# Diverse Patient Attitudes Towards AI in Healthcare

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## Collaborators

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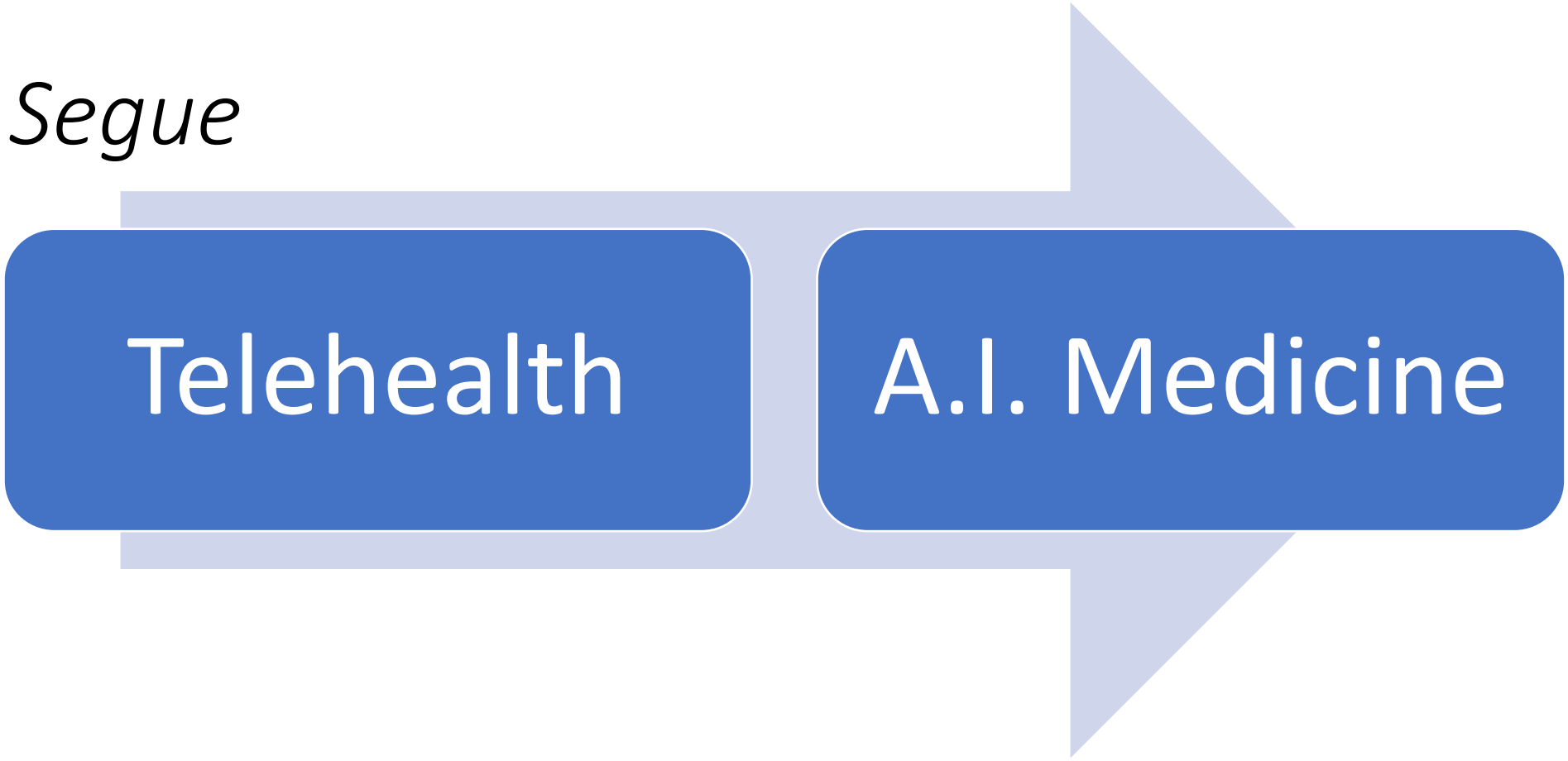
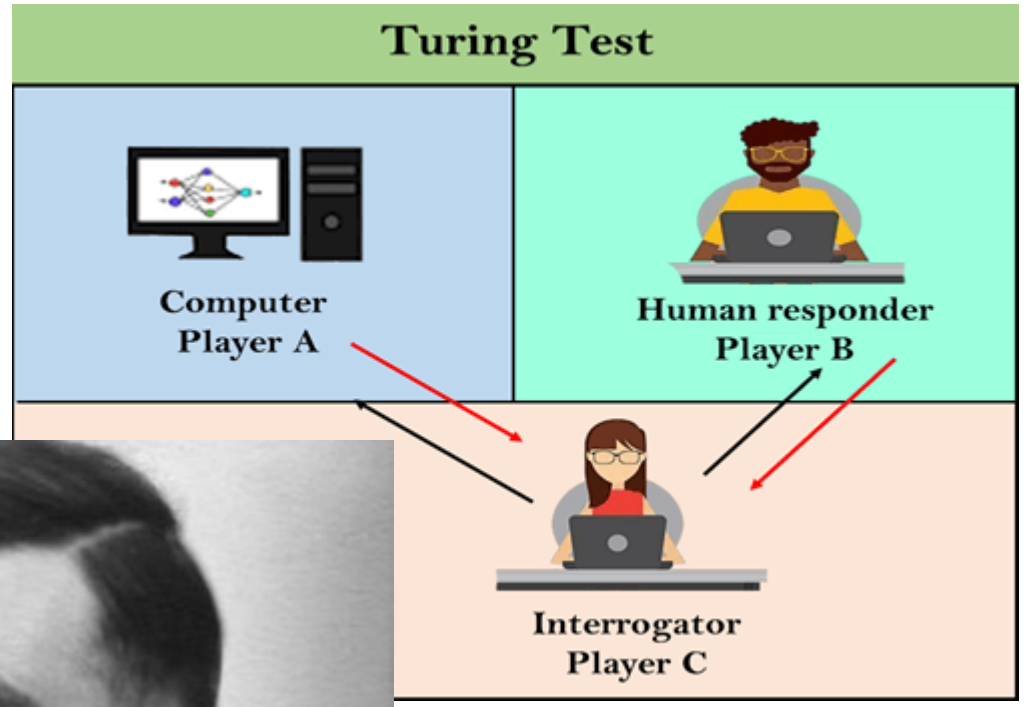
## Funding

