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Supporting Immunization Systems Through Chatbot- Powered Social Listening

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Vaccine hesitancy



Vaccine hesitancy – the reluctance or refusal to vaccinate despite the availability of vaccines – threatens to reverse progress made in tackling vaccine-preventable diseases. [Vaccination](#) is one of the most cost-effective ways of avoiding disease – it currently prevents 2-3 million deaths a year, and a further 1.5 million could be avoided if global coverage of vaccinations improved.

Measles, for example, has seen a 30% increase in cases globally. The reasons for this rise are complex, and not all of these cases are due to vaccine hesitancy. However, some countries that were close to eliminating the disease have seen a resurgence.



VIRA is a chatbot from Johns Hopkins that answers COVID-19 vaccine questions.

CHAT NOW!

Get access to evidence-based answers pre-vetted by Johns Hopkins vaccine scientists.



You're chatting with VIRA!

[Menu](#)

Hey, I'm VIRA, an informational chatbot. 🙋

Ask me your questions about COVID-19 vaccines! See [terms of use](#).

Thanks for joining! Please note that VIRA chatbot is designed for people in the U.S. Before we get started, please select what brought you here today.

[I came to find information about COVID-19 vaccines.](#)

[I'm looking for resources to share with others.](#)

[I'm concerned about the vaccine.](#)

[I'm curious about this chatbot.](#)

[None of the above.](#)

Type here

Send

?



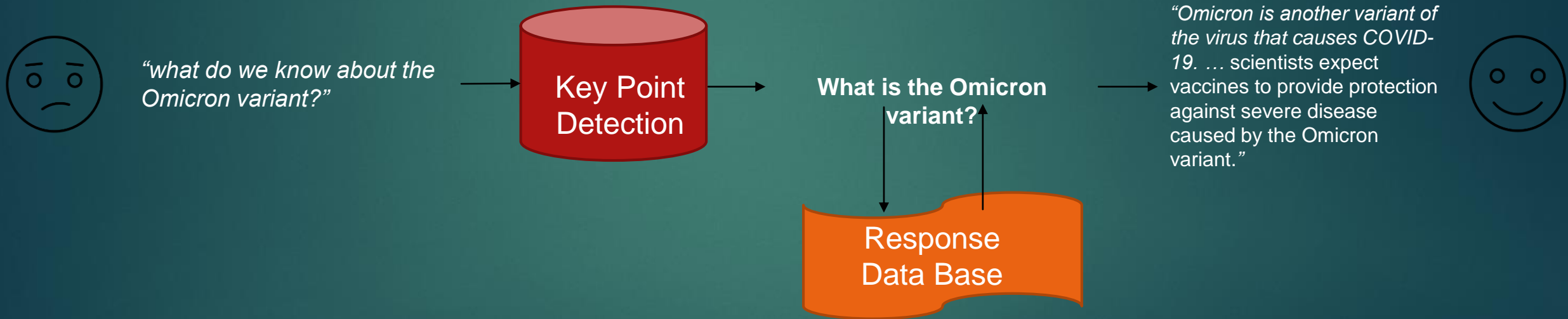
JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

