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Leonard D. Schaeffer Center for Health Policy & Economics

Future Burden of Heart Disease in the US, Europe, and Japan

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Introduction

- Heart disease is the leading cause of death globally (Global Burden of Disease Network 2020)
  - 9.1 million annual ischemic heart disease deaths
  - Increased by 2 million since 2000 – largest increase in deaths among all diseases
- Morbidity burden is also large
  - 197.2 million people living with ischemic heart disease in 2019
- The problem is expected to grow $\Rightarrow$ innovation in prevention and treatment is needed
  - Aging population
  - Slowdown in progress in developed countries

Objectives

- Project the future burden of heart disease in US, Europe, and Japan
  - Estimate future trends in prevalence
  - Estimate heart disease burden on expected quantity and quality of life of current 60-year-olds
- Compare disparities in projected burden
  - Between geographies
  - By sex
  - By education

Outline

Methods

Future Prevalence Estimates (Population Simulation)

Future Burden Estimates (Cohort Simulation)

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Prevalence Estimates (Population Simulation)

Burden Estimates (Cohort Simulation)

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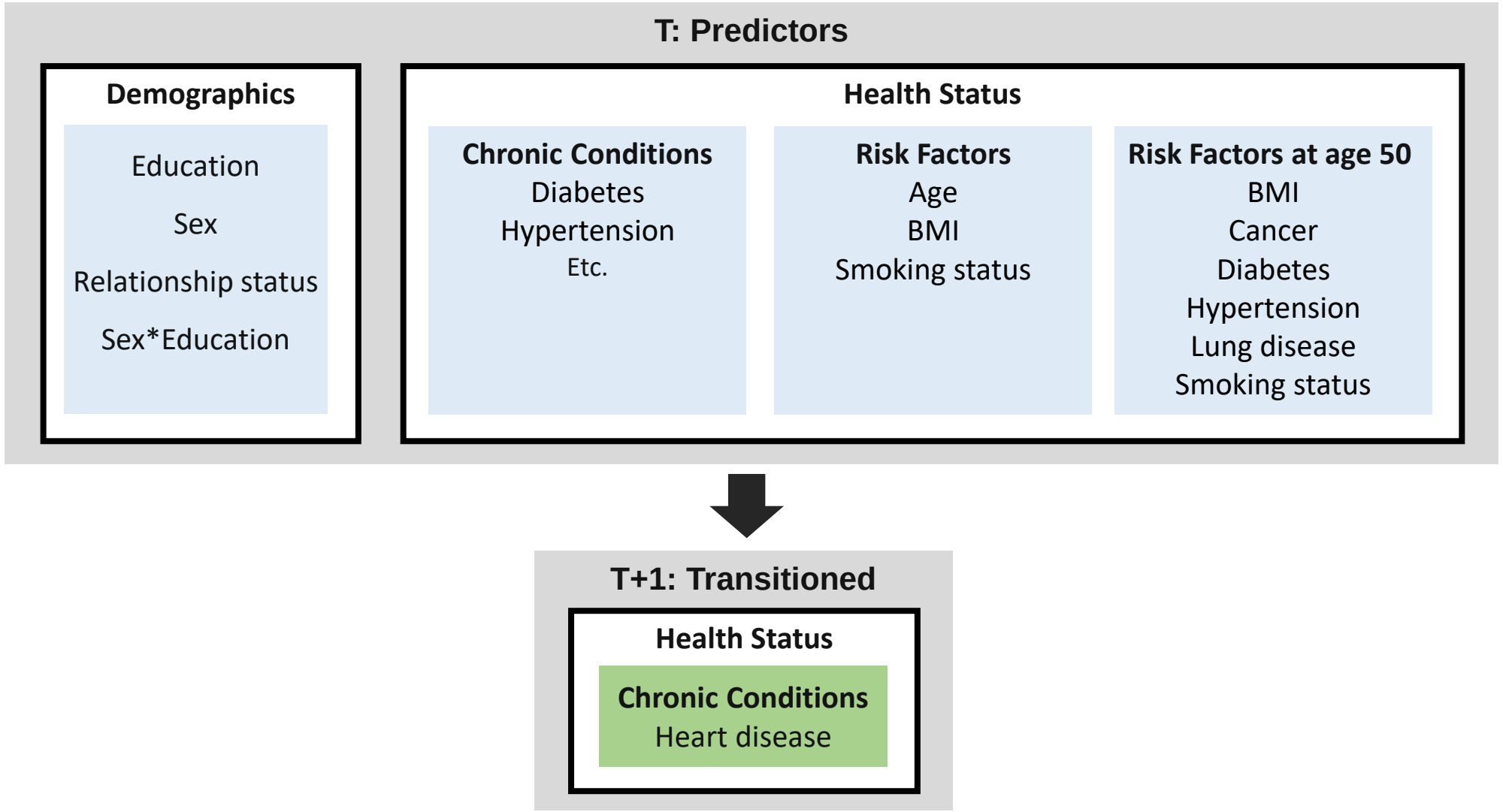
Modeling approach