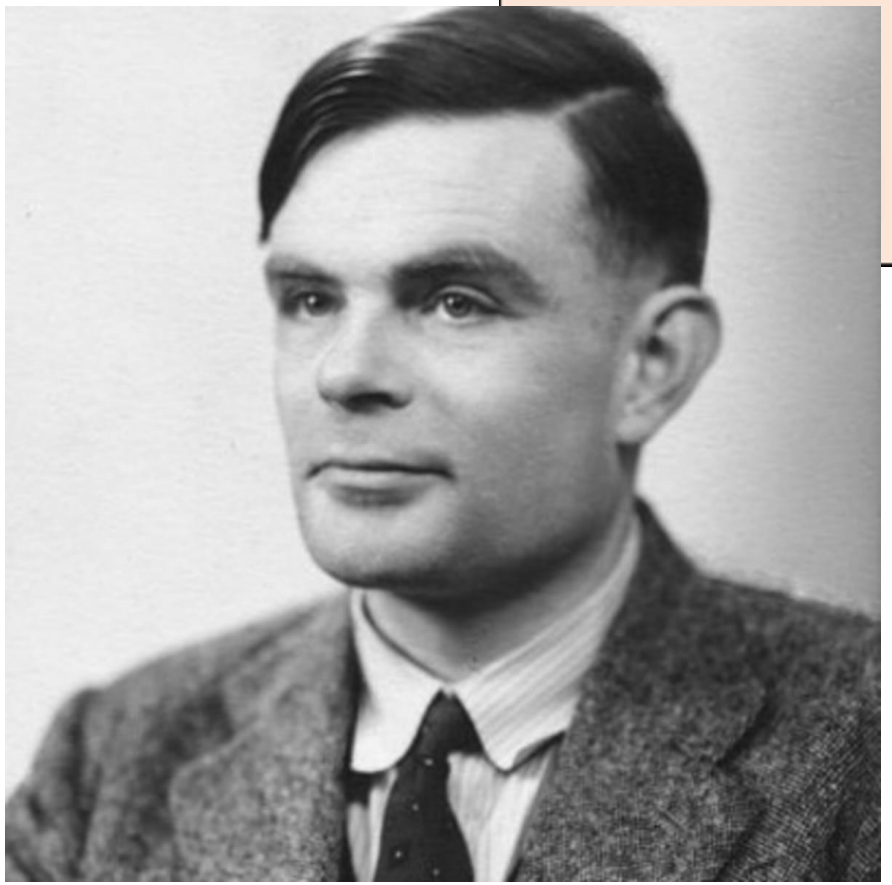
NIH
National Heart, Lung, and Blood Institute

*Segue*



# Who, *or what*, am I talking to?


Turing Test
Computer
Player A
Human responder
Player B
Interrogator
Player C



# Focus

Artificial Intelligence and Machine Learning (AIML) agents making decisions that would otherwise be performed by physicians.

- Diagnosing a sleep apnea
- Diagnosing a leukemia

# Motivation

- AI may be more **accurate** than human physicians
- AI may replicate human **biases** or remedy them
- If physicians use AI *or do not* they may face **liability**

- Prior research suggests patients are **hesitant**
- Use of AI could be **material** to informed consent

ACCESS!

- If patients resist AI, then they may suffer excess **morbidity / mortality**

# Research Questions

- Who is particularly concerned about use of AI in their healthcare?
  - *Will this track historic lack of trust in U.S. healthcare system among Blacks, Native Americans, and other groups suffering disparities?*
- How can AI be implemented in ways that address those concerns?
- How can the decision to use AI be framed to facilitate good decisions?

# Empirical Approach

- Rich clinical vignettes developed with physicians
- Pilot interviews with 25 diverse patients from NHLBI practices

- Randomized factorial experiment between-subjects
- Eight variables manipulated
- Writing prompts for engagement
- Replacement of junk responses
- Manipulation and attention checks

- Enriched survey sample from high-quality provider

# Sampling Method

- Active sampling from gold-standard online survey provider
- Oversample Black, Hispanic, Native American, and Asian respondents
- Reweight the sample for U.S. population

# Descriptive Statistics

| Factor | Mean (SD) or N (%) |
|---|---|
| Age | 48.07 (17.18) |
| Female | 1380 (55.83%) |
| Married | 1183 (47.86%) |
| Employed Full-Time | 853 (34.51%) |
| Less than 50K Income | 1194 (54.27%) |
| High School or Less | 864 (34.95%) |
| Some College or Associate Degree | 777 (31.43%) |
| Bachelor's Degree or More | 831 (33.61%) |
| Conservative* | 575 (23.27%) |
| Religion Important* | 1536 (62.14%) |
| White | 617 (24.96%) |
| Black | 528 (21.36%) |
| Hispanic | 489 (19.78%) |
| Asian | 511 (20.67%) |
| Native American | 327 (13.23%) |

# Vignette 1/2

Suppose that you start to feel tired, your joints ache, and you start to show unusual and unexplainable bruises. You visit your primary care physician. He tells you that these are warning signs of leukemia.

