THE MERCURY PROJECT

The Mercury Project Research Framework

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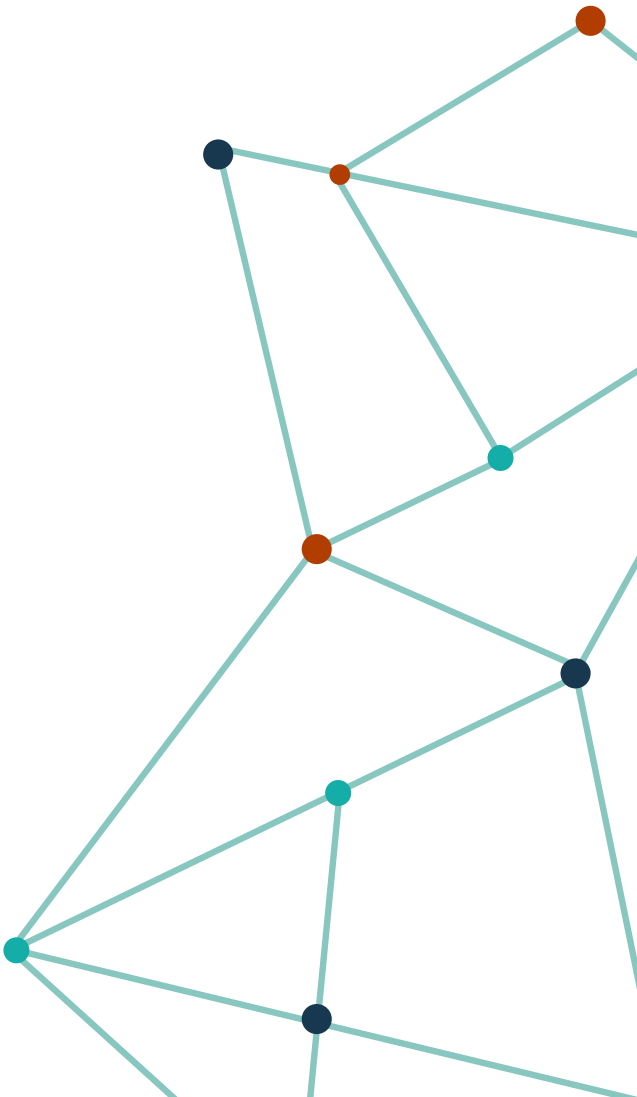

100 YEARS | SOCIAL SCIENCE RESEARCH COUNCIL

The Mercury Project is a consortium of 100+ social and behavioral scientists and practitioners committed to identifying cost-effective and scalable interventions to build vaccination demand and science-based health decision-making. While considerable attention has been addressed to mitigating problems of vaccine supply, much less effort has been devoted to solving problems of vaccination demand (WHO 2022). Teams in the Mercury Project consortium are evaluating a portfolio of interventions that vary in settings, target populations, and risk/reward ratios, with the goal of identifying those interventions that most cost-effectively increase vaccination demand at scale (Kremer *et al.* 2021).

Vaccination is an action with clear health benefits. But individuals may face a variety of barriers to realizing those benefits, including the direct and opportunity costs required to search for accurate vaccine information ("search costs"), to assess the accuracy of multiple forms of vaccine information ("decision costs"), and to acquire an actual vaccination ("logistical costs"). These costs are higher for those with fewer resources. Interventions that reduce these costs may increase vaccination demand, particularly among those with fewer resources. Interventions that leverage potential non-health benefits from vaccination, including the social benefits conferred through vaccine-acceptant social networks, may also increase vaccination demand.

REDUCING THE SEARCH COSTS OF ACQUIRING ACCURATE VACCINE INFORMATION

Vaccination has well-documented health benefits. Underestimating disease risk and/or overestimating vaccine risk can influence vaccine preferences (Sadique *et al.* 2013). Individuals' information environments may regularly expose them to inaccurate information about vaccines, including vaccine and vaccine-preventable disease risks. Searching for and acquiring accurate vaccine information imposes both direct and opportunity costs on individuals ("search costs;" *cf.* Diamond 1971; Stigler 1961). These search costs, which are proportionately higher for those with fewer resources, may require the expenditure of time, cognitive effort, and/or financial resources. Information search costs may be reduced by directly providing individuals with accurate vaccine information (*cf.* Berliner Senderey *et al.* 2022; Brody *et al.* 2022; Jacobson *et al.* 2022; Jensen et al. 2022; Milkman *et al.* 2021; Omer *et al.* 2022; Powell-Jackson *et al.* 2018), and/or by changing individuals' information environments to increase the freely available presence of accurate information (Chen and Yang 2019; Levy 2021).

