

Use of Simulation to Address Equity Issues in Colorectal Cancer Screening

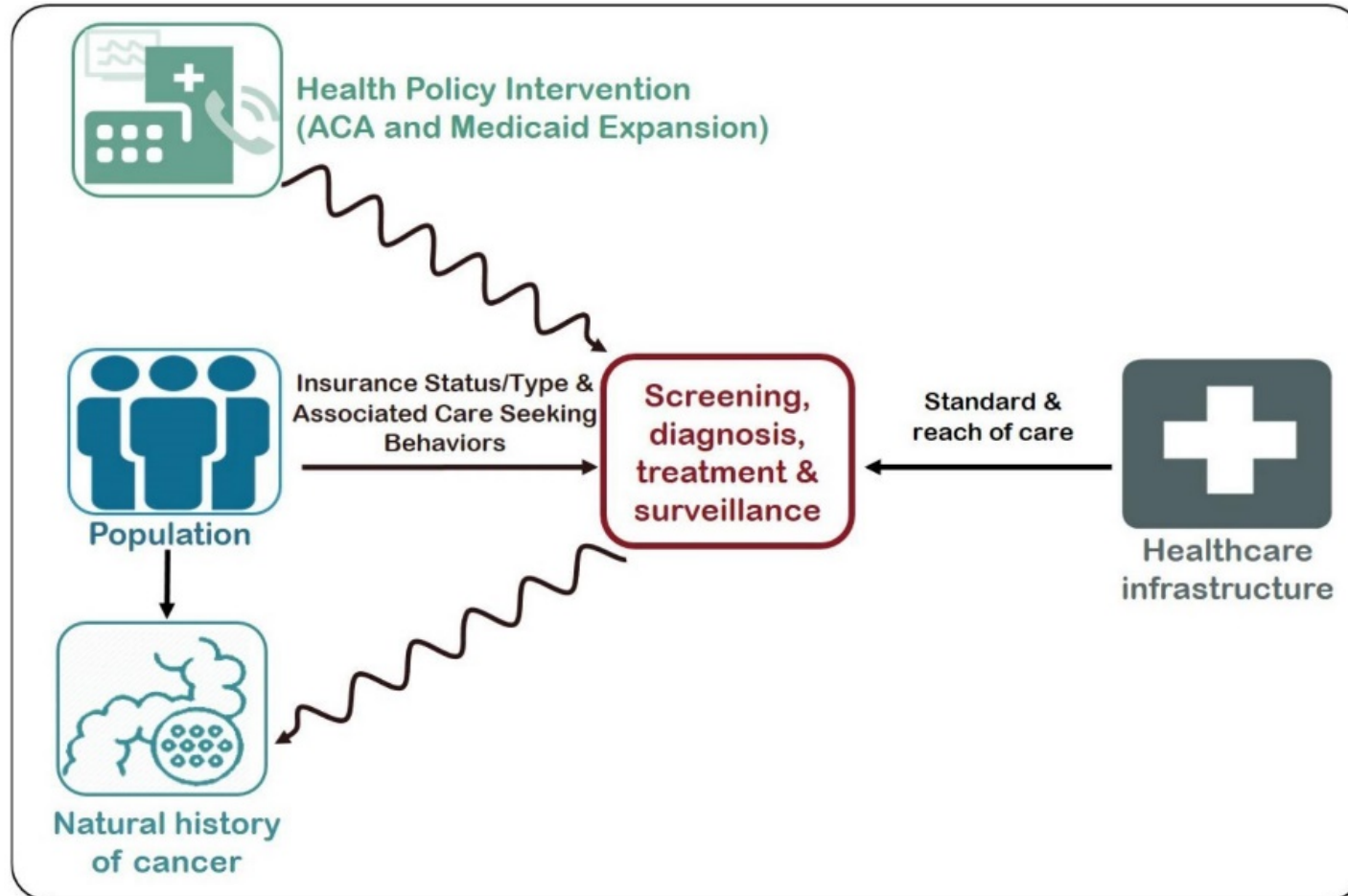


Modeling EBI Workgroup Objectives

- To understand how simulation can aid decision makers in the selection and implementation of interventions and policies to improve CRC screening and outcomes **population-wide** and **in medically underserved populations**
- To use systems science approaches to communicate complexity and uncertainty in decision making
- To develop approaches to use systems science approaches effectively in implementation research



Colorectal Cancer Population Simulation Model (aka PopSim)

