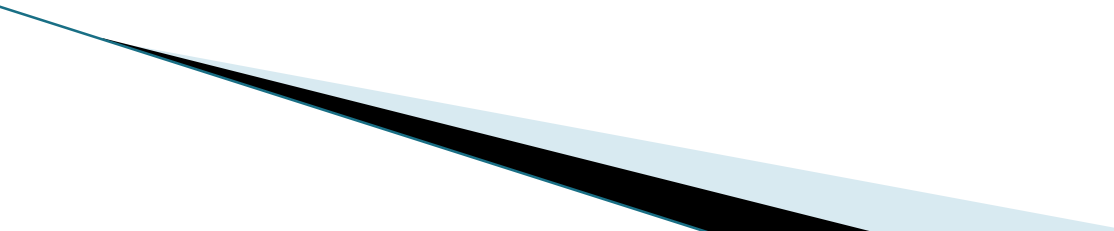


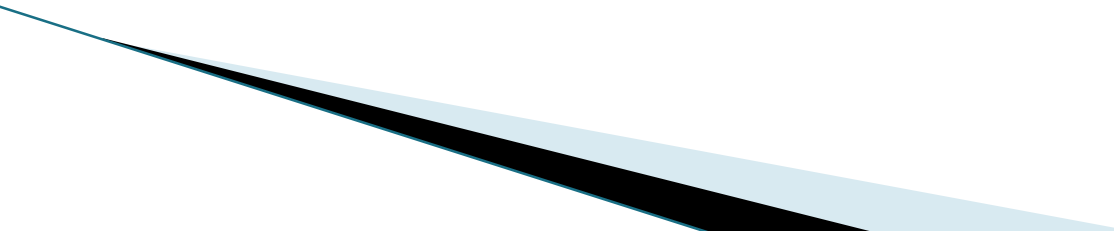
**Equity in health (and health
care): the Economist's
perspective
Michel Grignon**



Outline

- ▶ General framework: equity versus efficiency, equity as efficiency
 - ▶ Normative theories of equity (Economic or not): the underlying social planner's utility function
 - ▶ Measuring (in)equity:
 - (1) Gini as a social planner
 - (2) Equity of what: contribution, access, or health?
 - (3) Convenient estimator, convenient software
- 

General framework

- ▶ Economists follow lexicographic preferences when evaluating distributions:
 - A “distribution” is a “who gets what and in which quantity”
 - 1st determine all efficient distributions (maximize sum of utilities), 2nd pick the most equitable among those efficient distributions.
 - One consequence is: do not waste resources (that have societal utility) in order to make the distributions of outputs more fair.
- 

Example 1: pills for pain relief

- ▶ Two individuals, 48 pills available
- ▶ A and B similar in all respects except metabolism:
 - A needs 3 pills to gain 1 hour of pain relief, B needs only 1
- ▶ Efficient distribution maximizes pain relief in society:
 - Give B 24 hours (24 pills), leaves 8 hours (24 pills) to A
 - Is it equitable?
- ▶ How much should we waste to be equitable?
 - $4H = 48$, or 36 pills for A and 12 for B (both get 12 hours)
- ▶ Let us vote: who prefers efficiency, who stands for equity?

Example 2: pills, pain relief, and cigarettes

- ▶ Two individuals, 48 pills available
- ▶ A and B similar in all respects except that A smokes and B does not. **As a result:**
 - A needs 3 pills to gain 1 hour of pain relief, B needs only 1
- ▶ Efficient distribution maximizes pain relief in society:
 - What is it? Is it equitable? How much should we waste to be equitable?
 - Let us vote: who prefers efficiency, who stands for equity?

