

# **A Microsimulation-based Framework for Mitigating Societal Bias in Primary Care Data**

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# Race adjustments in clinical algorithms

**Racial health disparities** are pervasive in the US

**False beliefs** in **racial biological differences** contribute

**Race-based treatment criteria** can make disparities worse  
\*e.g. Race adjustments making minority patients appear healthier → less care

Efforts to **remove race adjustments** in clinical algorithms

## **Consequences of removing race adjustments**

Patterns of clinical care are likely to change.

### **Who will be affected and how?**

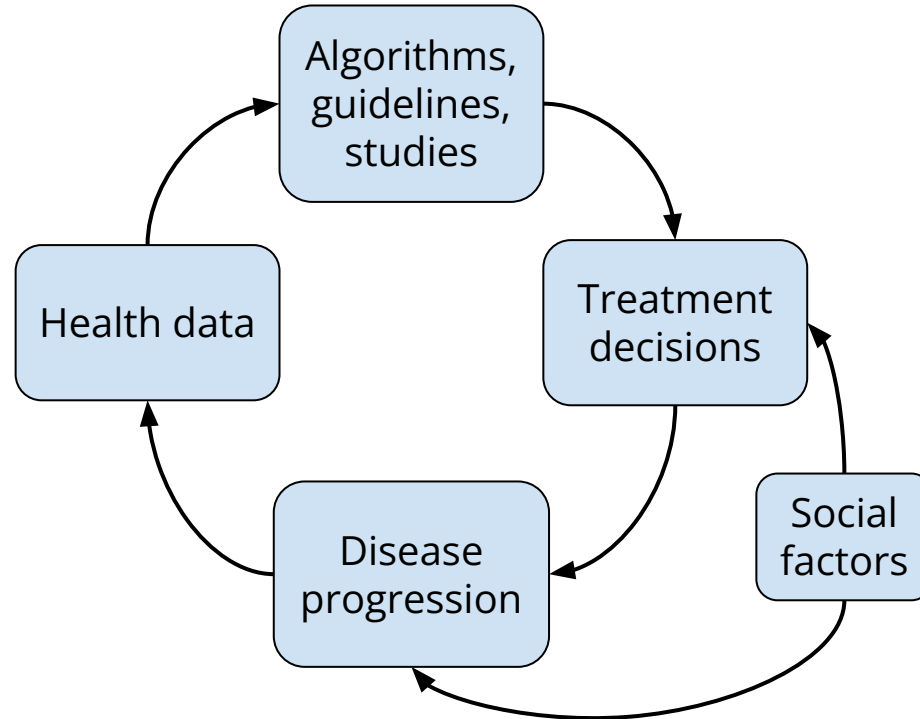
Electronic health record data will reflect outdated patterns of care.

### **How can we adjust past data to reflect this?**

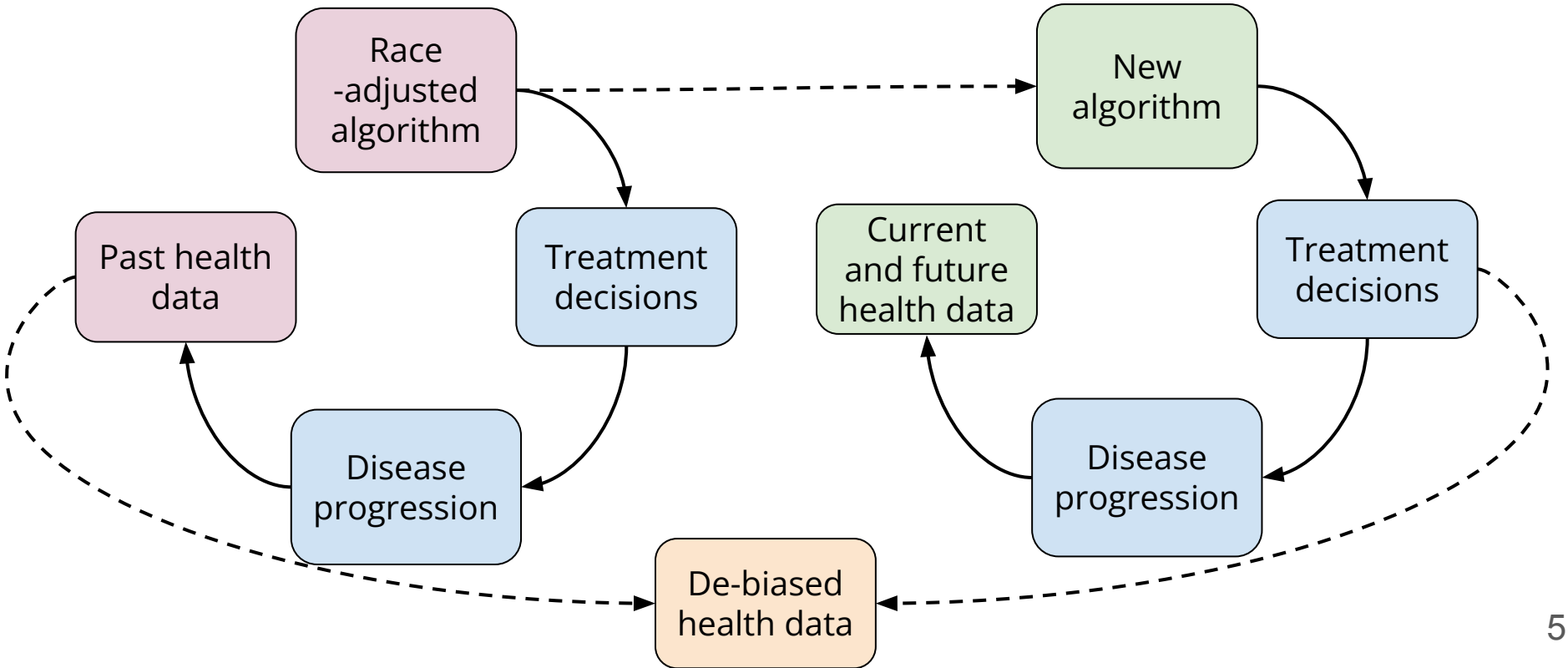
Racial health disparities primarily come from social drivers of health.

### **How can we use data on social drivers to model disparities?**

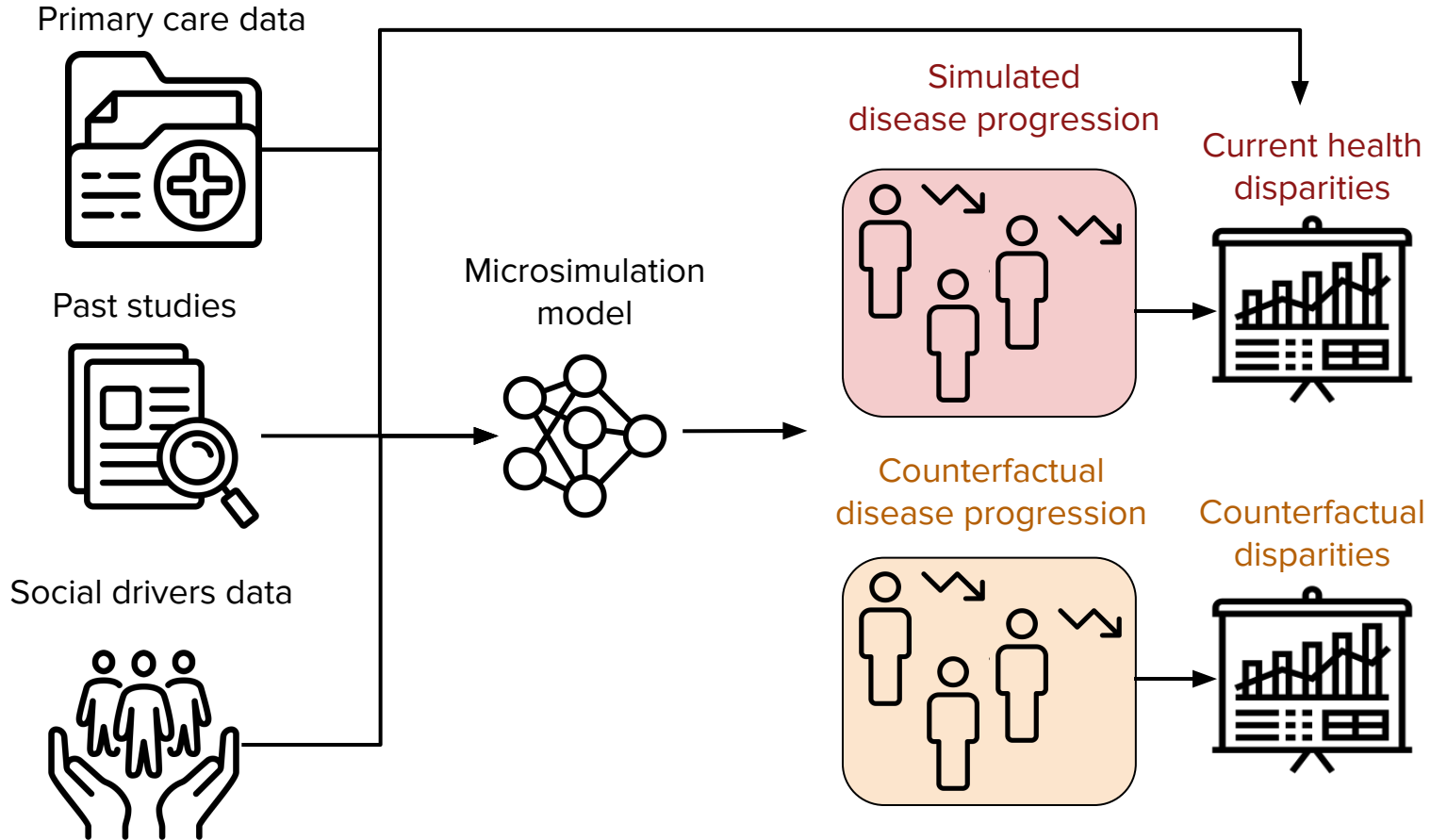
# Reproducing outcome disparities through data



