Saúde e condições de vida: para onde vamos?

(Maurício Barreto - Cidacs/Fiocruz)

Seminário Saúde, Ambiente e Desenvolvimento Sustentável

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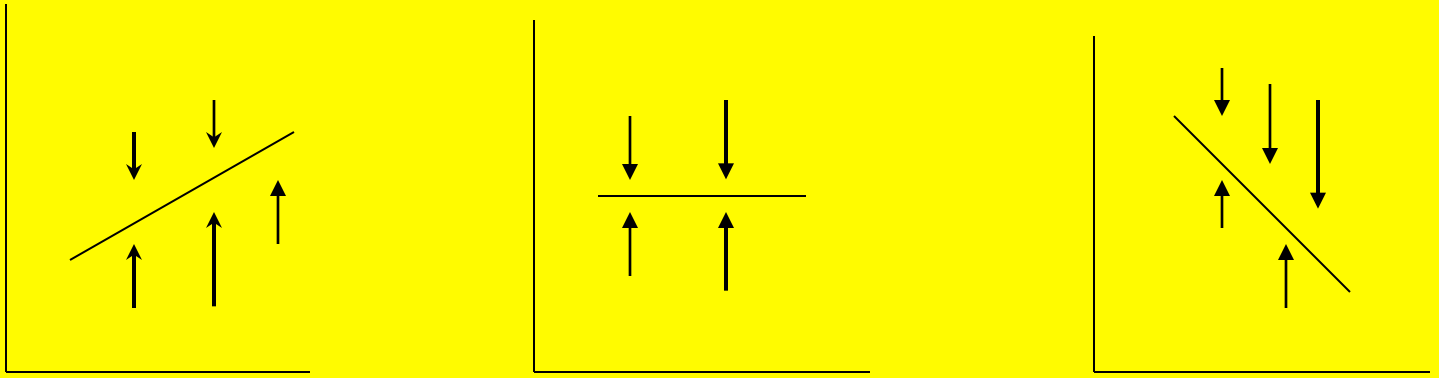
Tendências dos eventos de saúde no tempo

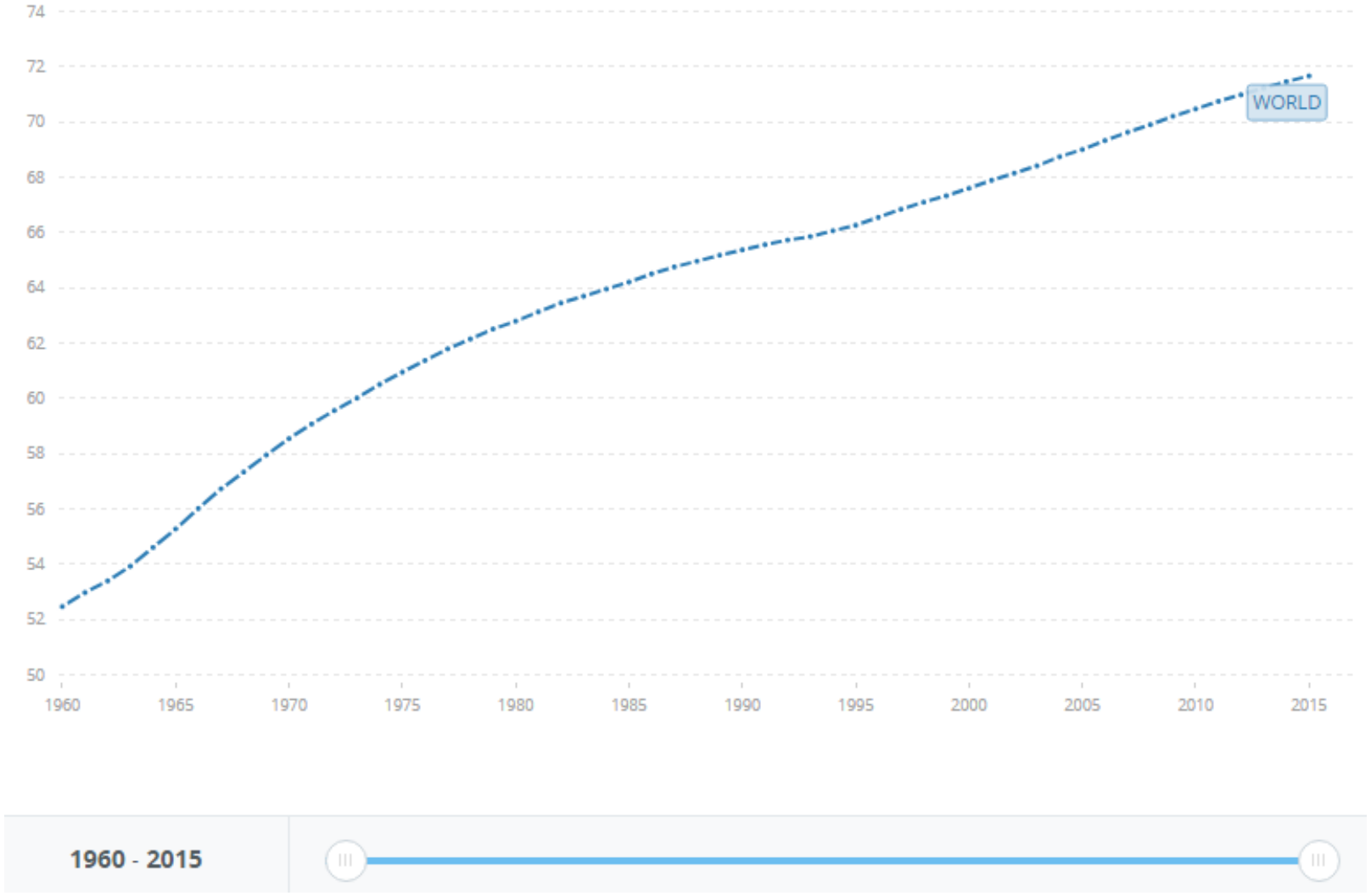


tempo

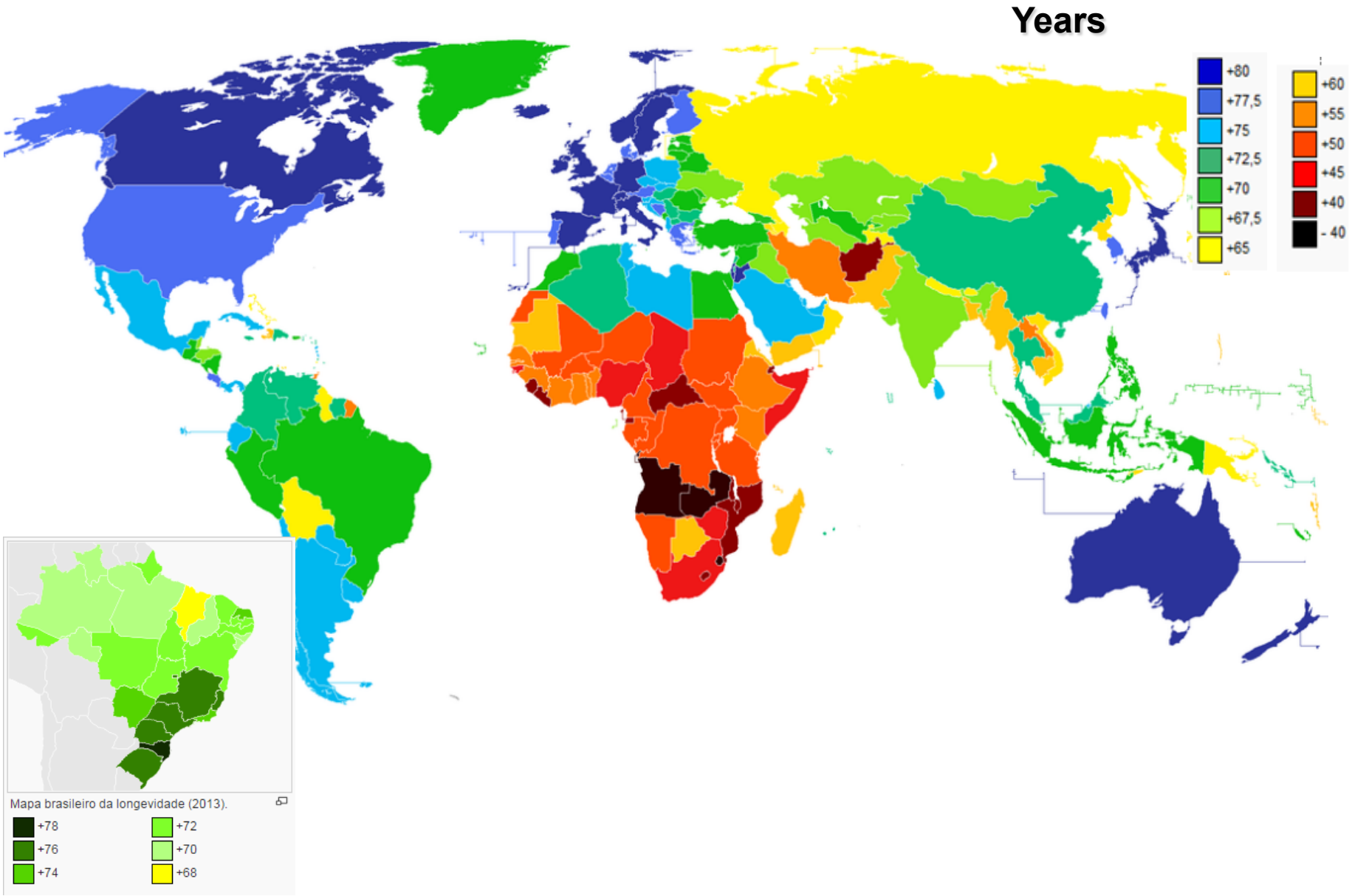
Obs. Algumas destas setas são aquilo que denominamos de intervenções. Em geral, espera-se que elas estejam entre aquelas que contribuem para a melhoria dos nivéis de saúde, porém nem sempre isto acontece.

- As condições Saúde como expressão dos processos históricos e dos contextos Políticos, Econômicos, Culturais, Sociais e Ambientais

