

Visualizing the Power of Evidence-Driven Policy in Countries in Transition

Giang Nguyen, Star Ying, Hannah Cho, Ariel Lee

International Strategy and Reconciliation Foundation

Igor Barahona

Mathematics Institute of the UNAM, Mexico

<https://star-is-here.github.io/jsm-deck/>



Giang Nguyen (ISR Foundation Center for Interdisciplinary Research)

Clara Kyung (McGill University)

Ariel Lee (ISR Foundation Center for Science Diplomacy)

Tiffany Lee (ISR Foundation Center for Science Diplomacy)

Hannah Cho (University of Pennsylvania)

Elliott Chun (University of North Carolina, Chapel Hill)

Cindy Won (Brown University)

Star Ying (Commerce Data Service, U.S. Department of Commerce)

Asaph Young Chun (U.S. Census Bureau)

Note: All authors are affiliated with the International Strategy and Reconciliation Foundation.

- Introduction
 - Research questions
 - Methodology
- Policy challenges in developing countries
- Power of evidence-based policymaking
- Principles of data visualizations
- Demonstration of data visualizations
- Conclusion

In 1996, the Tanzania Essential Health Interventions Project was launched.



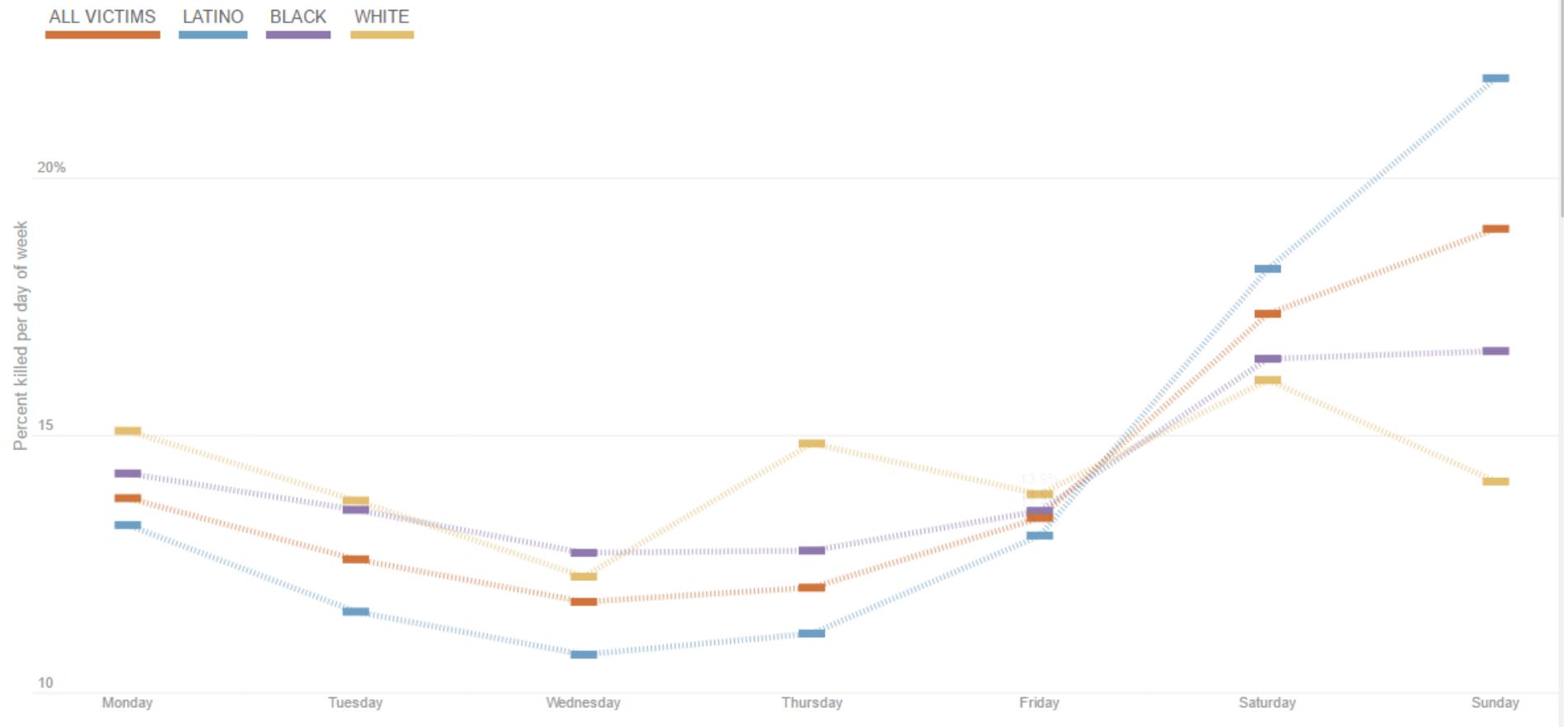
IDRC: P. Bennett

**Over 40% reductions in infant mortality
between 2000 and 2003 in two pilot
districts**



From “2015: The Year in Graphics”, Los Angeles Times

Percent of victims killed by day of week, 2000-2014



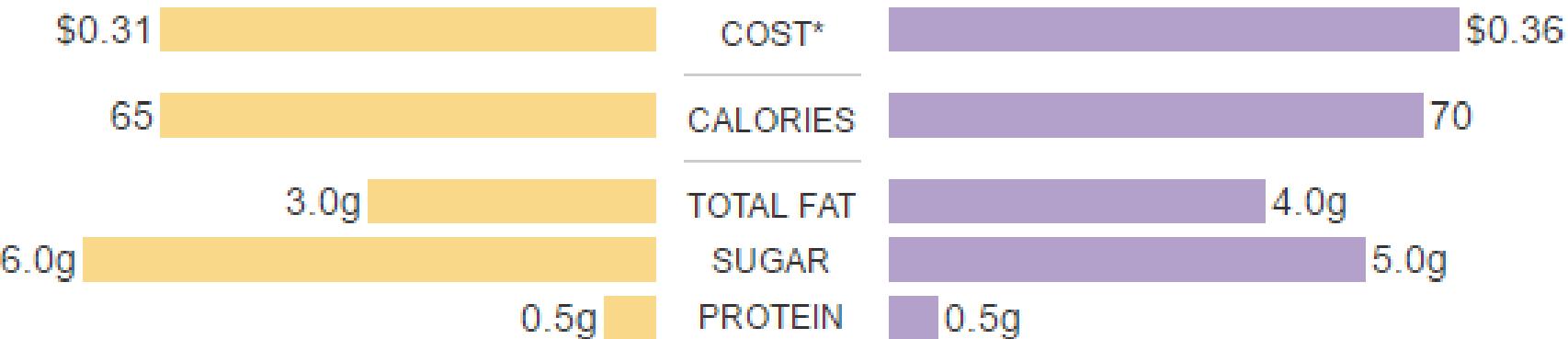
Source: L.A. Times Homicide Report

Armand Emamdjomeh / [@latdatadesk](#)



Caramel deLites

More cookie than caramel, milkier chocolate; cookie has vanilla flavor



Samoas

Heavier caramel layer, darker chocolate coating, more toasted coconut

From “2015: The Year in Graphics”, Los Angeles Times

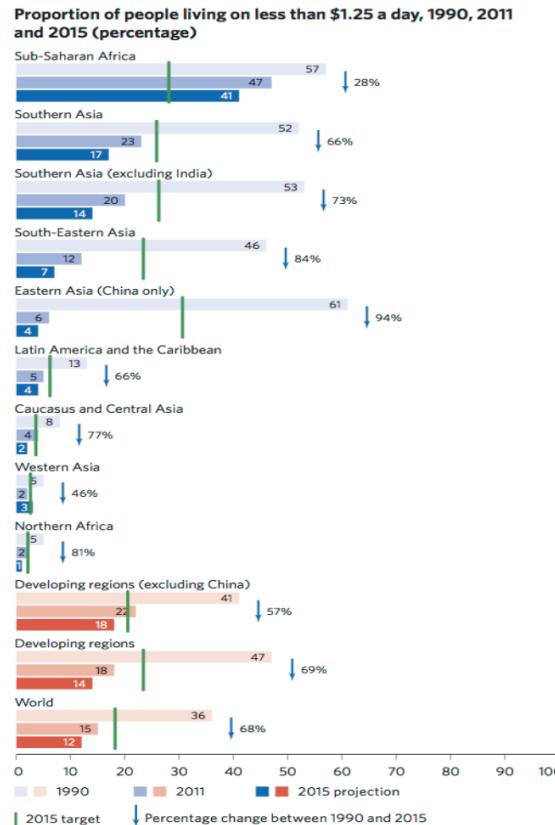
**Investigate the power of data
visualization as an evidence-based
approach to policymaking**

- DVs and EBP in countries in transition?
- Multiple data sources?
- How to demonstrate power of EBP with DVs?
- Merits and drawbacks of EBP and DVs?

- Three main sources of data:
 - United Nations' Millennium Development Goals Indicators
 - World Bank's Open Data
 - DPRK Survey and Census Data
- Develop DVs pertaining to health, economic, and social issues in countries in transition

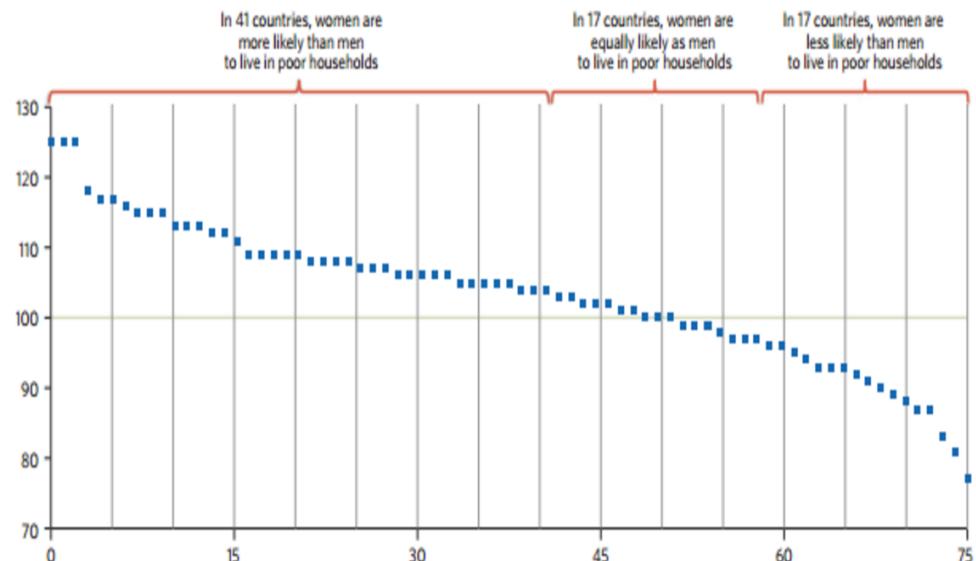
- Incredible progress has been made in achieving the Millennium Development Goals set in 2000.
- Nonetheless, there still remains much work to be done in a variety of areas towards **Sustainable Development Goals** the U.N. aims to accomplish by 2030:
 - Poverty and hunger
 - Gender inequality
 - Child and maternal mortality
 - Disease
 - Environmental sustainability
 - Setbacks due to crises, shocks, and vulnerabilities

Extreme Poverty and Hunger



Note: Sufficient country data are not available for Oceania.

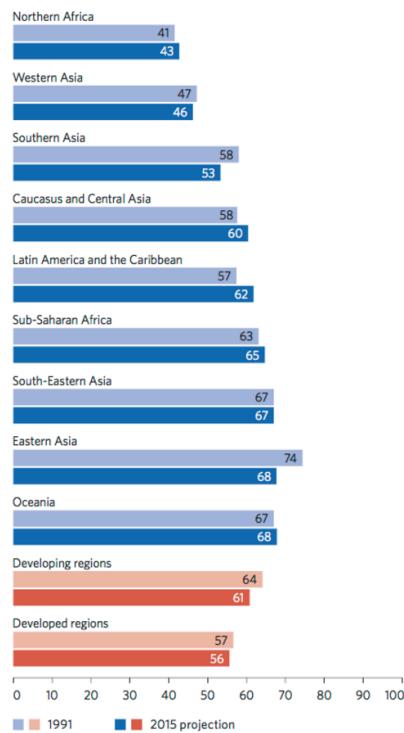
Ratio of women to men of working age (20 to 59) in the lowest wealth quintile of all households, selected developing countries, 2000–2013



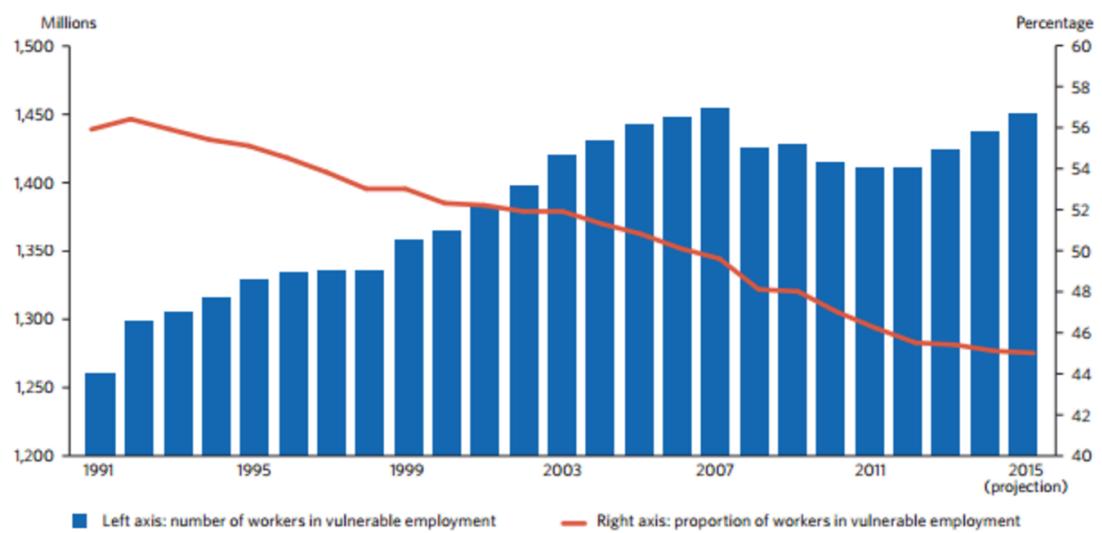
Notes: This indicator is weighted by the ratio of females to males aged 20–59 in all households to reflect the fact that women may be overrepresented in the entire population. It uses the wealth asset index in the Demographic and Health Surveys and Multiple Indicator Cluster Surveys as a proxy measure for poverty. Values above 103 indicate that women are overrepresented in the lowest wealth quintile while values below 97 indicate that men are overrepresented in the lowest wealth quintile. Values between 97 and 103 indicate parity.

Employment opportunities are being outpaced by the growing labour force

Employment-to-population ratio, 1991 and 2015 (percentage)

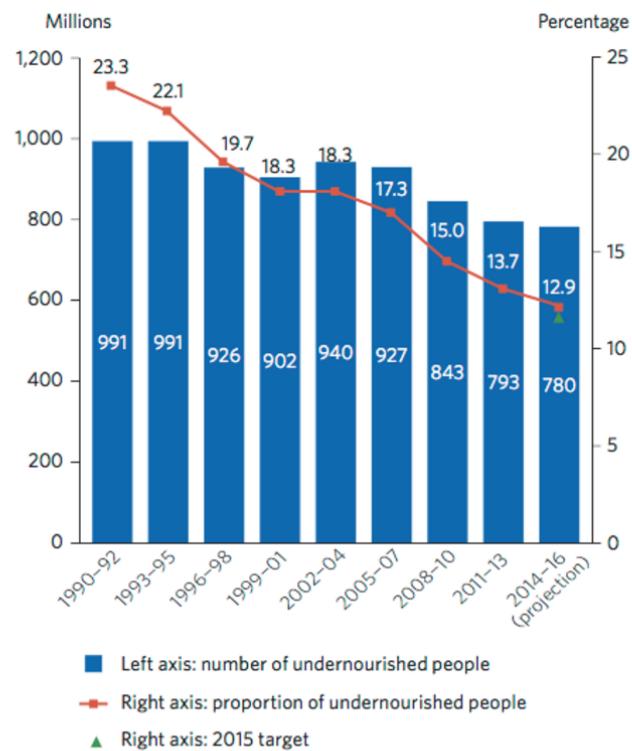


Number and proportion of own-account and contributing family workers in total employment, 1991–2015

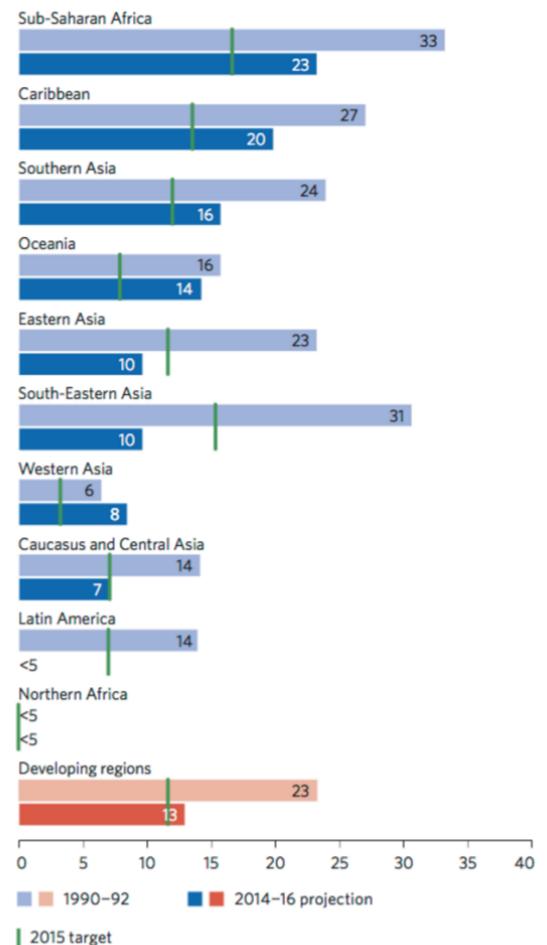


Progress on ending hunger has been significant despite the challenging global environment

Number and proportion of undernourished people in the developing regions, from 1990–1992 to 2014–2016

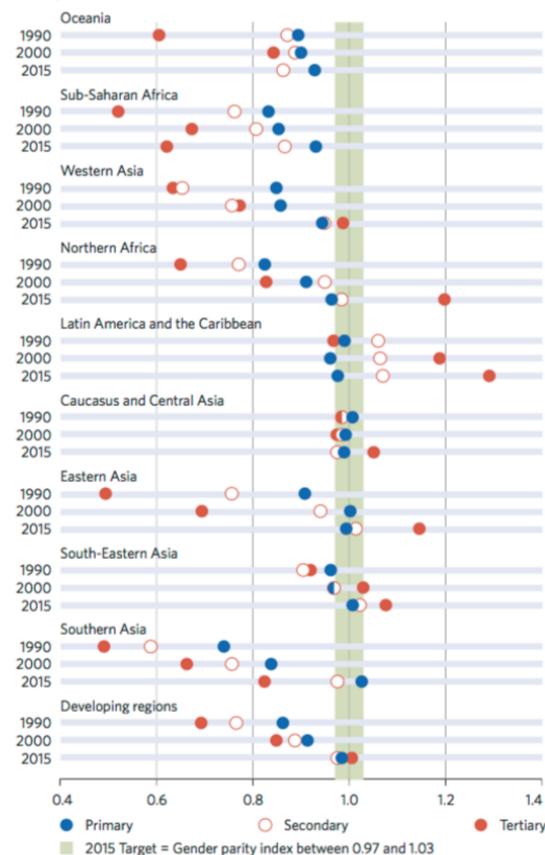


Proportion of undernourished people, 1990–1992 and 2014–2016 (percentage)



Gender Inequality

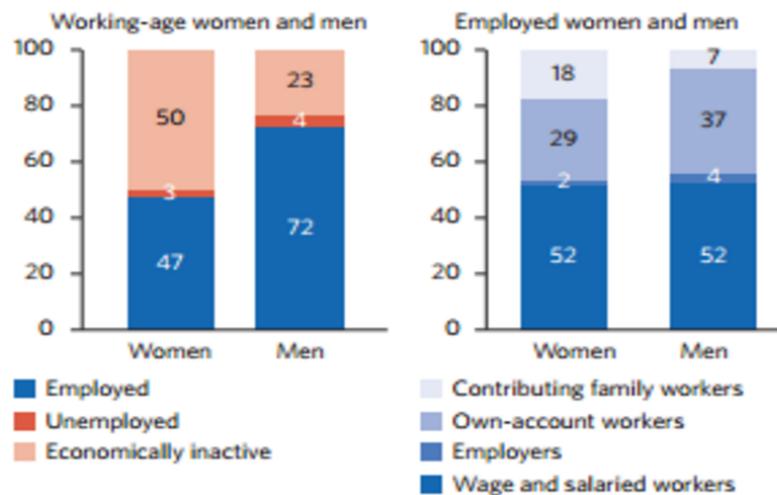
Gender parity index* for gross enrolment ratios in primary, secondary and tertiary education in developing regions, 1990, 2000 and 2015



* The gender parity index is defined as the ratio of the female gross enrolment ratio to the male gross enrolment ratio for each level of education.

