

Health Technology Assessment of COVID-19 vaccination in Nigeria

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Session structure

Aim: to share our experience in the production and uptake of evidence for health technology assessment (HTA) of COVID-19 vaccines in Nigeria

- Economic evaluation of COVID-19 vaccines: methods and results
- Challenges and approaches to resource use estimation for costing COVID-19 vaccines
- Identifying stakeholders and pathways to support HTA evidence uptake

COVID-19 in Nigeria

- First confirmed case of COVID-19 in Nigeria in February 2020
- By end of 2021: 3,000 related deaths reported
 - Excess mortality evidence: 50x higher
- Slow deployment and low uptake of vaccines:
 - Range of vaccines donated by COVAX and others
 - 12% fully vaccinated by mid-2022 (global average 62%)
- Need for quantification of costs and outcomes
 - Severely resource-constrained environment
 - Opportunity costs of vaccine delivery (for donated vaccines)
 - Investment case of national purchasing of vaccines + delivery approaches

Health Technology Assessment

- End of 2020: Federal MoH contacted University of Nigeria Nsukka
 - Need for evidence on value for money of vaccine options for HTA
- HTA: “systematic and multi-disciplinary evaluation of properties of health technologies covering direct and indirect consequences” (WHO)
- HTA in Nigeria: currently inception stage, consultations by group of stakeholders (incl. African CDC) but no institutionalisation
 - COVID-19 vaccines one of first opportunities to adopt HTA framework for decision-making
- Collaboration between University of Nigeria, LSHTM, CGD

Economic evaluation of COVID-19 vaccines in Nigeria

Sergio Torres-Rueda

Introduction

- Government request for evidence on ‘value for money’ of COVID-19 vaccine options to feed into HTA
- Strong preference for local evidence to inform specific policy choices
- Aim: to conduct a cost-effectiveness analysis (CEA) of a range of COVID-19 vaccine scenarios in Nigeria

RESEARCH ARTICLE


What, how and who: Cost-effectiveness analyses of COVID-19 vaccination to inform key policies in Nigeria

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Abstract

While safe and efficacious COVID-19 vaccines have achieved high coverage in high-income settings, roll-out remains slow in sub-Saharan Africa. By April 2022, Nigeria, a country of over 200 million people, had only distributed 34 million doses. To ensure the optimal use of health resources, cost-effectiveness analyses can inform key policy questions in the health technology assessment process. We carried out several cost-effectiveness analyses exploring different COVID-19 vaccination scenarios in Nigeria. In consultation with Nigerian stakeholders, we addressed three key questions: what vaccines to buy, how to deliver them and what age groups to target. We combined an epidemiological model of virus transmission parameterised with Nigeria specific data with a costing model that incorporated local resource use assumptions and prices, both for vaccine delivery as well as costs associated with care and treatment of COVID-19. Scenarios of vaccination were compared with no vaccination. Incremental cost-effectiveness ratios were estimated in terms of costs per disability-adjusted life years averted and compared to commonly used cost-effectiveness ratios. Viral vector vaccines are cost-effective (or cost saving), particularly when targeting older adults. Despite higher efficacy, vaccines employing mRNA technologies are less cost-effective due to high current dose prices. The method of delivery of vaccines makes little difference to the cost-effectiveness of the vaccine. COVID-19 vaccines can be highly effective and cost-effective (as well as cost-saving), although an important determinant of the latter is the price per dose and the age groups prioritised for vaccination. From a health system perspective, viral vector vaccines may represent most cost-effective choices for Nigeria, although this may change with price negotiation.

Policy Questions

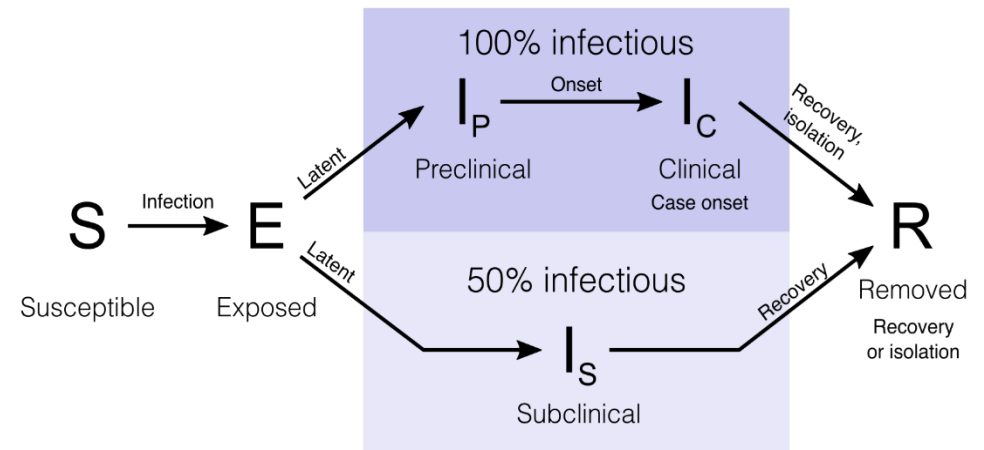
- Which COVID-19 vaccines should be bought?
- Which is the best way to deliver vaccines?
- What age groups should be prioritised?

Overview of study

- CEA analysis
- Model-based analysis (combined epi + costs)
- Provider's perspective
- Intervention: four vaccines
 - Viral vector vaccines (similar to Astra-Zeneca and Johnson & Johnson)
 - mRNA vaccines (similar to Pfizer and Moderna)
- Comparator: no vaccine scenario
- Time horizon: 12-month programme
- Delivery mechanism:
 - Health facility
 - Campaign
 - Targeted campaign
- Populations:
 - All adults, 18-49, 50+
- Coverage:
 - 25%-100%
- Cost-effectiveness thresholds:
 - US\$364 – US\$2097

Methodology: Epidemiological Outcomes

- Age-stratified compartmental transmission model (SEIRS+V) of COVID-19 (CovidM) adapted to Nigeria
- Number of deaths and cases (by severity) over 5-year period
- Health outcomes converted to disability adjusted life years (DALYs) averted
- One-time variant introduction
- Two scenarios: 1. preventing infection (and thus disease) and 2. preventing disease (with no impact on infection)



