

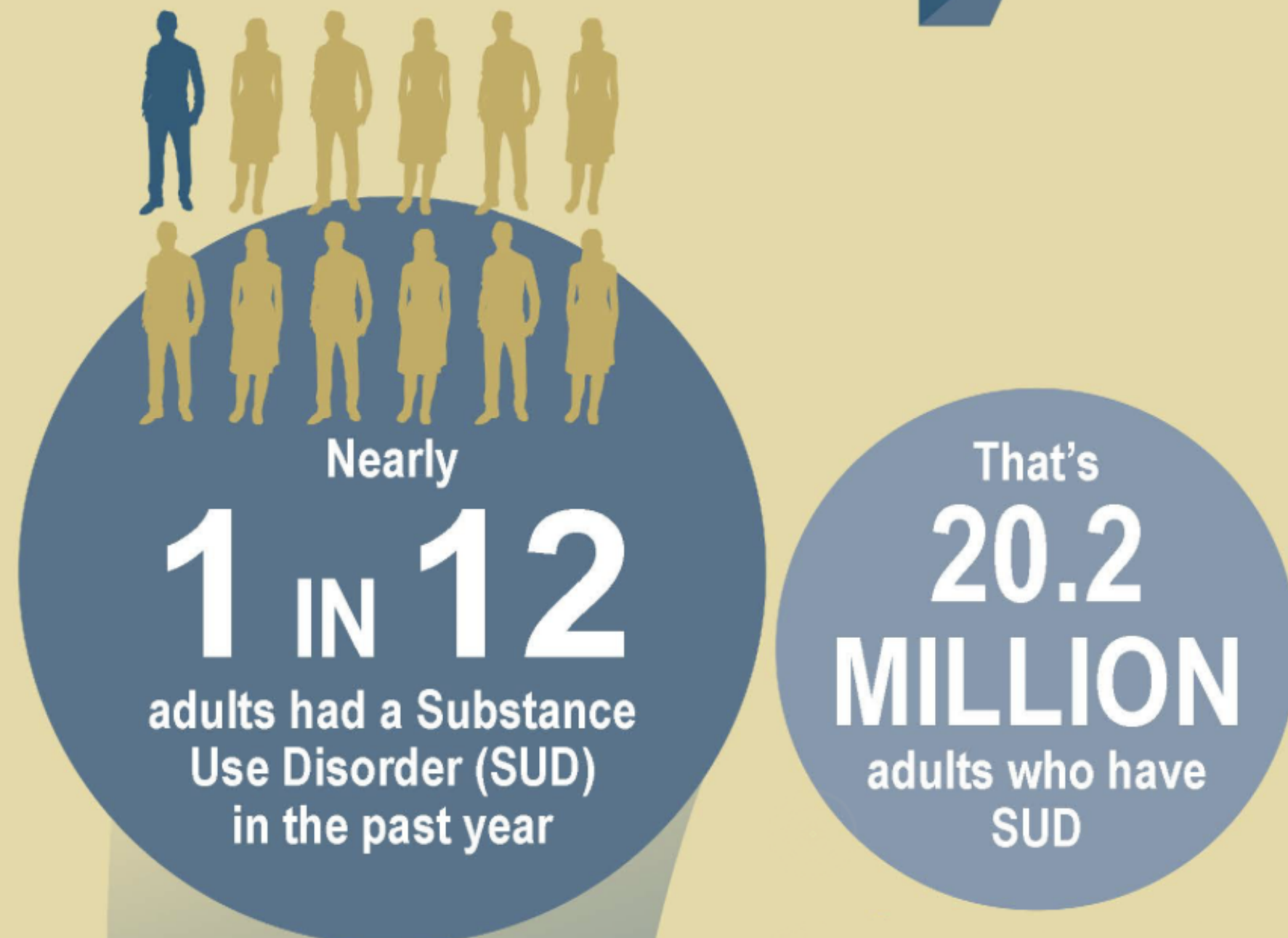
Designing LLM-based Tools with Behavioral Health Organizations

Naveen Raman
Carnegie Mellon University

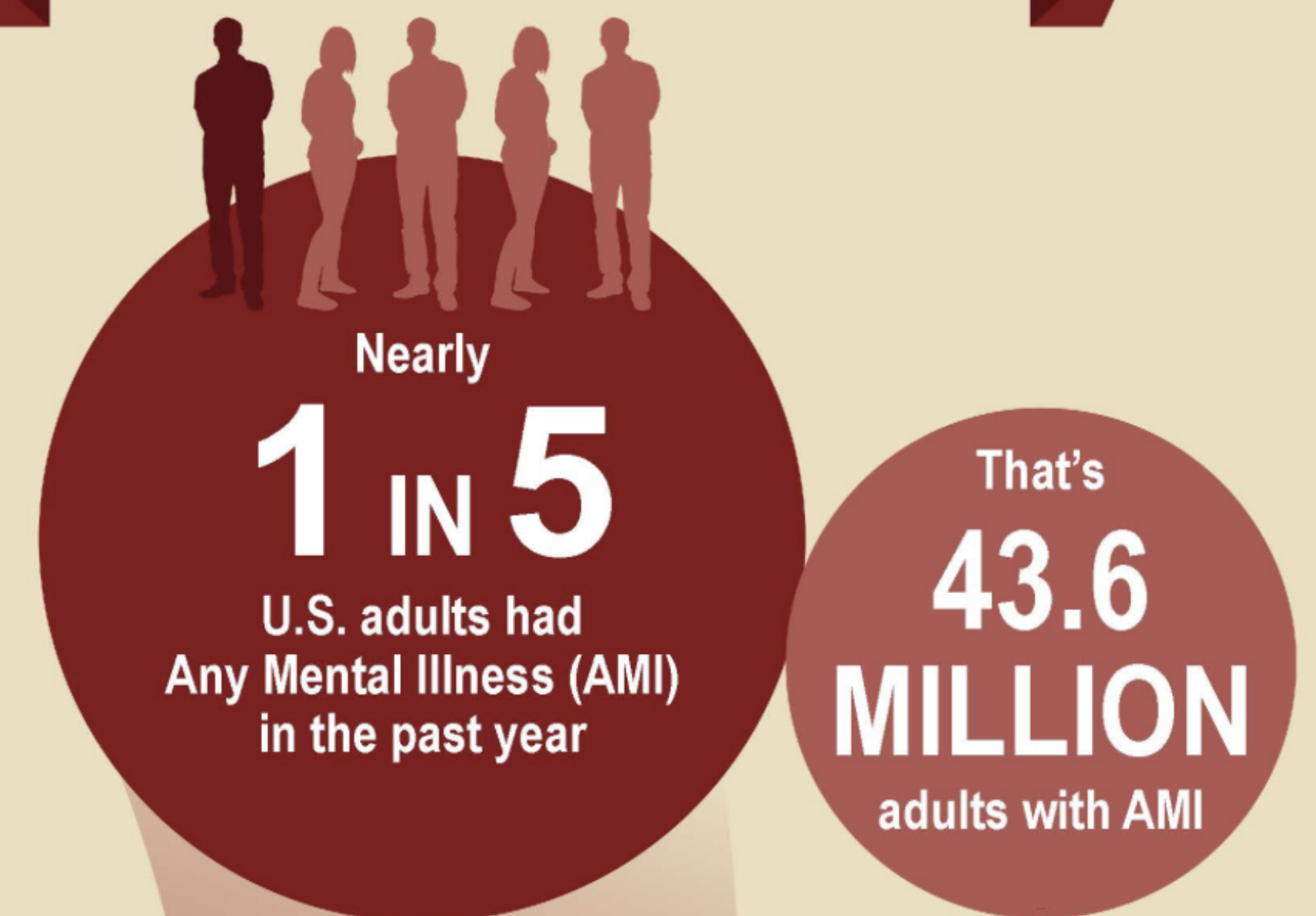
Columbia HCI | October 23rd

Behavioral Health is Critical

SUBSTANCE USE IN THE U.S.



MENTAL HEALTH IN THE U.S.



Behavioral Health conditions include mental health and substance use disorders

[AMA 2022]

Behavioral health conditions **cost over \$80 billion annually** in the United States

[JAMA 2017]

Some facing behavioral health issues experience **homelessness, unemployment**

[SWHC 2013] 2

‘Nobody Has Openings’: Mental Health Providers Struggle to Meet Demand

With anxiety and depression on the rise, meeting demand has been challenging for people



Share full article



27

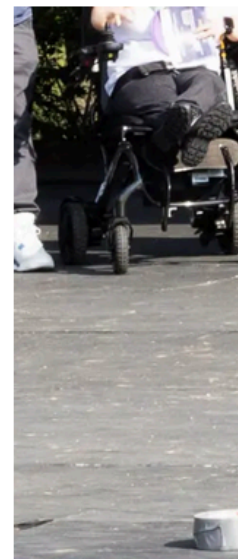


Federal Agency Dedicated to Mental Illness and Addiction Faces Huge Cuts

The Substance Abuse and Mental Health Services Administration



Listen



Mental Health and Substance Use Disorders Often Go Untreated for Parents on Medicaid



By Emily Baumgaertner

April 19, 2024



Share full article



Substance Abuse and Mental Health

Peer-Run Organizations Tackle Behavioral Health



Peer-Run Behavioral Health Organizations (PROs) tackle behavioral health conditions through peer providers with lived experiences

Helps tackle behavioral health conditions in hard to engage and hard to reach communities

But They Face a Variety of Challenges



Peer Providers are Overburdened

Growing need and complexity of service user demands



Dependence on Low Tech Solutions

Under-developed technological infrastructure makes it difficult to navigate resources

What should the role of AI
be in Behavioral Health
settings?



We ask Two Key Questions:

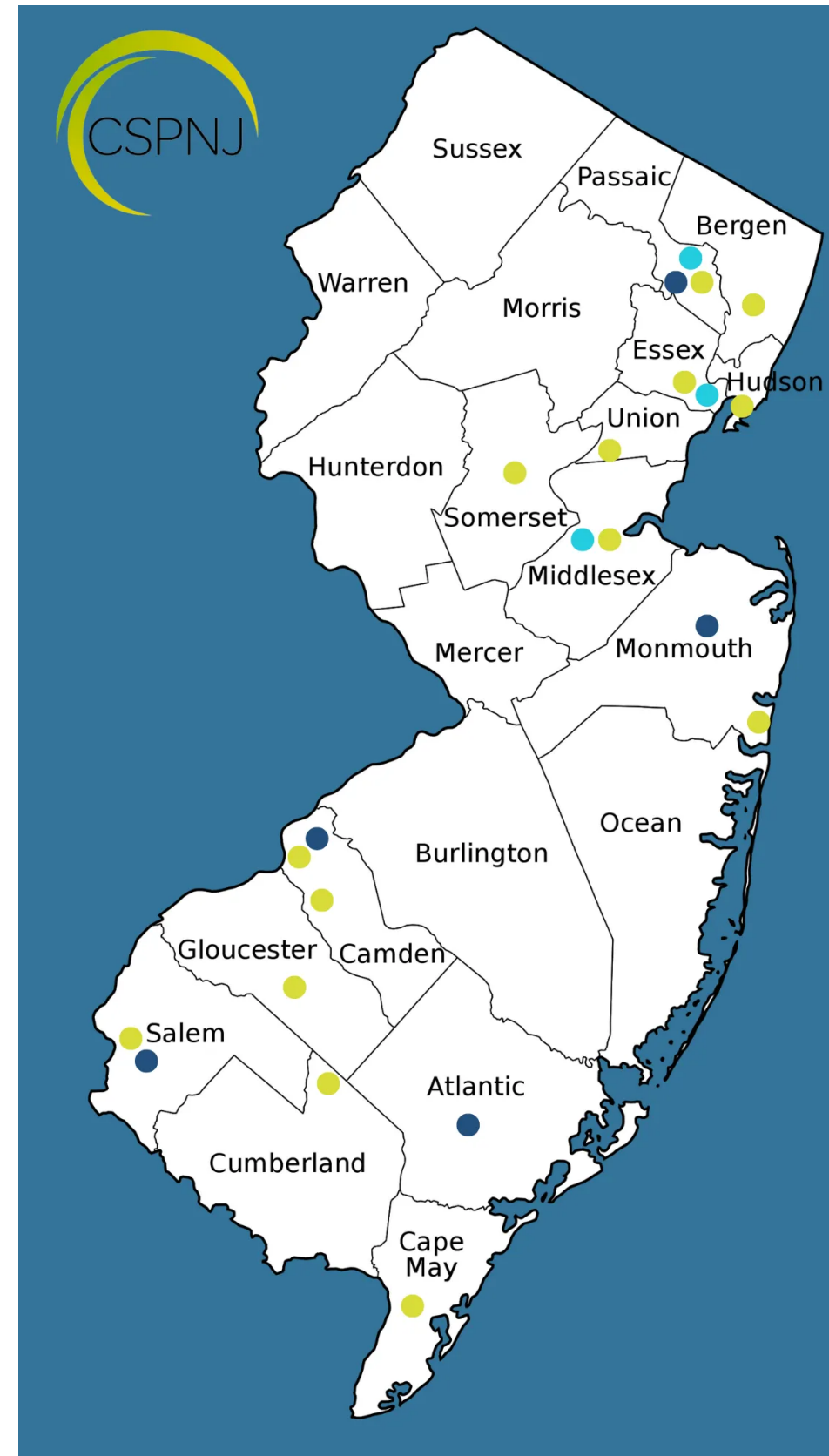
Question #1

What should the role of AI be
in peer-run behavioral health organizations?

Question #2

How can we develop an AI that
best helps peer-run behavioral health organizations?