Notes: Data for 2015 are projections. Data for 1990 for the Caucasus and Central Asia refer to 1993. Projections for 2015 for primary and tertiary education in Oceania are not available. For primary education, 2012 data are used.

Distribution of working-age women and men (aged 15 and above) by labour force participation and employed women and men by status in employment, 2015 (percentage)

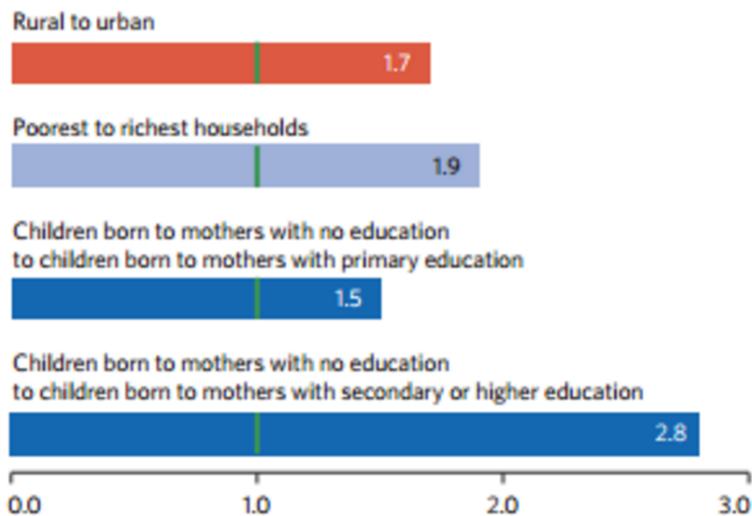


Note: Data for 2015 are projections.

Percentages in charts may not always add to 100 because of rounding.

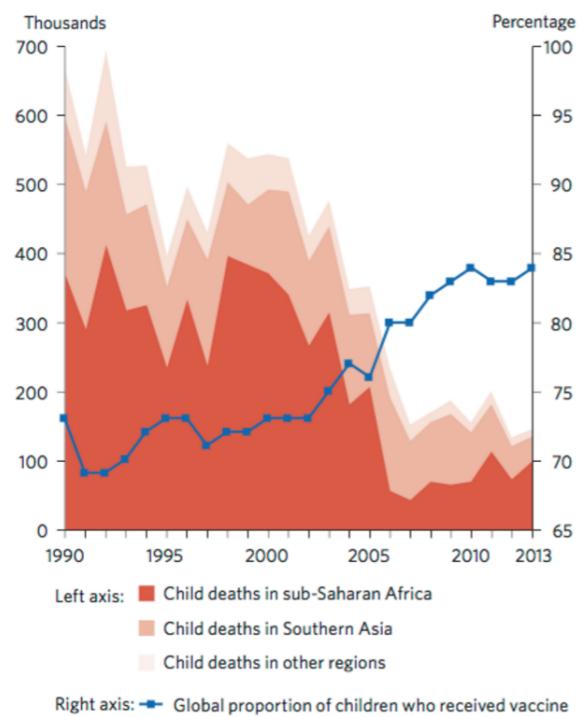
Child Mortality

Ratio of under-five mortality rate for children by residence, wealth quintile and mother's education, 2005–2013



Note: Data are based on the MICS and DHS survey that took place between 2005 and July 2013. Data from most recent survey in that period are used for countries with multiple surveys. Data by wealth quintile are based on 55 surveys, data on education are based on 59 surveys, data on residence are based on 60 surveys.

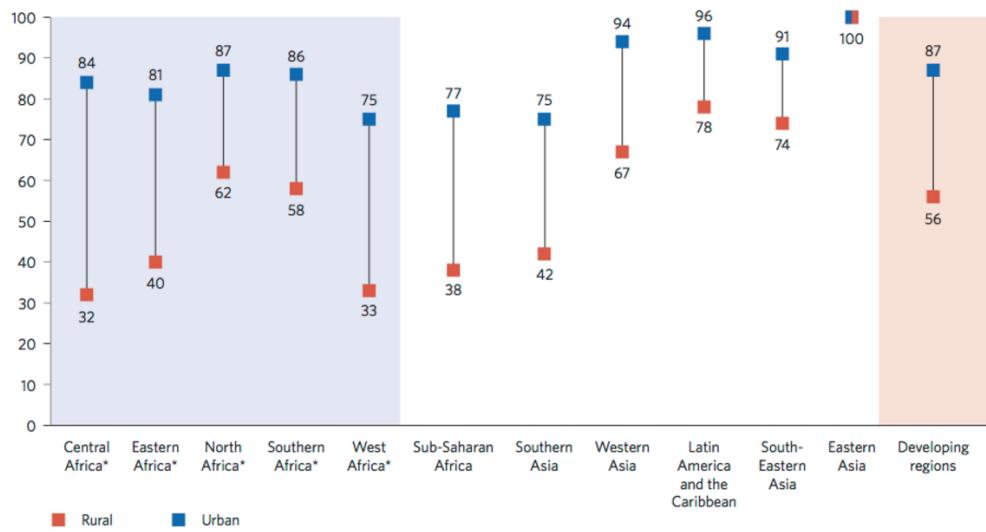
Estimated child deaths due to measles (thousands) and proportion of children in the appropriate age group who received at least one dose of measles-containing vaccine (percentage), 1990–2013



Maternal Mortality

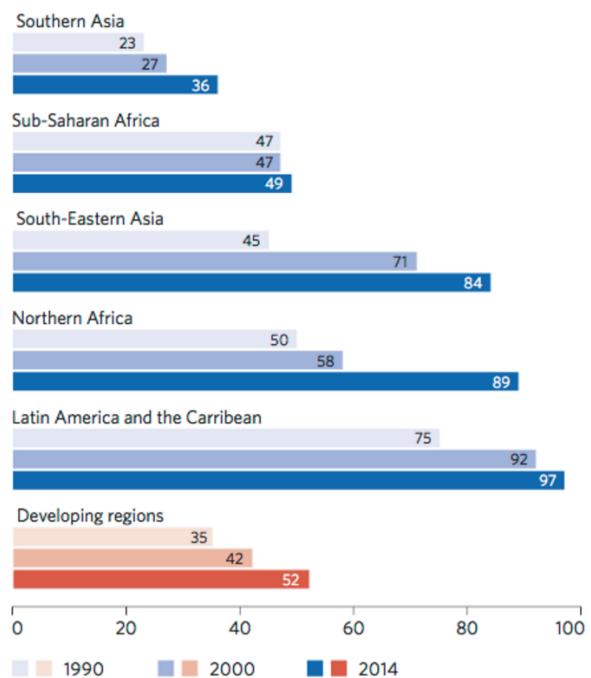
Inequalities in access to maternal health care persist across most regions

Proportion of deliveries attended by skilled health personnel in rural and urban areas, 2010–2014 (percentage)



*The composition of the subregions of Africa is shown on page 71.

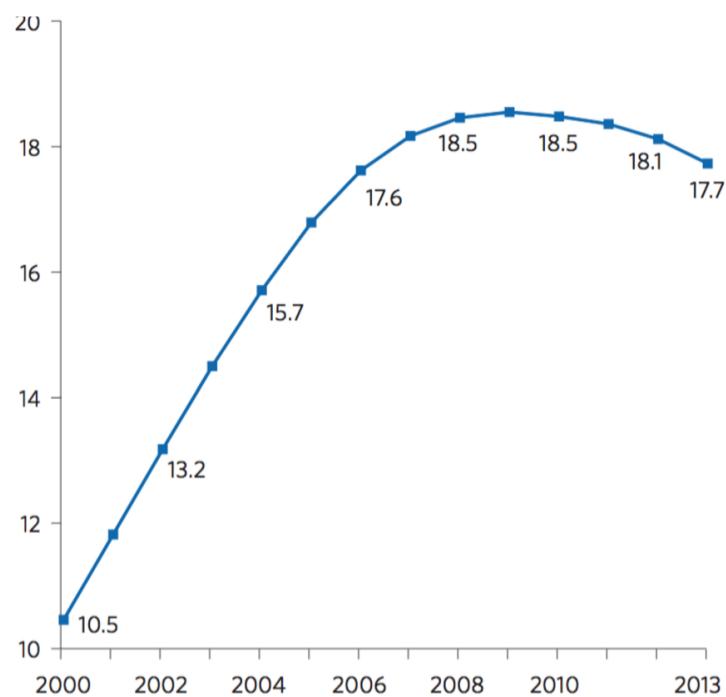
Proportion of women aged 15–49 attended four or more times by any provider during pregnancy, 1990, 2000 and 2014 (percentage)



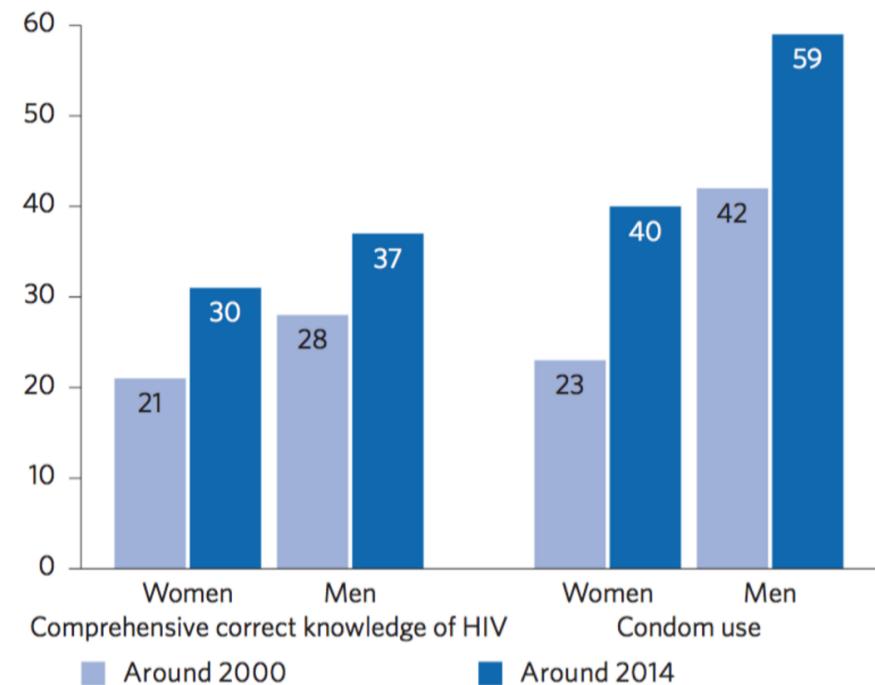
Combating Diseases

The number of people newly infected with HIV continues to decline

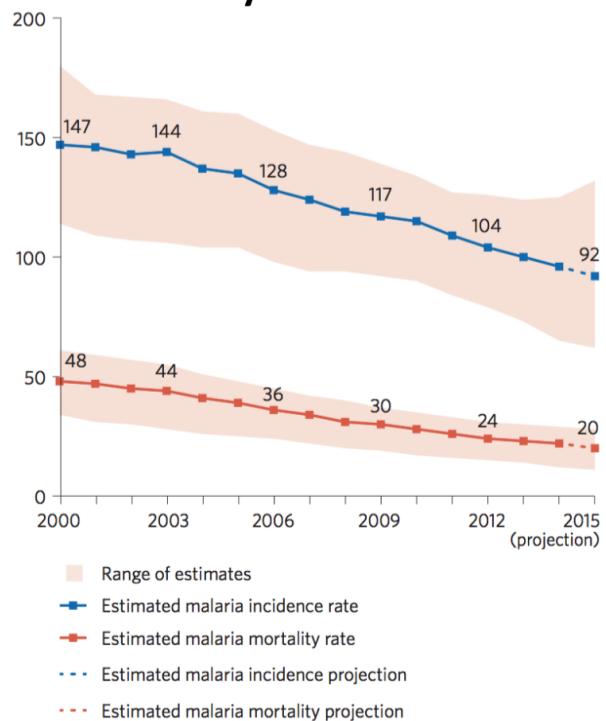
Estimated number of AIDS-related orphans worldwide



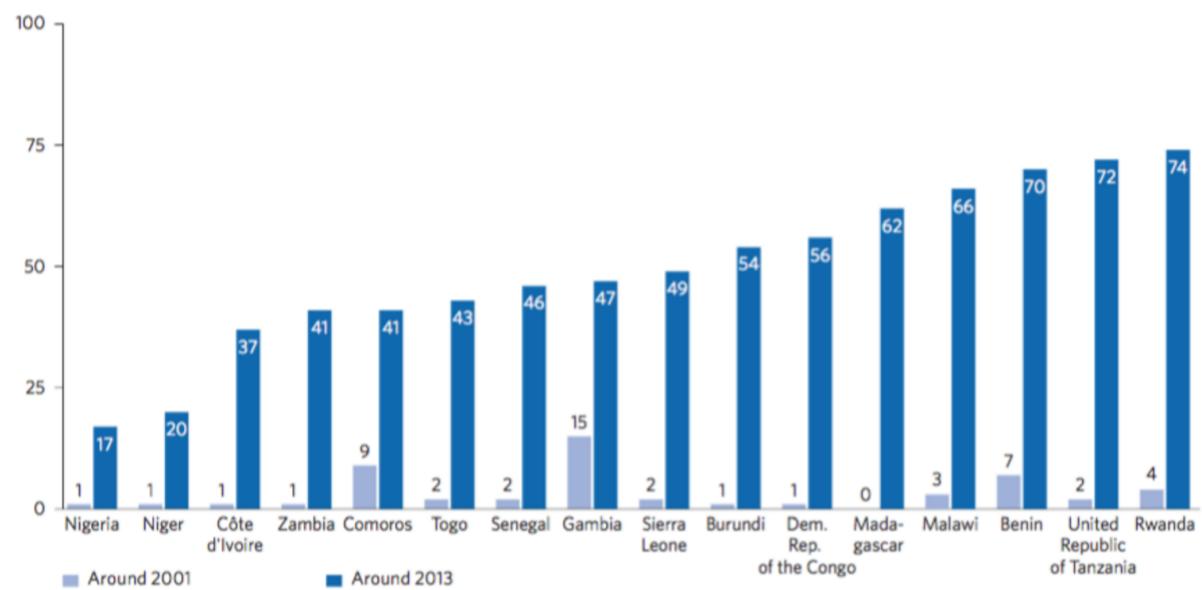
Proportion of age 15-24 in sub-Saharan Africa with correct knowledge application of disease prevention



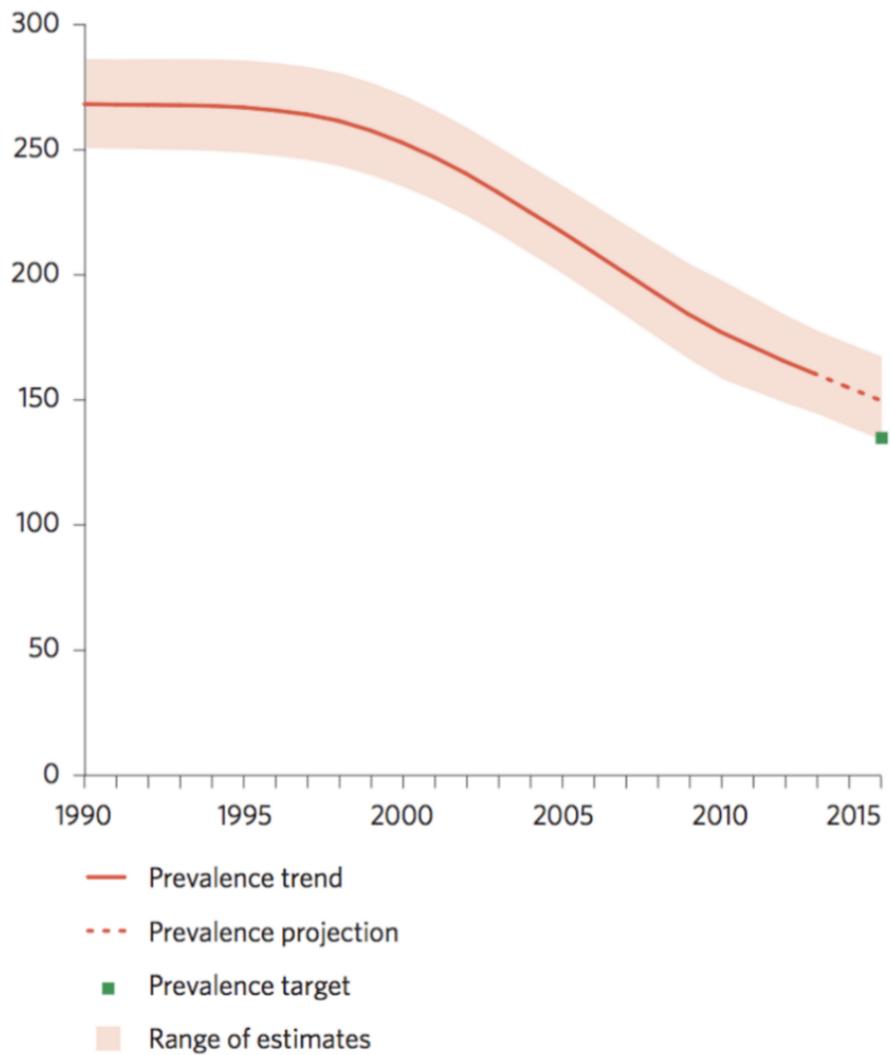
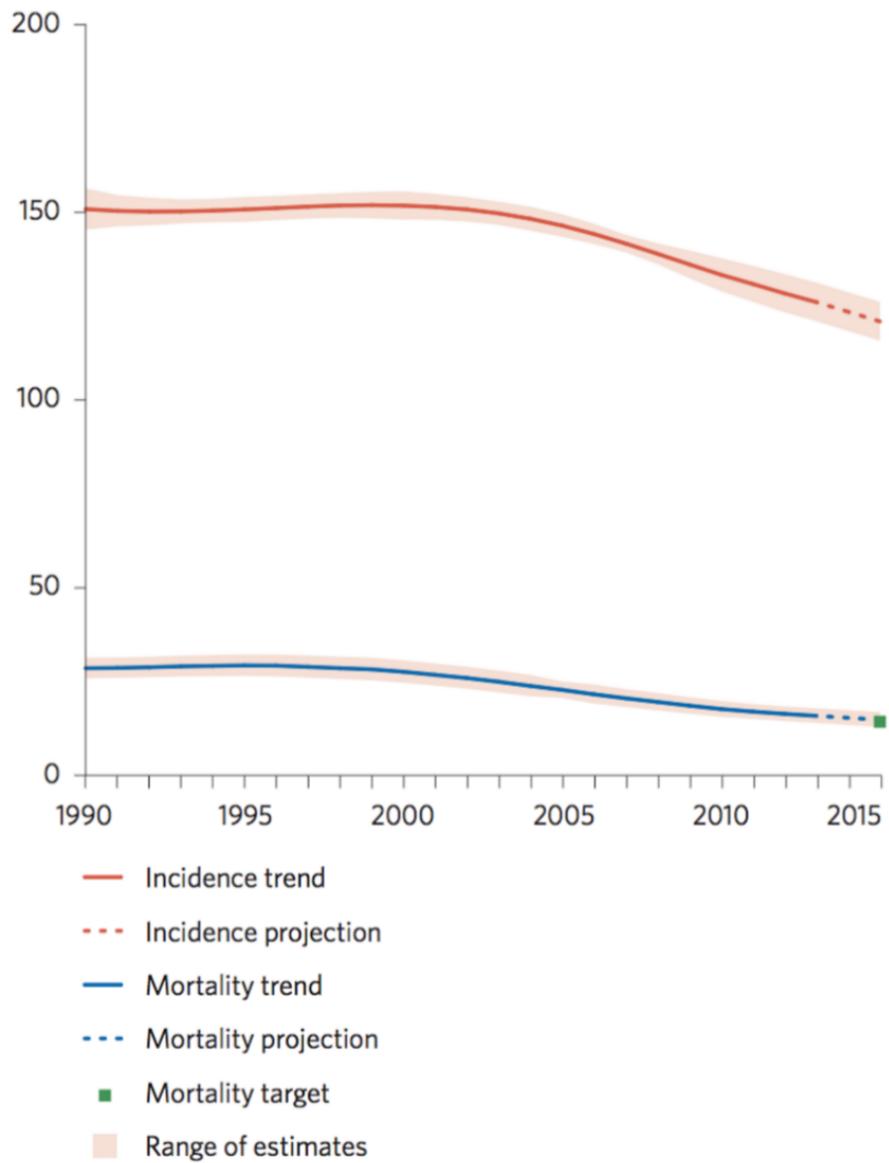
Change in malaria incidence rate and mortality rate