Methodology: Costing

Intervention costs

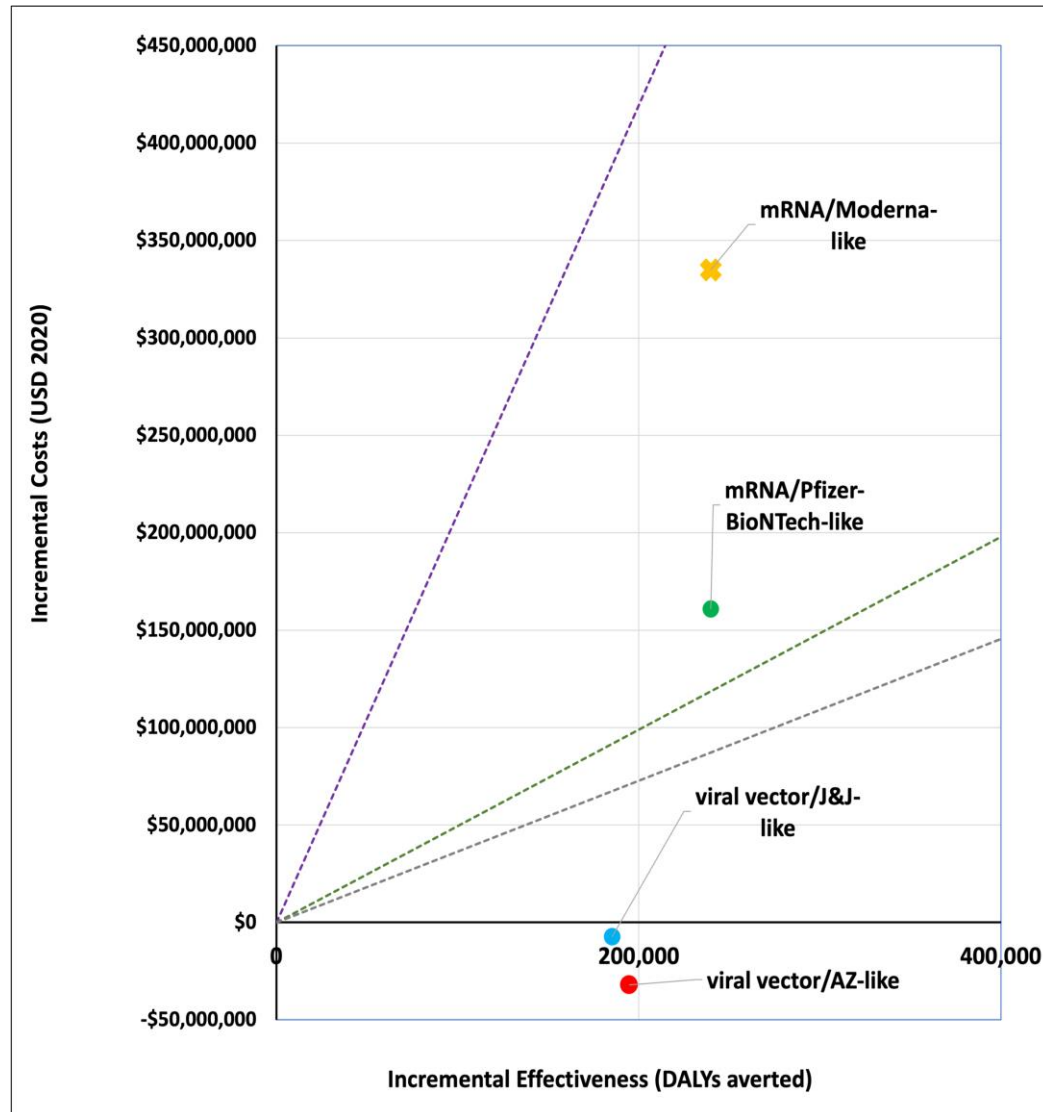
- Ingredients-based bottom-up normative approach
- 13 vaccination sub-activities necessary for the planning, roll-out and delivery of vaccines, as well as the cost of the dose itself
- Process of resource use description and quantification
- Assumed different resource requirements by type of vaccine (e.g., specific cold chain types)
- Costed 3 delivery methods: different resource use assumptions

Consequential costs

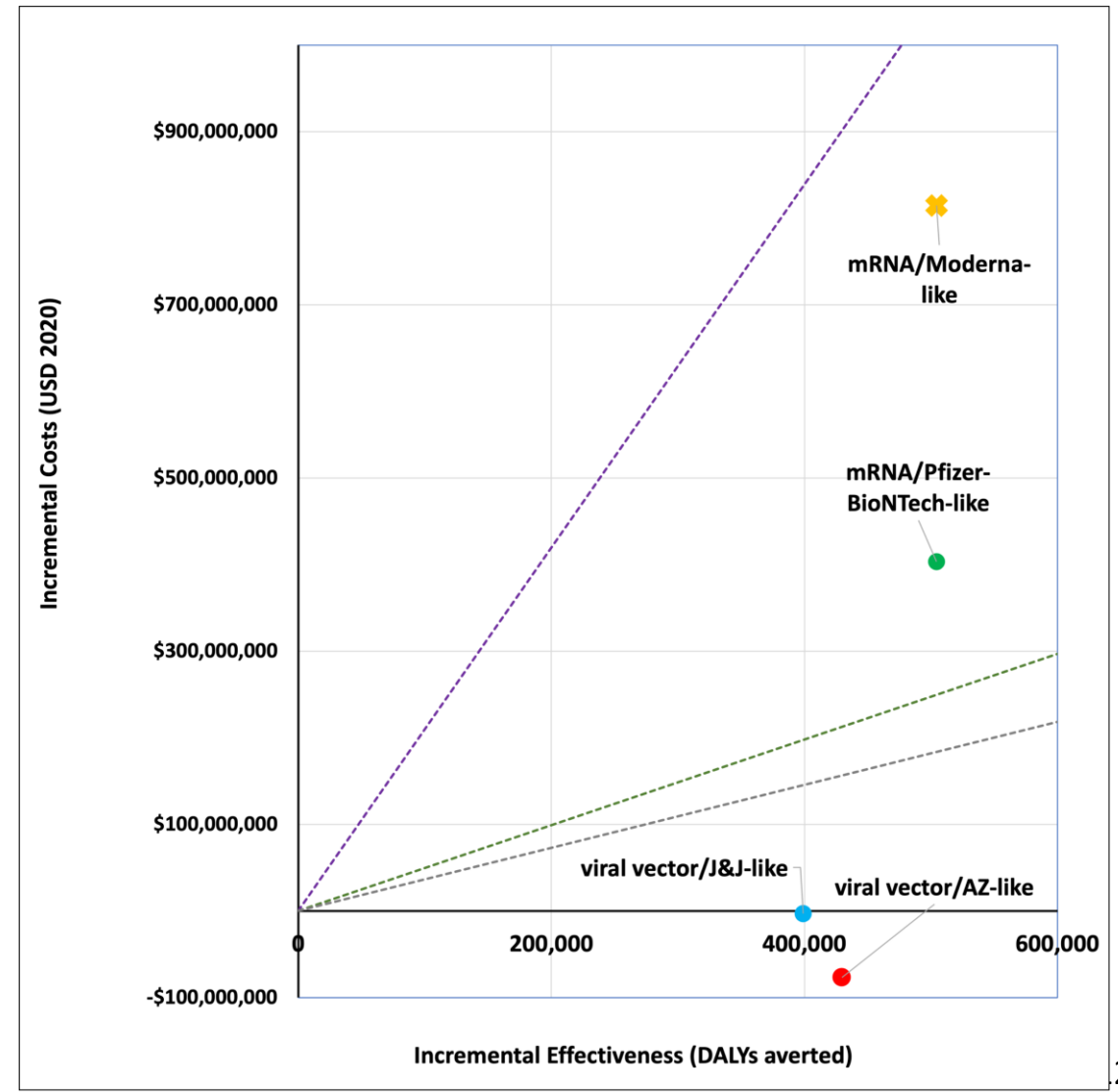
- Care and treatment costs
- Defined the health sector response as per WHO guidelines
- Calculated through a normative, bottom-up costing method

Policy Question 1: What vaccines to buy?