- Project the future of heart disease for the US, Europe, and Japan using microsimulation models (US FEM, EU-FEM, and Japan-FEM)
    - Project heart disease prevalence and counts by age, sex, and education
    - Assess the burden of heart disease on quantity and quality of life for a cohort
    - Describe disparities

Projecting heart disease incidence in US



Heart disease impacts many outcomes in US FEM

T: Predictors

Health Status

Chronic Conditions
Heart disease

T: Contemporaneous

T: Subjective Well-being: QALY

T: Medical Cost and Use

- Individual: OOP expenditures, Rx amount and expenditures
- Medicaid expenditures
- Medicare (Part A, B and D) expenditures and enrolled
- Total medical expenditures
- Utilization: doctor visits, hospital encounters and nights

T+1: Transitioned

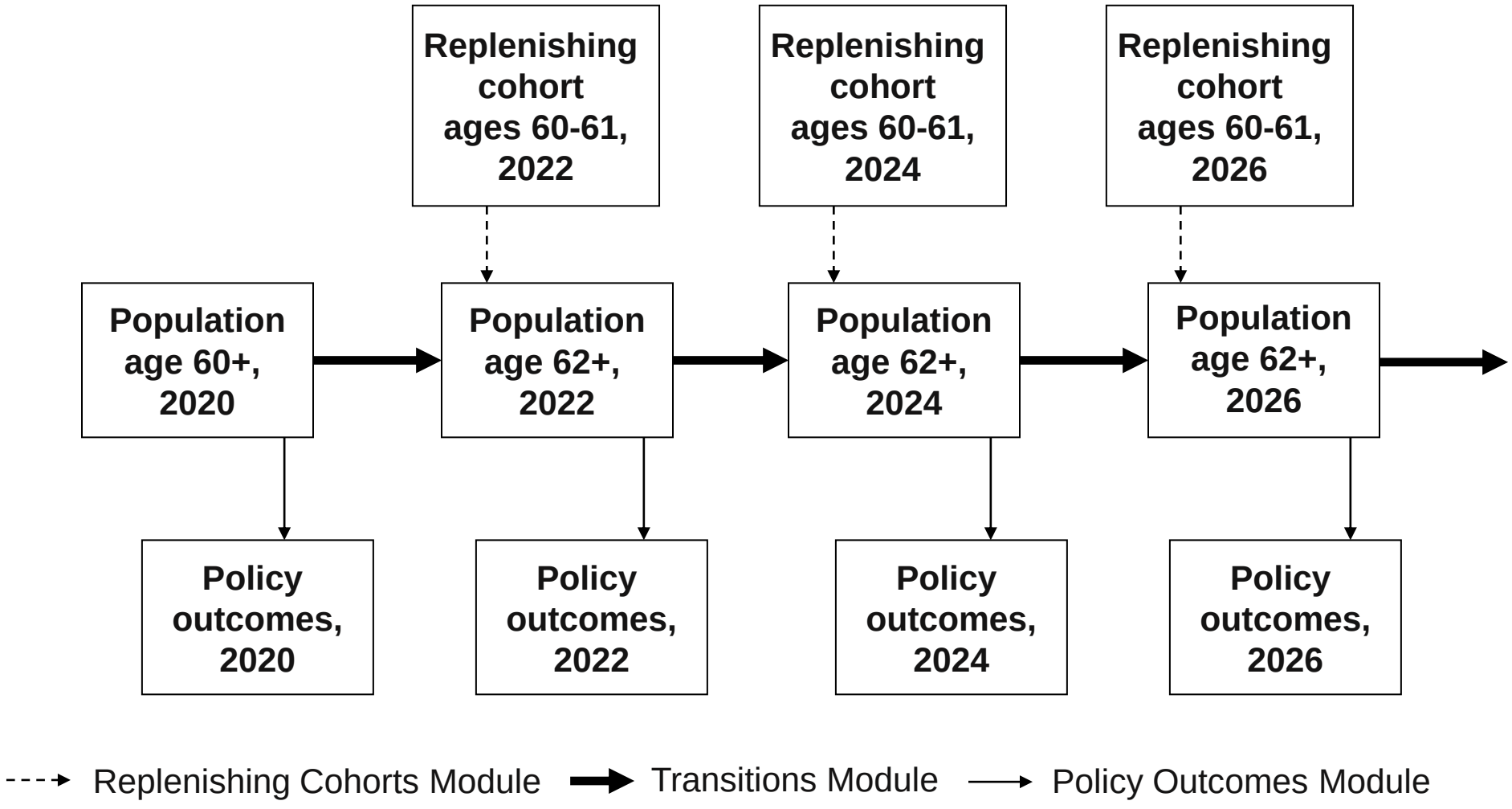
T+1: Health Status

- Mortality
- Chronic conditions: CHF, stroke
- Functional limitations: ADL, IADL, pain level, nursing home residence
- Cognition: cognitive ability
- Risk factors: BMI, smoking status

T+1: Economic Status

- Employment status: working for pay
- Health insurance: private
- Earnings, capital income, wealth
- Private program participation: DB pension
- Public program participation: disability, claiming SS and SSI, other
- Taxes: property tax
- Transfers: help hours, other government