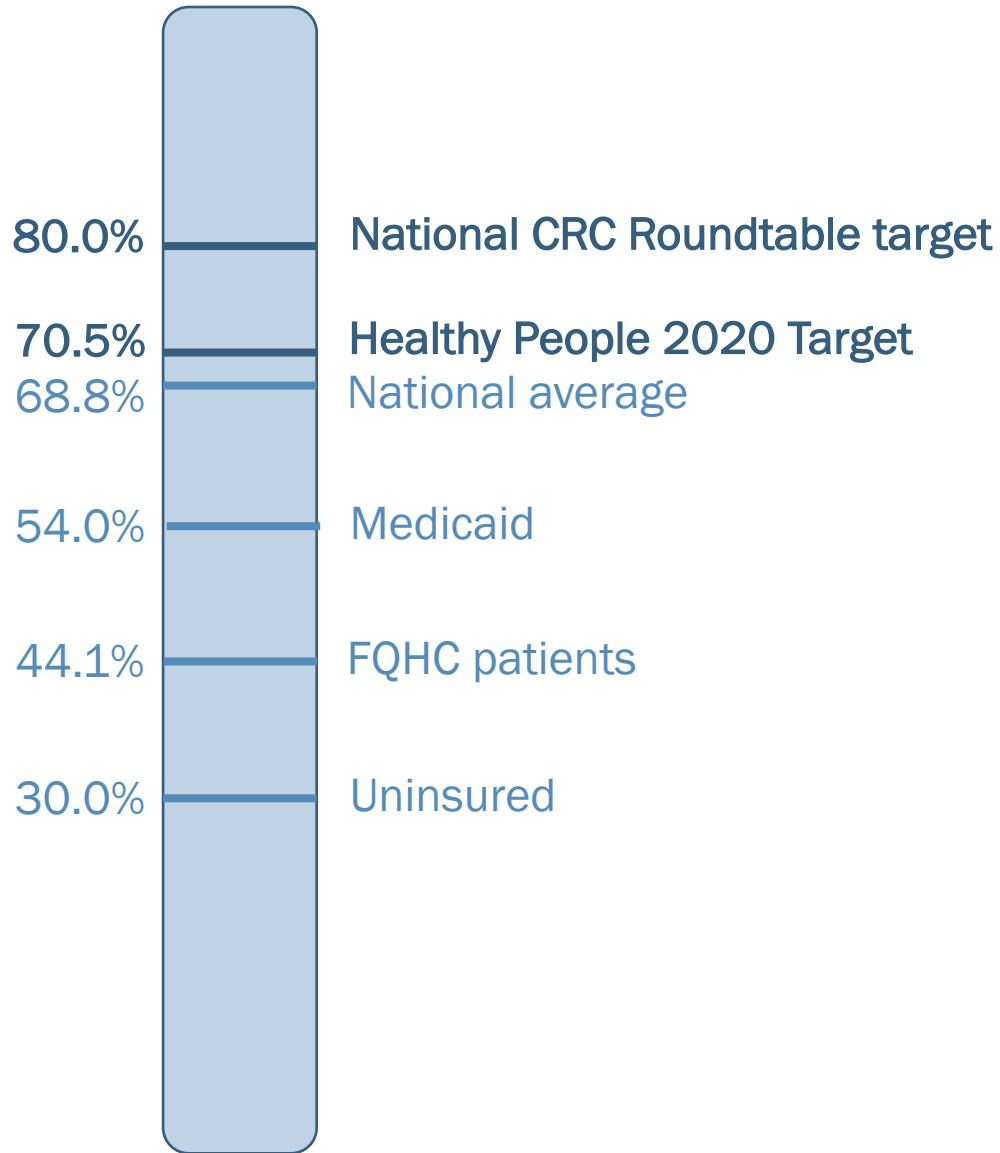


Data Sources:

- American Community Survey Public Use Microdata Sample
- Census
- Cancer Registry
- Claims data
- Literature review



CRC Screening Rate, 2018



How do we achieve the **70.5%** and **80%** screening targets statewide and in specific patient populations?

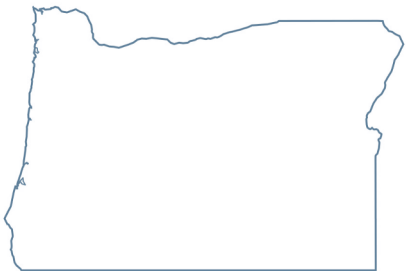


Our prior work has shown meaningful increases in CRC screening with EBI implementation...

Simulated OR population up-to-date on December 31, 2023 (after 5 years)
with screening as usual, and percentage-point change for EBIs

Variable	Screening as Usual, %	Detailing+	Reminders	Mailed FIT	Mailed Navigation	Mailed FIT + Navigation
Overall	50.1%	7.2%	5.8%	10.0%	14.1%	20.2%
By gender						
Male	48.2%	6.8%	5.9%	10.0%	14.3%	21.8%
Female	52.0%	7.5%	5.8%	9.9%	13.9%	18.8%
By race						
White	50.0%	7.2%	5.9%	9.7%	14.2%	20.5%
African American	50.5%	6.9%	5.8%	11.1%	13.8%	19.5%
Other	50.8%	7.2%	5.8%	10.9%	13.8%	19.3%
By ethnicity						
Hispanic	49.8%	7.1%	5.9%	11.3%	14.1%	20.1%
Non-Hispanic	50.2%	7.2%	5.8%	9.6%	14.1%	20.3%
By geography						
Urban	51.1%	7.3%	5.8%	10.3%	14.0%	19.4%
Rural	48.6%	7.0%	5.9%	9.4%	14.4%	21.6%
By age						
50-54	48.0%	7.3%	6.0%	10.3%	14.5%	21.1%
55-59	50.9%	7.2%	5.8%	10.1%	14.1%	20.0%
60-64	52.9%	6.9%	5.5%	9.1%	13.5%	19.1%

