Knowledge exchange for developing a framework to assess the prevention potential across four major risk factors

Carl Michael Baravelli, Researcher
Ingeborg Forthun, Researcher

2nd European Workshop on Burden of Disase
18th of September 2026, Berlin

NIPH
Norwegian Institute of Public Health

Questions for discussion

1. **Which tools or frameworks for public health decision-making should we learn from?**
2. **What are the strengths and weaknesses of our proposed system, its design and overall approach?**
3. **How can we assess the impact of interventions on social inequalities?**
4. **What is the best format – app, interactive calculator, report or other? How much simplification and uncertainty is acceptable?**

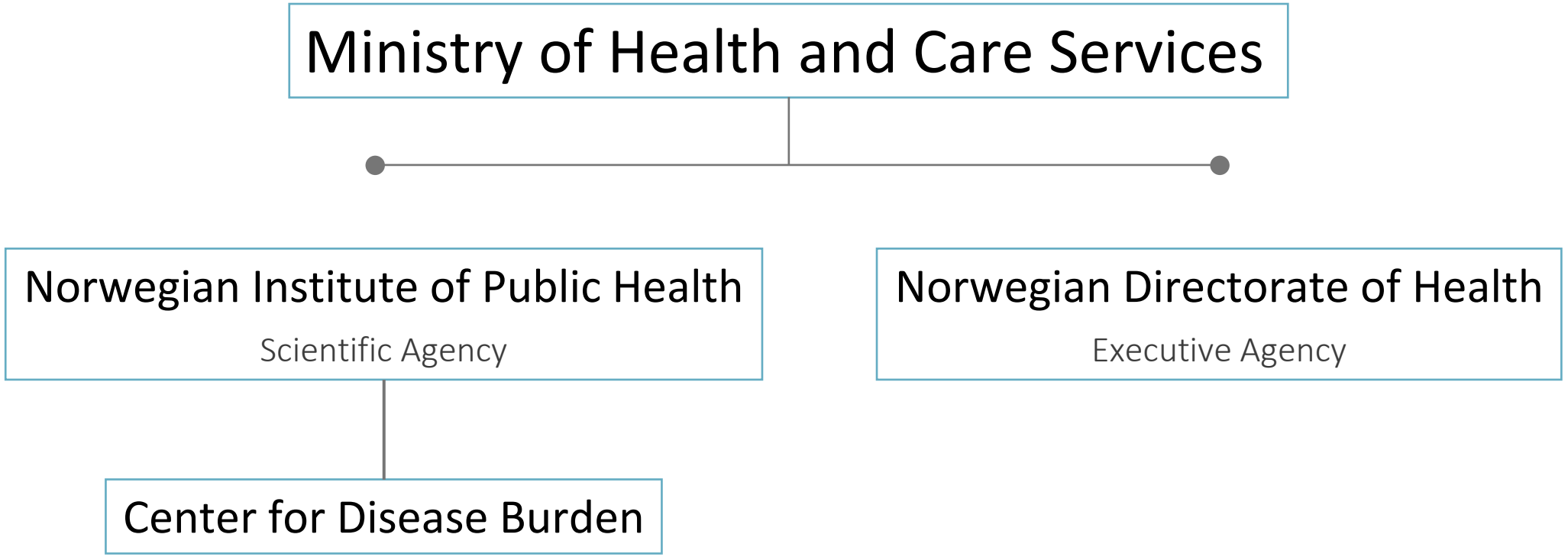
Overview of the assignment

- Develop a framework for assessing and comparing the prevention potential of interventions targeting smoking, alcohol use, unhealthy diet and low physical activity
- The framework should support evidence-informed prioritisation by combining:
  - Burden of disease
  - Intervention effectiveness
  - Societal costs
  - Effects on health inequalities

