

Equity and inequality

Measures of inequality (1)
Social inequality in health (2)
Poverty analysis (3)

Inequality measures

Inégalités horizontales et verticales
Mesures de concentration
Progressivité - Régressivité

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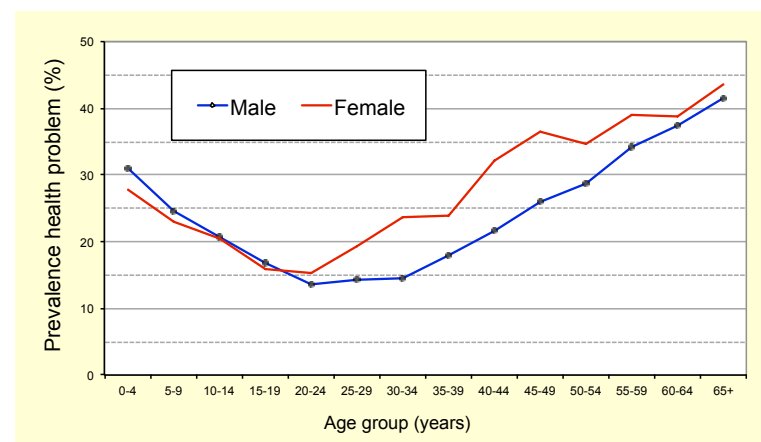
Examples

- ! Kotthatara Panchayat (rural municipality), Kerala, India
 - ! Health survey
 - ! Community based monitoring system
 - ! Poverty, health, social indicators
 - ! Needs of disadvantaged groups (Tribes, Paniyas, women)
 - ! Development policies
 - ! Community Based Health Insurance
- ! Burkina Faso (various studies)
 - ! Community interventions to improve access to primary health care services
 - ! Health, health consumption, cost of ill-health

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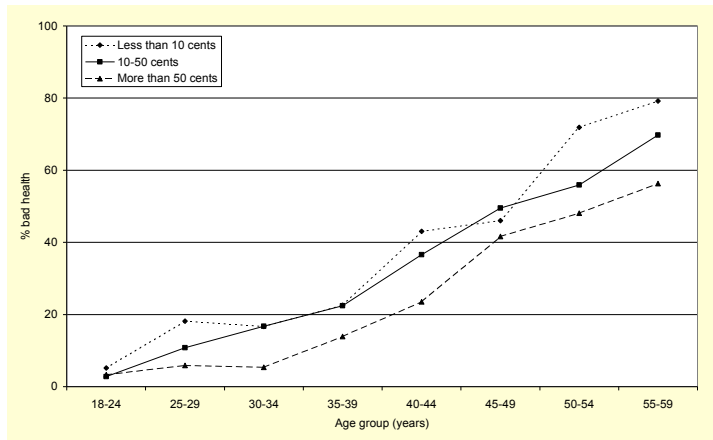
Kottathara Panchayat, Kerala: Age-specific prevalence of a health problem, by sex



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Mohindra et Haddad, 2008

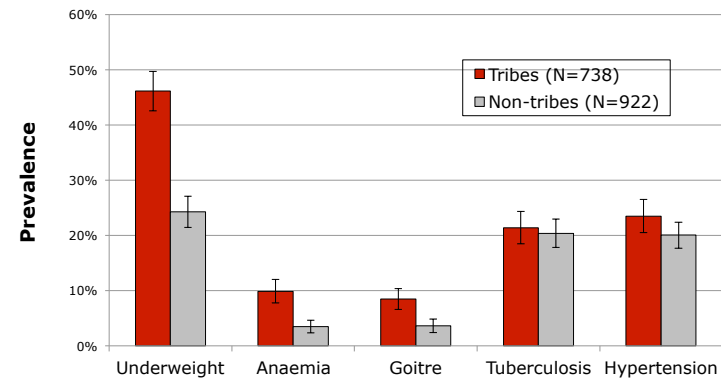
Percentages of women reporting bad health, according to land possession, by age