# What would past data have looked like without race adjustments?



# Our approach: model the data generating process



# Chronic kidney disease (CKD)

## Pervasive and underdiagnosed

Affects more than 1 in 7 US adults

As many as 9 in 10 do not know they have it

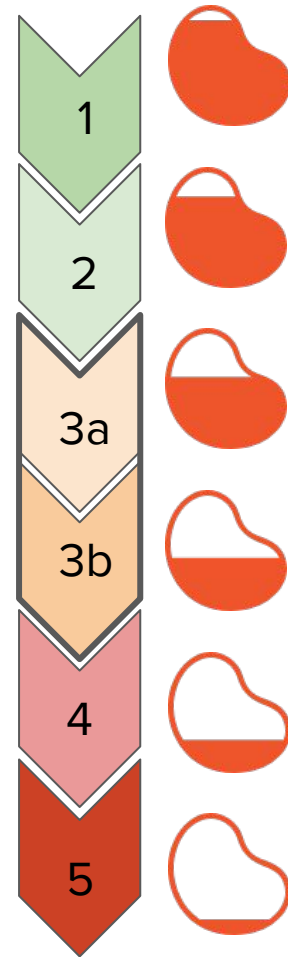
## Serious

Strictly progressive

Final stages require dialysis or kidney transplant

## Large disparities

Largely due to social factors



adapted from  
kidney.org

# CKD: removal of race adjustment in 2021

**eGFR: estimating % remaining kidney function**

Staging

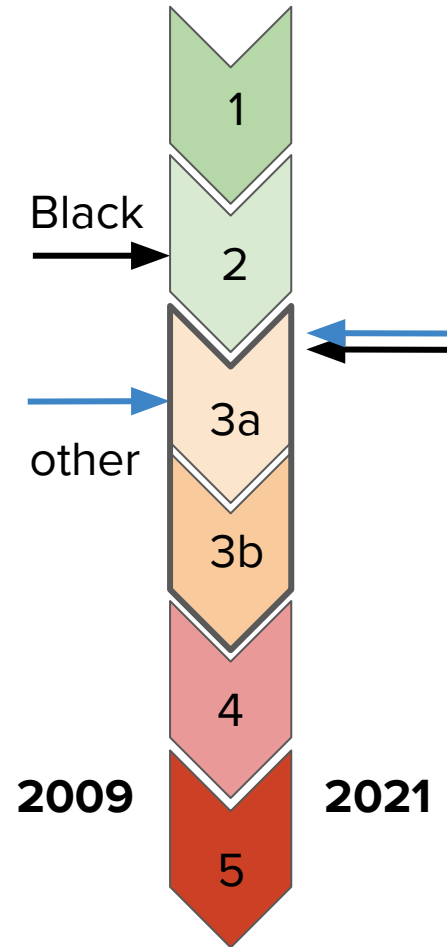
Treatment decisions

## Equation change

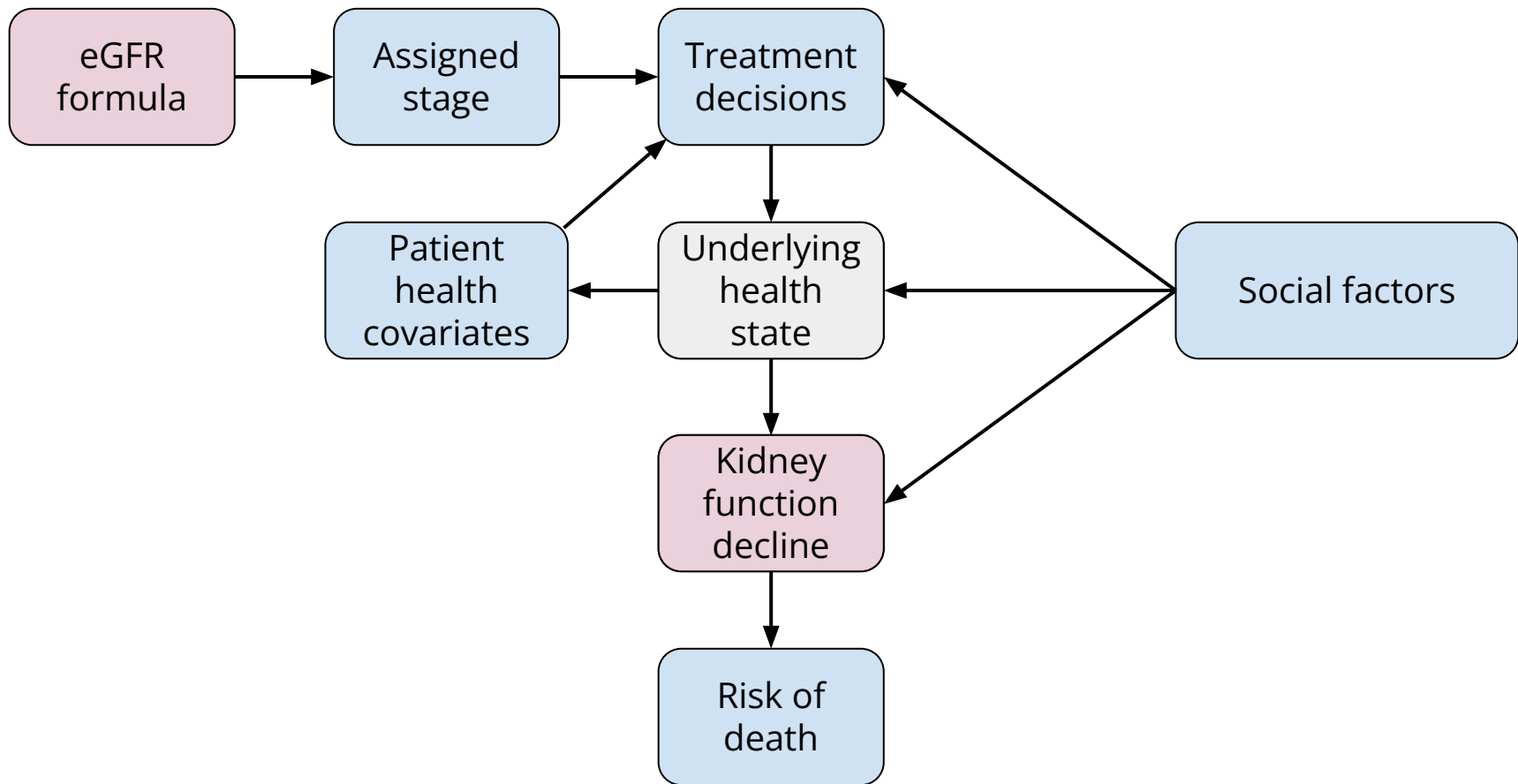
2009: Black patients appear healthier

2021: removal of race adjustment

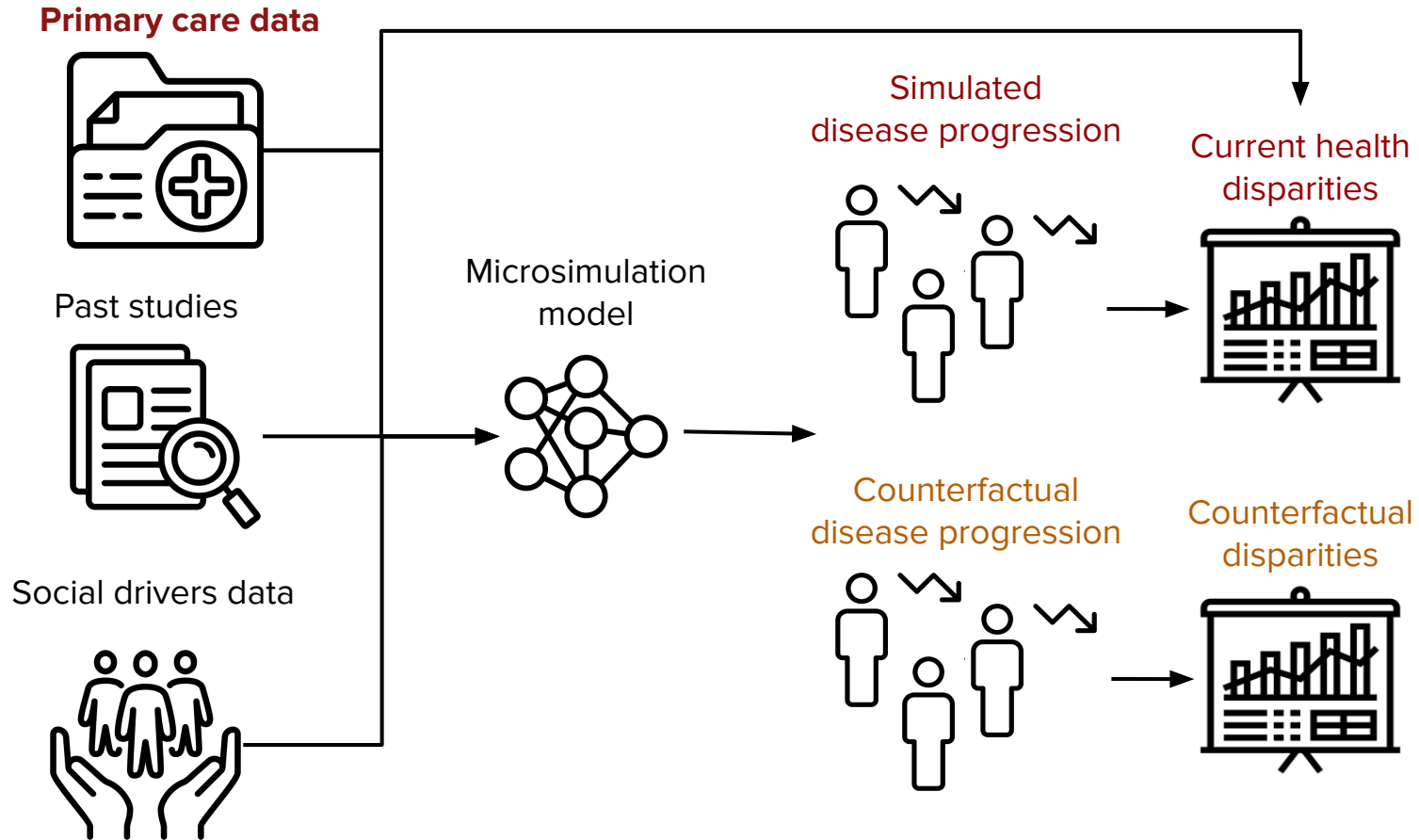
**Example:** 60 year old woman, 1.1mg/dL serum creatinine