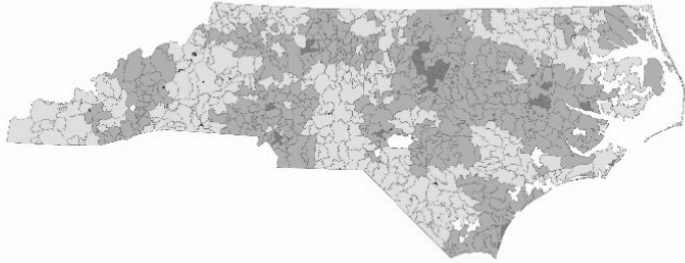
Example:



...and with health insurance expansion

Percent up-to-date with CRC screening by NC zip code

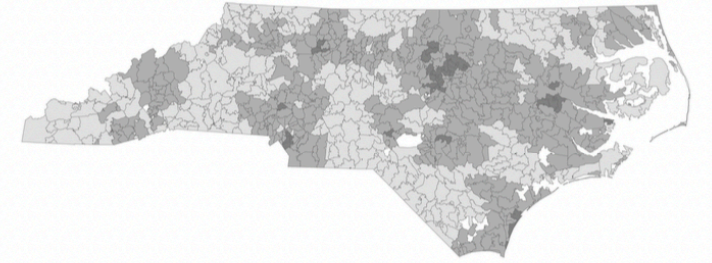
ACA, 2017



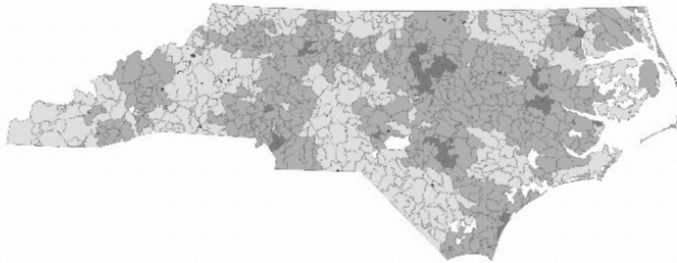
No ACA, 2022



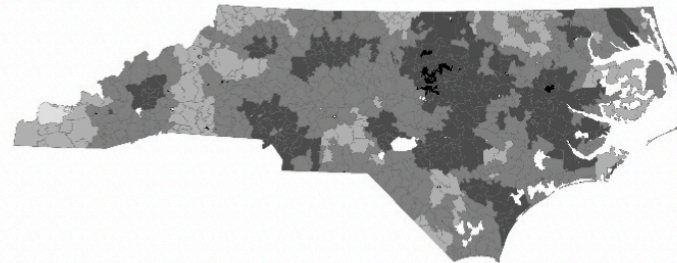
ACA, 2022



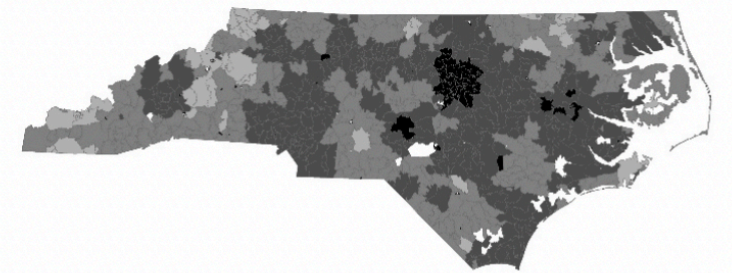
Medicaid expansion, 2022



Conservative Medicare-for-all, 2022

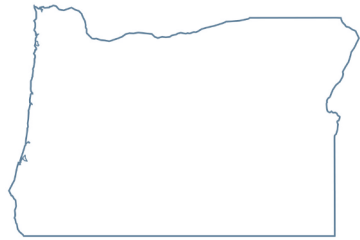


Enhanced Medicare-for-all, 2022

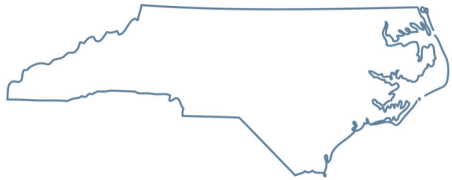


...but no individual EBIs or single health policies were capable of reaching current targets population-wide

After 5 years of intervention:



Mailed FIT + navigation had greatest gain among EBIs of 20.2 percentage points in CRC screening – total **70.3% screened**



Zip code with highest percent up-to-date under enhanced Medicare-for-all scenario had **67.7% screened**

Which “go big” strategies – multicomponent EBIs + health insurance expansion – could help to achieve targets?