Efficiency vs Equity

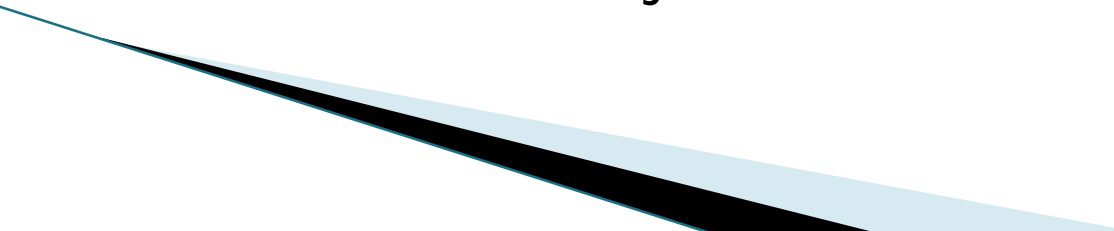
- ▶ What makes a difference in our votes in these 2 distributions is the role of decision versus situation (or rationality versus cosmic catastrophe)
- ▶ James Duesenberry: “economics is all about how people make choices; sociology is all about how they don’t have any choices to make.” (1960, p. 233)
- ▶ Choice → Efficiency 1st; No choice → Equity 1st
- ▶ (*Free to choose vs Free to lose*)



PAUL
NOTH

*“Henceforth, we steal from the rich and provide incentives
to help the poor steal for themselves.”*

Equity as Efficiency

- ▶ Health and health care are not standard goods
 - ▶ Cosmic catastrophe more likely, rational choice less relevant
 - ▶ Equity can trump efficiency
 - Equity is NOT altruism (preference for redistribution, glow effect)
 - Culyer (1980): “The whole point of making a judgement about justice is so to frame it that it is (and can be seen to be) a judgement made independently of the interests of the individual making it”
 - ▶ Equity is allocating scarce resources in order to maximize an objective function that reflects principles
- 

Normative theories of equity: the social planner's utility function

Two individuals (or two groups)

One scarce resource to distribute: resource is in finite quantity

Production possibility frontier: technical constraints on the distribution (how much of the resource to take away from B to increase A's allocation by one unit? Previous case: 1 to 3)

Social planner's utility function (or Social Welfare Function): given by a contour or iso-utility locus. All distributions yielding the same level of utility for society

Social planner strictly reflects society's utility. Society does not care who is who: interpersonal preferences based on principles.

Normative theories of equity: the social planner's utility function (2)

Social planner's utility represented by a straight line: utilitarianism (individuals are perfect substitutes)

Utilitarianism with unequal weights: desert
If social planner's function represented as convex toward the origin: individuals are complements for society. Improving B's allocation cannot compensate 1 / 1 A's mistreatment

Normative theories of equity: the social planner's utility function (3)

Extreme convexity = egalitarianism, A and B must receive the same R in order to maximize the social planner's utility. Equal weight : equality of health. Different weights: equality of opportunity (disadvantaged individuals are compensated - e.g. More educated individuals receive less care than low educated ones for illnesses that depend on lifestyle choices, such as lung cancer)

Normative theories of equity: the social planner's utility function (4)

Process-based approaches to equity

1) Constraining the possibility space: process rather than outcomes theories of equity

Example (graph): utilitarianism with unequal weights and constraints on minimal decent level of health for both

Binding: optimum is not where preference line is tangent to PPF

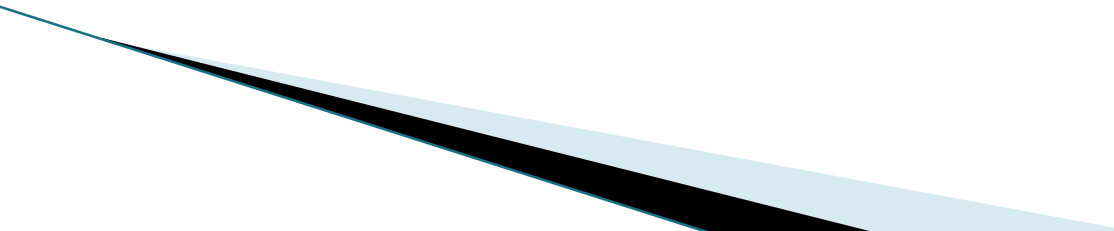
Normative theories of equity: the social planner's utility function (5)

Process-based approaches to equity (2)

2) Constraining the PPF (lower level): among all feasible distributions only those that satisfy a given constraint such as equal rights (libertarianism), equal access (Mooney, Le Grand), no-envy (Varian), or participatory democracy (Habermas) –

These theories are usually utilitarian (beyond the restriction on the PPF).