# Our approach: model the data generating process





# PRIME: the largest primary care registry in the US

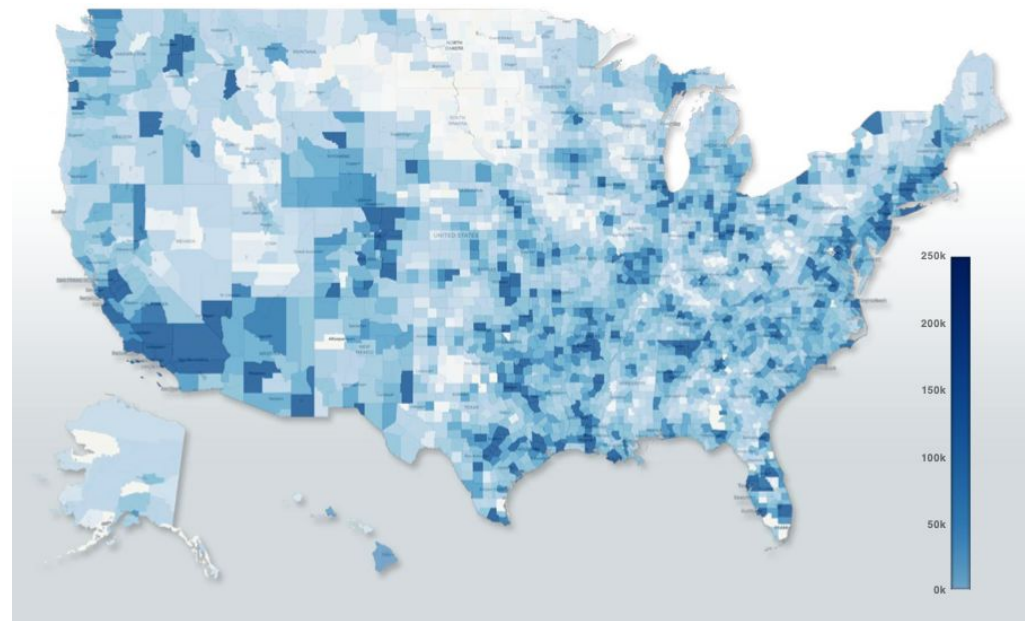
## Dataset:

- 8M patients
- 1300 clinics

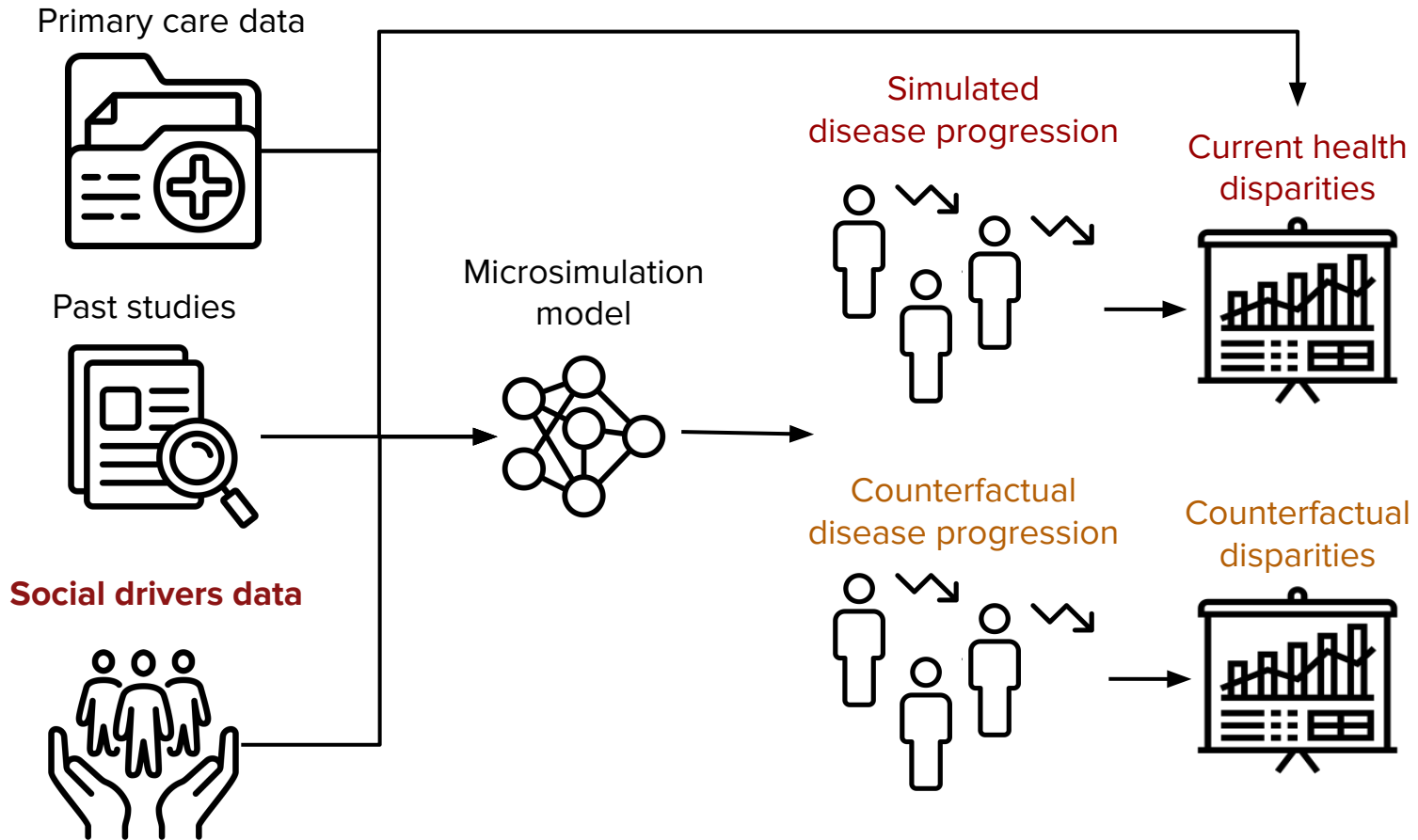
## Our cohort:

Adults with at least two blood tests since 1/1/2017 and recorded demographics.