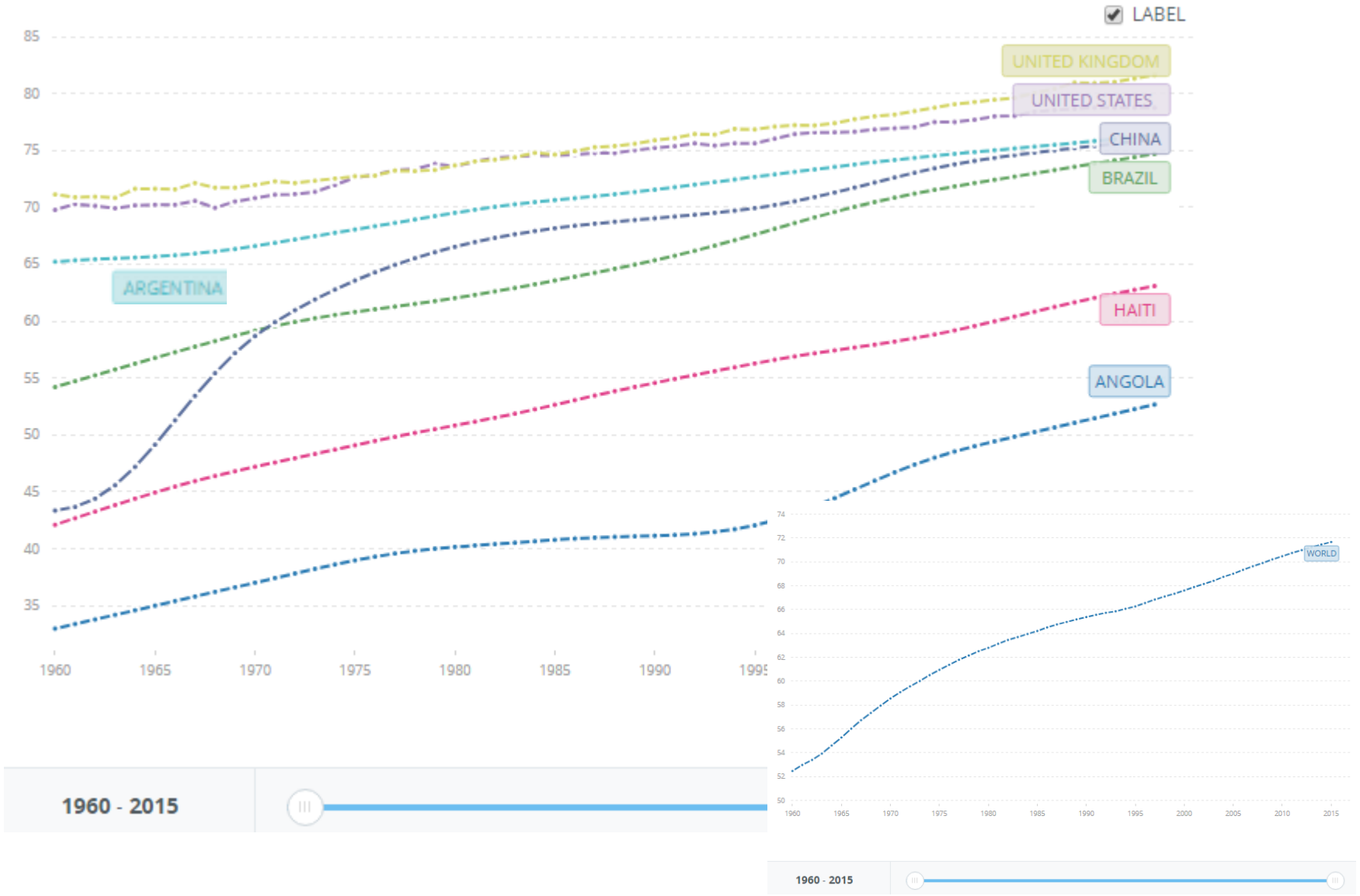
Expectativa de vida ao nascer (anos)
Global 1960-2015



Life Expectancy at Birth



Expectativa de vida ao nascer (anos)
1960-2015



- Somente entendemos as condições de saúde e as desigualdades através de comparações, sincrôncas e diacrônicas entre sociedades diversas e de suas trajetórias no tempo.

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Evidence for a limit to human lifespan

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Nature. 2016 Oct 5;538(7624):257-259

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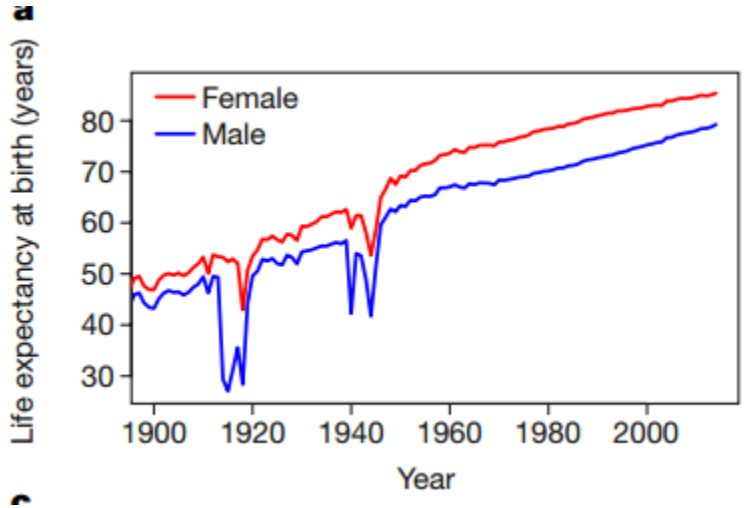


Driven by technological progress, human life expectancy has increased greatly since the nineteenth century. Demographic evidence has revealed an ongoing reduction in old-age mortality and a rise of the maximum age at death, which may gradually extend human longevity[1,2]. Together with observations that lifespan in various animal species is flexible and can be increased by genetic or pharmaceutical intervention, these results have led to suggestions that longevity may not be subject to strict, species-specific genetic constraints. Here, by analysing global demographic data, we show that improvements in survival with age tend to decline after age 100, and that the age at death of the world's oldest person has not increased since the 1990s. Our results strongly suggest that the maximum lifespan of humans is fixed and subject to natural constraints.

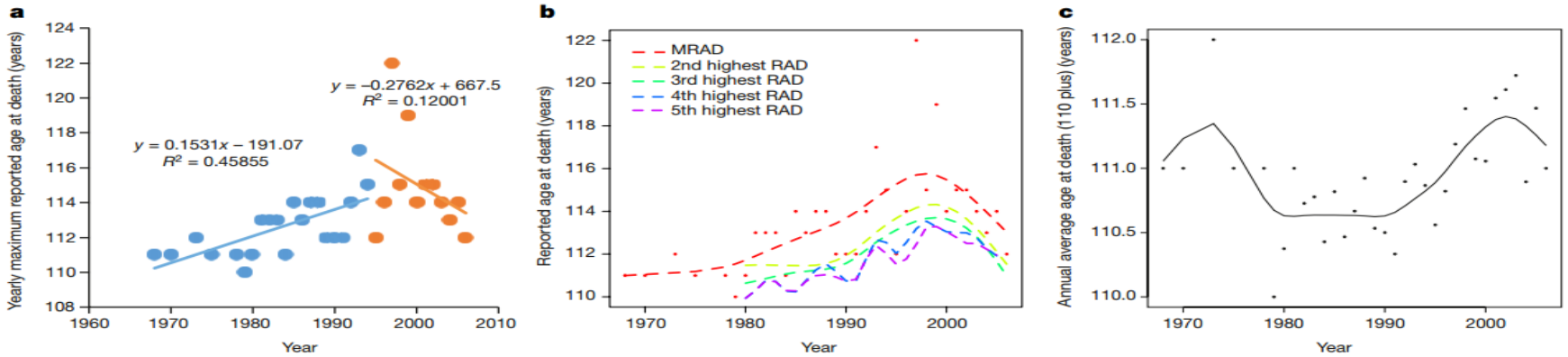
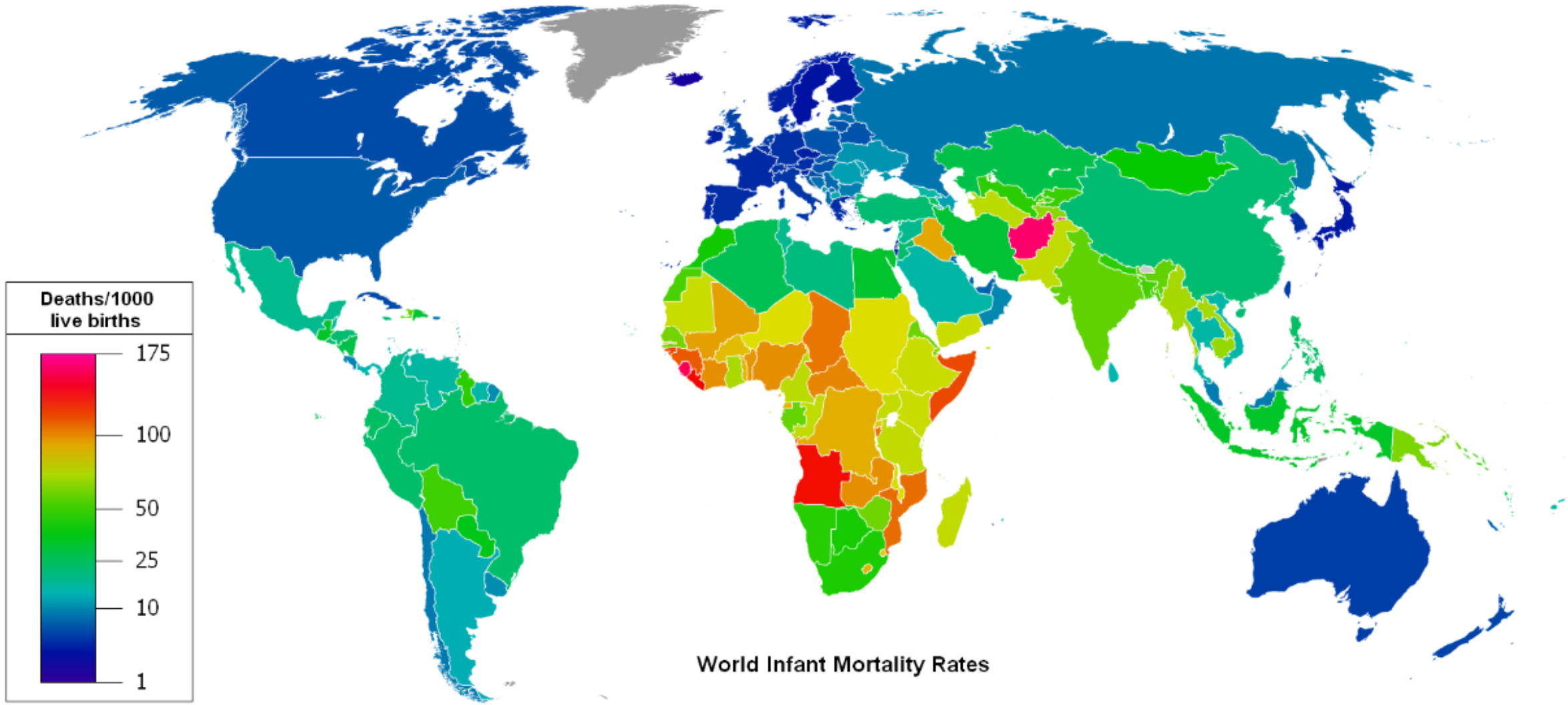
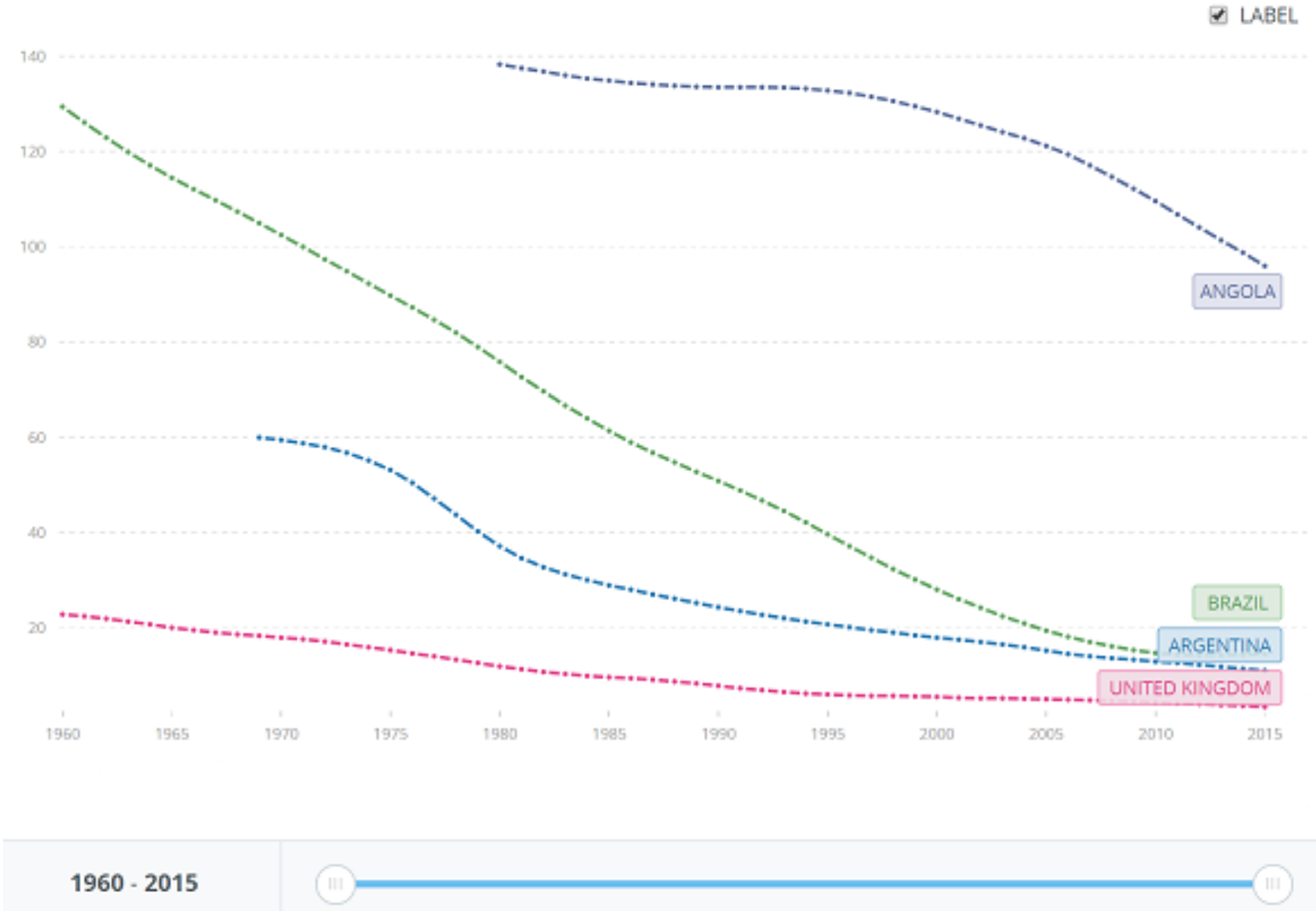