Mohindra et Haddad, 2008

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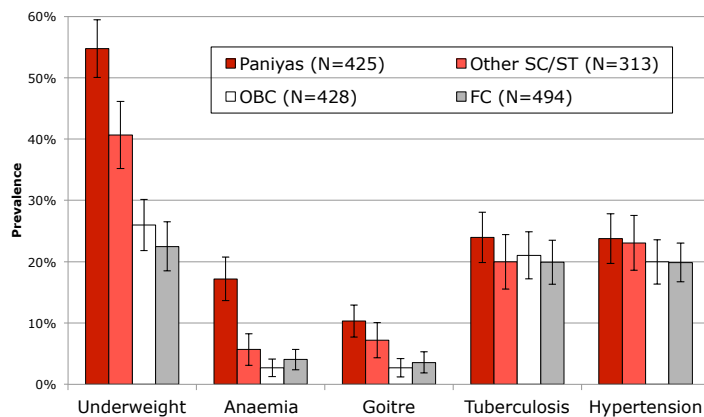
Morbidity across tribal and non-tribal groups (standardized by age and sex; error bars 95% CI)



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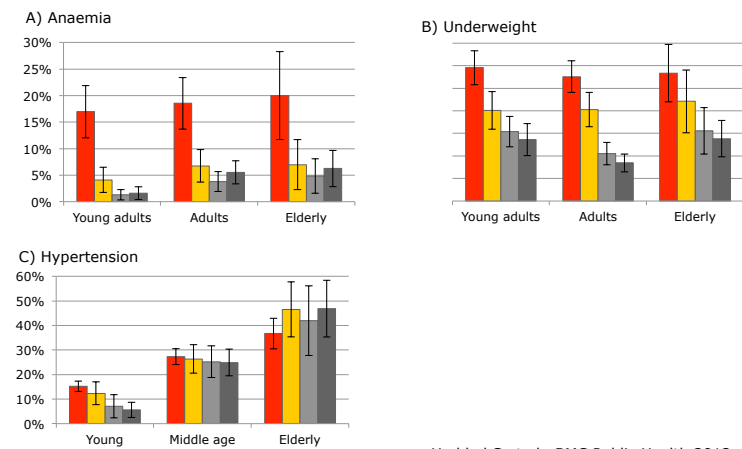
Heterogeneity of indigenous populations : morbidity across social groups (standardized by age and sex)



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Morbidity prevalence by age and social group: Trans-generational transmission of health disadvantages



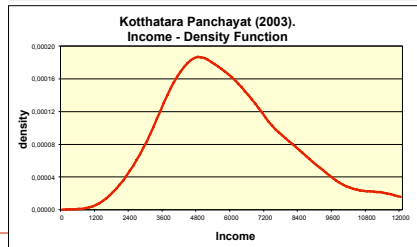
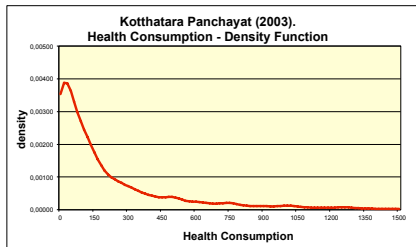
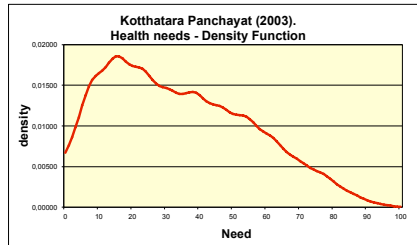
Haddad S et al., BMC Public Health 2012, 12:390

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Graphical analysis: density curves