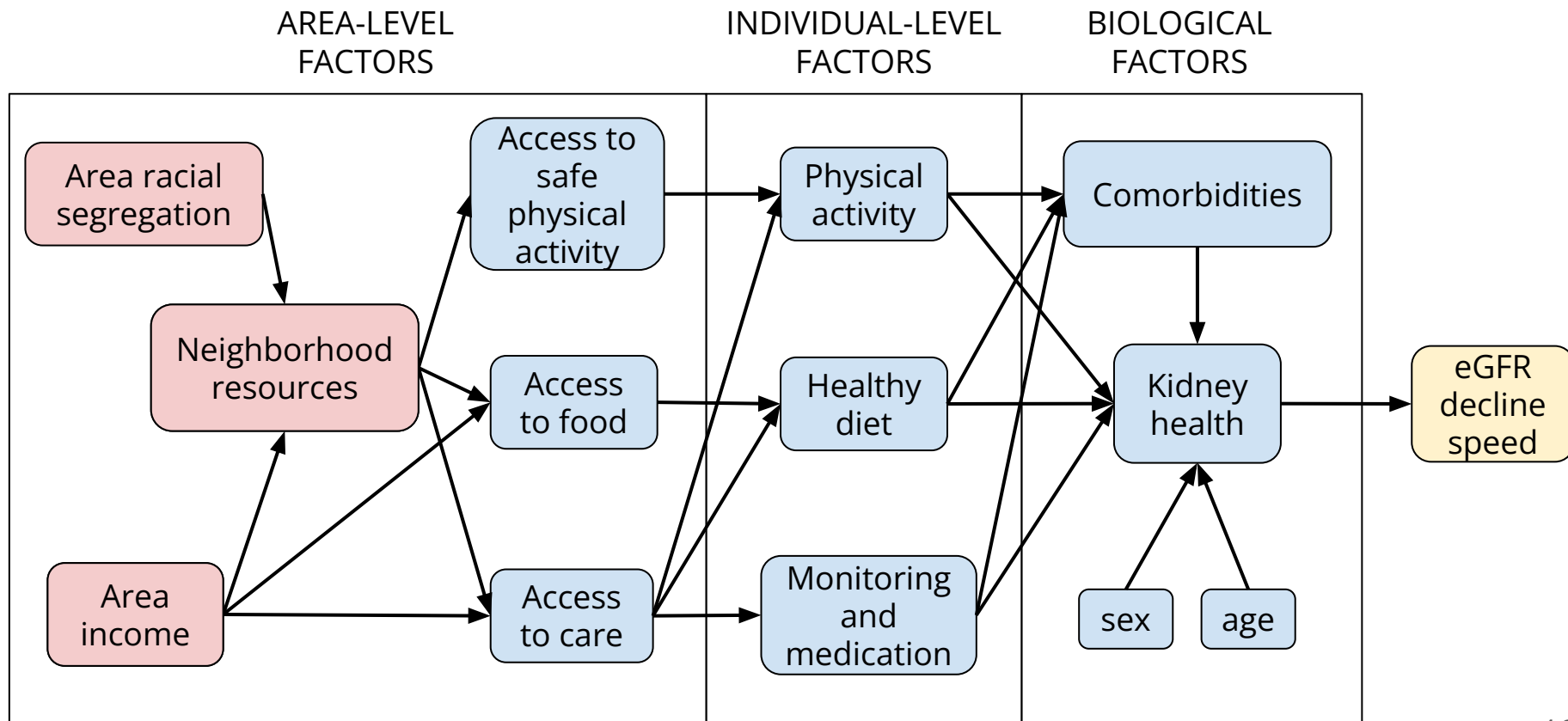
- 1M patients
- 750 clinics



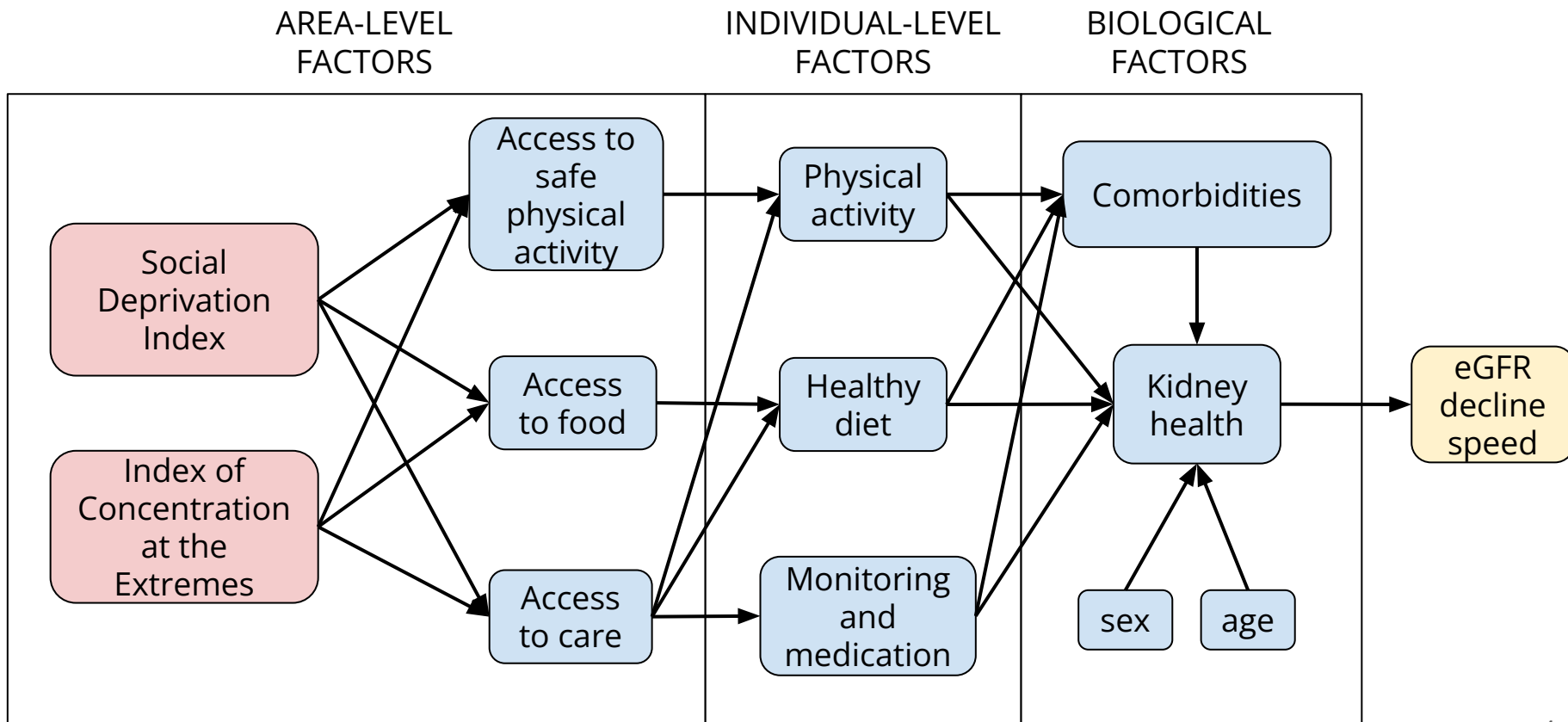
Source: The American Board of Family Medicine

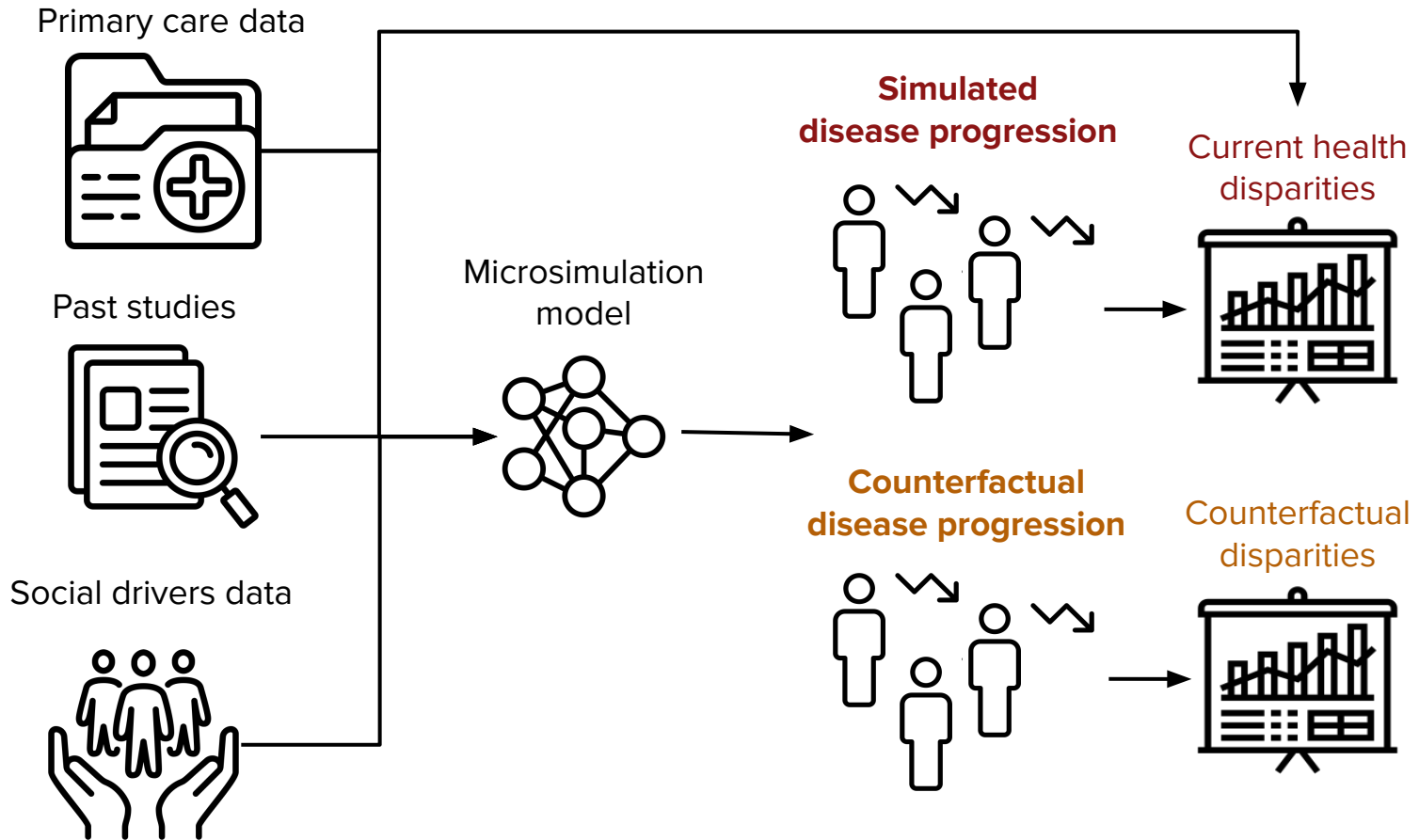


# Social drivers of health disparities

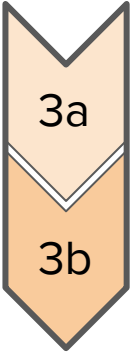
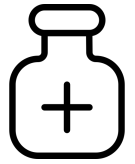
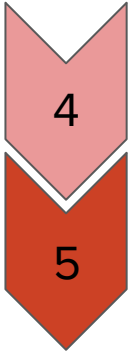