Conclusion Normative theories

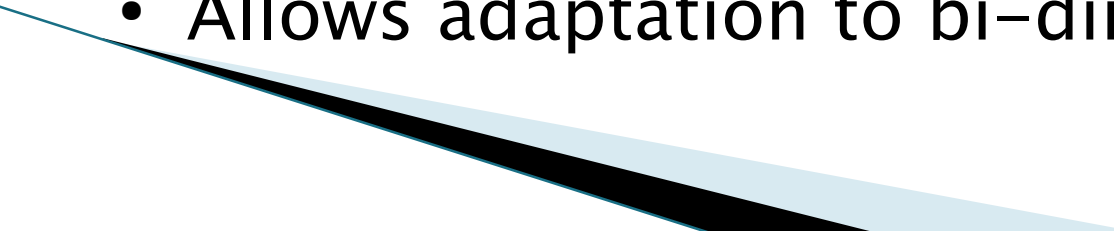
- ▶ Different conceptions of what ought to be deemed equitable
 - ▶ Each conception can be linked to a specific social welfare function
 - ▶ When measuring inequity: important to know the underlying social welfare function.
- 

Gini as a social planner

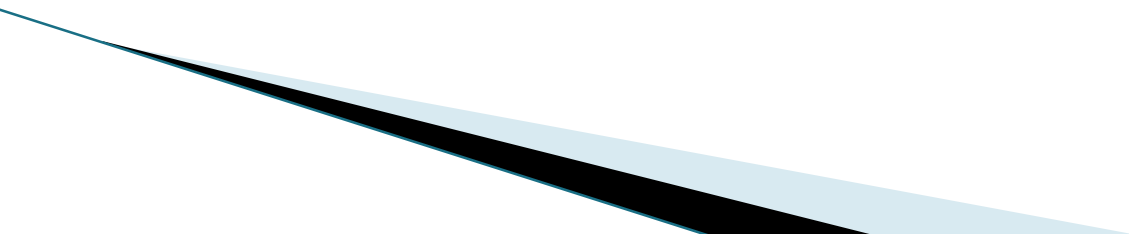
- ▶ Quantitative measures of inequity based on concentration indices
- ▶ Concentration: what proportion of the resource (good health, health care use) is in the hand of the P% who rank lowest on the classification variable
- ▶ Example 1:
 - resource = classification variable (Gini index). Typically, concentration of income: what proportion of total income in the hand of the 10%, 20%, 30% etc. poorest?
 - If answer is 1%, 3%, 7%, distribution of income is concentrated among the rich

Why concentration index?

Standard inequality measures are statistical (range, relative mean deviation, variance, coefficient of variation, Stdev of log), informational (Theil), or explicitly welfare-based (Atkinson: quantity of income needed to reach same level of welfare if equal distribution).

- However, Concentration only one that involves the rank
 - Allows adaptation to bi-dimensional measures
- 

Where does it land us?



Corrado Gini – 1884–1965.

Demographer and statistician, author of the
“Scientific Basis of Facism”, 1927



X-related concentration of Y

Income-related concentration of health or health care utilization:

What proportion of total ill-health (e.g. dummy variable indicating being in poor health) falls on the P% poorest?

Ranking individuals according to variable X (here, income, from poorest to richest) and calculate the share of the total variable Y (here, ill-health in society) that “belongs” to each proportion of lowest ranks of X

Why does it matter?

Because Gini is one of those measures that cannot provide a total ranking of distributions – contrary to an Atkinson « equivalent income » measure, Gini fails when Lorenz curves intersect

$A = 1 - e_l/\mu$, e_l such that $U(e_l)\mu = SW(\text{distribution})$

But it is the only bi-dimensional (because ranking plays a role)