International
Vaccine Access Center

POWERED
BY IBM

Detecting Concerns and Intents

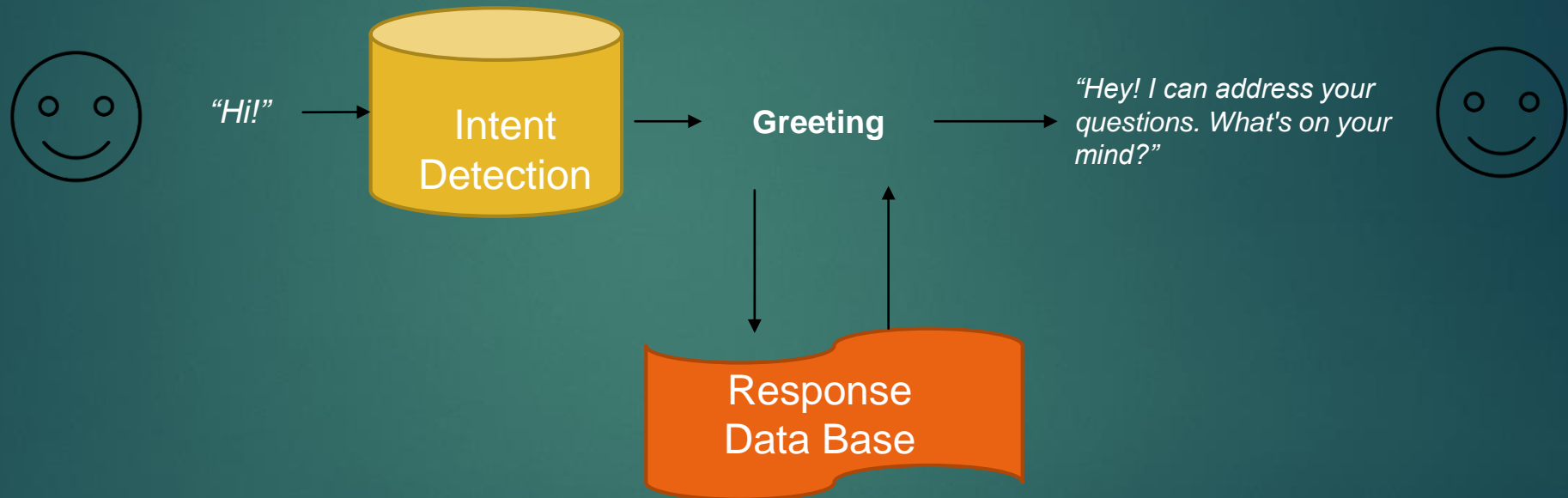
- ▶ **Deep learning model** maps user text to one of 182 common questions (**key points**)
- ▶ Model trained by showing it **various ways** in which people express each **key point**
- ▶ Each of the 182 key points is mapped to **pre-written responses** curated and vetted by JHU