- ! Needs
- ! Consumption
- ! Wellbeing



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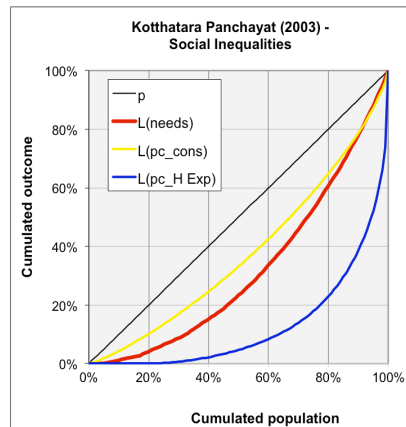
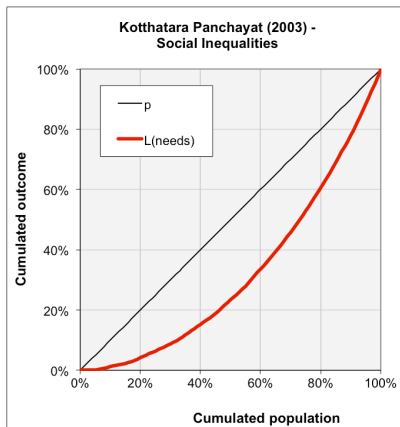
Graphical analysis: Lorenz curve

- ! Difference between current distribution and perfect equality
- ! $L(p)$:
 - ! Y: cumulative percentage of the outcome variable (percentiles)
 - ! X: cumulative percentage of the population ranked by outcome level (lowest to highest)
- ! Diagonal: line of perfect equality
- ! Position of $L(p)$: below the diagonal

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Lorenz curves



Kotthatar Panchayat: social inequalities (2003)

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Measures of inequality

- ! Ideally:
 - ! Reflect the overall level of inequality
 - ! Robust
 - ! Standardised (no metrics)
 - ! Decomposable
 - ! Population subgroups
- ! Economics
 - ! Anonymity
 - ! Scale independence
 - ! Population independence
 - ! Transferability

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Measures of inequality

- ! **Variance**
 - ! Same unit as the outcome + decomposable
- ! **Coefficient of variation**
 - ! Normalised measure of dispersion
- ! **Interquantile range, difference or ratio**
- ! **Gini index**
 - ! normalised, not decomposable
- ! **Atkinson inequality index**
 - ! sensitivity parameter (ϵ) for different weights given to inequalities at the bottom of the income distribution
- ! **Thiel index**
 - ! Sensitivity parameter (α) + decomposable

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Example: inequalities in Kottathara Panchayat

		QR	CV	Gini	Atkinson	Thiel	
		(0.2 - 0.8)			e = 0.5	e = 0.8	t = 2
Household health needs	Indicator	0.286	0.643	0.364	0.136	0.300	0.206
	SE	0.077	0.008	0.040	0.004	0.010	0.005
HH health expenditures (PC)	Indicator	0.008	3.820	0.750	0.520	0.810	7.300
	SE	0.005	0.525	0.014	0.020	0.010	2.000
Income (consumption - HC_X)	Indicator	0.510	0.530	0.249	0.050	0.080	0.140
	SE	0.006	0.003	0.004	0.002	0.003	0.001

Kotthathara Panchayat: social inequalities (2003)
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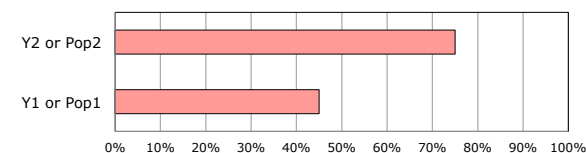
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Blinder-Oaxaca Decomposition of inequality

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The B-O decomposition

- ! The health gap (pred.):

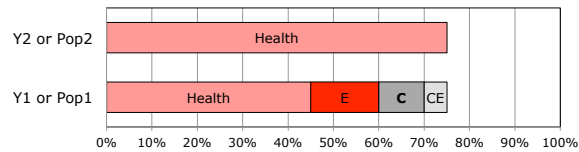


- ! BOD:
 - ! decompose inequality into its contributing factors
 - ! extent to which inequalities are explained by inequalities in the distribution / effects of observed health determinants

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BOD decomposes the health gap:



- Based on regression:
 - **E-component:** reflect differences in observable characteristics
 - group differences in the distribution of health determinants (endowments E).
 - **C-components:** reflect differences in the effects of health determinants:
 - indication of a discriminatory effect / unequal treatment of the groups
 - CE (interaction), usually combined with E