Structure of FEM population simulation



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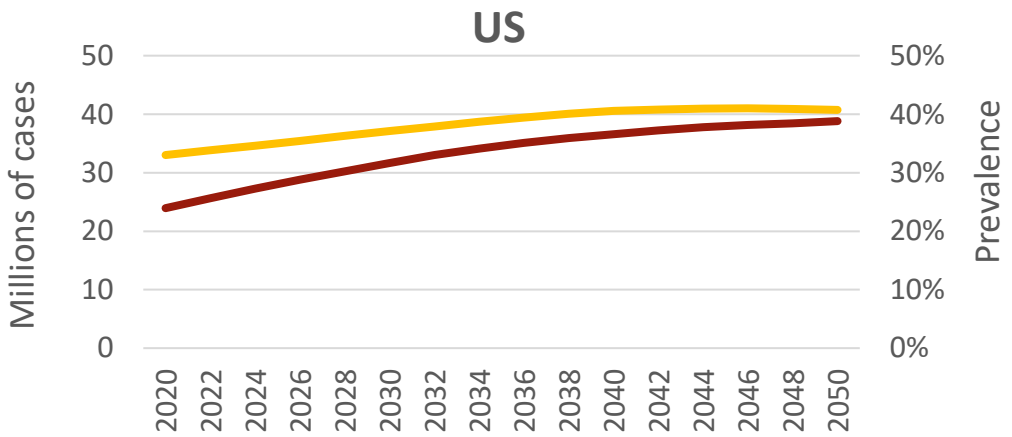
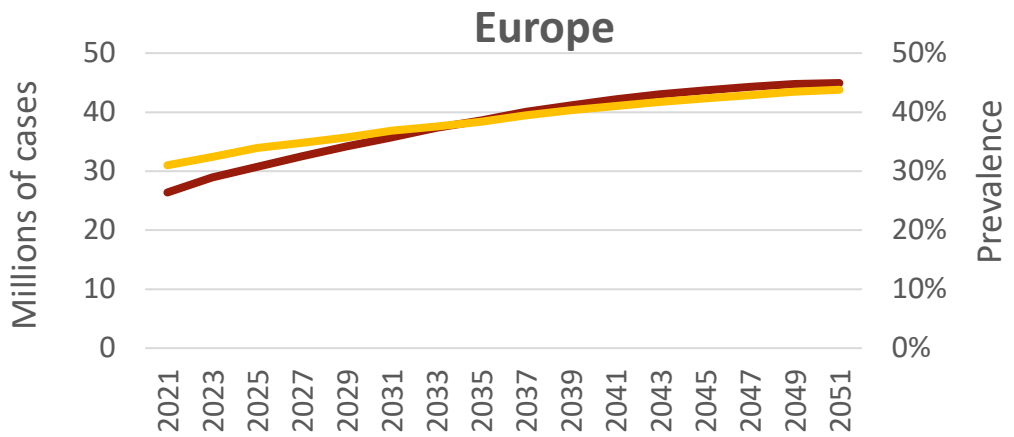
