UNPACKING COVID-19 UNCERTAINTY:
TOOLS FOR UNDERSTANDING VACCINE DEMAND

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Workshop agenda and objectives

Agenda

Overview of CHAI and Vaccine Markets Team

Why does so much uncertainty still exist around demand for a COVID-19 vaccine?

What are the different groups under consideration for COVID-19 vaccination and their approximate size?

How can a flexible demand forecasting tool be used to assess demand under various potential scenarios?
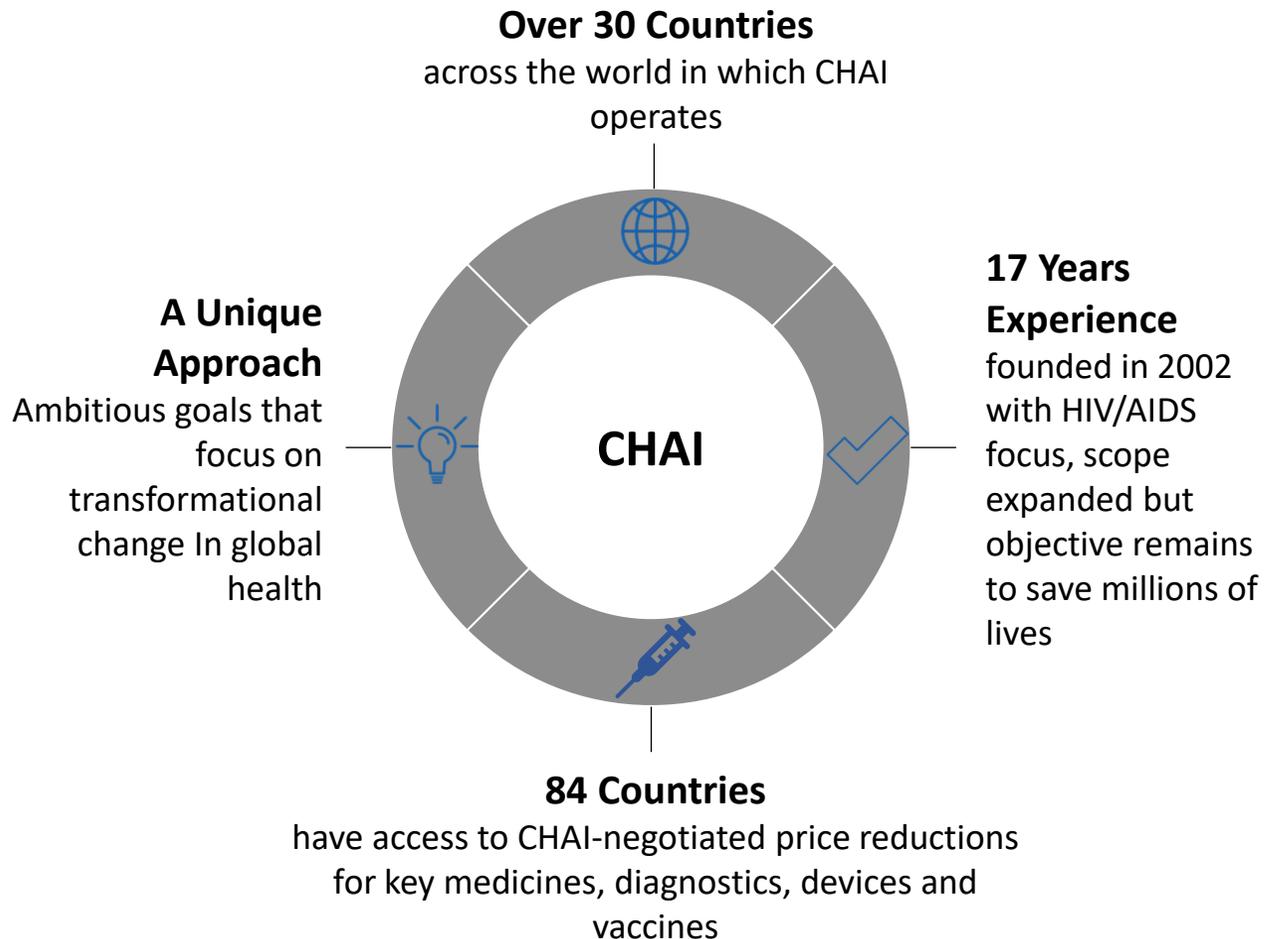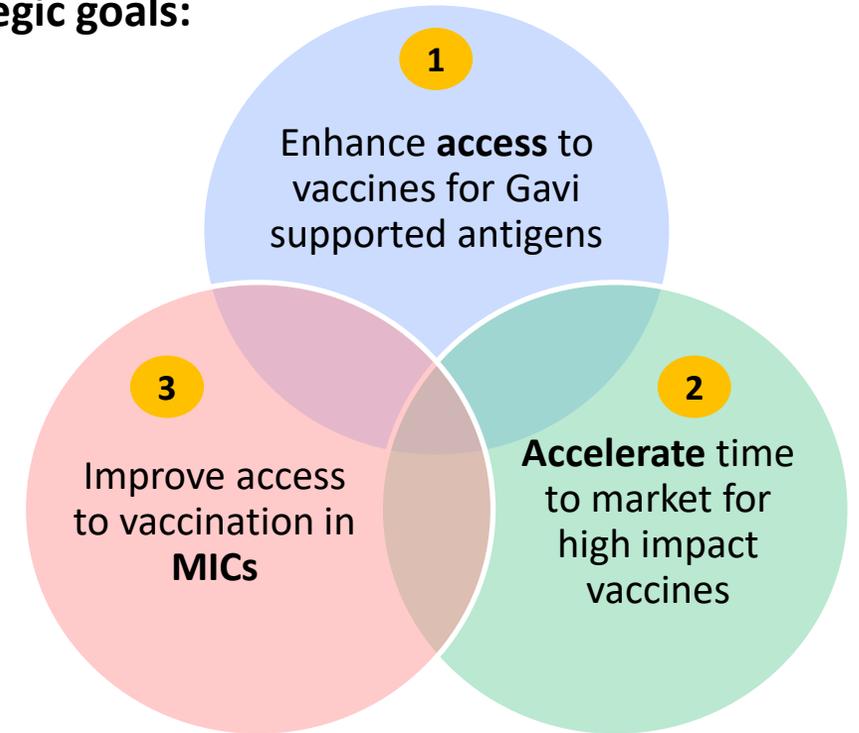
Q&A

