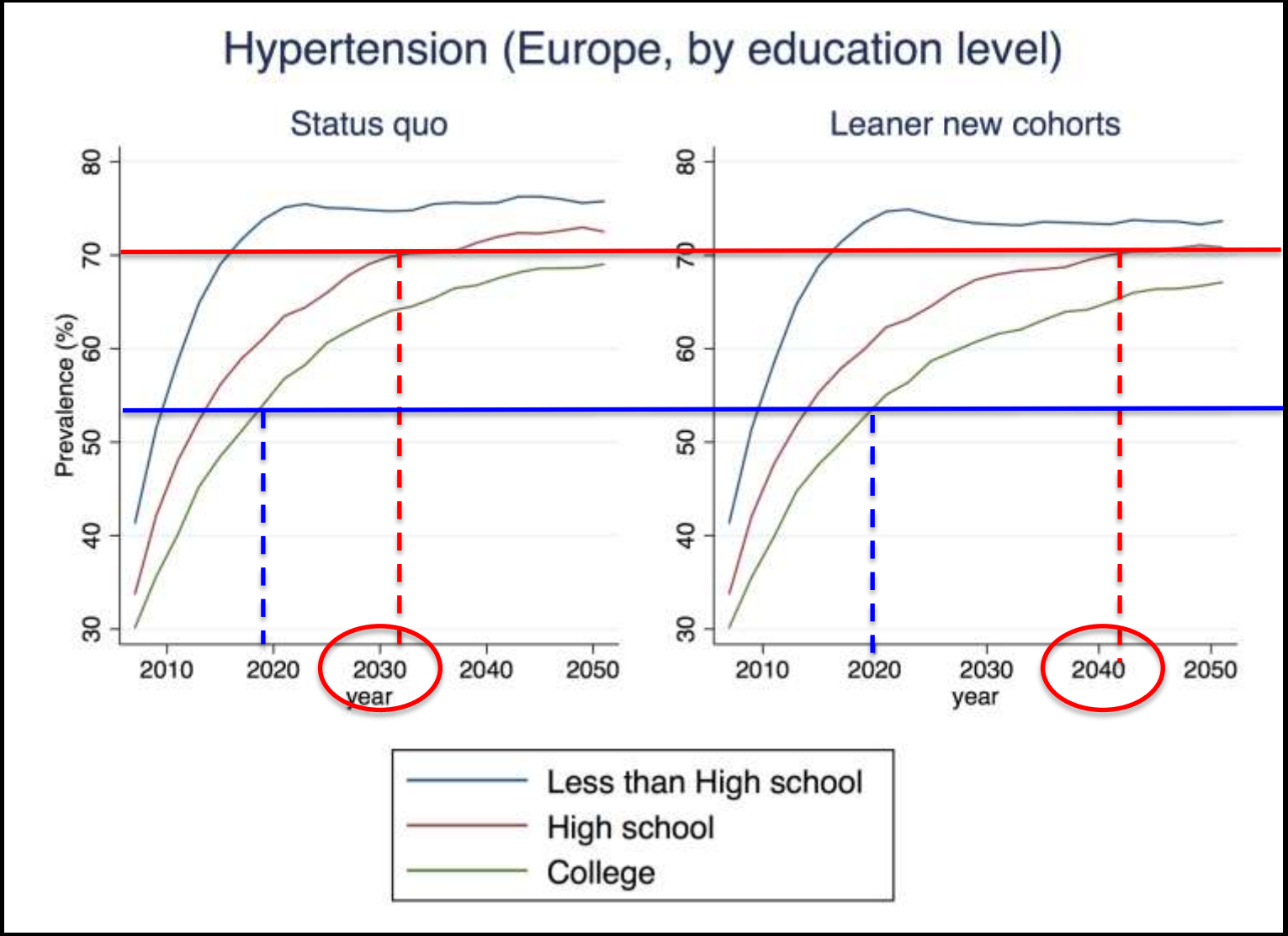
Simulation results: new leaner cohorts



Simulation results: new leaner cohorts



Simulation results: new leaner cohorts



Simulation results: yearly saving from new leaner cohorts (x 1,000,000)