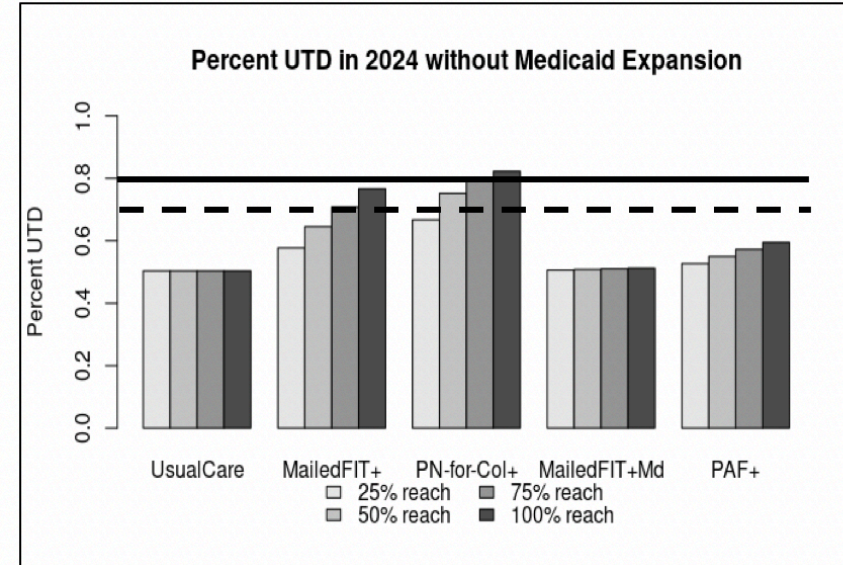
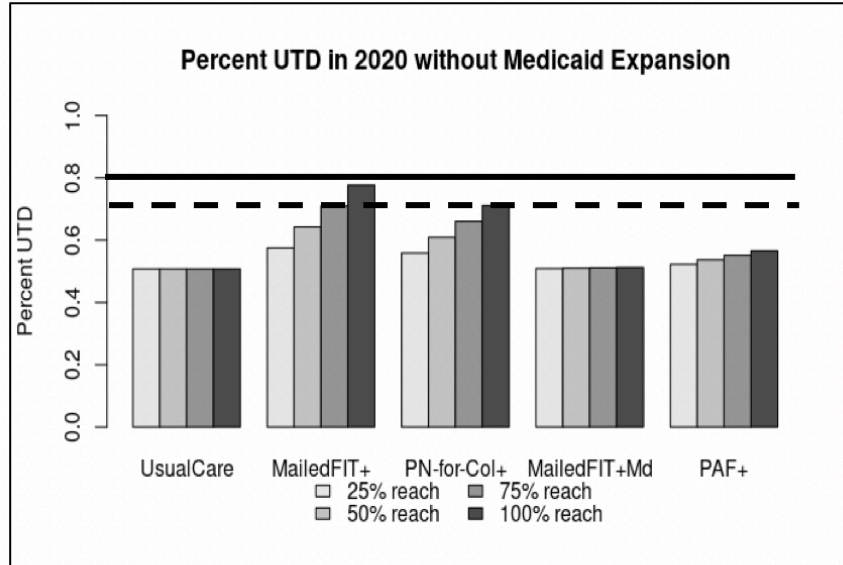


Which of these “go big” EBIs are able to reach targets?

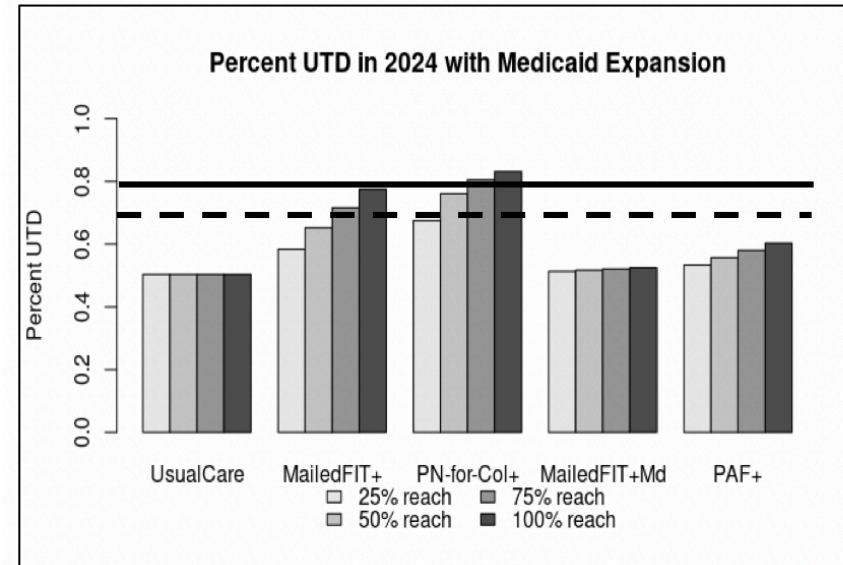
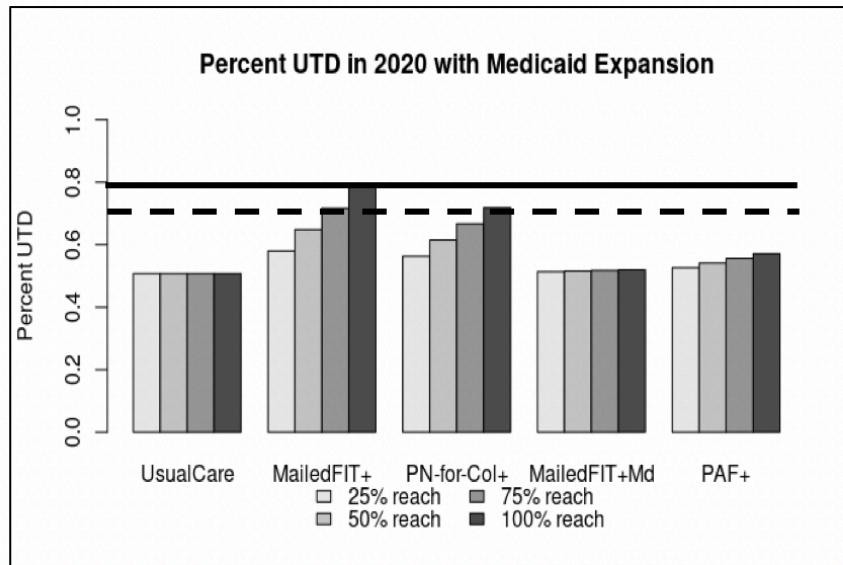
After 1 year of intervention...