Working with a Partner Organization: CSPNJ



New-Jersey Wide

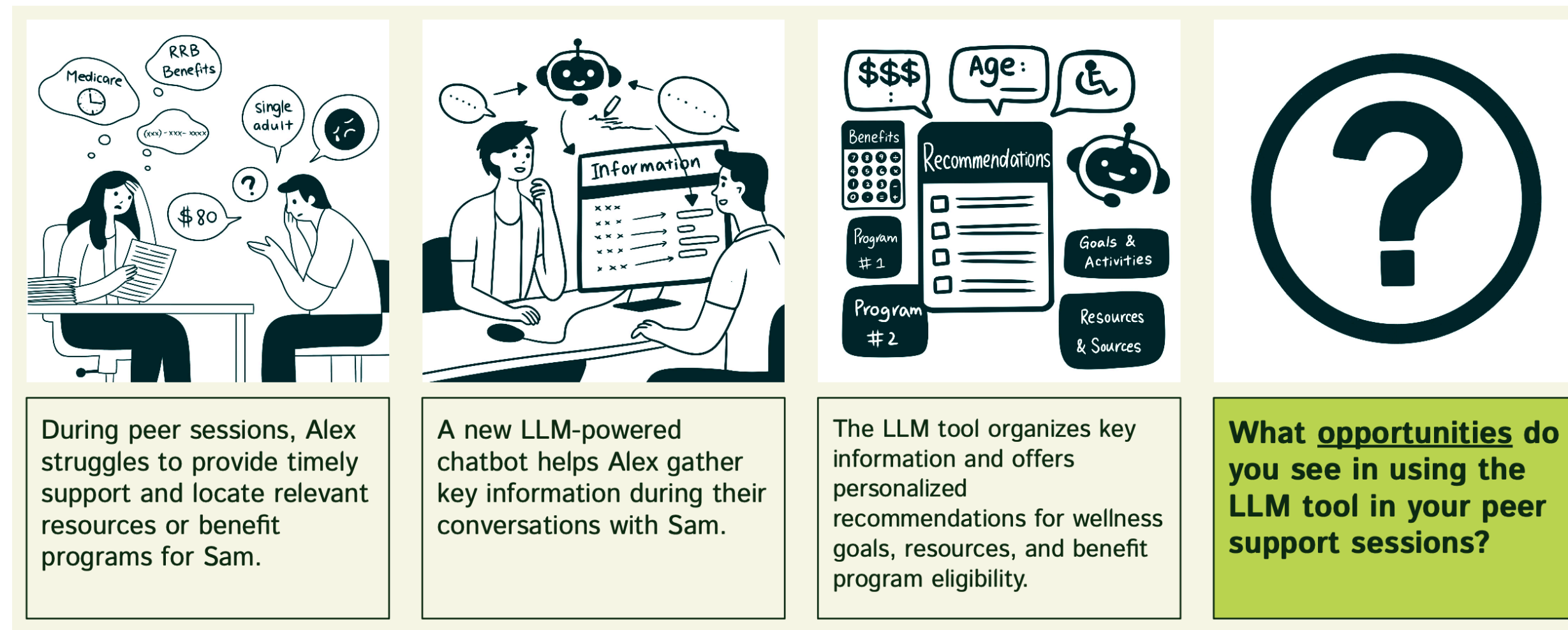


**Serves 15-100
people daily**

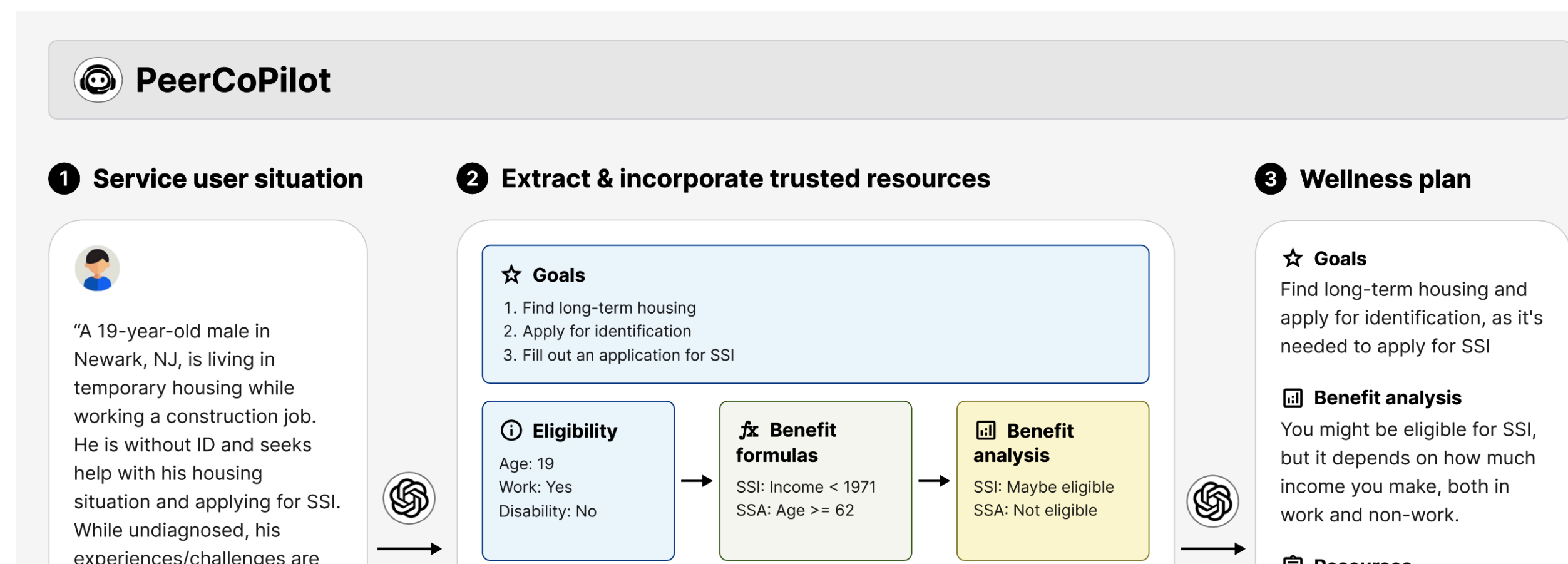


**Provides Housing, Food,
and Other Services**

Two Studies

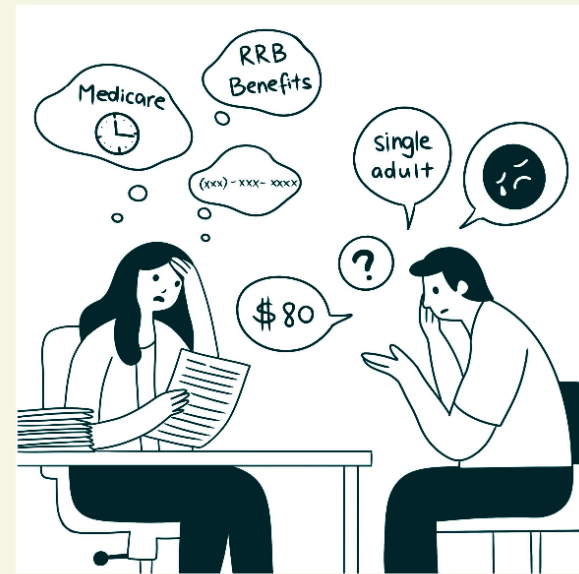


Risks and Opportunities of LLMs in Behavioral Health



Developing PeerCoPilot, an LLM-based tool for Behavioral

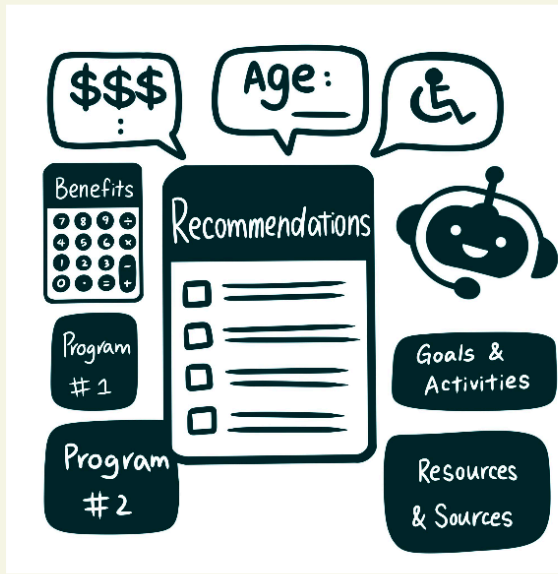
Two Studies



During peer sessions, Alex struggles to provide timely support and locate relevant resources or benefit programs for Sam.



A new LLM-powered chatbot helps Alex gather key information during their conversations with Sam.

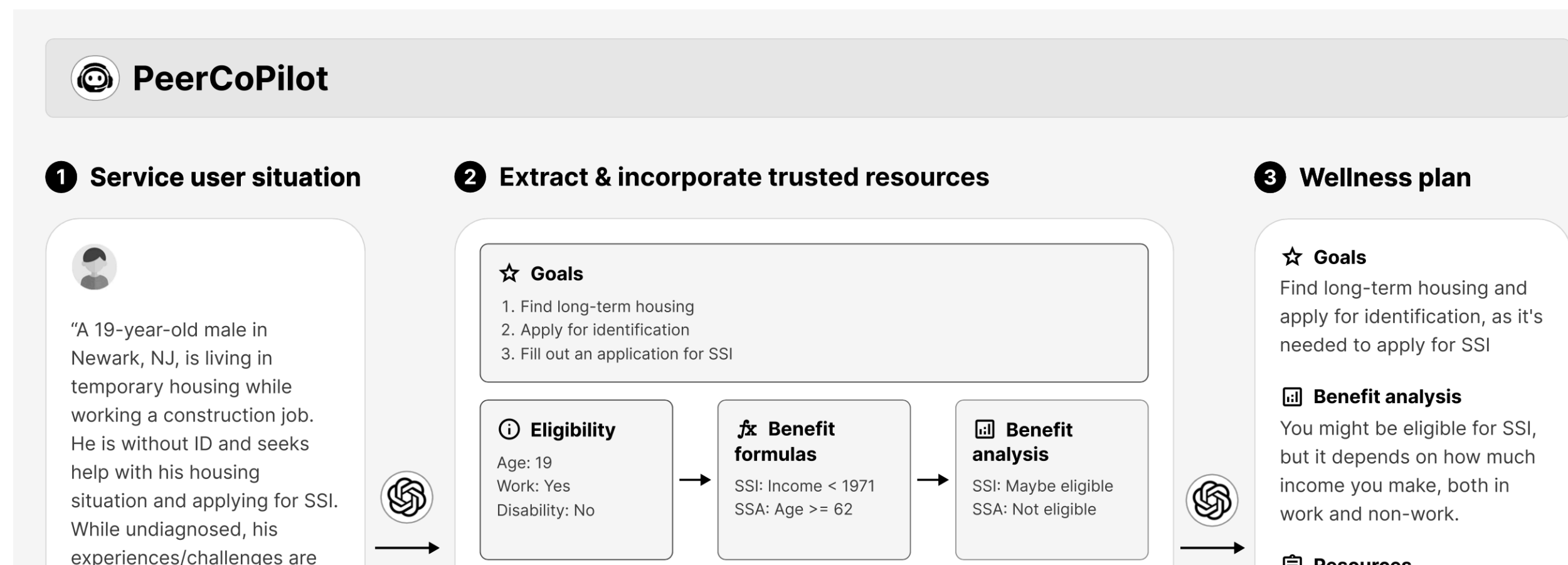


The LLM tool organizes key information and offers personalized recommendations for wellness goals, resources, and benefit program eligibility.



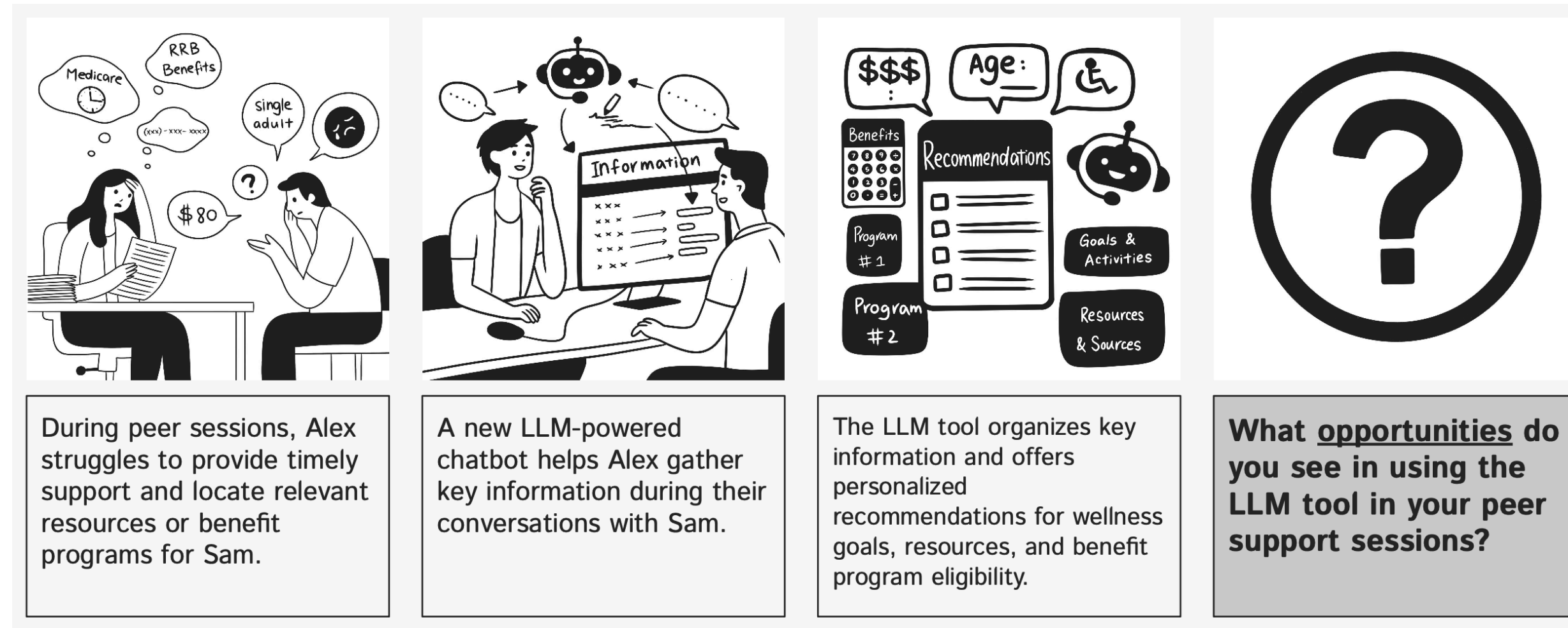
What opportunities do you see in using the LLM tool in your peer support sessions?

Risks and Opportunities of LLMs in Behavioral Health

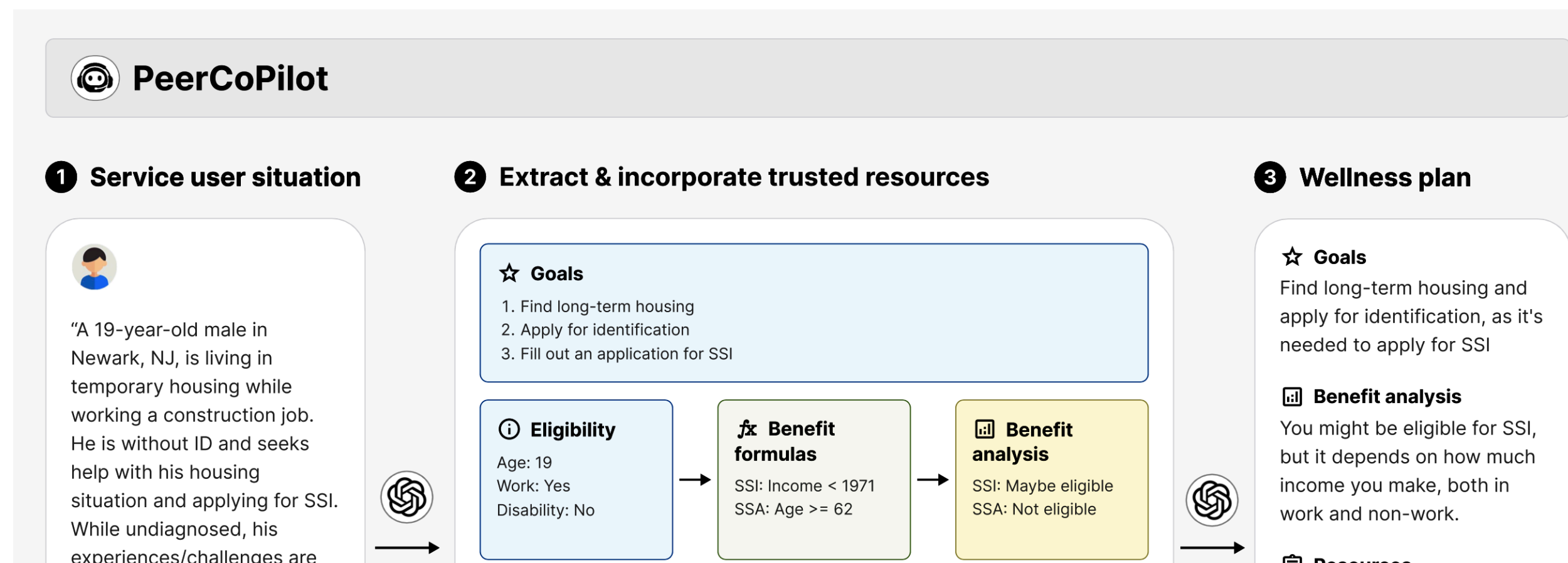


Developing PeerCoPilot, an LLM-based tool for Behavioral

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Risks and Opportunities of LLMs in Behavioral Health