Figure 2 | Reported age at death of supercentenarians. All data were collected from the IDL database (France, Japan, UK and US, 1968–2006). **a**, The yearly maximum reported age at death (MRAD). The lines represent the functions of linear regressions. **b**, The annual 1st to 5th highest reported ages at death (RAD). The dashed lines are estimates of the RAD using cubic smoothing splines. The red dots represent the MRAD. **c**, Annual average age at death of supercentenarians (110 years plus, $n = 534$). The solid line is the estimate of the annual average age at death of supercentenarians, using a cubic smoothing spline.

Infant Mortality Rates



Source: Population Reference Bureau 20


LABEL
140
120
100
80
60
40
20
1960
1965
1970
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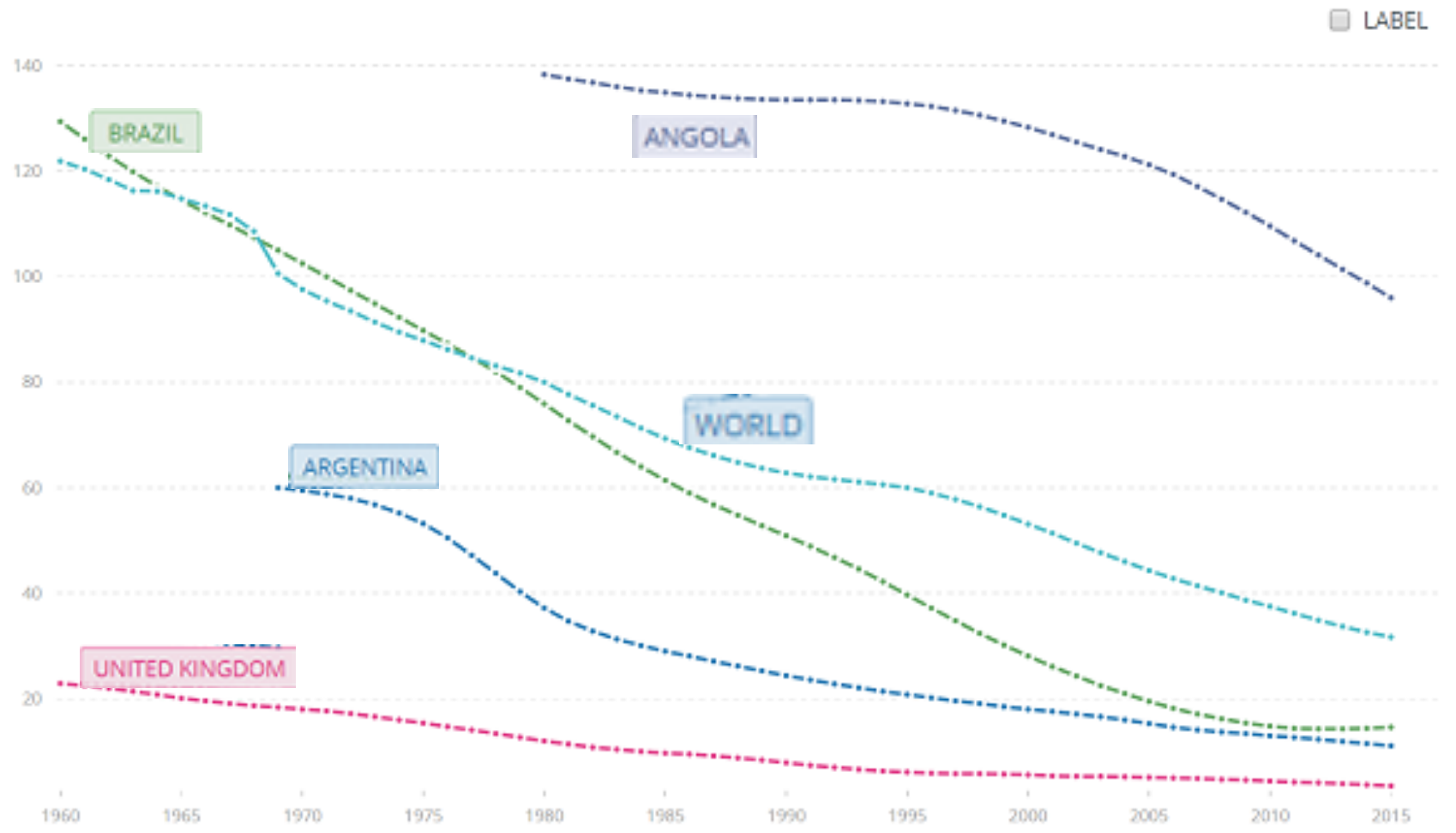
2015
ANGOLA
BRAZIL
ARGENTINA
UNITED KINGDOM
1960 - 2015


LABEL
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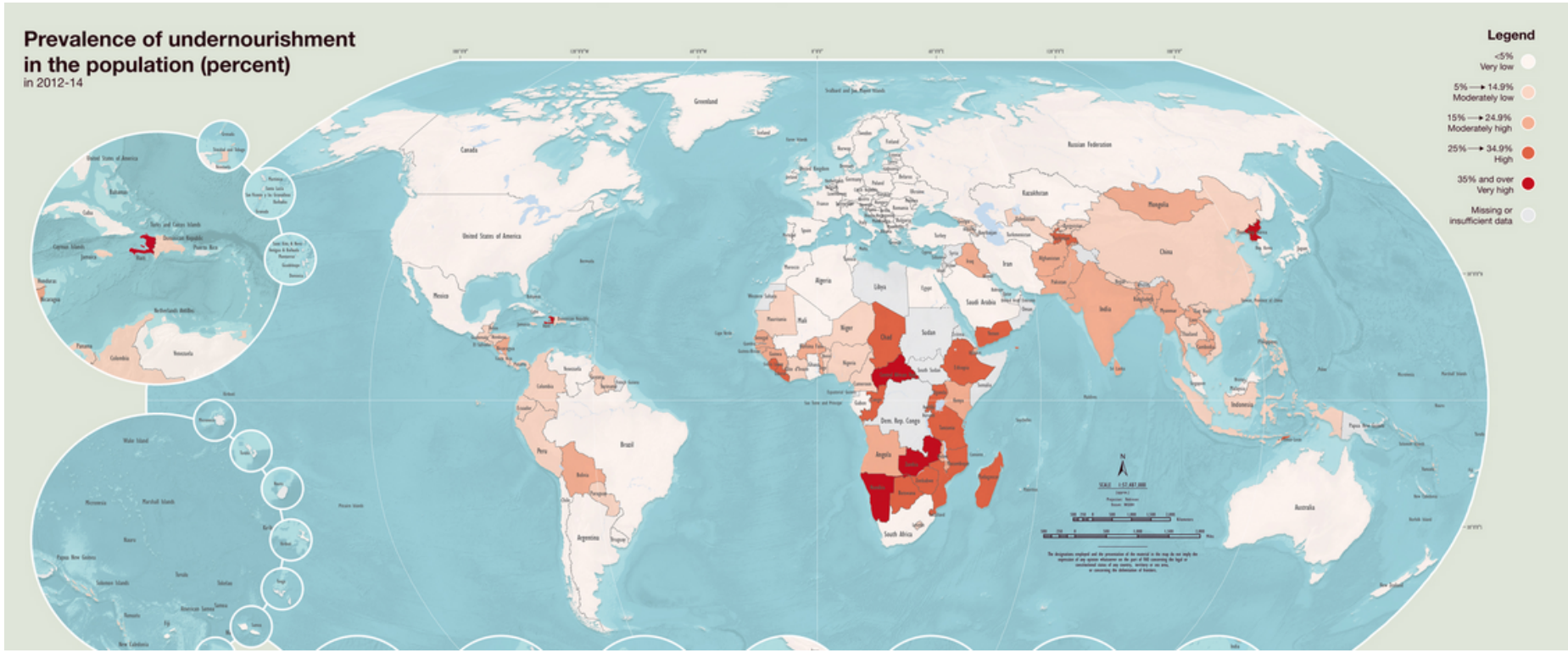
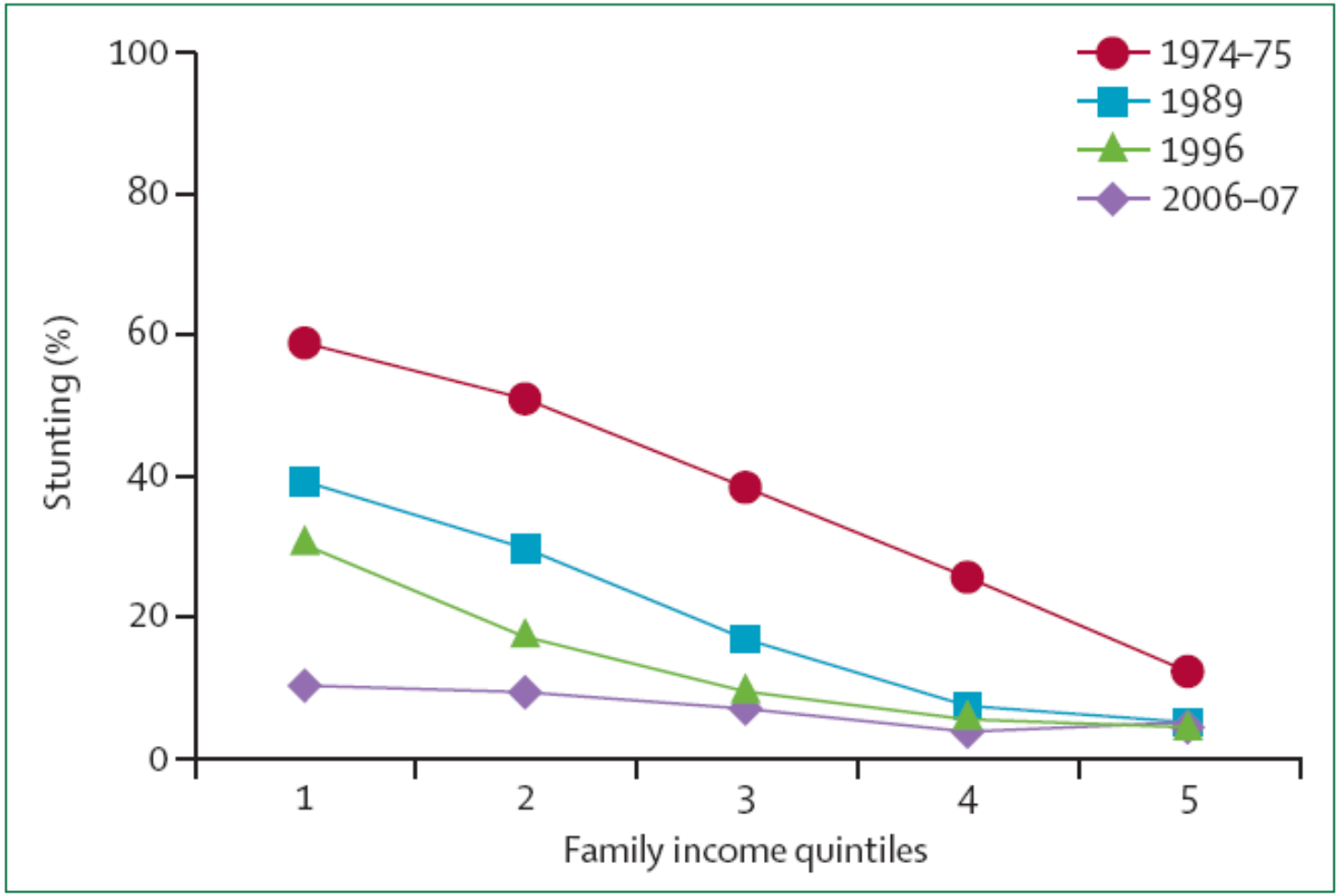
1960 - 2015