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B-O Decomposition (2)

$$\begin{aligned} \bar{y}^2 - \bar{y}^1 &= \beta^2 \bar{x}^2 - \beta^1 \bar{x}^1 \\ &= (\bar{x}^2 - \bar{x}^1) \beta^1 + (\beta^2 - \beta^1) \bar{x}^1 + (\bar{x}^2 - \bar{x}^1)(\beta^2 - \beta^1) \\ &= E + C + CE \end{aligned}$$

- E = gap in the distribution of determinants (endowments) :
 - Ex: differential access to community services
- C = Gap in the effects of health determinants:
 - Ex: differential ability to take advantage of existing services.

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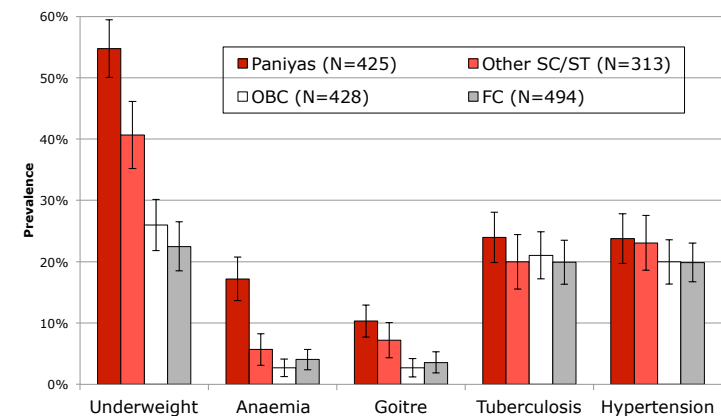
Application

- Multiple topics
 - Gender inequality
 - Income & poverty analysis
 - Rural – urban differences
 - Health: comparison of vulnerable – non vulnerable groups
 - migrant, indigenous, poor, etc.
- Intervention research
 - role of specific factors
 - over time,
 - intervention vs non intervention sites
 - explain gaps by a set of factors that vary systematically with the group variable

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Heterogeneity of indigenous populations : morbidity across social groups (standardized by age and sex)



Haddad S et al., BMC Public Health 2012, 12:390

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Underweight gap: BOD between tribal and non tribal groups

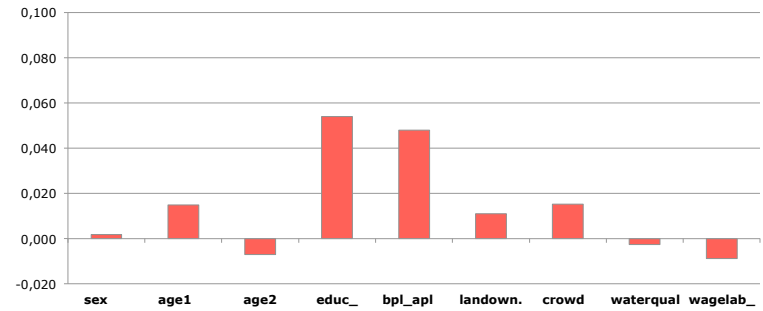
! fairlie bmi_scale_dummy q103 age1 age2 educ_dummy bpl_apl landown_dummy crowd_dummy waterqual_dummy wage1ab_no65over_dummy [pweight = indweighth t], by(nontribe2) ro

```

Number of obs = 1474
N of obs G=0 = 662
N of obs G=1 = 812
Pr(Y=0|G=0) = .46212056
Pr(Y=0|G=1) = .22951821
Difference = .23260235
Total explained = .12607562
    
```

bmi_scale_y	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
sex	.001904	.0017582	1.08	0.279	-.001542 .0053501
age1	.0149224	.0080249	1.86	0.063	-.0008061 .030651
age2	-.0069891	.0066389	-1.05	0.292	-.020001 .0060228
educ_dummy	.0540669	.0130755	4.13	0.000	.0284395 .0796944
bpl_apl	.0479726	.0235755	2.03	0.042	.0017654 .0941798
landown_du-y	.0111001	.0089651	1.24	0.216	-.0064712 .0286713
crowd_dummy	.0153446	.009066	1.69	0.091	-.0024244 .0331135
waterqual_-y	-.0025968	.0021705	-1.20	0.232	-.0068509 .0016574
wage1ab_no-y	-.008779	.0112265	-0.78	0.434	-.0307825 .0132244