100% coverage of 50+ yo; vaccine mechanism: infection



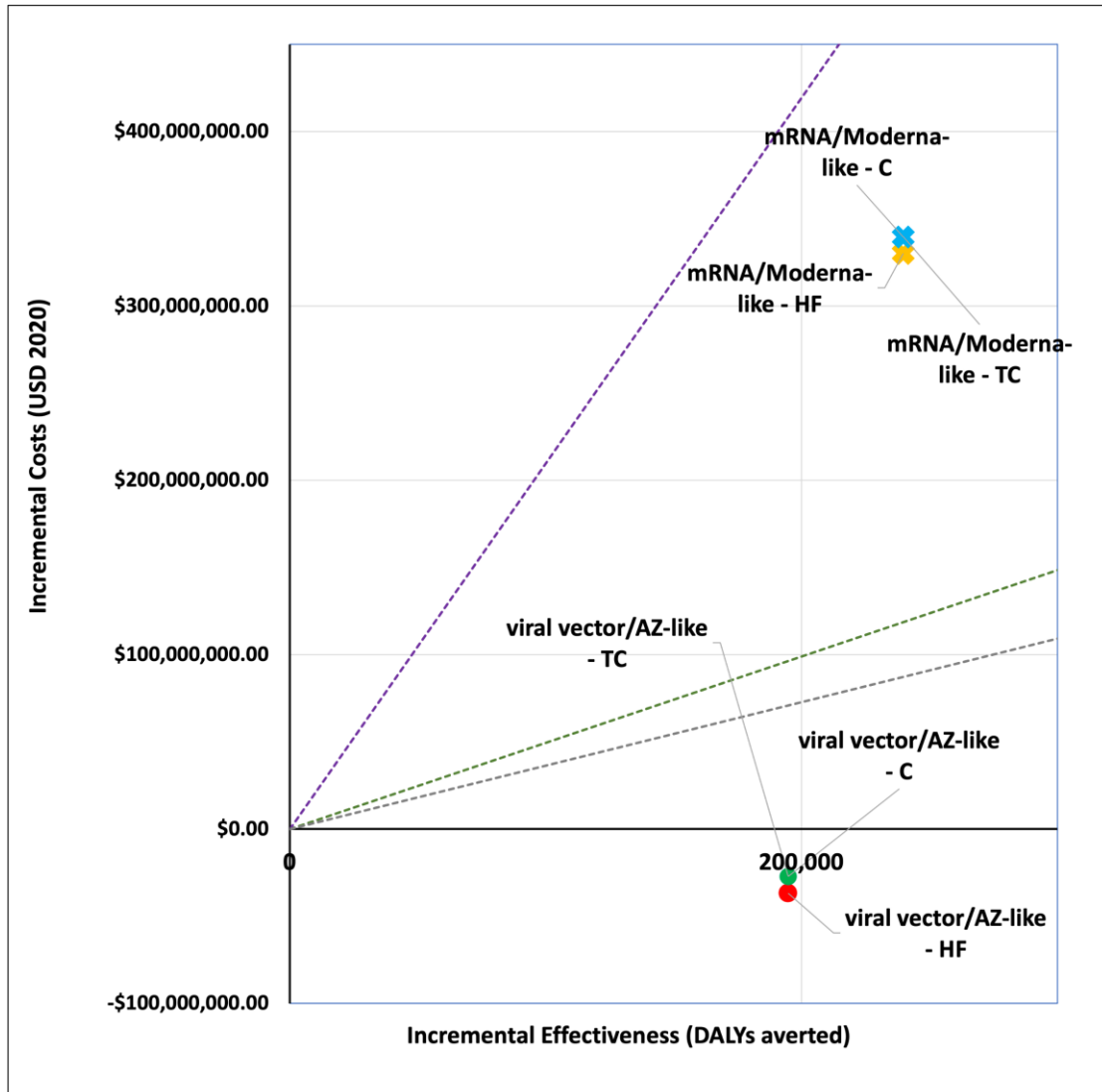
25% coverage of adult population (prioritising 50+ yo, then 18-49); vaccine mechanism: infection



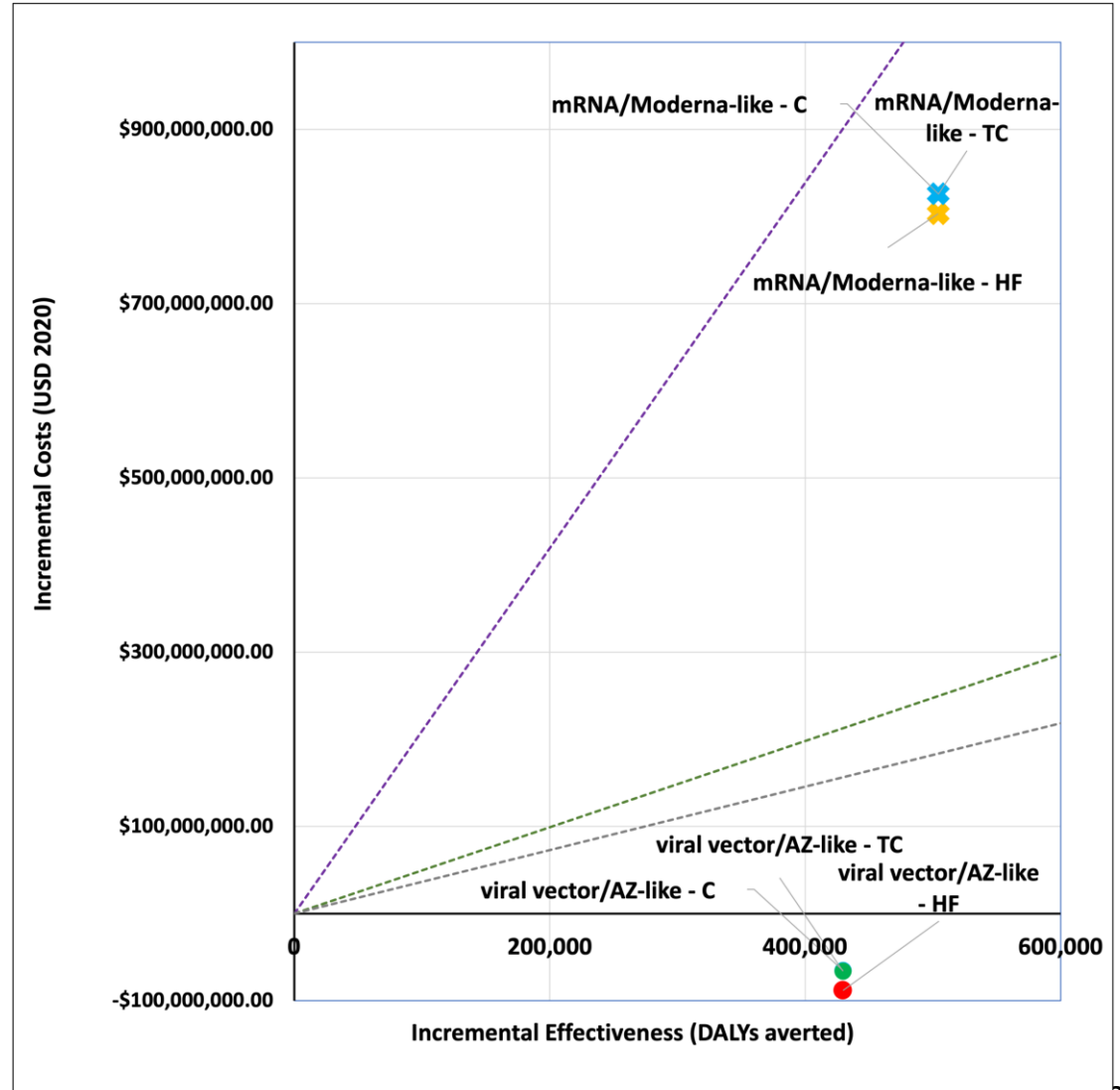
CE thresholds: ---- 1xGDP (US\$ 2097) ---- Ochalek high (US\$ 495) ---- Ochalek low (US\$ 364)