The underlying social welfare

- ▶ Gini Index = twice the area between diagonal and green dashed curve
- ▶ Or, $1 - 2 * \text{AreaB}$
- ▶ Discrete distribution – individuals ranked by h (1 for poorest, n for richest): Lorenz is defined as

$$L\left(\frac{h}{n}\right) = \frac{\sum_{i=1}^h x_h}{n\mu}$$

► The area B is therefore:

$$\begin{aligned} \sum_{h=1}^{n-1} \frac{1}{2} (L(h) + L(h+1)) \left(\frac{h+1}{n} - \frac{h}{n} \right) &= \frac{1}{2n^2\mu} \sum_{h=1}^{n-1} \left(\sum_{i=1}^{h+1} x_i + \sum_{i=1}^h x_i \right) \\ &= \frac{1}{2n^2\mu} \sum_{h=1}^{n-1} 2 \sum_{i=1}^h x_i + x_{h+1} = \frac{1}{2n^2\mu} \left(\sum_{h=1}^{n-1} 2(n-h)x_h + \sum_{h=1}^n x_h - x_1 \right) \end{aligned}$$

Since $2(n-h) = 0$ for $h=n$ and with the convention that $x_1 = 0$ this can be rewritten as:

$$G = 1 - 2B = \frac{\sum_{h=1}^n nx_h - \sum_{h=1}^n (2(n-h) + 1)x_h}{n^2\mu} = \frac{\sum_{h=1}^n (2h - n - 1)x_h}{n^2\mu}$$

- ▶ Re-ranking in descending order (richest becomes 1st): $k = n+1-h$, or $h = n+1-k$ and $2h-n-1$ becomes $2n+2-2k-n-1 = n-(2k-1)$ and the Gini can be re-written as:

$$G = \frac{\sum_{k=1}^n (n - (2k - 1))x_k}{n^2\mu} = 1 - \frac{\sum_{k=1}^n (2k - 1)x_k}{n^2\mu}$$

The underlying social welfare

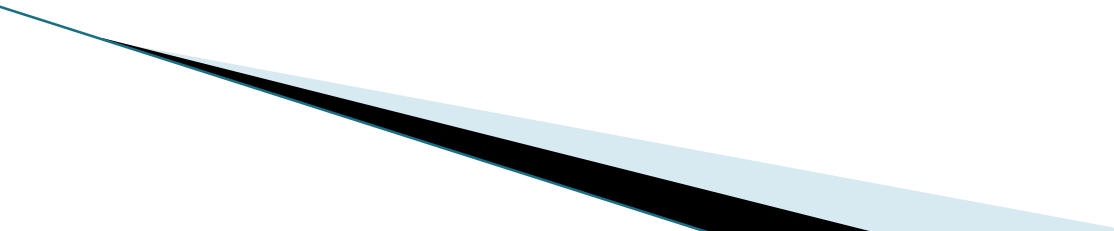
- ▶ Basic assumption: society cares for efficiency and equity in a complementary way; for a distribution h (h_1, h_2, \dots, h_n) in a pop'n with n members:
 - $F(h) = \mu(h)(1 - I(h))$ (if $I = 0$, perfect equality, welfare is the mean; if $I = 1$, perfect inequality, society is unhappy no matter how high the mean is)
 - Gini is one specific index for I (with k descending rank):

$$G = 1 - \frac{\sum_{k=1}^n (2k-1)x_k}{n^2\mu} = 1 - \frac{F(h)}{\mu(h)}$$

Underlying social welfare (2)

- ▶ Gini index is a measure of relative rather than absolute inequality
- ▶ Starting from situation where 90% worse-off have 0 and 10% better-off have 1 we move to a situation where 80% worse-off have 0 and 20% better-off have now 1
- ▶ If you believe inequality has increased (more rich get 1) – absolute inequality is your concern
- ▶ If you believe inequality has decreased, relative inequality is your concern.

Underlying social welfare (3)

- ▶ Given that $n^2 = \sum(2i-1)$, the underlying $F(h)$ is the sum of values of the concentration variable (h that belongs to each individual i) weighted by $(2i-1)$, i the descending rank according to the classification variable
 - ▶ Tolerance for inequality (as a matter of societal principles, not individual preferences):
- 

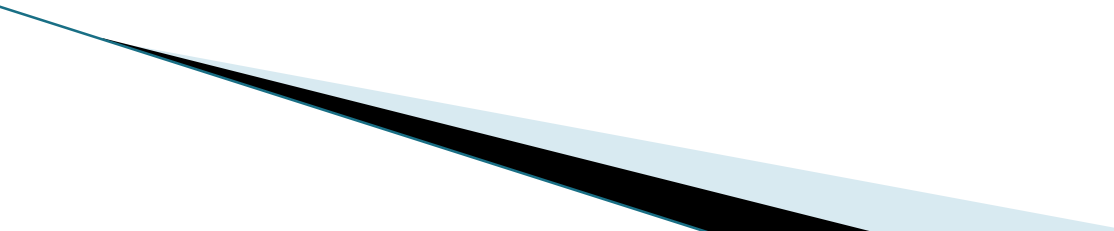
Underlying social welfare (4)