Objectives

- The goals of this workshop are to:
  — Share insights about COVID-19 disease evolution and potential COVID-19 demand scenarios
  — Illustrate how demand forecasting may be used to inform decision making and pipeline planning for any vaccine

CHAI is an international NGO that aims to increase access to life-saving health products

We operate at the nexus of business, government, and health to save lives and reduce disease.

Over 30 Countries
across the world in which CHAI operates

A Unique Approach
Ambitious goals that focus on transformational change In global health

CHAI

17 Years Experience
founded in 2002 with HIV/AIDS focus, scope expanded but objective remains to save millions of lives

84 Countries
have access to CHAI-negotiated price reductions for key medicines, diagnostics, devices and vaccines

The Vaccines Markets Team achieves this with three strategic goals:

1. Enhance **access** to vaccines for Gavi supported antigens

2. **Accelerate** time to market for high impact vaccines

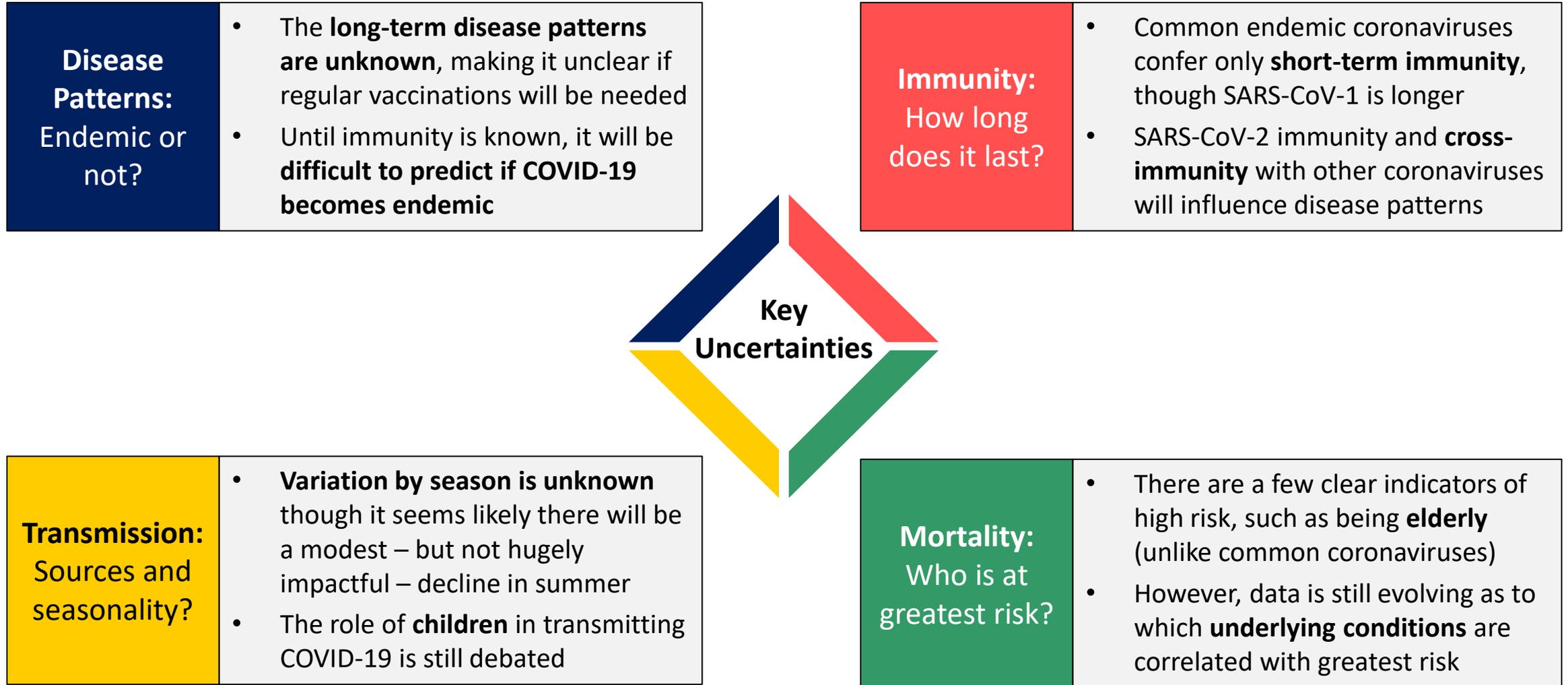3. Improve access to vaccination in **MICs**

COVID-19 influences all three goals: we are supporting partners and countries to develop and prepare for COVID-19 vaccination, as fast as possible

1. **What is the current level of your company's engagement in COVID-19 vaccine development?**
    a. We have a COVID-19 vaccine candidate in development
    b. We are interested in / considering developing a COVID-19 candidate
    c. We are not developing a COVID-19 candidate, but have interest in being a recipient for bulk / drug substance transfer
    d. We are not developing a COVID-19 candidate, but have interest in being a recipient for Fill & Finish / drug product transfer
   e. We are not planning to engage in COVID-19 vaccine development or manufacturing

Why does so much uncertainty still exist around demand for a COVID-19 vaccine?

Disease Patterns: Endemic or not?

- The **long-term disease patterns are unknown**, making it unclear if regular vaccinations will be needed
- Until immunity is known, it will be **difficult to predict if COVID-19 becomes endemic**

Immunity: How long does it last?

- Common endemic coronaviruses confer only **short-term immunity**, though SARS-CoV-1 is longer
- SARS-CoV-2 immunity and **cross-immunity** with other coronaviruses will influence disease patterns

Key Uncertainties

Transmission: Sources and seasonality?

- **Variation by season is unknown** though it seems likely there will be a modest – but not hugely impactful – decline in summer
- The role of **children** in transmitting COVID-19 is still debated

Mortality: Who is at greatest risk?