REDUCING THE DECISION COSTS OF ASSESSING THE ACCURACY OF VACCINE INFORMATION

Individuals who have acquired accurate vaccine information may also be exposed to inaccurate vaccine information. Assessing the accuracy of multiple sources of vaccine information also imposes both direct and opportunity costs on individuals ("decision costs;" *cf.* Goldin *et al.* 2020), which are again proportionately higher for those with fewer resources. Individuals may rely on decision heuristics in the presence of decision costs, including making standing decisions to accept the accuracy of information from specific sources or messengers ("trust;" *cf.* Ho 2021). Some trusted sources or messengers may not, however, convey accurate vaccine information. Interventions that reduce individuals' decision costs by increasing the credibility of sources providing accurate vaccine information, and/or by reducing the credibility of sources providing inaccurate vaccine information, may increase vaccination demand.

These interventions may include delivering accurate vaccine information through already trusted messengers (Alsan and Eichmeyer 2023; Bartoš *et al.* 2022; Larsen *et al.* 2022; Milkman *et al.* 2021; Rabb *et al.* 2022; Ronzani *et al.* 2022), building the capacities of new trusted messengers to deliver accurate vaccine information (Mobarak *et al.* 2022), providing individuals with skills to more easily distinguish between accurate and inaccurate vaccine information (Bowles *et al.* 2023; Brashier *et al.* 2021; Cook, Lewandowsky, and Ecker 2017; Guess *et al.* 2020; Maertens *et al.* 2021; Roozenbeek *et al.* 2022; Vraga *et al.* 2022), fact-checking and labeling inaccurate vaccine information (Bowles *et al.* 2023; Pennycook *et al.* 2021), supporting guided vaccination conversations (Andersson *et al.* 2009; Broockman and Kalla 2016; Lemaitre *et al.* 2019), and building information literacy and information processing skills (Badrinathan 2021; Maertens *et al.* 2021).

REDUCING THE LOGISTICAL COSTS OF ACQUIRING VACCINATIONS

Individuals who have cleared informational and decisional barriers to vaccination still face logistical barriers to vaccination. Vaccination is an action that requires time, cognitive effort, and potentially financial resources, again imposing direct and opportunity costs on individuals and households that are proportionately larger for those with fewer resources. Individuals seeking vaccinations must identify vaccination site locations, make vaccination appointments if necessary, remember vaccination appointment times, take time off from work, secure childcare if necessary, and secure transportation to vaccination sites. These logistical barriers to vaccination may be mitigated through interventions that reduce the direct and opportunity costs of identifying vaccination site locations (Baskin 2018; Dai *et al.* 2021), making and remembering vaccination appointments (Brody *et al.* 2022; Johansen *et al.* 2023; Kagucia *et al.* 2021; Kawakatsu *et al.* 2020; Patel *et al.* 2022; Regan *et al.* 2017; Rogers *et al.* 2015; Wynn *et al.* 2021; Yokum *et al.* 2018), taking time off from work, securing childcare, and/or securing transportation to vaccination sites (Campos-Mercade *et al.* 2021; IDinsight and Hanovia 2020; Jacobson *et al.* 2022; Kusuma *et al.* 2017; Launay *et al.* 2014; Mobarak *et al.* 2022; Ofstead *et al.* 2013). Logistical costs of vaccination may also be offset by framing vaccinations as valuable assets that can be lost (Berliner Senderey *et al.* 2022; Dai *et al.* 2021; Glanz *et al.* 2020; Johansen *et al.* 2023; Keppeler *et al.* 2022; Milkman *et al.* 2021).