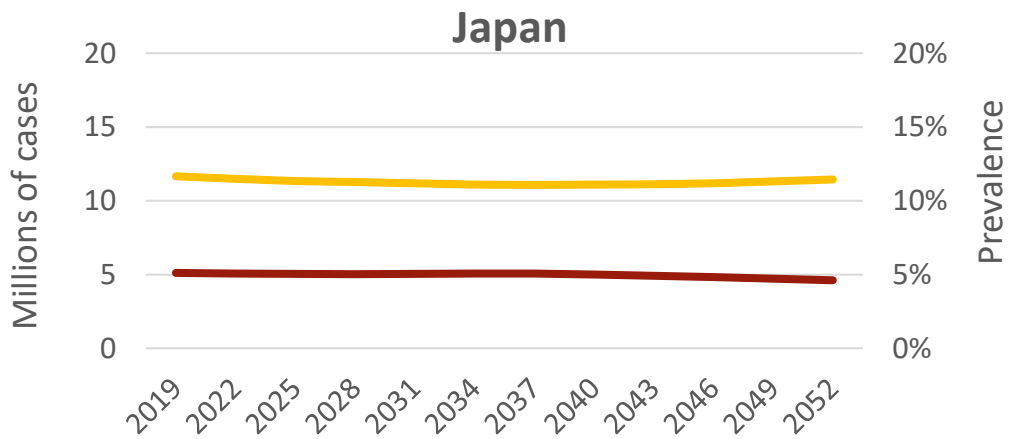
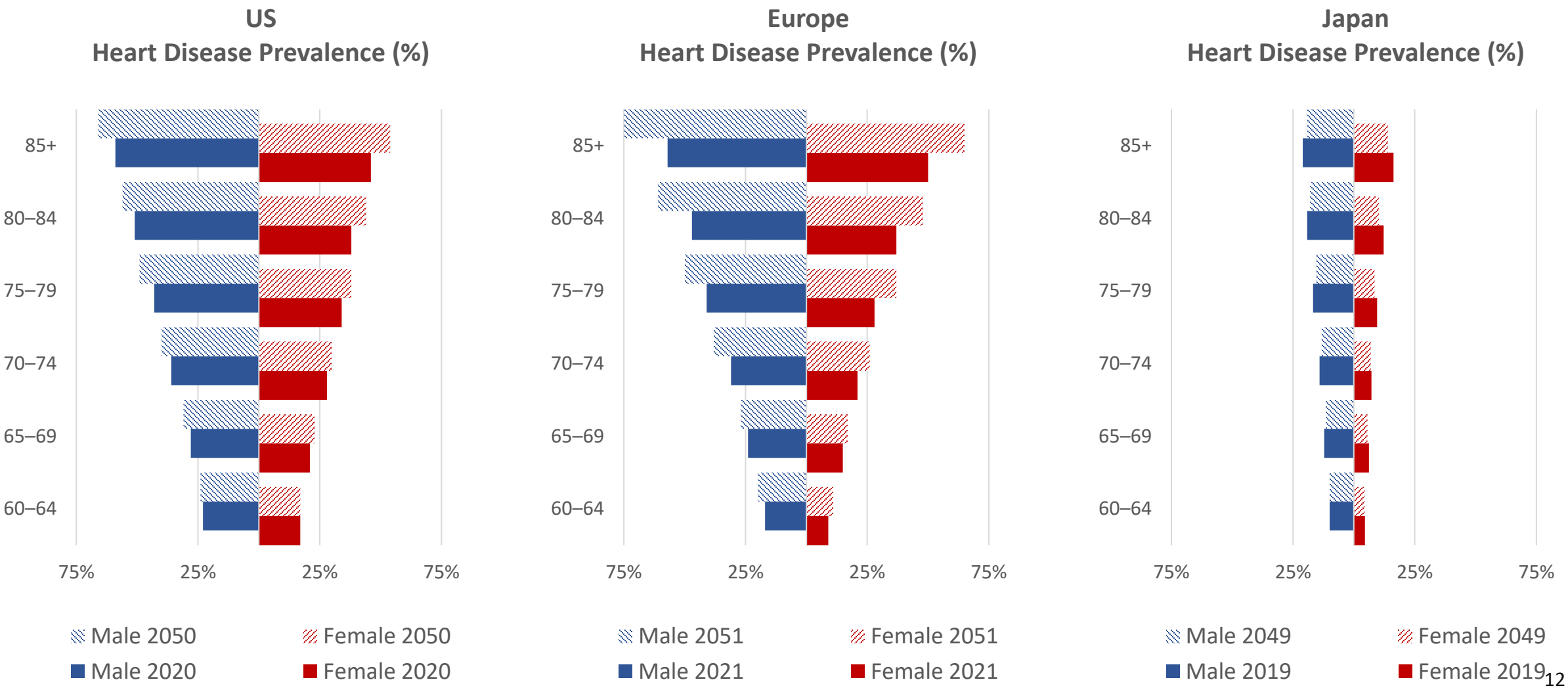
Prevalence among 60+ projected to increase in US and Europe; flat in Japan