After 5 years of intervention...

*Without
Medicaid
expansion...*



*With
Medicaid
expansion...*



*Hicklin 2021,
in progress*

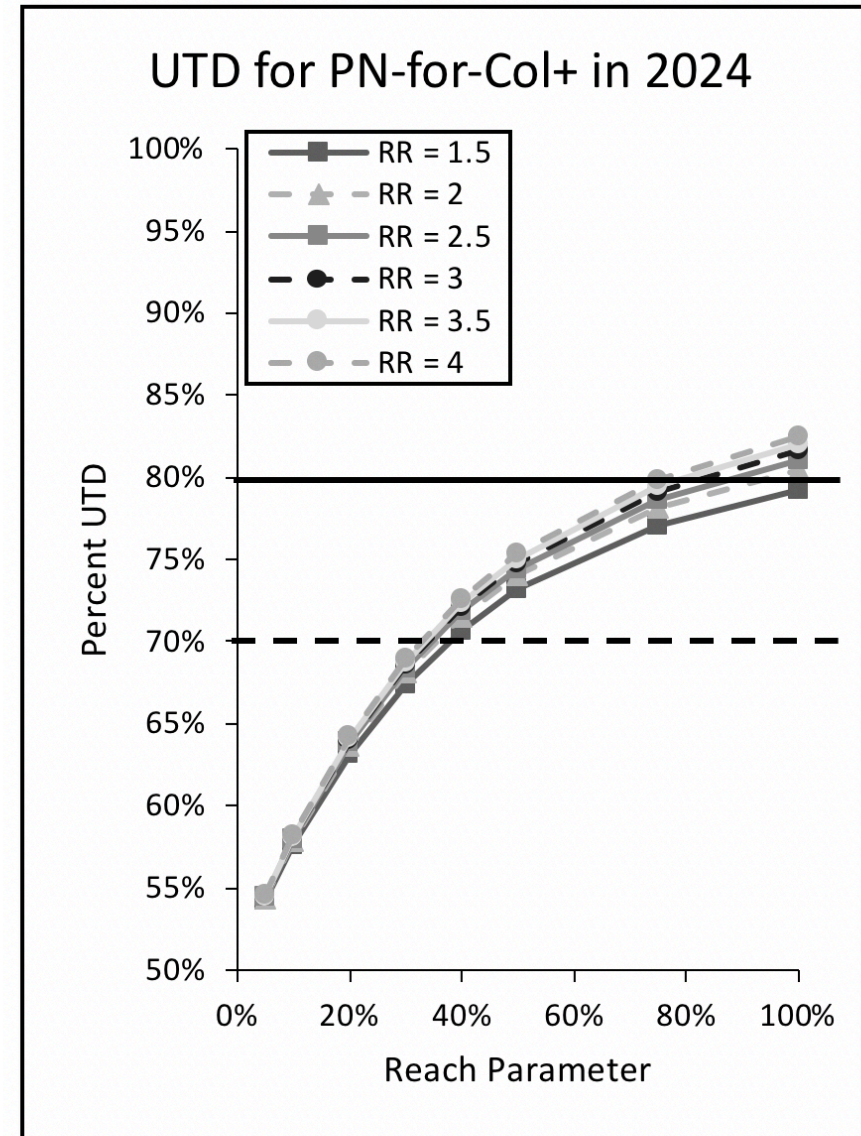
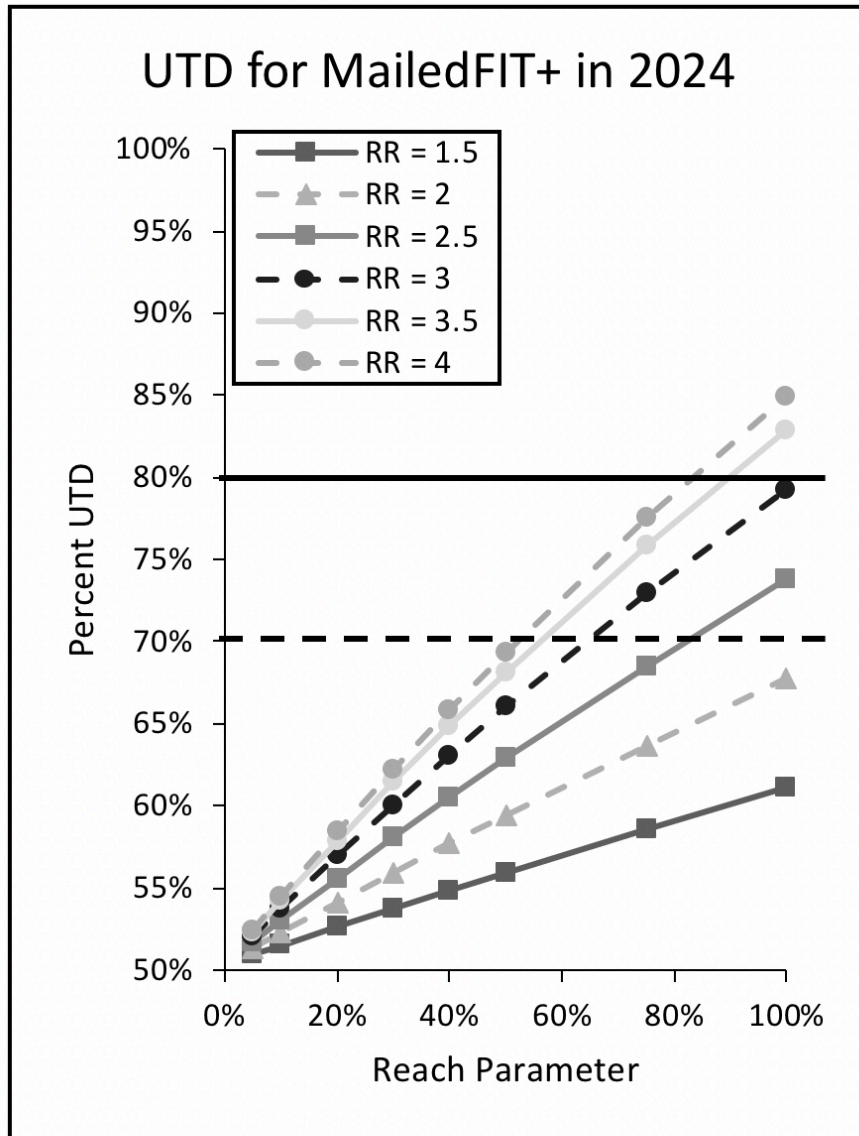


Threshold analysis – level of reach needed

Mailed FIT+	Achieved the 70.5% target with 74% reach after 1 year and 5 years
Patient navigation for colonoscopy+	Achieved the 70.5% target with 97% reach after 1 year & the 80% target with 78% reach after 5 years
Mailed FIT+ for Medicaid	Achieved the 70.5% target with 97% reach after 5 years in the Medicaid population, assuming Medicaid expansion
Provider assessment & feedback+	Not able to achieve screening targets



Tradeoffs between intervention effectiveness (relative risk) and population reach



Selecting EBIs to address screening disparities

Simulated NC
population up-to-date
on CRC screening
after 5 years
(December 31, 2024)
assuming 75%
intervention reach

Bold indicates percent UTD \geq 70.5% target