INCREASING THE SOCIAL BENEFITS FROM VACCINATION

Although the most obvious benefit of vaccination is health-related, it may be possible to leverage other kinds of benefits valued by individuals in support of vaccination demand. For example, individuals in a variety of contexts value social acceptance by their neighbors and peers (Allcott 2011; Bond *et al.* 2012; Gaube *et al.* 2018; Gerber *et al.* 2008; Karing and Naguib 2021; Marshall 2019). These contexts include vaccination (Bicchieri *et al.* 2021; Hoy *et al.* 2022; Karing 2019). Interventions that increase the social benefits of vaccination from vaccine-accepting neighbors and peers, including by increasing the information available about others' vaccination status (Alatas *et al.* 2023; James *et al.* 2021; Karing 2019; Karing and Naguib 2021; Moehring *et al.* 2023), reminding individuals about familial and social impacts of vaccination (Berliner Senderey *et al.* 2022; Clayton *et al.* 2021; Mulder and Lokate 2022; Mussio and de Oliveira 2022; Rabb *et al.* 2021; Ruggeri *et al.* 2022; Tironi *et al.* 2021), and sharing accurate vaccine information within social networks (Siddiqi *et al.* 2020), may increase vaccination demand.

Table 1: Mercury Project Intervention Designs

Projects	Reducing information search costs	Reducing decision costs	Reducing logistical costs	Increasing social benefits
A tough call				
Addressing my concerns				
Afya Yako				
BIMLI				
Boosting boosters at scale				
Building a better toolkit				
Community-designed messages				
Community education to build trust				
Doctors' talks				
Harnessing influencers				
Health ambassadors				
Intention2Action				
Marklate don cam				
Messenger matters				
Muting low-quality sources				
Sharing in social networks				
Targeting networks				
Yaay ju wér, doom ju wér				

Table 2: Mercury Project Study Outcomes

Projects	Exposure to accurate vaccine information	Knowledge about vaccines/vaccine-preventable diseases	Confidence in vaccines	Knowledge of others' vaccination choices	Vaccine information literacy skills	Sharing accurate vaccine information	Vaccination intentions	Vaccination behavior
A tough call	■	■			■	■		■
Addressing my concerns	■	■	■		■		■	■
Afya Yako		■	■		■	■		■
BIMLI		■	■		■	■		■
Boosting boosters at scale								■
Building a better toolkit					■			
Community-designed messages						■	■	
Community education to build trust		■	■				■	■
Doctors' talks		■	■					■
Harnessing influencers			■		■	■		■
Health ambassadors		■	■			■	■	■
Intention2Action		■	■				■	■
Marklate don cam	■	■	■				■	■
Messenger matters		■	■	■			■	■
Muting low-quality sources	■					■		
Sharing in social networks		■	■	■		■		■
Targeting networks	■					■		
Yaay ju wér, doom ju wér	■	■	■				■	■

MERCURY PROJECT GRANTEE DESCRIPTIONS

A TOUGH CALL: *Impacts of mobile technology on Covid-19 information and protective behavior decision-making*

Partnering with a local government in northern India, researchers will evaluate the impacts of mobile phone access on information-seeking and health-protective behaviors. This evaluation is set in the context of a response to the digital gender divide, whereby the government of Chhattisgarh provided free smartphones and improved access to the internet to two million women in rural areas across the state who live in areas with at least one village with more than 1,000 residents. With this improved internet access, women may have better access to information—including health information—but this information may be accurate or inaccurate.

This intervention design incorporates one lever to promote vaccine uptake:

- Reducing information search costs

This study team will measure multiple outcomes, including:

- Exposure to accurate vaccine information
- Knowledge about vaccines/vaccine-preventable diseases
- Vaccine information literacy skills
- Sharing accurate vaccine information
- Vaccination behavior

ADDRESSING MY CONCERNS: *Increasing vaccine uptake through tailored interactive decision aids*

Leveraging that some of the most effective interventions for driving vaccine uptake involve counseling sessions trusted physicians, this research team will test the impact on Covid-19 and flu vaccine uptake of an interactive individually tailored, video-based decision aid can be deployed on social media and will help people make decisions about vaccines that are informed by a better understanding of their risks and benefits, how they work, and how they are developed. The team will iteratively develop and test the video-based decision aid in English and Spanish.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search costs
- Reducing decisions costs
- Increasing social benefits

This study team will measure multiple outcomes, including:

- Exposure to accurate vaccine information
- Knowledge about vaccines/vaccine-preventable diseases
- Confidence in vaccines
- Vaccine information literacy skills
- Vaccination intentions
- Vaccination behavior

AFYA YAKO: *Countering inaccurate public health information through local media in Tanzania*