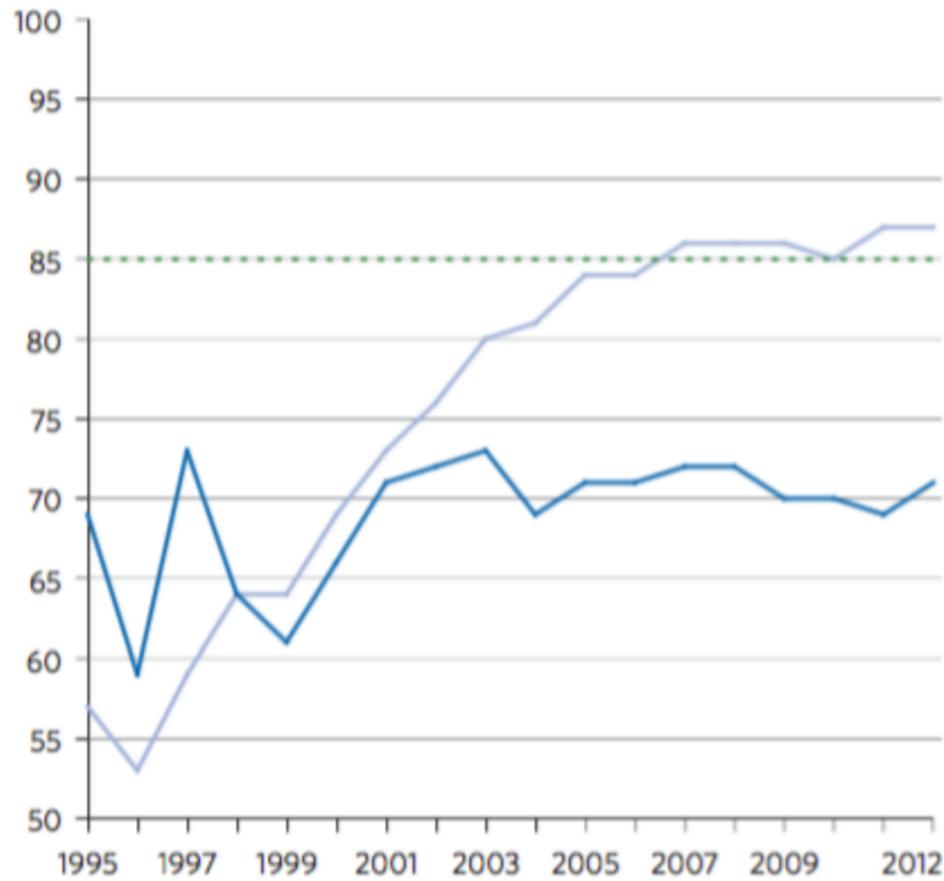


Children under five sleeping under insecticide-treated mosquito nets (Proportion)



Tuberculosis incidence, mortality, and prevalence rates



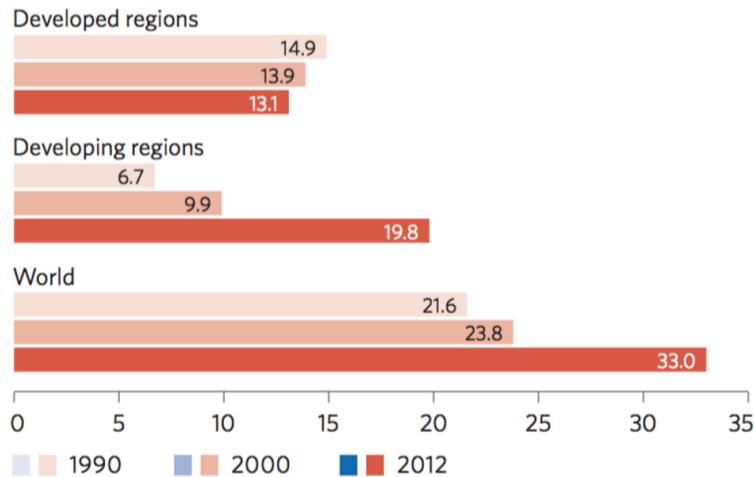


Tuberculosis treatment success rate in developed and developing regions

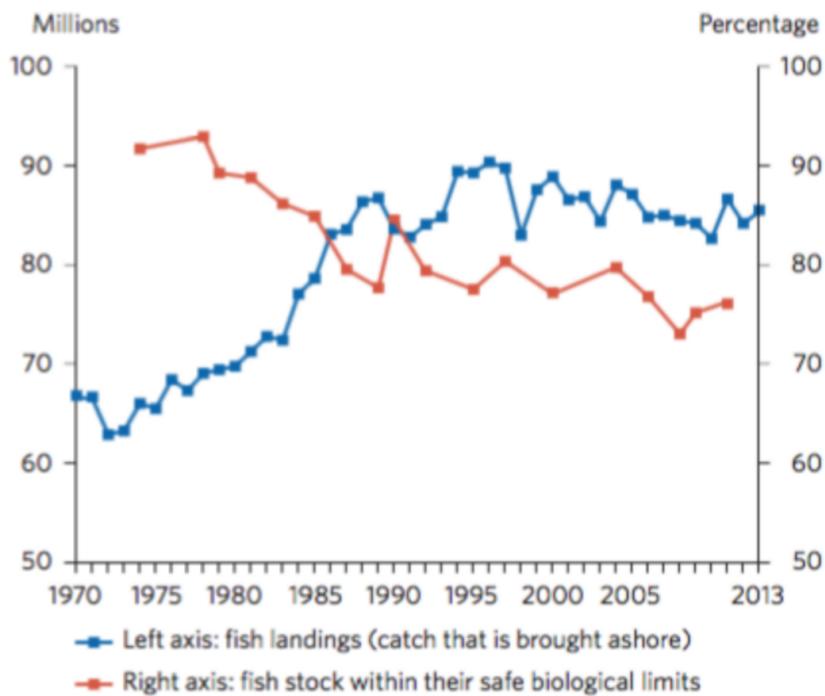
- Developed regions
- Developing regions
- Target

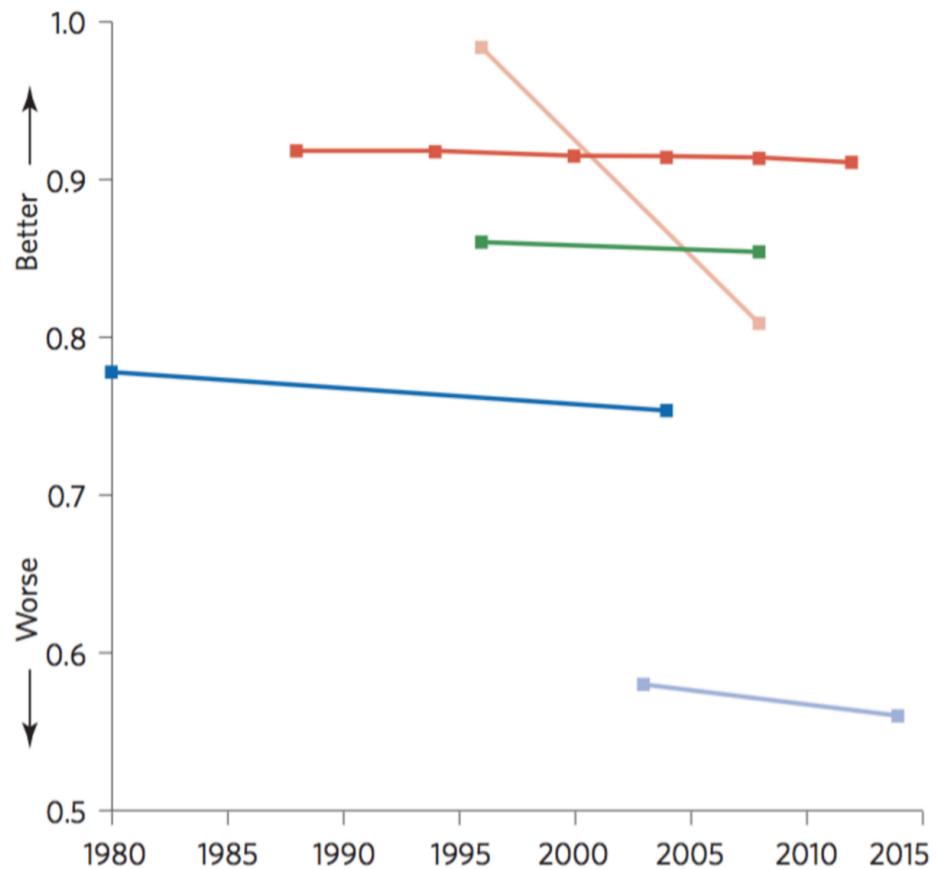
Environmental Sustainability

Emissions of Carbon Dioxide



Proportion of fish stocks within their safe biological limits and fish landings

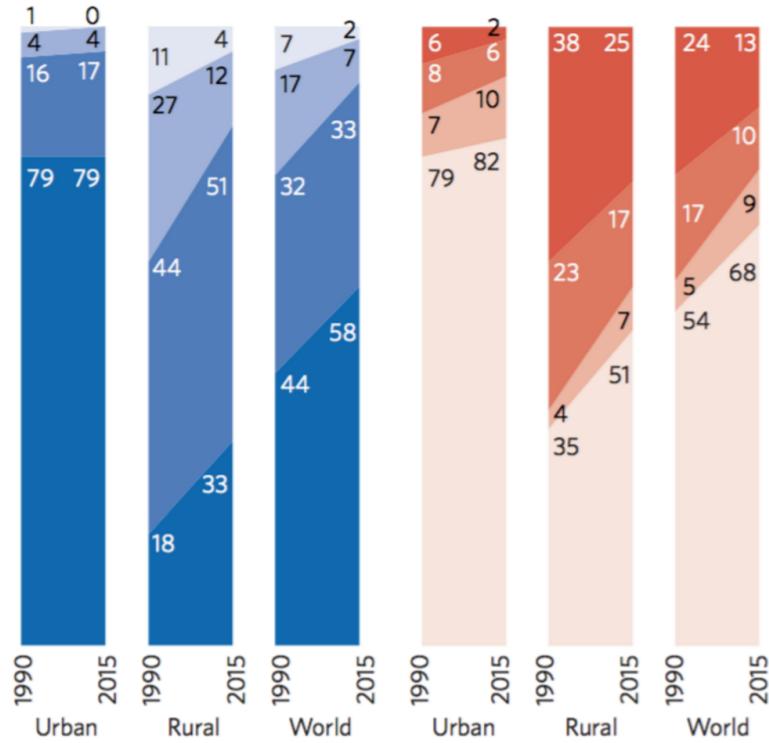




IUCN Red List* Index of species survival

*Indicator of the changing state of global biodiversity, based on the International Union for Conservation of Nature's Red List

- □ Birds
- □ Amphibians
- □ Mammals
- □ Cycads
- □ Corals



Proportion of population using improved and unimproved drinking water sources and sanitation facilities

- Surface water
- Unimproved
- Other improved
- Piped on premises
- Open defecation
- Unimproved
- Shared
- Improved

Setbacks due to crises, shocks, and vulnerabilities

Unexpected crises and unforeseen problems in certain regions have proven to be sudden and major obstacles that impede progress

1. **2008 Economic Crisis** severely affected many sub-Saharan African countries
2. **Ebola outbreak** teaches many lessons for health and development
3. Developing countries are vulnerable to **natural disasters**
4. **Political instability and conflict** has been a major factor hindering progress

Evidence-based Policymaking

EBP utilizes evidence from research to inform the policymaking process.

The current fiscal environment makes it imperative that we produce more value with each dollar that government spends. Doing so will require better use of evidence in policymaking.

- The Hamilton Project from The Brookings Institution

One obvious tool missing from the budget-cutters' toolbox is evidence-based policymaking.

- The Heritage Foundation

- Advantage of EBP: its methodical approach to policymaking
- The advantage of EBP could be shown in three aspects:
 - social benefit
 - economic benefit
 - fiscal benefit

- EBP can also be applied to countries in transition, with greater potential for improvement.
- Issues with applying EBP to countries in transition:
 - political instability,
 - conflict,
 - academic freedom,
 - media freedom,
 - and civil society

Data Visualizations for Evidence-based Policymaking

Data Visualization:

*“the use of computer-supported
interactive visual representations of
abstract data to amplify cognition”*

- Card, Mackinlay, Shneiderman (1999)

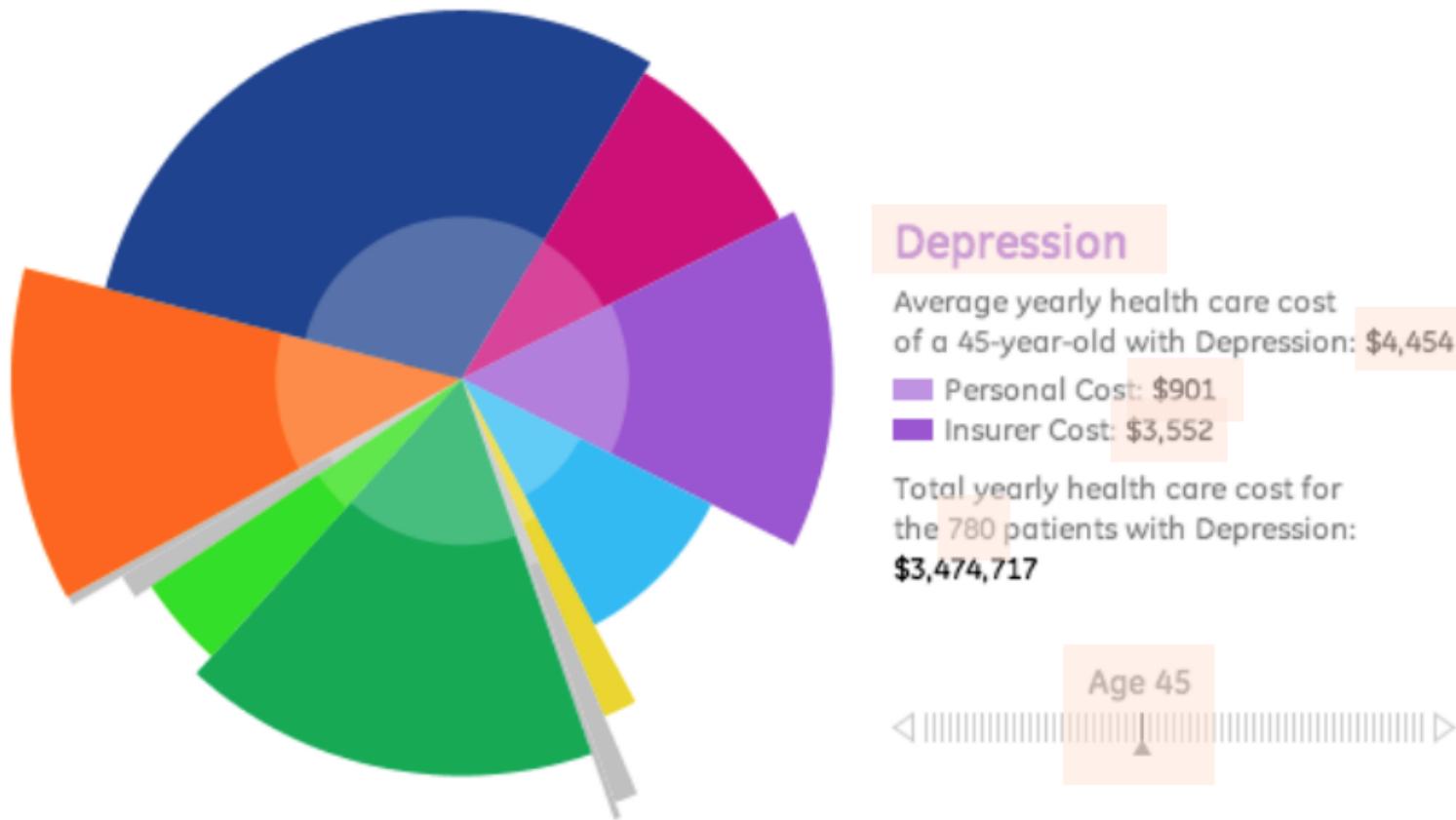


Figure: Visualization of medical costs, by Ben Fry of Seed Media Group, seen in “Information Visualization, Design, and the Arts: Collision or Collaboration” (Few, 2010)

- Few's critiques:
 - What do the radii mean?
 - Should we compare the areas of the slices?
 - What about the angles of the slices?
 - Trouble comparing radii and areas

North Korea Tuberculosis

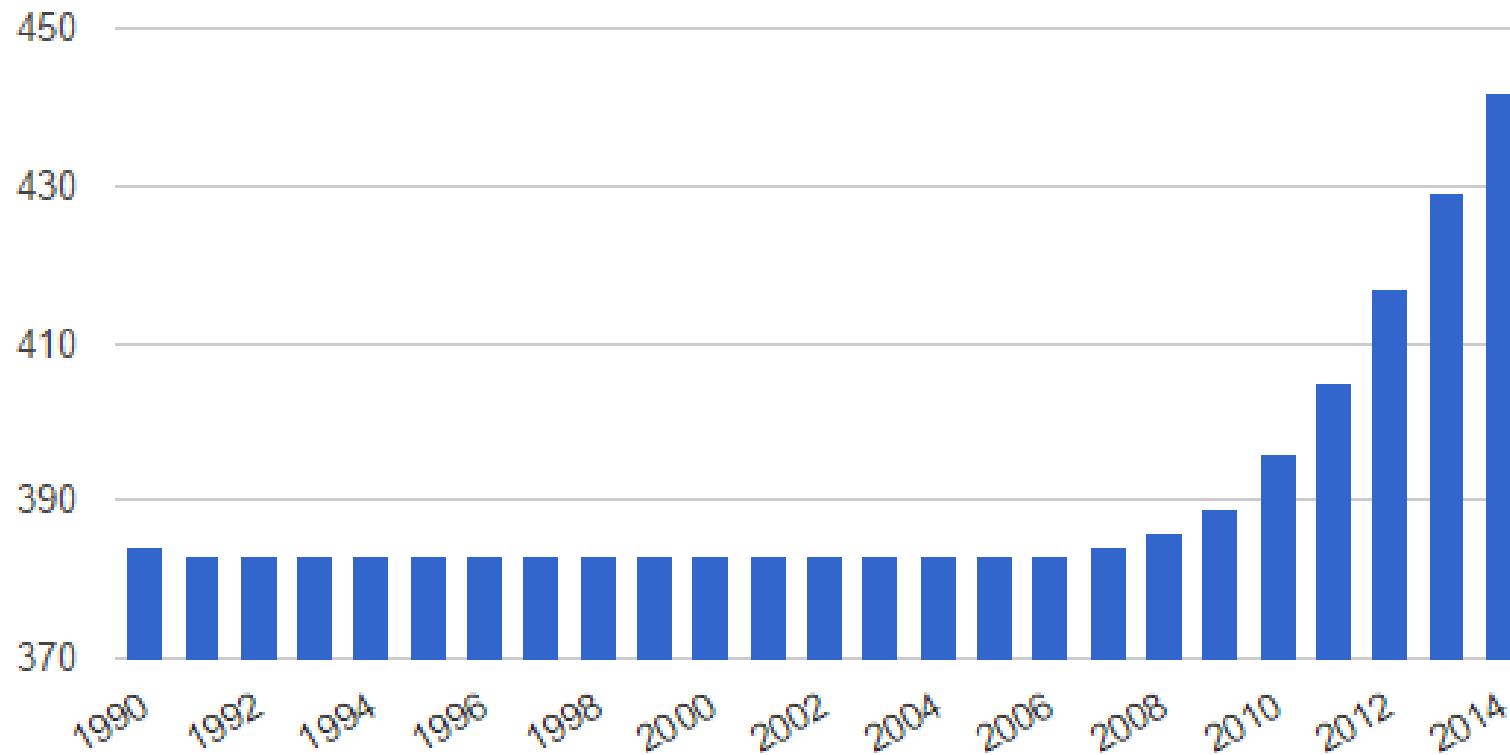


Figure: TB in the DPRK from “North Korea Tuberculosis”, TheGlobalEconomy.com

Quantitative values should be displayed using the lengths of simple, two-dimensional objects.