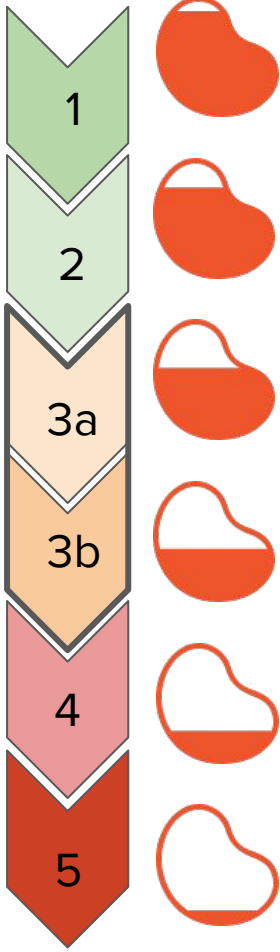
# Social drivers of health disparities





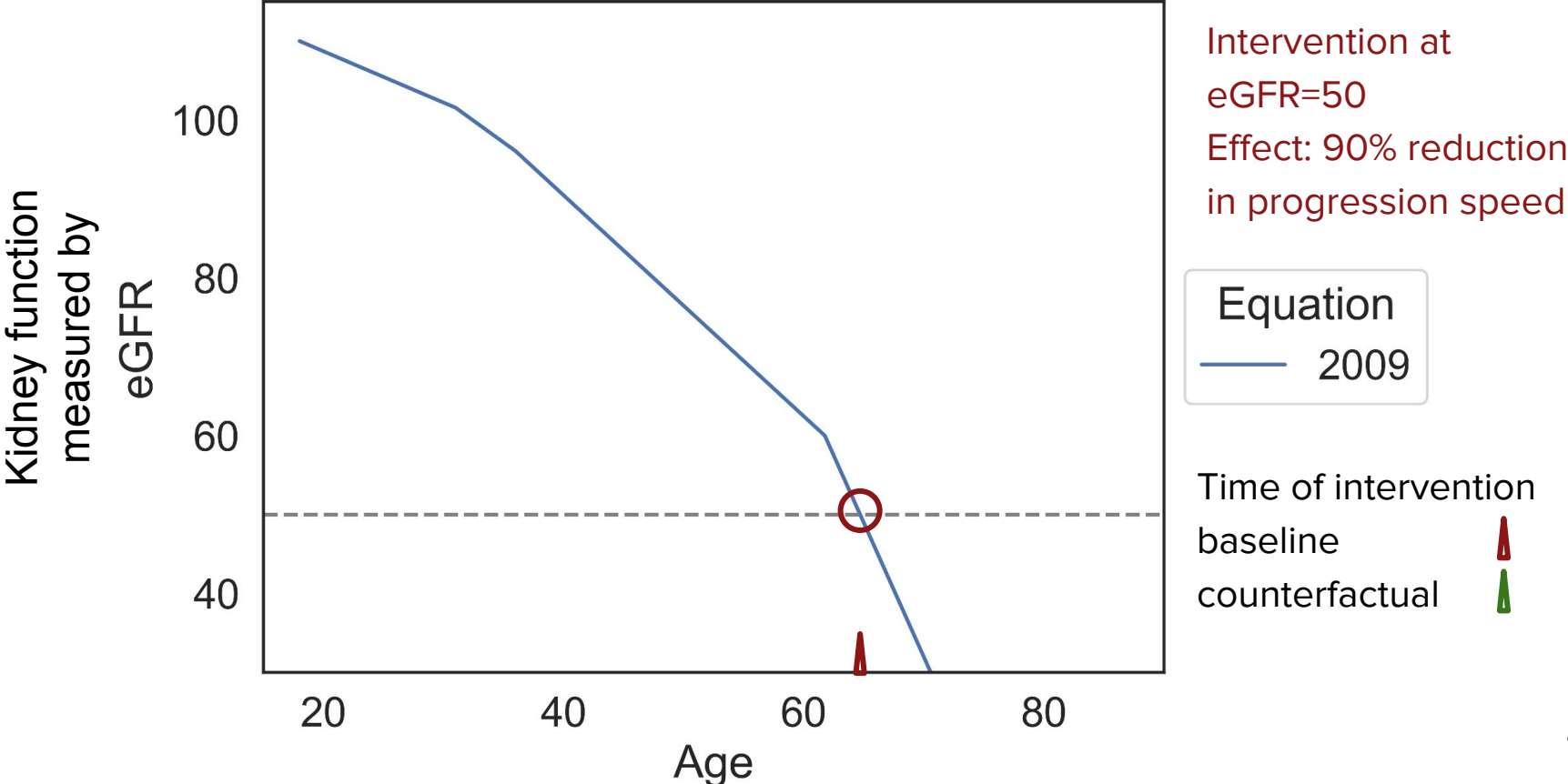
# Effect of equation change on CKD progression

eGFR	Stages	Intervention	Effect
30-60	 <p>3a 3b</p>	<p>Comorbidity management</p> 	<p>Slower progression for patients with comorbidities</p>
<30	 <p>4 5</p>	<p>Nephrology referral</p> 	<p>Slower progression</p>

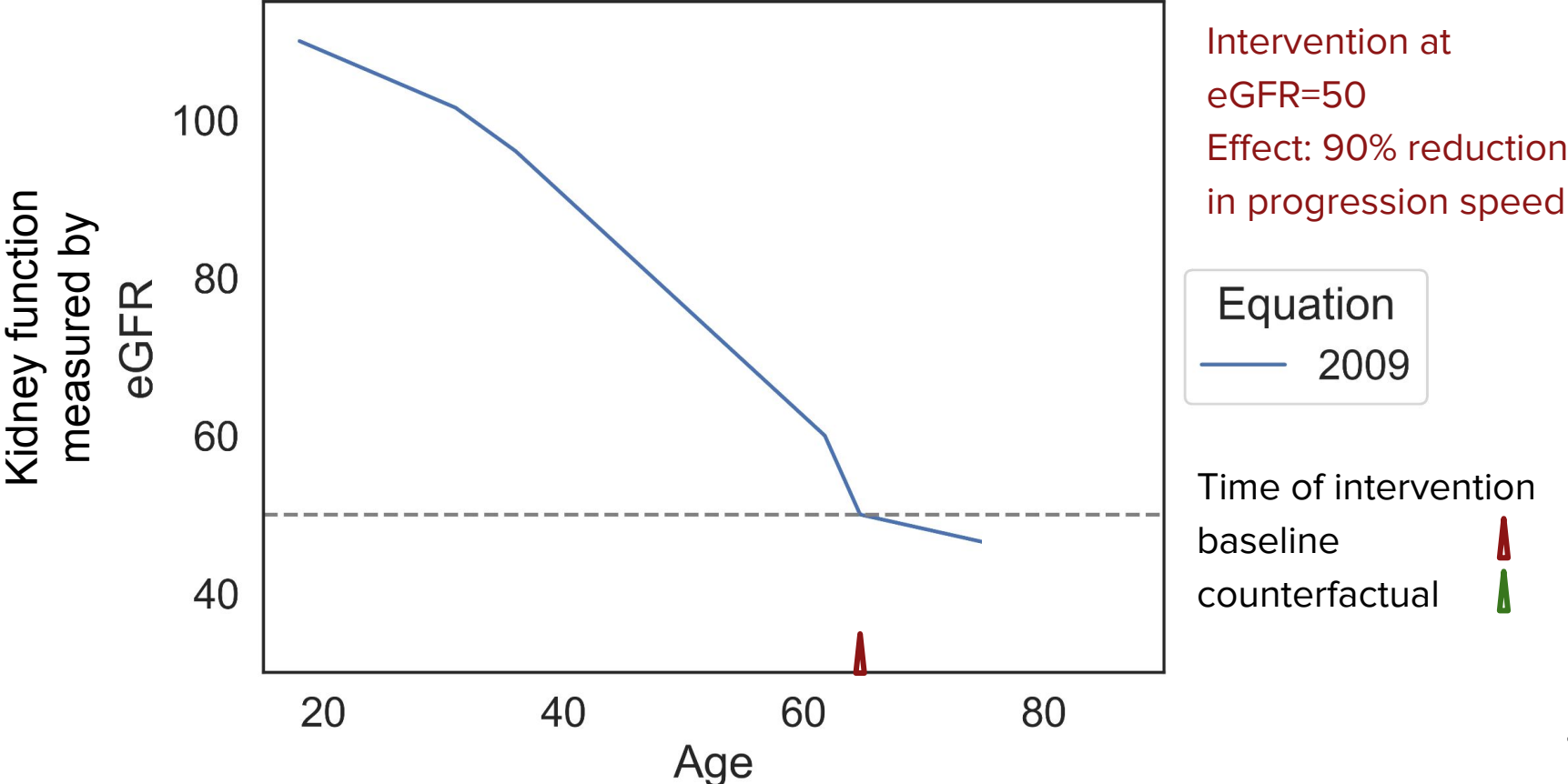




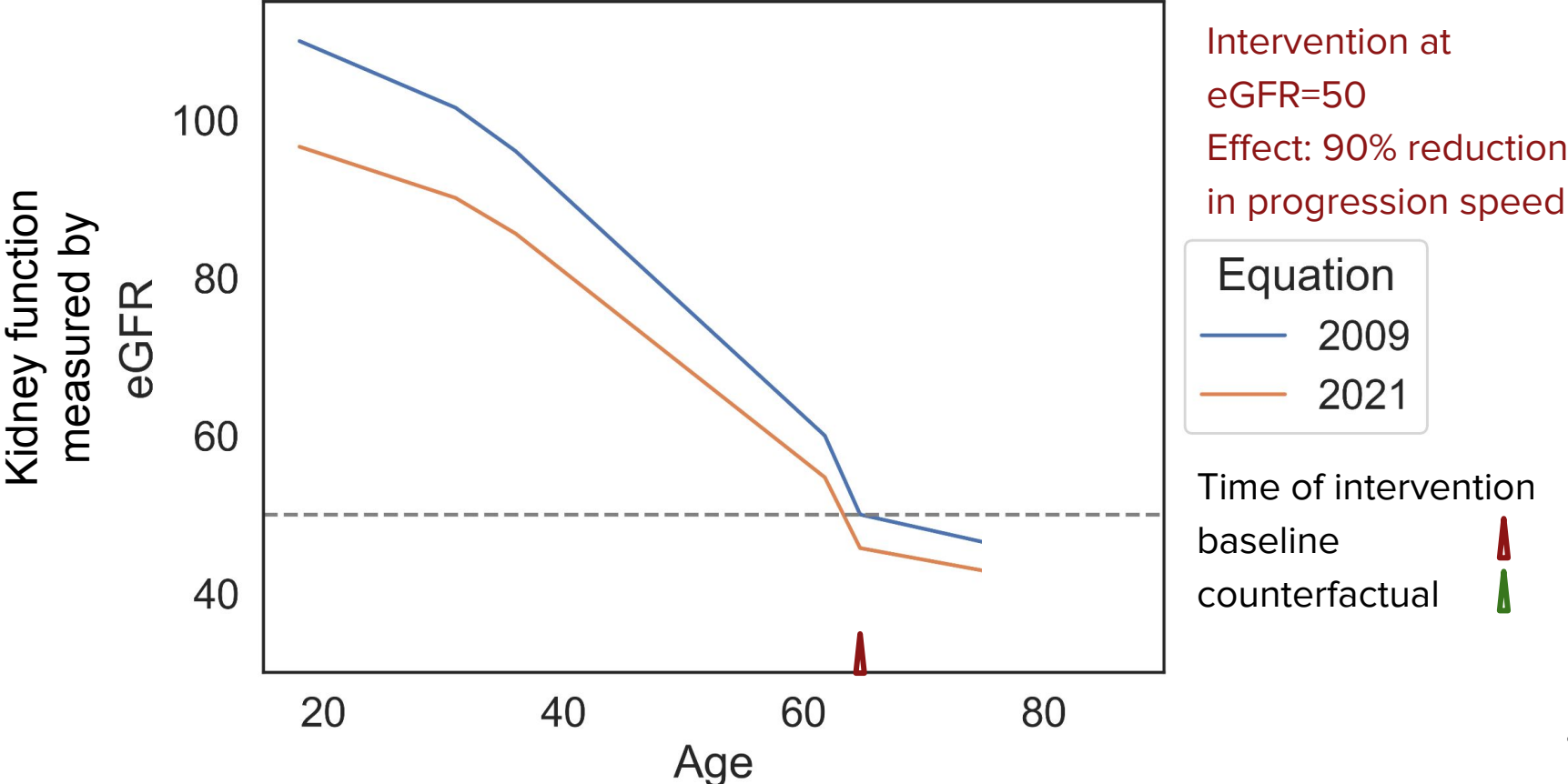
# Effect of equation change on CKD progression