Developing PeerCoPilot, an LLM-based tool for Behavioral Health

Three Human-Centered Questions

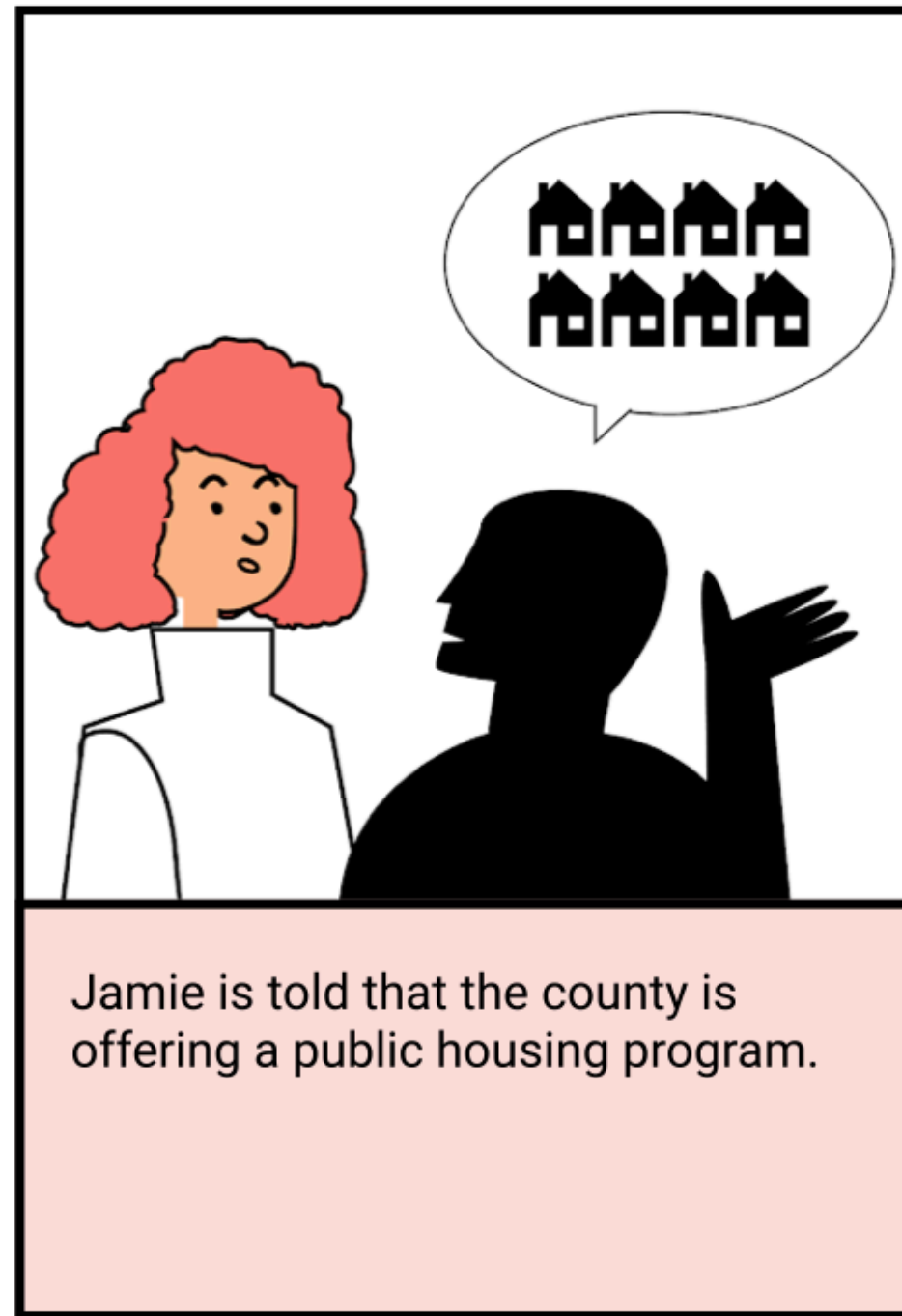
What are the perceived opportunities?

What are the perceived risks?

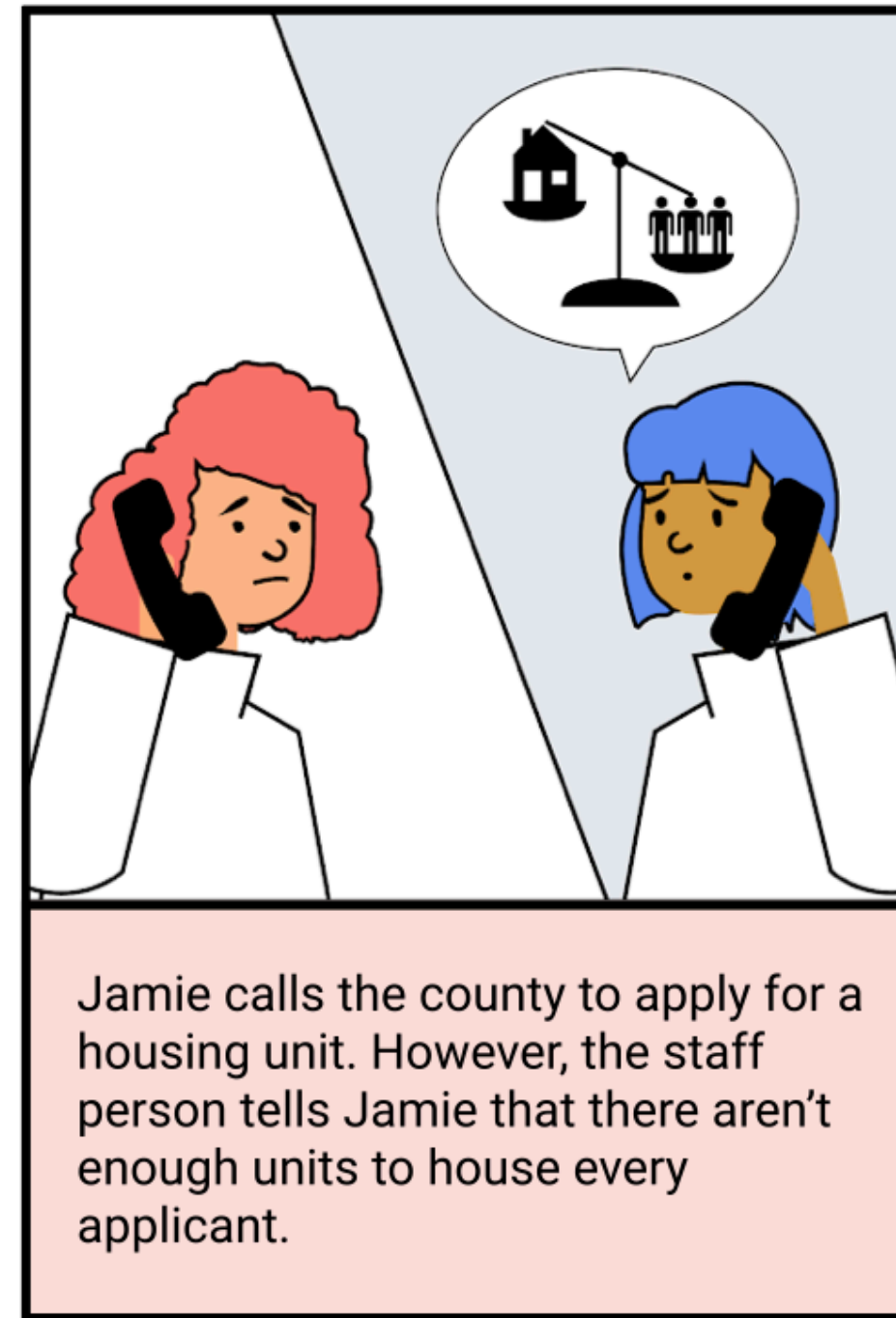
How can we mitigate these risks?



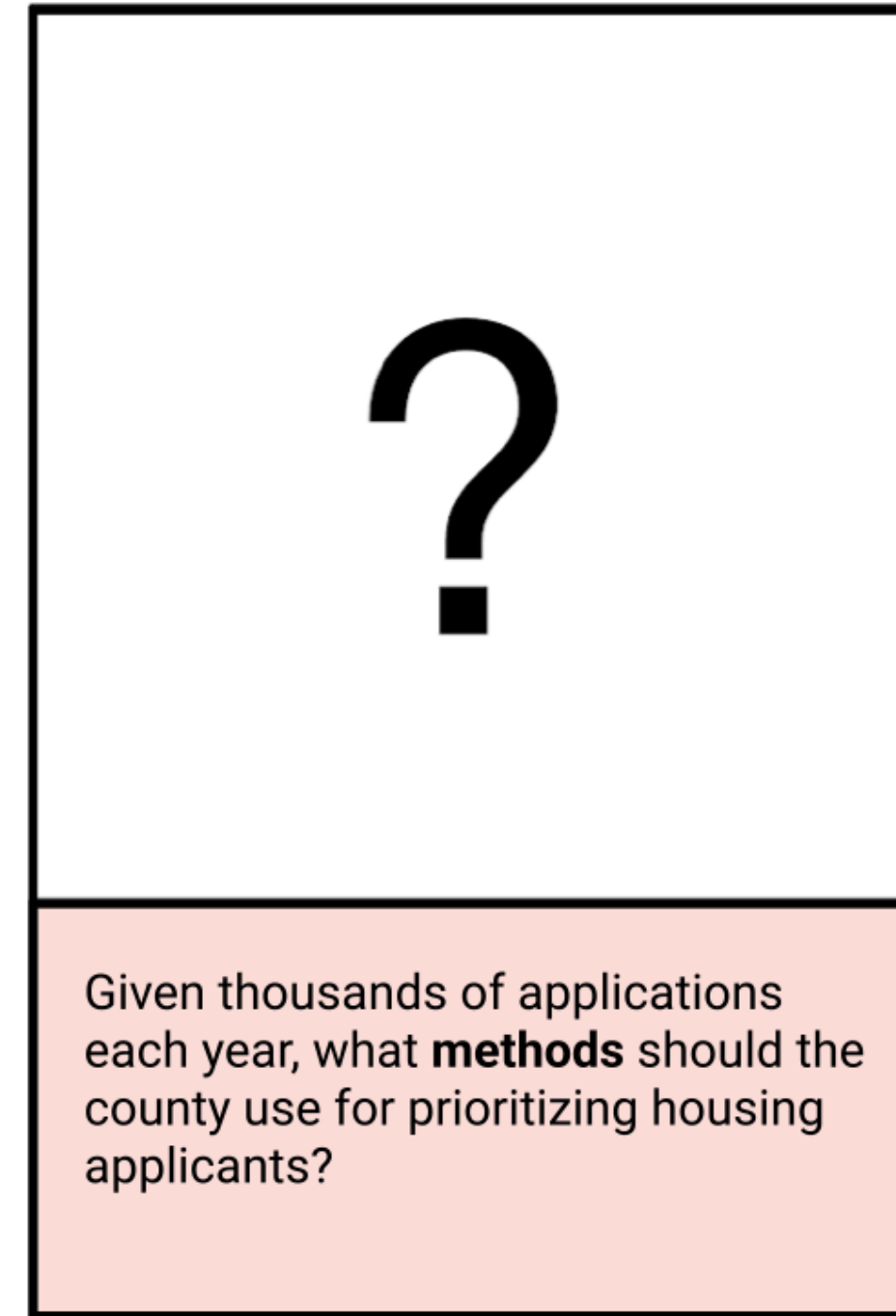
(a)



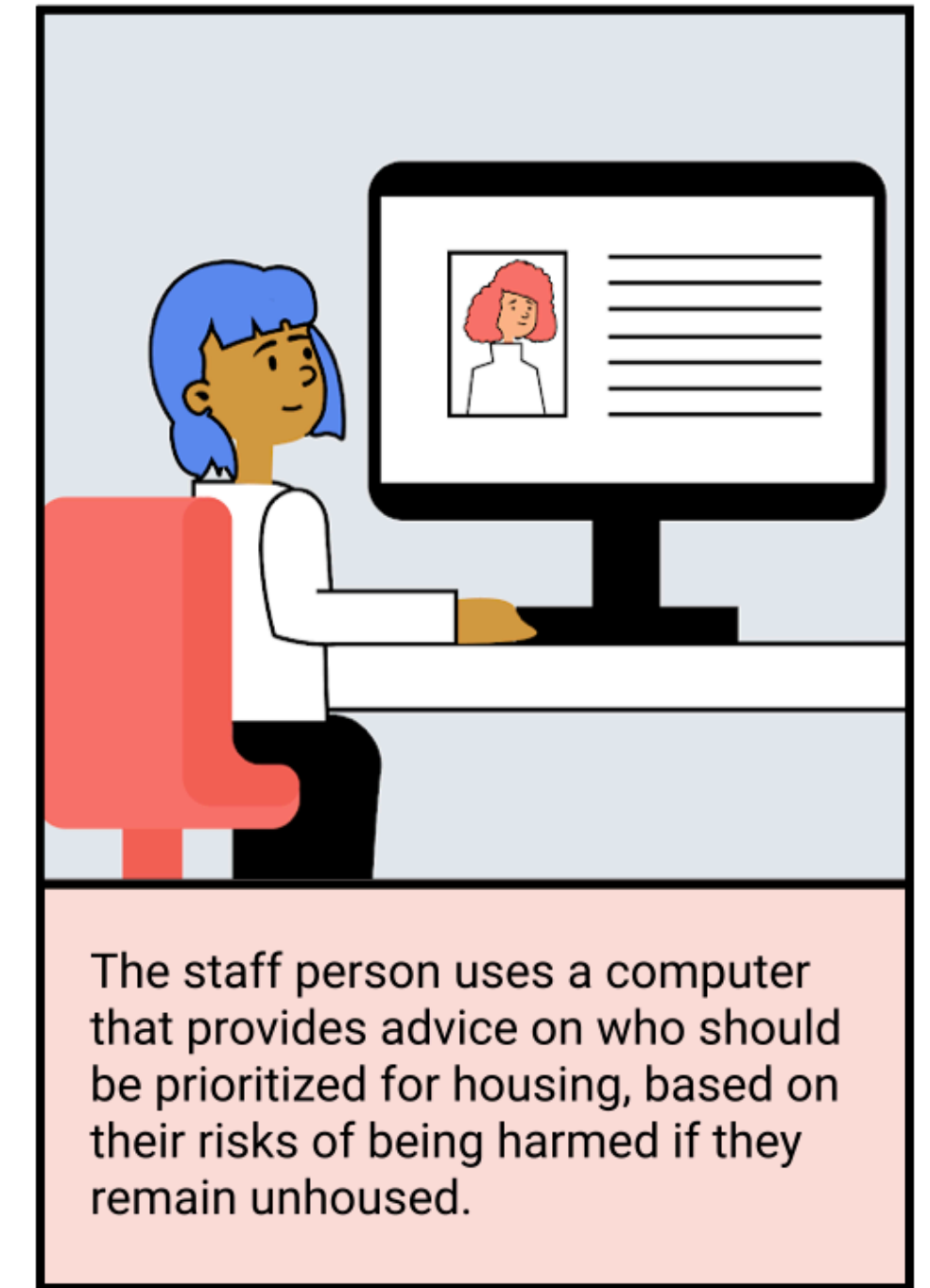
(b)



