Invisible Inputs: Analyzing Bias in AI Healthcare Tools

Name: _____

Date: _____

Activity Sheet 1

Engage: What's the Proxy?

Sometimes we can't measure exactly what we want, so we measure something else that stands in for it. That "stand-in" is called a proxy. If the stand-in matches the real thing closely, it's a good proxy. If it doesn't match well, it's a bad proxy and can give us the wrong idea.

1. Read each scenario.
2. Identify the stand-in (proxy) being used.
3. Decide what it's really trying to measure.
4. Explain whether it's a good or bad way to measure it, and why.

Scenario	What are we really trying to measure?	What is being measured instead (proxy)?	Does this work well or not? Why?
The longest books in the library automatically win "Best Writing Awards."			
A science video with thousands of likes is assumed to be the most educational.			
A school assumes a student's family income based on the brand of sneakers they wear.			
A fitness tracker judges your fitness only by how many calories you burn.			

Point-Counter Color Codes

+1 = This data point increases a patient's need for extra care.

–1 = This data point decreases a patient's need for extra care.

0 = This data point has no clear effect on a patient's need for care. (Fast - BBkB)

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Activity Sheet 2

Data Feature Evaluation Table

Data Feature	What It Measures	Why It's Used	Risk of Misleading Results	Influence in Care
Chronic Conditions	Number of long-term diagnosed conditions (e.g., diabetes, asthma)	Directly related to medical need	Some communities may be underdiagnosed due to lack of care or bias in diagnosis	
Appointment Attendance	Whether a patient shows up to scheduled medical visits	Used to judge reliability and follow-through	May reflect job insecurity, lack of transportation, or caregiving responsibilities	
Past Medical Spending	Total money spent on a patient's care in the past, including hospital visits, doctor appts, tests, medication	Assumes high-cost patients need more help	May reflect access, not health. If people weren't offered care, they cost less, even if they needed more	
Number of ER Visits	How often a patient has visited the emergency room	Seen as a sign of poor health or lack of preventive care	Can reflect lack of primary care access or neighborhood safety, not just patient health	
Number of Social Media Followers	How many people follow a patient's social media accounts	As a measure of social influence	May reflect popularity or privilege, not health. Using it could reinforce bias toward more visible groups	
Zip Code	Where the patient lives	Sometimes used to infer environmental risks or access to care	Can hint at a person's race, income, or neighborhood. Some areas have less access to healthcare.	
Medication History	The prescriptions a patient has filled	Indicates ongoing medical needs	Patients who can't afford meds or don't trust the system prescribing them medications may appear healthier than they are	
BMI (Body Mass Index)	A ratio of weight to height, used to assess health risk	Associated with risk for some medical conditions	Doesn't account for muscle mass, body composition, or cultural health differences	

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Activity Sheet 3

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Activity Sheet 3 – Sample Solution

Case Study | Invisible Inputs:

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In 2019, researchers looked at a computer program used in many large hospitals and insurance systems across the United States. The program was designed to predict which patients were likely to need extra medical support in the future. Hospitals used it to decide who should be invited into special care programs that provide extra doctor visits, nurse check-ins, and help managing serious illnesses. At the time, the program was being applied to around 200 million people every year.

The program didn't directly measure how sick a patient was - this is difficult to determine with one data point. Instead, it used past medical spending as a stand-in, or proxy, for health needs. The idea was that patients who spent more money on healthcare in the past must have more serious needs.

On the surface, this seemed reasonable. If someone has many prescriptions or expensive treatments, it probably means they have serious conditions. But the researchers discovered that using spending as a proxy created a huge blind spot.

What the Data Showed

- Black patients with chronic illnesses were often flagged as healthier than they really were. Even when Black and white patients had the same number of health problems, the program predicted that the Black patients needed less extra care.
- The difference came from medical spending. On average, Black patients spent less money on healthcare than white patients. This was not because they were healthier. It was because of unequal access to doctors, specialists, and treatments.
- By linking "spending" to "need," the program quietly built existing inequality into its predictions. Thousands of patients who should have qualified for extra care were left out.

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Sample Patients

Imagine the algorithm is asked to decide which patients should get extra care support. Here are four patients with similar health needs:

Patient	Health Conditions	Past Year Medical Spending	Algorithm Prediction	Reality
Patient A	Diabetes + high blood pressure	**$20,000**	High need → flagged for extra care	Correct. Patient A needs extra support
Patient B	Diabetes + high blood pressure	**$8,000**	Low need → not flagged for extra care	Incorrect. Patient B needs just as much support as A
Patient C	Asthma + heart disease	**$15,000**	High need → flagged for extra care	Correct. Patient C needs extra support
Patient D	Asthma + heart disease	**$6,000**	Low need → not flagged for extra care	Incorrect. Patient D needs just as much support as C

- Patients A and C had higher spending, so the algorithm said they deserved extra care.
- Patients B and D had the same health conditions, but because they spent less money on care, the algorithm assumed they didn't need help
- In real life, many Black patients looked like B and D. They had serious health conditions but lower spending, often because of barriers to healthcare.

Why It Matters

When researchers corrected the bias, they found that nearly twice as many Black patients should have been flagged for extra care. The algorithm wasn't intentionally racist. It never even looked at race as a variable. But its choice of proxy data (spending = need) caused unfair results.

This case shows how powerful and dangerous proxies can be in AI. Choosing the wrong stand-in can quietly build inequality into decisions that affect real people's lives.

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Patient Cards

Name: _____

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Patient 1: Jordan R.

Jordan is a graphic designer who lives in a middle-income neighborhood and loves spending weekends at the local art market. Jordan has no chronic conditions, takes no prescription medications, and maintains a healthy BMI. They attend every doctor appointment and have had very low medical spending overall, though they've made a high number of ER visits. Outside of health care, Jordan is active on social media and has built a large following by posting digital art tutorials.

Patient 2: Riley K.

Riley lives in a low-income neighborhood and works part-time at a local grocery store, where they love chatting with the regulars. They have no chronic conditions and attend most of their doctor appointments, though they've had to cancel a few. Riley has spent very little on medical care and has had only one ER visit. They don't use social media and enjoy lingering over novels and tea. Riley takes several prescription medications and has a high BMI.

Patient 3: Sidney L.

Sidney lives in a wealthy neighborhood and works in finance. They have no chronic conditions but frequently miss their doctor appointments. Despite this, Sidney's past medical spending has been high, and they take several prescription medications. They have had no ER visits. Sidney keeps their social media private, though many friends and family follow their posts. Away from work, Sidney enjoys collecting vintage records and often spends evenings listening to jazz. Their BMI is in the average range.

Patient 4: Ellis M.

Ellis lives in a working-class neighborhood and teaches music lessons from home. They have several chronic conditions and take multiple prescription medications. Ellis hasn't needed to go to the ER but has had very high medical spending overall. They attend most doctor appointments but occasionally cancel when transportation is difficult. Their BMI is above average. On social media, Ellis isn't very active but keeps in touch with family through posts and tags. In their free time, Ellis enjoys playing the piano for neighbors and friends.