Part of the Gap attributable to changes in the distribution of endowments



Decomposition of the health gap between tribal and non tribal populations

	Underweight		Anemia		Goitre		Hypertension&	
	M1*	M2**	M1*	M2**	M1*	M2**	M1*	M2**
Prevalence (predicted)								
General population	0.237	0.237	0.039	0.039	0.037	0.037	0.227	0.228
Tribes	0.466	0.469	0.101	0.102	0.087	0.086	0.237	0.235
Health Gap (total difference)	0.229	0.232	0.062	0.063	0.050	0.050	0.009	0.007
Explained (characteristics)	0.003	0.118	0.001	0.054	0.007	0.022	0.018	0.006
Unexplained (condition)	0.226	0.114	0.061	0.009	0.043	0.028	-0.009	0.002
CI-Lower bound	0.17	0.04	0.04	-0.02	0.02	0.00	-0.01	-0.06
CI-Upper bound	0.28	0.19	0.09	0.03	0.07	0.06	0.07	0.07
% Unexplained by individual or family characteristics	99%	49%	98%	14%	86%	56%		

*: covariates : age 18-30, age 31-59, sex

** : covariates: as in M1, plus: Education, Poverty (BPL), Land ownership, Wage laborer, Crowd, Water quality

&: percentage of unexplained gap is not computed due to the existence of negative values in the unexplained health gap

Illustration (Oaxaca / fairlie commands in Stata).

- ! Child Hemoglobinemia levels in Ghana
 - ! Baseline 2000
 - ! Post-intervention period 2004.

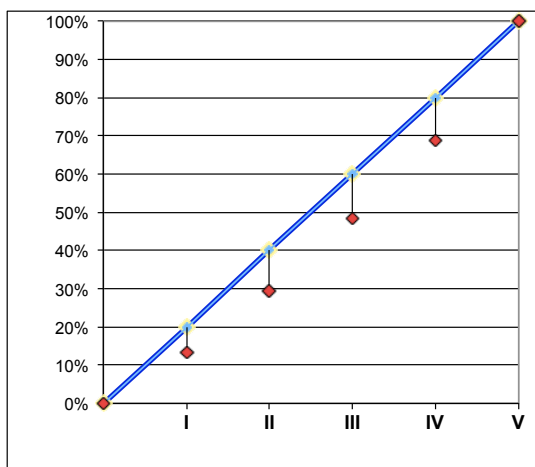
(3) Social inequality in health

Concentration curve

- ! Outcome: needs, participation, benefits, expenditures...
 - ! Concentration curve
 - ! Y: cumulative percentage of the outcome variable
 - ! X: cumulative percentage of the population ranked by income** level (poorest to richest)
** or any other measure of standards of liv
 - ! Position of the curve:
 - ! above diagonal if higher concentration among the poor: mortality, deprivation, poor health, social exclusion, etc.
 - ! below diagonal if lower concentration among the poor: well-being, good health, savings, leisure time
-

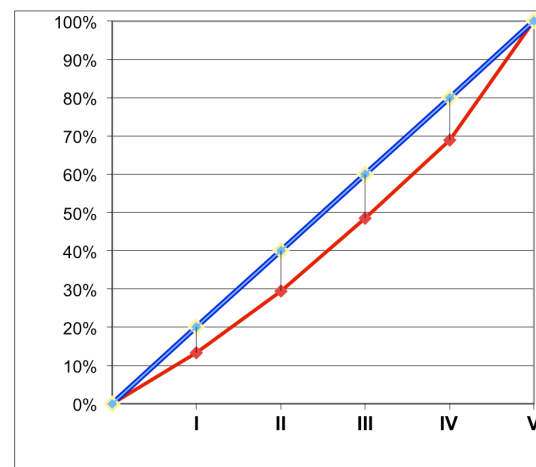
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Concentration curve