Bold^ indicates percent UTD \geq 80% target

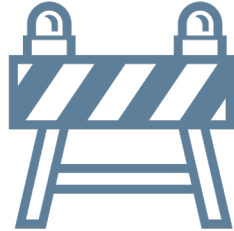
Characteristic	Usual Care (Referent)	Mailed FIT+	PN-for-Col+	Mailed FIT+forMd	PAF+
Overall	50.4%	+20.44	+29.28	+0.65	+6.90
Gender					
Male	49.2%	+19.17	+28.33	+0.75	+7.17
Female	51.3%	+21.52	+30.08^	+0.57	+6.66
Race					
White	51.3%	+20.57	+29.49^	+0.45	+6.96
Black	48.5%	+19.97	+28.71	+1.38	+6.80
Other	44.9%	+20.23	+28.41	+0.95	+6.45
Ethnicity					
Hispanic	43.8%	+20.53	+28.81	+1.35	+6.65
Geography					
Urban	51.0%	+20.45	+28.74	+0.62	+6.88
Rural	48.3%	+20.41	+30.94	+0.74	+6.94
Age					
50-54	42.4%	+23.92	+31.17	+1.31	+7.21
55-59	46.5%	+23.05	+32.07	+1.14	+6.87
60-64	49.0%	+22.32	+30.24	+0.93	+6.72
65+	56.3%	+16.82	+26.71^	+0.01	+6.85
Insurance					
Private	53.8%	+25.53	+32.35^	+0.00	+7.99
Medicare	57.0%	+17.02	+26.54^	+0.00	+6.85
Medicaid	41.7%	+22.72	+37.78	+19.62	+8.06
Dual	48.0%	+17.23	+30.19	+0.12	+7.24
Uninsured	18.1%	+14.43	+24.79	-0.01	+2.58