Europe (selected years)

Year	Diabetes	Hypertension	Total
2007	0	0	0
2017	-1,534	-1,723	-3,257
2027	-3,505	-3,597	-7,102
2037	-5,154	-4,718	-9,872
2047	-5,855	-4,292	-10,148
Total 2007-2051	-78,575	-72,701	-151,281

Simulation results: cumulative saving from new leaner cohorts (x 1,000,000)

Italy (selected years)

Year	Diabetes	Hypertension	Total
2007	0	0	0
2017	-38	-777	-815
2027	-147	-3,319	-3,467
2037	-742	-7,843	-8,585
2047	-2,002	-12,706	-14,708

Simulation 4

HTA

The role of new technology/treatment

Simulation results: introducing a new technology/treatment

Evaluation of the introduction of a new “magic" drug for weight loss

Assumption I

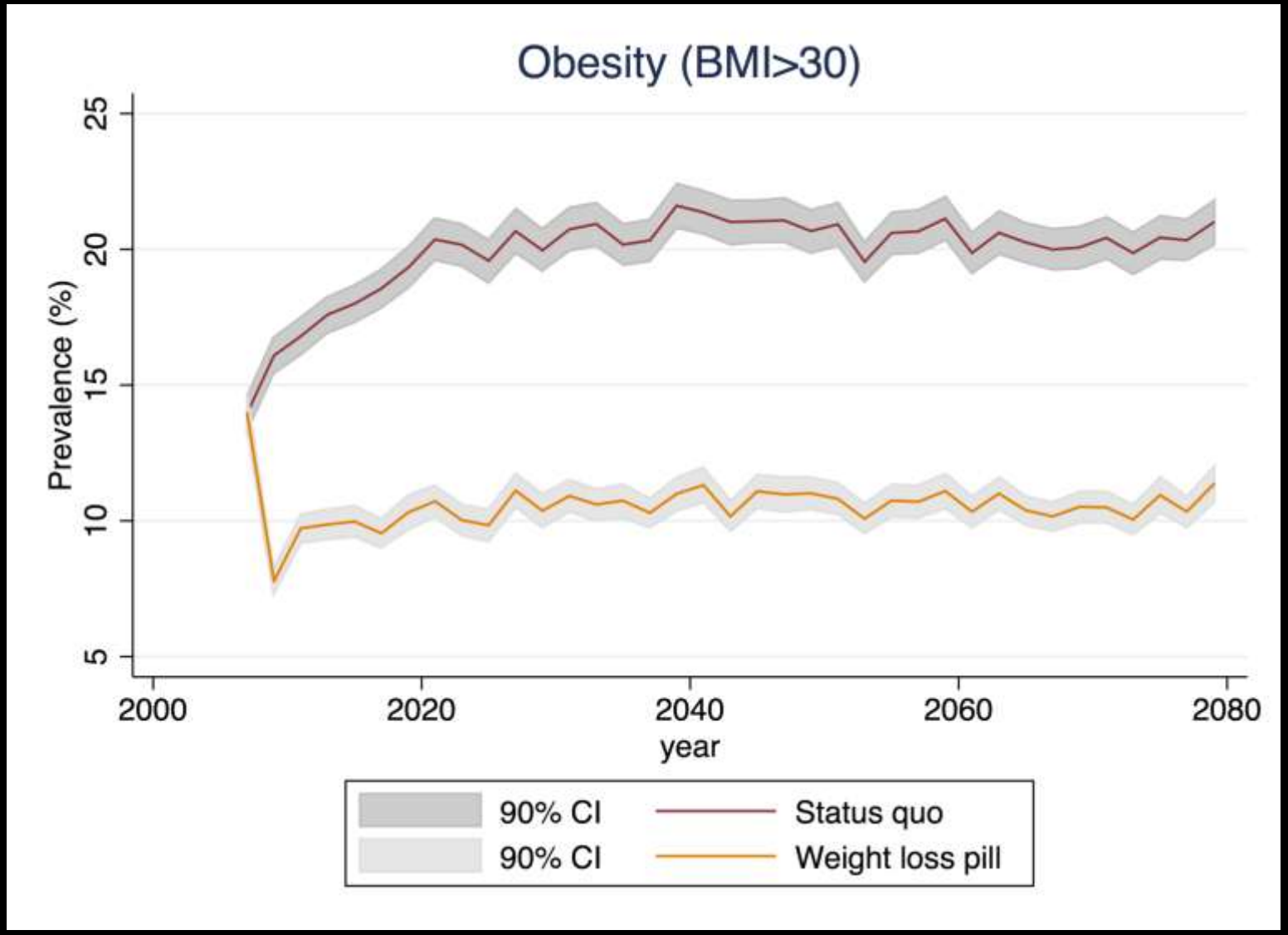
Effect on BMI:

1. 7,5% for 25 <BMI 30;
2. 15% for 30 <BMI 35;
3. 22,5% for 35 <BMI 40;
4. 30% for BMI> 40;

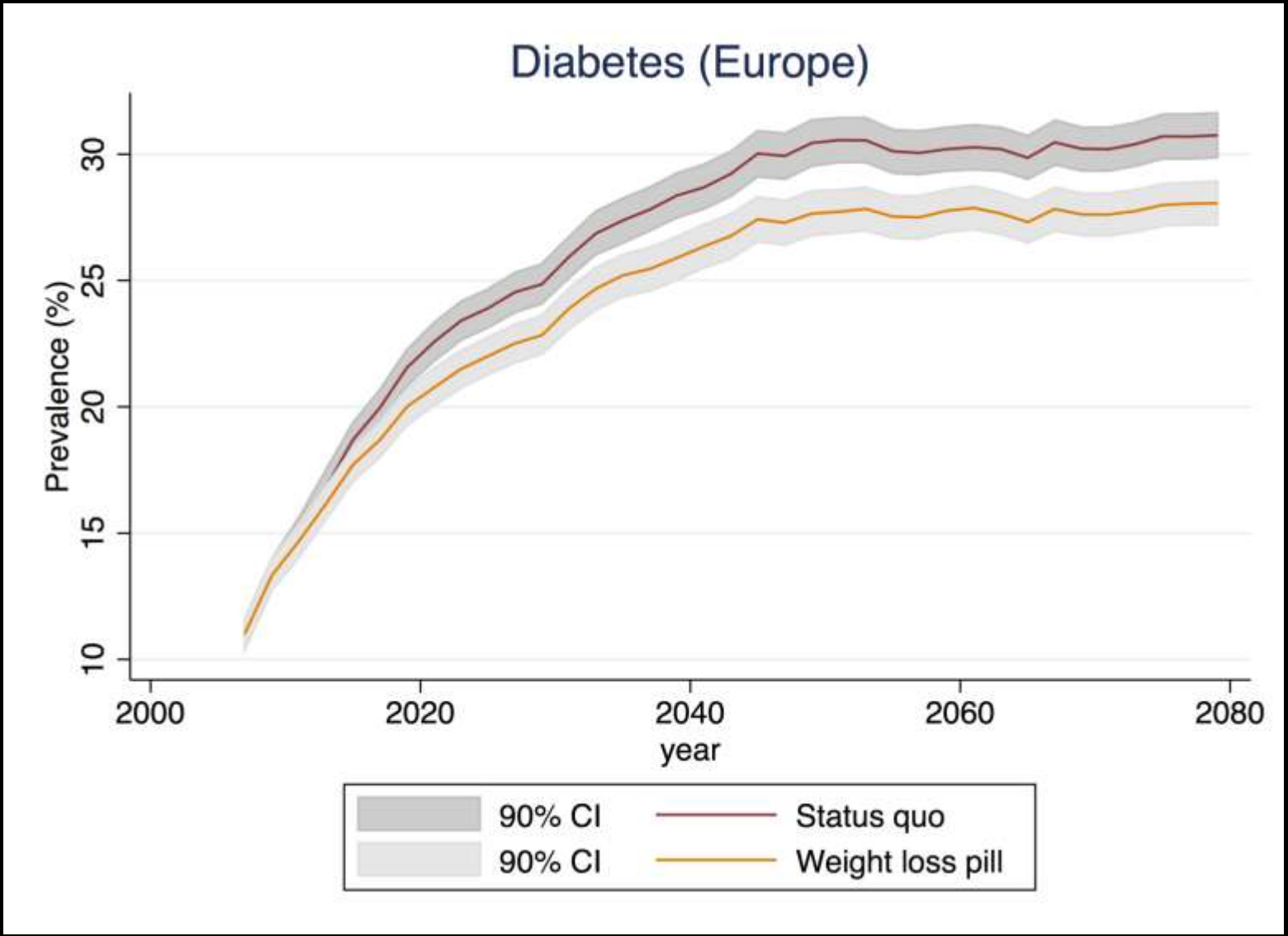
Assumption II