- There are a few clear indicators of high risk, such as being **elderly** (unlike common coronaviruses)
- However, data is still evolving as to which **underlying conditions** are correlated with greatest risk

How could COVID-19 play out over the long-term and how might this influence demand?
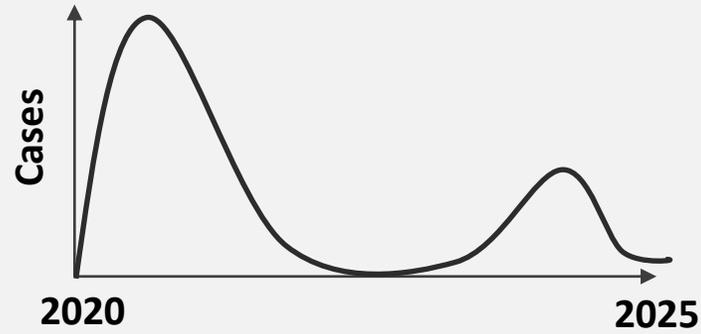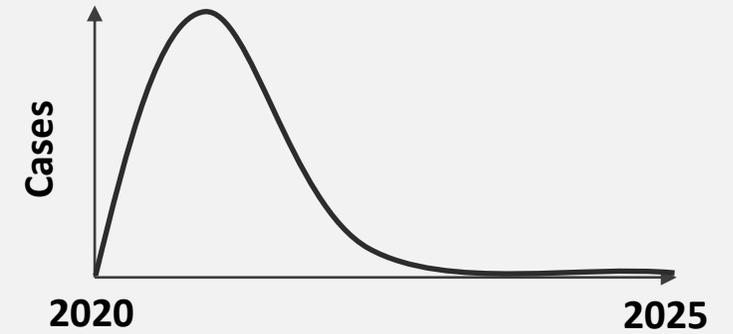
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Annual or Biennial Outbreaks
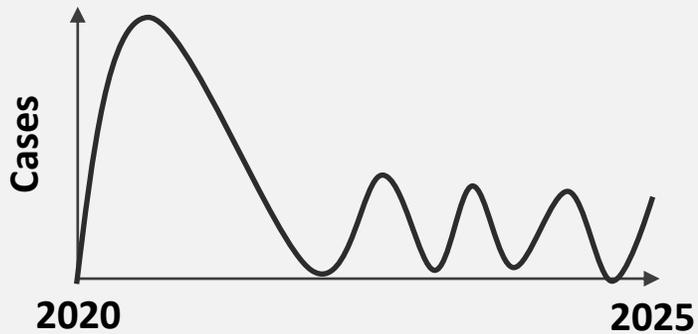
- May ultimately resemble **pandemic influenza** and select other coronaviruses, and **circulate annually or biennially**
- Likely if immunity short-term

Sporadic Outbreaks

- Potential for **resurgence even after extended period**
- Possible if moderate length immunity and cross immunity from other coronavirus

Burn Out

- SARS-CoV-2's **closest genetic relative is SARS-CoV-1** eradicated after a brief epidemic
- May be **unlikely** for SARS-CoV-2 based on modelling

High annual demand — **Decreasing COVID-19 Vaccine Demand** — *Limited stockpile*

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What are the different groups under consideration for COVID-19 vaccination and their approximate size?

Target Populations For Consideration	Total Individuals Globally (2021)	Key Factors Influencing Volume
Health Care Workers	~58 M	Only includes direct care providers, could expand to include administrative/support roles
Key Workers (e.g., front line/essential)	~157 M	Assumes KWs represent 2% of the population, could expand (for example, to 5 or 10%)
High Risk (based on comorbidities)	~925 M	Includes diabetes, HIV/AIDs, TB, chronic respiratory and CV disease but further research and refinement needed[1]
General Population Over Age 65	~705 M	Could be expanded to include, for example, all over age 55 (1.4 B); size reduced if high risk vaccinated first
Productive Workforce (Ages 20 – 64)	~4.5 B	Will be reduced based on the size of the KW population, if KWs are vaccinated first
Youth (Under Age 20)	~3.3 B	May be influenced by data on ability of children to spread disease

Supply is currently unknown but will greatly influence which of the target populations under consideration will ultimately be targeted. Volumes will also be influenced by factors such as the rate of country introductions and the coverage rates achieved

[1] A selection of diseases which have been suggested to increase COVID risk have been included, but further research may result in adding and/ or removing diseases as additional data is published. Includes 25% reduction for overlap between diseases and 25% reduction for mild disease.