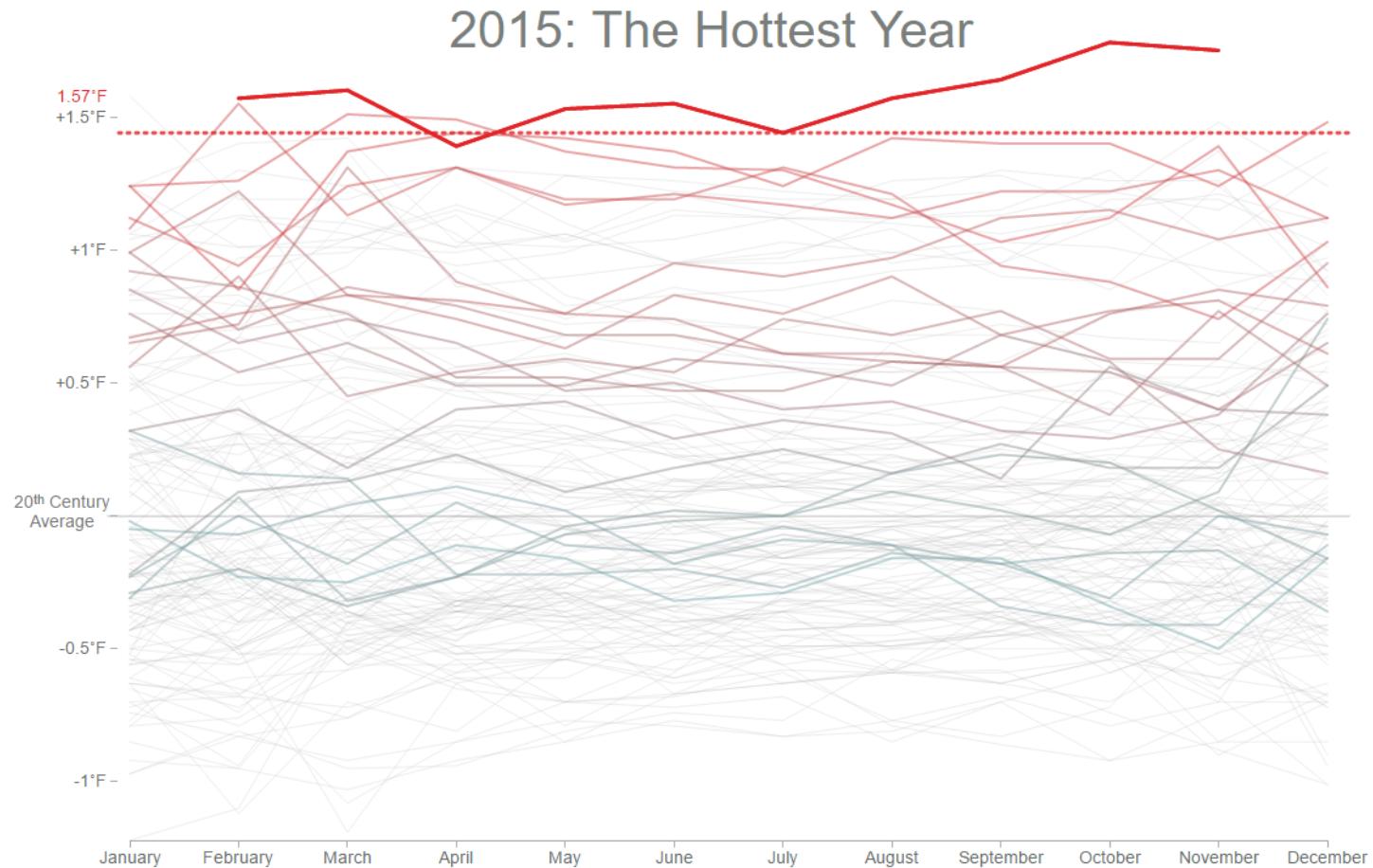


Figure: Snapshot of animation showing temperatures, 1880-2015, from bloomberg.com

Viewers cannot see a pattern formed by multiple values if they only look at one value at a time.

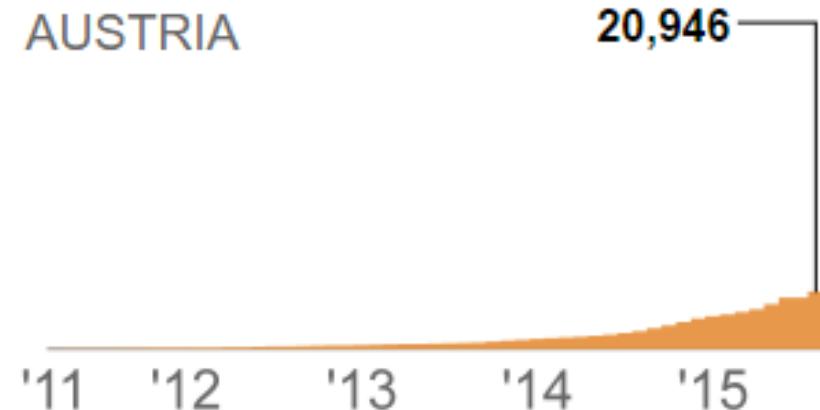
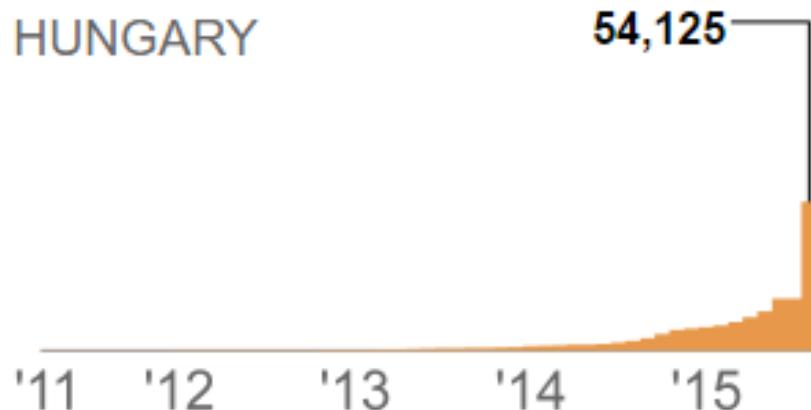
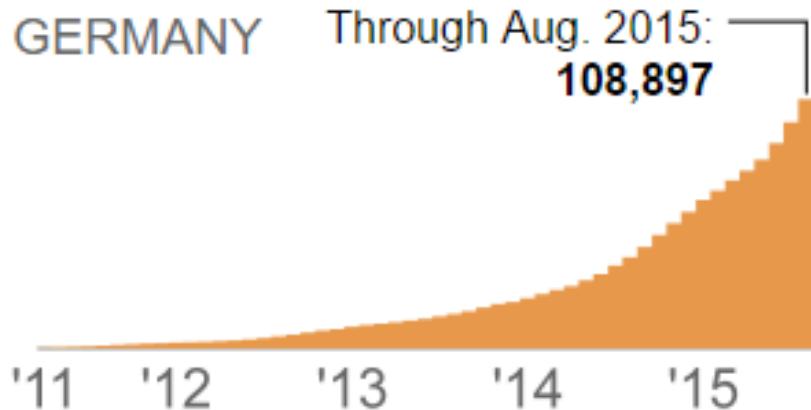


Figure: Asylum applications, April 2011 - August 2015, extracted from latimes.com

Showing multiple graphs together can be better than showing a single graph.

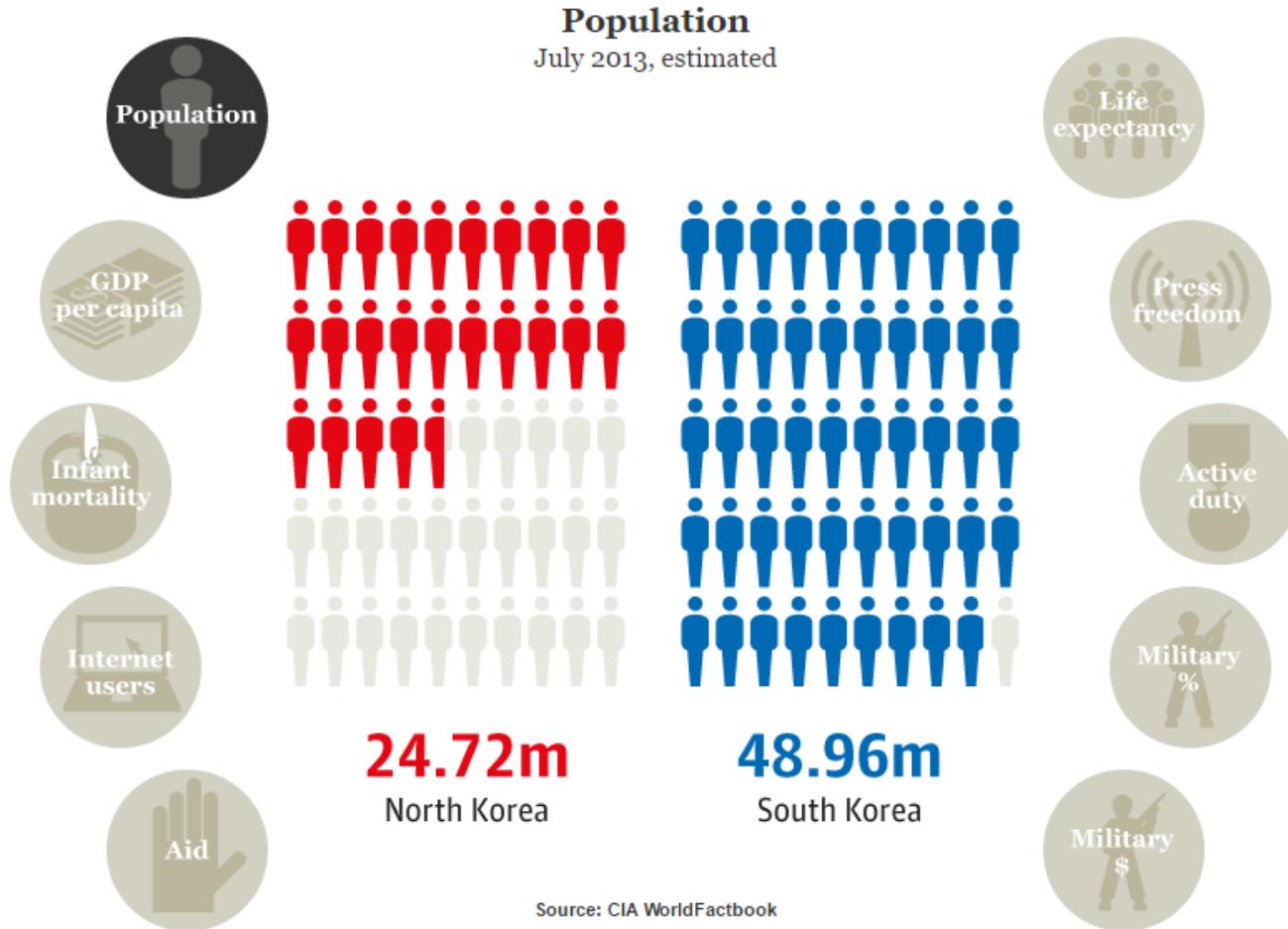


Figure: North Korea vs. South Korea, 2013, from theguardian.com

Viewers should be able to focus on data of interest.



What comes to mind when you glance at this picture?

503 x 26

System One

"Fast thinking"

Intuitive

System Two

"Slow thinking"

Effortful

Interactive DVs trigger System Two

Visualizations tailored to key policy issues for countries in transition

49

Data Visualization Designers:

Igor Barahona, Ariel Lee, Hannah Cho, Giang Nguyen, Star Ying

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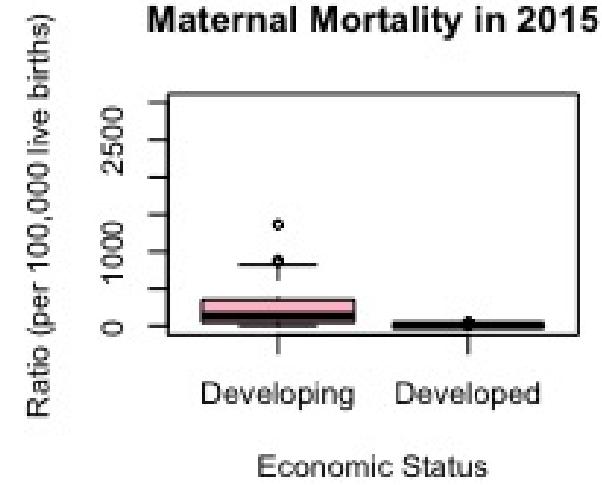
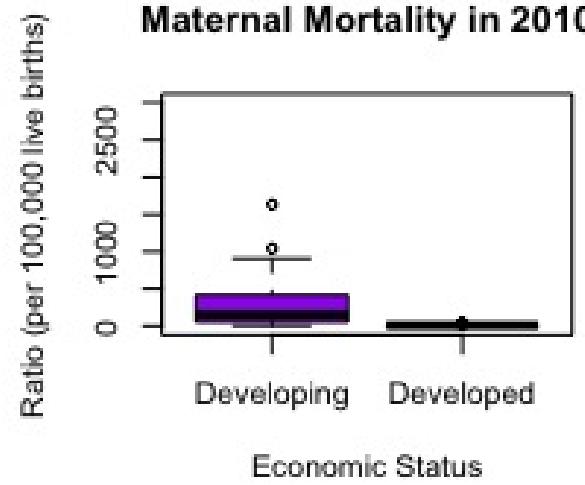
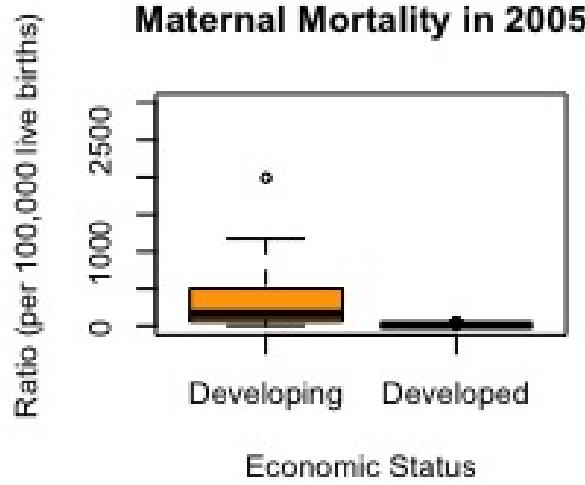
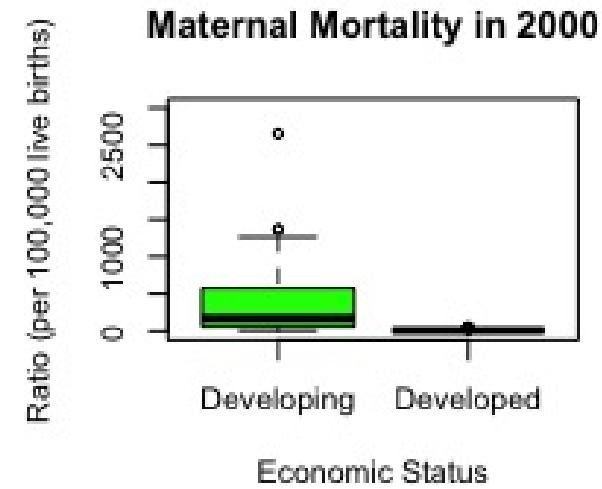
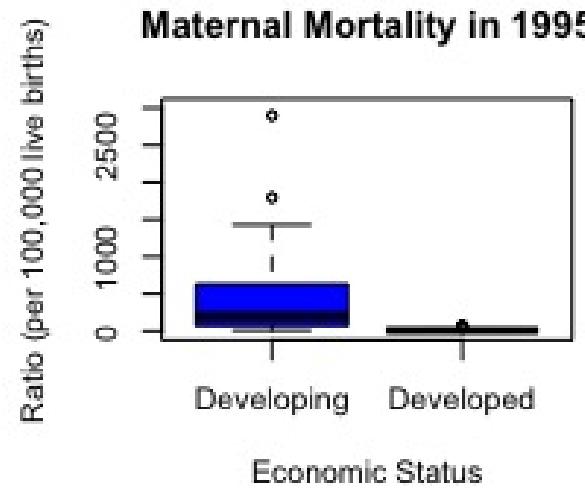
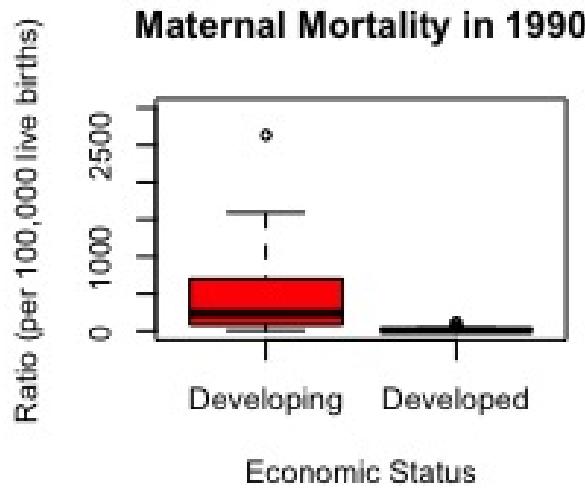
Poverty in Mexico and its Relation with Social Metrics