(c)



(d)



(e)

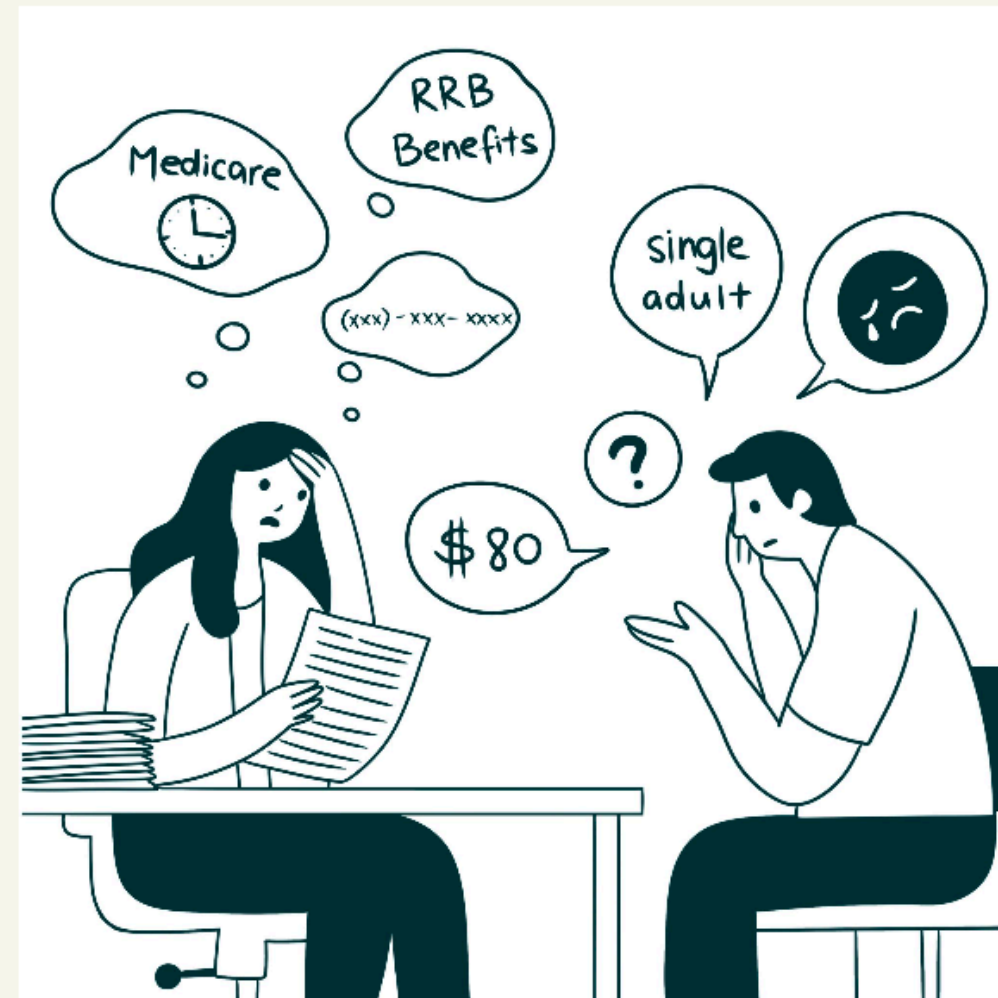
Understanding Perspectives through Comicboarding

We use **comicboards** to get feedback and understand their perspectives on AI



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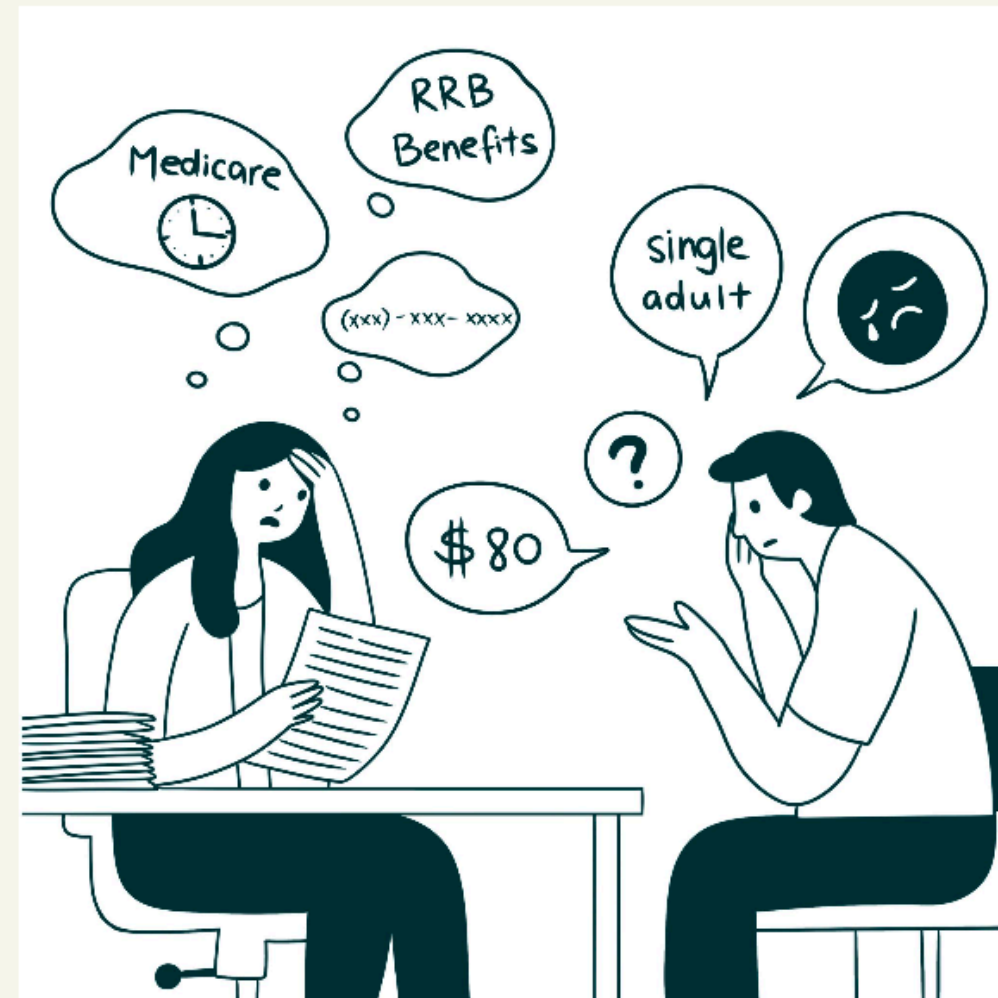
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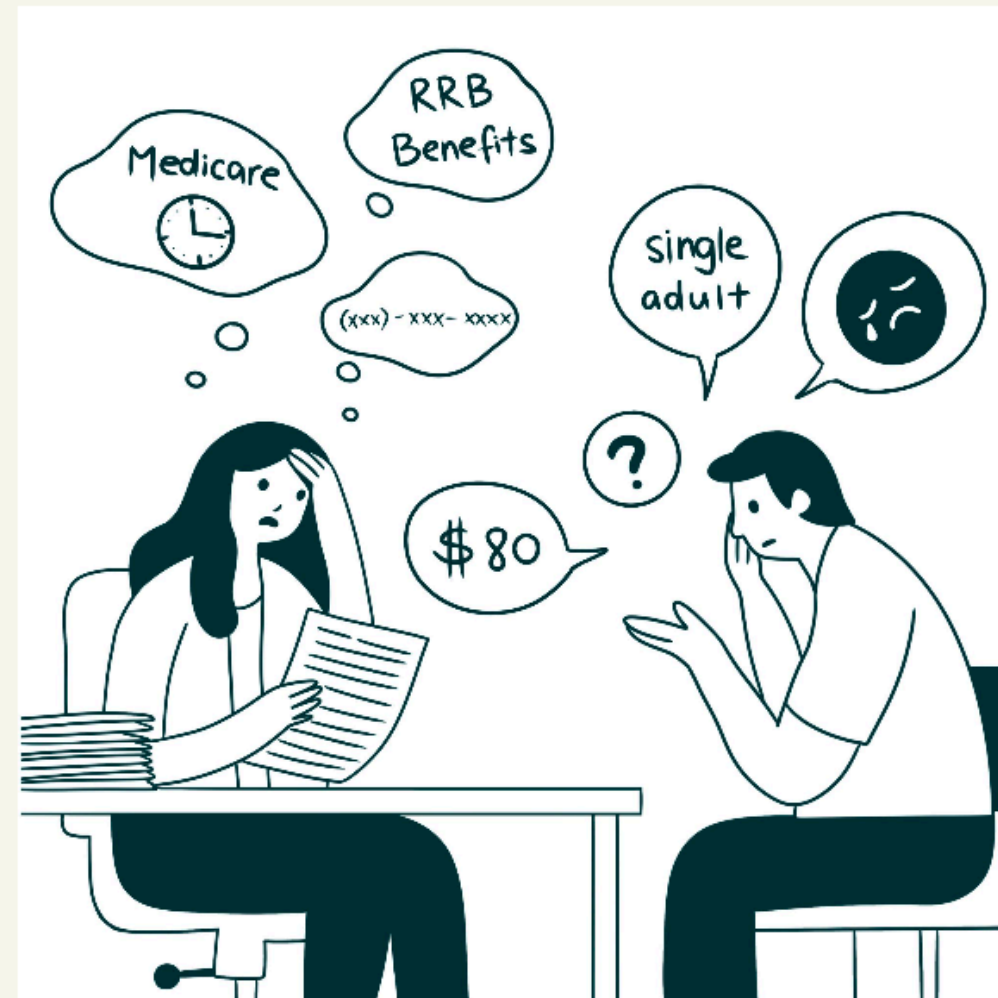
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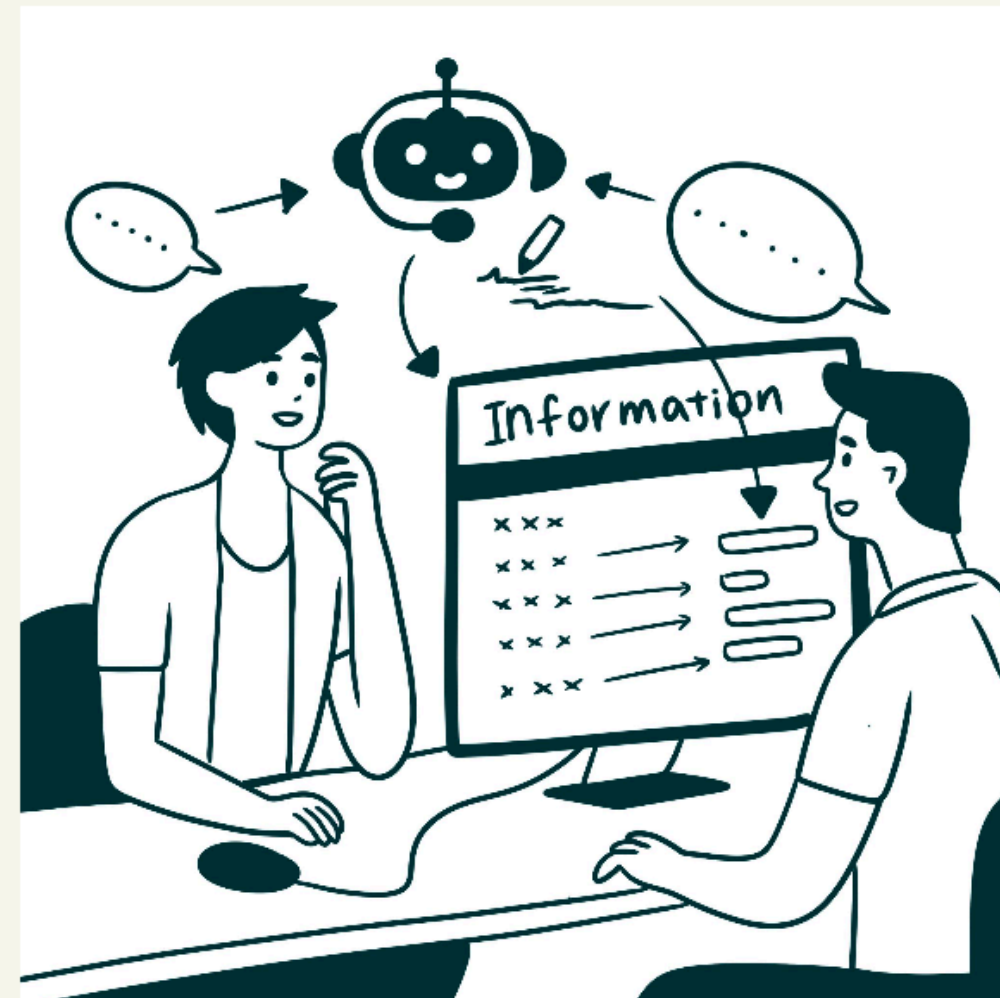
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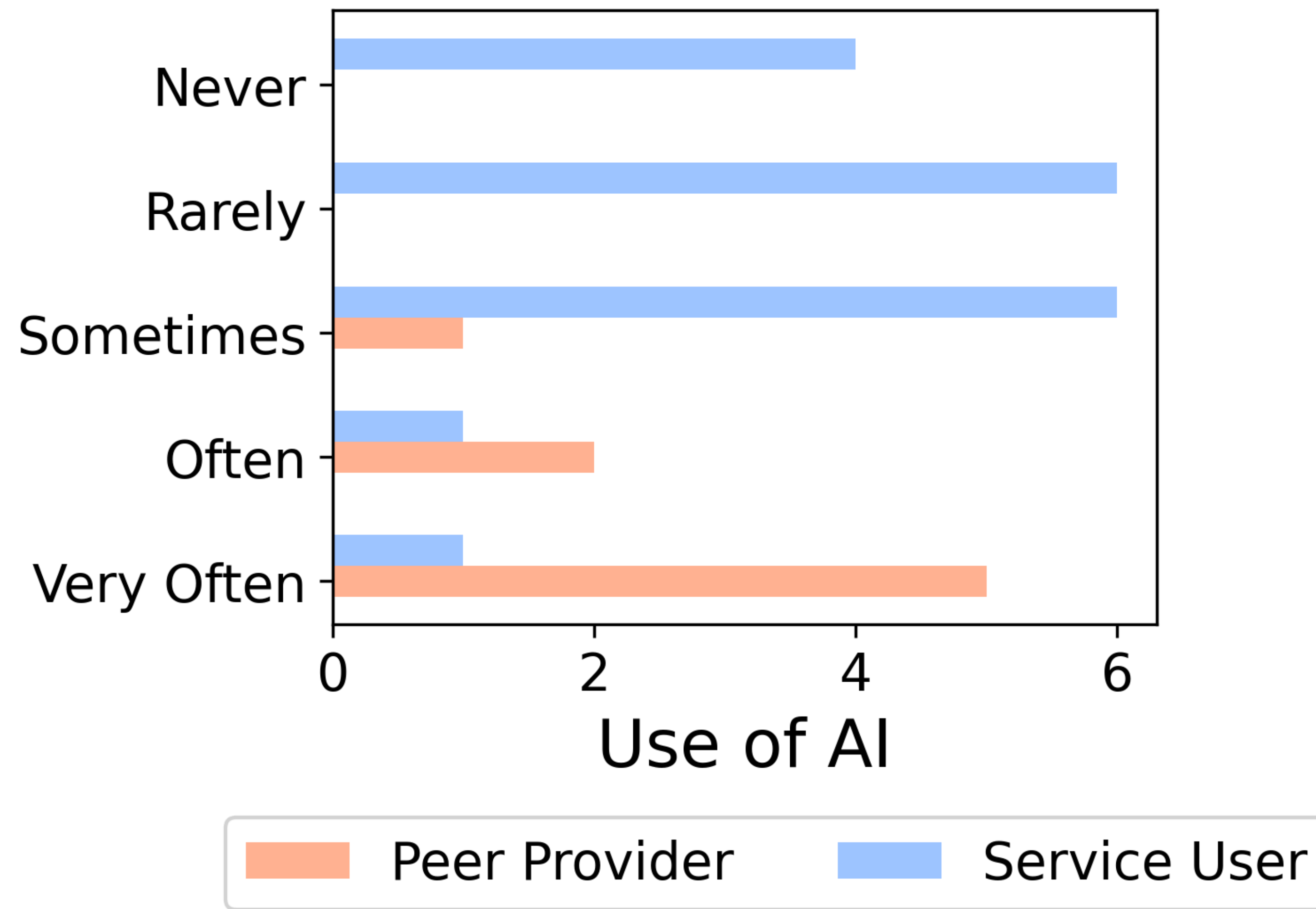


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What opportunities do you see in using the LLM tool in your peer support sessions?