Leukemia is a blood cancer caused by a rise in the number of white blood cells in your body. Those white blood cells crowd out the red blood cells and platelets that your body needs to be healthy. The extra white blood cells don't work right.

There are several different types of leukemia. Some do not require treatment right away, but others can spread to lymph nodes or the central nervous system if not treated. Leukemia can be fatal. However, treatments have improved in recent years. If properly diagnosed and treated, 40 percent of adults with leukemia can now expect long-term remission and survival.

# Vignette 2/2

Your doctor offers either of two options:

- You could go to the offices of Dr. Williams, a hematologist-oncologist, a specialist doctor who is trained to diagnose leukemias, or
- You could go to the office of Med-X, which is built around a proprietary computer system designed to diagnose leukemias. Your blood and genetic information would be drawn by a nurse, and the medical analysis would be done entirely by a machine using artificial intelligence (AI). With every case it sees from tens of thousands of patients worldwide, the AI system gets more accurate in its diagnoses. If you visit the AI clinic, your data will be de-identified and then become part of the system.

# Main outcome (dependent variable)

Which provider would you choose to diagnose your health problem?

- Dr. Williams, the specialist physician
- The Med-X clinic, the AI computer system

# Insert Poll Question Here

# Manipulated Variables

| Variable | Level 1 | Level 2 |
|---|---|---|
| **Illness Severity** | Leukemia ("…There are several different types of leukemia. Some … can spread to lymph nodes or the central nervous system if not treated. Leukemia can be fatal…") | Sleep apnea ("…you are getting poor sleep at night, with very loud snoring, and sometimes it seems like you stop breathing or gasp for air during sleep…. |
| **AI Accuracy** | No description. | "Your doctor tells you that, based on scientific studies in leading journals, the AI system is proven more accurate at diagnoses compared to even specialist human physicians." |

| Variable | Level 1 | Level 2 |
|---|---|---|
| **AI Listens (Personal)** | No description | “The Med-X clinic staff will carefully listen to understand your lifestyle, preferences, values, and goals. … you will have an extensive 45-minutes interview with a trained counselor, who will ask a range of questions to get your perspective on your healthcare.” |
| **AI Tailored (Personal)** | No description | “The AI system’s advice will be tailored to you. [It] will incorporate 36 different measurements and attributes specific to you to generate a unique and personalized treatment plan, just for you.” |

| Variable | Level 1 | Level 2 |
|---|---|---|
| **AI Racial Unbiased** | No description. | “Although research suggests that human physicians can be biased by racial and ethnic stereotypes, the AI system has been carefully designed and tested to ensure that treatment recommendations are unbiased.” |
| **AI Financial Unbiased** | No description. | “Although research suggests that human physicians can be biased by their financial relationships with drugmakers and insurance companies, the AI system has been carefully designed and tested to ensure that treatment recommendations are unbiased.” |

| Variable | Level 1 | Level 2 |
|---|---|---|
| **PCP Incorporates AI Advice** | Defer-Portal: "Your doctor explains, 'From either clinic, you will receive the results as an electronic message in your patient portal, the next day. It will tell you the diagnosis and what to do next.'" | Incorporate-Explain: "Your doctor explains, "When we get the results back from either clinic, I will explain them and talk them through with you. I will incorporate the results into my ultimate opinion on what we should do next.'" |
| **PCP Nudges toward AI** | None: "Your doctor says, 'We can get you into either Dr. Williams or the Med-X AI clinic; it is your choice.'" | Default-Easy: "Your doctor says, 'For some time, I have been recommending the Med-X AI clinic for all my patients, and the nurse has already confirmed available appointments for you. But if you prefer to see Dr. Williams, I can give you a referral instead. It is your choice.'" |