The pill is taken (at random) by 80% of the eligible population (BMI > 25, stock + new cohorts).

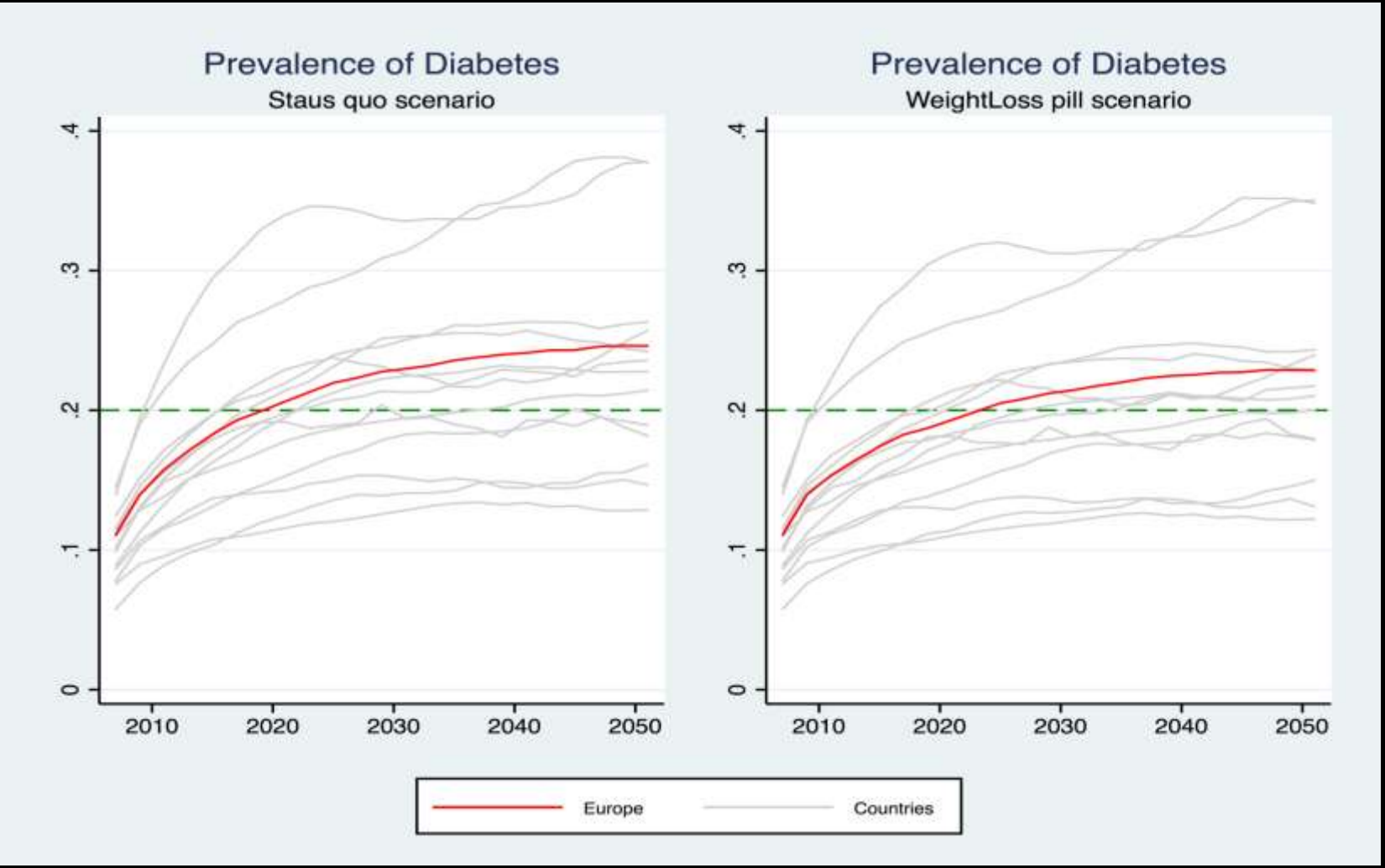
Simulation results: changes in prevalence