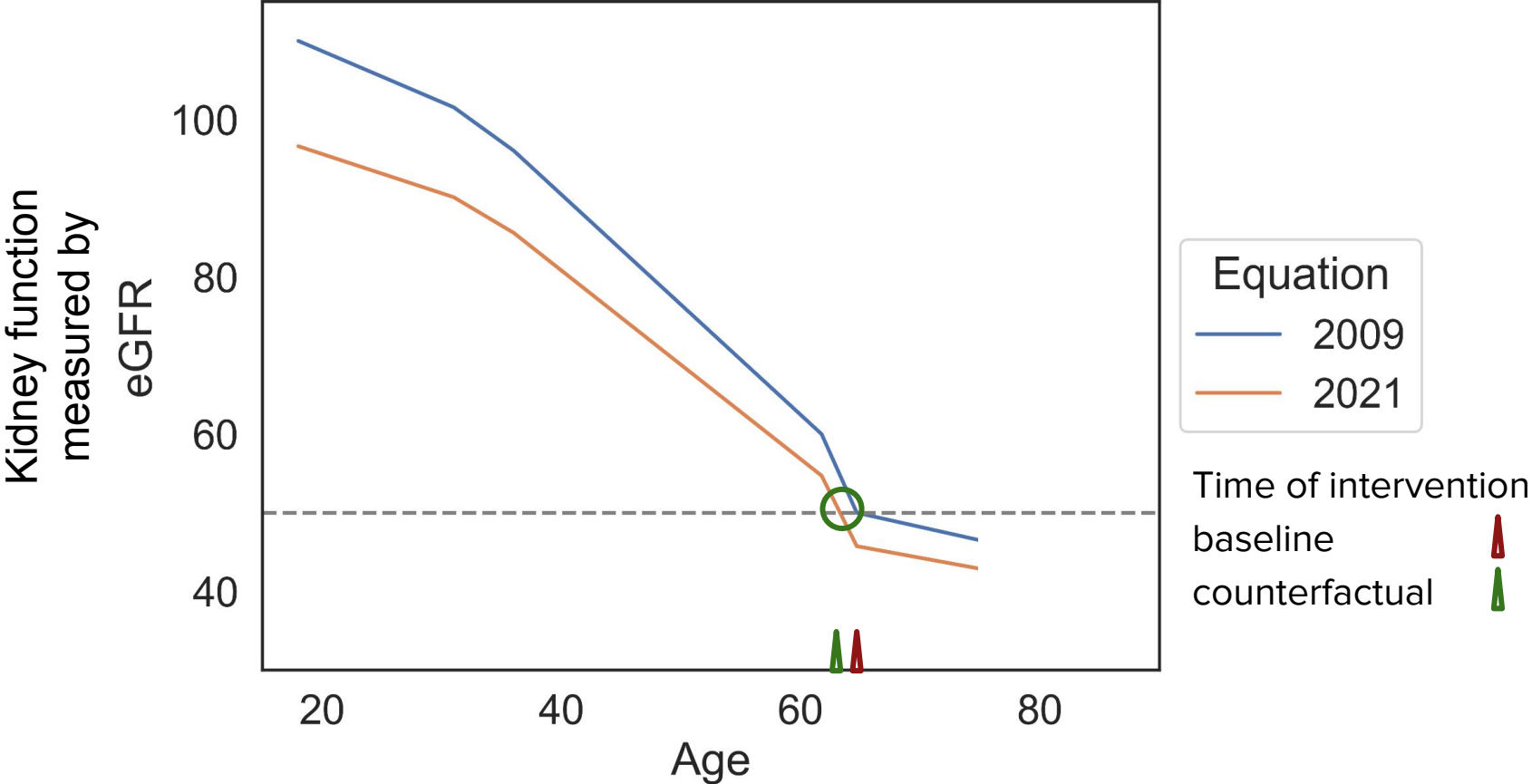
# Effect of equation change on CKD progression



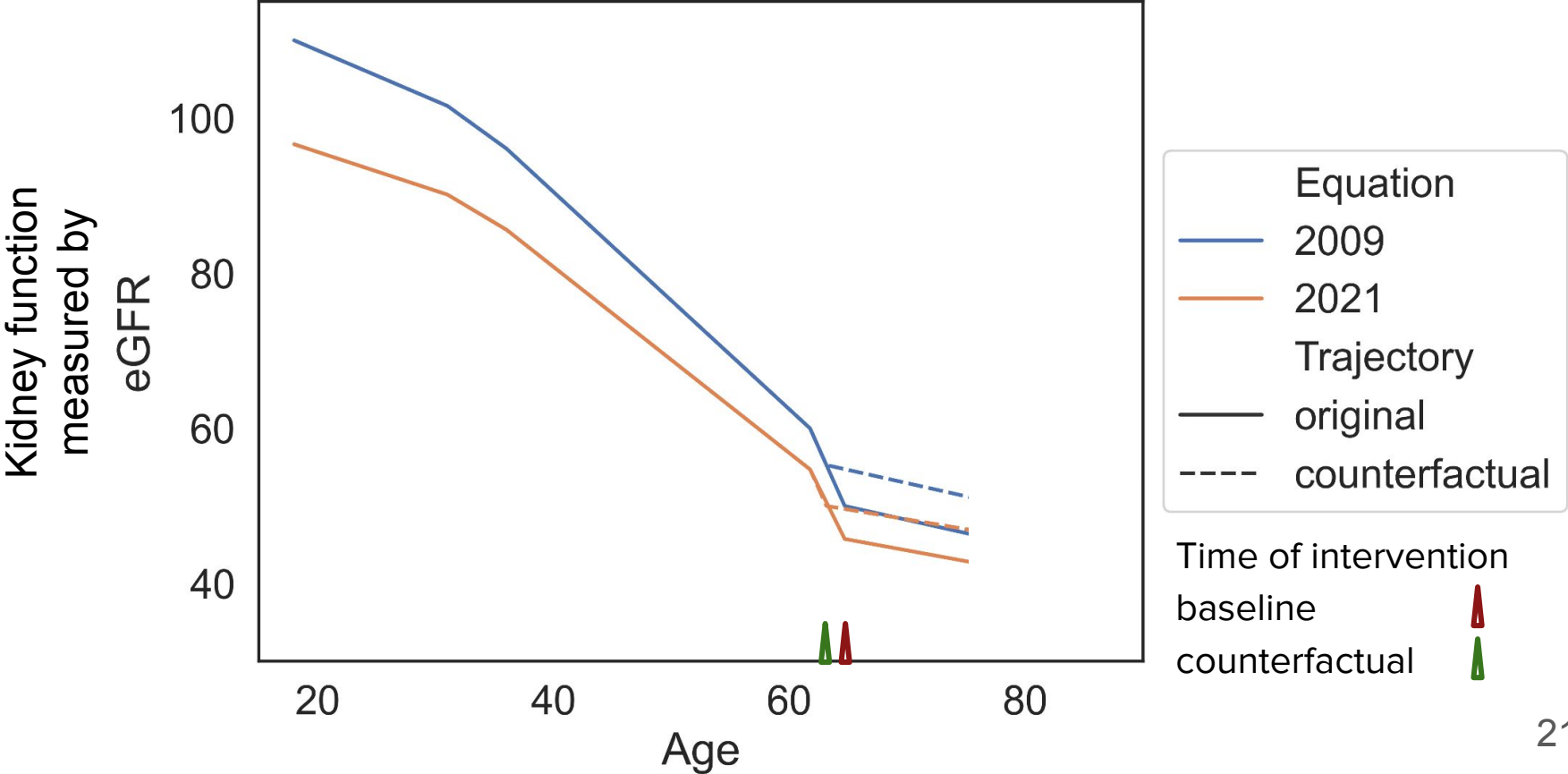
# Effect of equation change on CKD progression