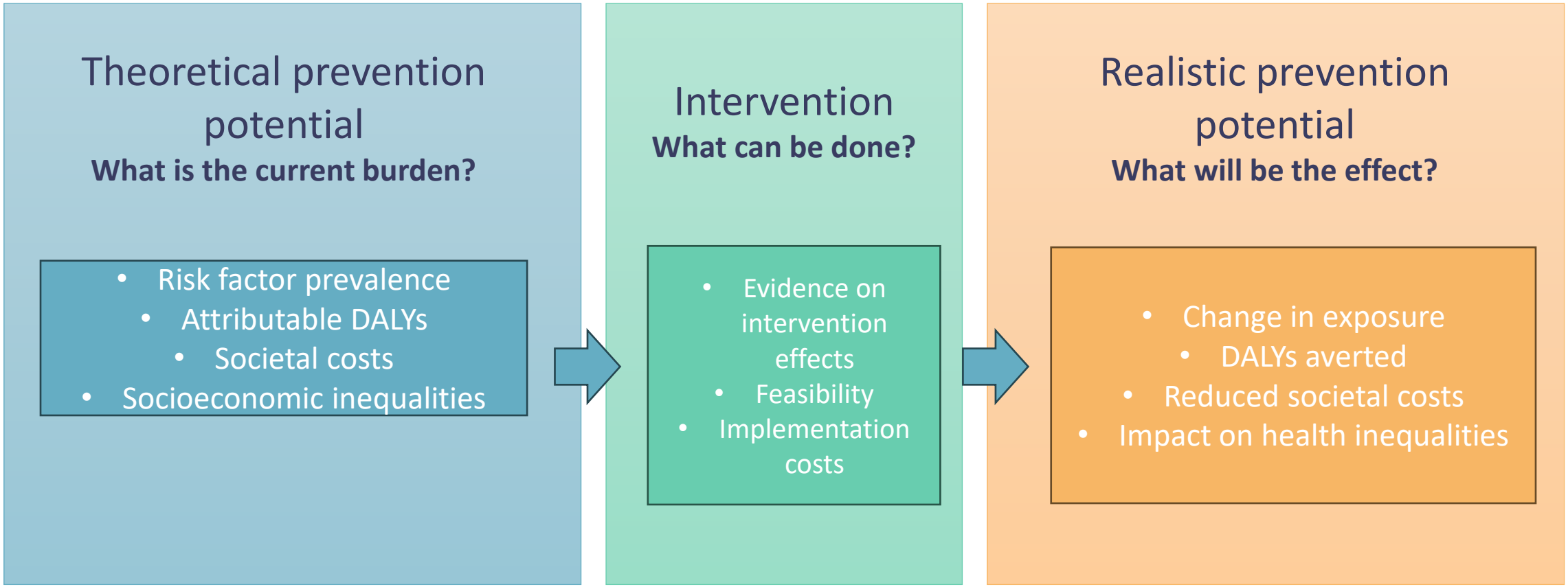
The long-term ambition:
An interactive decision-support tool that allows users to explore how alternative interventions may affect disease burden, costs and health inequalities.

NIPH

Who are we?


Ministry of Health and Care Services
Norwegian Institute of Public Health
Scientific Agency
Norwegian Directorate of Health
Executive Agency
Center for Disease Burden

The key challenge



NIPH

Phase 1
- Define the problem and goals

Phase 2
- Identify relevant interventions

Phase 3
- Estimate intervention effects

Phase 4
- Assess, compare and recommend

NIPH

Phase 1: Describe the problem and set goals

What must be quantified – and the data each step requires

What needs to be assessed	Data required
Risk factor exposure Levels and trends for tobacco, alcohol, diet and physical activity	Norwegian population exposure data, by age, sex and socioeconomic group
NCD burden Incidence, prevalence, mortality and trends	GBD estimates; Norwegian registry and survey data on NCDs
Attributable burden Share of burden attributable to each risk factor, by socioeconomic group	Relative risks and exposure distributions → population attributable fractions (PAFs) - by age, sex and socioeconomic group
Societal costs Health care costs, productivity loss and monetised health loss	Health care expenditure, productivity loss, value of a statistical life (VSL) / life-year