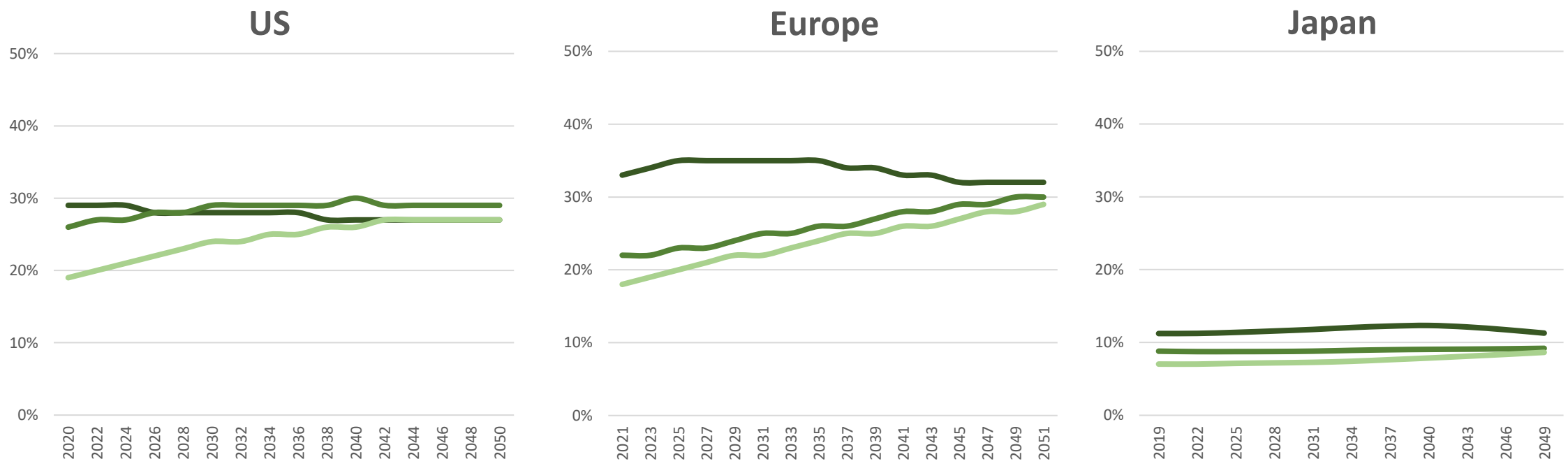




Age-specific prevalence to increase in US and Europe; not Japan



Educational disparities in heart disease projected to narrow for women in US and Europe