FAO

HUNGER MAP 2014



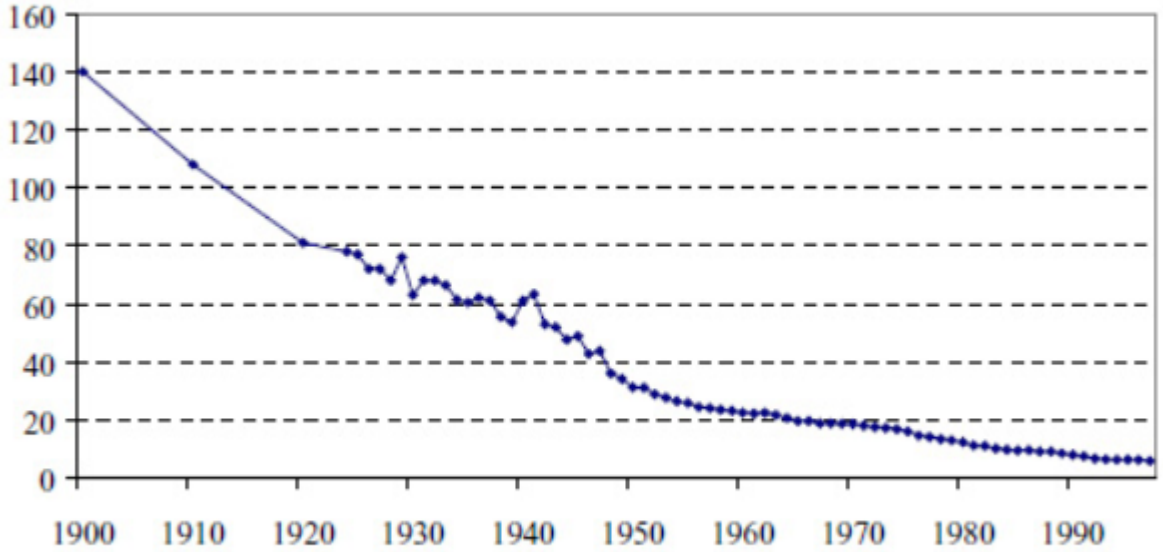
Prevalence of undernutrition (<5 years) by family income and year of survey, 1974/5 - 2006/7



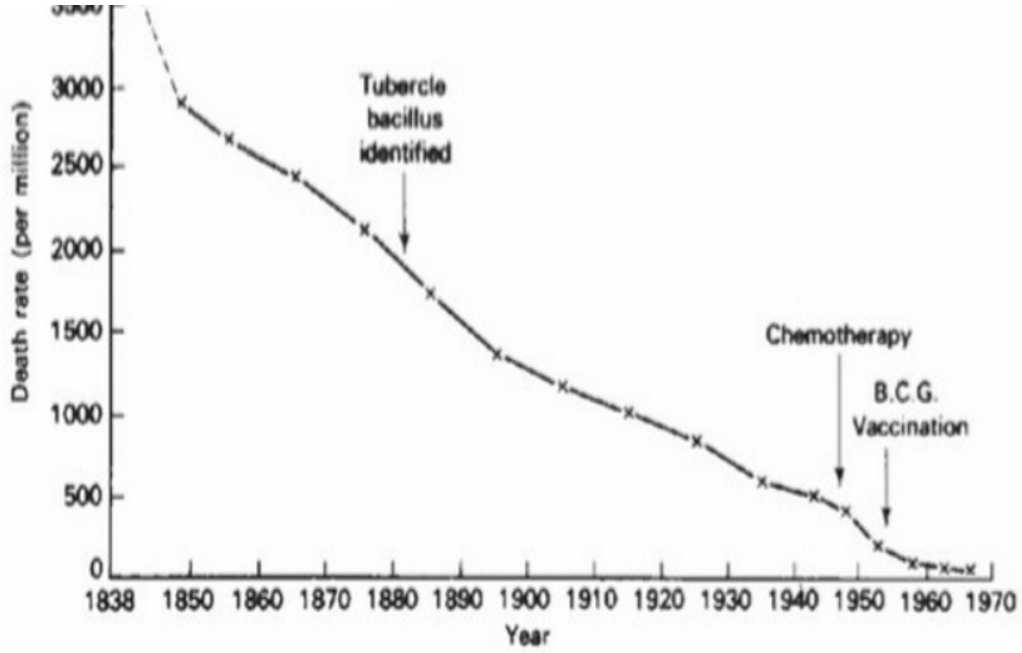
Lancet, 2011

- O que é responsável pelas mudanças das condições de saúde ao longo do tempo, as Tecnologias Médicas ou as Políticas Econômicas, Sociais e Ambientais?

Infant Mortality per Thousand Births



The data is interpolated from 1900 to 1924: it was collected every ten years in 1900, 1910 and 1920. From 1924 an annual record was taken.



Life Expectancy at Birth

As condições de saúde se modificam, em geral, para melhor, no processo de desenvolvimento

Figure 3.1: The Preston Curve in 2000.

Circles have a diameter proportional to population size. GDP per capita is in purchasing power parity (PPP) dollars.

The road to 25×25: how can the five-target strategy reach its goal?

*Neil Pearce, Shah Ebrahim, Martin McKee, Peter Lamptey, Mauricio L Barreto, Don Matheson, Helen Walls, Sunia Foliaki, Jaime Miranda, Oyun Chimeddamba, Luis Garcia Marcos, Andy Haines, Paolo Vineis

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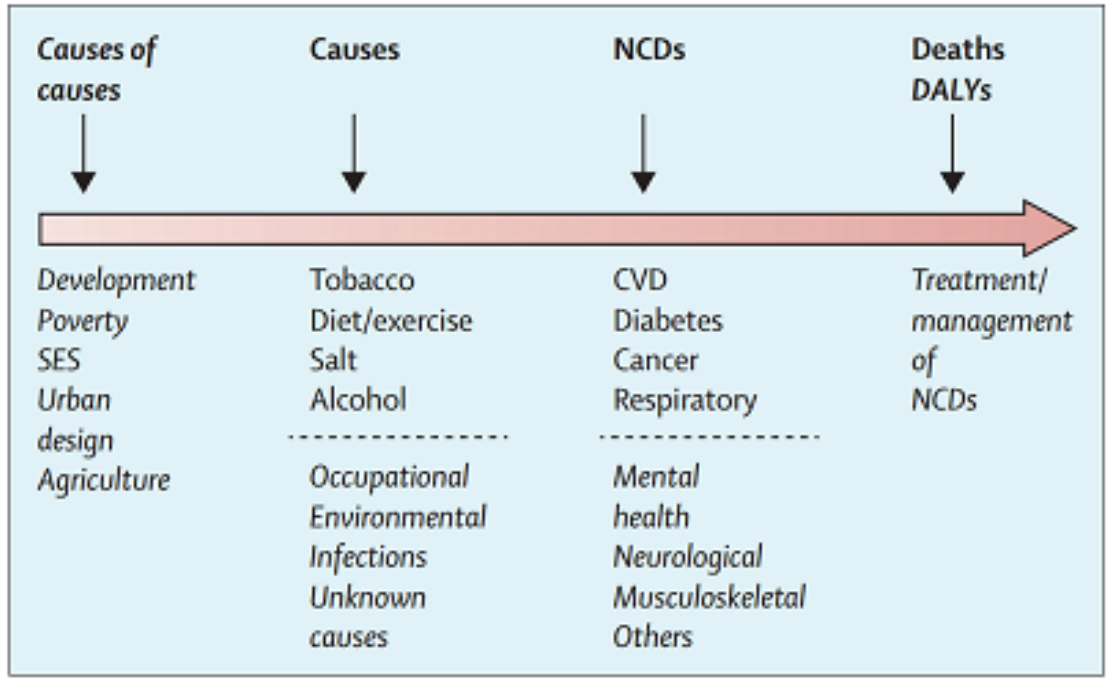

Figure: **Models for prevention of non-communicable diseases**
The elements covered by the standard model are in standard type. The missing elements are in italics. SES=socioeconomic status. NCDs=non-communicable diseases. CVD=cardiovascular disease. DALYs=disability-adjusted life-years.

Socioeconomic status and the 25 × 25 risk factors as determinants of premature mortality: a multicohort study and meta-analysis of 1·7 million men and women

Silvia Stringhini*, Cristian Carmeli*, Markus Jokela*, Mauricio Avendaño*, Peter Muennig, Florence Guida, Fulvio Ricceri, Angelo d'Errico, Henrique Barros, Murielle Bochud, Marc Chadeau-Hyam, Françoise Clavel-Chapelon, Giuseppe Costa, Cyrille Delpierre, Silvia Fraga, Marcel Goldberg, Graham G Giles, Vittorio Krogh, Michelle Kelly-Irving, Richard Layte, Aurélie M Lasserre, Michael G Marmot, Martin Preisig, Martin J Shipley, Peter Vollenweider, Marie Zins, Ichiro Kawachi, Andrew Steptoe, Johan P Mackenbach, Paolo Vineis†, Mika Kivimäki†, for the LIFEPATH consortium‡

Summary

Background In 2011, WHO member states signed up to the 25×25 initiative, a plan to cut mortality due to non-communicable diseases by 25% by 2025. However, socioeconomic factors influencing non-communicable diseases have not been included in the plan. In this study, we aimed to compare the contribution of socioeconomic status to mortality and years-of-life-lost with that of the 25×25 conventional risk factors.

Methods We did a multicohort study and meta-analysis with individual-level data from 48 independent prospective cohort studies with information about socioeconomic status, indexed by occupational position, 25×25 risk factors (high alcohol intake, physical inactivity, current smoking, hypertension, diabetes, and obesity), and mortality, for a total population of 1751479 (54% women) from seven high-income WHO member countries. We estimated the association of socioeconomic status and the 25×25 risk factors with all-cause mortality and cause-specific mortality by calculating minimally adjusted and mutually adjusted hazard ratios [HR] and 95% CIs. We also estimated the population attributable fraction and the years of life lost due to suboptimal risk factors.