Key takeaways



Possible, albeit challenging, to achieve screening targets at population level



Must address access barriers facing medically underserved populations – especially the uninsured

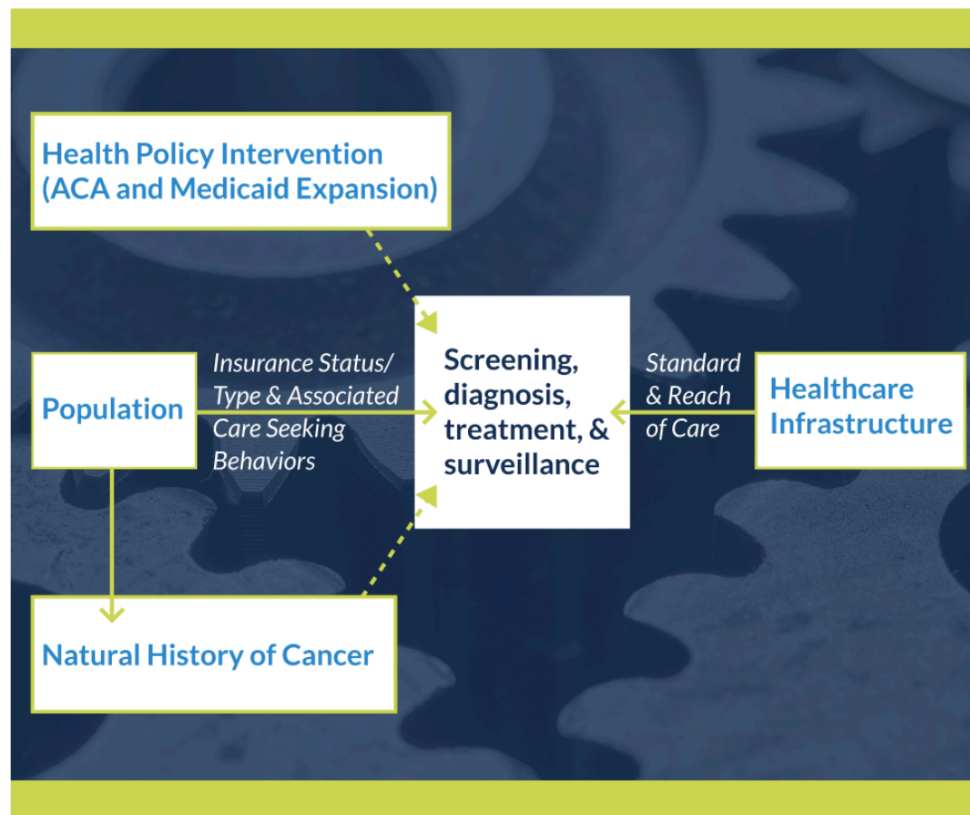


- Consider tradeoffs in:
- Reach
 - Effectiveness
 - Cost
 - Ability to reduce disparities



Population Simulation for Healthcare Decisions

The Cancer Control Popsim (**Population Simulation for Healthcare Decisions**) team is comprised of academic public health researchers who are focused on mathematically modeling the expected impact of evidence-based interventions (EBI) and health policy changes on population health outcomes, particularly within the context of colorectal cancer (CRC) screening and outcomes. We represent the Modeling EBI Impact Workgroup within the Cancer Prevention and Control Research Network (CPCRN), a national thematic research network funded by the Centers for Disease Control and Prevention (CDC) dedicated to reducing the burden of cancer and addressing health disparities within cancer care.