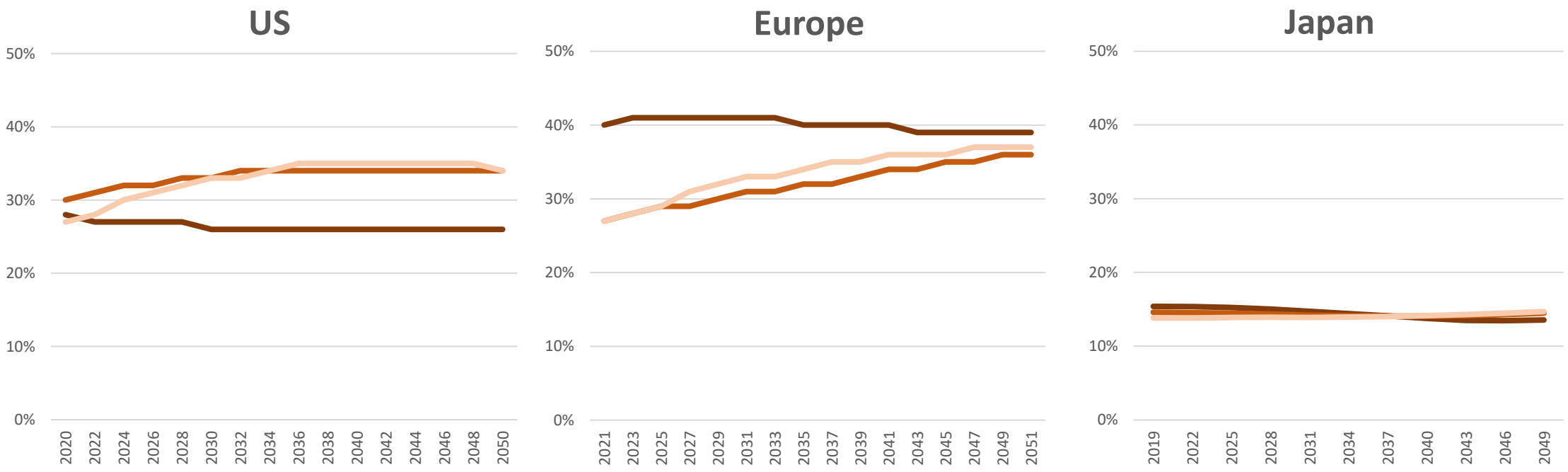


Heart disease prevalence for less than high school

Heart disease prevalence for high school

Heart disease prevalence for college

Educational disparities projected to narrow for men in Europe



Heart disease prevalence for less than high school

Heart disease prevalence for high school

Heart disease prevalence for college

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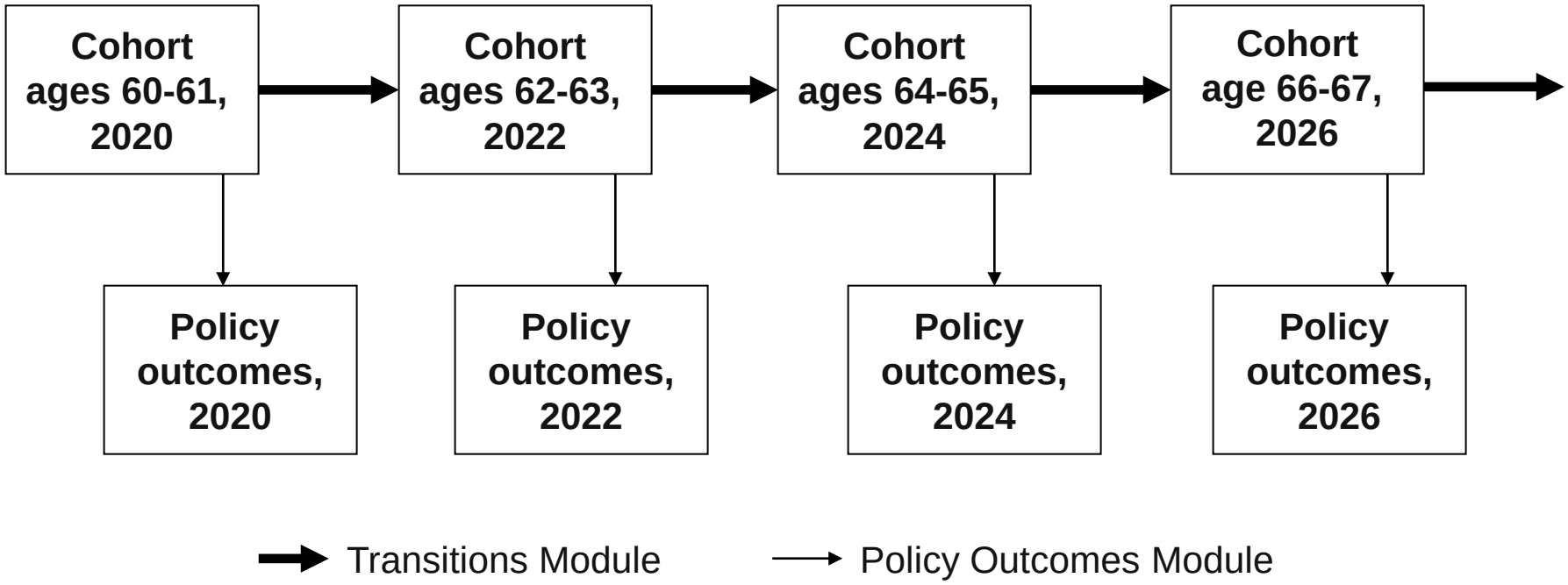
Calculating burden and impact of intervention

Burden of heart disease

- Compare the current projections for current cohort of 60-year-olds to a counterfactual world without future incidence of heart disease
- The difference in quantity and quality of life is the burden due to heart disease
- Captures burden from changes in
  - Heart disease mortality
  - Heart disease morbidity (functional limitations)
  - Morbidity and mortality influence as a comorbidity

