



*Department of Population Health*

# INCORPORATING EQUITY INTO QUANTITATIVE HEALTH POLICY ANALYSES

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# Background

- Health disparities and inequities are an increasing concern
- Terminology can be confusing
  - Disparity is difference between subgroup and referent group
    - +/- value judgment that the difference is unfair
  - Inequality is difference between specified subgroups
  - Inequity = differences between specified subgroups + value judgment that differences are unfair
    - Typically because disadvantages are compounded
- Inequities extend across many axes and dimensions
  - Socioeconomic status (SES)
  - Race/ethnicity
  - Community

# Background

- Population Health
  - Definition: The health outcomes of a group of individuals, including the distribution of such outcomes within the group.
- Yet population health metrics only reflect health in aggregate
  - Life-years, Quality-adjusted life-years, Disability-adjusted life-years, Years of Life Lost
- Population health metrics
  - Do not reflect distribution of health
    - Magnitude of dispersion
    - Whether dispersion compounds other disadvantages
  - Do not inform policy regarding disparities, equality, or equity

# Background

- Cost-effectiveness Analysis (CEA) enables a policy maker to maximize population health gains given existing resource constraints
  - Important method for population health research and policy
    - Minimize HIV incidence by 2030 in Zimbabwe
    - Minimize COVID-related deaths in NYC through end of year
    - Maximally reduce overdose death rates in Connecticut next year
- CEA methods reflect health gains in aggregate
  - Do not reflect magnitude of dispersion
  - Do not reflect whether dispersion
    - Compounds existing inequalities
      - The healthy get healthier more rapidly than the unhealthy get healthier
    - Compounds existing inequities
      - Higher SES people get healthier more rapidly than lower SES people unhealthy get healthier

# Background

- Researchers in UK recently started applying a 50-year-old economics tool to incorporate valuation of health equity into CEA
  - Atkinson Index
- Economics abounds with inequality indices that quantify the magnitude of dispersion
  - Although most were developed to assess wealth inequality, they can be applied to other fields and domains
  - **The Atkinson Index stands out because it incorporates a value judgment about the fairness of that dispersion**
  - **Therefore suited to incorporating equity into quantitative health policy analyses**

# Background

- Atkinson Index is a function of
  - Total Quantity + Dispersion of that quantity + Value judgment regarding how bad dispersion is
    - That value judgement is quantifiable parameter labeled “Inequality Aversion”
  - More “inequality aversion” → dispersion is valued more negatively
  - Less “inequality aversion” → dispersion is valued less negatively
- In addition to “inequality aversion” the other unfamiliar idea invoked by the Atkinson Index is “Equally Distributed Equivalent” (EDE)
  - EDE = The quantity of a resource (e.g., money, health), which if distributed equally in a hypothetical scenario, would be equivalently valued to its existing unequal distribution
    - More inequality aversion → EDE is lower (greater decrement compared to unadjusted value) → requires a greater increase in aggregate quantity to offset
    - Less inequality aversion → EDE is higher (lesser decrement compared to unadjusted value) → requires a lesser increase in aggregate quantity to offset

## Illustration: Inequality aversion

- Suppose you could choose which society you prefer:
  - Society A: Everyone lives to age 85.
  - Society B: Lower SES people live to age 80, higher SES people live to age 90
- In both societies, the average lifespan is 85.
- If you prefer Society A, you have some inequality aversion.
  - Sometimes difficult to disaggregate from risk aversion.
- How strong is your inequality aversion?

## Inequality aversion: Illustration

- Now change the societies you wish to choose between:
  - Society A: Everyone lives to age 85.
  - Society B: Lower SES live to 84.5, higher SES to 90.



## Inequality aversion: Illustration

- Now change the societies you wish to choose between:
  - Society A: Everyone lives to age 85.
  - Society B: Lower SES live to 84.5, higher SES to 90.
- If you prefer Society A, your inequality aversion is high ( $\epsilon > 100$ )

# Inequality aversion: Illustration

- Again, change the societies you are choosing between:
  - Society A: Everyone lives to age 85.
  - Society B: Lower SES live to 80.5 years, higher SES live to 90 years.

## Inequality aversion: illustration

- Again, change the societies you are choosing between:
  - Society A: Everyone lives to age 85.
  - Society B: Lower SES live to 80.5 years, higher SES live to 90 years.
- If you prefer Society B, your inequality aversion is low ( $\epsilon < 2$ )

# Empirically assessed inequality aversion

- $\epsilon \approx 10$  in survey of British general public
  - Corresponds to indifference between everyone living to 85 vs. low SES living to 82 & high SES living to 90
- $\epsilon \approx 3-6$  empirically assessed in Canadian general public
- Not yet empirically assessed in United States general public

Robson, M., Asaria, M., Cookson, R., Tsuchiya, A., & Ali, S. (2017). Eliciting the level of health inequality aversion in England. *Health Economics*, 26(10), 1328-1334.

# Correspondence with principles of distributive justice

- Egalitarianism (Equal distribution most highly valued) or Maximinism (Share of distribution allotted to the worst-off is most highly valued)
  - Greater inequality-aversion
  - EDE-adjusted quantity has large decrement compared to unadjusted quantity
  - If low SES live 84.5 years and high SES live 90.0 years
    - Unadjusted LE is 87.25 years but EDE-adjusted LE is 85 years
- Utilitarianism (Equal distribution not valued; only total amount matters)
  - Lesser inequality-aversion
  - EDE-adjusted quantity has small or no decrement compared to unadjusted quantity
  - If low SES still live 84.5 years and high SES still live 90.0 years,
    - Unadjusted LE remains 87.25 years but EDE-adjusted LE now 87 years
- Prioritarianism (economists and ethicists apply this differently)
  - Intermediate inequality-aversion

# Calculation of EDE

$$EDE_{Atkinson} = \bar{H} \cdot \left[ \sum_i \left( \frac{H_i}{\bar{H}} \right)^{1-\varepsilon} f(x_i) \right]^{1/(1-\varepsilon)}$$

$\bar{H}$  is the mean level of health for the entire population.

$H_i$  is the level of health for subgroup  $i$ .

$\varepsilon$  is the Atkinson inequality aversion parameter.  
• The greater the value, the greater the aversion to inequality.

$f(x_i)$  is the proportion of the population in subgroup  $i$ .

- If we analyzing a benefit (lifespan, income):  $EDE_{Atkinson} < \bar{H}$ 
  - We would “sacrifice” some average benefit to have a more equal society
- If we are analyzing a harm (disease burden):  $EDE_{Atkinson} > \bar{H}$ 
  - We would “tolerate” some average harm to have a more equal society

# Applications to HIV (work in progress)

- When evaluating alternative policy options or formulating Quality Improvement goals
  - Compare EDE-adjusted as well as unadjusted outcomes
  - Use levels of inequality aversion corresponding to covariance of
    - HIV-related health burden and race/ethnicity
    - HIV-related health burden and socioeconomic status
    - Inequality aversion parameters likely between 3 and 11
  - Often will impact resource allocation guidelines and cost-effectiveness analysis results
    - Averting 100 HIV infections in disparity-impacted subgroup and 200 infections in non-disparity-impacted subgroup will NOT be equivalent to averting 300 infections
    - Depending on level of inequality-aversion, would be equivalent to averting between 200 and 300 infections
    - More resources would be allocated to disparity-affected subpopulations
- Additional research needed to learn more about levels of inequality aversion in U.S.



**THANK YOU**