- ▶ Any concentration index is based on two assumptions regarding the SWF
(beside $F = \mu(1-I)$)
- ▶ Assumption #1 = additivity: if $h \{p.t\} h'$ then $(h+h'') \{p.t\} (h'+h'')$
- ▶ Assumption #2 = Principle of health transfer: a transfer of health from better off to worse off (in health) does not reduce F provided ranks are not affected

Underlying social welfare (5)

- ▶ Additivity might be violated in real life situations: in a poor country, planner might prefer $(0.5;0.1)$ to $(0.3;0.3)$ since at least 0.5 is in decent health. But $(0.8;0.8)$ will be preferred to $(1.0;0.6)$.
- ▶ Health transfer raises an issue of multi-dimension assessment of fairness (if healthiest is poor, is it still Okay?)

Measuring (in)equity in health

- ▶ Assume we agree to use concentration-type methods for outcome-oriented measures of inequity
 - ▶ Assume further that we want to measure income-related inequity in health
 - ▶ Remaining question is: Inequity of what?
 - Financing (contribution)
 - Access
 - Utilization of health care services
 - Health (outcomes)
- 

Inequity of what?

- ▶ Financing – no one should jeopardize consumption because of health care spending
 - Concept of catastrophic spending
 - Different from contribution according to ability to pay (redistributive objective)
- ▶ Issues are:
 - what proportion of income spent on health is “catastrophic”? (Bundorf and Pauly)
 - What if individuals cut on health care?

Inequity of what? (2)

- ▶ Inequity of Access: preferred option for economists (feasible set, not choices or behaviours)
- ▶ Definitions:
 - Def1 (Mooney, 1983): Same (money and time) price
 - This is a supply side definition. Issue: does not guarantee equal access across income levels

Inequity of access (2)

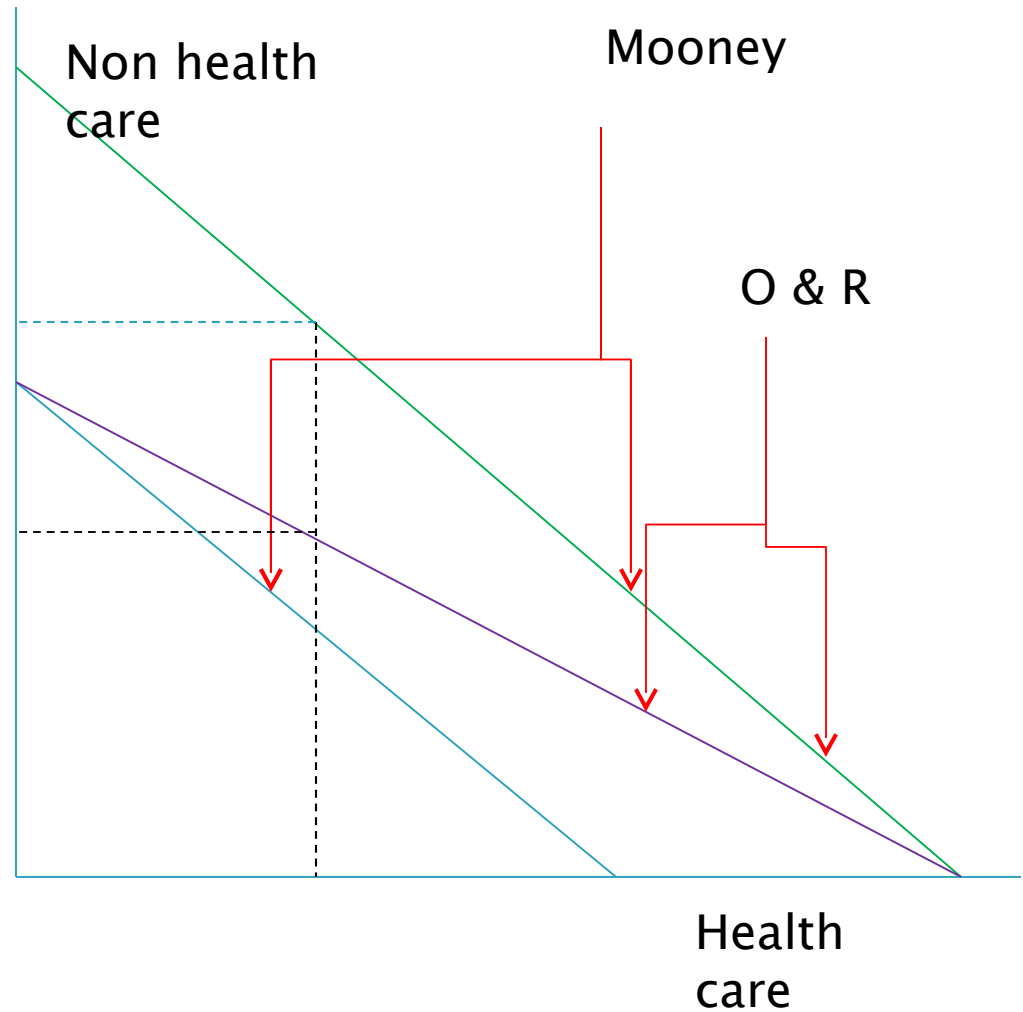
Def2 (Olsen and Rodgers, 1991):