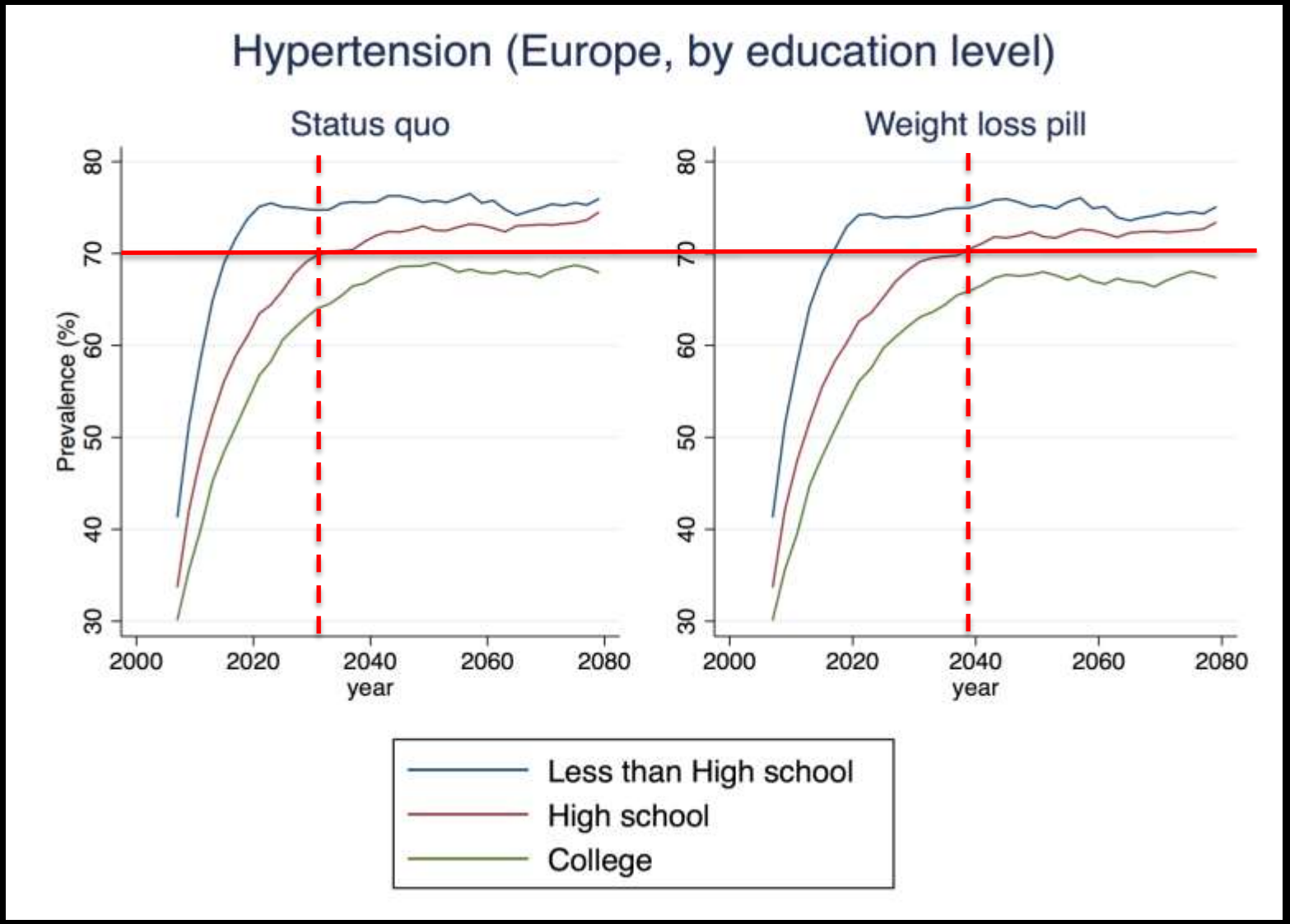
Simulation results: changes in prevalence