Policy Question 2: How to deliver vaccines?

100% coverage of 50+ yo; vaccine mechanism: infection

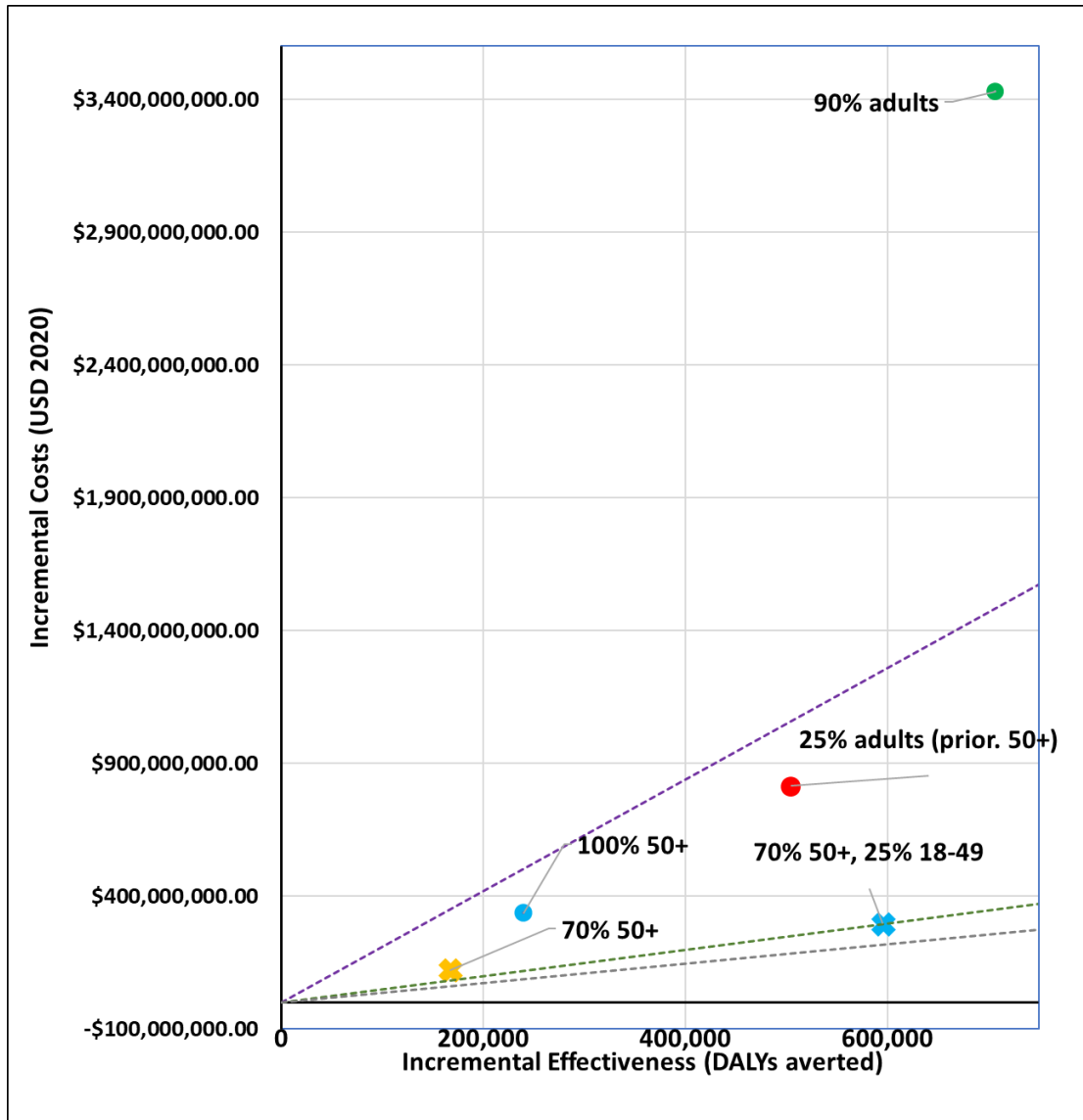


25% coverage of adult population (prioritising 50+ yo, then 18-49); vaccine mechanism: infection