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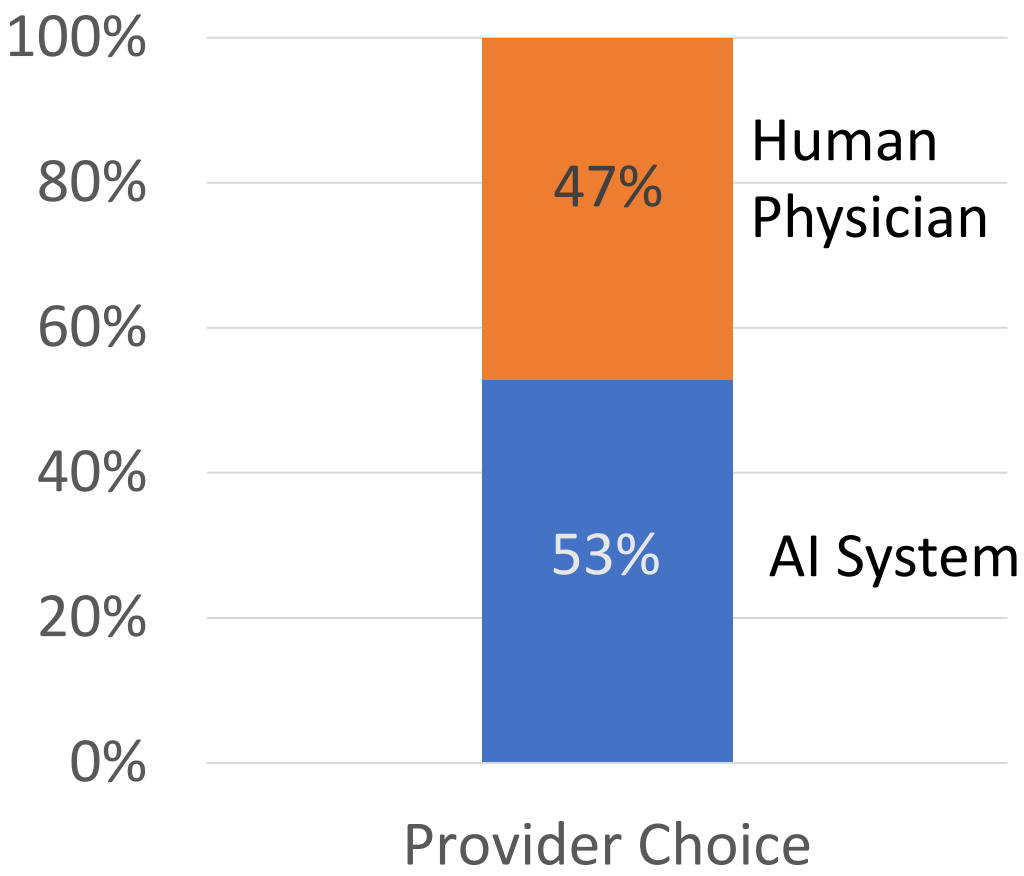
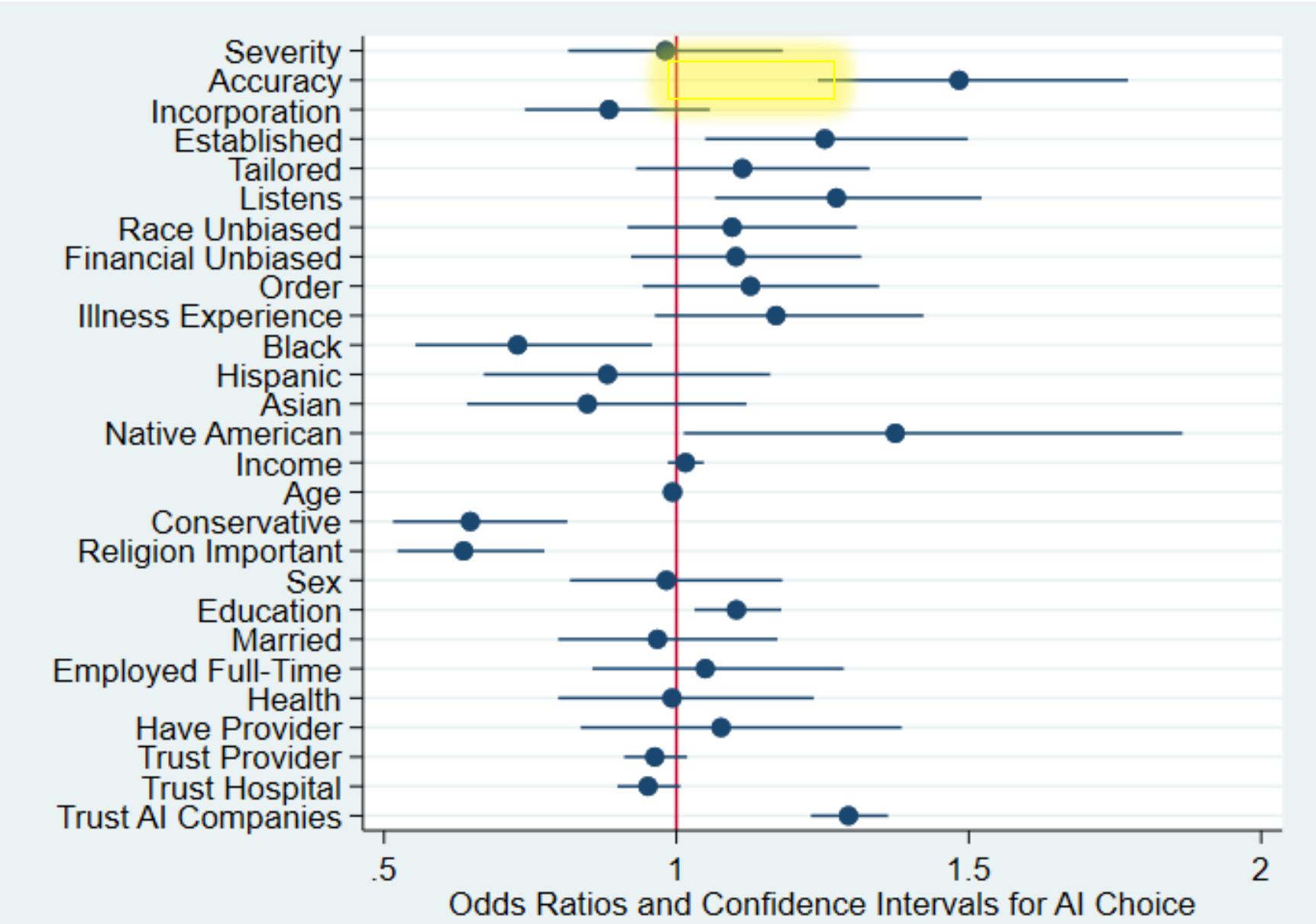
# Results

