

# Exploring demand-side mitigation: comparing historical dietary changes and IAM scenarios

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	FOOD	IMPACT (GHG emissions per gram of protein)	COST (Retail price per gram of protein)
LOW	Wheat		\$
	Corn		\$
	Beans, chickpeas, lentils		\$
	Rice		\$
	Fish		\$\$\$
	Soy		\$
	Nuts		\$\$\$
	Eggs		\$\$
MEDIUM	Poultry		\$\$
	Pork		\$\$
	Dairy (milk, cheese)		\$\$
HIGH	Beef		\$\$\$
	Lamb & goat		\$\$\$

Lighter shade shows emissions from agricultural production, darker shade shows emissions from land-use change.

### How Much Protein Do You Need?

The average daily adult protein requirement is **56g** for a man and **46g** for a woman but many people consume much more than they need.

0g      average daily adult protein requirement 51g      average US daily protein consumption 83g

Sources: GlobAgri-WRR model developed by CIRAD, Princeton University, INRA, and WRI (GHG data); USDA and BLS (2016) (US retail price data). Notes: see [www.wri.org/proteinscorecard](http://www.wri.org/proteinscorecard).

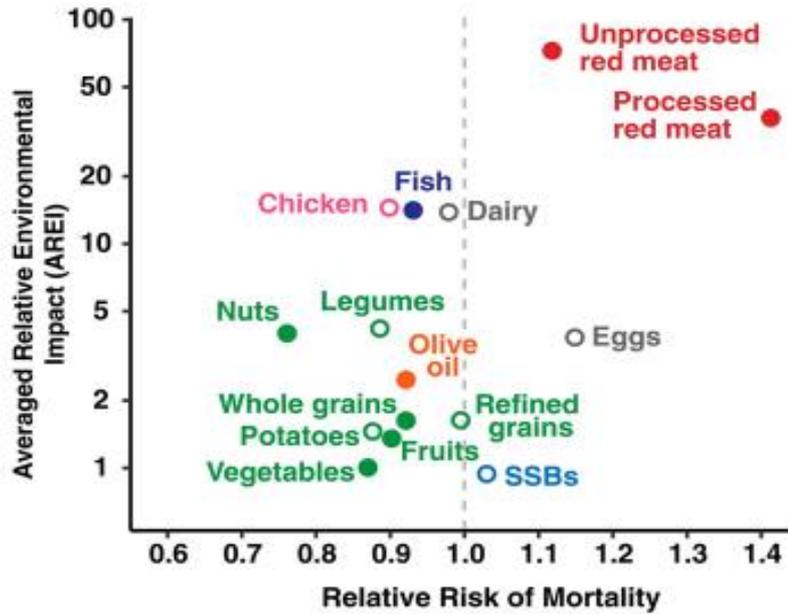
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Association between a food group's impact on mortality and its averaged relative environmental impact (log scale).



Michael A Clark et al. PNAS 2019;116:46:23357-23362

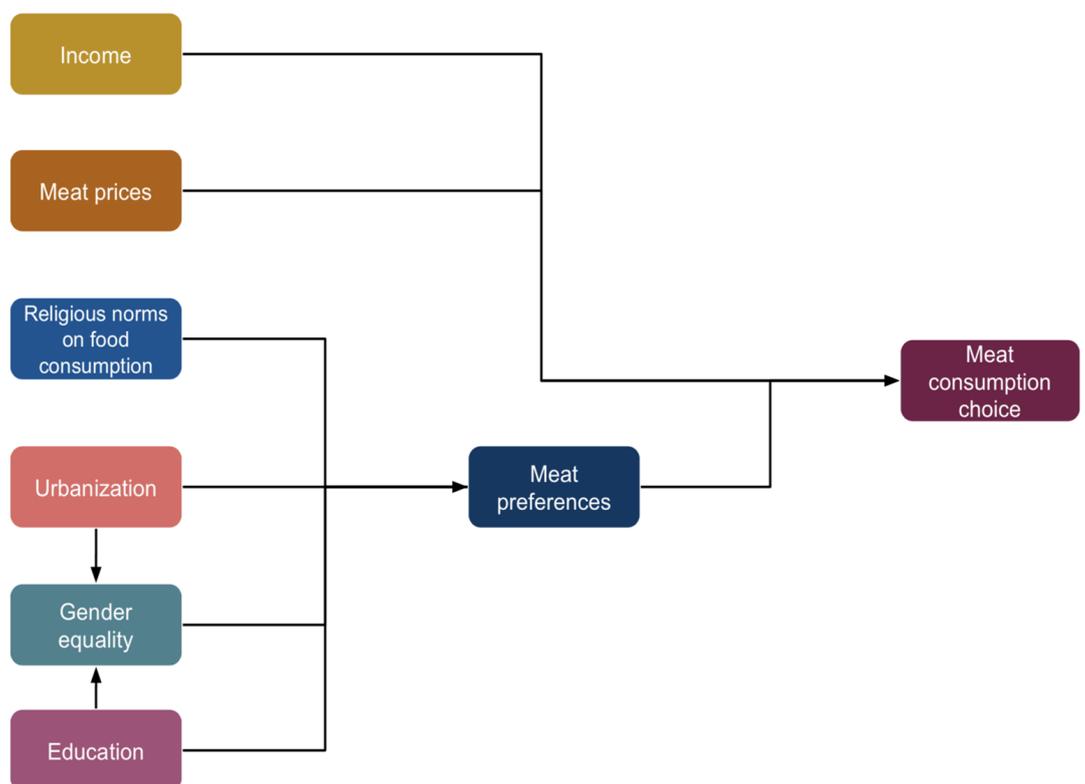
## Dietary changes and climate mitigation