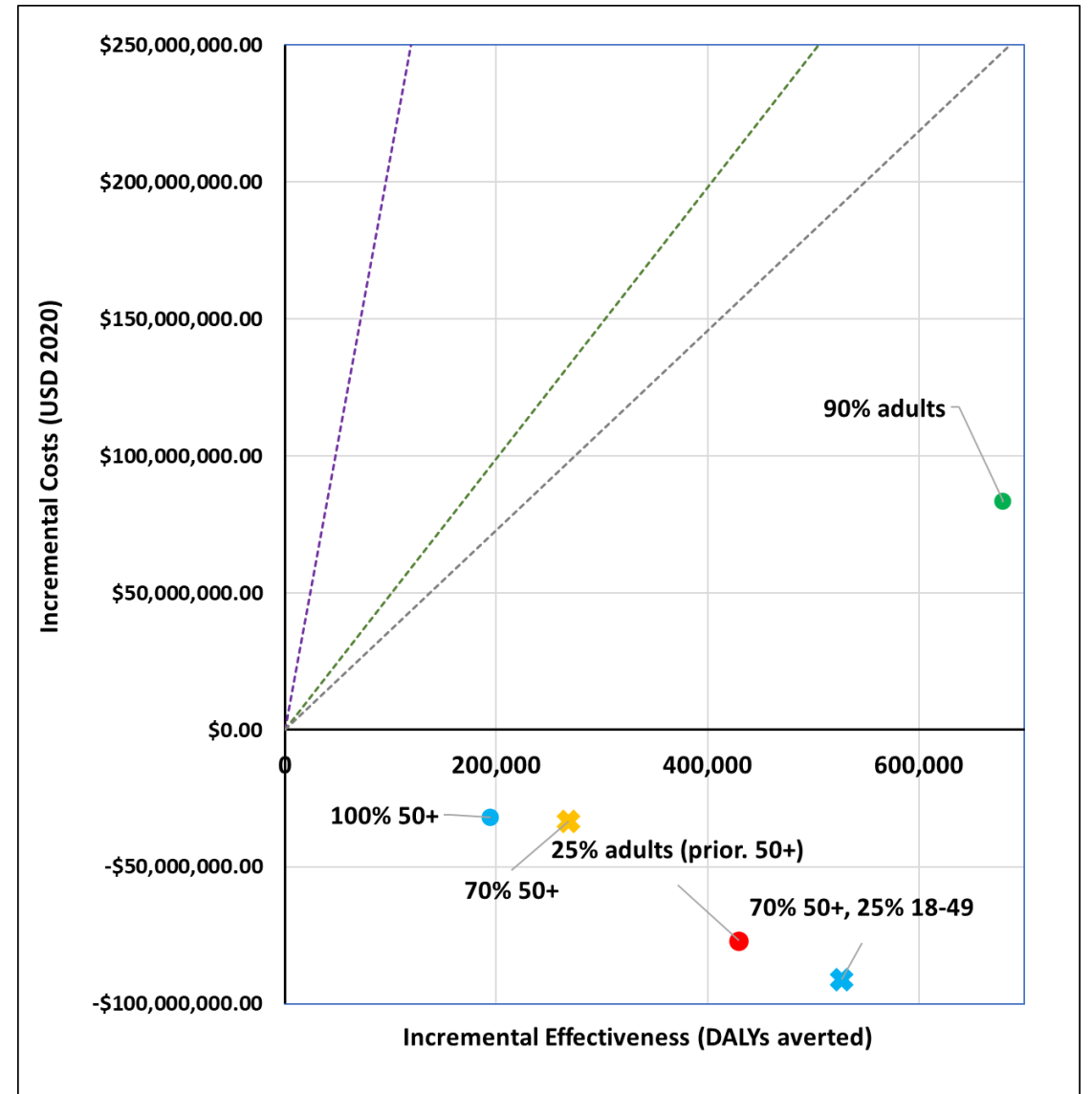


Policy Question 3: Who to vaccinate?

mRNA/Moderna-like; vaccine mechanism: infection



viral vector/AZ-like; vaccine mechanism: infection



CE thresholds: ---- 1xGDP (US\$ 2097) ---- Ochalek high (US\$ 495) ---- Ochalek low (US\$ 364)

Conclusions and Implications

- COVID-19 vaccination for Nigeria is cost-effective and represents good value for money
- The viral vector vaccines (similar to those of AZ and J&J) are the most cost-effective options among the vaccine choices available in Nigeria.
 - Price per dose is driver of CE (should not exceed US\$6 per dose)
 - Variations in efficacy less important than price (key to engage in price negotiations)
- Strategy focusing on 50+ yo and above is likely to be most-cost-effective; but strategies that include vaccine coverage for 18-49 yo could avert 2x more DALYs and would also be cost-effective
 - Broadly confirms government approach pre-HTA
- Delivery mechanism does not appear to change these conclusions
 - A combination of delivery strategies may likely yield higher coverages.

Challenges and approaches to resource use estimation for costing COVID-19 vaccines

Chinyere Okeke

Background

- Ingredients-based costing: Prices x Quantities (P&Qs)
- Estimation of resource use (quantities): essential first step to determine costs of interventions
- Two parts:
 1. Understanding delivery pathways and ‘activities’ (e.g., “vaccines delivered only in first-level health facilities by nurse assistants”)
 2. Quantification of resources (“State X has 1300 first-level facilities and vaccinations delivered two mornings per week by 2 nurses assistants per facility”)
- Need for context-specific cost data
 - Local evidence use > greater likelihood of evidence uptake in policy

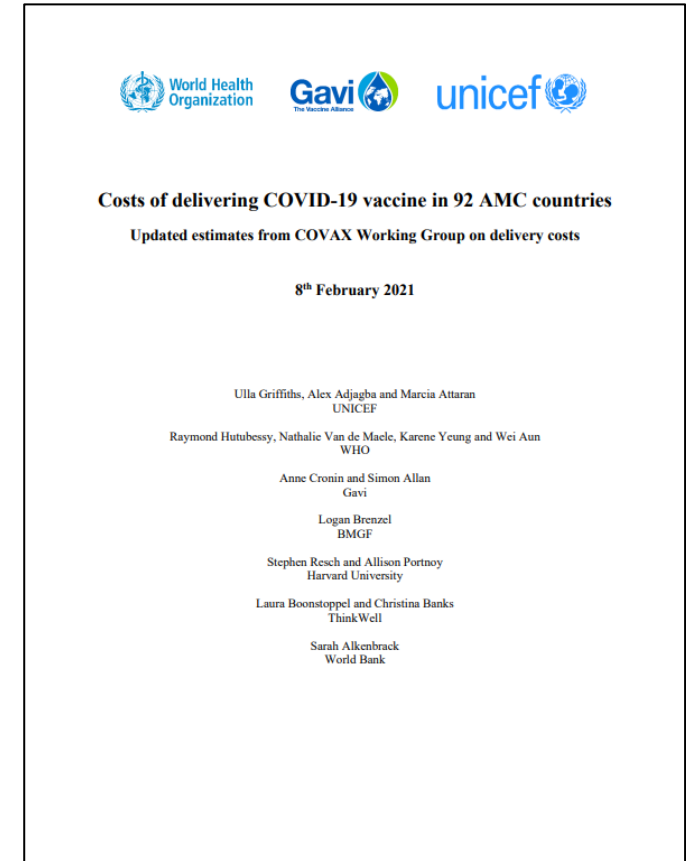
General approach

- Potential sources of resource use data:
 - Primary data collection
 - Often used in economic evaluation (esp. pilot sites/trials)
 - Not feasible in COVID-19 context
 - Transferring data from other settings
 - Risk of variation in health system structure, political contexts and constraints
 - Data rarely disaggregated (difficult to extrapolate)