What is CHAI's COVID-19 demand forecasting tool?

This tool CAN…
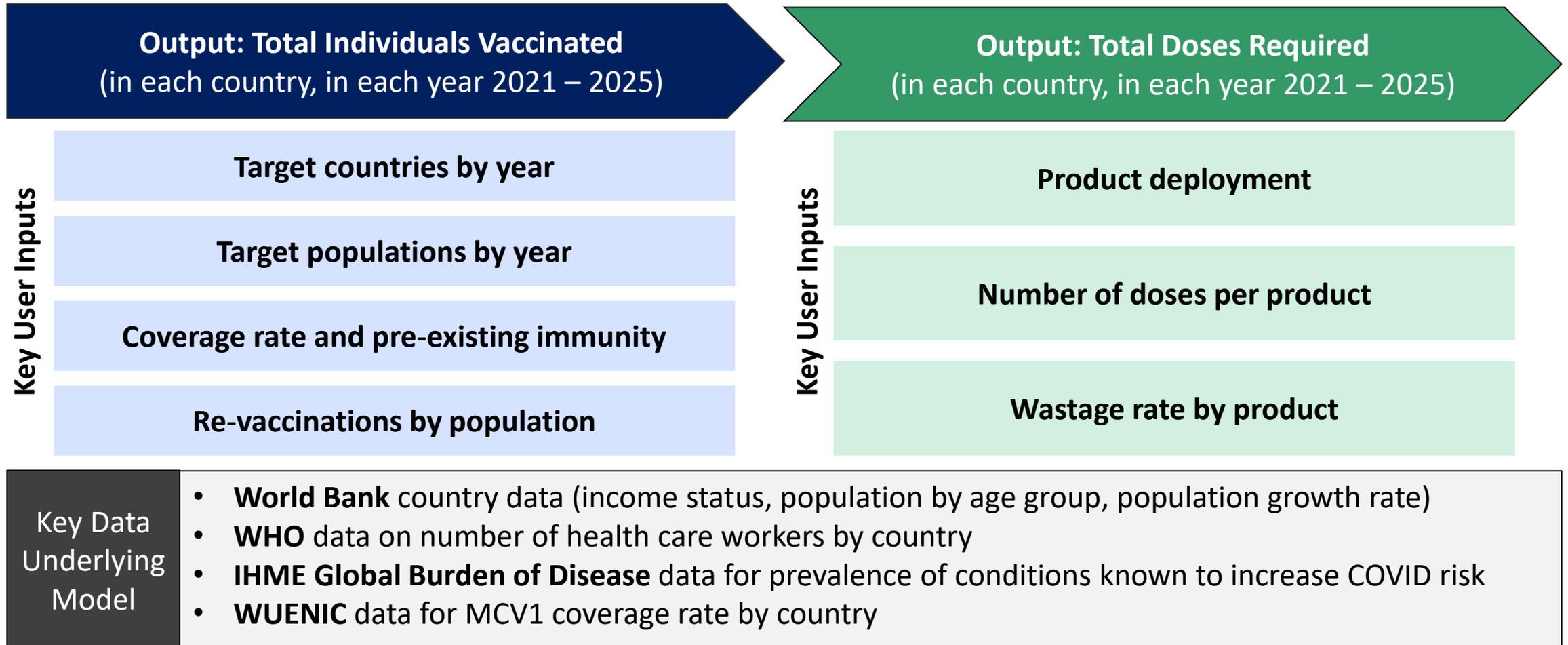
✓ Serve as a **flexible tool** for estimating different potential demand outcomes