Structure of FEM cohort simulation

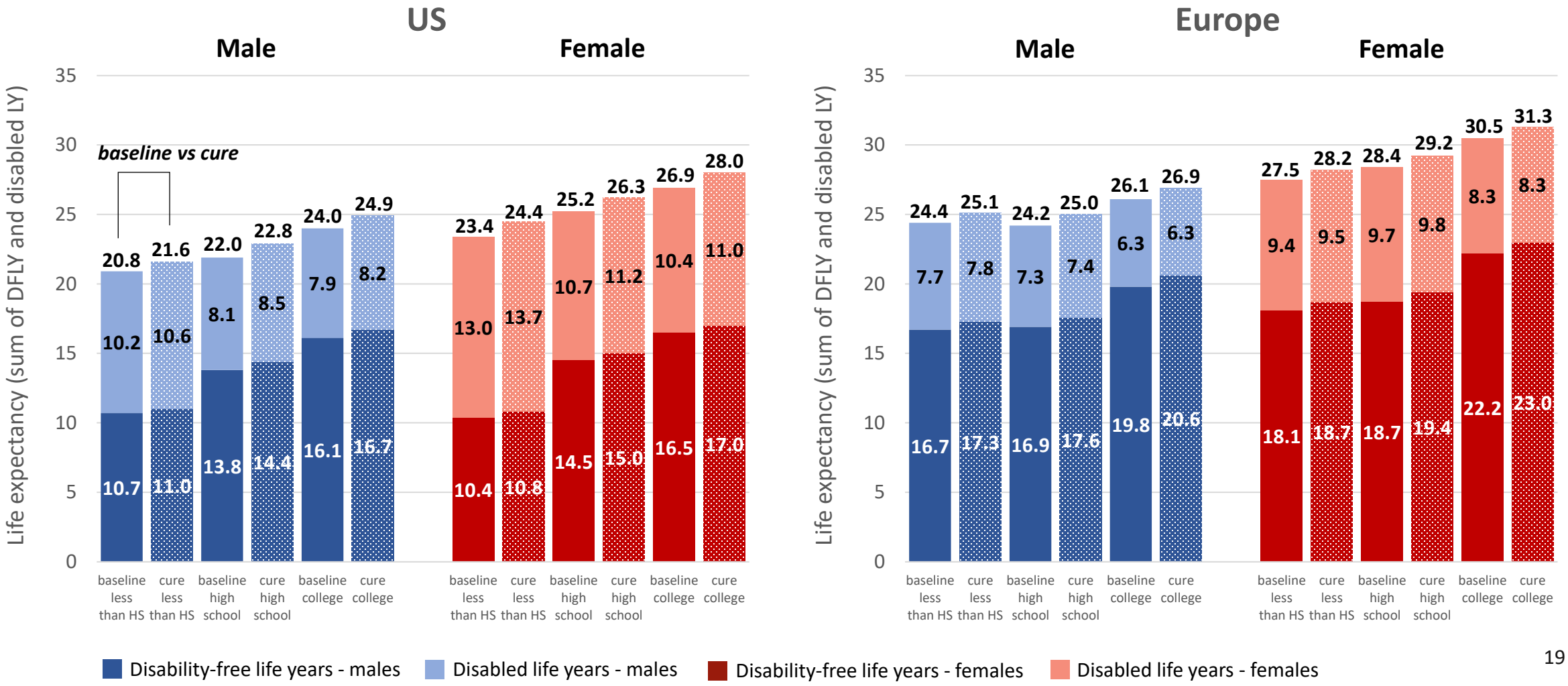


A typical 60-year-old American in 2020 loses 0.9 to 1.1 years, European loses 0.8 to 0.9 years, and Japanese loses 0.2 to 0.3 years to heart disease