The maximum attainable level of care (given price and income) should be the same for all

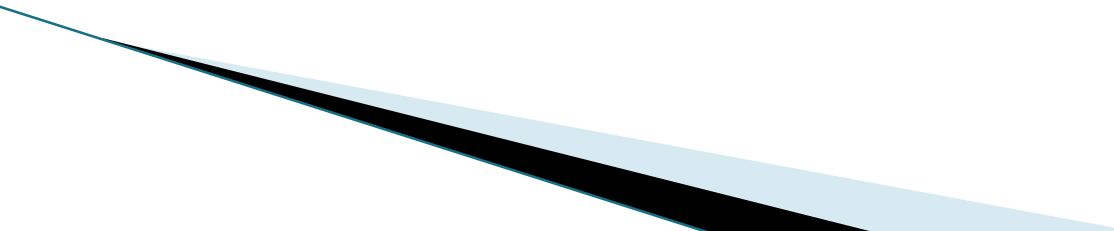
If rich individuals (income = 100) pay full cost of health care and price is 10 (max they can buy is therefore 10), those making 50 should pay \$5 only per unit of health care. Issue: does not guarantee equal treatment (poor still have to forgo more non health care consumption to reach the same level of health care as the rich)

Access cont'd

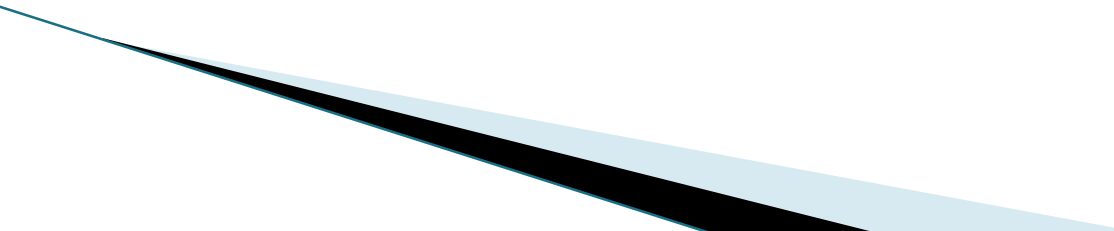
O&R: price of health care is decreased to raise maximum amount feasible to same level as of rich
New budget constraint of the poor = purple line
Poor has to forgo more of other goods than the rich to reach that same amount of health care (more effort)