# Provider Choice

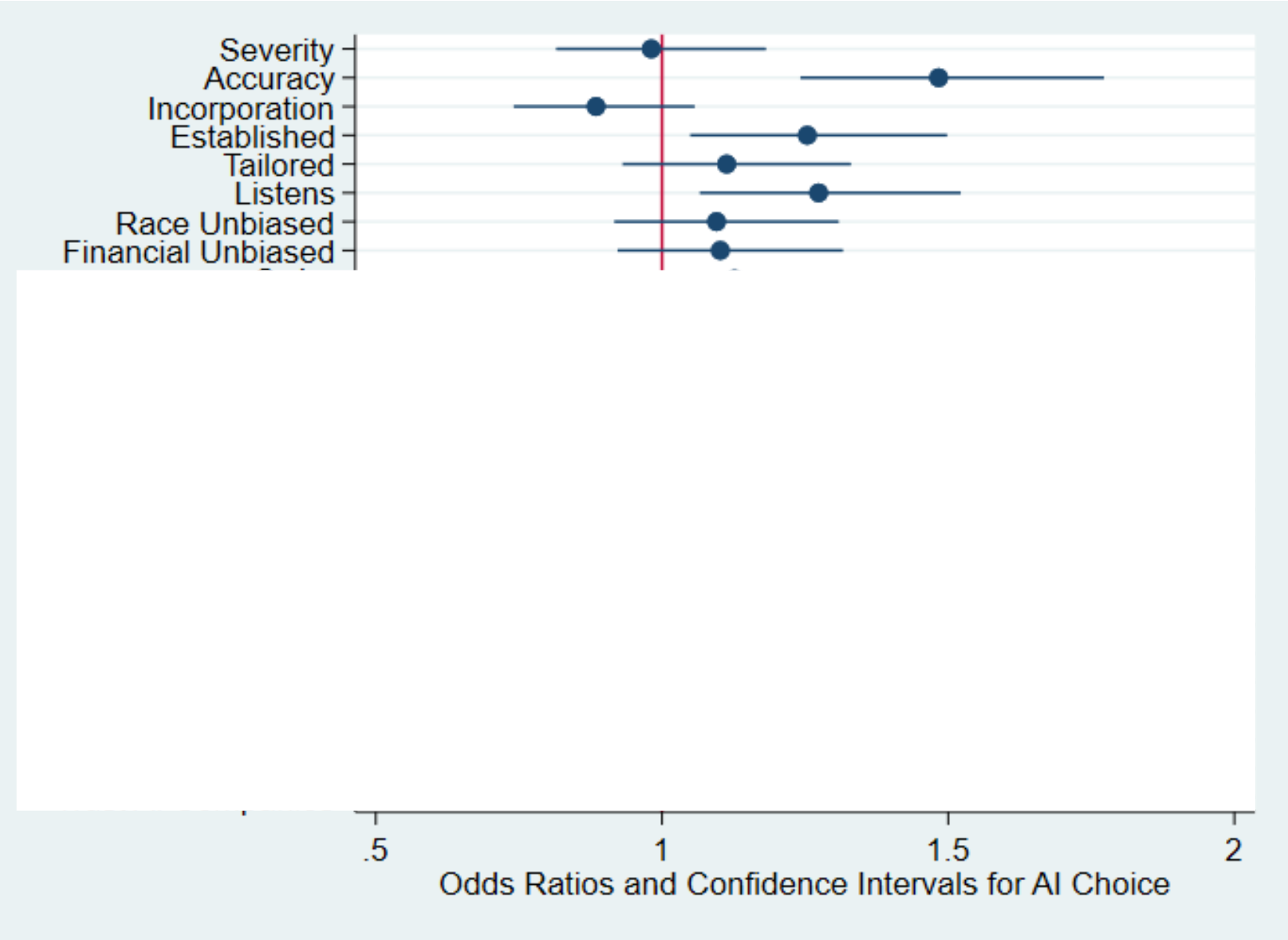
## Across All Conditions, Weighted to U.S. Population




Weighted data, CI approx.