✓ Allow for input of an individual user's **independent assumptions**

✓ Calculate **annual demand scenarios** by country from 2021 – 2025

✓ Be used as an **example of how to build demand forecasts** for other antigens

This tool CANNOT…

✗ Provide a perspective on which potential demand outcomes are most likely

✗ Suggest specific assumptions as most appropriate for estimating demand

✗ Anticipate demand post-2025 (e.g., long-term routine immunization)

✗ Take into consideration supply constraints

The WHO and Gavi are also working on a COVID-19 vaccine demand forecast. Once publicly available, their forecast will be shared with DCVMN and should be treated as the primary COVID-19 demand forecast

How does CHAI's COVID-19 demand forecasting tool work?

Output: Total Individuals Vaccinated
(in each country, in each year 2021 – 2025)

Output: Total Doses Required
(in each country, in each year 2021 – 2025)

Key User Inputs

Target countries by year

Target populations by year

Coverage rate and pre-existing immunity

Re-vaccinations by population

Key User Inputs

Product deployment

Number of doses per product

Wastage rate by product

Key Data Underlying Model

- **World Bank** country data (income status, population by age group, population growth rate)
- **WHO** data on number of health care workers by country
- **IHME Global Burden of Disease** data for prevalence of conditions known to increase COVID risk
- **WUENIC** data for MCV1 coverage rate by country

How can the tool be used to assess potential demand scenarios? (1/3)

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| Key Input	Hypothetical 1	Hypothetical 2	Hypothetical 3
Target countries by year	All	All	All
Target populations by year:			
2021	**HCW**	**HCW, Over 65**	**30% total pop.**
2022	**Over 65**	**High Risk**	**30% total pop.**
2023	**50% 20 – 64**	**33% 20 – 64**	**10% total pop.**
2024	**50% 20 – 64**	**33% 20 – 64**	**Revaccinate HCW**
2025	**Under 20**	**33% 20 – 64**	**Revaccinate over 65**
Coverage rate by country	Off	On	Off
Pre-existing immunity	None (0%)	None (0%)	None (0%)
Re-vaccinations by population	None	None	None
Product deployment by country	One product	One product	One product
Number of doses per product	2	2	2
Wastage rate by product	10%	10%	10%

The following <u>hypothetical</u> scenarios are intended to illustrate how demand may vary based on different target populations. They <u>do not</u> provide a comprehensive view of all the ways in which demand could play out
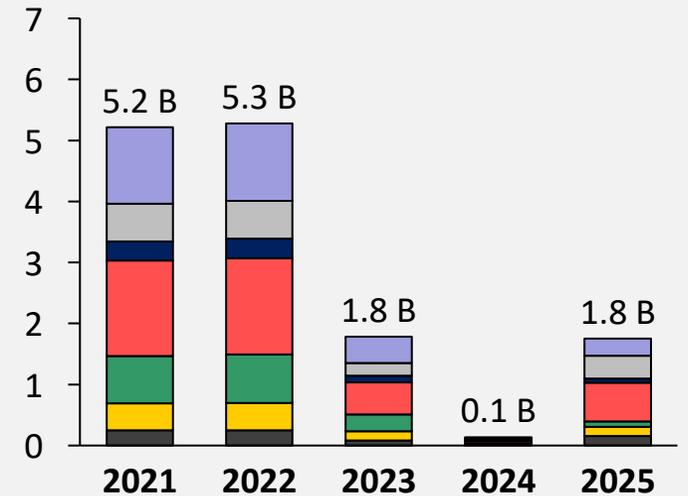