Partnering with local radio stations in Tanzania to produce weekly public health programs designed to combat inaccurate health information, researchers will assess the effects of a four-month nationwide campaign, Afya Yako ("Your Health" in Swahili). The initiative will include a scripted radio drama and two-way dialogue encouraged through radio call-in, and will draw on citizen feedback; the program and dialogue will explain vaccine benefits as well as dramatize vaccine decision-making to build audience skills. A subset of villages within the campaign's broadcast radius will also receive an in-person mobilization campaign. Researchers will work to equip interested parties at local radio stations with the knowledge and skills to recognize and dispel inaccurate information as it emerges.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search costs
- Reducing decision costs
- Reducing logistical costs

This study team will measure multiple outcomes, including:

- Knowledge about vaccines/vaccine-preventable diseases
- Confidence in vaccines
- Vaccine information literacy skills
- Sharing accurate vaccine information
- Vaccination behavior

BIMLI (BIHAR INFORMATION AND MEDIA LITERACY INITIATIVE): *A media literacy field experiment in North Indian schools*

Partnering with local authorities, researchers will evaluate if inoculating against inaccurate health information through a grassroots training program will be effective in addressing inaccurate health information among secondary school students in India. BIMLI—Bihar Information and Media Literacy Initiative—aims to help students learn about the problem of health misinformation in India and its consequences, how and why misinformation spreads, and strategies to inoculate against it.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search costs
- Reducing decision costs
- Increasing social benefits

This study team will measure multiple outcomes, including:

- Knowledge about vaccines/vaccine-preventable diseases
- Confidence in vaccines
- Vaccine information literacy skills
- Sharing accurate vaccine information
- Vaccination behavior

BOOSTING BOOSTERS AT SCALE: *A megastudy to increase vaccination at scale*

Partnering with large U.S. companies, researchers will simultaneously test different tactics designed to increase Covid-19 booster uptake. Interventions will include texts from trusted messengers as well as offers to subsidize transport costs to vaccination sites. This megastudy aims to identify which tactics effectively increase vaccinations overall and which tactics work best for whom (*e.g.,* based on age, gender, race, etc.), which could help address disparities in vaccination rates across different demographic groups.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search costs
- Reducing decision costs
- Reducing logistical costs
- Increasing social benefits

This study team will measure one outcome:

- Vaccination behavior

BUILDING A BETTER TOOLKIT (FOR FIGHTING INACCURATE HEALTH INFORMATION): *Large collaborative project to compare information interventions*

Researchers will test ways to help people distinguish between true and false information and to reduce the spread of false information in online spaces. A series of online experiments and real-world tests in partnership with YouTube will allow the researchers to create a handbook for practitioners, detailing the relative strengths and weaknesses of each intervention and guiding their choices. The handbook will help practitioners build a toolkit of useful interventions to address inaccurate health information and understand which interventions will be most effective for their particular problem and context.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search costs
- Reducing decision costs

This study team will measure one outcome:

- Vaccine information literacy skills

COMBATTING INACCURATE HEALTH INFORMATION WITH COMMUNITY-CRAFTED MESSAGING: *Developing a scalable community-driven approach in Latin America and the United States*

Partnering with local NGOs in Brazil, Mexico, and the US, as well as Facebook and YouTube, researchers will evaluate the effectiveness of health-information messaging generated from members of a given community in improving vaccine attitudes and intentions. These messages will also be compared to messaging currently in use, created by technical experts who represent government and public health organizations.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search costs
- Reducing decision costs
- Increasing social benefits

This study team will measure multiple outcomes, including:

- Sharing accurate vaccine information
- Vaccination intentions

COMMUNITY EDUCATION TO BUILD TRUST: *Leveraging community health workers to combat inaccurate health information in Haiti, Malawi, and Rwanda*

Working in and with Partners in Health and its local affiliates—Abwenzi Pa Za Umoyo (Malawi), Zanmi Lasante (Haiti), and Inshuti Mu Buzima (Rwanda)—researchers will test a new system to support Community Health Workers (CHWs) as they in turn support their communities. This will include discussions of inaccurate and misleading health information with CHWs and establishing an SMS and phone-hotline system to hear concerns from CHWs and provide tailored scripts to overcome inaccurate information to encourage vaccine demand and take-up.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search costs
- Reducing decision costs
- Reducing logistical costs