Findings During 26·6 million person-years at risk (mean follow-up 13·3 years [SD 6·4 years]), 310277 participants died. HR for the 25×25 risk factors and mortality varied between 1·04 (95% CI 0·98–1·11) for obesity in men and 2·17 (2·06–2·29) for current smoking in men. Participants with low socioeconomic status had greater mortality compared with those with high socioeconomic status (HR 1·42, 95% CI 1·38–1·45 for men; 1·34, 1·28–1·39 for women); this association remained significant in mutually adjusted models that included the 25×25 factors (HR 1·26, 1·21–1·32, men and women combined). The population attributable fraction was highest for smoking, followed by physical inactivity then socioeconomic status. Low socioeconomic status was associated with a 2·1-year reduction in life expectancy between ages 40 and 85 years, the corresponding years-of-life-lost were 0·5 years for high alcohol intake, 0·7 years for obesity, 3·9 years for diabetes, 1·6 years for hypertension, 2·4 years for physical inactivity, and 4·8 years for current smoking.

Interpretation Socioeconomic circumstances, in addition to the 25×25 factors, should be targeted by local and global health strategies and health risk surveillance to reduce mortality.

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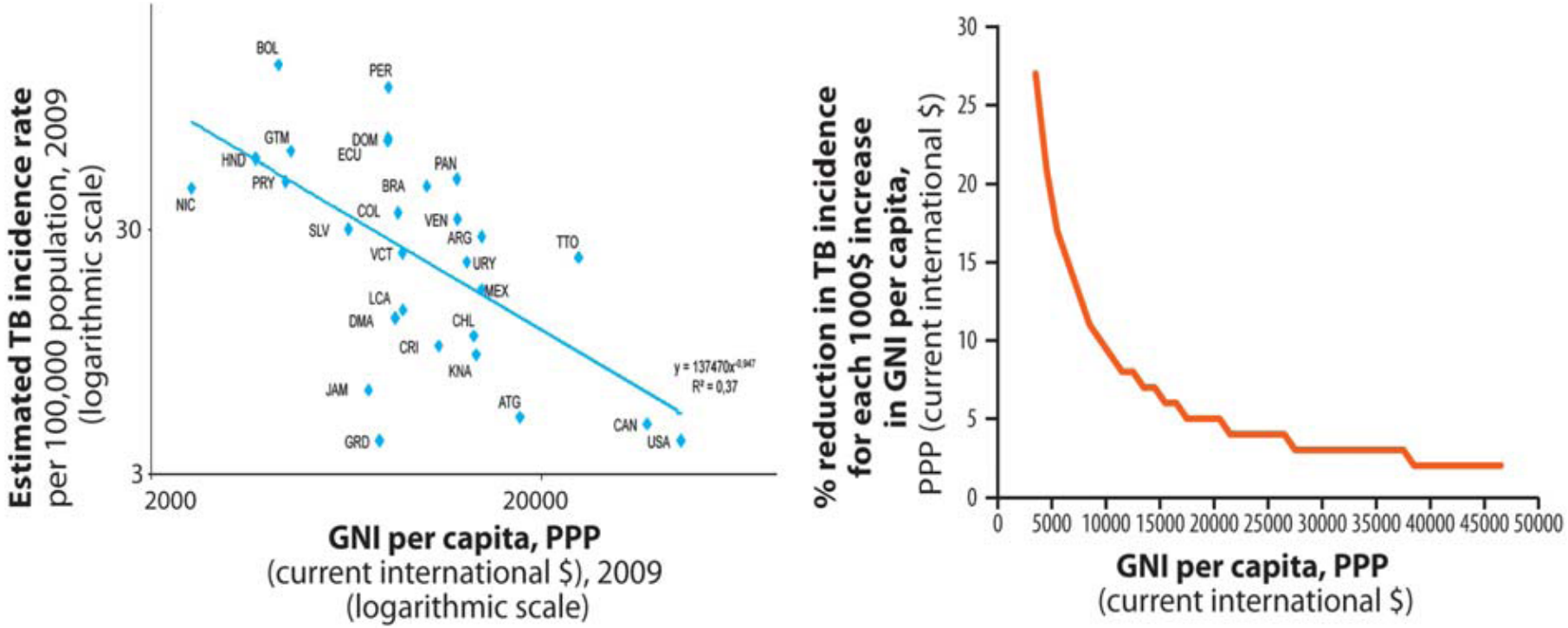
Relation between GNI per capita, PPP (current international $) and estimated TB incidence rate per 100,000 population (left), and expected reduction in TB incidence by increase in GNI per capita (right), 2009



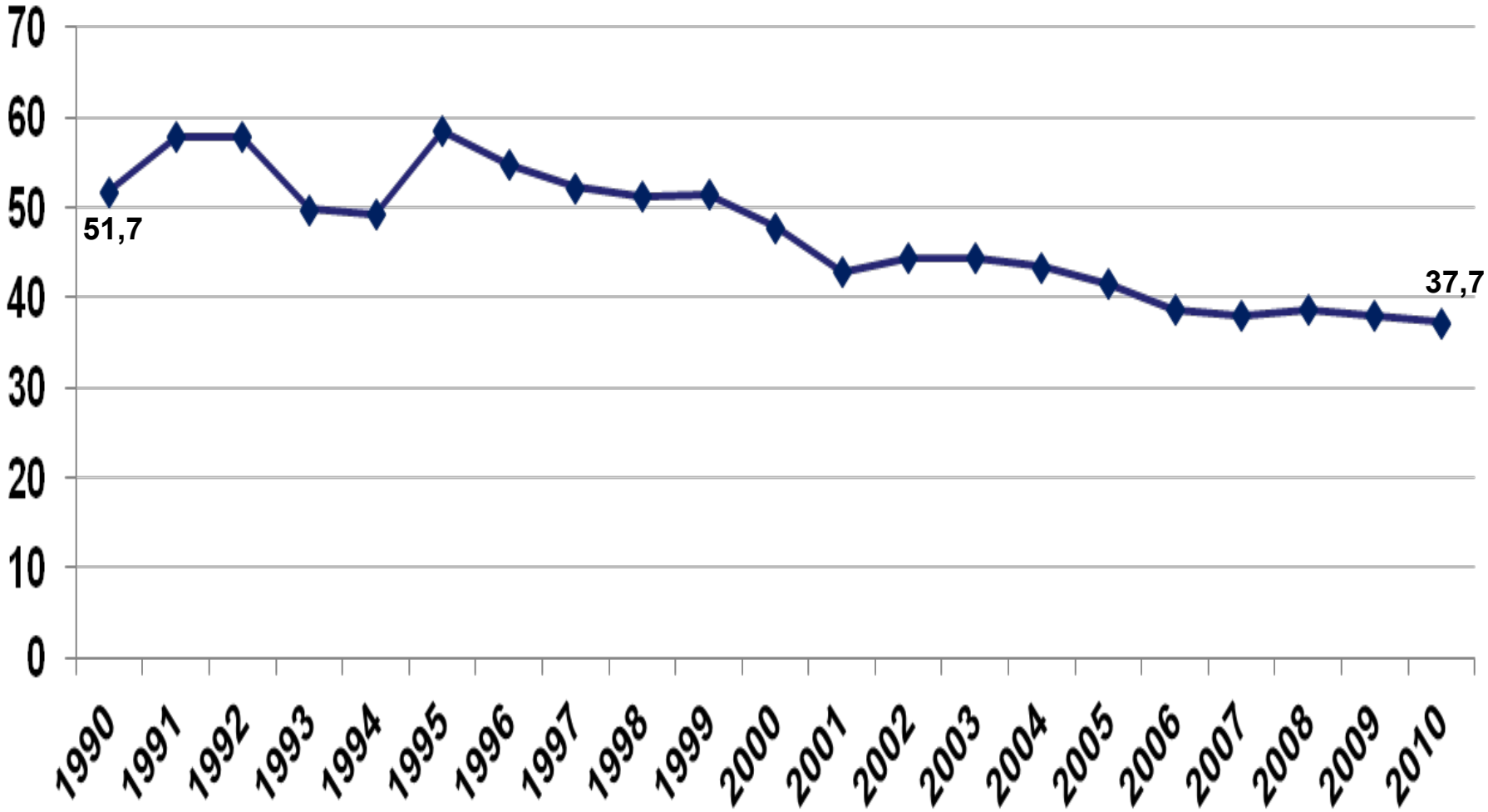
**USA - United States of America; CAN - Canada; TTO - Trinidad and Tobago; ATG - Antigua and Barbuda; MEX – Mexico; ARG - Argentina; KNA - Saint Kitts and Nevis; CHL - Chile; URY - Uruguay; VEN - Venezuela; PAN - Panama; CRI - Costa Rica; BRA - Brazil; LCA - Saint Lucia; VCT - Saint Vincent and the Grenadines; COL - Colombia; DMA - Dominica; PER - Peru; DOM - Dominican Republic; ECU - Ecuador; GRD - Grenada; JAM - Jamaica; SLV - El Salvador; GTM - Guatemala; PRY - Paraguay; BOL - Bolivia; HND - Honduras; NIC - Nicaragua*

Source: OPAS / Tuberculosis in the Region of the Americas, 2009.

TB incidence rate. Brazil, 1990-2010.

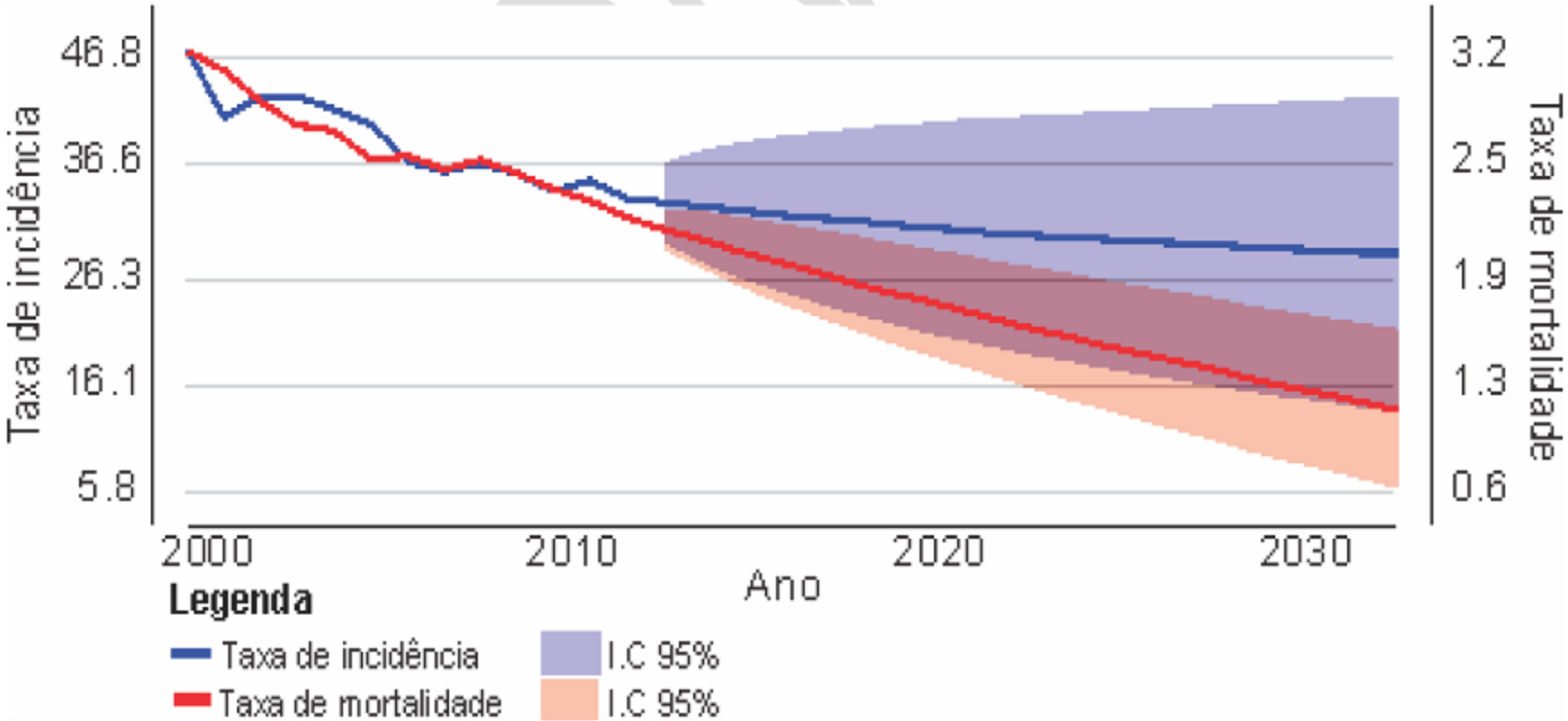
Per 100 thousand inhab.