Igor Barahona

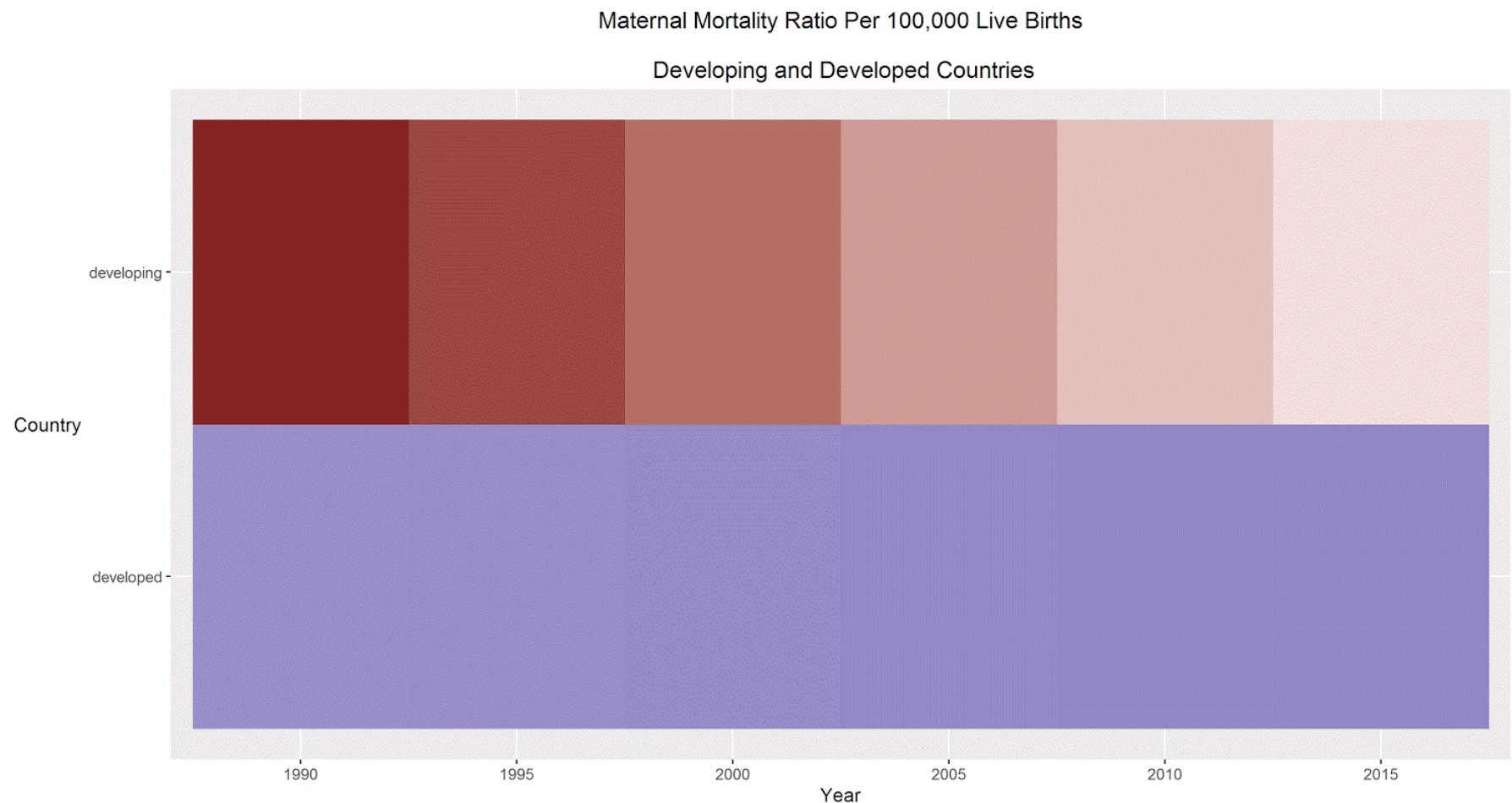
Women's Health, Education and Political Empowerment in Developing and Developed Countries and Evidence-Based Policy Implications

Ariel Lee

Maternal Mortality Ratio per 100,000 live births of Developing and Developed Countries

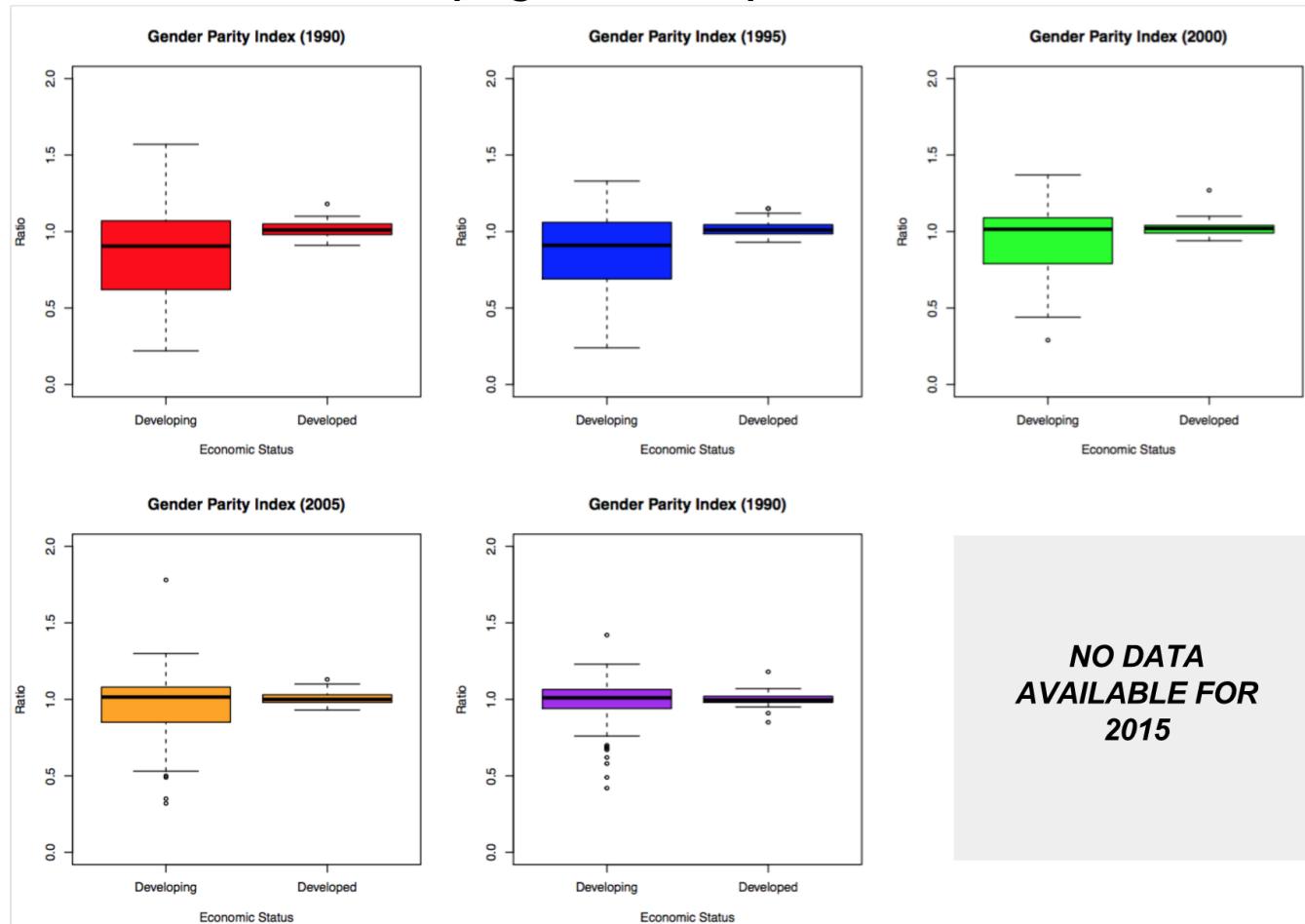


Heatmap of Maternal Mortality in Developing and Developed Countries



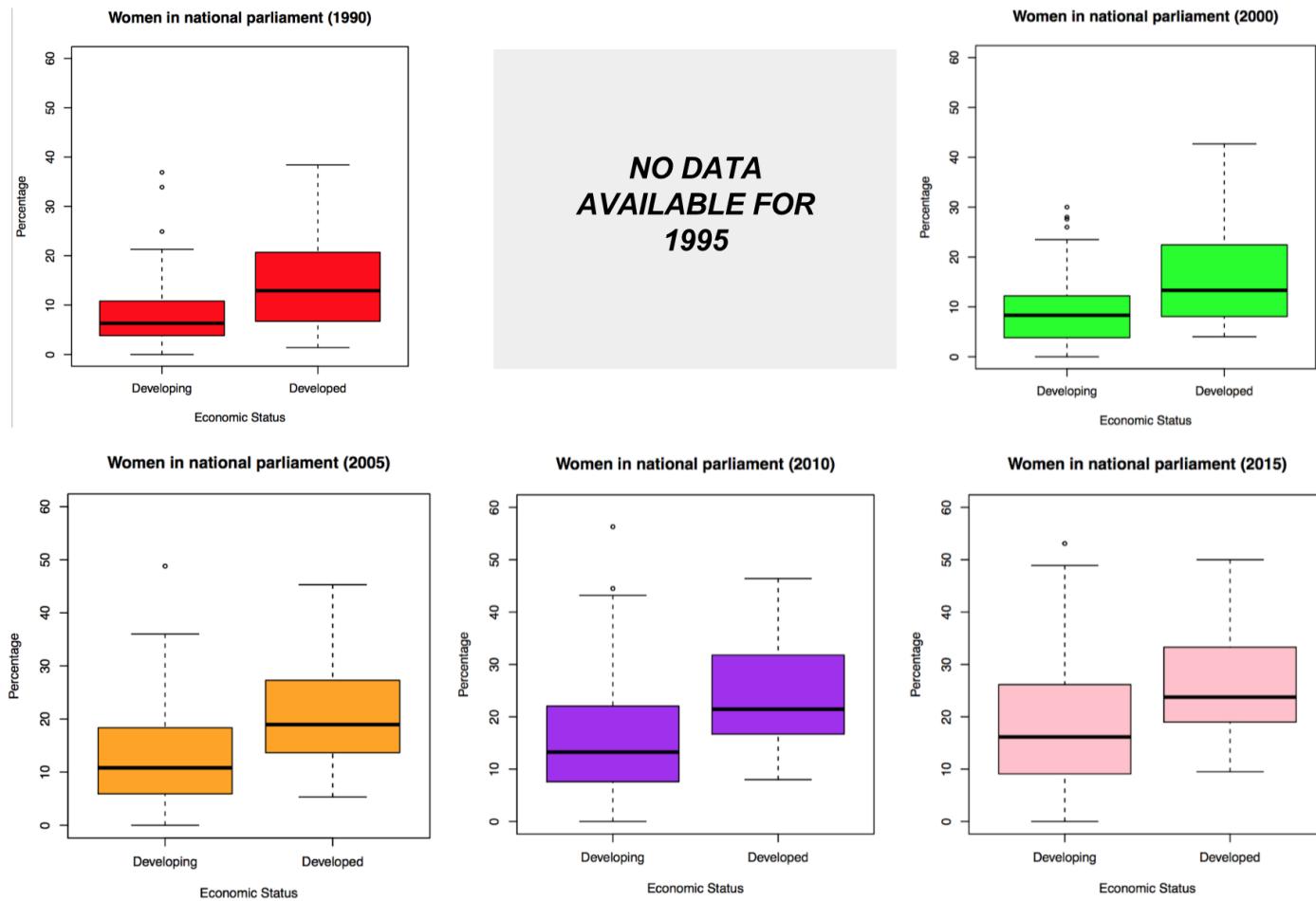
Gender Parity Index in secondary level enrolment in Developing and Developed Countries

Gender Parity Index in secondary level enrolment in Developing and Developed Countries



Proportion of Seats Held by Women in National Parliament in Developing and Developed Countries

Proportion of Seats Held by Women in National Parliament in Developing and Developed Countries

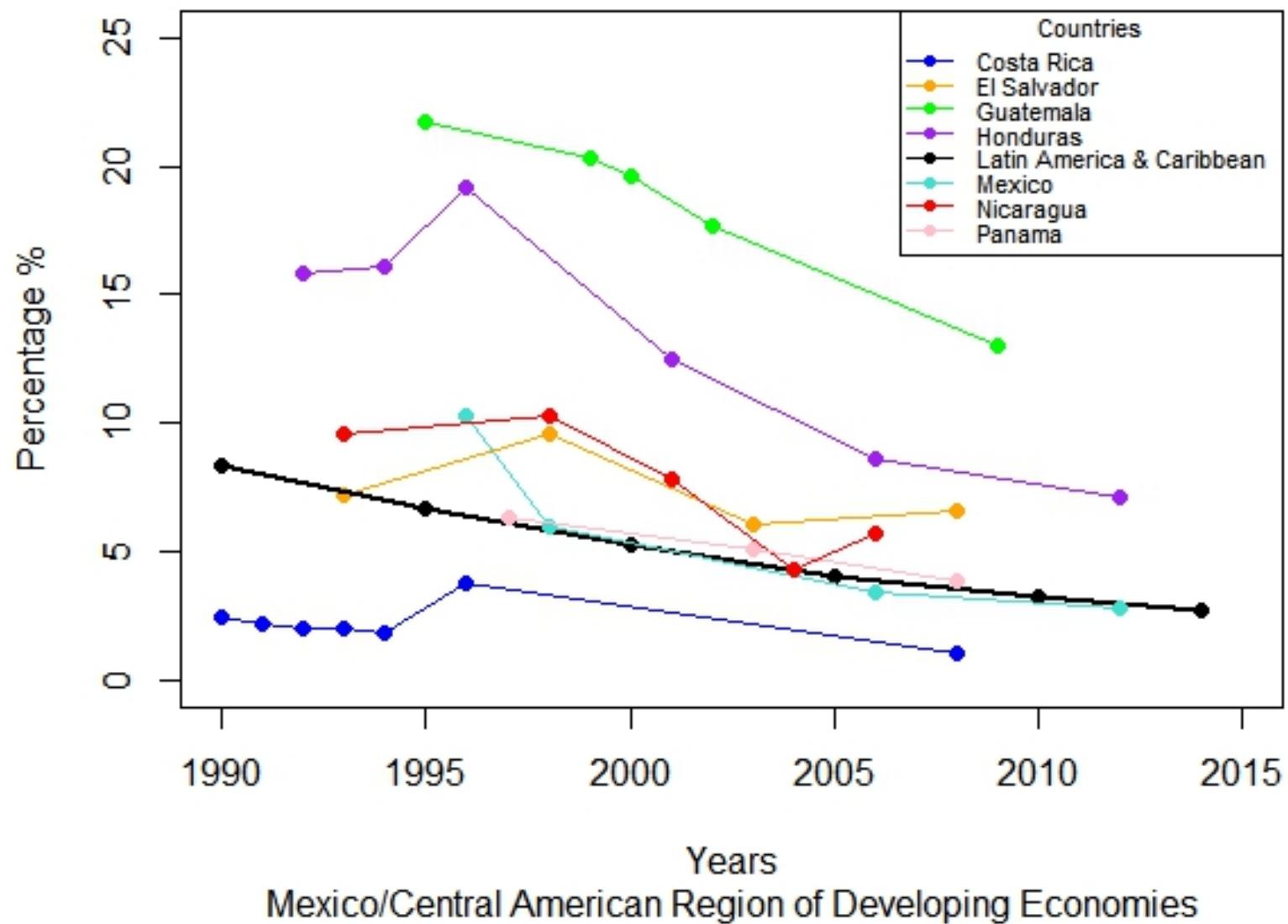


- Focus more on helping certain developing countries (outliers)
- Developing countries contain a range of countries
- Developed countries need to work on women in higher levels of society

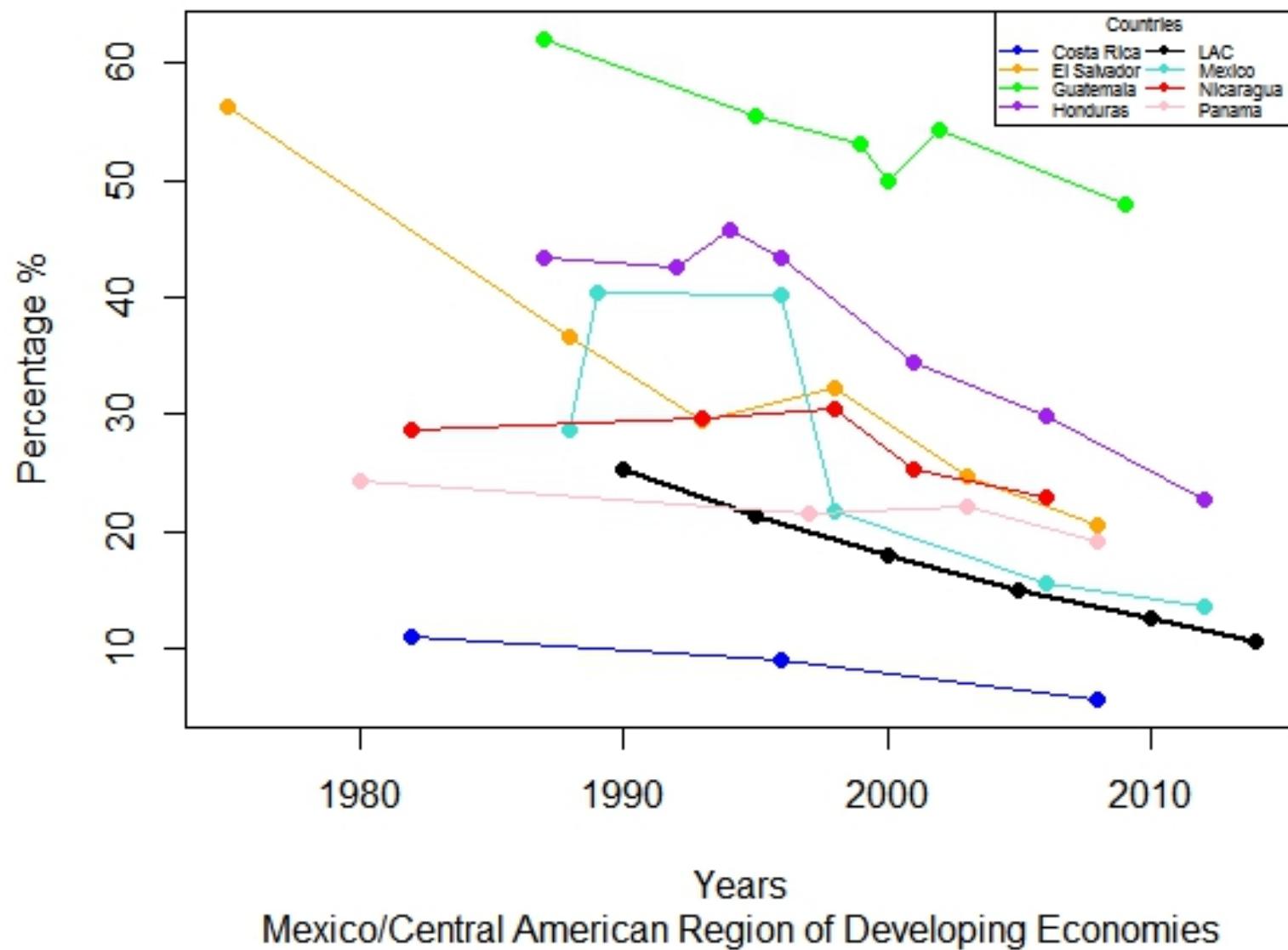
Malnutrition in Central America and its Relationship to Key Health Conditions