Goal: reduce NCD morbidity, mortality and attributable burden – and the associated societal costs

NIPH

Phase 1: Key challenges

Access to exposure data

- Norwegian surveys are high quality but hard to harmonise in near real time
- GBD exposure estimates are not public - available (maybe) on request
- Public Summary Exposure Values are risk-weighted and hard to interpret

Gaps in GBD risk–health outcome pairs

Physical inactivity	Only 5 outcomes; evidence base from GBD 2013 – burden likely underestimated
Diet	~44 pairs; ultra-processed food not included as a dietary risk
Smoking	Broadest outcome set, but some well-evidenced outcomes not modelled
Alcohol	Harm to others and fetal alcohol spectrum disorders outside the framework; dementia evidence strengthening

Within GBD's own framework, coverage is broad for diet, smoking and alcohol (Burden of Proof). Most gaps are outcomes that fall outside the GBD cause list or comparative risk assessment structure.

NIPH

Behavioural risk factors and socioeconomic gradients

Exposure gaps define prevention potential – but GBD does not report burden by socioeconomic group

Smoking

Higher in lower socioeconomic groups

Unhealthy diet

Higher in lower socioeconomic groups

Physical inactivity

Higher in lower socioeconomic groups

Alcohol

Frequency higher in higher SE groups; episodic drinking higher in lower SE groups

Two ways to estimate socioeconomic differences in attributable burden

Option A: Downscale GBD estimates

Split GBD burden totals across groups using Norwegian socioeconomic gradients

+ Feasible; covers all GBD causes and risks; consistent with GBD totals
– Modelled estimates of modelled data; does not capture socioeconomic differences in the GBD PAF (exposure proportion)

Option B: Group-specific burden and PAFs

Estimate burden and PAFs directly from aggregated Norwegian registry and survey data

+ Captures socioeconomic differences in exposure; grounded in Norwegian data
– Resource-intensive; limited to risk factors with good Norwegian data

Phase 2: Identify and describe relevant interventions

What needs to be considered for each candidate intervention

- **Expected effect on exposure**
- **Strength and relevance of the evidence**
- **Feasibility and implementation costs**
- **Target population and health inequalities**

Examples of intervention types

Tobacco

- Taxes
- Standardised packaging
- Smoke-free areas

Alcohol

- Taxes and pricing
- Limits on availability
- Marketing restrictions

Diet

- Product reformulation
- Front-of-pack labelling
- Menu calorie labelling

Physical activity

- Active transport
- Physical activity in schools
- Workplace initiatives

Key challenge: Lack of evidence on effect on DALY, and in a Norwegian context

Phase 3: Estimate the realistic impact of an intervention



Intervention

Exposure change

Disease-specific effects

DALYs

Costs and distributional effects

Health care costs, production loss, and effects across socioeconomic groups

Key challenge: time lags and competing risks between exposure change and health outcomes

Current approach: counterfactual reference

Example: Directorate of Health estimate of the societal costs of smoking

What it does

- Estimates the societal costs of smoking: health loss (DALYs), production loss and health care costs in 2021
- Combines GBD data with the Directorate's national cost estimates

Key challenges

- No explicit intervention is evaluated
- Focuses on attributable burden, not realistic prevention potential
- Does not estimate when health gains would occur if no one smoked nor who would benefit

Helsedirektoratet · report, February 2026

Samfunnsøkonomiske kostnader ved røyking – kostnadsanslag for 2021 basert på oppdatert metodikk

Societal costs of smoking – cost estimates for 2021 based on updated methodology

helsedirektoratet.no

Costs of cancer associated with smoking

Part of the problem description – an illustrative calculation for Norway for 2021