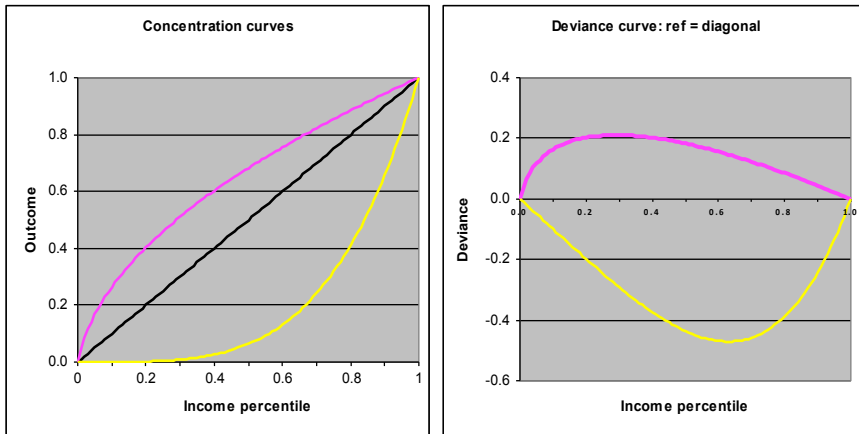
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Concentration curve



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The deviation curve

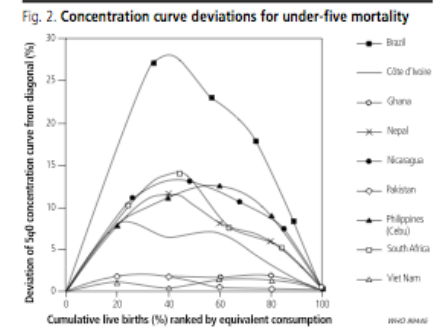


Source: simulations de l'auteur

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Illustration

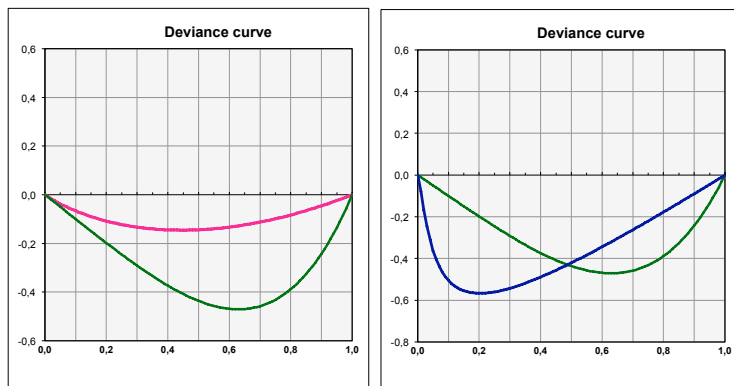


Wagstaff, 2000

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Concentration curve dominance



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The concentration index

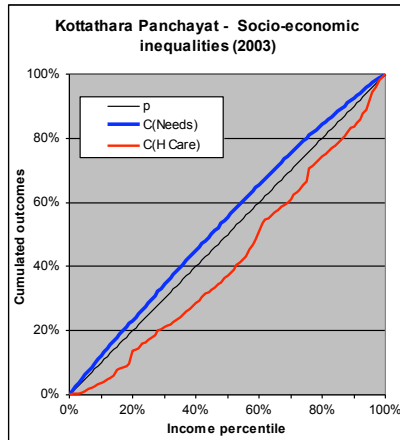
- ! CI: $2 \times$ area between CC and the line of equality (diagonal)
- ! $-1 < CI < 1$
 - ! Sign: (-) if outcome:
 - ! is more concentrated among the poor (mortality, poor health)
 - ! diminishes with standard of living
- ! Properties:
 - ! standardized measure (comparability)
 - ! scale independence & Population independence
 - ! decomposable
- ! Can be"
 - ! adjusted for cluster sampling (software DAD)
 - ! standardized for age, sex, etc.