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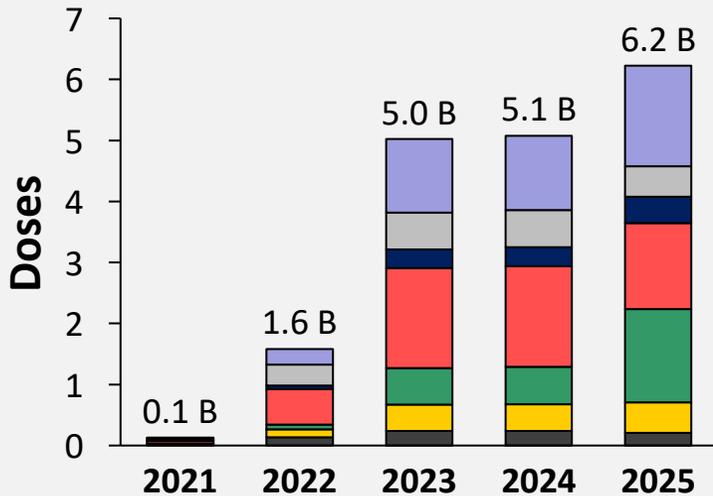
HCW in 2021, Over 65 in 2022, 50% of Ages 20 – 64 each in 2023 and 2024, Under 20 in 2025 **(total population)**

2
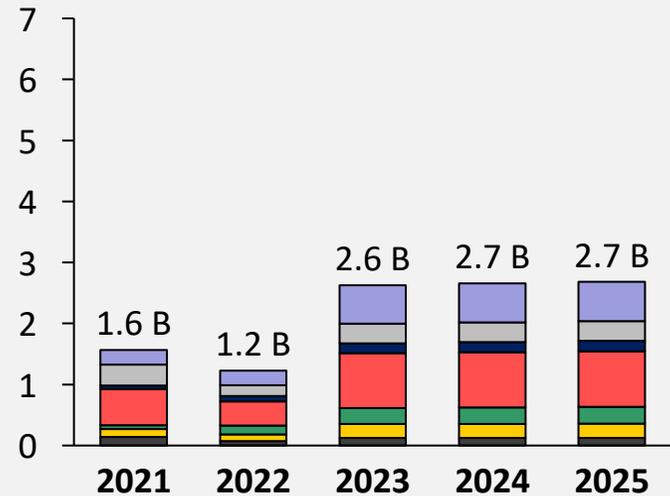
HCW and over 65 in 2021, High risk in 2022, 33% of Ages 20 – 64 each in 2023, 2024, and 2025 **(no under 20)**

3

30% pop. in 2021 and in 2022, 10% of pop. in 2023 (for herd immunity), HCW re-vacc. 2024, over 65 re-vacc. 2025

Legend:
- South Asia
- Europe & Central Asia
- Middle East & North Africa
- East Asia & Pacific
- Sub-Saharan Africa
- Latin America & Caribbean
- North America

Model Walk-Through / Screen Share

Wrap-up and Q&A

Key Takeaways
• There remain **many unknowns** surrounding COVID-19 disease evolution and thus what vaccine demand will look like
• **Circular links** between available supply and achievable demand will influence the shape of the demand forecast over time
• Utilizing demand forecasts can help developers **make informed decisions** on pipeline development

Next Steps
• **Review materials** from today's session
• Continue to **stay on top of the developments** in the COVID-19 vaccine space
• Feel free to **reach out** to CHAI if interested in discussing the topic further
• When available, review **WHO/Gavi COVID-19 demand forecast,** which will be shared with DCVMN when it is published

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Sources and Further Resources for Understanding COVID-19 Uncertainty

- "Projecting the transmission dynamics of SARS-CoV-2 through the post-pandemic period". Science 2020. Kissler et al. https://science.sciencemag.org/content/368/6493/860.full

- "Patterns of common coronavirus infections could aid understanding of COVID-19". UK Research and Innovation 2020. https://www.ukri.org/news/patterns-of-common-coronavirus-infections-could-aid-understanding-of-covid-19/

- "COVID-19 and Postinfection Immunity: Limited Evidence, Many Remaining Questions". JAMA 2020. Kirkcaldy et al. https://jamanetwork.com/journals/jama/fullarticle/2766097

- "How do children spread the coronavirus? The science still isn't clear". Nature 2020. Mallapaty. https://www.nature.com/articles/d41586-020-01354-0

- "Seasonality of SARS-CoV-2: Will COVID go away on its own in warmer weather?" Harvard Center for Communicable Disease Dynamics. Lipstich. https://ccdd.hsph.harvard.edu/will-covid-19-go-away-on-its-own-in-warmer-weather/