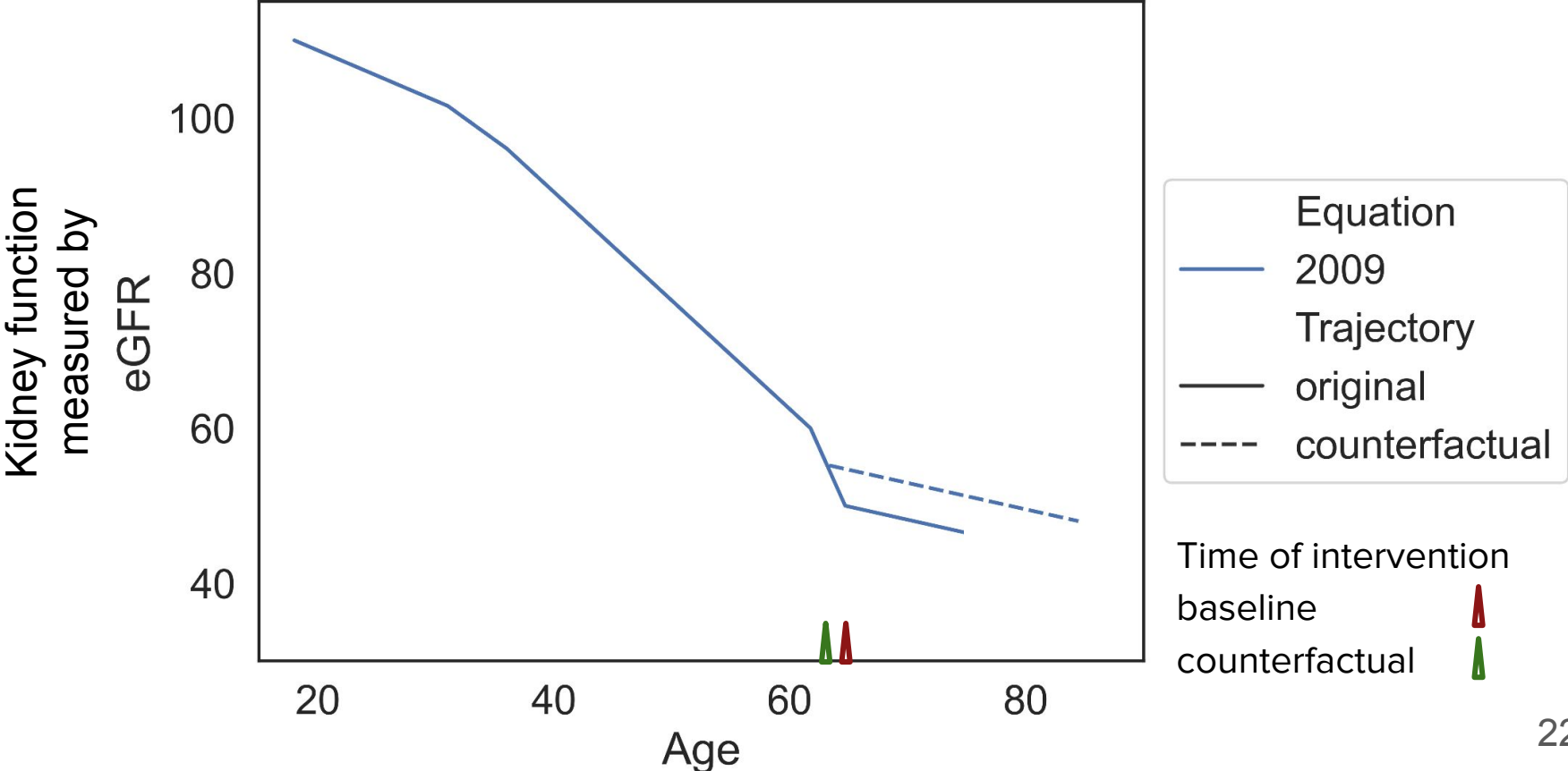
# Effect of equation change on CKD progression



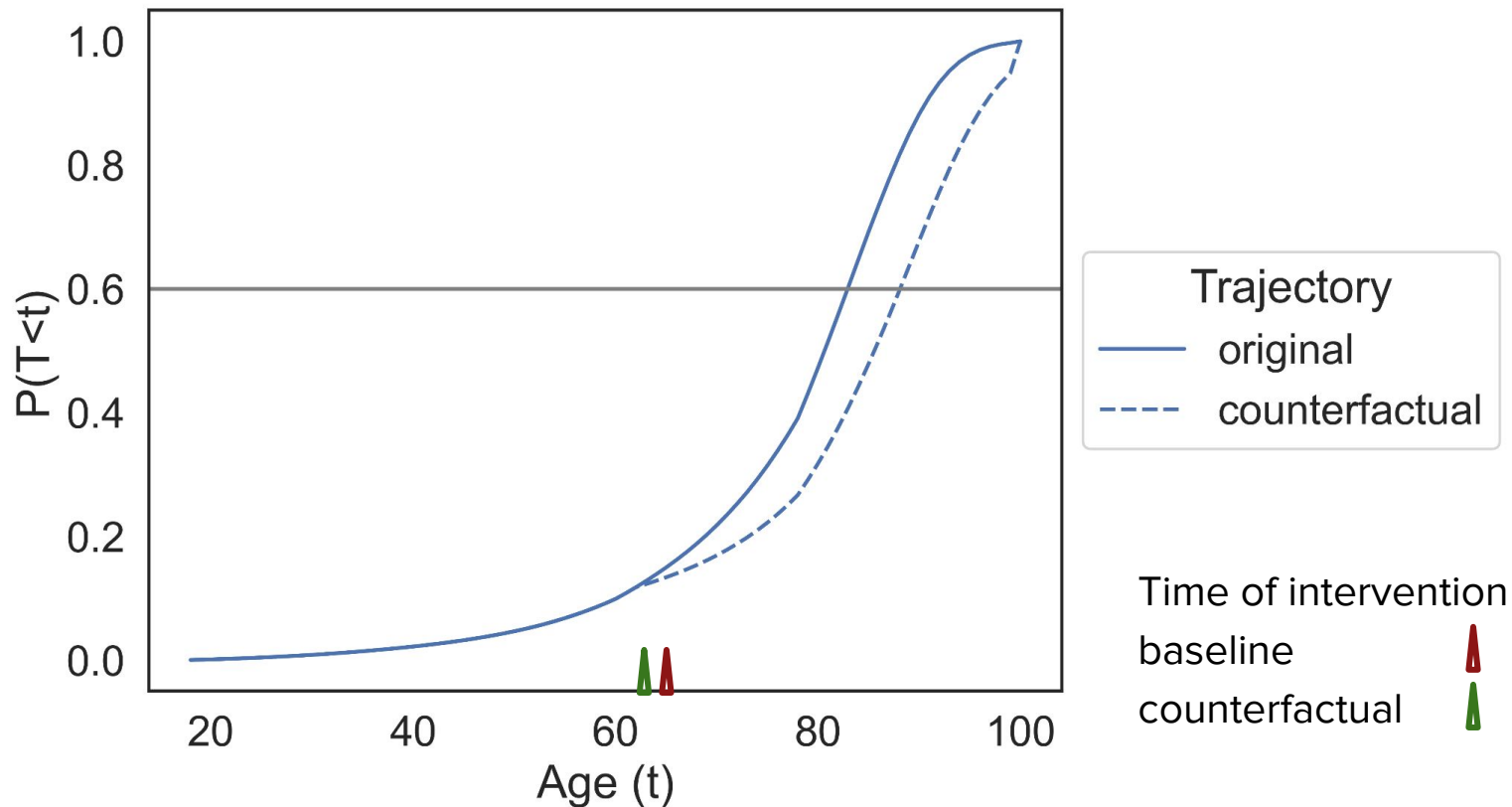
# Effect of equation change on CKD progression