**Avoid AI** **Neutral** **Prefer AI**




# Experimental Variables

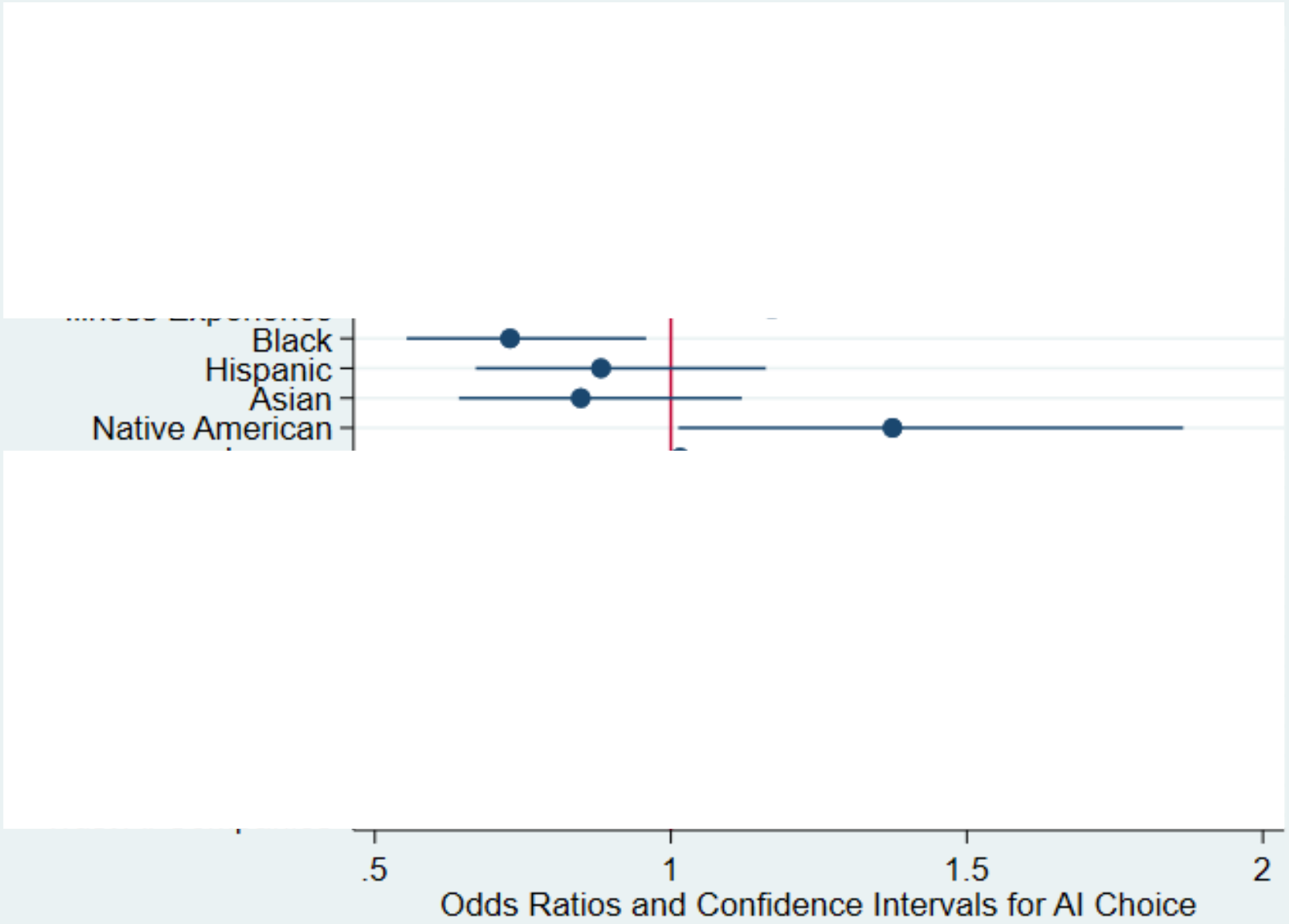
**<u>Helps AI Uptake:</u>**

- Proven accuracy
- Nudge that describing AI as default and “established.”
- AI listens to patient.

***<u>Not</u>* <u>help:</u>**

- Physician incorporation of advice

# Race and Ethnicity



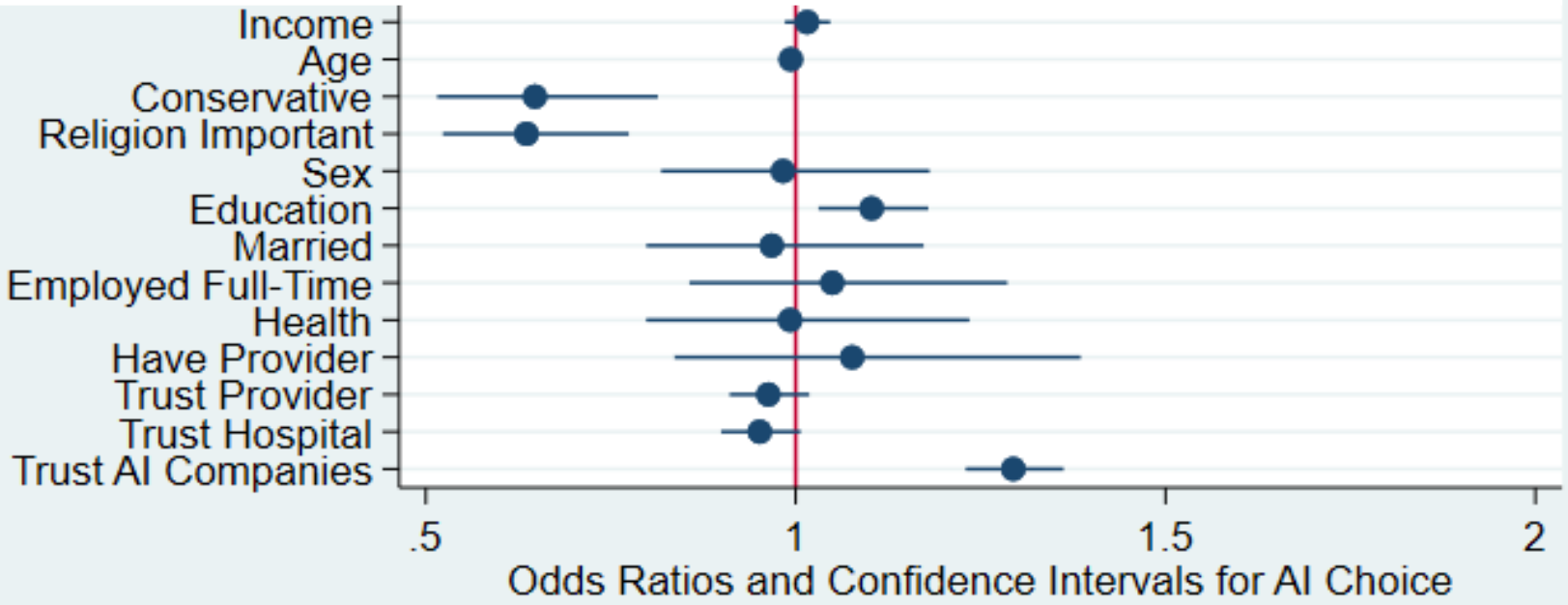

Black respondents were *less* likely to embrace AI.