Hannah Cho

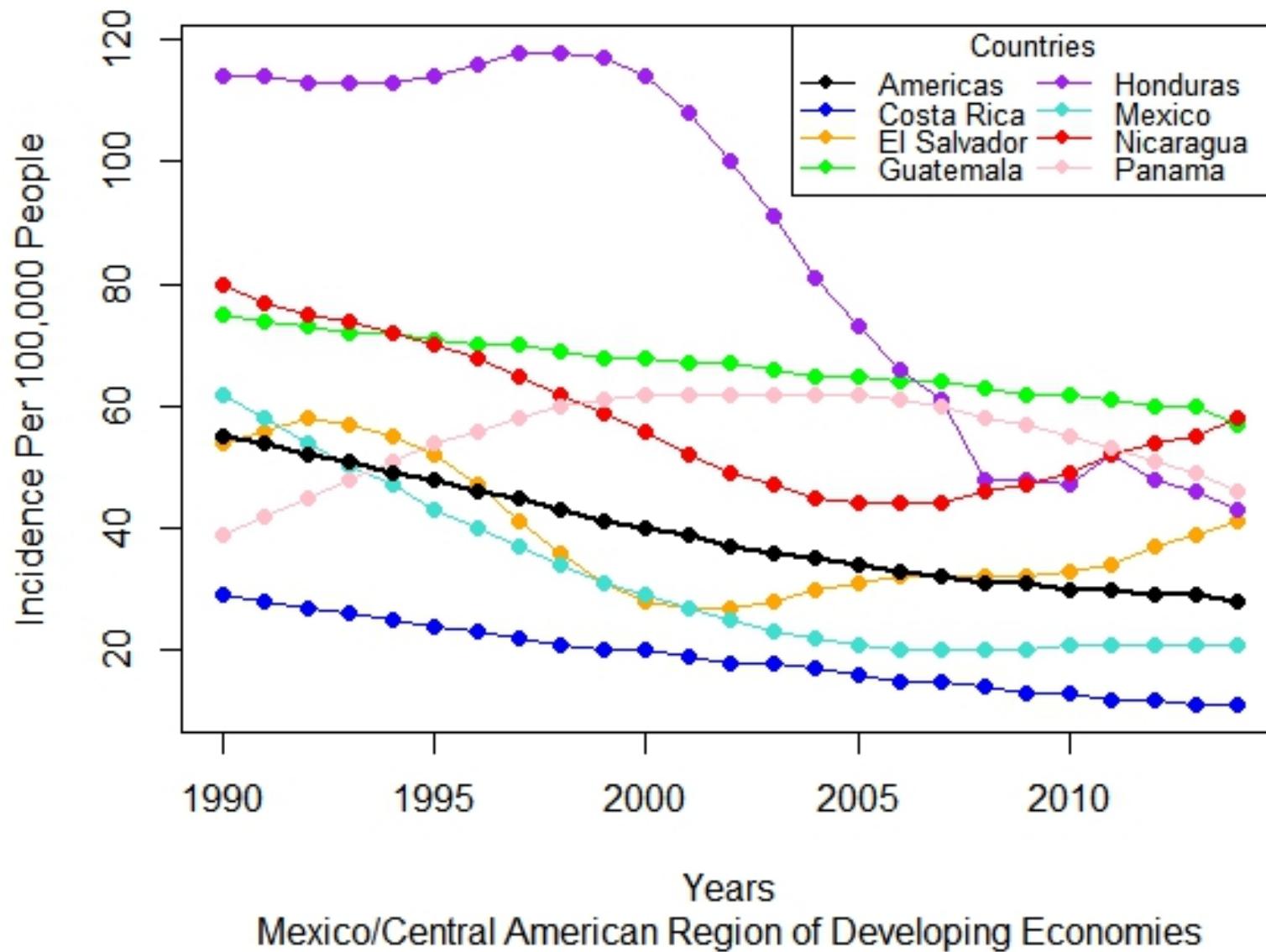
Percentage of Underweight Children Under Age 5 by Country



Prevalence of stunting, height for age (% of children under 5)

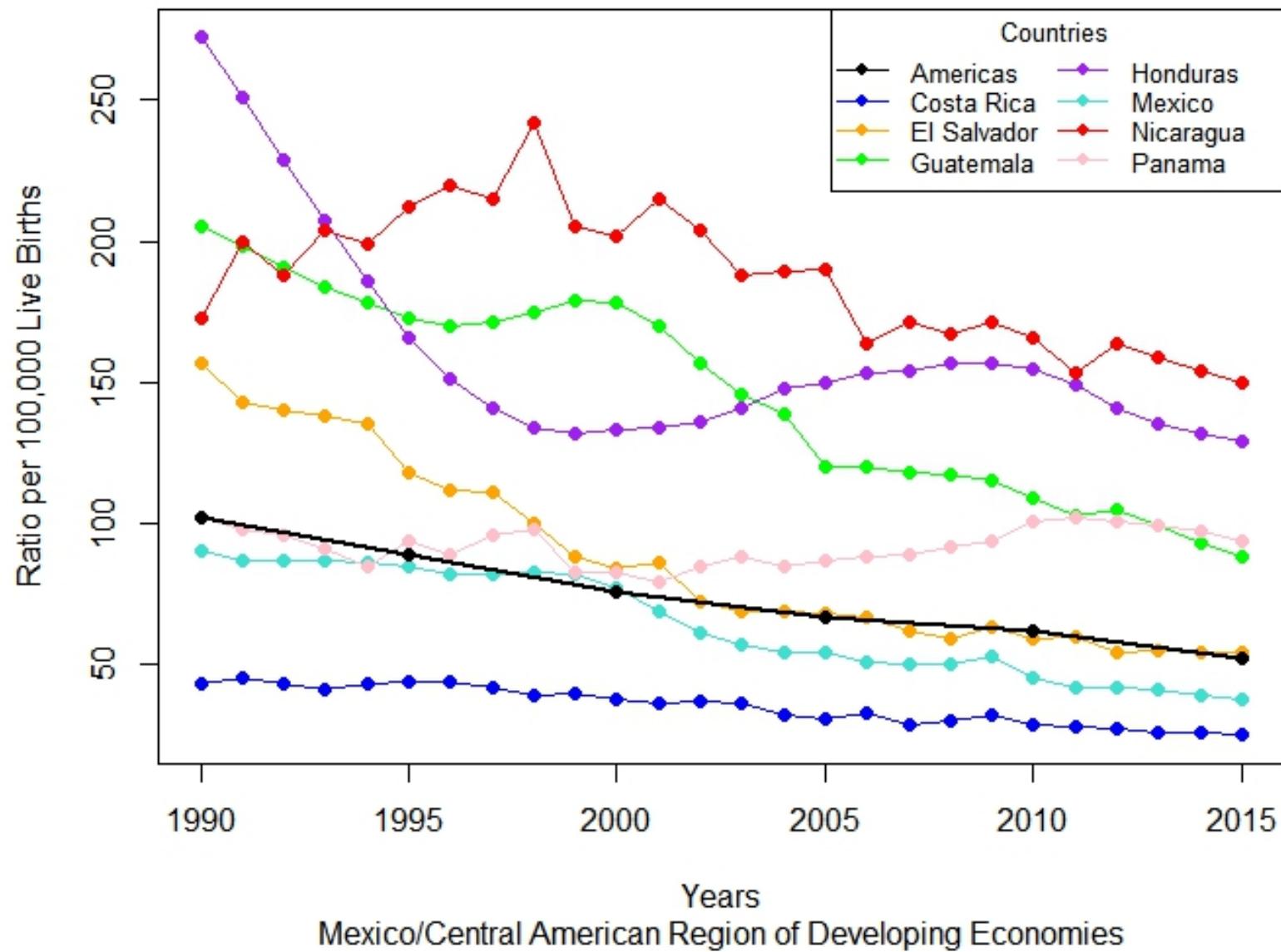


Incidence of tuberculosis (per 100,000 people)



Years
Mexico/Central American Region of Developing Economies

Maternal mortality ratio (modeled estimate, per 100,000 live births)

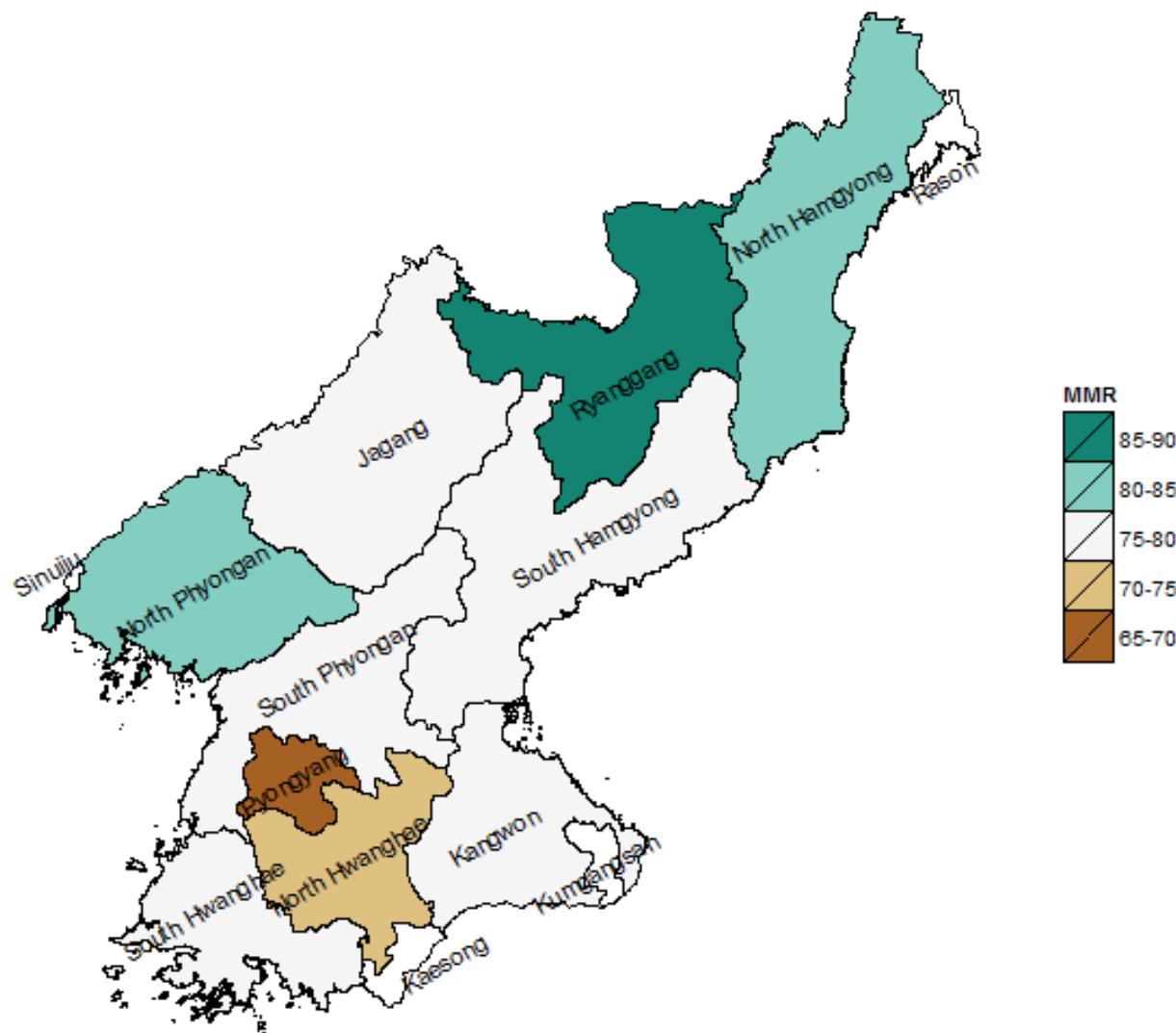


- Use countries such as Costa Rica and Honduras as examples
- Inequalities in access to health care facilities need to be eliminated.
- Focus on countries like Nicaragua and Guatemala

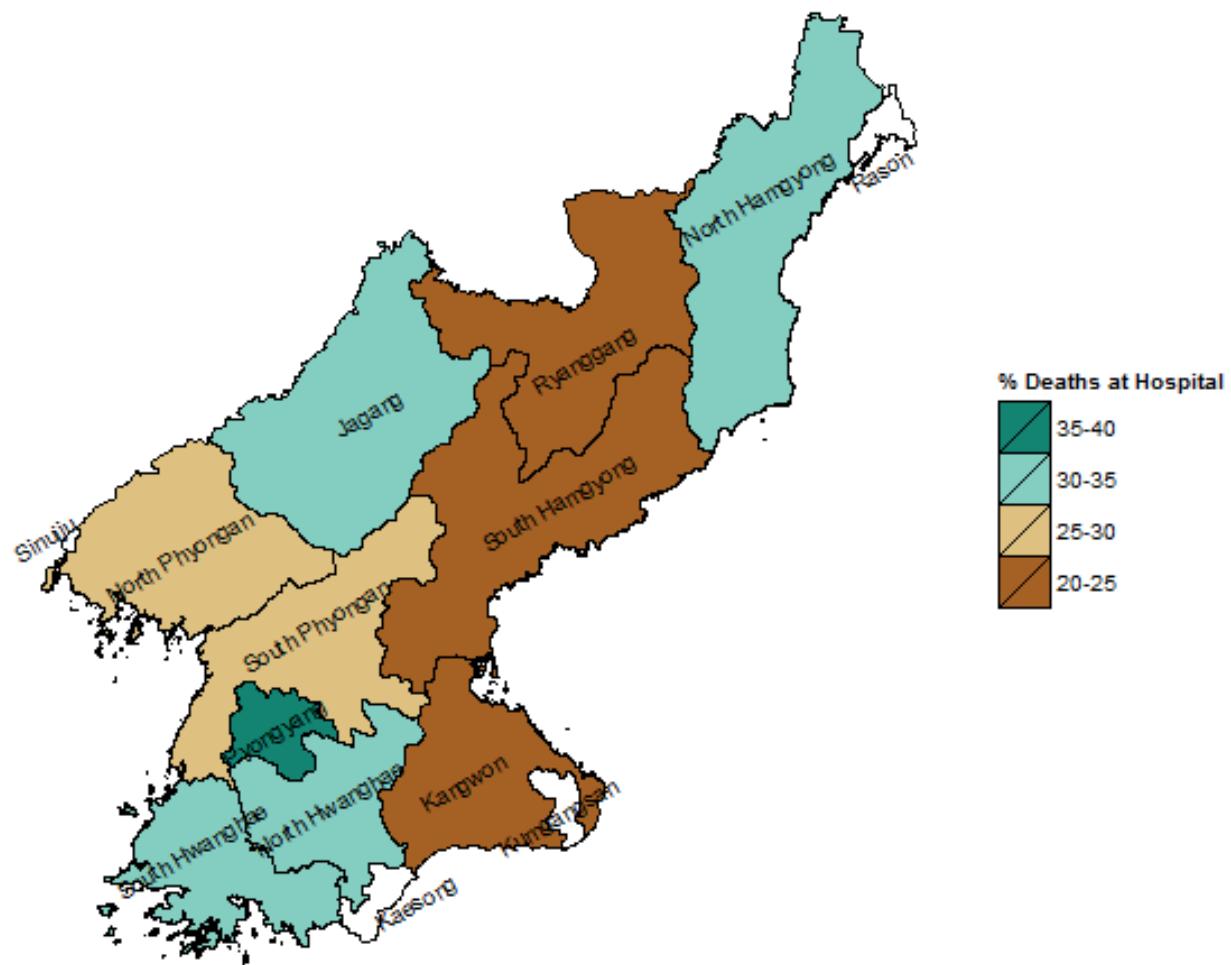
Malnutrition in DPRK (North Korea) and Evidence-based Policy Implications