NOK 33.9 bn

Health loss

34 551 cancer DALYs attributed to smoking (GBD) × NOK 0.98 million per DALY

+

NOK 3.5 bn

Health care costs

Smoking-attributable share of specialist and primary care, prescriptions, nursing care

+

NOK 4.4 bn

Production loss

Smoking-attributable share of sickness absence, disability and premature death

=

NOK 41.8 bn

Total costs

Health loss + health care costs + production loss

Share of total costs



Percentages rounded

Note: health loss dominates, so the value assigned per DALY largely drives the total

Phase 4: Overall assessment and recommendations

Combining health and socioeconomic evidence into a basis for decisions

Health gains of interventions
NIPH

+

Socioeconomic impact of interventions
Norwegian Directorate of Health

→

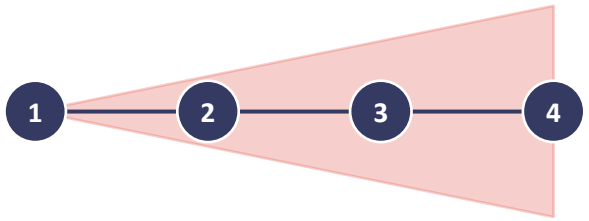
Overall assessment
Health and socioeconomic prevention potential → recommended interventions

How do we make it available?

Report (PDF)
Methods, assumptions and full results

Calculator / app
Test interventions and assumptions; see effects on burden and costs

How do we communicate uncertainty without overwhelming?



Uncertainty accumulates across Phases 1–4 – not only in burden estimates

Ranges and scenarios rather than single numbers

Confidence rating and key assumptions for each estimate

Direction of bias stated where uncertainty cannot be quantified

Layered detail: headline → ranges → technical appendix

Pragmatic principle: a transparent estimate with its uncertainty is more useful for policy than no estimate

Existing calculators and forecasting tools

Useful for modelling risk factor scenarios – but not specific interventions

Australia

Health Interventions Impact Calculator (HIIC)

University of Melbourne (SHINE programme)

Input: Change in disease rates or exposure; timing, target group, cost

Output: HALYs, deaths averted, health costs, income

shine-hiic.com

Sweden

NCDSim

Public Health Agency of Sweden, Swedish Cancer Society, Swedish Heart-Lung Foundation

Input: Future prevalence of 8 risk factors

Output: Cancer and CVD cases, deaths and costs

GitHub (open source)

Norway

Food4HealthyLife

University of Bergen

Input: Sustained change in food group intake

Output: Life expectancy gained

food4healthylife.org

Global, incl. Norway

GBD Tobacco Forecasts

IHME / GBD 2021 Tobacco Forecasting Collaborators

Input: Three fixed smoking prevalence scenarios

Output: Deaths and YLLs by cause, age and sex, to 2050

IHME VizHub

What our system also needs

Specific intervention
Effect of e.g. a tax or regulation – and on social inequality

What existing tools model

Change in exposure
Scenario defined by the user or model

Health and economic outcomes
Burden, mortality, costs

Challenge: a calculator is one component of the system – it cannot by itself identify the best intervention

Example: Health Intervention Impact Calculator

2.5% reduction in BMI to TMREL, both sexes, 25-44 years, Australia



Source: IHME GBD Tobacco Forecasts; GBD 2021 Tobacco Forecasting Collaborators, Lancet Public Health 2024

Reference
Current trends continue

Elimination by 2050
Steady decline to 5% prevalence

Elimination by 2023
0% from 2023 – the maximum

What it shows

- User-defined scenario: size, target group, timing and cost
- Cumulative HALYs gained, cumulative deaths averted over 20 years, total spent – by age group
- Built for Australia; wider coverage announced

Questions for discussion

1. **Which tools or frameworks for public health decision-making should we learn from?**
2. **What are the strengths and weaknesses of our proposed system, its design and overall approach?**
3. **How can we assess the impact of interventions on social inequalities?**
4. **What is the best format – app, interactive calculator, report or other? How much simplification and uncertainty is acceptable?**