Decrease = 26% (average ↓1,4% per year, 2010 ↓4%)



Source: MS / SVS / SINAN.

Figura 13. Tuberculose. Taxas de incidência e mortalidade por 100.000 hab. Brasil, 2000 a 2033



Gomes et al. BMC Infectious Diseases (2016) 16:132
DOI 10.1186/s12879-016-1464-8

BMC Infectious Diseases

DEBATE Open Access

End TB strategy: the need to reduce risk inequalities

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Abstract

Background: Diseases occur in populations whose individuals differ in essential characteristics, such as exposure to the causative agent, susceptibility given exposure, and infectiousness upon infection in the case of infectious diseases.

Discussion: Concepts developed in demography more than 30 years ago assert that variability between individuals affects substantially the estimation of overall population risk from disease incidence data. Methods that ignore individual heterogeneity tend to underestimate overall risk and lead to overoptimistic expectations for control. Concerned that this phenomenon is frequently overlooked in epidemiology, here we feature its significance for interpreting global data on human tuberculosis and predicting the impact of control measures.

Summary: We show that population-wide interventions have the greatest impact in populations where all individuals face an equal risk. Lowering variability in risk has great potential to increase the impact of interventions. Reducing inequality, therefore, empowers health interventions, which in turn improves health, further reducing inequality, in a virtuous circle.

Keywords: Tuberculosis, Heterogeneity, Cohort selection, Social inequality, Intervention impact

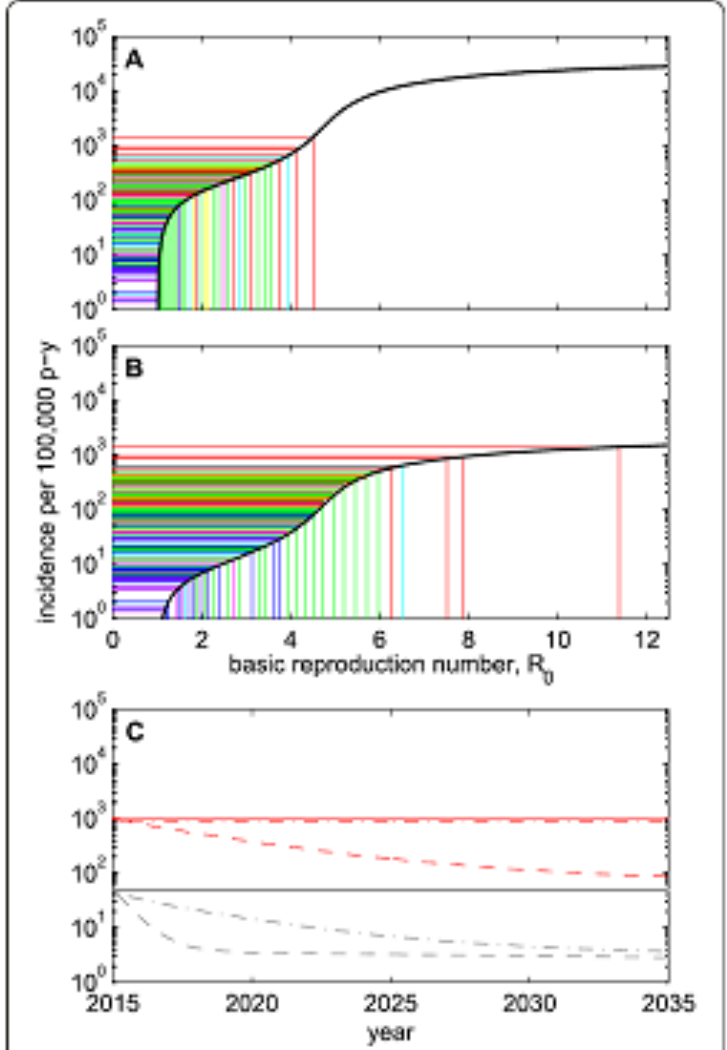

Fig 1 Global tuberculosis incidence per 100,000 person-years. **a**, **b**, Endemic equilibrium states for model in appendix (*black curves*: **a**, homogeneous; **b**, heterogeneous). Colored lines represent the TB incidences reported by WHO in all countries, and associated R_0. Countries are color-coded by WHO region: African (*red*); South-East Asia (*yellow*); Eastern Mediterranean (*cyan*); Western Pacific (*green*); Europe (*blue*); The Americas (*magenta*). **c**, Simulation of a vaccine that halves susceptibility to infection and reduces reactivation rate by 90 %. Dashed and dash-dotted curves correspond to populations with variance-to-mean ratios of 0 (homogeneous) and 20 (heterogeneous), respectively, in two epidemiological settings: baseline incidence of 1000 per 100,000 person-years (*red*); and 50 per 100,000 person-years (*grey*)

Impact of the Family Health Program on Infant Mortality in Brazilian Municipalities

Am J Public Health. 2009;99(1):87-93

Rosana Aquino, MD, PhD, Nelson F. de Oliveira, PhD, and Mauricio L. Barreto, MD, PhD

Fixed-Effects Models for the Bivariate Association Between Infant Mortality Rate and Family Health Program Coverage: Brazil, 1996–2004

Variables	Infant Mortality Rate		Neonatal Mortality Rate, RR (95% CI)	Postneonatal Mortality Rate, RR (95% CI)
	Crude RR (95% CI)	Adjusted RR (95% CI)		
FHP coverage				
No FHP[a] (Ref)	1.00	1.00	1.00	1.00
Incipient FHP[b]	0.84 (0.82, 0.85)	0.87 (0.86, 0.89)	0.90 (0.89, 0.92)	0.82 (0.80, 0.84)
Intermediate FHP[c]	0.77 (0.75, 0.79)	0.84 (0.82, 0.86)	0.86 (0.84, 0.89)	0.78 (0.75, 0.81)
Consolidate FHP[d]	0.68 (0.64, 0.73)	0.78 (0.73, 0.83)	0.81 (0.76, 0.88)	0.69 (0.62, 0.76)
Total fertility rate ≤2.4 children per childbearing-age woman		0.90 (0.87, 0.93)	0.92 (0.88, 0.95)	0.88 (0.84, 0.92)
Per capita income ≥BR$258.00		0.92 (0.89, 0.94)	0.93 (0.89, 0.96)	0.89 (0.85, 0.93)
Functional illiterates rate ≤26.0% of individuals aged ≥15 y		0.87 (0.84, 0.89)	0.89 (0.86, 0.92)	0.83 (0.79, 0.87)
Percentage of persons living in households with running water ≥96.0%		0.91 (0.89, 0.93)	0.93 (0.90, 0.95)	0.88 (0.85, 0.91)
Gini index[e] ≤0.55		1.18 (1.14, 1.22)	1.21 (1.16, 1.26)	1.10 (1.05, 1.16)
Local hospitalization		0.88 (0.82, 0.96)	0.88 (0.80, 0.96)	0.94 (0.84, 1.06)

thebmj

BMJ 2014;348:g4014 doi: 10.1136/bmj.g4014 (Published 3 July 2014)

RESEARCH

Impact of primary health care on mortality from heart and cerebrovascular diseases in Brazil: a nationwide analysis of longitudinal data

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Abstract

Objectives To evaluate the impact of Brazil's recently implemented Family Health Program (FHP), the largest primary health care programme in the world, on heart and cerebrovascular disease mortality across Brazil from 2000 to 2009.

Design Ecological longitudinal design, evaluating the impact of FHP using negative binomial regression models for panel data with fixed effects specifications.

Setting Nationwide analysis of data from Brazilian municipalities covering the period from 2000 to 2009.

was consolidated during all the previous eight years. Moreover, FHP coverage increased the number of health education activities, domiciliary visits, and medical consultations and reduced hospitalisation rates for cerebrovascular and heart disease. Several complementary analyses showed quantitatively similar results.

Conclusions Comprehensive and community based primary health care programmes, such as the FHP in Brazil, acting through cardiovascular disease prevention, care, and follow-up can contribute to decreased cardiovascular disease morbidity and mortality in a developing country such as Brazil.

Table 2| **Fixed effect negative binomial models for crude and adjusted association between standardised mortality rates and annual coverage with Family Health Program (FHP) in 1622 selected municipalities in Brazil, 2000-09**

Variables	Cerebrovascular diseases mortalityrate		Heart diseases mortality rate		Accidents mortality rate	
	Crude rate ratio (95% CI)	Adjusted rate ratio (95% CI)	Crude rate ratio (95% CI)	Adjusted rate ratio (95% CI)	Crude rate ratio (95% CI)	Adjusted rate ratio (95% CI)
FHP population coverage:						
No coverage	1	1	1	1	1	1
Incipient (>0 to <30%)	0.94 (0.92 to 0.97)	0.98 (0.95 to 1.00)	0.93 (0.89 to 0.94)	0.98 (0.94 to 1.02)	1.00 (0.97 to 1.02)	0.99 (0.96 to 1.02)
Intermediate (≥30% to <70%)	0.79 (0.76 to 0.81)	0.86 (0.83 to 0.89)	0.73 (0.70 to 0.76)	0.81 (0.78 to 0.85)	0.99 (0.96 to 1.02)	0.97 (0.95 to 1.00)
Consolidated (≥70%)	0.71 (0.69 to 0.74)	0.82 (0.79 to 0.86)	0.66 (0.63 to 0.69)	0.79 (0.75 to 0.80)	1.04 (1.01 to 1.08)	1.02 (0.98 to 1.06)
Percentage of population below poverty line >15.9%	—	1.10 (1.07 to 1.13)	—	1.11 (1.06 to 1.15)	—	1.00 (0.97 to 1.03)
Monthly per capita income >R$525	—	0.96 (0.93 to 0.99)	—	0.97 (0.93 to 1.02)	—	1.02 (0.97 to 1.05)
Percentage of population having basic household appliances >48.4%	—	0.97 (0.94 to 0.99)	—	0.96 (0.91 to 0.99)	—	1.04 (1.01 to 1.07)
Percentage of population in households with inadequate sanitation >13.8%	—	1.07 (1.03 to 1.12)	—	1.10 (1.03 to 1.17)	—	0.99 (0.95 to 1.03)
Percentage illiteracy among people aged over 15 years >11.0%	—	1.08 (1.05 to 1.12)	—	1.09 (1.04 to 1.15)	—	1.00 (0.96 to 1.03)
Presence of local hospital beds	—	0.93 (0.85 to 1.02)	—	0.86 (0.75 to 0.98)	—	0.95 (0.87 to 1.04)
No of physicians per 1000 inhabitants >0.55	—	0.97 (0.95 to 0.99)	—	0.95 (0.92 to 0.98)	—	1.02 (1.00 to 1.05)
Urbanisation rate >76.6	—	0.93 (0.88 to 0.99)	—	0.98 0.90 to 1.07)	—	0.99 (0.93 to 1.05)
Percentage highly educated among people aged over 25 years >4.8%	—	0.94 (0.91 to 0.97)	—	0.89 (0.85 to 0.93)	—	1.01 (0.98 to 1.04)
Presence of tomography and ultrasonography in municipality	—	0.86 (0.84 to 0.88)	—	0.88 (0.85 to 0.91)	—	0.97 (0.95 to 0.99)
No of observations	16 220		16 150		16 220	
No of municipalities	1622		1615		1622	