Noam Slonim,
Distinguished engineer and lead scientist
IBM Research

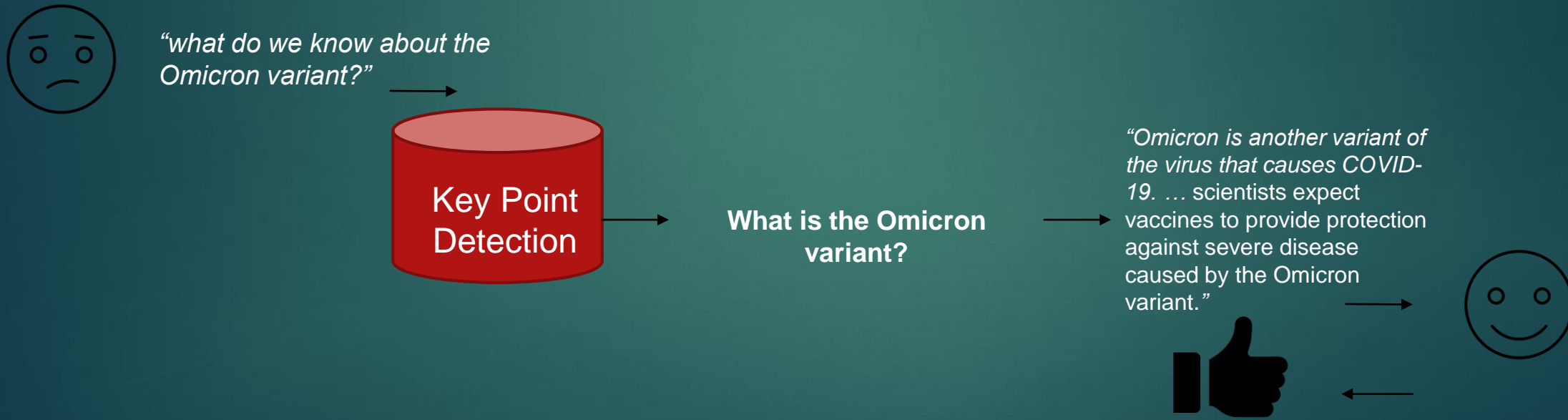
Detecting Concerns and Intents

- ▶ An additional model maps user text to **chit-chat intents**



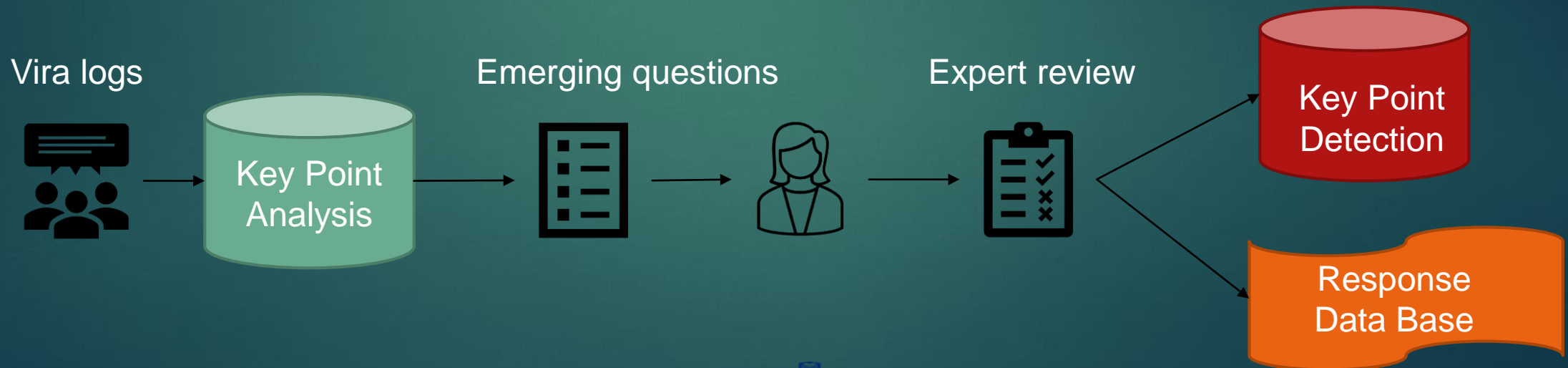
Feedback Mechanism

- ▶ Users provide **feedback for responses**
- ▶ Helps **steer the conversation** back on track
- ▶ Helps us **understand where to improve** the system



Expanding to New Questions

- ▶ As information circling Covid-19 vaccines is developing rapidly, so are the potential questions
 - ▶ Approvals for children?
 - ▶ Roll out of booster shots?
 - ▶ Efficacy on new Covid-19 variants?
- ▶ We utilize **Key Point Analysis** (Bar-Haim et. al, ACL, 2020) to surface emerging questions
- ▶ Questions yet to be covered are added, following review





Anonymous Chat Logs

08/01/2021, 00:57:02

Bot:

Hey! Ask me your vaccine questions.

Keypoint Prediction Thumbs Up

User:

What is mRNA?

Keypoint: What is mRNA?

Intent: concern

Bot:

I hear you. mRNA is like giving your body the instructions for how to find and fight the virus. mRNA vaccines have been in development for many years and have been proven to be safe and effective against COVID-19.



Keypoint: mRNA is safe and effective

User:

Are the vaccines effective against the delta variant?

Keypoint: What is the delta variant?

Intent: concern

Bot:

Perhaps check this out: the Delta variant is a mutation of the COVID-19 virus. While some mutations are normal and unproblematic, the Delta variant is extremely contagious and poses a big risk to unvaccinated people. The best way to protect yourself and your loved ones from the variant is by getting vaccinated.



Keypoint: The delta variant is a dangerous COVID-19 variant

User:

Are there computer chips in the vaccines?