Target audience: decision-makers

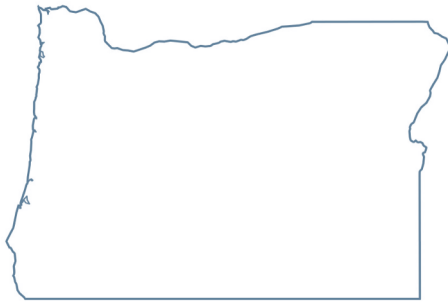


Simulated Interventions

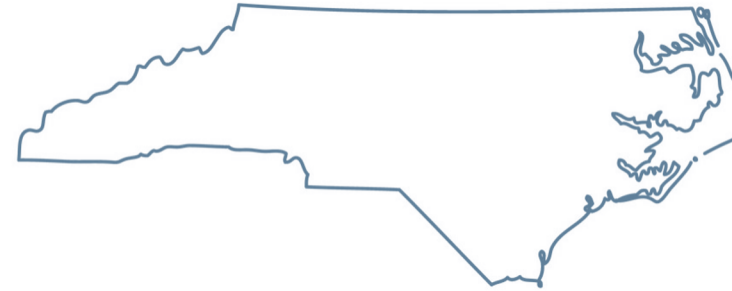


CANCER CONTROL
POP SIM

Population Simulation for Healthcare Decisions



- Patient reminders
- Mailed FIT
- Patient navigation
- Academic detailing
- Mailed FIT + navigation



- Mailed FIT+
- Patient navigation for screening colonoscopy+
- Mailed FIT+ for Medicaid
- Provider assessment and feedback+





Interventions

Detailing+

Academic detailing & provider assessment and feedback

A clinic-level intervention that consists of provider education, screening practices. The onsite provider training covers the in how to talk to patients about CRC screening, and best-practice get screened for CRC. Each provider receives an individual qu progress in boosting CRC screening rates among patients, inc recommendations for improvement.

Reminders

Mailed FIT

Navigation

Mailed FIT + Navigation

Select Interventions

Results

Screening

Colorectal Cancer

Cost-Effectiveness

Costs

Menu Item

Select Interventions

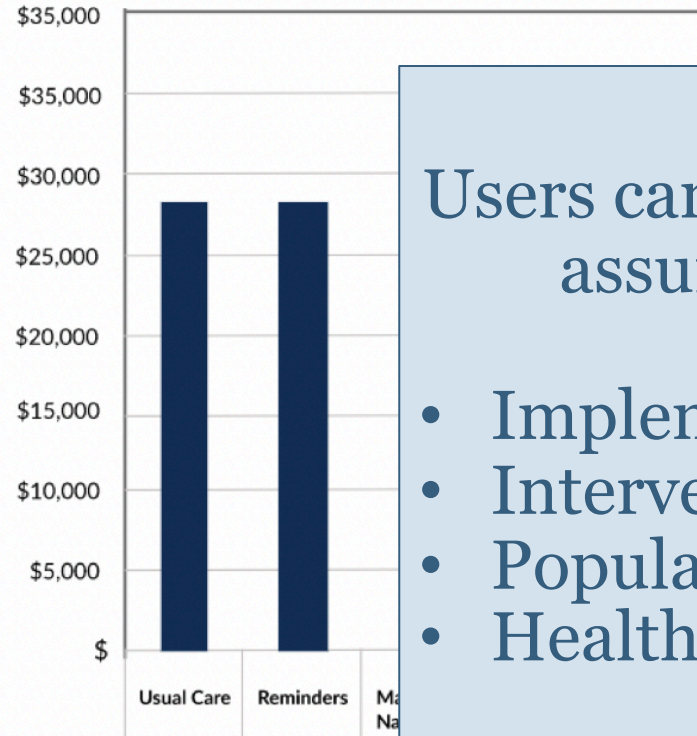
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- Detailing +
- Reminders
- Mailed FIT
- Navigation
- Mailed FIT + Navigation



Costs

Implementation and Total Costs of Interventions at Five Years



- Implementation Costs
- Follow-up Costs
- Cancer Treatment Costs

Users can then modify the model assumptions, including:

- Implementation costs
- Intervention effectiveness
- Population reach
- Health insurance expansion

Colorectal Cancer

CRC cases averted among Medicaid patients exposed to five years of intervention, simulated impact over their full life course and reported as an unadjusted rate per 100,000 people.

Intervention	Follow-up Costs
Usual Care	XXX
Reminders	XXX
Mailed FIT + Navigation	XXX

By ethnicity +

By geography +

By stage +

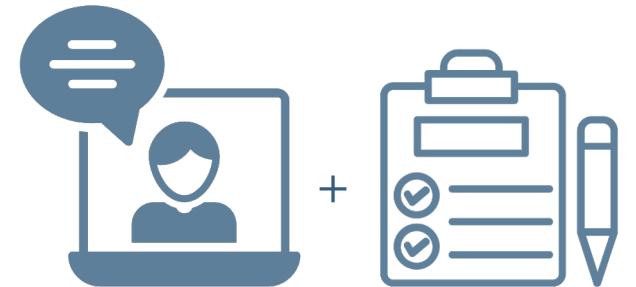


Next steps for PopSim work



Launch Cancer Control PopSim website

Assess feasibility of using PopSim to inform intervention implementation through interviews and surveys with decision-makers



Use simulation model to conduct cost-effectiveness analysis for the ACCSIS-SCORE mailed FIT + patient navigation intervention in FQHCs



Workgroup Team

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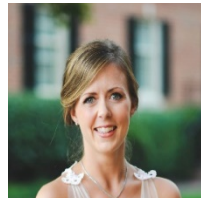
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