Native American respondents were *more* likely.

# Other Demographics

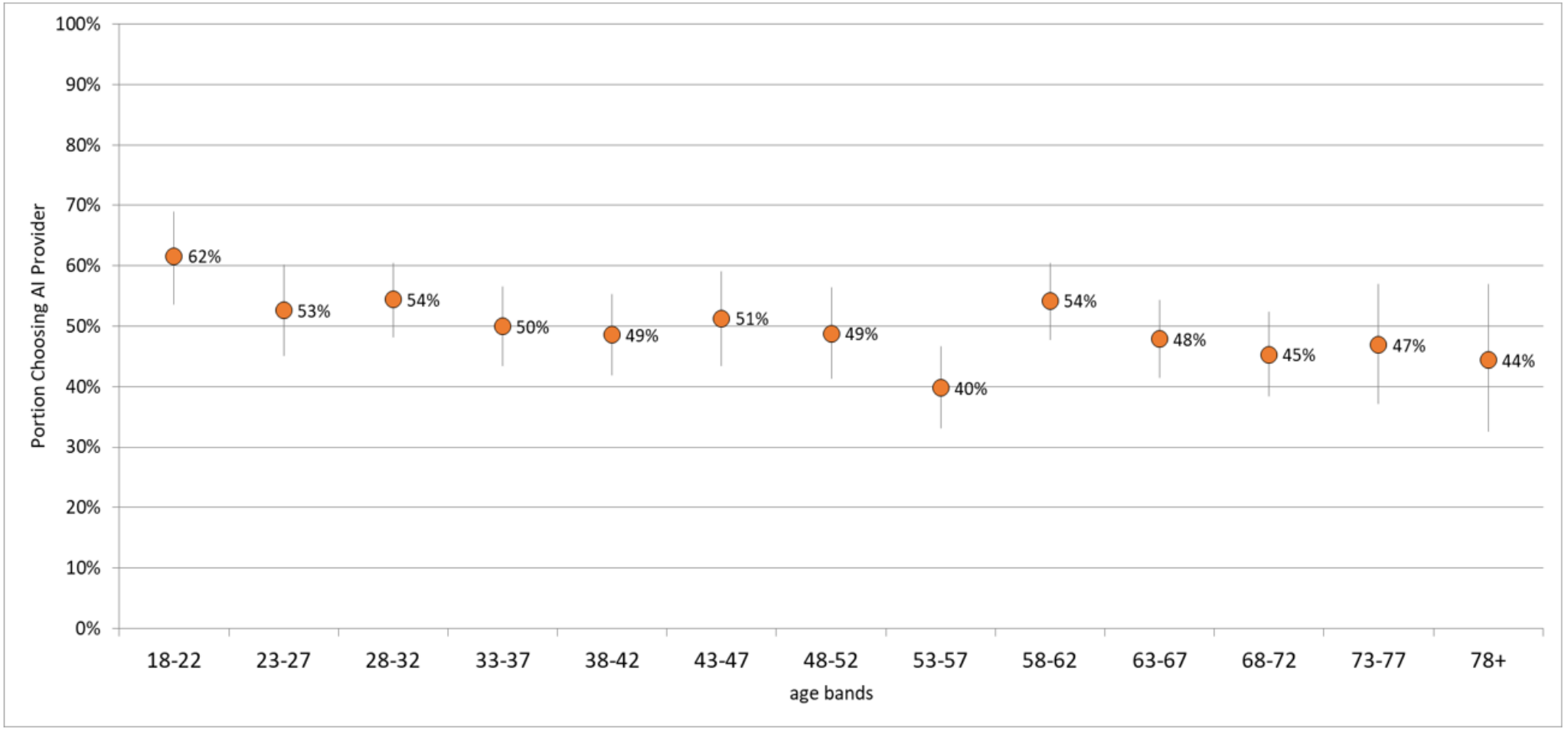
Age
Conservatives
Religious

Educated

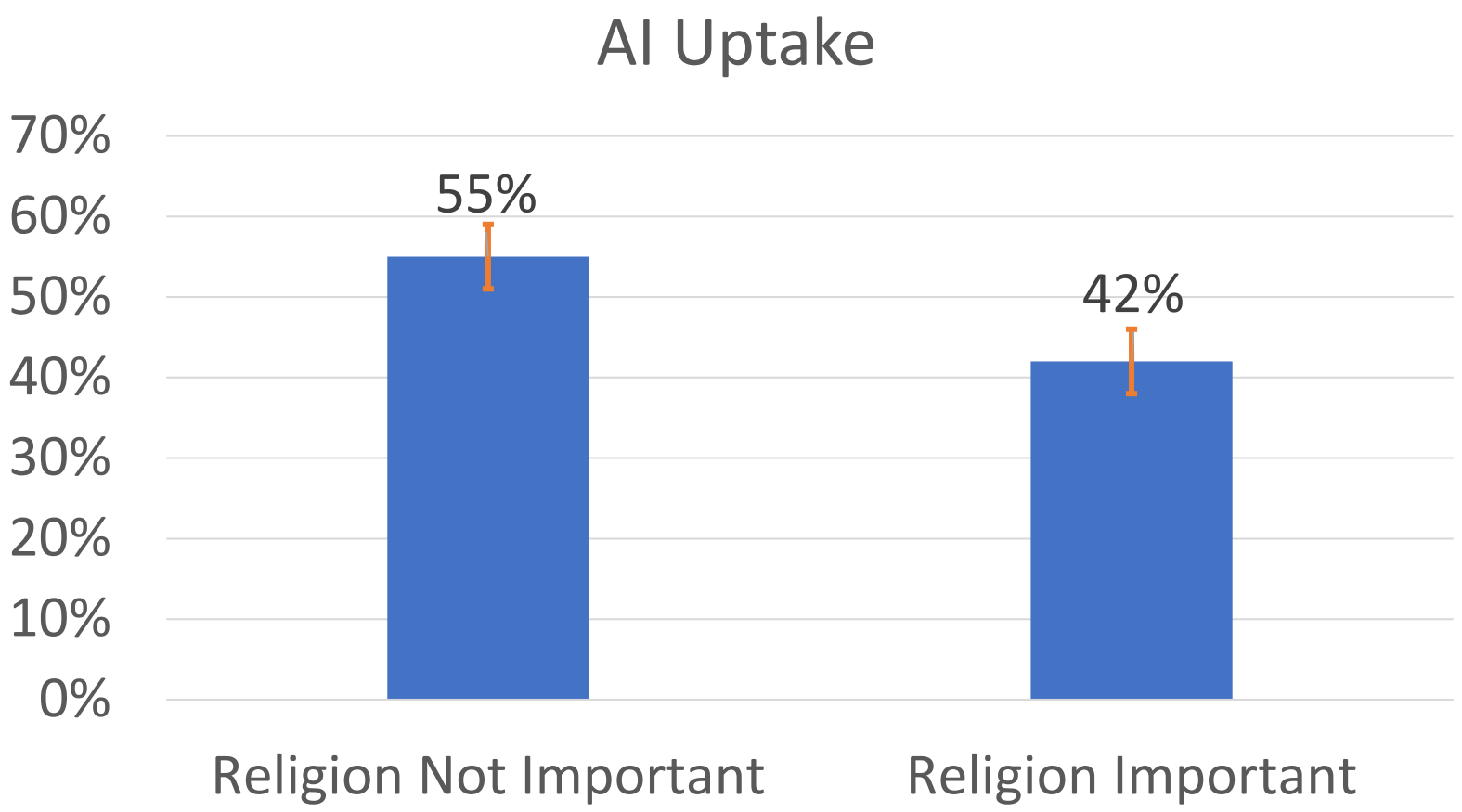


# Older Respondents Have Lower AI Uptake

*Figure 2 -- Proportion (95%CI) of Mock Patients Choosing AI Provider versus Human Physician by Respondent Age (N=2,354)*



# Religious People Less Likely to Accept AI




Weighted data, CI approx.

# Qualitative -- Anti-AI

- **I trust the doctor more than I trust AI. The doctor is an expert in this field and AI is learning as it gathers information…**
- **I chose to speak to a Dr. because I would have many questions and I also feel more comfortable with a human being and not a machine.**
- I prefer nontraditional healthcare approaches and see an acupuncturist rather than MD. Definitely not receptive to machine diagnoses.
- There is no such thing as anonymous or secure once medical information is incorporated into a database.
- I do not trust computer programs which is what AI is. I have known too many computer programmers who aren't as competent as you imagine them to be. Algorithms are fallible.
- I am open minded to the progress in many areas, however even a computer based diagnostic has a human pushing the buttons. Nothing is error free and I like the human connection of seeing my Doctor.

# Qualitative -- Pro-AI

- **AI would, it seems to me, to provide more extensive and thorough data than an individual second opinion doctor.**
- **Though the artificial intelligence diagnosis would seem less personal I like the thought that it would be an unbiased diagnosis and treatment plan. …may be more accurate since it is based on a lot of information.**
- I think that the AI would give me the best chances of survival. I would want to get the best available care, and possibly help others by submitting samples to the database.
- I suppose I felt confident going with the AI if my doctor was recommending it.
- I think the machine is the best way to go. We just dont know what tomorrow will bring and the dr would have the time with his practice and his hospital visits and the teli and video calls he has to do to make his patients happy he really won't have the time to do as much research that [AI] will have …

## Limitations

- Vignettes (imagination)
- Only 2 clinical scenarios
- Only 7 other variables
- Just one snapshot in time

## Strengths

- Large sample
- Demographics enriched
- Randomized for causal inference
- Easy to replicate ($\Delta$ over time)

# Conclusions 1/2

**AI hesitancy is:**

- very substantial
- robust against manipulation
- across all races / ethnicities
- especially strong for religious folks

# Conclusions 2/2

**What helps?**

- **Yes:** reassurances about AI accuracy, listening and nudges towards it
- **Maybe:** reassurances about biases
- **No:** physicians promising to incorporate AI advice

# Thank you!

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