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Kotthathara Panchayat: Social inequalities in health

	HH health needs	pc Health Expenditures
Income Quintile	1	240
	2	260
	3	388
	4	411
	5	446
Total	33.6	349
SII		
Estimate	-2.98	54
SE	0.26	16
C(p)		
Estimate	-0.076	0.157
SE	0.006	0.038



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Interpretation of the CC

- ! Carries implicit value judgement:
 - ! reflects a given level (α) of inequality- aversion
 - ! usually: $\alpha = 2$
- ! Interpretation
 - ! Relationship between income and health
 - ! Doesnot reflect income inequality

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Distinctions between Lorenz – Concentration curves

Lorenz

- 1.! One variable (outcome)
- 2.! Individual ranked by outcome level
- 3.! Below the diagonal
- 4.! Gini: $0 < L(p) < 1$

Concentration

- 1.! Two variables
- 2.! Individuals ranked by income level
- 3.! Below or above the diagonal
- 4.! CI: $-1 < C(p) < 1$

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Poverty analysis

Poverty

- ! An ethical concept
 - ! “individual situations that are unacceptable, that means unfair, unjust, in a given society” (Asselin & Dauphin)
 - ! normative considerations, in regards to equity
- ! Rooted in various philosophical traditions
 - ! Welfare / economic well-being considerations
 - ! Income - utility information
 - ! Freedom considerations, social contract theories
 - ! Basic capabilities – information on rights, freedom to achieve
 - ! Humanitarian preoccupations
 - ! Basic needs – information on specific forms of deprivation

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How is poverty defined?

- ! Process
 - 1.! identifying a uni- or multidimensional subspace for equality,
 - 2.! specifying a critical level for each
- ! Most common approaches in practice
 - ! Living standard measures: income (capture opportunities), expenditures, consumption (better proxy for permanent income)
 - ! Poverty line
- Or
- ! Non welfarist measures: “multidimensional poverty indicators”
- ! Poverty profiles, asset scores, ranking approaches

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Poverty line

- ! A standard of consumption / welfare
- ! A reference level in a given society.
- ! Specification
 - ! Absolute PL:
 - ! Cost of a bundle of goods required to fulfill basic needs
 - ! Food energy requirements (ex: 2200 cal per adult)
 - ! Basic non food consumption needs.
 - ! Assumption: equivalent needs.
 - ! Relative PL:
 - ! Ex: 50% of the median income adjusted for family size.

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Poverty lines in Canada

- ! No “official” PL
- ! The Low-Income Cut-Off (LICO)
 - ! income level at which a family may be in straitened circumstances
 - ! 35 LICO depending on family and community size.
<http://www.statcan.ca/english/freepub/75-202-XIE/2006000/technote1.htm>
- ! Low-Income Measure (LIM)
 - ! 50% of the median income of an equivalent household.
- ! Market-Basket measure (MBM)
 - ! Disposable income required by a household to meet basic needs
 - ! Human Resources and Social Development Canada (HRSDC)

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Poverty indicators

- ! **Head count index (incidence)**

- ! $H = q/n$ (% pop below the poverty line z).

- ! **Poverty gap & PG Index (intensity)**

- ! $PG = 1/(N) \cdot \sum(z-y_i)$ (monetary value)
- ! $PGI = 1/(N) \cdot \sum((z-y_i) / z)$ (PG as a % of poverty line)
 - ! average shortfall of the total population from the poverty line.
 - ! min cost to eliminate poverty (if perfect targeting)

- ! **Squared poverty gap (severity)**

- ! $PGI = 1/(N) \cdot \sum((z-y_i)^2 / z)$
- ! Takes into consideration inequality among the poor