Simulation results: changes in prevalence



Simulation results: changes in prevalence



Simulation results: yearly savings “magic pill” (x1,000,000)

Europe (selected years)

Year	Diabetes	Hypertension	Stroke	Hearth	Total
2007	0	0	0	0	0
2017	-3,543	-1,483	-564	-1,230	-8,101
2027	-5,575	-1,031	-994	-787	-10,531
2029	-5,550	-1,114	-724	-828	-10,944
2037	-6,926	-825	-1,432	-1,654	-13,677
2047	-7,823	-271	-1,685	-1,488	-13,771
2051	-7,030	539	-990	-326	-10,300
Total 2007-2051	-114,750	-19,376	-23,227	-26,355	-227,123

Simulation results: cumulative saving effects “magic pill” (x 1,000,000)

Italy (selected years)

Year	Diabetes	Hypertension	Stroke	Hearth	Total
2017	-1,494	-824	-238	-419	-3,367
2027	-5,383	-2,023	-912	-1,668	-11,623
2037	-10,025	-2,882	-1,437	-2,627	-20,234
2047	-14,898	-3,140	-1,844	-3,587	-28,545

Other simulations: an overwiew

- Measuring disease burden
- Economic analysis and inequality in access: The OECD *Aging Unequally* project

Caveats and pros

More data = much better results

These models are data hungry!

We provide projections not predictions

Like maps provide information, don't drive

Transparency

Limitations and assumptions are well described. We will adopt an ***"open source"*** approach for research collaborations.

It's an ongoing project

Everybody is welcome to collaborate with our team.

Model scalability

At which level could be used:

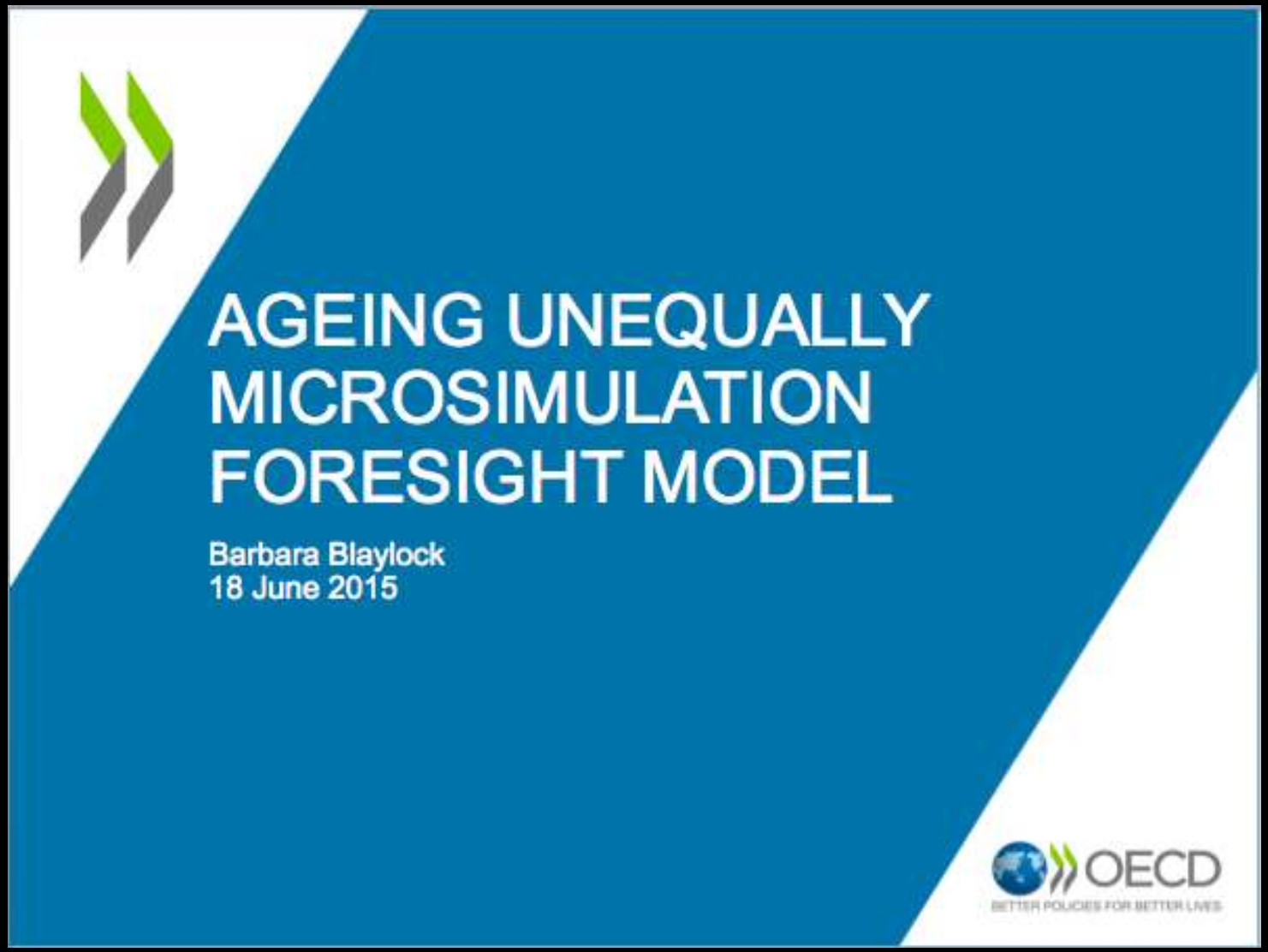
Any conceivable aggregation of patients, such as:

- City council
- LHA
- Province
- Region
- Country

Potential stakeholders at EU and country level

1. International organizations
2. Ministry of Economics
3. Ministry of Health
4. Ministry of Labor and Welfare
5. Government agencies
6. Health care policy makers at Central, Regional and local levels (LHA)
7. Institutional health care providers, such as hospital systems and medical clinics
8. Patients, caregivers, and patient advocacy organizations
9. Clinicians and their professional associations
10. Health care industry representatives
11. Health care researchers and research institutions

The next steps



The next steps

Primary Research Tool: OECD-FEM in Development

- Dynamic microsimulation models of health and economic outcomes for OECD member economies
- Will be used to
  - Age generational cohorts of individuals over their life course
  - Model scenarios in which policy parameters are changed
- Pilot development based on US-FEM and EU-FEM
  - Cohorts enter the model at age 50
  - Model inputs will be sourced, when possible, from other Ageing Unequally descriptive analyses or OECD projects/publications
  - Policy scenarios will be targeted to Ageing Unequally project and limited by timeline for completion
- Intended for frequent updates and future use in other projects

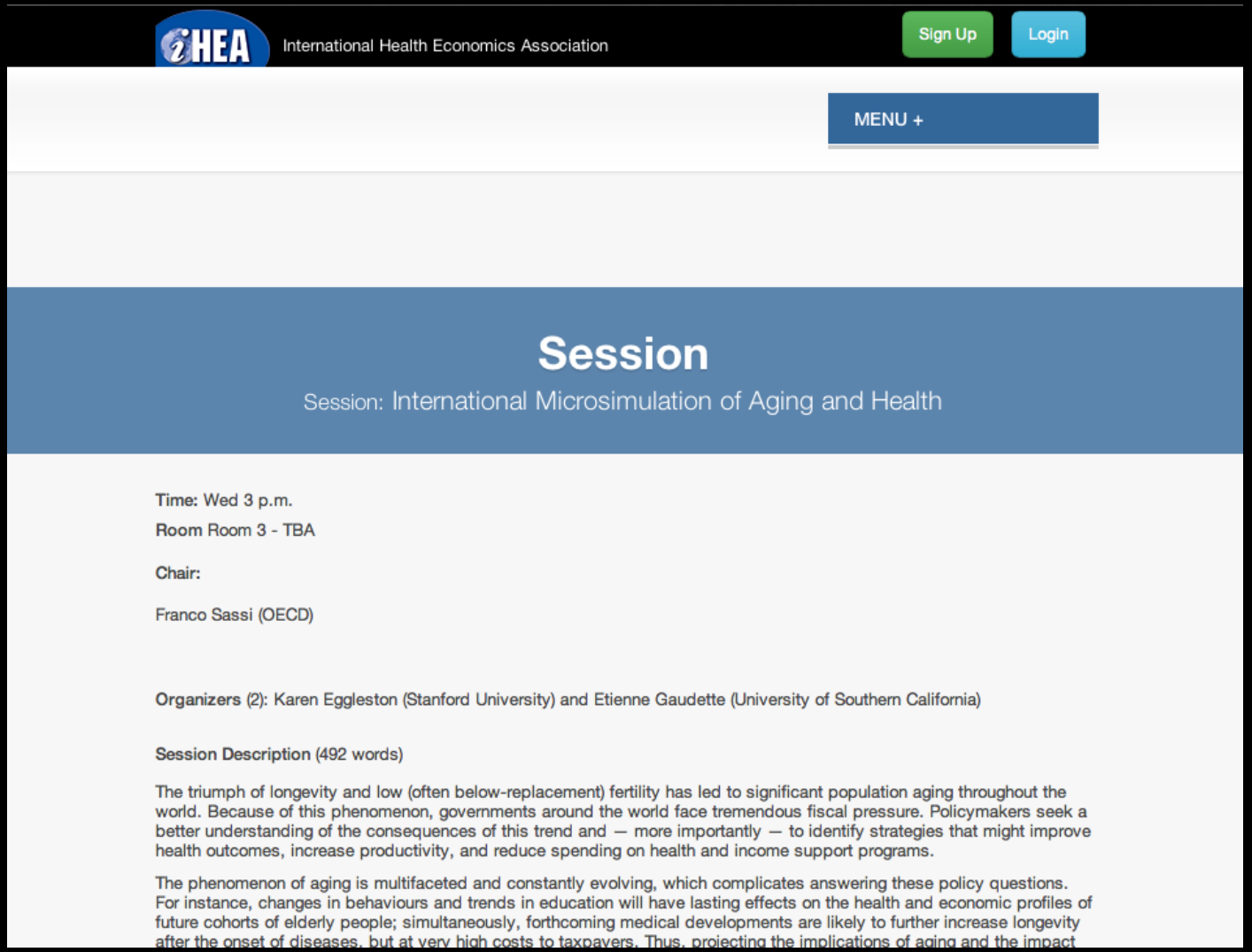
11

The next steps

- July 18-19 – International FEM meeting in Rome @ Univ. Tor Vergata - Villa Mondragone

- Signing the MOU between CEIS and OECD
- Completion of the I-FEM model
- Completion of the EU-FEM model with UK and Ireland
- Completion of the EU-FEM model with the income, pension, tax & benefits and labor choice modules

iHEA special session with OECD and partners



iHEA International Health Economics Association

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MENU +

Session

Session: International Microsimulation of Aging and Health

Time: Wed 3 p.m.

Room Room 3 - TBA

Chair:

Franco Sassi (OECD)

Organizers (2): Karen Eggleston (Stanford University) and Etienne Gaudette (University of Southern California)

Session Description (492 words)

The triumph of longevity and low (often below-replacement) fertility has led to significant population aging throughout the world. Because of this phenomenon, governments around the world face tremendous fiscal pressure. Policymakers seek a better understanding of the consequences of this trend and — more importantly — to identify strategies that might improve health outcomes, increase productivity, and reduce spending on health and income support programs.

The phenomenon of aging is multifaceted and constantly evolving, which complicates answering these policy questions. For instance, changes in behaviours and trends in education will have lasting effects on the health and economic profiles of future cohorts of elderly people; simultaneously, forthcoming medical developments are likely to further increase longevity after the onset of diseases, but at very high costs to taxpayers. Thus, projecting the implications of aging and the impact

Thank you!