Vaccine Impact Modelling Consortium (VIMC) **Health Economic Modelling**

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Vaccine Impact Modelling Consortium

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- VIMC is an international community of modellers providing high-quality estimates of the public health impact of vaccination, to inform and improve decision making.

VIMC background

- The Vaccine Impact Modelling Consortium (VIMC) comprises 22 modelling groups on 11 diseases, with its secretariat based at Imperial College London
  - Funded by the Bill & Melinda Gates Foundation, Gavi, the Vaccine Alliance, and the Wellcome Trust
- Core aims by 2027:
  - To provide reliable and accessible estimates of vaccine impact across the Gavi portfolio
  - To address critical modelling related vaccine policy questions raised by stakeholders who will be dynamically engaged in our work
  - To translate the Consortium's modelling to real world policy that improves health outcomes
  - To foster a diverse international community of vaccine impact modelers, inclusive of modelers in low- and middle-income countries (LMICs)
  - To provide training in infectious disease modelling and its application to vaccine preventable diseases for both modelers and policymakers

VIMC project working groups

VIMC project working groups aim to answer discrete,

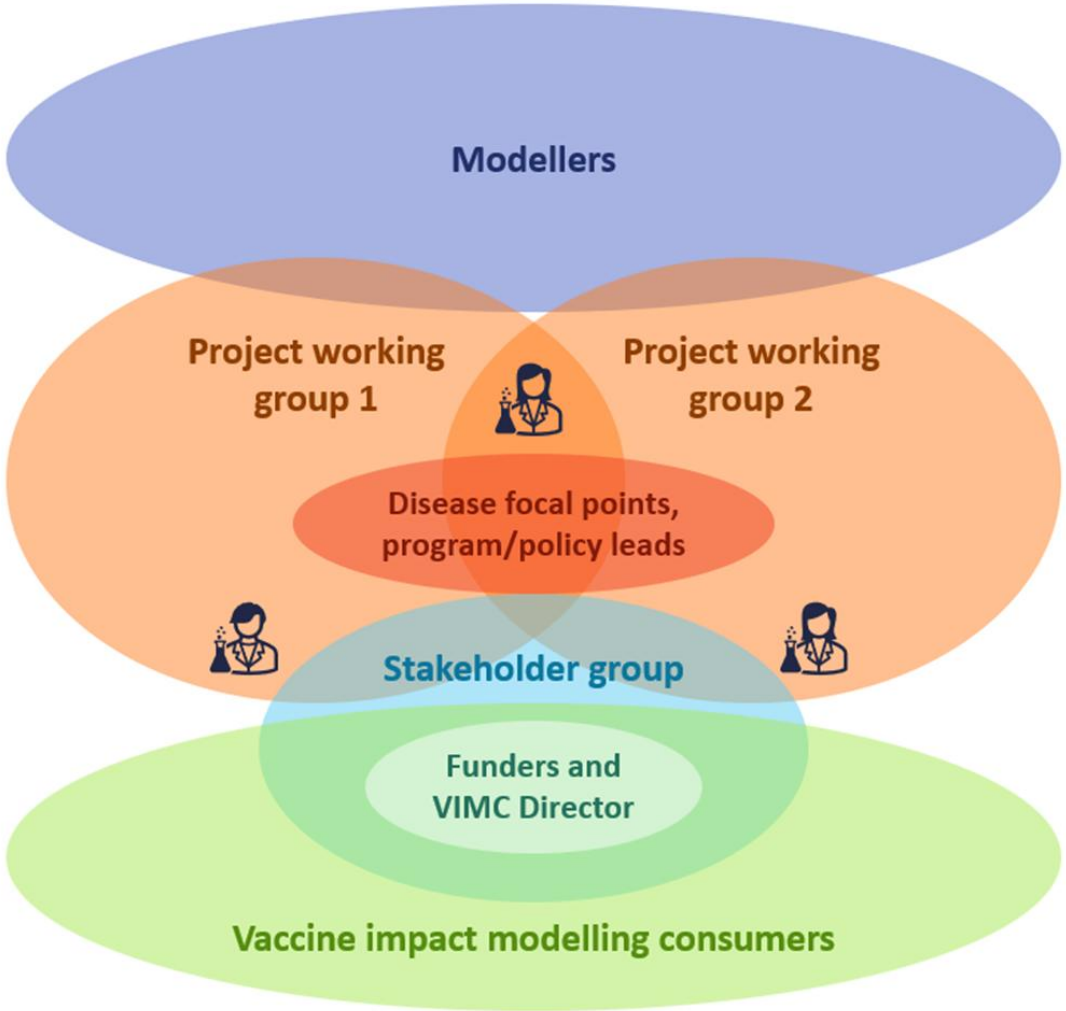
policy-relevant questions

in collaboration with a

diverse range of engaged stakeholders

then translate and disseminate results to create

real-world health benefits.