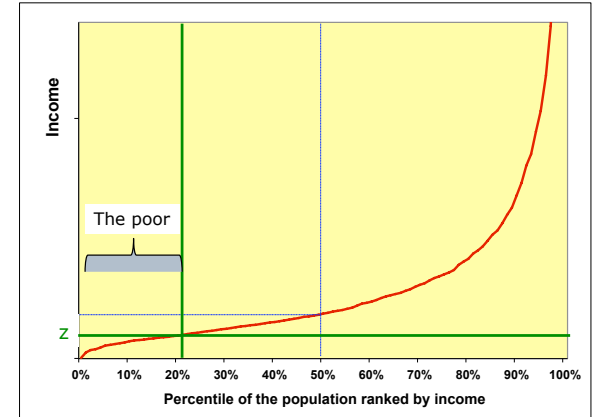
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Poverty incidence: Income curve and poverty line

Z: Pov. line

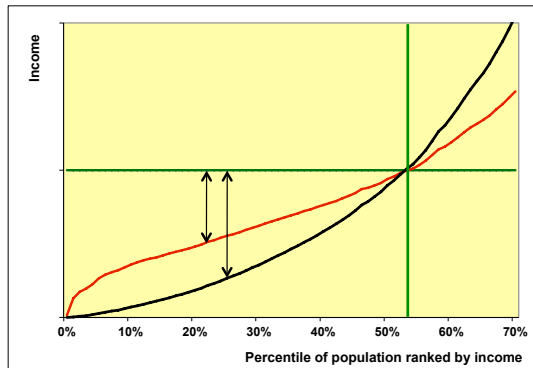
HCI = q / n



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HCI Treats all poor similarly!



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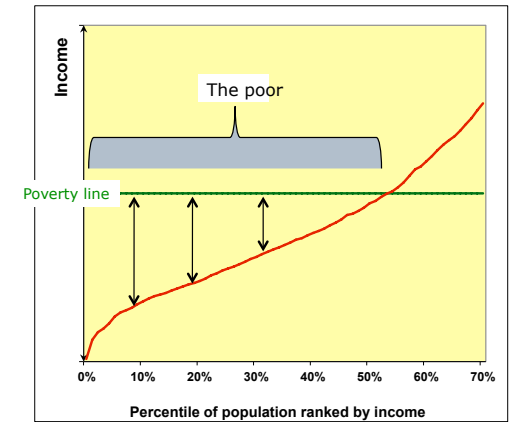
How poor are the poor?

$PG = 1/(N) \cdot \sum(z-y_i)$
(monetary value)

$PGI = 1/(N) \cdot \sum((z-y_i) / z)$
(PG as a % of poverty line)

- ! average shortfall of the total population from the poverty line.

- ! min cost to eliminate poverty (if perfect targeting)



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Comparing poverty over time

- ! Changes in poverty indicators
- ! Decomposition: gains and population shifts
 - ! Growth
 - ! Redistribution
 - ! Interaction

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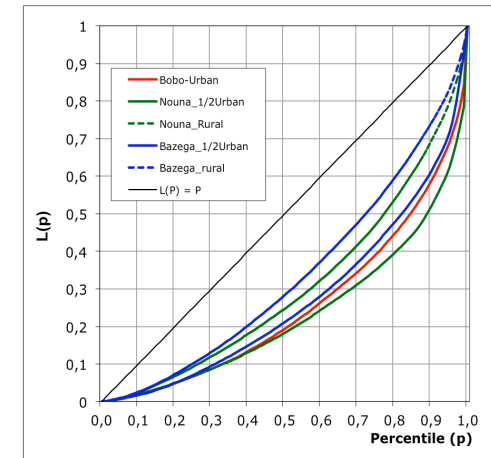
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Lorenz curves and Gini Index: Income inequality in Burkina Faso

annual consumption
per adult equivalent

Gini

All	0,5169
Bobo-Urban	0,4940
Nouna_1/2Urban	0,5366
Nouna_Rural	0,3883
Bazega_1/2Urban	0,4610
Bazega_rural	0,3274



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