This study team will measure multiple outcomes, including:

- Knowledge about vaccines/vaccine-preventable-diseases
- Confidence in vaccines
- Vaccination intentions
- Vaccination behavior

DOCTORS' TALKS: *An mHealth community-led intervention to combat inaccurate Covid-19 information and improve vaccine attitudes and behavior in Ghana*

Partnering with the Ghana Health Service, researchers will assess the effects of improving government health workers' communication and persuasive skills in support of Covid-19 and other vaccination. To date, government health care workers—trusted health messengers in many communities—have not been systematically mobilized to promote vaccination and dispel inaccurate health information. Researchers will work to equip clinical health workers with the knowledge and skills to have open, persuasive vaccination conversations with patients who present at a clinic for other reasons.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search costs
- Reducing decision costs
- Reducing logistical costs

This study team will measure multiple outcomes, including:

- Knowledge about vaccines/vaccine-preventable diseases
- Confidence in vaccines
- Vaccination behavior

HARNESSING INFLUENCERS TO COUNTER INACCURATE HEALTH INFORMATION: *Scalable solutions in the Global South*

Partnering with the fact-checking NGOs AfricaCheck (in Kenya, Nigeria, and South Africa) and Chequea Bolivia, researchers will test approaches to counter inaccurate health information and change users' engagement with reliable information. In one approach, positive social media influencers—high-profile journalists and social activists with relatively large local followings—will be provided with digital-literacy training resources and fact-checks, along with modest financial compensation. In another approach, researchers will provide the fact-checkers with data on viral posts by serial spreaders of inaccurate information. In a final approach, researchers will support the fact-checkers in directly reaching out to spreaders of inaccurate information and their followers to debunk the inaccuracies they have shared or have been subjected to and provide digital literacy training materials.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search costs
- Reducing decision costs
- Increasing social benefits

This study team will measure multiple outcomes, including:

- Confidence in vaccines
- Vaccine information literacy skills
- Sharing accurate vaccine information
- Vaccination behavior

HEALTH AMBASSADORS: *EGAP-PASGR-CERAP Sub-Saharan African partnership*

Partnering with Ministries of Health in Côte d' Ivoire, Senegal, Malawi, and Zimbabwe, researchers will help select and train 'health ambassadors' to have face-to-face, bilateral engagement to move the public past their mistrust and toward vaccine demand and uptake. Health ambassadors will offer a direct and private opportunity to discuss vaccination concerns. The health ambassadors will be social mobilizers recruited to work alongside public health authorities to address individuals' concerns and promote vaccine uptake. The health ambassadors will then proactively engage individuals around vaccine risks and benefits face-to-face in an effort to increase public fluency and confidence in reliable scientific information about Covid-19 and Covid-19 vaccine uptake to ultimately increase vaccination rates.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search costs
- Reducing decision costs
- Increasing social benefits

This study team will measure multiple outcomes, including:

- Knowledge about vaccines/vaccine-preventable diseases
- Confidence in vaccines
- Sharing accurate vaccine information
- Vaccination intentions
- Vaccination behavior

INTENTION2ACTION: *An intention-action framework for improving the impact of public health initiatives*

The research team will explore why behavioral interventions succeed in some contexts but not in others. The team will test interventions to understand when and among whom behavioral interventions can effectively change individuals' health behaviors—including vaccination and preventative screenings—in natural settings as well as how to optimally combine different types of interventions.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search cost
- Reducing decisions costs
- Reducing logistical costs

This study team will measure multiple outcomes, including:

- Knowledge about vaccines/vaccine-preventable diseases
- Confidence in vaccines
- Vaccination intentions
- Vaccination behavior

MARKLATE DON CAM: *Scaling bundled vaccination in rural Sierra Leone*

Working with the Expanded Programme on Immunization at the Sierra Leone Ministry of Health and Sanitation and their technical partner Concern Worldwide, the research team will test if bringing Covid, HPV for 10- to 12-year-old girls, and routine childhood vaccinations at the same time to villages, using mobile vaccination teams can be effective and cost-effective at improving vaccine uptake. Further, the team will test if endorsements from high-level authorities to disseminate accurate vaccine information increases vaccine uptake in the villages.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search cost
- Reducing decisions costs
- Reducing logistical costs
- Increasing social benefits