Giang Nguyen

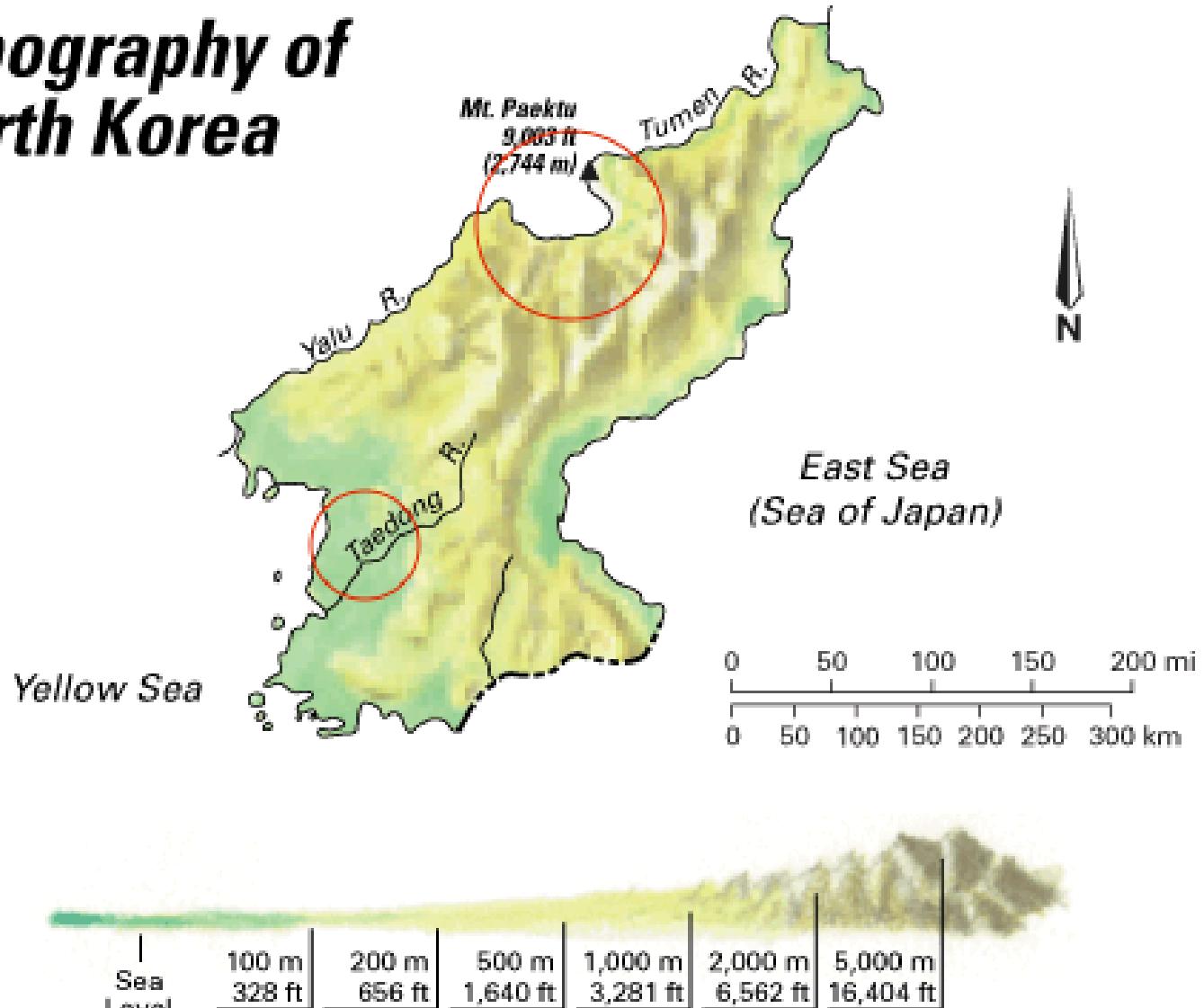
Maternal Mortality Rate by Province



Percentage Deaths at Hospital by Province



Topography of North Korea

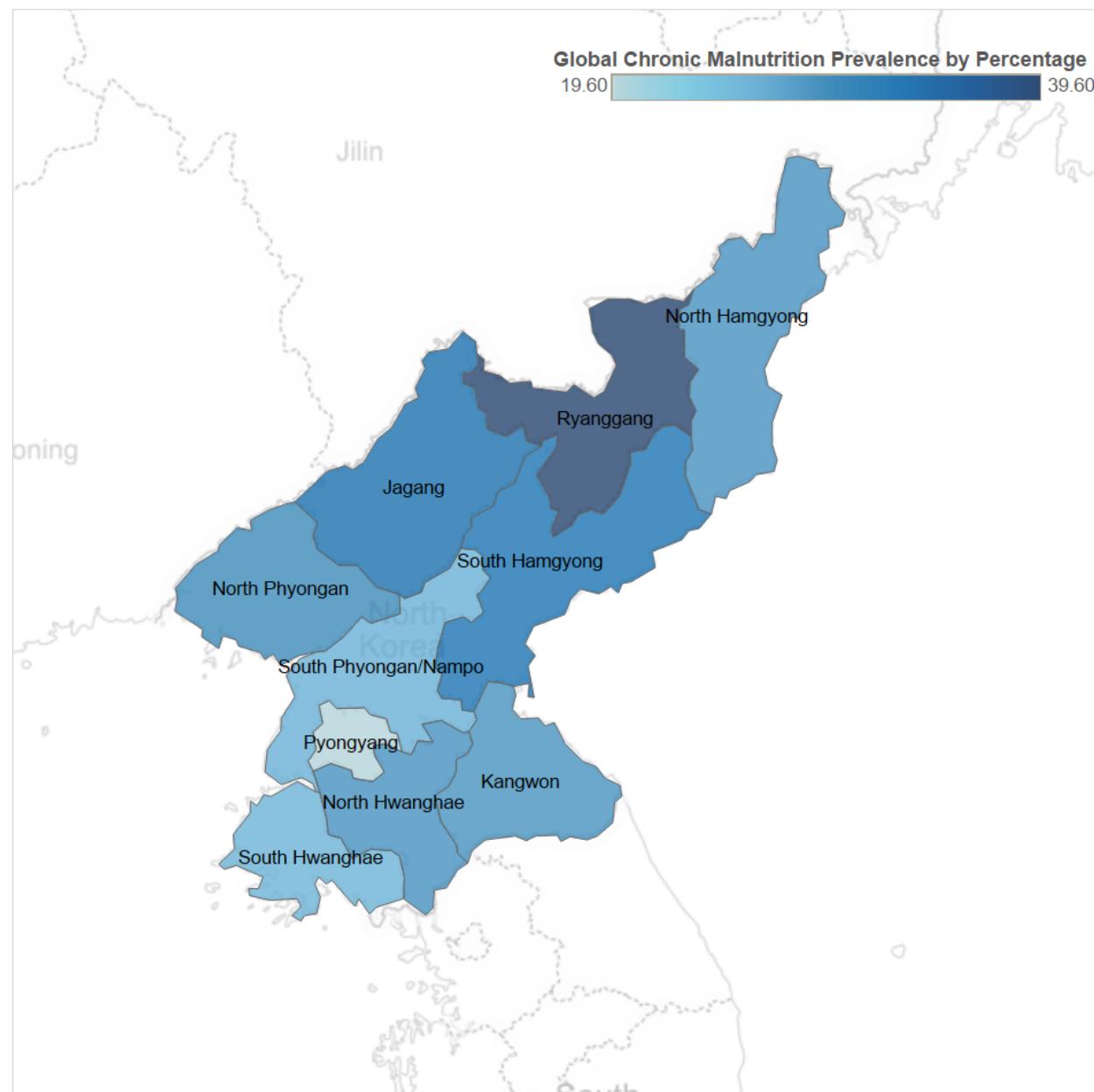


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Chronic malnutrition (stunting)

- Defined from the height of age (H/A) index, expressed in z-score (HAZ)
- HAZ represents the number of standard deviations units from the median of the WHO 2006 reference population.
- Global stunting is defined as HAZ < -2 SD.
- Moderate stunting is defined as HAZ < -2 SD and >= -3 SD.
- Severe stunting is defined as HAZ < -3 SD.
- Stunting is irreversible after 24 months of age.

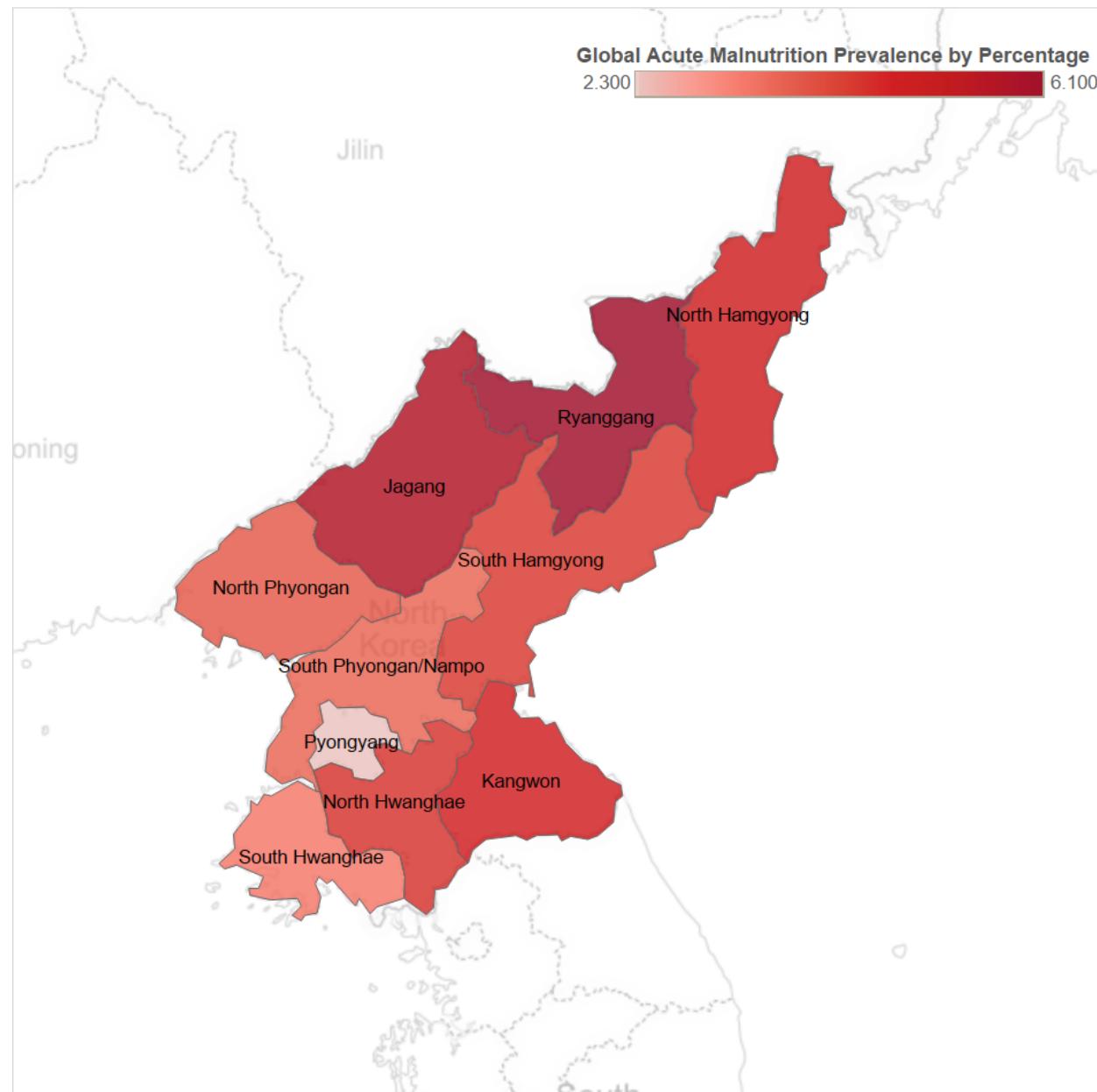
Prevalence of Global Chronic Malnutrition in Children by Province



Acute malnutrition (wasting)

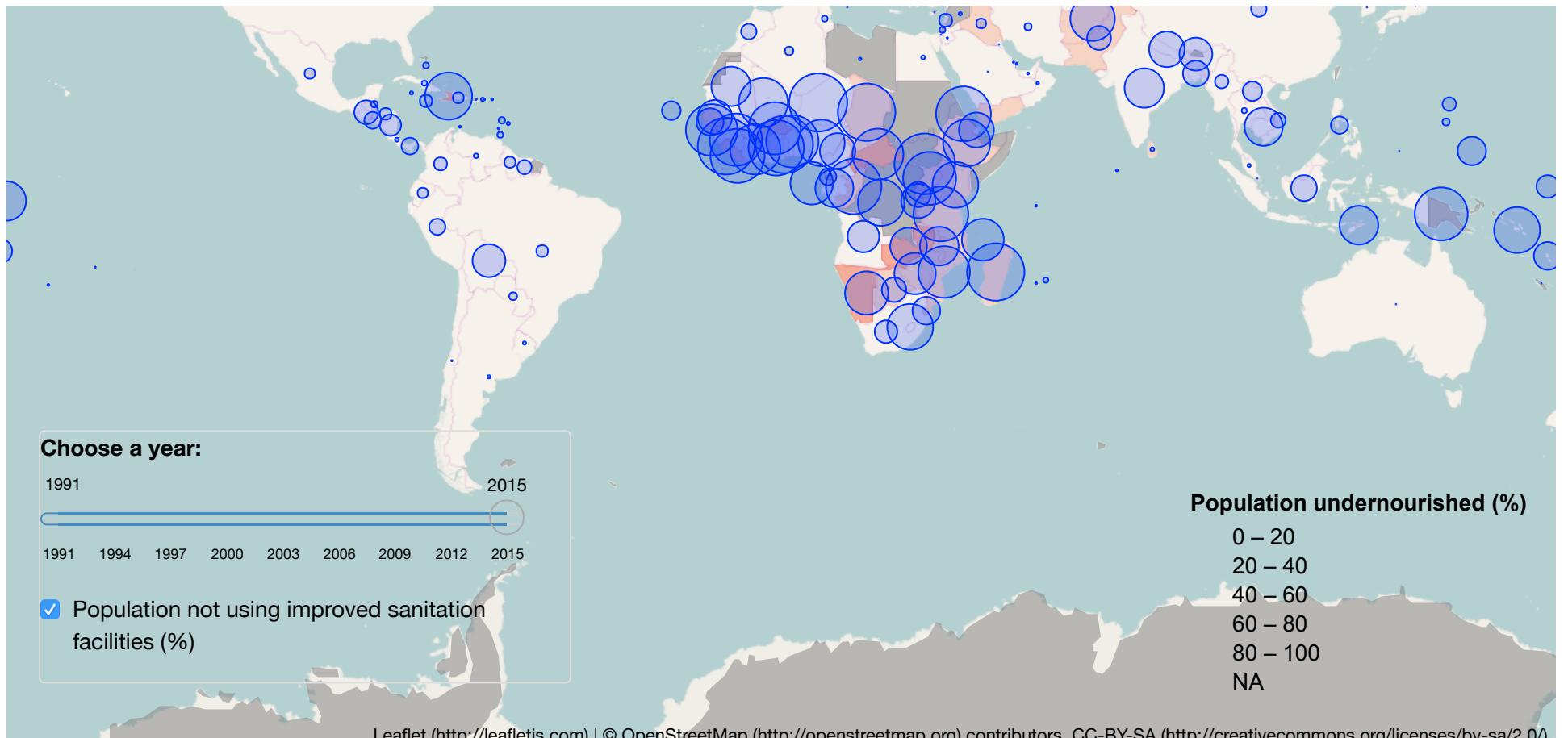
- Estimated from the weight for height (W/H) index, expressed in z-score (WHZ)
- WHZ represents the number of standard deviations units from the median of the WHO 2006 reference population.
- Global wasting is defined as WHZ < -2 SD.
- Moderate wasting is defined as WHZ < -2 SD and \geq -3 SD.
- Severe wasting is defined as WHZ < -3 SD.

Prevalence of Global Acute Malnutrition in Children by Province



Interactive DVs of Public Health Issues

Giang Nguyen



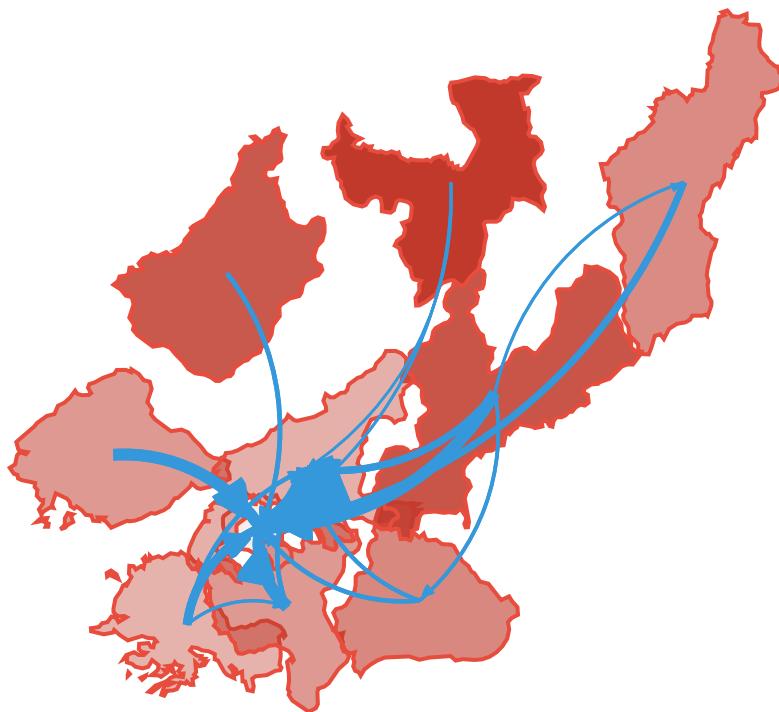
Data source: United Nations' MDG Indicators Database (<http://mdgs.un.org/unsd/mdg/Data.aspx>). Please send questions and comments to Giang Nguyen (giang.huong.nguyen92@gmail.com)

https://star-is-here.shinyapps.io/giang_leaflet/

Visualizing Malnutrition in DPRK

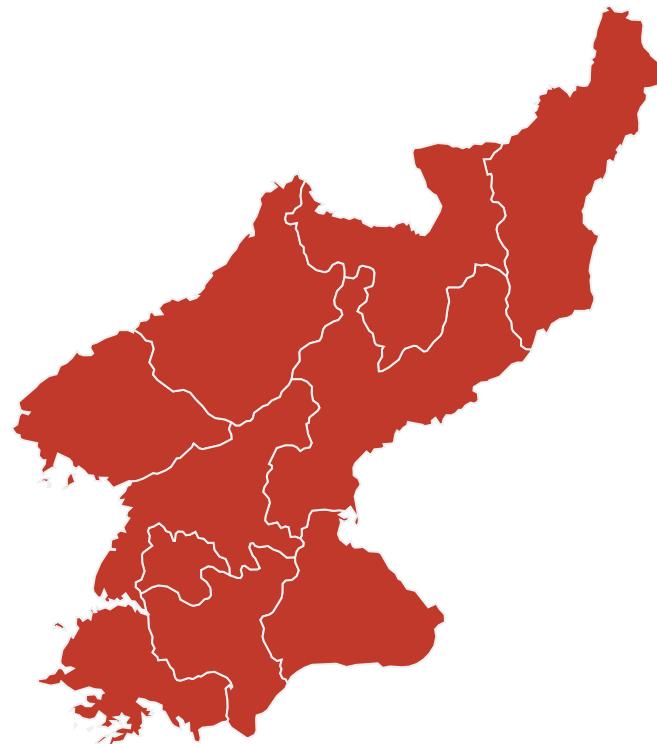
Star Ying

Province: Stunting Rate(%)



Net Migration Exceeding 1000

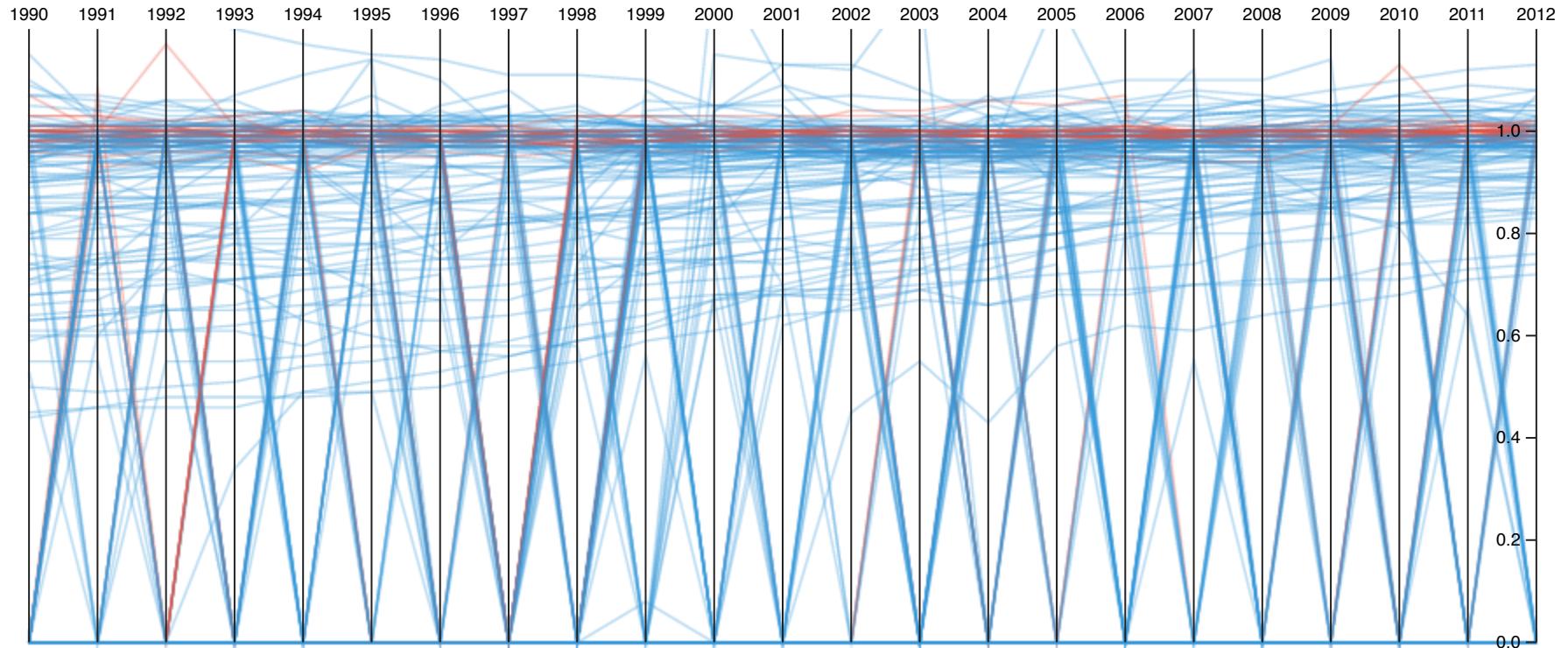
Province (Population):
Global Chronic Malnutrition
Global Acute Malnutrition