# Effect of equation change on CKD progression

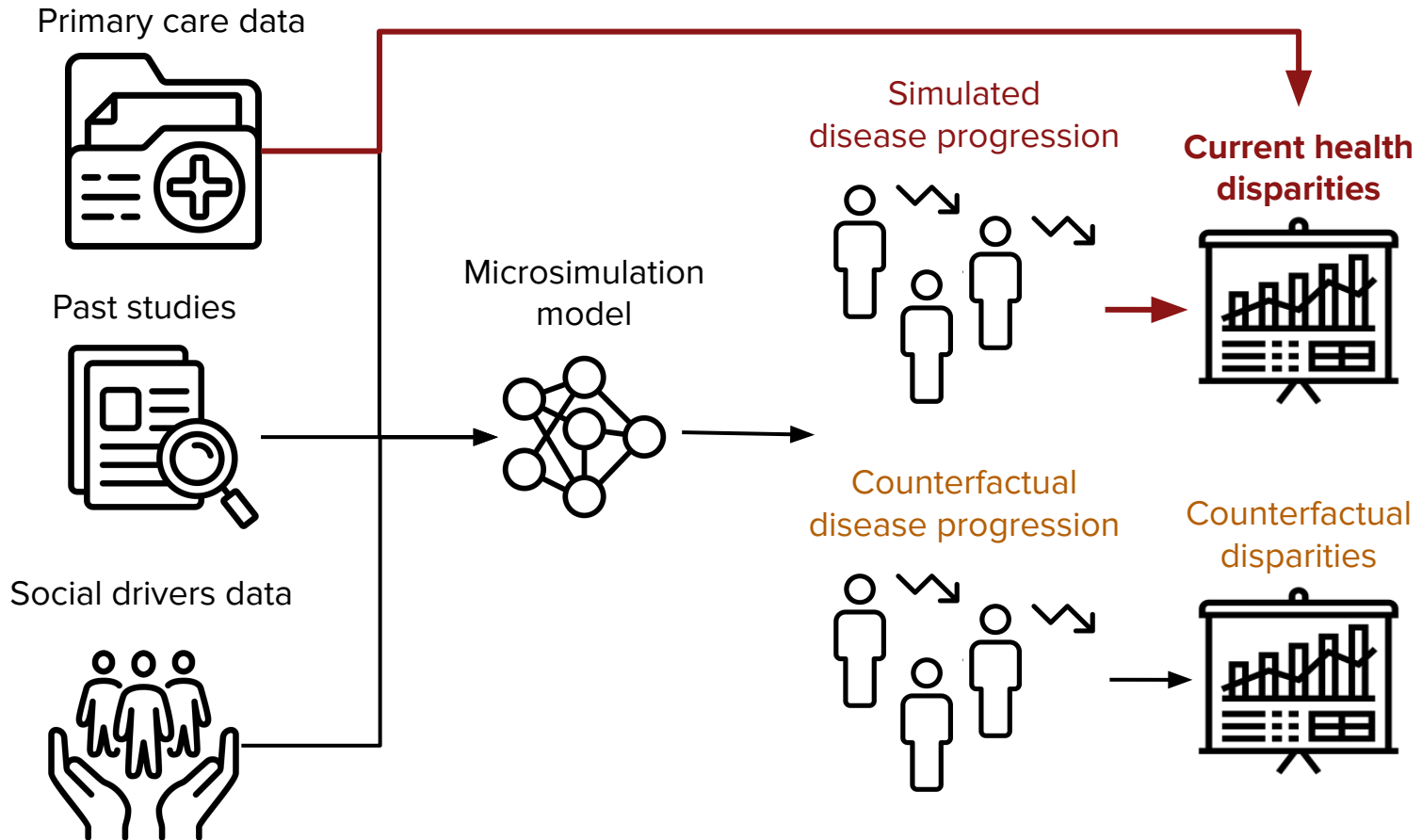


## Effect of equation change on mortality

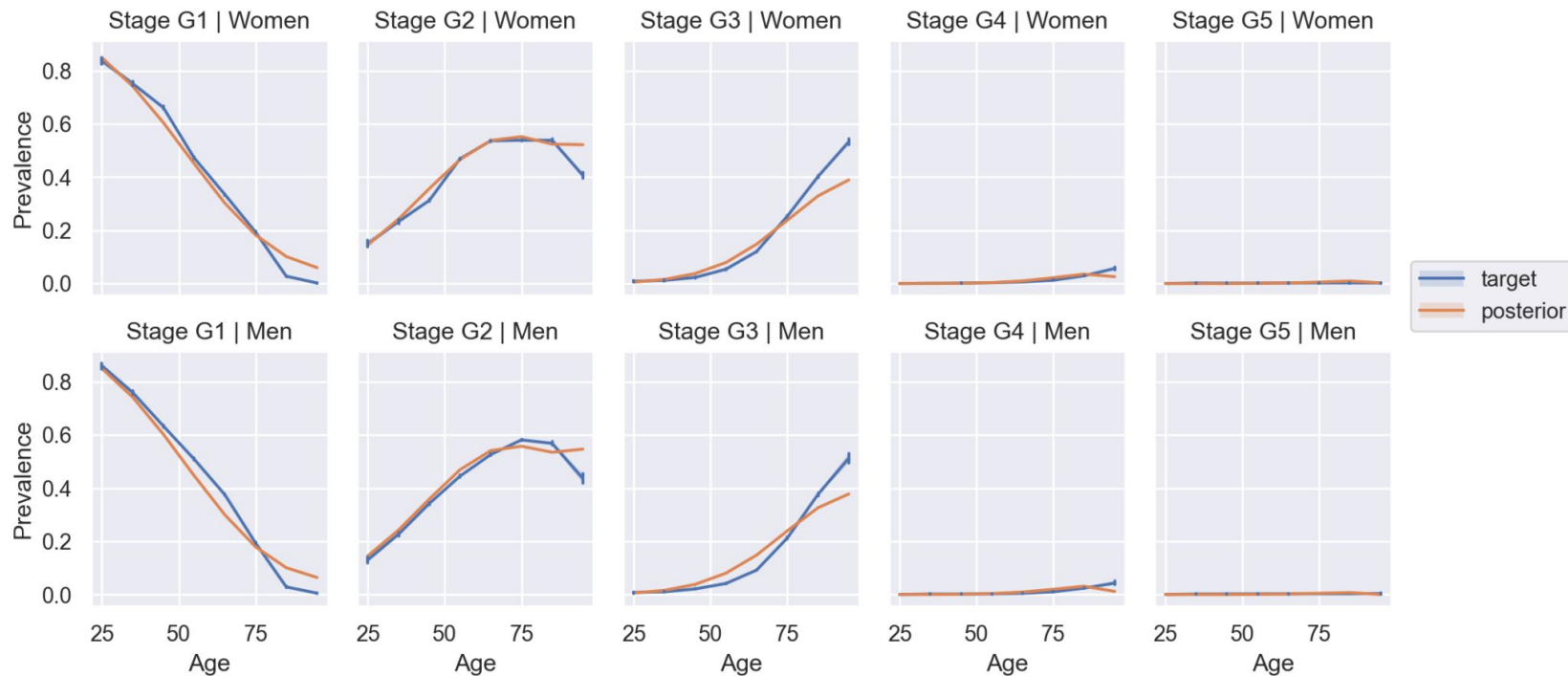


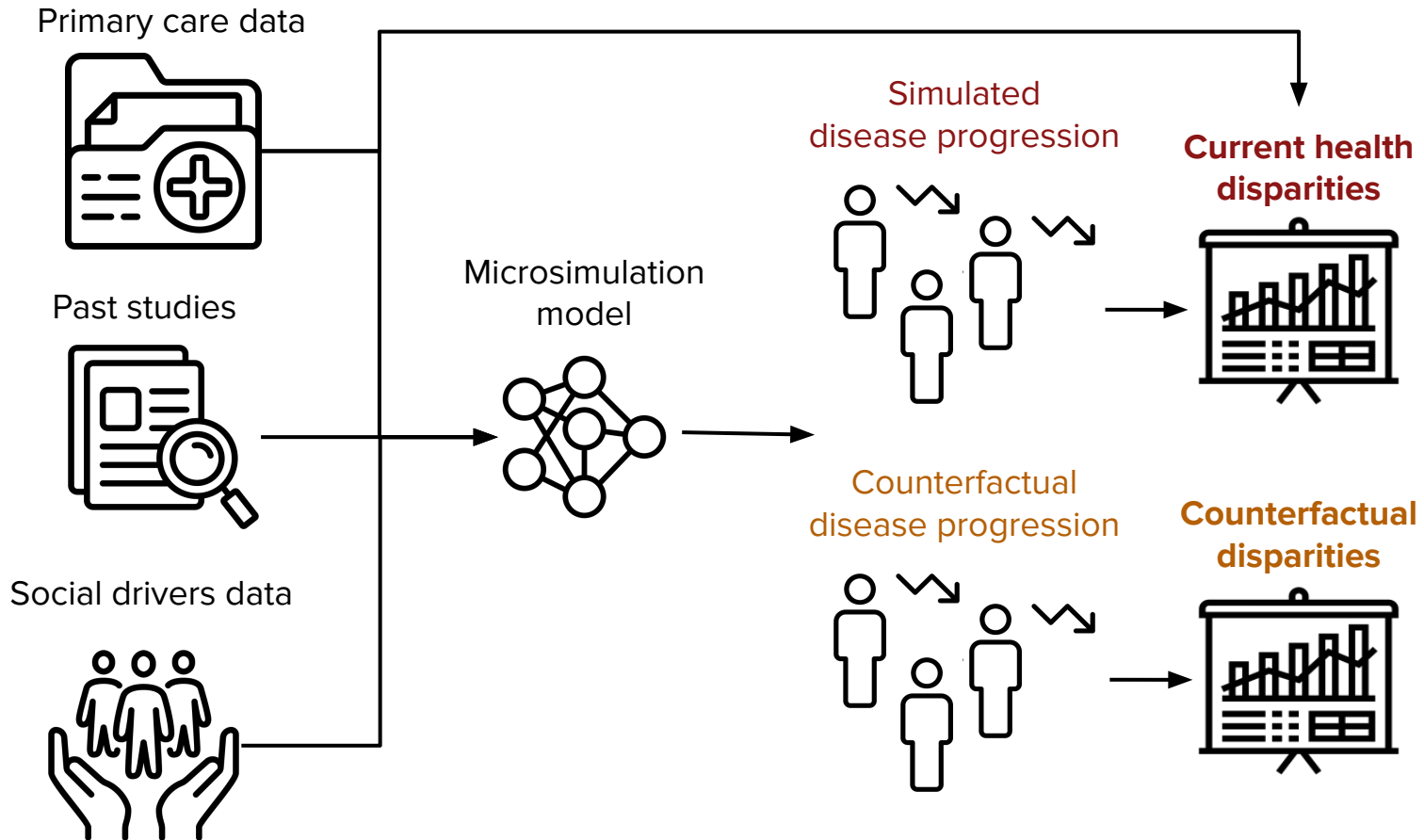
# Preliminary results



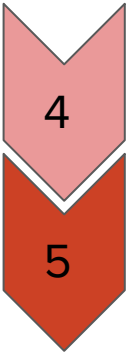



# Calibration results: CKD stage prevalence across ages





## Considering counterfactual interventions

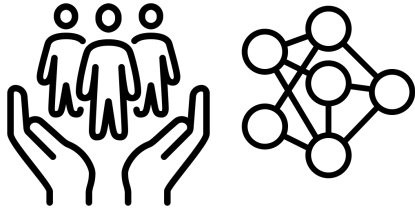
eGFR<30 	Nephrology referral 	Slower progression	45-55% of patients
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Preliminary results: survival rates remain virtually unchanged (as suggested by prior work\*)

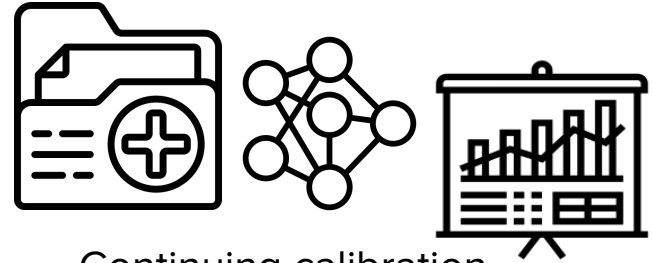
Next steps: considering earlier interventions

\*Cusick, Marika M., et al. "Algorithmic Changes Are Not Enough: Evaluating the Removal of Race Adjustment from the eGFR Equation." *arXiv preprint arXiv:2404.12812* (2024).

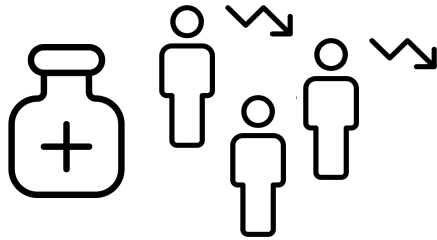
## Next steps



Integrating social drivers into the model



Continuing calibration

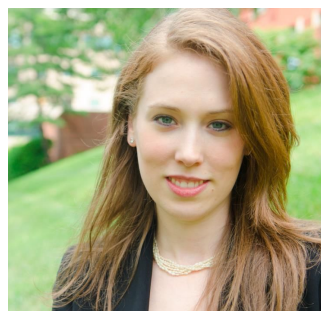


Sensitivity analysis around the timing and impact of interventions



Stratified evaluation

# Agata Foryciarz, Fernando Alarid-Escudero, Gabriela Basel, Marika Cusick, Robert L. Phillips, Andrew Bazemore, Alyce Adams, Sherri Rose



National Library  
of Medicine

NLM grant  
**R01-LM013989**

## Takeaways

Intervening on data through simulations can help address data bias

Data science can benefit from decision science methods

Removing race adjustments, while important, is not sufficient for addressing health disparities

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