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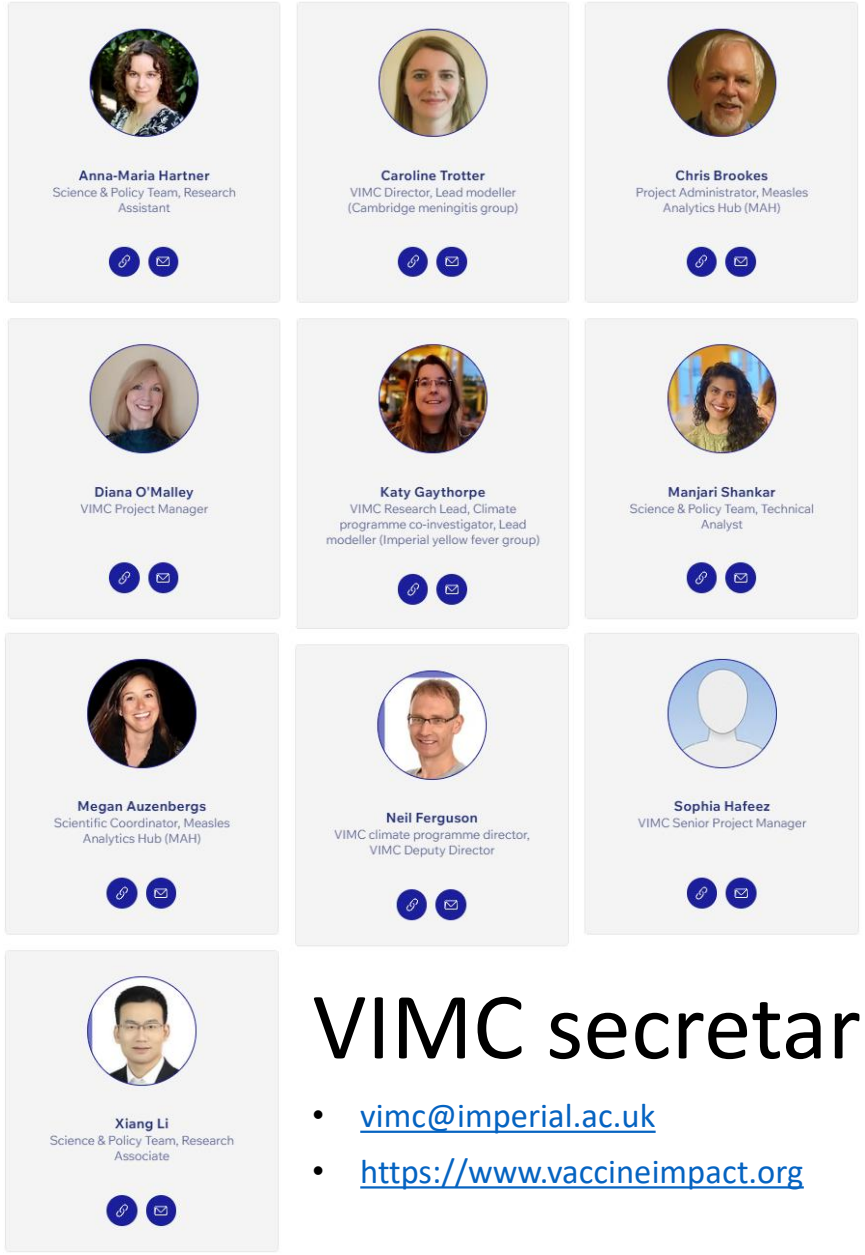
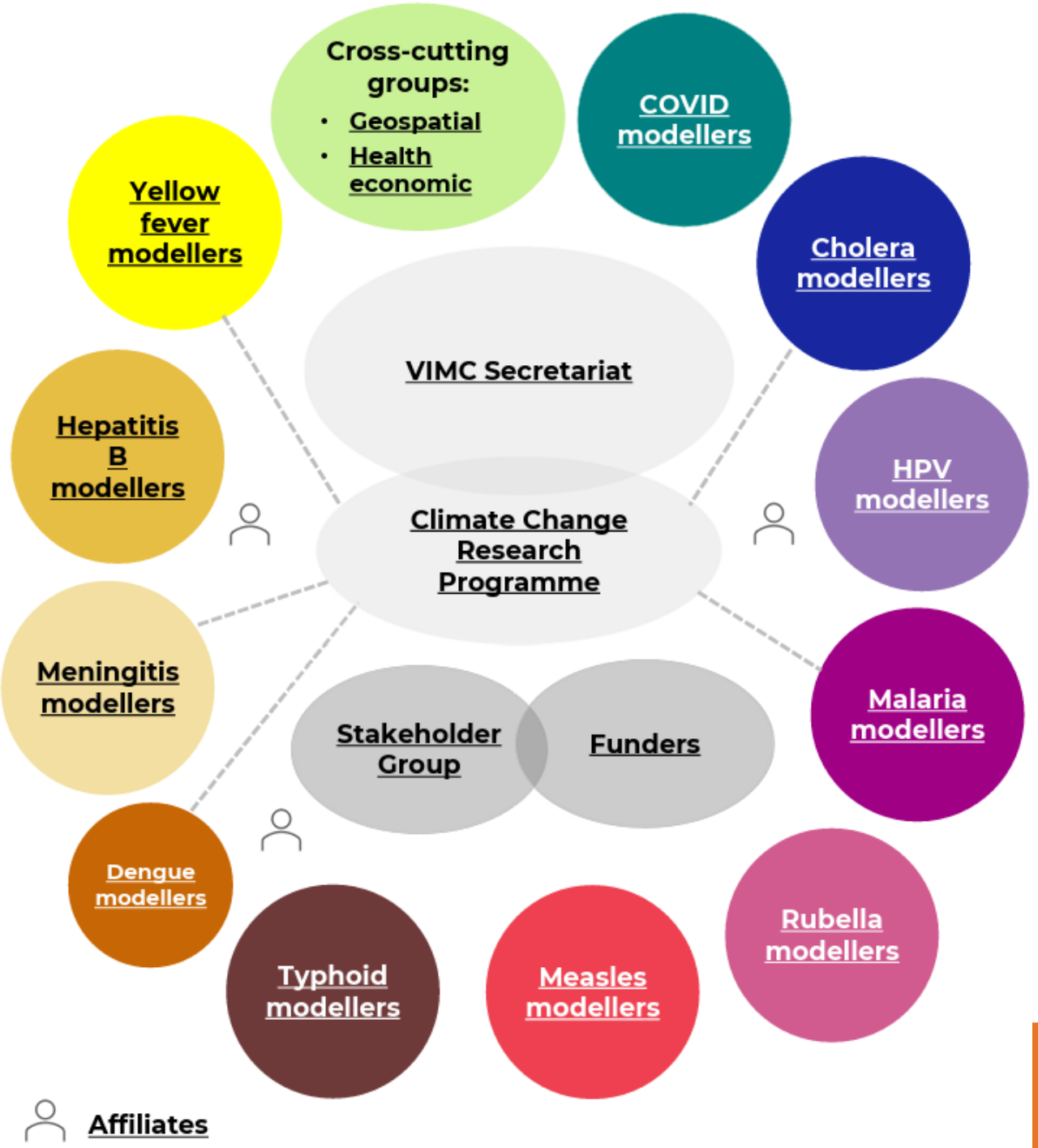
VIMC network and opportunities