Keypoint: They will put a chip/microchip to manipulate me

Intent: concern

Bot:

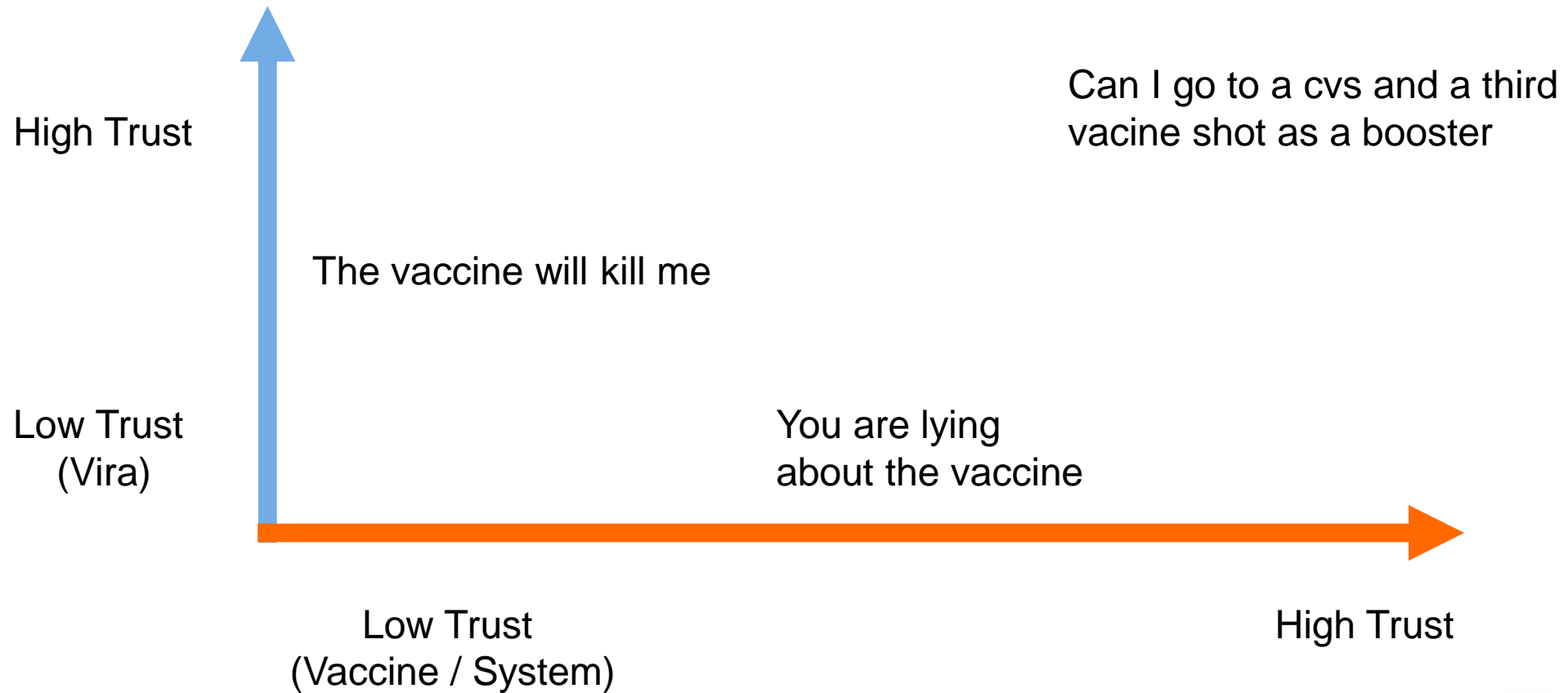
Allow me to respond. You will not be microchipped or manipulated when getting a COVID-19 vaccine. There are no tracking mechanisms in the vaccines.



Keypoint: There are no tracking devices



Next Up: Trust Models



Social Listening: Support for health departments

- Validating effective messaging
- Pointing to top concerns of the public
 - Reports of severe side effects or deaths from the vaccine
 - The COVID-19 vaccine is not safe
 - What is COVID-19?
 - The COVID-19 vaccines contain microchips
 - Can the vaccine make me sterile or infertile?
 - What is mRNA?
- Highlight new concerns
 - Does the vaccine cause autism?
 - Does the vaccine create allergies?