Diverse Population from CSPNJ



Increasing Localized Information

1. Importance of Specific Localized Information

1. *“An LLM would make things centralized... with the eight dimensions of wellness, we need something that can combine them all.” [PS11]*

2. Risk of Overgeneralization

1. *“AI responds in the same manner} and gives a straight yes or no...but in reality, there’s a lot of gray lines.” [SU4]*

3. Importance of Community-Centered Evaluation

1. *“Nothing about us without us... we need to be involved in the testing and training from the beginning” [PS11]*

Importance of Trust

1. LLMs need to inspire trust

1. *“Working with LLM would be the same as teaching a skill... showing them first and modeling it builds that safety and trust so they feel like they can do it on their own.” [PS11]*
2. *“You're building that relationship at that moment...by being involved in it, that reduces some of that fear that someone may encounter with it” [PS14]*

2. Trust is Needed to Provide Specific Information

1. *“Trying to get accurate information out of people is hard...with their legal issues...if they have any felonies or whatnot demographics...how honest are people gonna be...they're not gonna tell me that.” [PS15]*

Maintaining Autonomy

1. LLMs need to complement not supplement

1. *“The harm [is] if it’s being used where you’re no longer using it, and it’s just doing it for you.” [PS2]*
2. *“Remind the peer to ask more personal questions. It would be important to still...use their own knowledge...to make sure it’s individualized and that we are guiding it through” [PS2]*

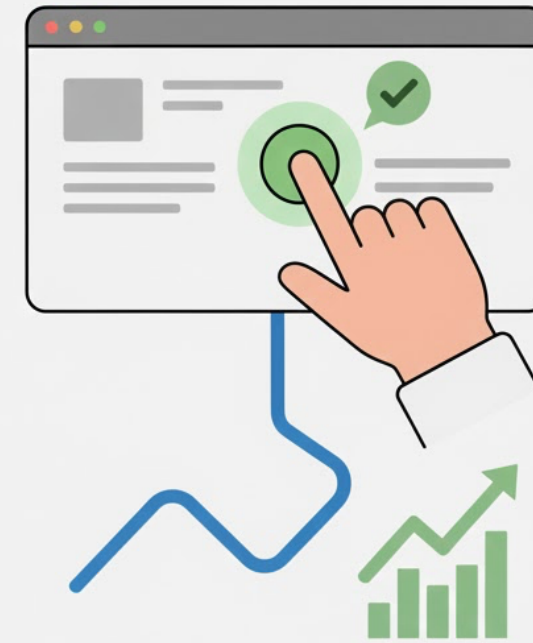
2. Need for Critical Analysis when working with LLMs

1. *“We could avoid that risk...by guiding, and having setups where the peer specialist is learning how to use it through a guiding method rather than just only relying on it.” [PS2]*

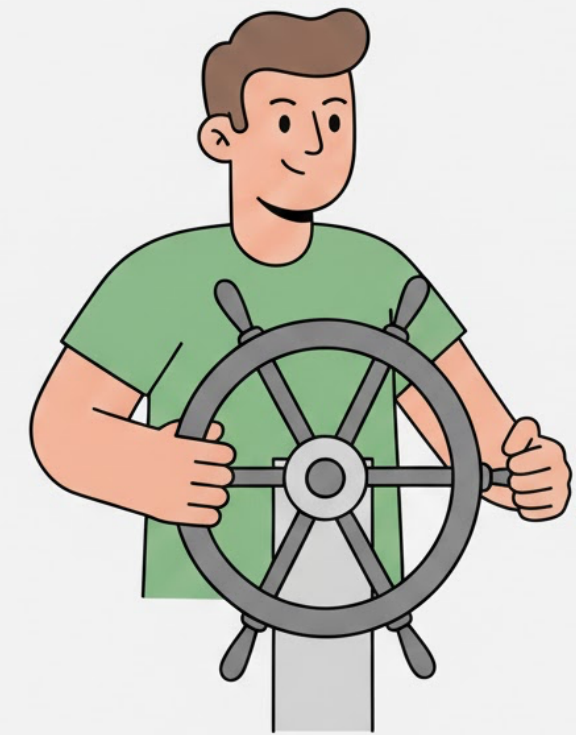
Bigger Themes



Locality

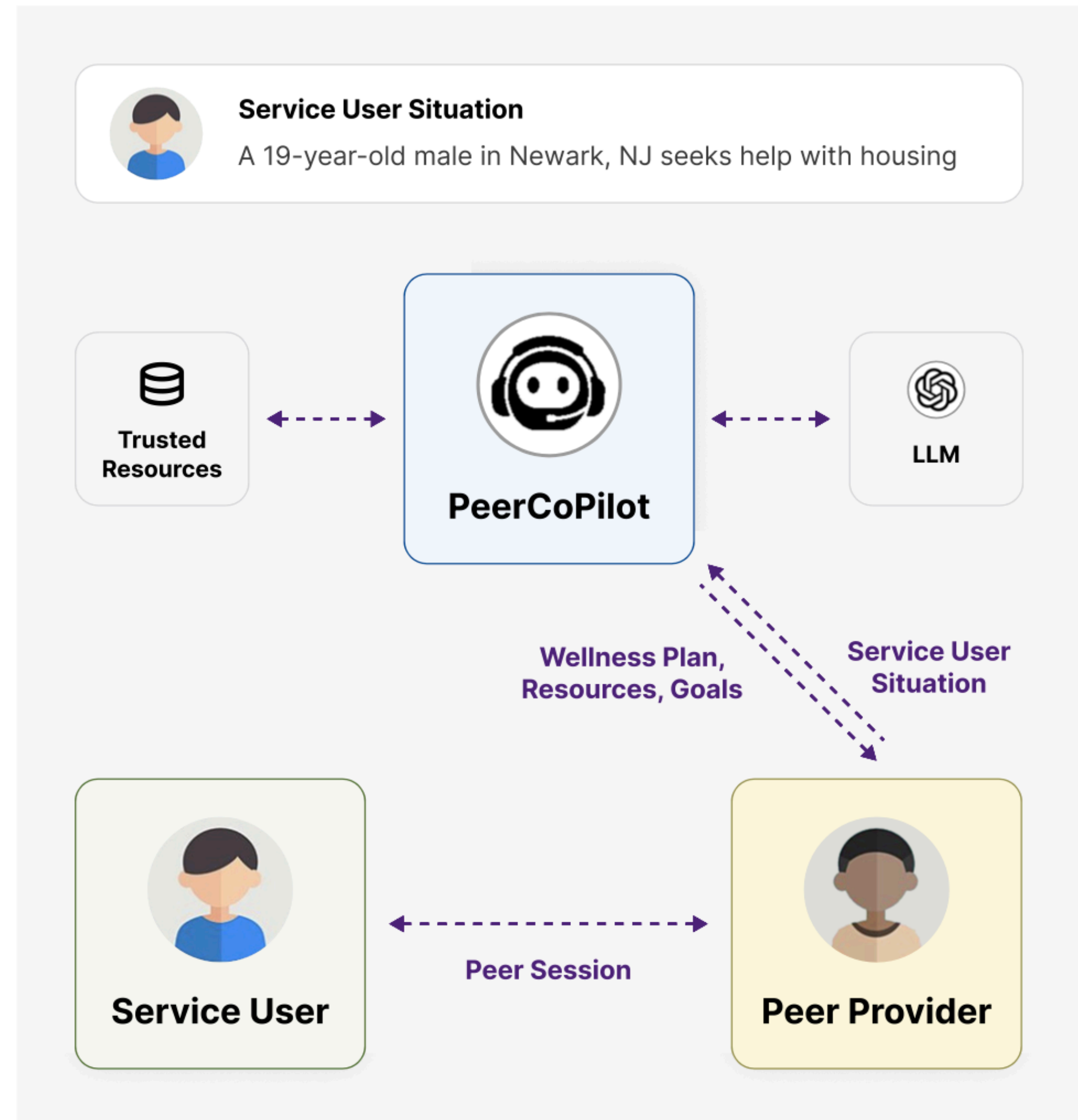


Trust



Autonomy

Introducing PeerCoPilot



1 Service user situation



"A 19-year-old male in Newark, NJ, is living in temporary housing while working a construction job. He is without ID and seeks help with his housing situation and applying for SSI. While undiagnosed, his experiences/challenges are consistent with PTSD and he has a marked trauma history"



2 Extract & incorporate trusted resources

★ Goals

1. Find long-term housing
2. Apply for identification
3. Fill out an application for SSI

📄 Eligibility

Age: 19
Work: Yes
Disability: No



fx Benefit formulas

SSI: Income < 1971
SSA: Age >= 62



📊 Benefit analysis

SSI: Maybe eligible
SSA: Not eligible



📄 Resource needs

Housing
ID



📄 Database

Newark Housing
Authority
National Alliance for
Homelessness



📄 Resource recommendation

Newark Housing
Authority: Can help
him find shelter

❓ Questions

1. How long does your temporary housing last for?
2. Have you applied for SSI previously?
3. Do you have any non-work income?

3 Wellness plan

★ Goals

Find long-term housing and apply for identification, as it's needed to apply for SSI

📊 Benefit analysis

You might be eligible for SSI, but it depends on how much income you make, both in work and non-work.

📄 Resources

The Newark Housing Authority provides information on housing, including tips on applying for Section 8 housing...

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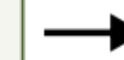
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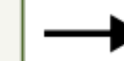
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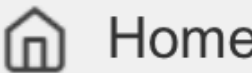
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Wellness Goals

What is the service user’s needs and goals for today’s meeting?

hello

Hello! How can I assist you today?

can you provide some resources for food

To assist with food resources, understanding the user's specific situation would be beneficial. Here are a few questions that can help determine the most suitable

Describe the service user’s situation...