Approach: Estimation of resource use through iterative process combining literature review, expert elicitation (and some primary data)

1. Defining activities, pathways & ingredients

- Definition of vaccination ‘activities’ from COVAX Working Group estimates
 - 13 cost categories (e.g., training, social mobilization)
- Semi-systematic review for activity descriptions
 - Peer-reviewed and gray literature on vaccine rollout (incl. GAVI applications)
 - Qualitatively descriptions of all activities (often requires review of technical appendices)
 - Preference for Nigeria data (if unavailable, other sub-Saharan African settings)
- Qualitative description of dimensions compiled



1. Defining activities, pathways & ingredients

4	Social mobilization	<p>trainings conducted by a junior level</p> <ul style="list-style-type: none">*Involvement of national and zone-level consultants to prepare messaging and strategy*Community awareness facilitation and events: town criers and local leaders*National TV ads*National radio ads*Health facility flyer and banners <p>Volume per dose : 3.76cm³</p>
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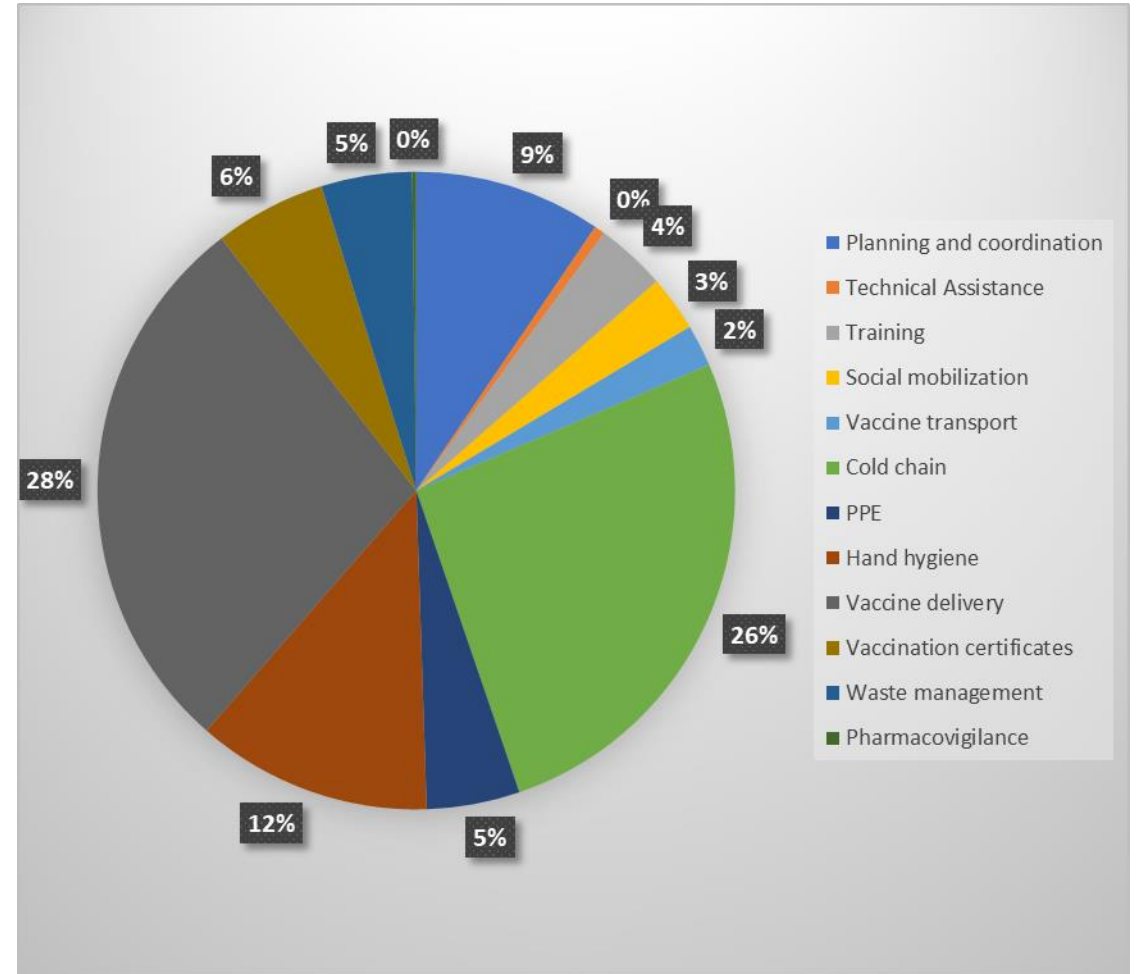
- Review by experts
 - Clinicians
 - Health economists
 - Vaccine logistics
 - Epidemiologists
- Iterative process: several rounds of review + further searches
- Uncertainty about constraints (supply and demand)
 - Explored scenarios of *'reasonable relaxation of constraints'*

2. Resource quantification

- After agreement on pathways, activities and ingredients description > quantification of inputs
 - E.g., How many town criers need to be engaged nationally for demand creation?
- Important to think about scaling factors (variable and fixed costs)
 - *Resources per vaccine delivered*
 - *Resources per day of vaccination per delivery site*
 - *Resources per year at national level planning*
- Data sources: peer-reviewed literature, MoH (and primary sources)
- Constraints included: max number of facilities, health workers, vaccines per day, etc.
- Some relaxation of constraints modelled: some cold chain improvements, transportation capability

Further steps

- Added prices (from MoH accounts + literature)
- Review of cost drivers by input and cost component
 - Plausibility review
- Comparison to similar studies to corroborate



Reflections on process

Strengths

- Context-specific
- Feasible under pandemic constraints
- Relatively rapid (~2 months)

Weaknesses

- Lack of validation of data
- Hard to quantify constraints (and resources needed to relax them)
- Difficulties with high number of scenarios and vaccine types

Identifying stakeholders and pathways to support HTA evidence uptake

Benjamin S.C. Uzochukwu

Background

- HTA in Nigeria in nascent stage
- To ensure evidence uptake in HTA > essential to involve key stakeholders in the conceptualization of research
- Studies suggest that adequate engagement of key stakeholders in evidence generation leads to increased research uptake
- Context: Produce cost-effectiveness evidence, based on local data and answering locally-relevant questions, to feed into HTA process

Aims and Methods

Aims

- To outline the processes to identify COVID-19 vaccine stakeholders involved in the selection, approval, funding, procurement and roll-out of vaccines in Nigeria
- To describe the process routes identified to support uptake of HTA-related information for evidence-informed policy in Nigeria.