Table 3| **Fixed effect negative binomial models for adjusted association* between standardised mortality rates and average coverage of Family Health Program (FHP) in 1622 selected municipalities in Brazil, 2000-09**

Variables	Adjusted rate ratio (95% CI)		
	Cerebrovascular diseases mortality rate	Heart diseases mortality rate	Accidents mortality rate
Average FHP population coverage in past 4 years:			
No coverage	1	1	1
Incipient (>0 to <30%)	0.92 (0.89 to 0.95)	0.92 (0.88 to 0.96)	0.99 (0.96 to 1.02)
Intermediate (≥30% to <70%)	0.83 (0.80 to 0.86)	0.81 (0.78 to 0.85)	0.99 (0.96 to 1.02)
Consolidated (≥70%)	0.77 (0.74 to 0.81)	0.75 (0.71 to 0.79)	1.02 (0.98 to 1.07)
Average FHP population coverage in past 6 years:			
No coverage	1	1	1
Incipient (>0 to <30%)	0.90 (0.87 to 0.92)	0.90 (0.86 to 0.94)	0.99 (0.96 to 1.02)
Intermediate (≥30% to <70%)	0.82 (0.79 to 0.85)	0.79 (0.75 to 0.82)	1.00 (0.97 to 1.03)
Consolidated (≥70%)	0.73 (0.70 to 0.76)	0.69 (0.65 to 0.73)	1.03 (0.98 to 1.07)
Average FHP population coverage in past 8 years:			
No coverage	1	1	1
Incipient (>0 to <30%)	0.89 (0.86 to 0.92)	0.89 (0.85 to 0.93)	1.00 (0.97 to 1.03)
Intermediate (≥30% to <70%)	0.81 (0.78 to 0.84)	0.78 (0.75 to 0.83)	1.01 (0.97 to 1.04)
Consolidated (≥70%)	0.69 (0.66 to 0.73)	0.64 (0.59 to 0.68)	1.02 (0.98 to 1.07)
No of observations	16 220	16 150	16 220
No of municipalities	1622	1615	1622

*Models adjusted for percentage of population below poverty line, per capita income (monthly), percentage of population having basic household appliances, percentage in households with inadequate sanitation, percentage illiteracy among >15 year olds, presence of local hospital beds, number of physicians per 1000 inhabitants, urbanisation rate, percentage highly educated among >25 year olds, and presence of tomography and ultrasonography in the municipality.

PLOS | MEDICINE

RESEARCH ARTICLE

Association between expansion of primary healthcare and racial inequalities in mortality amenable to primary care in Brazil: A national longitudinal analysis

Thomas Hone[1]*, Davide Rasella[2,3], Mauricio L. Barreto[2,3], Azeem Majeed[1], Christopher Millett[1,4,5]

What did the researchers do and find?

- We examined trends in mortality from ambulatory-care-sensitive conditions for black/*pardo* (mixed race) and white Brazilians from 2000 to 2013, and evaluated whether there were changes in mortality associated with expansion of PHC in municipalities.
- PHC expansion was associated with reductions in mortality for both racial groups, but black/*pardo* Brazilians experienced a 2-fold greater reduction in mortality than white Brazilians.
- The targeted rollout of PHC in Brazil to poorer and smaller municipalities and the greater unmet needs of black/*pardo* Brazilians at the start of the rollout are likely to explain these findings.

By Thomas Hone, Davide Rasella, Mauricio Barreto, Rifat Atun, Azeem Majeed, and Christopher Millett

Large Reductions In Amenable Mortality Associated With Brazil's Primary Care Expansion And Strong Health Governance

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HEALTH AFFAIRS 36,
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ABSTRACT **Strong health governance is key to universal health coverage. However, the relationship between governance and health system performance is underexplored. We investigated whether expansion of the Brazilian Estratégia de Saúde da Família (ESF; family health strategy), a community-based primary care program, reduced amenable mortality (mortality avoidable with timely and effective health care) and whether this association varied by municipal health governance. Fixed-effects longitudinal regression models were used to identify the relationship between ESF coverage and amenable mortality rates in 1,622 municipalities in Brazil over the period 2000–12. Municipal health governance was measured using indicators from a public administration survey, and the resulting scores were used in interactions. Overall, increasing ESF coverage from 0 percent to 100 percent was associated with a reduction of 6.8 percent in rates of amenable mortality, compared with no increase in ESF coverage. The reductions were 11.0 percent for municipalities with the highest governance scores and 4.3 percent for those with the lowest scores. These findings suggest that strengthening local health governance may be vital for improving health services effectiveness and health outcomes in decentralized health systems.**

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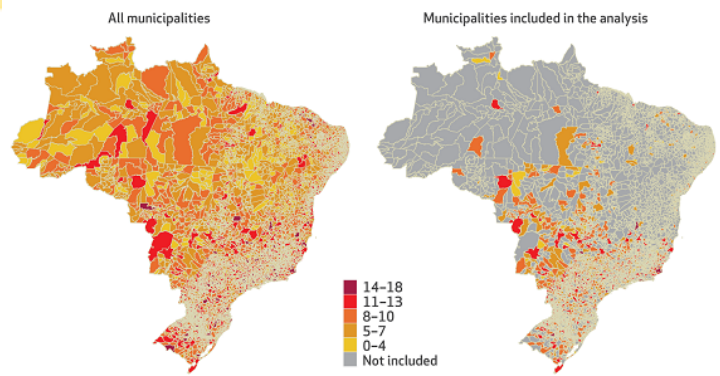
EXHIBIT 1

Health governance scores of all 5,565 Brazilian municipalities and the 1,622 included in the analysis



SOURCE Authors' analysis. NOTES As explained in the text, we generated a health governance score for each municipality consisting of eighteen indicators (each scored 0 or 1) based on government policy guidance, intelligence and oversight, collaboration and coalition building, regulation, and accountability. Thus, the total score for each municipality ranged from 0 to 18. In the regression analysis, municipalities were divided into terciles and used in interactions.

Associations between municipal-level factors and amenable and nonamenable mortality rates showing different associations of ESF coverage, by tercile of health governance scores in 1,622 Brazilian municipalities, 2000–12

	Rate ratio	
	Amenable mortality	Nonamenable mortality
Percent of population with ESF coverage	0.957***	0.995
ESF coverage interaction with:		
Tercile 1	1 (ref)	1 (ref)
Tercile 2	0.998	1.019
Tercile 3	0.931**	0.922***
Other characteristics		
Year	0.982****	0.982****
Fertility rate	0.990	1.009
Mean household income[a]	1.002	0.998
Non-family medicine doctors[b]	0.996	1.000
Public hospital beds[b]	1.008***	1.001
Municipality health expenditure per capita[a]	1.010**	1.004
Percent of population:		
Without electricity	0.959	2.171***
With household garbage collection	1.060	0.976
With access to piped water and an indoor toilet	0.902	1.965****
With secondary education[c]	0.547	0.776
Unemployed[d]	1.356	2.021**
Illiterate[c]	1.002	0.303****

SOURCE Authors' analysis. NOTES The exhibit shows results from a fixed-effect panel regression. For example, the association between year and amenable mortality is estimated as a rate ratio of 0.982 and is interpreted as a 1.8 percent reduction (the difference from 1) in the mortality rate for each additional year in the study period. The rate ratios from the interaction (between ESF coverage and governance tercile) are interpreted as the additional estimated reductions in mortality in terciles 2 and 3 compared to tercile 1. The overall effect sizes for terciles 2 and 3 are calculated as the product of overall effect for ESF coverage and the tercile-specific effect (for example, for tercile 3: $0.931 \times 0.957 = 0.890$). Robust standard errors were used. The municipalities in tercile 1 had the lowest health governance scores in 2000, while those in tercile 3 had the highest. There were 21,086 observations for the 1,622 municipalities. Fertility rate is the mean number of births per woman. *Amenable* means amenable to health care. ESF is Estratégia de Saúde da Família (family health strategy), which is explained in the text. R$ are 2012 Brazilian reals. [a]In R$100s. [b]Per 1,000 population. [c]Among people older than age twenty-five. [d]Among people older than age eighteen. **$p < 0.05$ ***$p < 0.01$ ****$p < 0.001$

Effect of a conditional cash transfer programme on childhood mortality: a nationwide analysis of Brazilian municipalities

Davide Rasella, Rosana Aquino, Carlos A T Santos, Rômulo Paes-Sousa, Mauricio L Barreto

Methods The study had a mixed ecological design. It covered the period from 2004–09 and included 2853 (of 5565) municipalities with death and livebirth statistics of adequate quality. We used government sources to calculate all-cause under-5 mortality rates and under-5 mortality rates for selected causes. BFP coverage was classified as low (0·0–17·1%), intermediate (17·2–32·0%), high (>32·0%), or consolidated (>32·0% and target population coverage ≥100% for at least 4 years). We did multivariable regression analyses of panel data with fixed-effects negative binomial models, adjusted for relevant social and economic covariates, and for the effect of the largest primary health-care scheme in the country (Family Health Programme).

Findings Under-5 mortality rate, overall and resulting from poverty-related causes, decreased as BFP coverage increased. The rate ratios (RR) for the effect of the BFP on overall under-5 mortality rate were 0·94 (95% CI 0·92–0·96) for intermediate coverage, 0·88 (0·85–0·91) for high coverage, and 0·83 (0·79–0·88) for consolidated coverage. The effect of consolidated BFP coverage was highest on under-5 mortality resulting from malnutrition (RR 0·35; 95% CI 0·24–0·50) and diarrhoea (0·47; 0·37–0·61).

Interpretation A conditional cash transfer programme can greatly contribute to a decrease in childhood mortality overall, and in particular for deaths attributable to poverty-related causes such as malnutrition and diarrhoea, in a large middle-income country such as Brazil.

	BFP models		FHP models		FHP and BFP (adjusted)
	Crude	Adjusted	Crude	Adjusted	
BFP population coverage					
Low (0·0–17·1%)	1·00	1·00	..	..	1·00
Intermediate (17·2–32·0%)	0·91 (0·90–0·93)	0·93 (0·91–0·95)	..	..	0·94 (0·92–0·96)
High (>32·0%)	0·82 (0·80–0·85)	0·86 (0·83–0·89)	..	..	0·88 (0·85–0·91)
Consolidated (>32·0% and TPC ≥100% for at least 4 years)	0·76 (0·72–0·80)	0·81 (0·76–0·85)	..	..	0·83 (0·79–0·88)
FHP municipality population coverage					
No FHP (0·0%)	..	..	1·00	1·00	1·00
Incipient (<30%)	..	..	0·97 (0·92–1·02)	0·98 (0·94–1·03)	0·99 (0·94–1·04)
Intermediate (≥30%)	..	..	0·89 (0·85–0·93)	0·91 (0·87–0·96)	0·93 (0·88–0·97)
Consolidated (≥70% and implemented for at least 4 years)	..	..	0·81 (0·77–0·86)	0·85 (0·80–0·90)	0·88 (0·83–0·93)
Income per person (monthly, >BR$380)*	..	0·94 (0·92–0·97)	..	0·93 (0·91–0·96)	0·95 (0·92–0·97)
Proportion of municipality population eligible for BFP* >22·4%	..	1·07 (1·02–1·11)	..	1·10 (1·06–1·15)	1·07 (1·03–1·12)
Proportion of individuals living in households with inadequate sanitation* <16·7%	..	1·10 (1·05–1·15)	..	1·11 (1·06–1·16)	1·10 (1·05–1·15)
Proportion of individuals older than 15 years who are illiterate† >11·1%	..	1·04 (1·00–1·09)	..	1·05 (1·01–1·10)	1·04 (1·00–1·08)
Total fertility rate† >2·32	..	1·08 (1·04–1·11)	..	1·08 (1·05–1·12)	1·07 (1·03–1·10)
Rate of admission to hospital (per 100 inhabitants)* >4·27	..	1·02 (0·99–1·04)	..	1·02 (0·99–1·04)	1·01 (0·99–1·04)
Number of observations	17 118	17 118	17 118	17 118	17 118
Number of municipalities	2853	2853	2853	2853	2853