This study team will measure multiple outcomes, including:

- Exposure to accurate vaccine information -Knowledge about vaccines/vaccine-preventable diseases
- Confidence in vaccines
- Vaccination intentions
- Vaccination behavior

MESSENGER MATTERS: *Medical mistrust, social learning, and vaccine decision-making in rural Namibia*

Working with rural, underserved communities in rural northwest Namibia, the research team will explore the influences of rapid market integration affecting the ways people learn about disease and their likelihood of using preventative care measures like vaccines. The team will examine how local models of illness shape vaccination practice, how individual-level factors—including medical mistrust—shape perceptions and use of the healthcare system, how sociodemographic factors shape vaccine beliefs, and how social learning influences individual vaccination decisions.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing search costs
- Reducing decisions costs
- Increasing social benefits

This study team will measure multiple outcomes, including:

- Knowledge about vaccines/vaccine-preventable diseases
- Confidence in vaccines
- Knowledge of others' vaccine choices
- Vaccination intentions
- Vaccination behavior

MUTING LOW-QUALITY SOURCES: *A field experiment to mitigate the harm of inaccurate health information online*

Researchers will create sustained changes to information exposure over time by encouraging users to change the composition of the social media accounts they follow and measure their effects on real-world behavior. This will allow them to assess the extent to which respondents can be nudged to alter the set of accounts they follow and thus the information they consume. The aim is to encourage increased engagement with trustworthy news sources and reduce engagement with low-quality sources and/or inaccurate health information.

This intervention design incorporates one lever to promote vaccine uptake:

- Reducing information search costs

This study team will measure multiple outcomes, including:

- Exposure to accurate vaccine information
- Sharing accurate vaccine information

SHARING IN SOCIAL NETWORKS: *Evidence from a field study in Sierra Leone*

In partnership with Sierra Leone's Ministry of Health and Sanitation (MoSH),UNICEF, and Development Media International (DMI), researchers will investigate how to leverage and enhance social learning in the context of vaccine take-up and response to inaccurate and misleading health information. In a first study, participants will be randomized to receive training on information literacy, vaccine literacy, both or neither. The impact of these interventions on trained individuals' and their network's vaccination take-up rates and ability to identify inaccurate health information will be assessed. In a

second, sequentially run study, researchers will delve into the barriers to social learning by evaluating how different interventions harnessing underlying motivations for information sharing impact social learning and, consequently, the health outcomes of participants' networks.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search costs
- Reducing decision costs
- Increasing social benefits

This study team will measure multiple outcomes, including:

- Knowledge about vaccines/vaccine-preventable diseases
- Confidence in vaccines
- Knowledge of others' vaccination choices
- Sharing accurate vaccine information
- Vaccination behavior

TARGETING NETWORKS SPREADING INACCURATE HEALTH INFORMATION: *Network-transforming interventions for reducing the spread of inaccurate health information online*

Researchers will design, build, and evaluate network-transforming interventions: software-assisted systems to alter the underlying networks that spread inaccurate health information online. A health-information-monitor Twitter account will continuously track emerging inaccurate health information on English-speaking Twitter and deliver counter-messaging to the recipients of those inaccuracies, with the aim of motivating users to unfollow the source.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing information search costs
- Reducing decision costs
- Increasing social benefits

This study team will measure multiple outcomes, including:

- Exposure to accurate vaccine information
- Sharing accurate vaccine information

YAAY JU WÉR, DOOM JU WÉR: *Increasing uptake and acceptance of Covid-19 vaccination through behavioral nudges, prebunking and bundling strategies in Senegal*

Working with the Ministry of Health and Social Action in Senegal, this research team will harness the acceptability and high uptake of routine childhood vaccinations administered through Senegal's Expanded Programme on Immunization. The team will test the impact on vaccine uptake of differing ways of offering Covid-19 vaccination/boosters to mothers during regular well-child visits at health posts as well as randomizing messages designed to counter vaccine hesitancy.

This intervention design incorporates multiple levers to promote vaccine uptake:

- Reducing decisions costs
- Reducing logistical costs

This study team will measure multiple outcomes, including:

- Exposure to accurate vaccine information -Knowledge about vaccines/vaccine-preventable diseases
- Confidence in vaccines
- Vaccination intentions
- Vaccination behavior

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