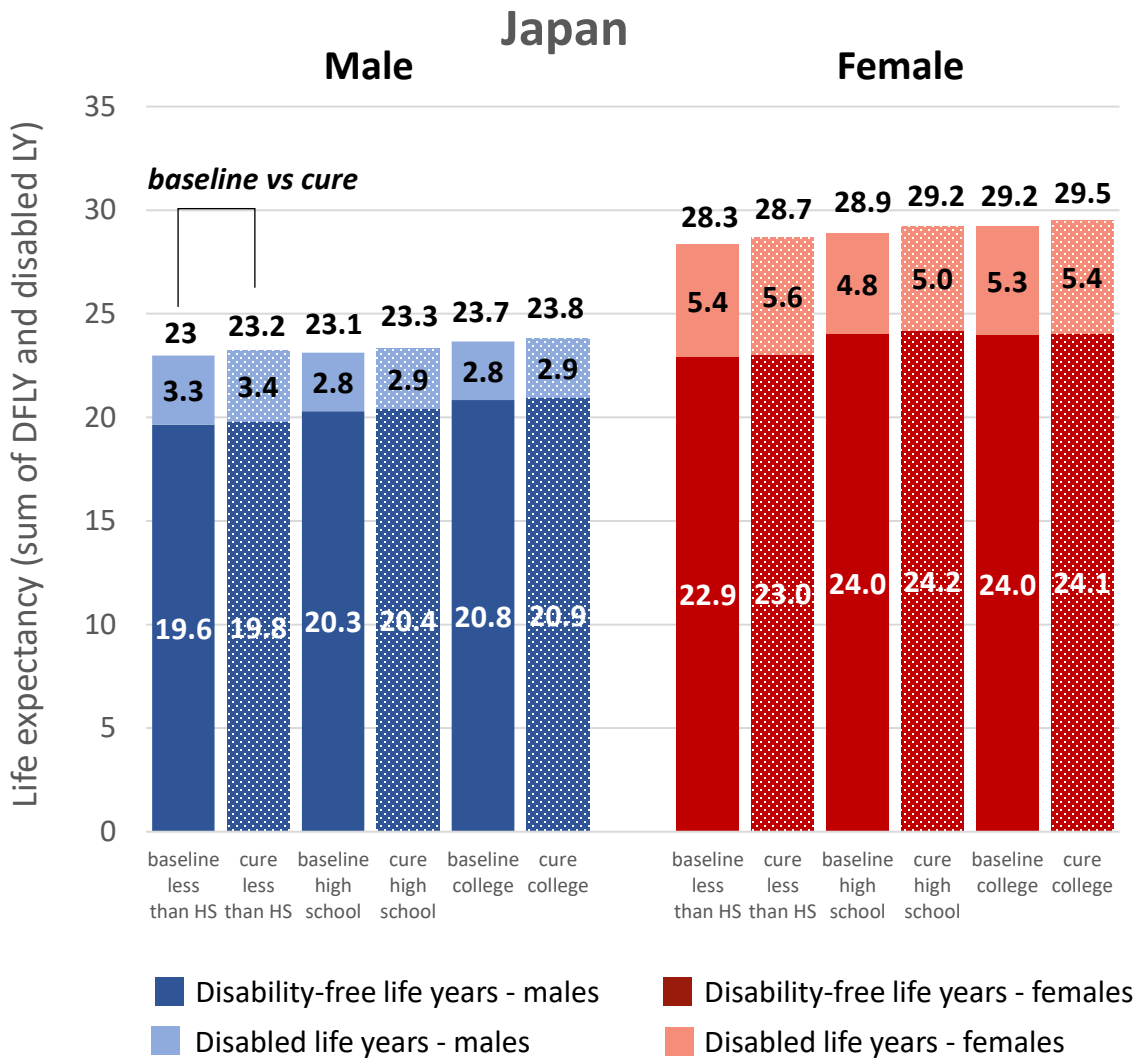
	US			Europe			Japan		
	DFLY	Disabled LY	**Life Expectancy**	DFLY	Disabled LY	**Life Expectancy**	DFLY	Disabled LY	**Life Expectancy**
Baseline	14.6	8.3	**22.9**	17.5	7.1	**24.6**	20.3	3.0	**23.3**
Cure	15.2	8.6	**23.8**	18.3	7.2	**25.5**	20.5	3.0	**23.5**
Baseline	15.2	10.8	**26.0**	19.5	9.3	**28.8**	23.7	5.0	**28.8**
Cure	15.7	11.4	**27.1**	20.2	9.4	**29.6**	23.9	5.2	**29.1**
Aggregate Burden	**$2.1 trillion**			**$2.6 trillion**			**$0.2 trillion**		

Note: Burden calculated as the difference in life expectancy in the 'cure' and baseline cases, extrapolated to current 60- to 64-year-old population numbers and valued at $100,000 per life year. Life expectancy is the sum of disability-free life years and disabled life years.

Comparing burden by gender and education in US vs. Europe



Japan is quite different



Summary: Average burden of heart disease by sex/education

		Burden of Heart Disease (years)		
		US	**Europe**	**Japan**
	Less than High School	0.8	0.7	0.3
	High School	0.9	0.8	0.2
	College	1.0	0.8	0.2
	Less than High School	1.0	0.7	0.4
	High School	1.1	0.8	0.3
	College	1.1	0.9	0.3

Note: Burden calculated as the difference in life expectancy in the 'cure' and baseline cases

Conclusion

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Conclusion

- Burden of heart disease is large and projected to grow
- Gains from innovation in treatment and prevention are large
- Unevenly distributed
  - Burden much higher in US and EU than Japan
  - Burden higher in women

    $\Rightarrow$ reducing burden could reduce disparities
  - Burden higher (lower) for more educated in US/EU (Japan)

    $\Rightarrow$ reducing burden could steepen (lessen) education gradient in US/EU (Japan)

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