Data are rate ratio (95% CI) unless otherwise specified. TPC=target population coverage. *Cutoff is median value. †Cutoff taken from Rasella and colleagues, 2010.[12]

Table 2: **Fixed-effect negative binomial models for association between under-5 mortality rates and *Bolsa Família* Programme (BFP) and Family Health Programme (FHP) cover**

	Diarrhoeal diseases	Malnutrition	Lower respiratory infections	External causes
BFP municipality population coverage				
Low (0·0–17·1%)	1·00	1·00	1·00	1·00
Intermediate (17·2–32·0%)	0·83 (0·74–0·92)	0·66 (0·57–0·77)	0·96 (0·88–1·05)	1·03 (0·95–1·13)
High (>32·0%)	0·68 (0·59–0·80)	0·54 (0·44–0·67)	0·94 (0·82–1·07)	0·92 (0·79–1·06)
Consolidated (>32·0% and TPC ≥100 for at least 4 years)	0·47 (0·37–0·61)	0·35 (0·24–0·50)	0·80 (0·64–0·99)	0·92 (0·72–1·16)
FHP municipality population coverage				
No FHP (0·0%)	1·00	1·00	1·00	1·00
Incipient (<30%)	0·90 (0·67–1·17)	0·88 (0·60–1·29)	0·83 (0·68–1·00)	0·95 (0·79–1·14)
Intermediate (≥30%)	0·71 (0·54–0·93)	0·72 (0·49–1·07)	0·71 (0·58–0·86)	0·87 (0·72–1·05)
Consolidate (≥70% and implemented for at least 4 years)	0·53 (0·39–0·71)	0·59 (0·38–0·91)	0·70 (0·56–0·87)	0·87 (0·70–1·08)
Number of observations	7356	5124	9894	10776
Number of municipalities	1226	854	1649	1796

Data are rate ratio (95% CI) unless otherwise specified. Models adjusted for income per person, proportion of municipality population eligible for BFP, proportion of individuals living in households with inadequate sanitation, proportion of individuals older than 15 years who are illiterate, total fertility rate, and rate of admissions to hospital.

Table 3: Fixed-effect negative binomial models for adjusted associations between ***Bolsa Família*** Programme (BFP) and Family Health Programme (FHP) coverage and under-5 mortality rates for some relevant groups of causes

	Measles, polio, and DPT vaccine coverage over 95% among children younger than 1 year OR* (95% CI)	Proportion of pregnant women with no prenatal visits at the moment of delivery RR† (95% CI)	Under-5 rate of admission to hospital RR‡ (95% CI)	Under-5 rate of admission to hospital for diarrhoeal diseases RR‡ (95% CI)	Under-5 rate of admission to hospital for malnutrition RR‡ (95% CI)	Under-5 rate of admission to hospital for lower respiratory infections RR‡ (95% CI)	Under-5 rate of admission to hospital for external causes RR‡ (95% CI)
BFP municipality population coverage							
Low (0·0–17·1%)	1·00	1·00	1·00	1·00	1·00	1·00	1·00
Intermediate (17·2–32·0%)	1·47 (1·29–1·68)	0·85 (0·83–0·87)	0·96 (0·95–0·97)	0·86 (0·84–0·87)	0·82 (0·76–0·87)	0·95 (0·93–0·97)	1·30 (0·85–1·99)
High (>32·0%)	1·98 (1·48–2·43)	0·66 (0·63–0·69)	0·92 (0·90–0·94)	0·80 (0·77–0·83)	0·68 (0·62–0·75)	0·88 (0·85–0·91)	1·19 (0·45–3·18)
Consolidated (>32·0% and TPC ≥100 for at least 4 years)	2·05 (1·53–2·76)	0·53 (0·48–0·57)	0·84 (0·81–0·86)	0·61 (0·57–0·65)	0·53 (0·44–0·63)	0·88 (0·83–0·93)	0·62 (0·10–3·90)
Number of observations	14166	15948	17118	17070	12528	17118	10776
Number of municipalities	2361	2658	2853	2845	2088	2853	1796

OR=odds ratio. RR=rate ratio. DTP=diphtheria, tetanus, pertussis. TPC=target population coverage. FHP=Family Health Programme. *Estimated by logistic regression models adjusted for FHP coverage. †Estimated by negative binomial regression models adjusted for FHP coverage. ‡Estimated by negative binomial regression models adjusted for FHP coverage, income per person, proportion of municipality population eligible for BFP, proportion of individuals living in households with inadequate sanitation, proportion of individuals older than 15 years who are illiterate, and total fertility rate.

Table 4: Fixed-effect models for associations between primary care indicators, rates of admission to hospital, and ***Bolsa Familia*** Programme (BFP) coverage

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PLOS | NEGLECTED TROPICAL DISEASES

Effect of the Brazilian Conditional Cash Transfer and Primary Health Care Programs on the New Case Detection Rate of Leprosy

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Abstract

Background: Social determinants can affect the transmission of leprosy and its progression to disease. Not much is known about the effectiveness of welfare and primary health care policies on the reduction of leprosy occurrence. The aim of this study is to evaluate the impact of the Brazilian cash transfer (Bolsa Família Program-BFP) and primary health care (Family Health Program-FHP) programs on new case detection rate of leprosy.

Methodology/Principal Findings: We conducted the study with a mixed ecological design, a combination of an ecological multiple-group and time-trend design in the period 2004–2011 with the Brazilian municipalities as unit of analysis. The main independent variables were the BFP and FHP coverage at the municipal level and the outcome was new case detection rate of leprosy. Leprosy new cases, BFP and FHP coverage, population and other relevant socio-demographic covariates were obtained from national databases. We used fixed-effects negative binomial models for panel data adjusted for relevant socio-demographic covariates. A total of 1,358 municipalities were included in the analysis. In the studied period, while the municipal coverage of BFP and FHP increased, the new case detection rate of leprosy decreased. Leprosy new case detection rate was significantly reduced in municipalities with consolidated BFP coverage (Risk Ratio 0.79; 95% CI = 0.74–0.83) and significantly increased in municipalities with FHP coverage in the medium (72–95%) (Risk Ratio 1.05; 95% CI = 1.02–1.09) and higher coverage tertiles (>95%) (Risk Ratio 1.12; 95% CI = 1.08–1.17).

Conclusions: At the same time the Family Health Program had been effective in increasing the new case detection rate of leprosy in Brazil, the Bolsa Família Program was associated with a reduction of the new case detection rate of leprosy that we propose reflects a reduction in leprosy incidence.

Citation: Nery JS, Pereira SM, Rasella D, Penna MLF, Aquino R, et al. (2014) Effect of the Brazilian Conditional Cash Transfer and Primary Health Care Programs on the New Case Detection Rate of Leprosy. PLoS Negl Trop Dis 8(11): e3357. doi:10.1371/journal.pntd.0003357

OTHER UNPUBLISHED ANALYSIS USING AGGREGATE PANEL DATA have shown Positive Impact of BF on:
tuberculosis, malaria, HIV, leishmaniasis, suicides, and homicides incidence and/or mortality.

	Frequency and trends
Health of mothers and children[2]	
Illegal abortions	Highly prevalent*
Maternal mortality	Slow decline*
Preterm delivery	Increasing
Ov	
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No	
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Psy	
Astnma	High prevalence
Cancers of the breast, lung, prostate, and colon	Increasing
Tobacco use	Declining but still at unacceptable levels
Excessive use of alcohol	High prevalence*
External causes[5]	
Homicides	Slight decline but still at epidemic levels
Traffic-related injuries and deaths	Slight decline but still at epidemic levels
Domestic violence	High prevalence*

*Reliable and representative data for time trends are not available.

Table 3: **Diseases and health problems that need special attention**

Health of mothers and children[2]

Illegal abortions	Highly prevalent*
Maternal mortality	Slow decline*
Preterm delivery	Increasing
Over-medicalisation of childbirth (caesarean sections, etc)	Increasing

	Frequency and trends
Health of mothers and children[2]	
Illegal abortions	Highly prevalent*
Maternal mortality	Slow decline*
Preterm delivery	Increasing
Over-medicalisation of childbirth (caesarean sections, etc)	Increasing
Infectious disease	
Dengue fever	
Visceral leishmania	
Non-communicab	
Overweight/obesit	
Diabetes	
Hypertension	
Psychiatric diseases	High prevalence*
Asthma	High prevalence*
Cancers of the breast, lung, prostate, and colon	Increasing
Tobacco use	Declining but still at unacceptable levels
Excessive use of alcohol	High prevalence*
External causes[5]	
Homicides	Slight decline but still at epidemic levels
Traffic-related injuries and deaths	Slight decline but still at epidemic levels
Domestic violence	High prevalence*

*Reliable and representative data for time trends are not available.

Table 3: **Diseases and health problems that need special attention**

Infectious diseases[3]

Dengue fever	Repeated epidemics, out of control
Visceral leishmaniasis	Increasing

	Frequency and trends
Health of mothers and children[2]	
Illegal abortions	Highly prevalent*
Maternal mortality	Slow decline*
Preterm delivery	Increasing
Over-m	
Infectio	
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Diabete	
Hyperte	
Psychiat	
Asthma	
Cancers	
Tobacco use	
Excessive use of alcohol	High prevalence*
External causes[5]	
Homicides	Slight decline but still at epidemic levels
Traffic-related injuries and deaths	Slight decline but still at epidemic levels
Domestic violence	High prevalence*

*Reliable and representative data for time trends are not available.

Table 3: Diseases and health problems that need special attention

Non-communicable diseases[4]	
Overweight/obesity	Rapid increase
Diabetes	Increasing
Hypertension	High prevalence, still increasing
Psychiatric diseases	High prevalence*
Asthma	High prevalence*
Cancers of the breast, lung, prostate, and colon	Increasing
Tobacco use	Declining but still at unacceptable levels
Excessive use of alcohol	High prevalence*

	Frequency and trends
Health of mothers and children[2]	
Illegal abortions	Highly prevalent*
Maternal mortality	Slow decline*
Preterm delivery	Increasing
Over-medicalisation of childbirth (caesarean sections, etc)	Increasing
Infectious diseases[3]	
Dengue fever	Repeated epidemics, out of control
Visceral leishmaniasis	Increasing
Non-communicable diseases[4]	
Overweight/obesity	Rapid increase
Diabetes	Increasing
Hypertension	High prevalence, still increasing
Psychiatric diseases	High prevalence*
Asthma	High prevalence*
Cancers of the breast, lung, prostate, and colon	Increasing
Tobacco	
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External causes[5]	
Homicides	Slight decline but still at epidemic levels
Traffic-related injuries and deaths	Slight decline but still at epidemic levels
Domestic violence	High prevalence*

*Reliable and representative data for time trends are not available.

Table 3: Diseases and health problems that need special attention

Conclusão

- A situação de saúde da população brasileira apresenta avanços importantes, mas também mantém velhos problemas não resolvidos e a criação de novos;

- Problemas "novos" e "antigos“ superpõem-se, aumentando a demanda por serviços de saúde;

- O futuro da saúde da população brasileira envolve um conjunto de politicas implementadas com alto grau de equidade e eficiência capazes de reverter ou atenuar problemas com tendência a agravamento e que devem incluir: a atenção primária à saúde; a proteção social; políticas ambientais e urbanas; ações regulatórias (fumo, indústria de alimentos, medicamentos etc)