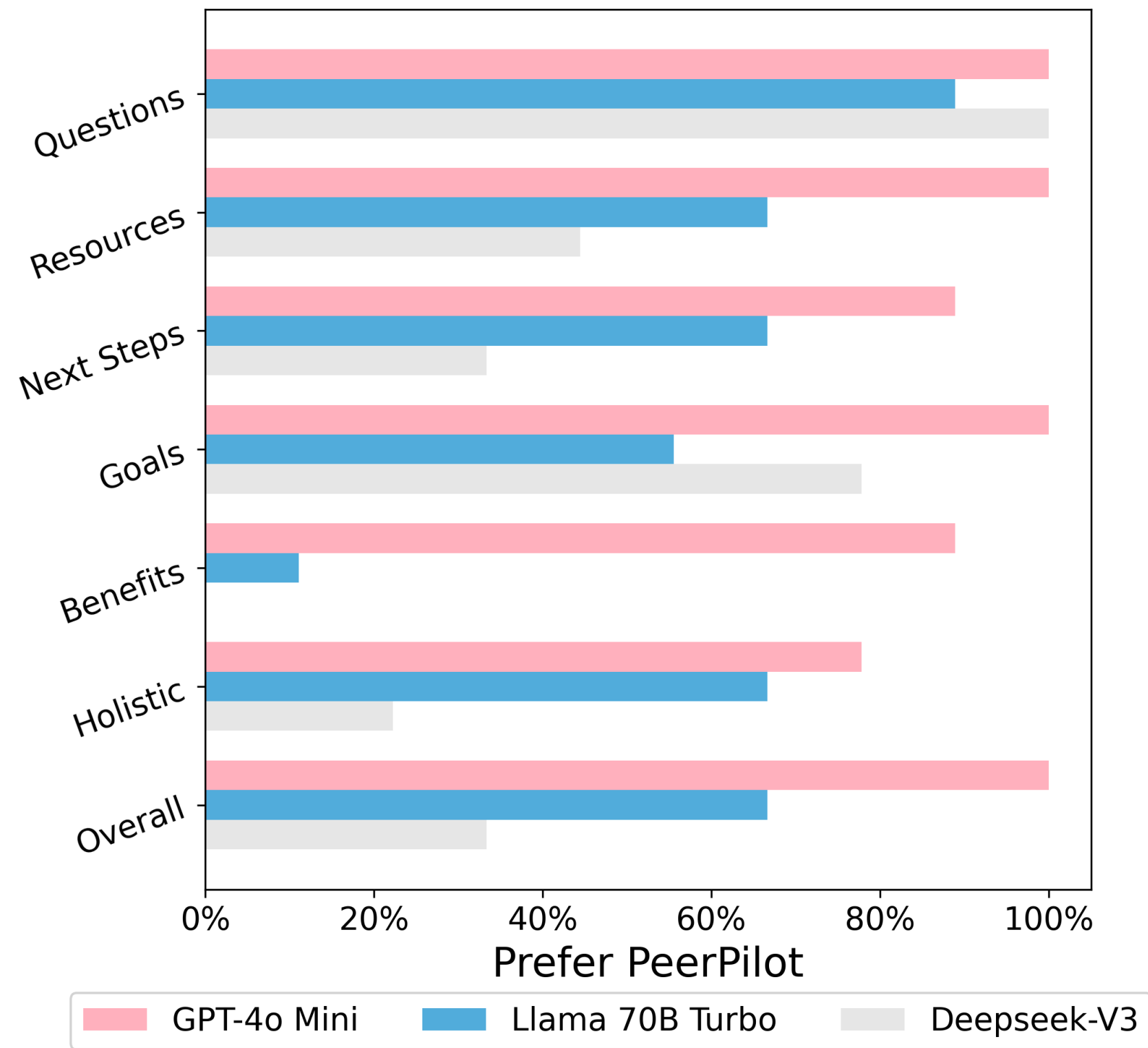


Reset
Session

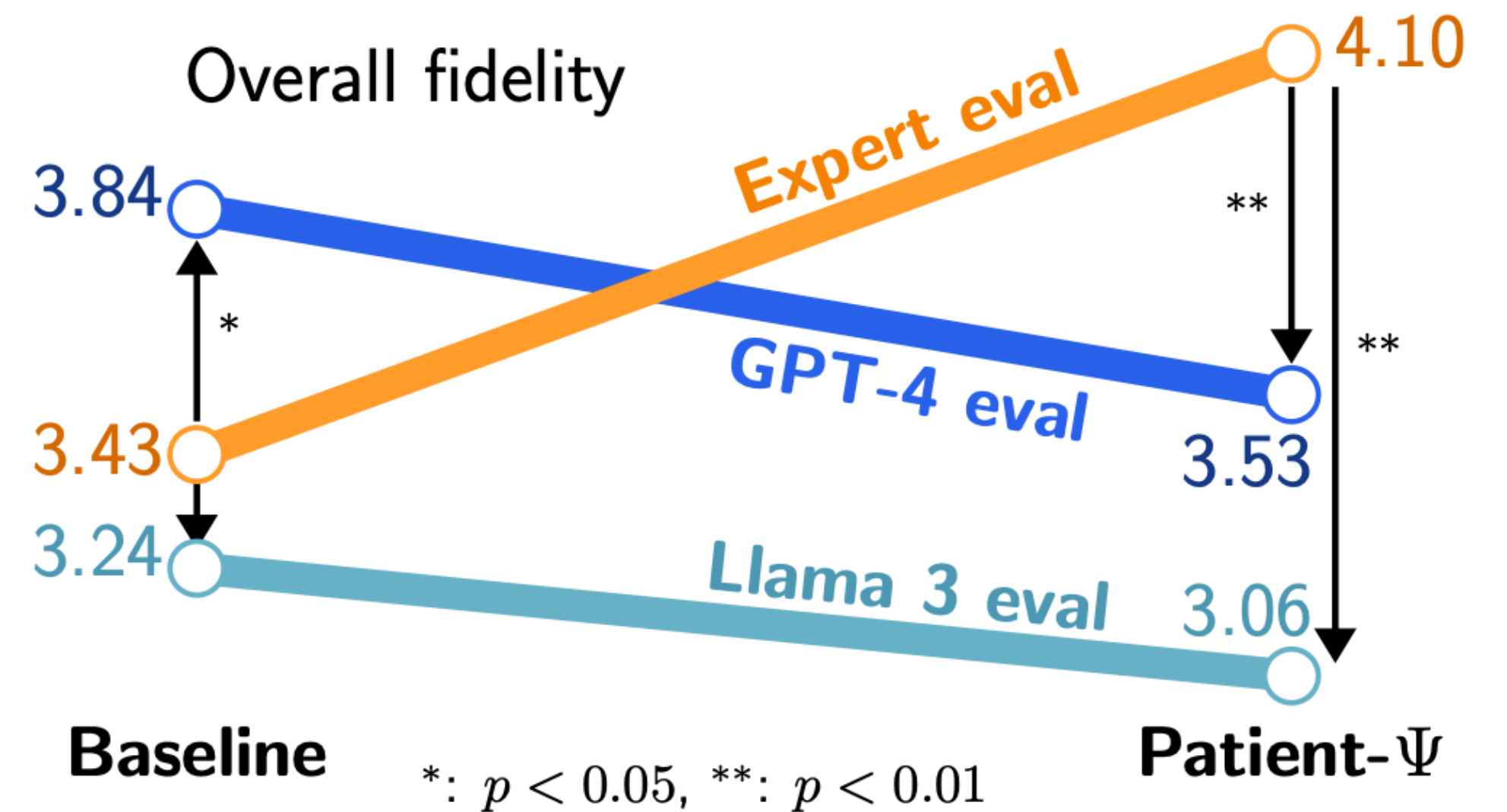
Save
Session
History

Tutorial

Evaluation Challenges



Inconsistency

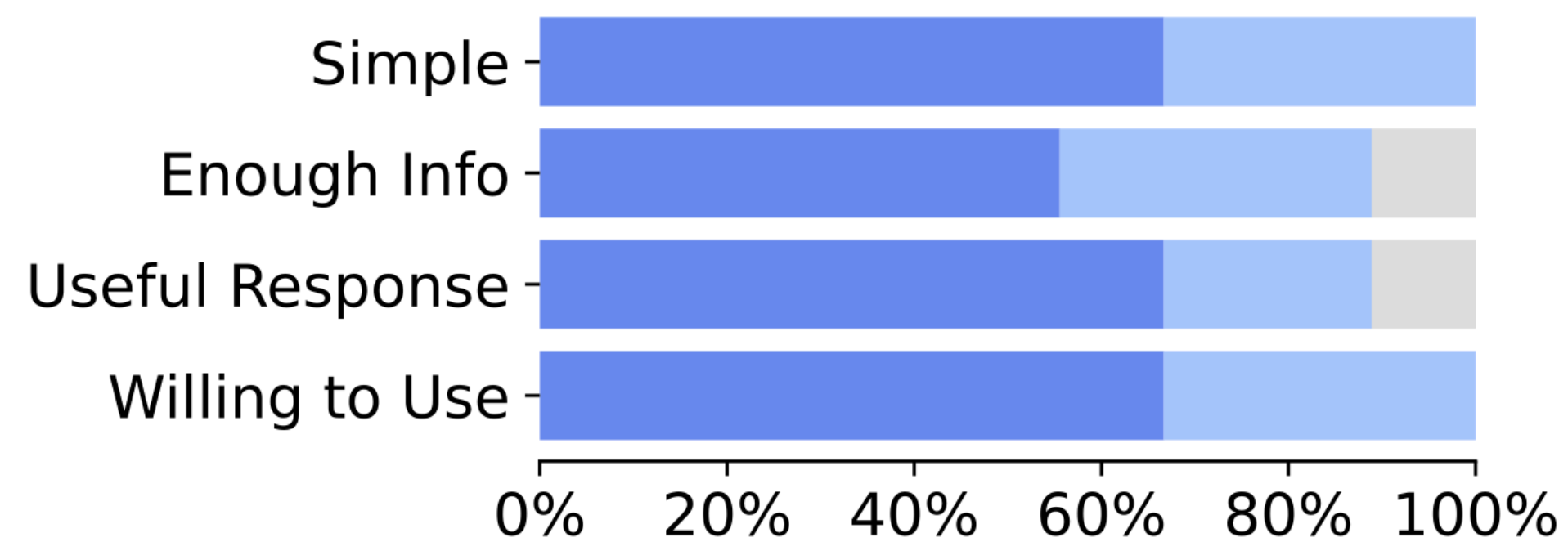


Miscalibration

Running a User Study

We have 9 peer providers and 6 service users interact with our tool in an onsite study

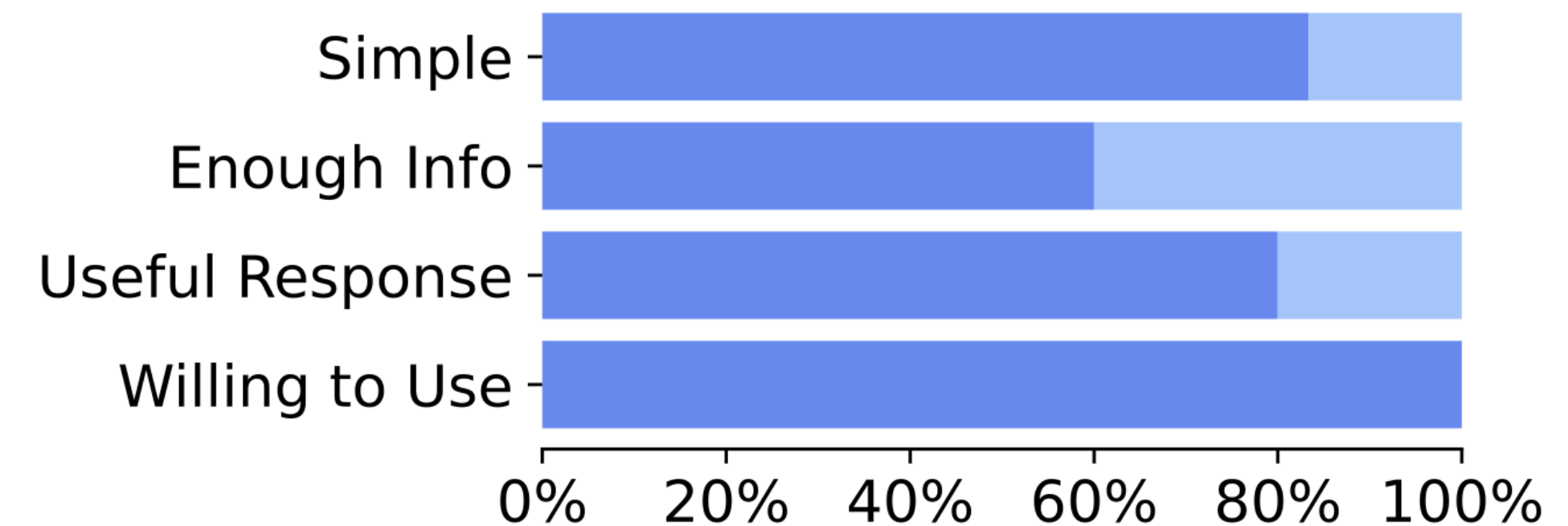
Understanding PeerCoPilot's Performance



Peer providers find our tool simple to use and are willing to use our tool in practice

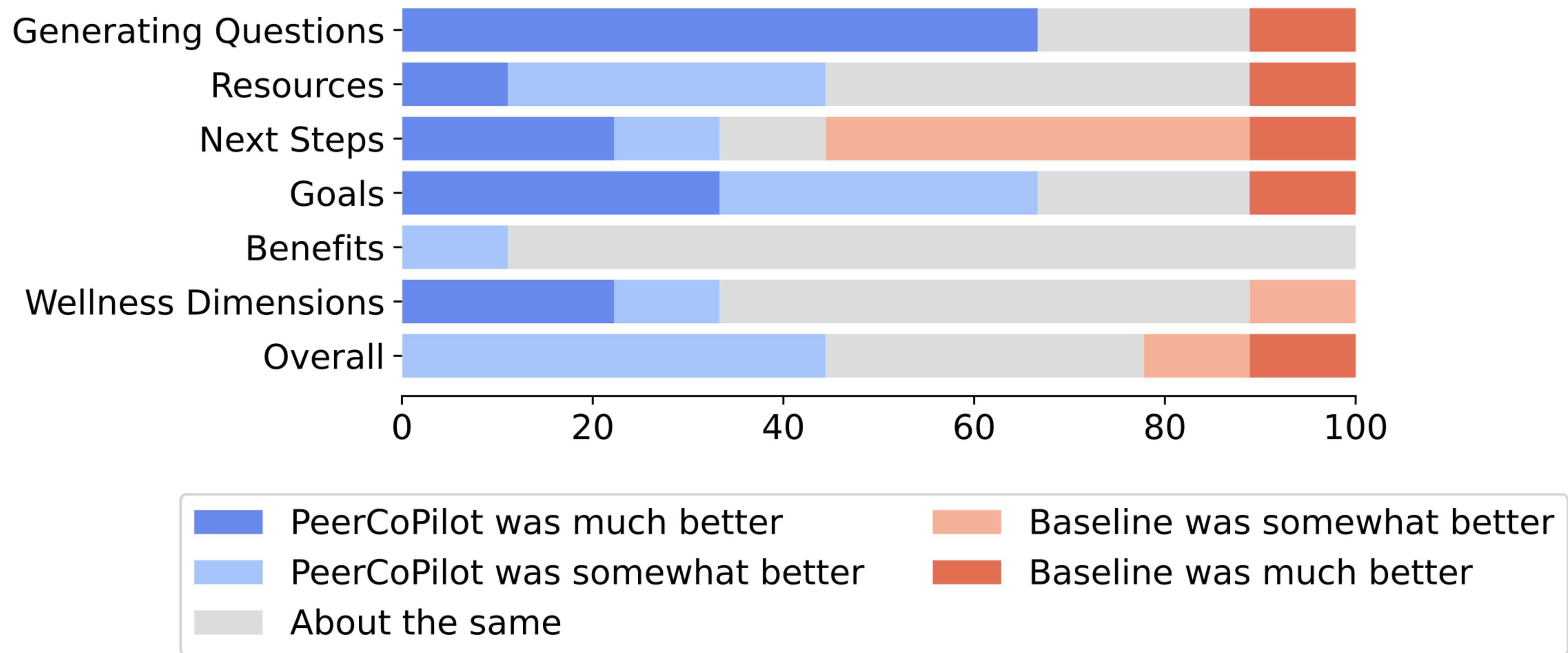


Similarly, **service users** also find our tool simple and that our tool generates useful responses