- We have an affiliate scheme where early career researchers can join our network, join a buddy system with other early career researchers, join our webinars and apply to join our VIMC-wide meetings
- We have fellowship opportunities where researchers can visit VIMC modelling groups for an extended period (1–2 months) and have reciprocal visits
- We have a short course (next in 2026) where we teach infectious disease modelling with a focus on vaccination for a week
- We release RfPs for other modelling questions and groups



VIMC secretariat

- vimc@imperial.ac.uk
- https://www.vaccineimpact.org



VIMC New Workstreams

- VIMC has established four new workstreams as of June 2025
  - Expanding Outbreak Vaccine Response Impact Framework
  - Vaccine Prioritization and Country-Level Estimates
  - **Supporting Health Economic Modelling**
  - Impact of Catch-Up Vaccination

VIMC health economic modelling – efforts so far

- **Sep 2023**
  - health economics breakout session held during VIMC annual meeting (Hampshire, UK)
- **Nov 2024**
  - health economics working group formed
- **Jan 2025**
  - initial survey administered to VIMC members
- **Apr 2025**
  - support for health economic modelling concept note finalized
  - one modeler per VIMC antigen identified to lead disease-specific efforts (‘antigen lead’)
- **Jun 2025**
  - presentation for consortium feedback during VIMC annual meeting (Accra, Ghana)

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Proposed approach for supporting health economic modelling in VIMC

- What minimally sufficient information and functionality in VIMC models is needed to conduct health economic analyses
  - Consideration: provide a foundation of relevant outcomes for Gavi, Gates, other stakeholders
- **Phase 1:** costing estimates
  - consortium-standardized: led by Health Economics Project Working Group
  - disease-specific: led by antigen leads and modelling teams
- **Phase 2:** further development with limited additional effort
  - cost-effectiveness analysis (incremental cost-effectiveness ratios)
  - cost-benefit analysis (return on investment)
  - budget impact analysis

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Cost-effectiveness analysis (CEA)