Methods

- i) Informal discussions with key stakeholders
- ii) Stakeholder mapping, analysis and engagement using a power/interest grid framework
- iii) Communication and dissemination strategies for HTA relevant evidence produced

1. Informal discussions with stakeholders

- FMoH approached research team at University of Nigeria Nsukka in December 2020
- Need to produce local evidence on the relative cost-effectiveness of different COVID-10 vaccines in Nigeria
- Informal discussions were held with the Minister of Health, the Nigerian Center for Disease Control (NCDC) and the National Primary Health Care Development Agency (NPHCDA) on the requirements and scope of evidence needed

2a. Stakeholder mapping

- We identified an initial set of influential stakeholders (n=12) based on knowledge of vaccine selection, approval, funding, procurement and roll-out in Nigeria (from a range of backgrounds):

Government agencies and actors

- Presidential Steering Committee
- Federal Ministry of Health
- Nigeria CDC
- National (and sub-national) PH Development Agency
- National FDA and Control
- Legislators

Non-government partners

- Nigeria Medical Association
- Development partners

Mixed groups

- Ministerial Advisory Committee on COVID-19
- Nigeria Group Immunisation- Technical Advisory Group
- National COVID-19 Vaccine Introduction Technical Working Group

2b. Stakeholder analysis and engagement

3 Step Approach

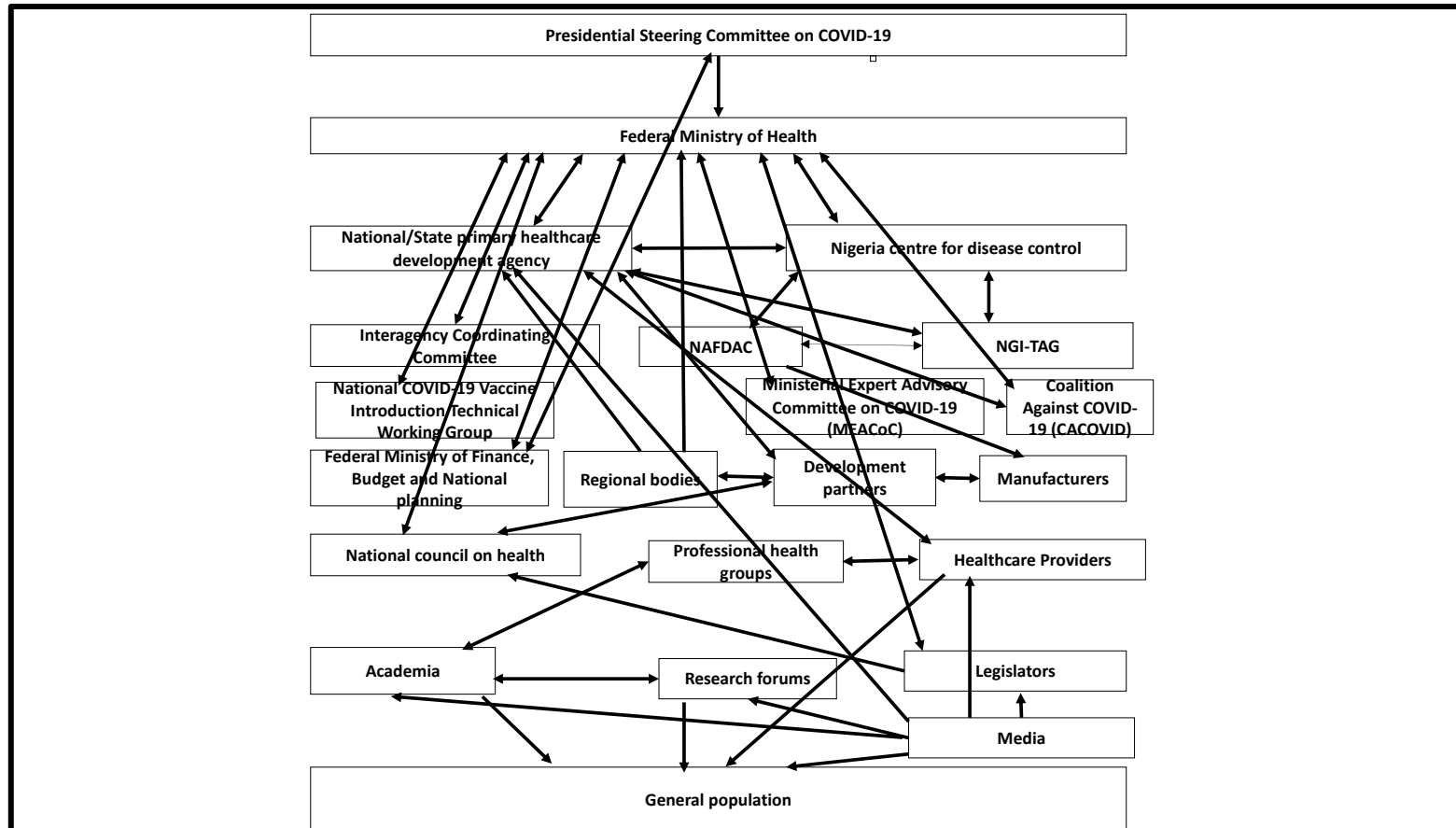
- Identify groups and individuals (the stakeholders) relevant to the policy issue of focus (COVID-19 vaccines)
- Determine the current position and interest (i.e., support or opposition) of each stakeholder on the issue
- Determining the relative power of each stakeholder on the issue

To define the power/influence authors relied on knowledge of the stakeholder's organisations and informal discussions with other stakeholders