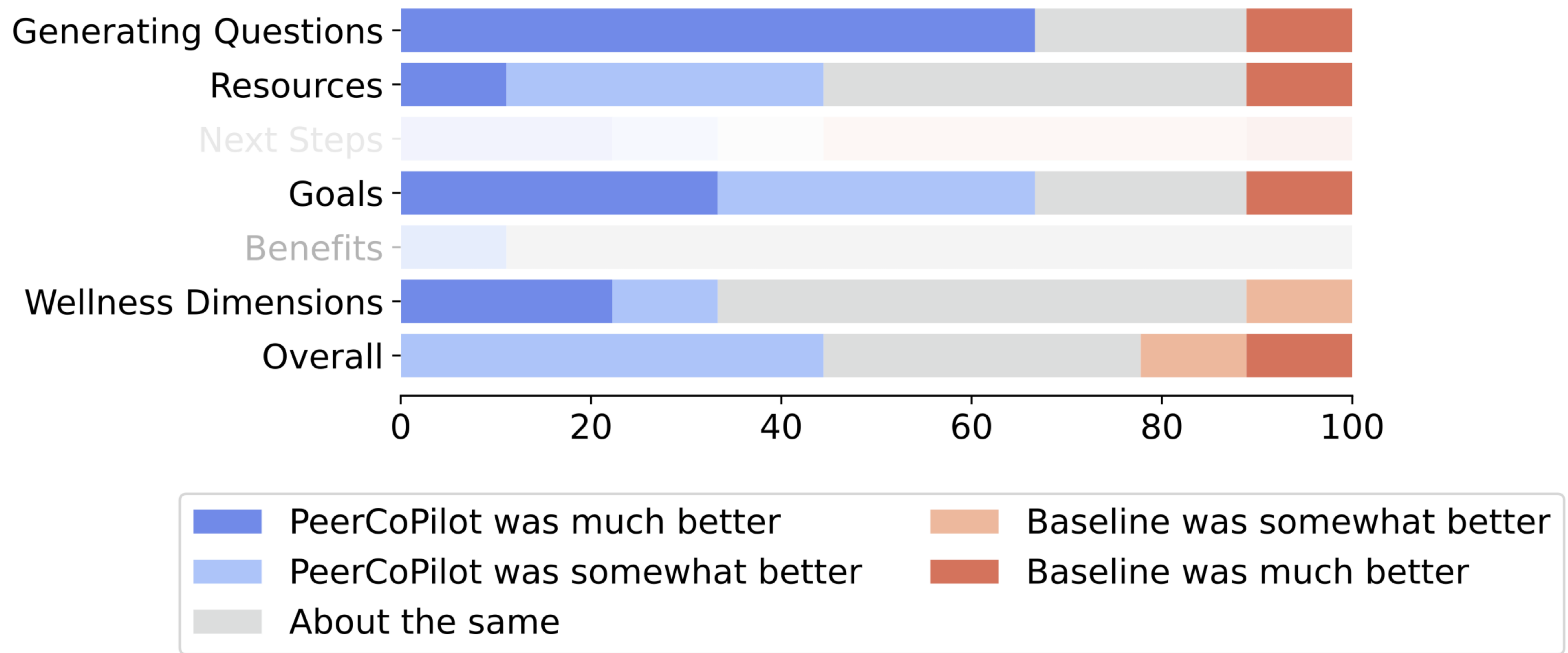
Comparison with Baseline

We also have peer providers compare our tool with a baseline LLM



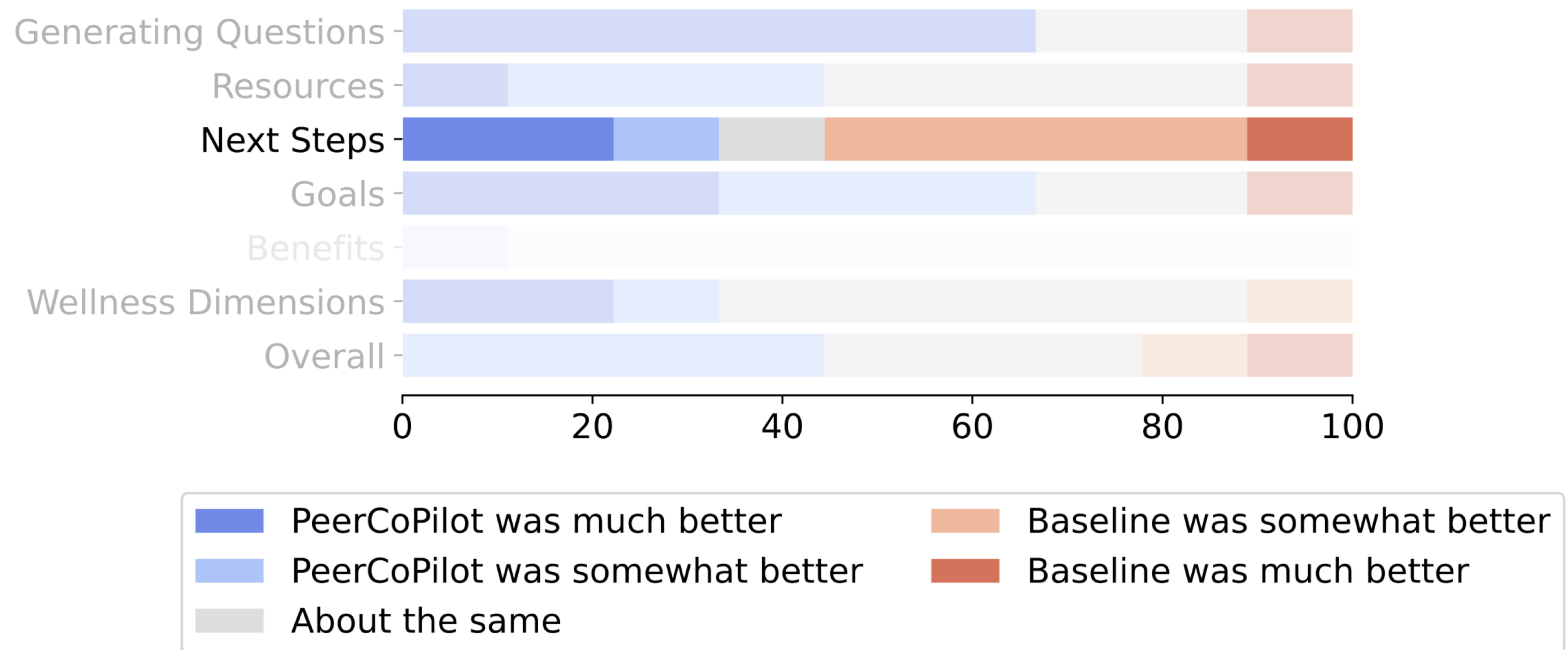
PeerCoPilot Performs Better than the Baseline

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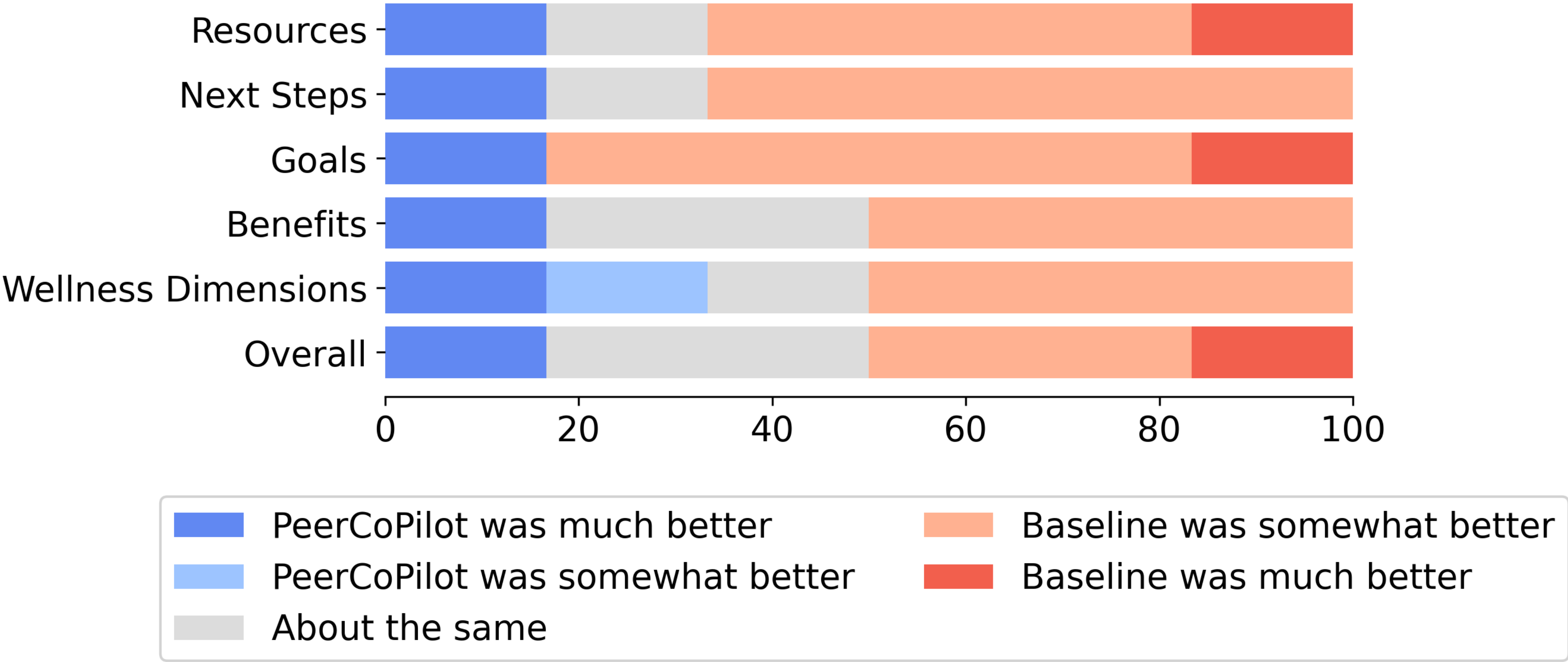
But There's Still Room for Improvement

We also have peer providers compare our tool with a baseline LLM



More Inconsistent Results with Service Users

We also ran into challenges with accessibility with service users



Three Key Themes

PeerCoPilot Usability

Peer providers are willing to use PeerCoPilot

"I found that PeerCoPilot's follow up questions and prompts would be crucial for a service provider to continue to assist someone in creating their wellness plan."

 Peer Provider 9

"I love that it gave this website and I can put in follow up questions."

 Peer Provider 4

"How can we develop a realistic wellness plan. I love that...How it's breaking it down by dimension."

 Peer Provider 4

Information Reliability

PeerCoPilot delivers more reliable and specific information

"Really interesting how specific PeerCoPilot is...insane that it gave the birth certificate requirements"

 Peer Provider 1

"PeerCoPilot gives me a little more information and it gives me a hyperlink to a website."

 Peer Provider 3

"[For the baseline] I noticed that some of the links weren't usable or did not go to the specific webpage."

 Peer Provider 9

Comparison with Baseline

PeerCoPilot provides better goals, resources, and questions

"After that, moving forward, it's all PeerCoPilot. PeerCoPilot is the tool that has the resources."

 Peer Provider 4

"Having the framework of the smart goal can make PeerCoPilot much better."

 Peer Provider 1

"Those generated questions are so important to continue moving those steps forward while providing that think tank process or opportunity of Am I prepared? What else do I need to do?"

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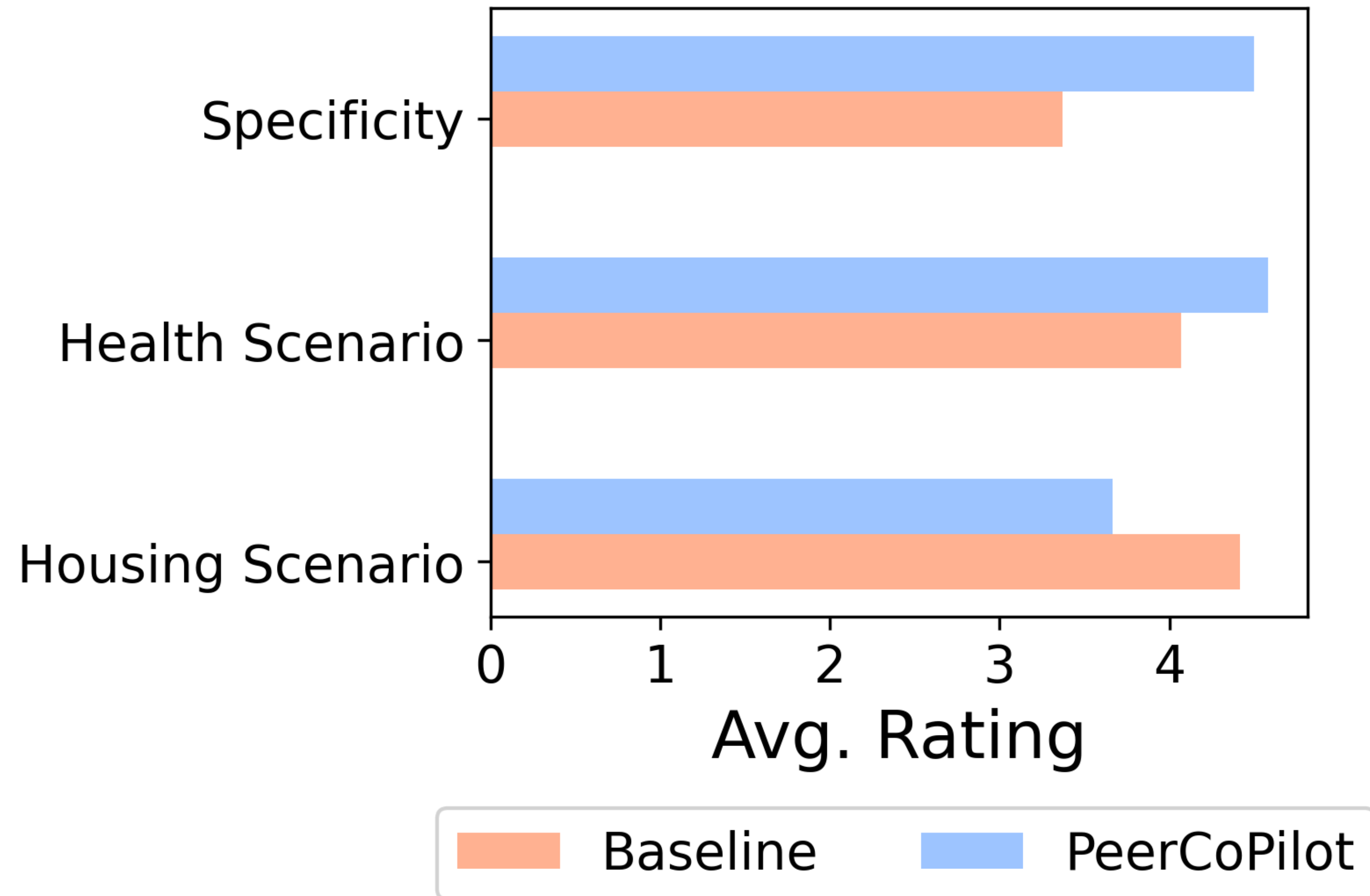
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Resource Recommendation



Human-AI Teaming

Immediate Needs: Supporting person find stable housing and resources that he would be able to utilize for immigration support. If desired, support around mental health, ideally something like peer support if he doesn't want medication, etc.

Goals: Visit potential centers/resources together, perhaps outreach to 1 a week. Look into more stable housing, again, utilizing personal and local networks. If possible, find free supports around budgeting, perhaps at the library or local universities he could access with limited barriers (Googling, struggling to find one that would be applicable without an ID).

Immediate Needs:

1. Housing Stabilization: Securing a permanent housing arrangement is vital for his stability and peace of mind. Temporary housing can increase stress, especially if he is already facing trauma-related challenges.
2. Legal Resources for Immigration Support: Access to legal aid is important for navigating his immigration status. Understanding his rights and options can help him feel more secure in his situation.
3. Mental Health Support: Given his history consistent with PTSD, connecting with mental health resources is crucial. Access to support groups or community programs can provide him with coping mechanisms and a sense of community.
4. Financial Wellness: Improving his financial situation is essential for overall stability. This can include budgeting assistance or exploring options for financial help.