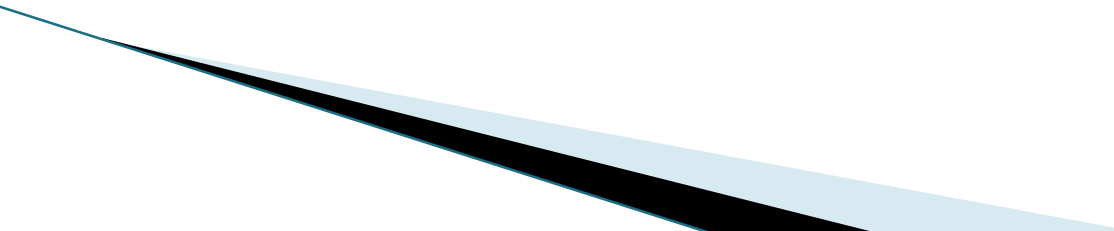
Empirical studies

- As a result, we use utilization as a proxy for access (outcome rather than process-oriented).
 - True rationale is: equal access should translate into equal use
 - Implication is: any behavioural difference (if systematically related to income) is attributed to the health care system
 - Illustrations = the poor tend to smoke more – immigrants tend to visit physicians less.
- 

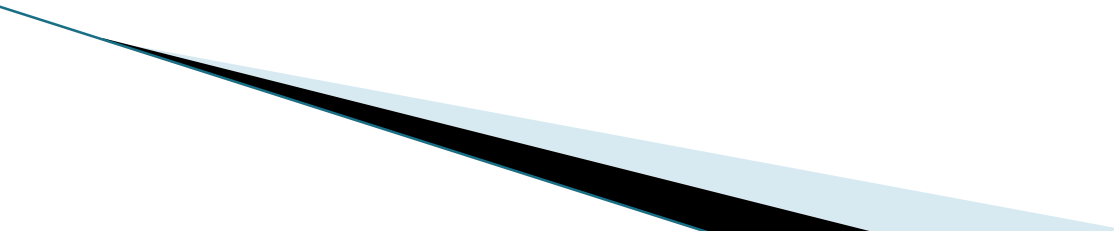
Empirical studies (2)

- ▶ Focus on two main measures:
 - ▶ Inequity of health care use, inequity of health
 - ▶ In both cases, income-related CI of standardized variable (use or health)
 - ▶ Standardization for health: age and gender (in case these correlate with income)
 - ▶ Standardization for use: **need**
- 

Need–standardization

- ▶ Definition(s) of need: concept and practical options
 - Ill health
 - Capacity to benefit (need is partially a supply–side concept, as is access): I can be healthy and need care (prevention), or sick but not need care (no effective treatment of palliative care available)
 - Level of expenditure necessary to exhaust capacity to benefit
 - ▶ Definitions clash if used in vertical equity
- 

Need-standardization

- ▶ Empirical studies = horizontal equity. Standardization by health status (two individuals same place same time same health will face same capacity to benefit and same max expenditure to exhaust capacity to benefit).
- 

Horizontal inequity index

▶ How it works

- Analogous to (indirect) demographic standardization
- Let medical care use (y_i) be explained linearly by

$$y_i = \alpha + \beta \ln inc_i + \sum_j \beta_j x_{ji} + \sum_k \gamma_k z_{ki} + \varepsilon_i$$

- where $\ln inc$ is log income, x_j are the need-proxies and z_k are the non-need control variables (other than income)
- Need-expected utilization: $\hat{y}_i^X = \hat{\alpha} + \hat{\beta} \overline{\ln inc}_i + \sum_j \hat{\beta}_j x_{ji} + \sum_k \hat{\gamma}_k \bar{z}_p$
 - where overscore indicates mean values and $\hat{}$ indicates OLS coefficients
- (Indirectly) need-standardized utilization is: $y_i^{IS} = y_i - \hat{y}_i^X + \bar{y}$
- Horizontal inequity = CI for need-standardized utilization

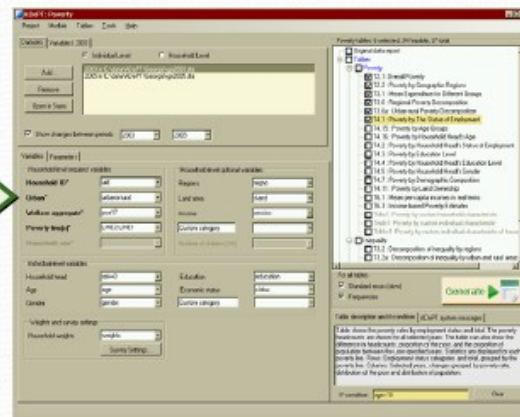
ADePT: a short introduction

ADePT: From data to report

User micro-level data: DHS, LSMS, LFS, ...