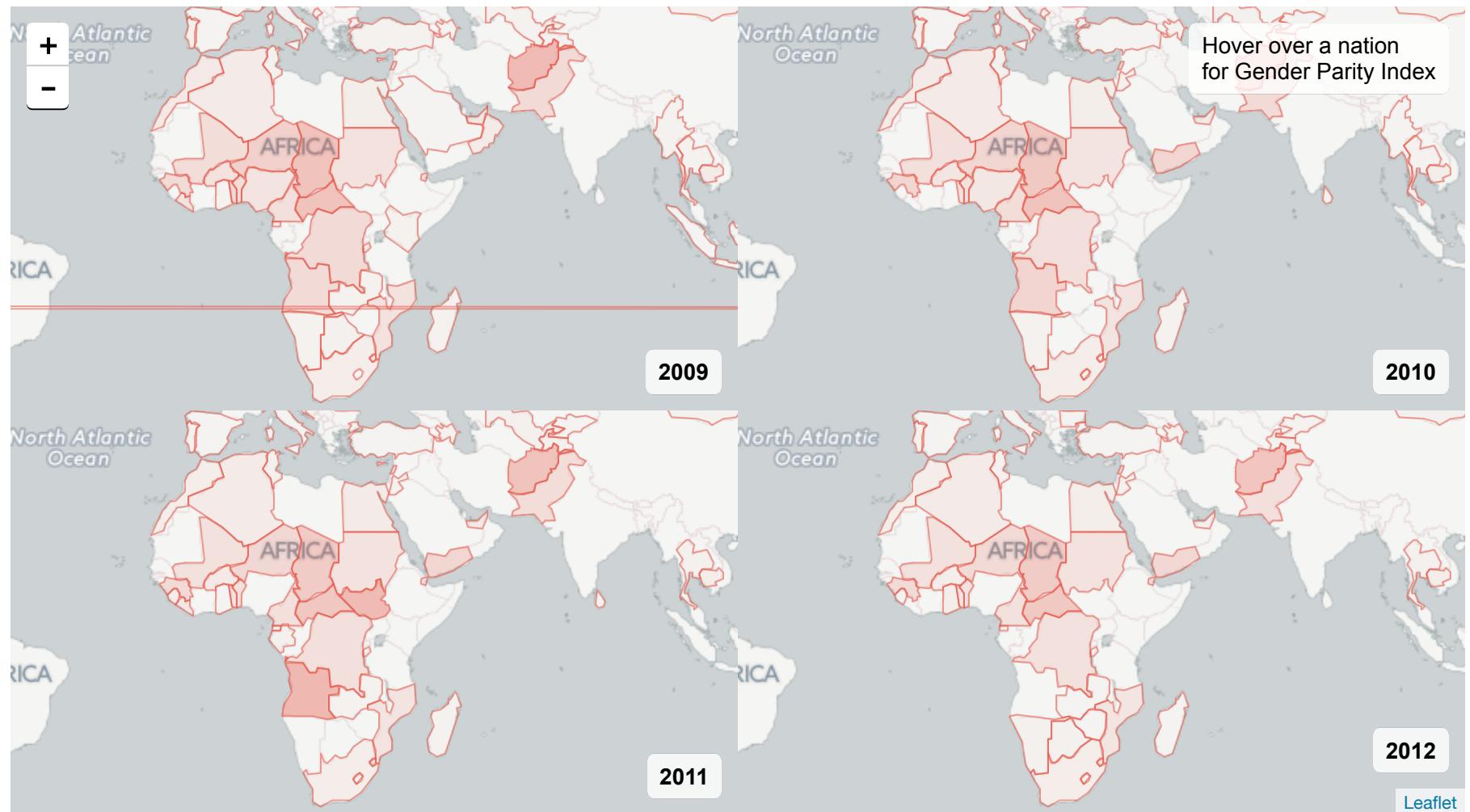
Visualizing Extensions to Social and Educational Indicators

Star Ying

Gender Parity Index in primary level enrolment



Gender Parity Index in primary level enrolment (2009-2012)



- We can use data visualizations of existing indicators to determine where nations are falling behind
- Supplement existing indicators with data from instruments that allow us to identify intervention points
- Can we use alternative data sources?
 - administrative records,
 - cellphone usage,
 - or **satellite data**.

Using Satellite imagery as proxies for MDG Indicators

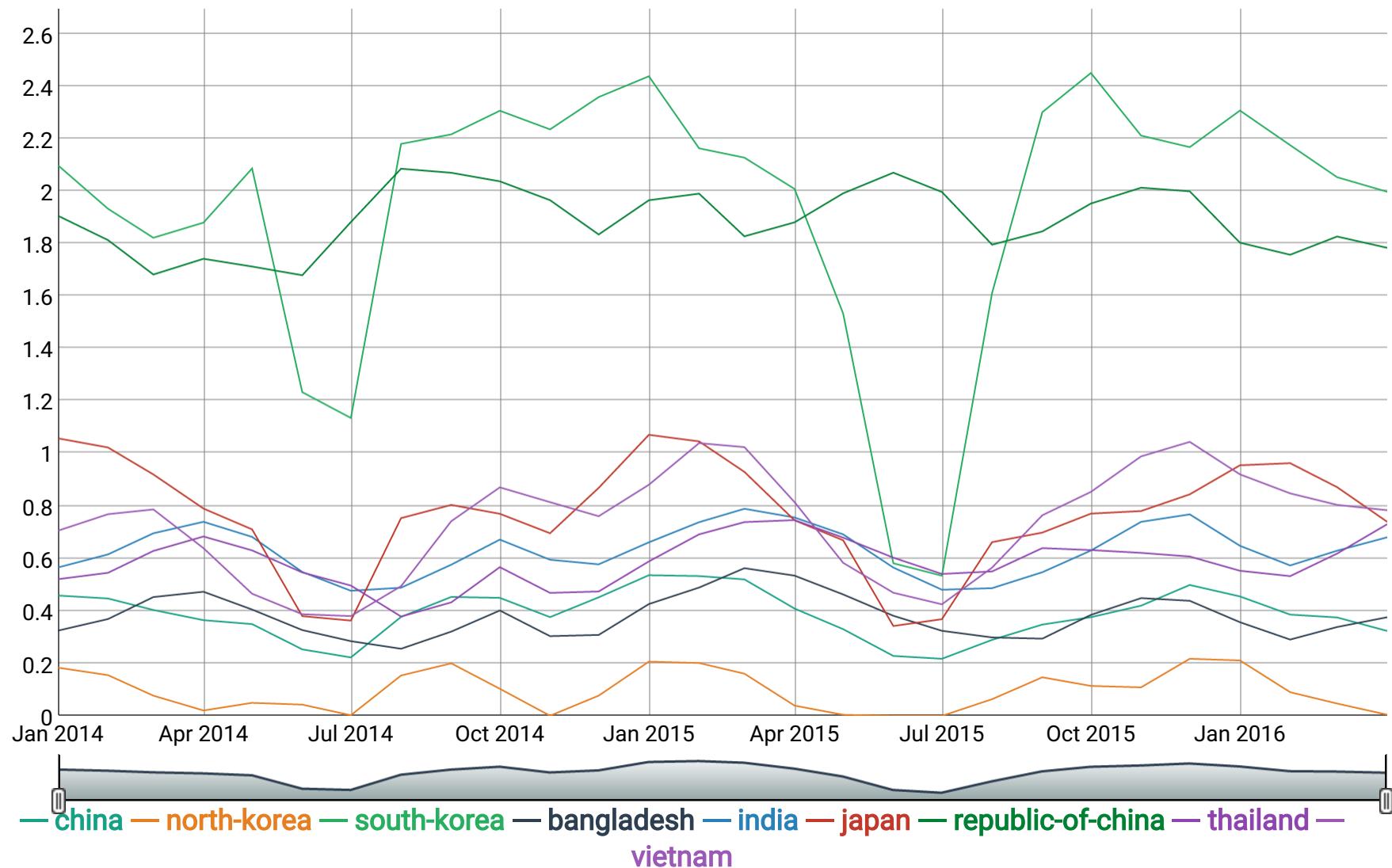
Two Satellite Products

- Visible Infrared Imaging Radiometer Suite (VIIRS) Nighttime Lights
- Defense Meteorological Satellite Program (DMSP) Nighttime Lights

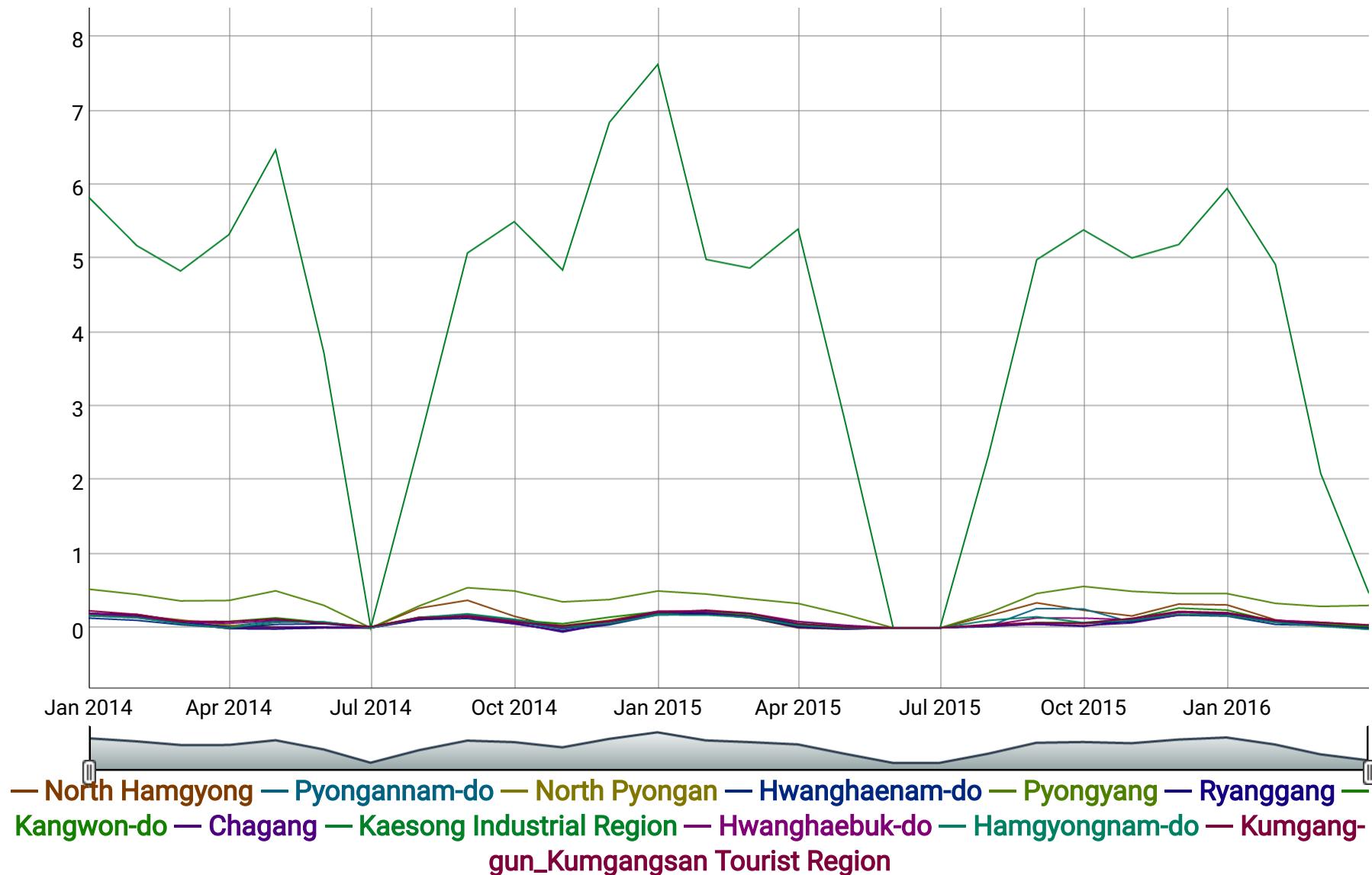
North Korea vs South Korea



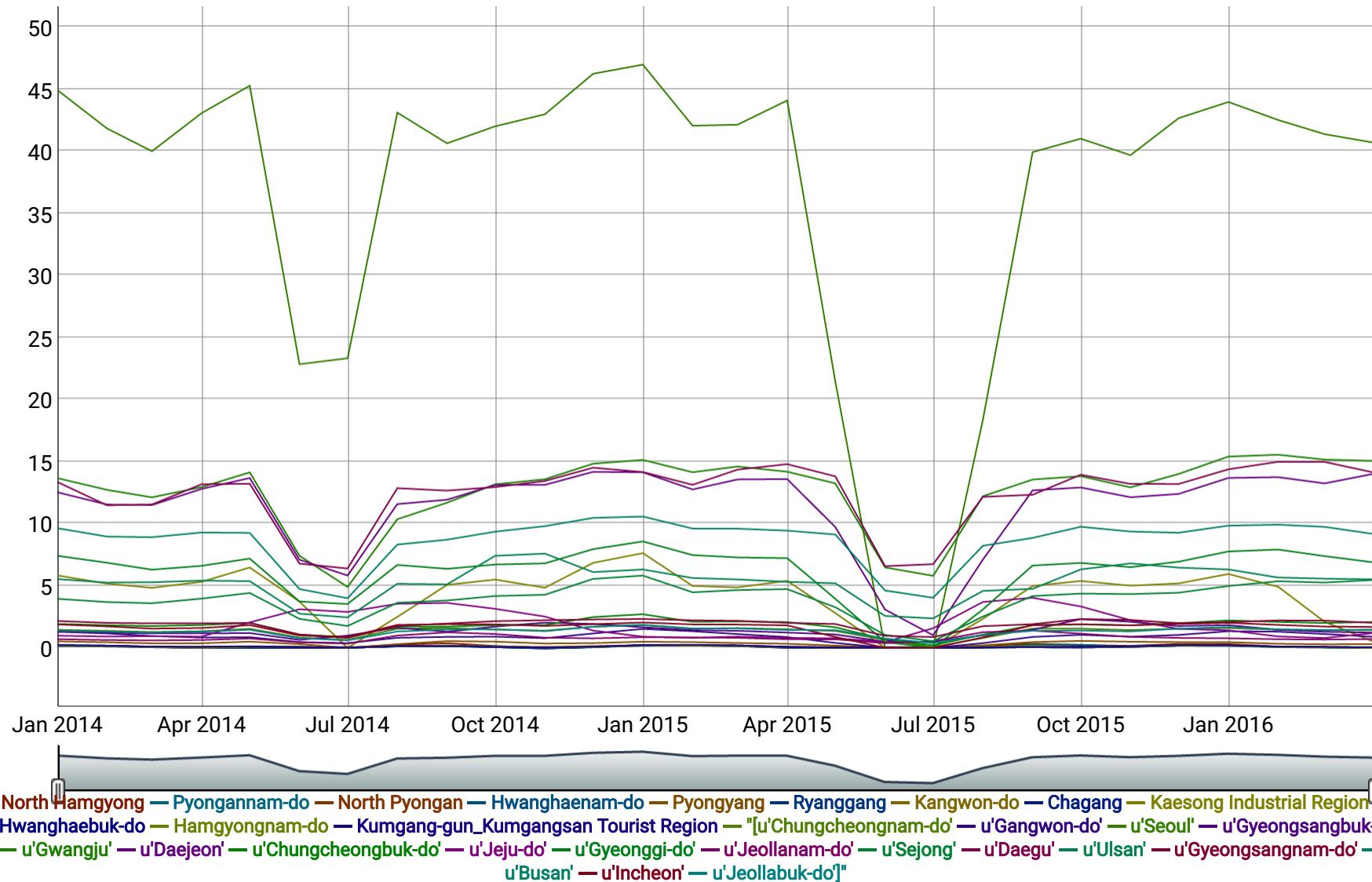
Monthly Average Radiance Levels of various Asian Nations from 2014 to present



Monthly Average Radiance Levels of North Korean Provinces from 2014 to present (tenths of radiance)

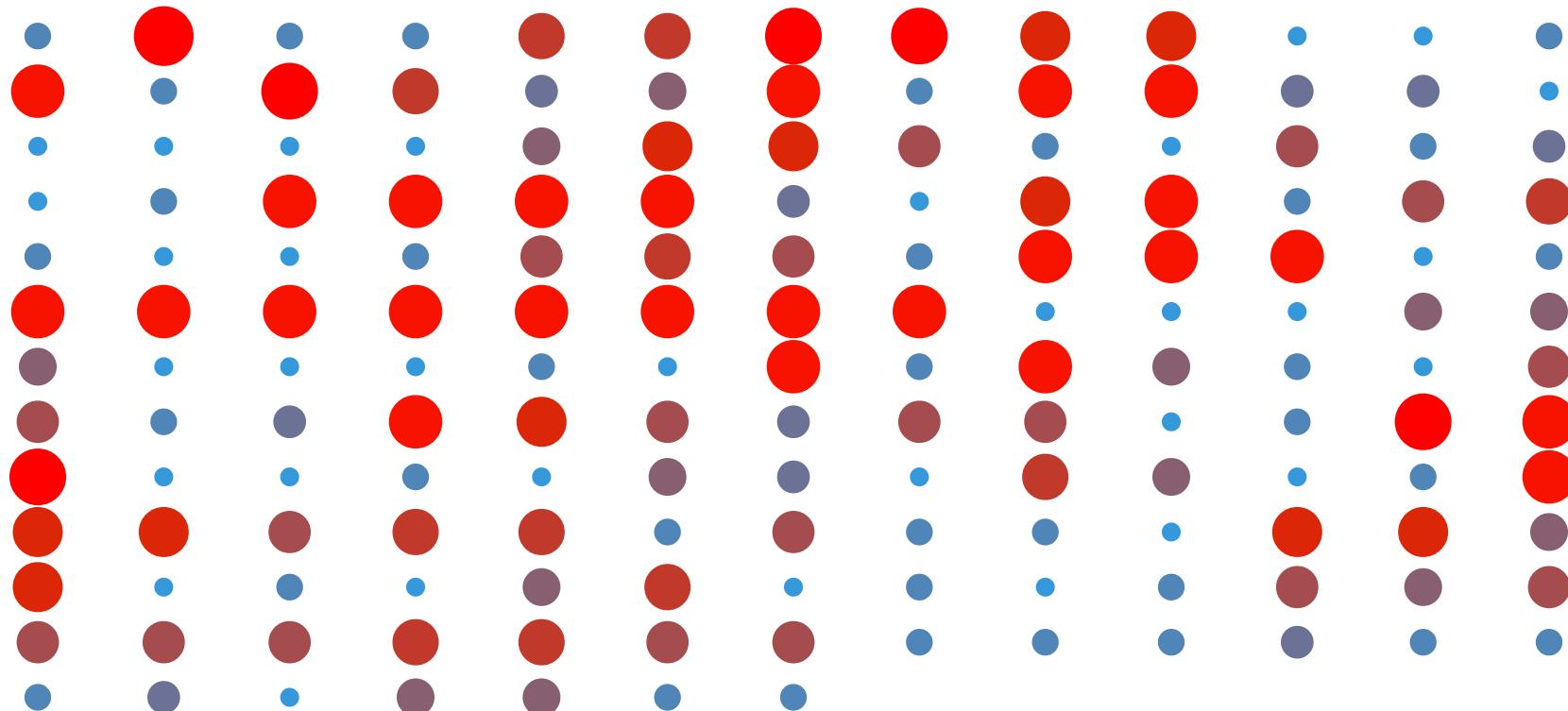


Monthly Average Radiance Levels of the Korean Peninsula Provinces from 2014 to present



SORT BY SERIES / CORRELATION COEFFICIENT

SERIES: CORRELATION COEFFICIENT



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- Visualizations/dashboarding is useful for policy but it is limited by the strength of the underlying data used
- There is potential to extend existing indicators with alternative data sources
- Further study is required

Conclusions

- Merits and drawbacks of data visualization for evidence-based policy development
 - Missing data
 - Correlation is not causation
- Benefits of interactive data visualization
- Next steps:
 - Create cohesive dashboard for all countries in transition

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