Goals:

1. Mindfulness:
 - o Goal: Practice mindfulness or meditation for 10 minutes each day for the next month.
 - Specific: Define a specific time of day to do this.
 - Measurable: Use a journal to track daily progress.
 - Achievable: Start with guided sessions through apps like

Without AI

With AI

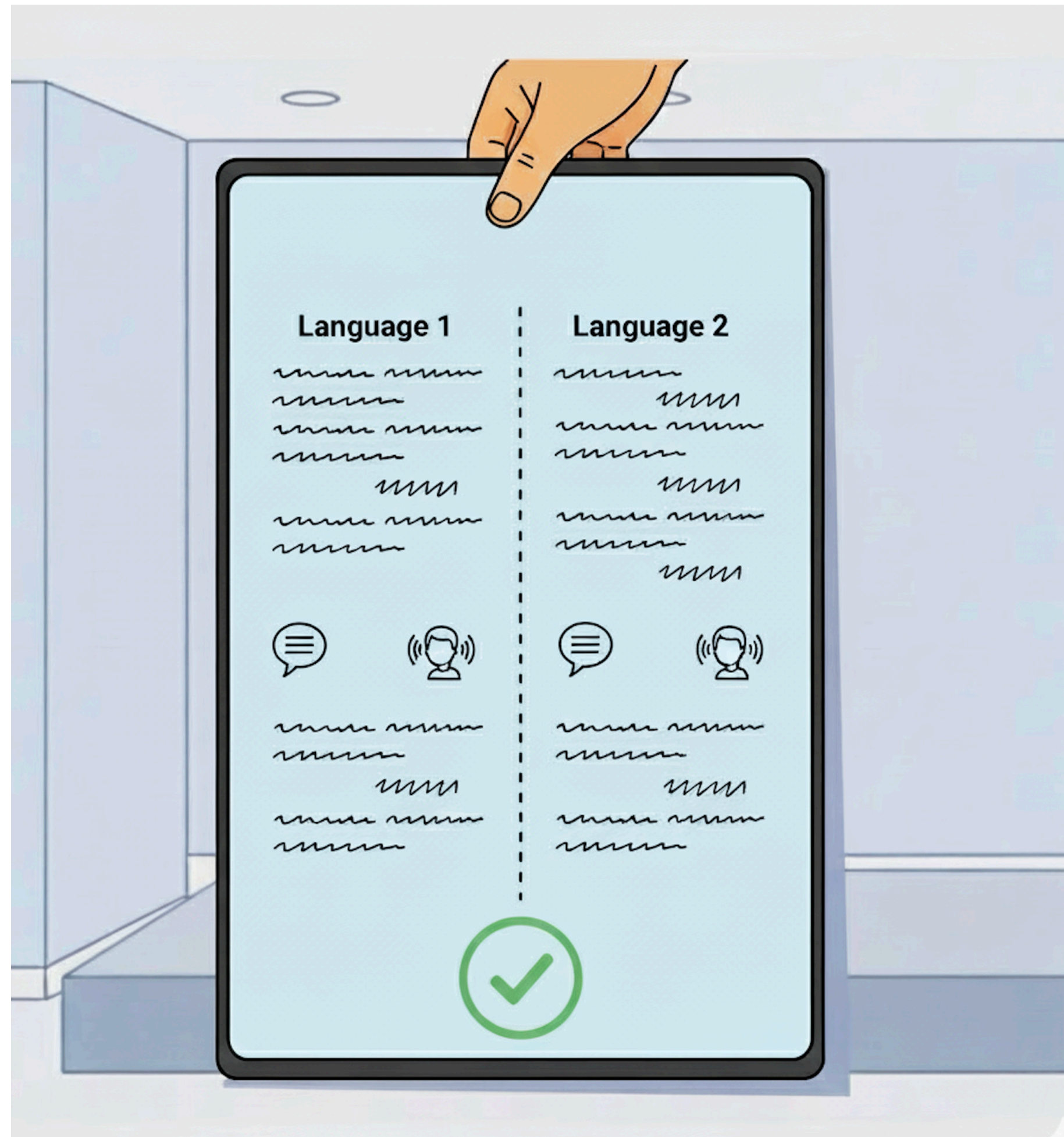
Deploying our Tool

Our tool is now **deployed at CSPNJ** to a handful of peer providers!

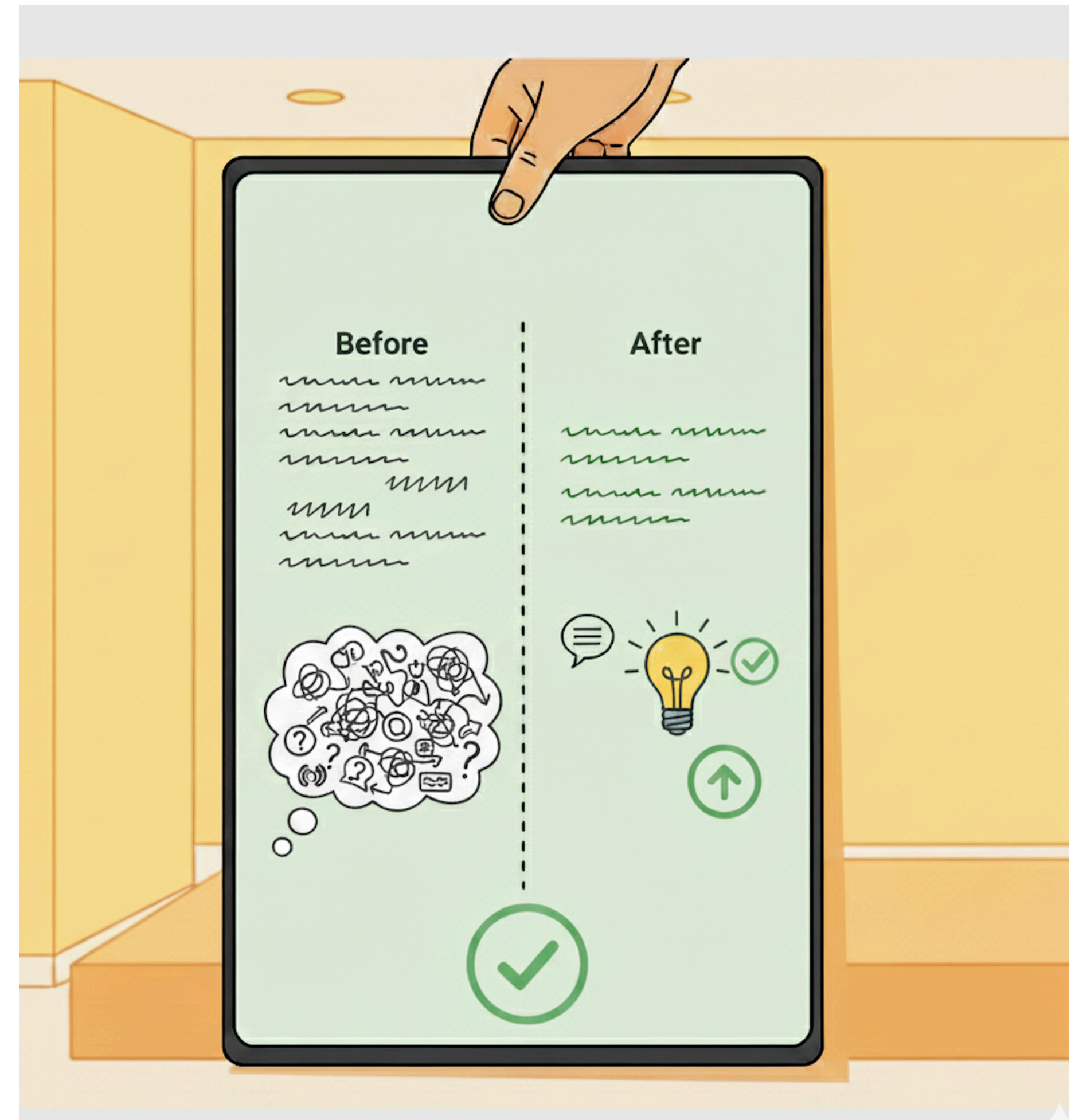
We're currently working on expanding deployment, improving user-friendliness, and iteratively refining based on feedback



Improvements to PeerCoPilot



Accessibility



Concision

Wellness Check-In

October 2025

🔍 Search

9 March, Sunday

- Follow-up Wellness Check-in w/ Cody Fisher
- Follow-up Wellness Check-in w/ Darlene Robison
- Follow-up Wellness Check-in w/ Andy Parker
- Follow-up Wellness Check-in w/ Mandy Lai
- Follow-up Wellness Check-in w/ Howard Chile
- Follow-up Wellness Check-in w/ Mary Lee
- Follow-up Wellness Check-in w/ Julia Juke
- Follow-up Wellness Check-in w/ Kyle Wood

30 March, Sunday

- Follow-up Wellness Check-in w/ Naveen Ramon

Improving Evaluation

How can we more thoroughly evaluate PeerCoPilot?

How can we more easily evaluate LLMs in a
community-centric manner?

We're still actively working with CSPNJ to improve PeerCoPilot and its evaluation in practice

Amazing Collaborators + Team



Gao Mo



Megan Chai



Cindy Peng



Shannon Pagdon



Nev Jones



Hong Shen

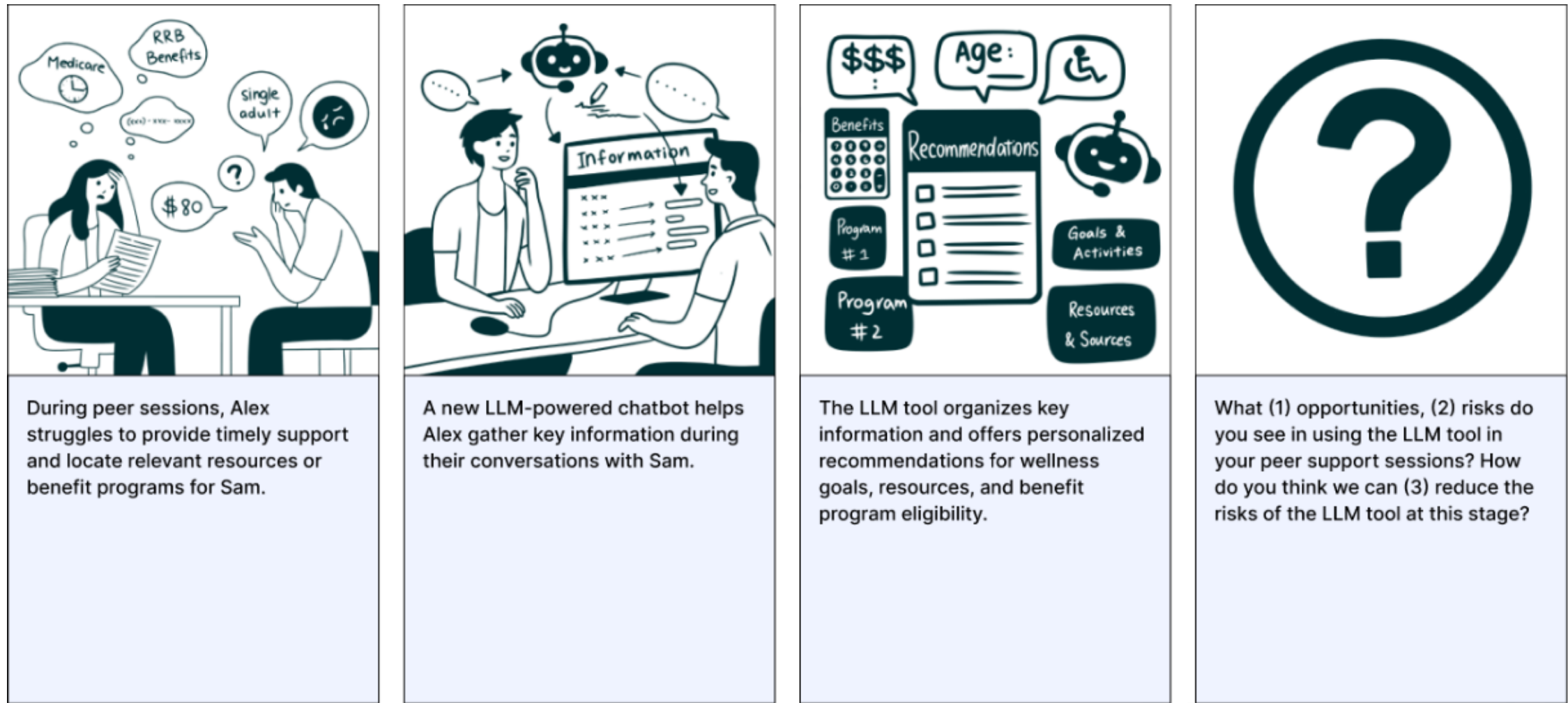


Peggy Swarbrick

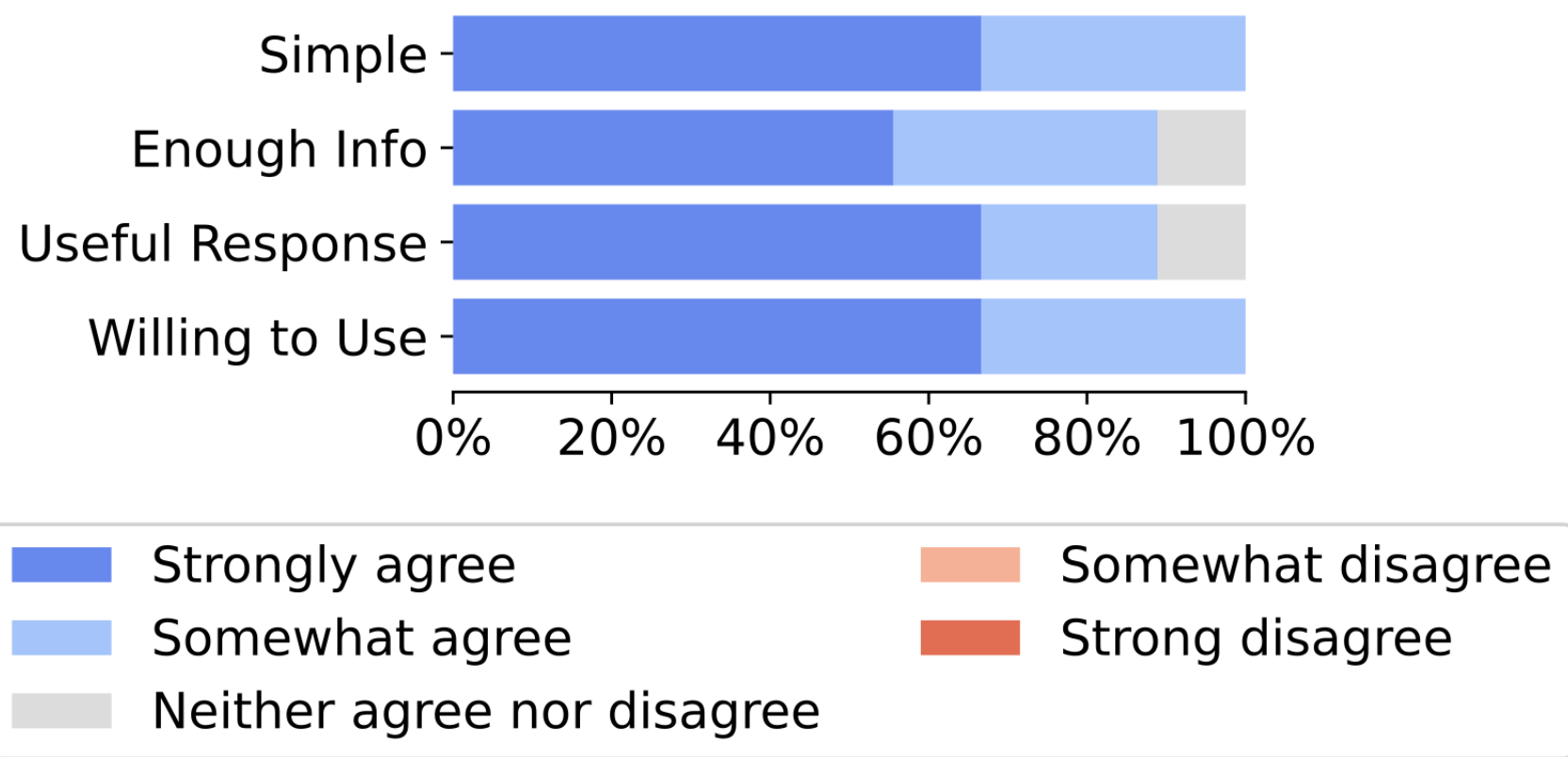


Fei Fang

Designing LLMs with Behavioral Health Orgs



User Study of AI in Behavioral Health



Development and Evaluation of AI-based Tool