3. Communication and dissemination to support uptake of evidence

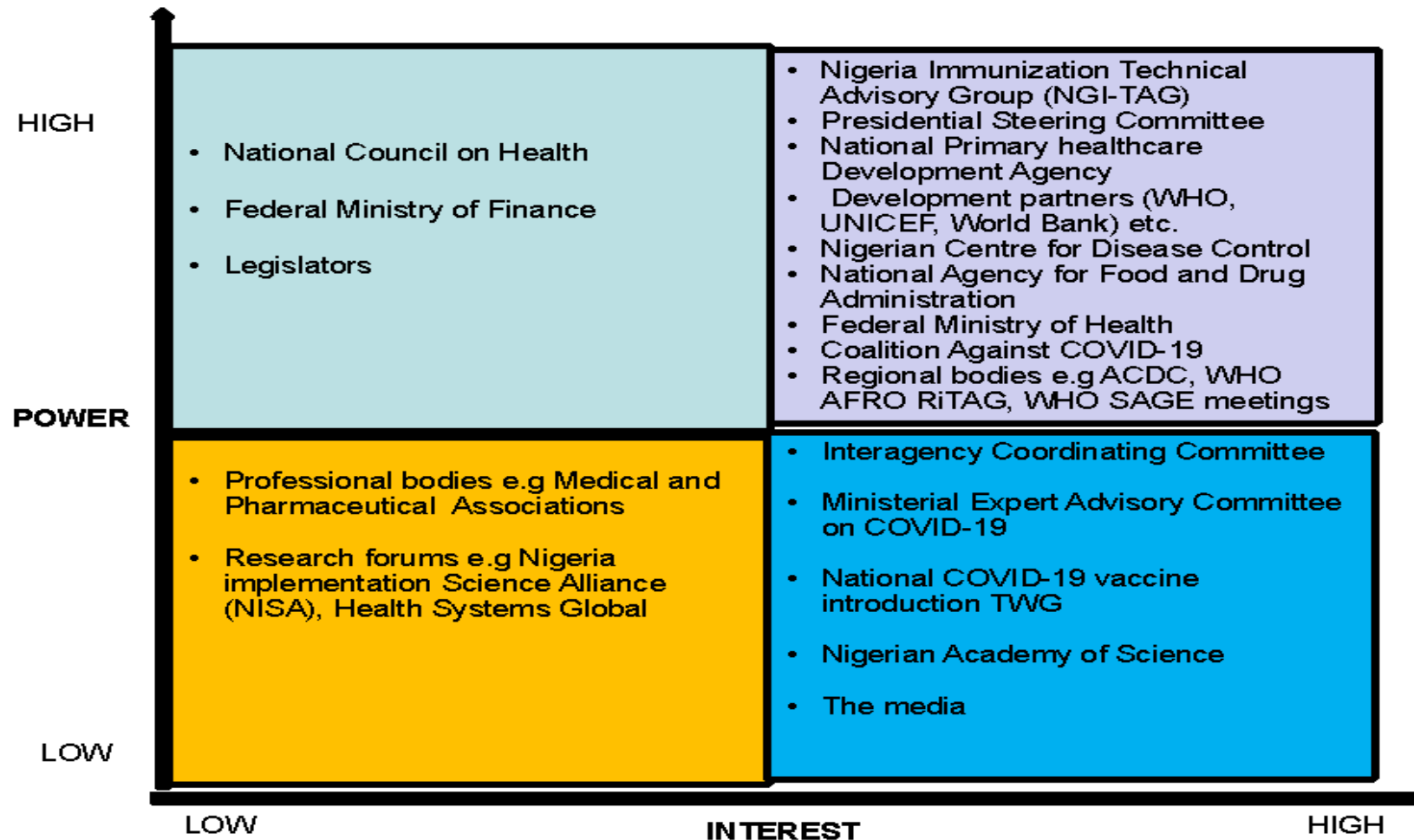
- Involvement of relevant policy makers in the project from inception
- Research link established between the LSHTM-Nigeria research team and Africa CDC
- Input from Nigerian policy makers (and Africa CDC) was sought, incl. key policy questions to support decision making in vaccine selection, approval, funding, procurement and roll-out activities.
- Input important in determining whether policy questions could be addressed with modelling tools available
- Continued discussions with policy makers at the FMOH through dissemination process

Results: Stakeholder mapping



Interaction of stakeholders involved in decision-making on vaccine procurement.

Results: Stakeholder dynamic



Power/Interest grid of COVID-19 vaccine selection, approval, funding, procurement and roll-out in Nigeria

Results: Policy Questions

**Informal discussion
with key stakeholders
generated six initial
policy questions**

1. Which COVID-19 vaccines should be bought?
2. How much of each vaccine should be bought?
3. What is the maximum price to pay for each specific vaccine?
4. What is the best way to deliver vaccines (e.g., fixed post at health facilities, campaigns, targeted campaigns)?
5. Which enabling interventions can best support vaccination?
6. How much funding can and should be allocated to support uptake and address vaccine hesitancy, and to which groups (e.g., young people, ethnic minorities, women, certain religions, those from socially deprived backgrounds)?

Results: Policy Questions

Further discussions with policy-makers yielded three suitable policy questions for analysis:

1. Which Covid-19 vaccines should be bought and what is the maximum price to pay?
2. What is the best way to deliver the vaccines?
3. What is the cost and cost-effectiveness of vaccinating people aged 18–49 years?

Intervention	COVID-19 vaccination, specifically the use of the following vaccines: Oxford/Astra-Zeneca and Johnson & Johnson Moderna & Pfizer-BioNTech
Comparator	No vaccination scenario
Perspective	Health system
Delivery mechanisms	<ul style="list-style-type: none">● Health Facility (HF)● Campaign (C)● Targeted Campaign (TC)
Age groups	All adults, 50+, 18-49 year olds
Coverage	25% to 100%

These three policy-relevant questions were further expanded by the researchers through an interactive and consultative process into the context specific decision problem. This was used as the basis for modelling the cost-effectiveness of the selected vaccines.

Results: Communication and dissemination plan to support uptake of the HTA evidence

Full HTA report presented to the Minister of Health and PSC on COVID-19

Production and distribution of policy briefs and blogs

Presentation at the NCH meetings (highest decision-making body on health)

Policy dialogues with decision-makers in the FMOH, FMOF, NCDC, NPHCDA, NHIS, NGI-TAG, PSC.

Co-production: preparation of peer-reviewed articles and blogs (as necessary) in collaboration with members of the team and policy-makers

Presentation at the national and international conferences

Results: Communication output and dissemination

- Targeted dissemination for different stakeholders
 - Peer-reviewed papers, blogs, conference presentations
 - Full reports for agencies making decisions
 - Policy briefs for policy makers

Key links

Policy brief: <https://www.cgdev.org/sites/default/files/understanding-cost-effectiveness-covid-19-vaccination-nigeria.pdf>

Blog: <https://www.cgdev.org/blog/price-priorities-pace-three-factors-drive-cost-effectiveness-covid-19-vaccination-strategies>.

Peer-reviewed paper: <https://doi.org/10.1371/journal.pgph.0001693>

Conclusions

- Evidence-to-policy framework requires engaging stakeholders throughout the process (from formulating policy questions to the final dissemination of results)
- High interest/high power stakeholders had most influence in process
- To inform decision-making processes and support any future pandemic response, researchers and policy makers in Nigeria and Africa need more direction on stakeholder participation approaches when utilising HTA

Reflections

- COVID-19 vaccine decisions have not driven institutionalisation of HTA
 - Likely due to emergency nature, lack of time to build capacity and excessive information from international sources
 - Need to leverage experience of other African settings (e.g., Ghana)
- Difficulties with timelines when reviewing evidence in emergency situations
 - Government chose types of vaccines ordered before HTA completed
 - But HTA results shaped/confirmed policies on delivery method and to age prioritization
- Early targeting stakeholders of high interest/high power in HTA activities and dissemination can influence uptake of findings
- Use of local evidence crucial in ensuring evidence use
- Normative, ingredients-based estimates of resource use (even if unvalidated) may be preferable for HTA than evidence from other settings
 - Such approaches are rapid and feasible; greater bottleneck may be epidemiological model estimates

Thank you!



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