- Metric: can be estimated as **cost per death averted** or **cost per DALY averted** using
  - VIMC health impact estimates (already generated – cases, deaths, and DALYs averted by vaccination)
  - Cost estimates (to be added)
- Perspective: health system or societal
- Payer: given full health system costs estimated, later information and decisions regarding proportion covered by individual payers (e.g., government, patient, Gavi) could be assumed and applied for analyses
- Time horizon: as relevant to specific disease, but can be assessed through 2100 by all VIMC models
- Impact: assessment could be calendar year, year of vaccination, or birth cohort
- Discounting: functionality to discount both costs and health gains
  - ➢ As long as this functionality is included, later decisions regarding a standardized assumption could be assumed and applied for analyses
    - (e.g., 3% for costs and 0% for health gains per WHO economic evaluation guidelines)

Approaches for cost-benefit analysis (CBA)

- Only additional assumption beyond CEA is a monetization of health gains
- **Net Monetary Benefit (NMB)** = *health benefit * CE threshold – (net cost of vaccination)*
  - Costs from societal perspective
  - Health benefit in terms of DALYs averted

net cost of vaccination =
vaccination costs – treatment costs averted by vaccination

- **Net Health Benefit (NHB)** = *health benefits – (net cost of vaccination / country-specific estimate of health opportunity cost to avert a single DALY)*
  - Costs from societal perspective
  - Health benefit in terms of DALYs averted
- **Return on Investment (ROI)** = NMB / cost of vaccination
  - Full cost of vaccination program
  - Outcome in terms of net monetary benefit per $1 invested in vaccination
- Later decisions regarding CE threshold definition (e.g., multiples of GDP per capita, country-level opportunity cost thresholds) could be standardized and applied for analyses

Budget impact analysis (BIA)

- With costing estimates, we could further estimate the budget impact of vaccination
  - ➢ primarily to inform the short-term impact on country budget needs, e.g., for future Gavi transition

Phase I costing work

- To include full costs in each perspective (health system and societal)
- To include disease-specific efforts that leverage expertise of VIMC modelling teams
- Health system perspective
  - vaccine costs
  - health service costs
- Societal perspective
  - health system perspective costs
  - patient/caregiver non-medical costs
  - patient indirect costs
  - productivity costs
  - indirect health service costs

Vaccine costs

- *vaccine price, supply costs, recurrent delivery costs (labor, social mobilization, monitoring & evaluation for vaccine safety, surveillance), introduction costs (social mobilization, training, program planning, monitoring & evaluation for vaccine safety, surveillance), wastage rate*
  - ➢ May be necessary to differentiate between social mobilization, monitoring & evaluation, and surveillance costs that are one-time introduction costs (to expand the vaccine program with a new vaccine) versus those that are recurrent
- Would likely involve a set of standardized assumptions across VIMC models
  - ➢ **AP is currently developing an update to PharmacoEconomics 2020 paper**

Health service costs

- *Specific to health services provided in the diagnosis and treatment of each disease*
  - could differ by health facility level and/or severity level
  - including costs borne by all payers, e.g., Gavi, country government, patient
- Healthcare access: base-case assumption of 100% healthcare access (all individuals requiring treatment receive treatment)
  - Additionally, aim for individual modelling teams to propose a realistic scenario assuming prevalent levels of healthcare access
- Individual VIMC teams would review literature using a standardized protocol (in development) to determine cost and care-seeking assumptions
  - Technical assistance for extrapolation of limited data to all VIMC countries can be provided by Health Economics Working Group

Patient/caregiver non-medical costs

- *Transportation to/from medical visit(s), cost of food/accommodation purchased while traveling to a health facility*
- Could be **disease-specific** or **standardized** across VIMC models

Patient/caregiver indirect costs

- *Income reported lost during treatment*
- Could be **disease-specific**
- **Alternatively**, could be measured as opportunity cost for seeking or being in care that is a valuation of time lost for patient and household members throughout disease episode with standardized assumptions across VIMC models

Productivity costs

- *Productivity loss due to premature death or long-term disability*
- Would likely involve a set of standardized assumptions across VIMC models, assuming per-capita GDP as proxy of productivity

Indirect health service costs

- For some pathogens, there may be a relevant indirect cost consequence of another disease/pathogen to consider
  - e.g., ART costs in the case of TB (not a current VIMC pathogen)

Extensions to non-VIMC pathogens

- All standardized costing efforts would apply to impact analyses of non-VIMC pathogens, as needed, but new efforts (beyond proposed scope) would be required for any disease-specific cost estimation
- This would also require future discussion to determine appropriate methods and sources/data, but could support analyses such as Immunization Agenda 2030

Question for the audience

- Should we consider additional outcomes or analytic frameworks for this initial scope of work?
- Any other feedback?

Thank you

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