- What are the drivers of dietary change?
- How feasible are certain dietary shifts and under which conditions (which contexts)?

# Drivers of dietary choices

- Historical relationship between economic development and meat demand (Marques et al., 2018; Sans & Combris, 2015)
- In scenarios, livestock consumption is mostly modeled as a function of GDP, population and prices (based on price elasticity assumptions)
- However, other social and cultural factors can be very important, like education, religion, social norms (Vranken et al., 2014, Milford et al. 2019, Eker et al. 2019, Falchetta et al. 2021).
- Important to look at economic, social, and cultural factors that can be shaped by policies

A stylized model of meat consumption choice



# Method

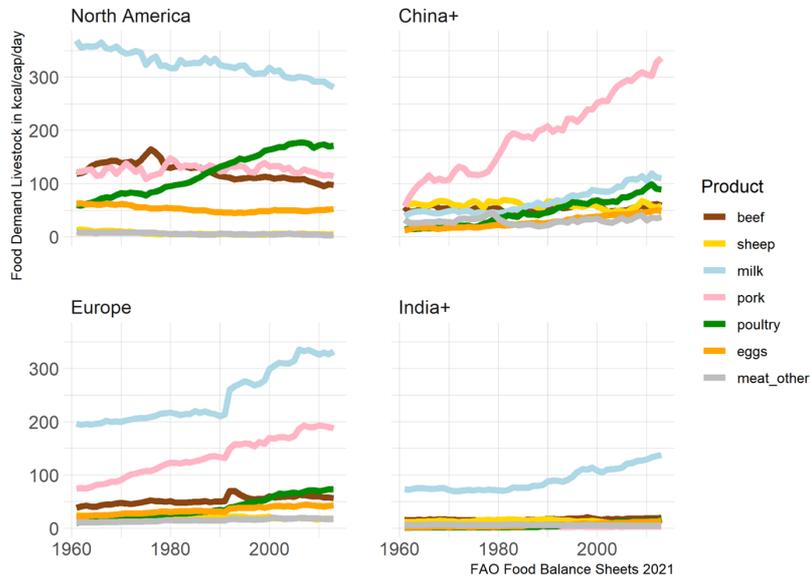
- We analyze historical trends of meat demand and compare them with trends in mitigation scenarios produced by IAMs.
  - Theoretically selected predictors (country fixed effects)
  - LASSO models for robustness checks
- We project trends of meat demand based on economic, social, and cultural predictors (non-linear relationship with GDP!).

One model per country
- We compare projected trends with trends present in IAM scenarios

# Data

Historical data	Projections	Scenario data
<ul style="list-style-type: none"><li>▪ Meat consumption</li><li>▪ GDP - non-linear</li><li>▪ Population</li><li>▪ Urbanization rate</li><li>▪ Urbanization rate growth</li><li>▪ Graduate education</li><li>▪ Gender gap in education</li><li>▪ Female graduate education</li><li>▪ Prices</li></ul>	<ul style="list-style-type: none"><li>▪ Meat consumption</li><li>▪ GDP - non-linear</li><li>▪ Population</li><li>▪ Urbanization rate</li><li>▪ Urbanization rate growth</li><li>▪ Graduate education</li><li>▪ Gender gap in education</li><li>▪ Female graduate education</li><li>▪ Prices</li></ul>	<p>→ Compared with projections built on predictive model based on historical data</p>

# Deriving historical caps



Explaining historical trends

(region FE model)