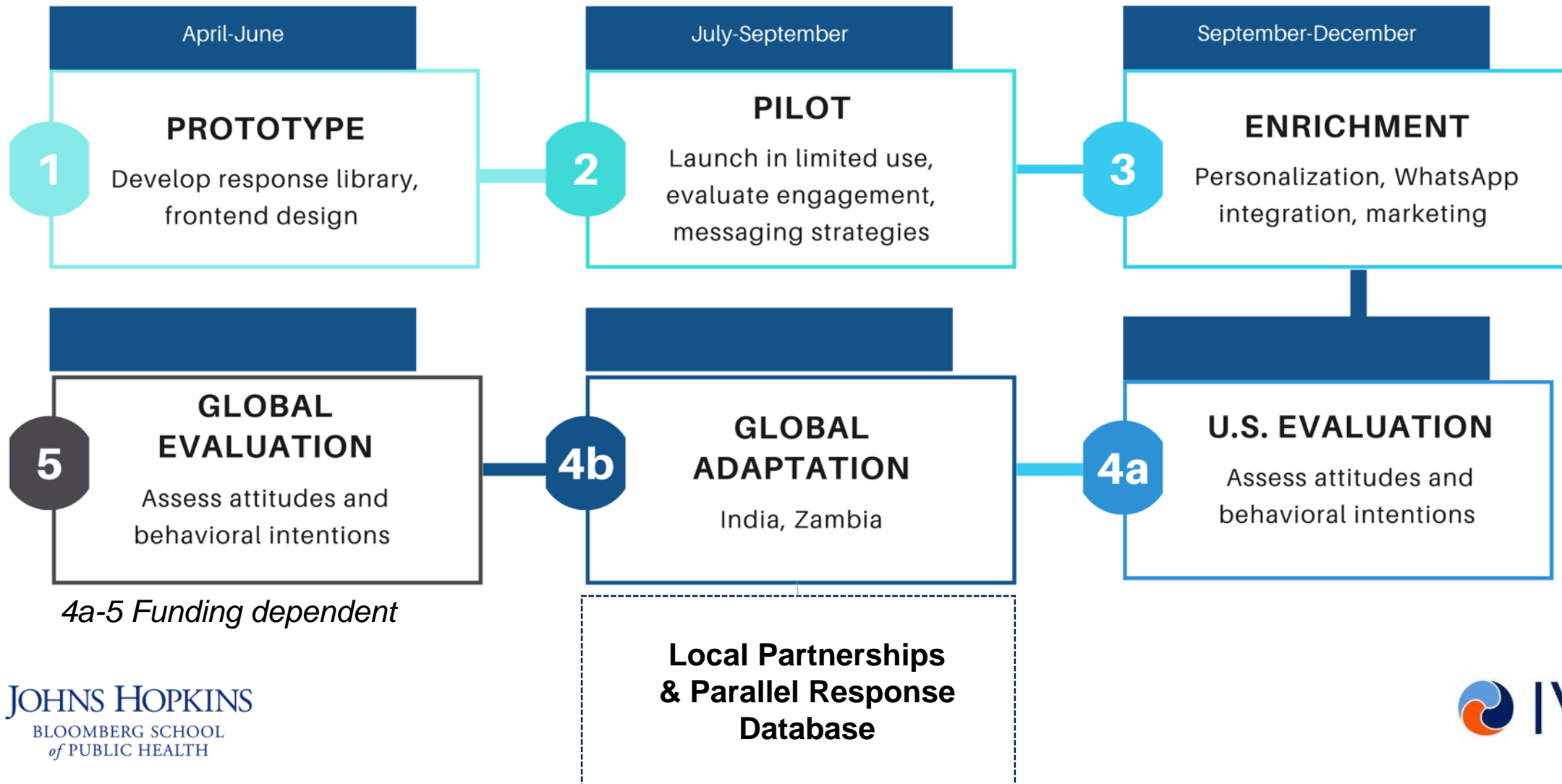


Future directions

- Information alone is not sufficient
- We aim to expand our capabilities:
 - Reflection of user concerns, conveying understanding and empathy
 - Pro-actively asking open-ended questions
 - Motivational interviewing
- Language: Spanish, Hebrew, Arabic, Russian, Amharic, Hindi
- Context: Zambia, India, Nigeria
- Not just COVID-19!



VIRA Chatbot Product Roadmap



Thank you ...

Johns Hopkins COVID-19
Training Initiative
Meta & WhatsApp
Vonage

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**Bloomberg
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VaxChat.org/Chat

 **IVAC**