ADePT



	Household Size			Household Income			Household Assets		
	2004	2005	Change	2004	2005	Change	2004	2005	Change
All	2.7	2.7	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Male	2.7	2.7	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Female	2.7	2.7	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Total	2.7	2.7	0.0	1.0	1.0	0.0	1.0	1.0	0.0

Inside ADePT:



User interface



Computational kernel (Stata)

Print-ready output

Main findings for Canada

- ▶ Survey data (self-reports) – NPHS and CCHS
 - Strong pro-poor bias in inpatient utilization (one of the strongest among OECD countries)
 - Pro-rich inequity in probability to visit a doctor (GP or specialist)
 - Pro-poor inequity in conditional number of visits to GP
 - Small pro-rich inequity in conditional number of visits to specialist
 - Strong pro-rich inequity in dental care (mostly preventive care): +0.12

Main findings for Ontario

- ▶ Survey data linked to administrative data (OHIP)
 - Incidence inpatient: more pro-poor
 - Conditional inpatient: less pro-poor
 - Incidence GP visit: less pro-rich
 - Conditional GP visit: less pro-poor
 - Incidence Specialist visit: less pro-rich
 - Conditional Specialist visit: from pro-rich to neutral
- ▶ *Overall: confirms self-report, but toward 0*
 - Day-procedures: strongly pro-rich

\$ value of health care services used

- ▶ Ontario – linked data
 - Total \$: 0.0001! Perfect neutrality
 - But: +0.008 for incidence and -0.006 for conditional expenditure
 - Day Procedure: incidence = +0.034 == offsets inpatient pro-poor (overall hospital \$ is -.0202, ns)
 - GP: pro-poor spending (-0.0204, p=1%, due to conditional)
 - Specialist: pro-rich spending (+0.034, p=1%, due to incidence)

So what? How to interpret a CI/HI?

Technical (albeit important) point: for a binary (bounded) variable of mean p , CI values are in $[p-1; 1-p]$

Hospital use: $p=8\%$ -- CI in $[-.92; +.92]$

GP use: $p = 90\%$ -- CI in $[-.10; +.10]$

Solution (Wagstaff 2005): $CI/(1-p)$

Generalization for $a < X < b$ with mean m :

$$CI_g = [m(b-a)/(b-m)(m-a)]CI$$

So what? (2)

General interpretation of a CI/HI: equivalent level of equal health or health care use for all
($F(h) = e$)

Amount to redistribute so that $I(h) = 0$

So what (3): decomposition

- ▶ CI (or HI) can be decomposed as follows:
 - For each variable (need or non-need) in the model (see slide 31) its contribution to overall inequity is the product of its own (income-related) CI and the elasticity of Health (Health Care) relative to that variable
 - If education is strongly correlated to income and health strongly correlates to education, one should expect strong pro-rich contribution of education (same for private insurance and use)
 - Region correlates with health and use, but not so much with income – weak contribution

Further readings

Wagstaff, Adam and Eddy van Doorslaer (2000) "Equity in health care finance and delivery" in *Handbook of Health Economics*, ed. A.J. Culyer and J.P. Newhouse, 1804–1862

Williams, Alan and Richard Cookson (2000) "Equity in health" in *Handbook of Health Economics*, ed. A.J. Culyer and J.P. Newhouse, 1863–1910

Culyer, Anthony J. and A. Wagstaff (1993) "Equity and Equality in Health and Health Care" *Journal of Health Economics*, 12(4): 431–457

▶ Bleichrodt, Han and Eddy Van Doorslaer

Hooked?

The full opus

- ▶ Owen O'Donnell, Eddy van Doorslaer, Adam Wagstaff, and Magnus Lindelow (2007)
Analyzing Health Equity Using Household Survey Data – A Guide to Techniques and Their Implementation, World Bank Institute – Learning Resources Series
- ▶ Downloadable **free of charge** at www.worldbank.org
- ▶