

# The Dimensions of Ordinal Well-Being Indexes: Using Orthogonal Weighting with the Kids Count Index

Discussion of the Ross Knippenberg paper  
by Michael Wolfson  
IARIW, Seoul, April 26, 2017

Performance indicators

## How to lie with indices

Learn the ruses of international

Print edition

The Economist

Performance indices

## Ranking the rankings

International comparisons are popular, influential—and sometimes flawed

“CROOKS already must learn them i. Huff in 1954 in “How to getting figures to s to. Sadly, Huff needs u, The latest way to bambooc “performance index”, whic

# Main Steps in Constructing a Summary Index

- choose a topic, e.g. population well-being
- select domains that are the key “constituents” or determining factors
  - e.g. poverty, health, literacy
- within each domain, select one or more indicators
  - e.g. for health: health status, infant mortality, health-adjusted life expectancy
- for each indicator, select a measure
  - e.g. for health status: self-reported, a generic measure like HUI or EQ-5D
- for the resulting set of measures, select an aggregation formula

or give up and use a “dashboard” (or flower petals per OECD)

# OECD's Flower Petals – Visualizing a Dashboard



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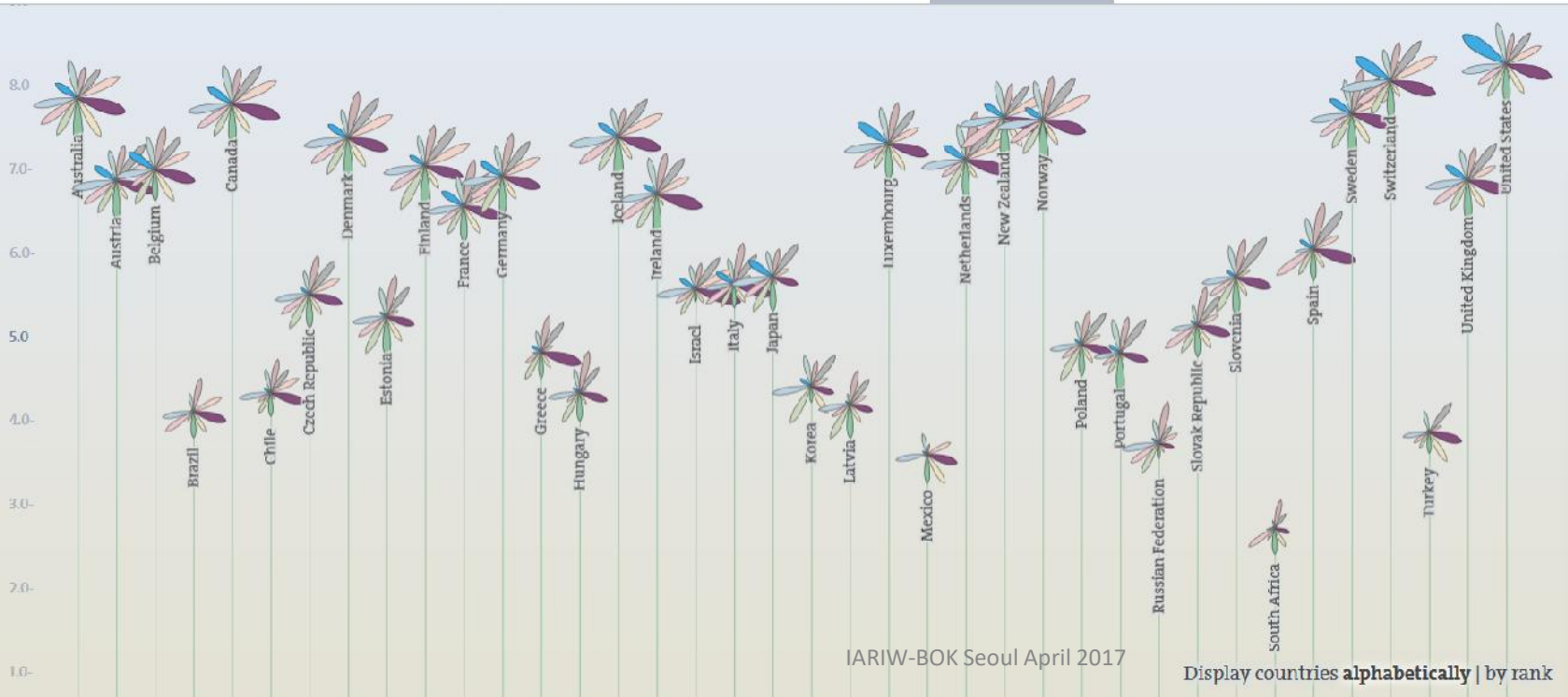
Index

Responses

Countries ▾

Topics ▾

FAQ



## Create Your Better Life Index

Rate the topics according to their importance to you:

	Housing	<input type="range"/>
	Income	<input type="range"/>
	Jobs	<input type="range"/>
	Community	<input type="range"/>
	Education	<input type="range"/>
	Environment	<input type="range"/>
	Civic Engagement	<input type="range"/>
	Health	<input type="range"/>
	Life Satisfaction	<input type="range"/>
	Safety	<input type="range"/>
	Work-Life Balance	<input type="range"/>

⊗ Reset    ⚙ Help

# Kids Count Index – Domains and Measures (Oh oh! some are highly correlated)

Economic Well-Being Indicators	<ol style="list-style-type: none"> <li>1. Children in poverty</li> <li>2. Children whose parents lack secure employment</li> <li>3. Children living in households with a high housing cost burden</li> <li>4. Teens not in school and not working</li> </ol>
Education	<ol style="list-style-type: none"> <li>5. Children not attending preschool</li> <li>6. Fourth graders not proficient in reading</li> <li>7. Eighth graders not proficient in math</li> <li>8. High school students not graduating on time</li> </ol>
Health	<ol style="list-style-type: none"> <li>9. Low-birthweight babies</li> <li>10. Children without health insurance</li> <li>11. Child and teen deaths per 100,000</li> <li>12. Teens who abuse drugs or alcohol</li> </ol>
Family and Community	<ol style="list-style-type: none"> <li>13. Children in single-parent families</li> <li>14. Children in families where the household head lacks a high school diploma</li> <li>15. Children living in high-poverty areas</li> <li>16. Teen births per 1,000</li> </ol>

# Kids Count Index – Aggregation Formula

- convert each measure to a z-score
- sum z-scores

## Knippenberg's Concerns

- dimensions  $\neq$  variable (??? what about “spanning set”)
- measures may be highly correlated – yes, OK
- measures are equally weighted when summed
- equal weighting implies orthogonality (really???)
- principal components inappropriate when measures are ratios

# Knippenberg's Solution

- accept domains → indicators → measures
- accept z-score normalization
- accept aggregation
- accept equal weighting
- accept need for orthogonalization
  
- but use new method for orthogonalization
  - “law of cosines” ≡ essentially a projection of vector onto an orthogonal plane
  - but not clear which plane to choose

# Points for Discussion

- even with full orthogonality = zero correlation, why aggregate?
  - yes, makes life easier for journalists and politicians
- when aggregating and with full orthogonality, why persist with equal weights
  - where are the “principled weights”?
  - e.g. think CPI and expenditure shares,
  - or other methods for eliciting the general public’s comparative weighting of different life domains, e.g. Esposito and Chiappero-Martinetti?
- and why think only of linear aggregation?



# Why Linear – Think Maslow's Hierarchy of Needs

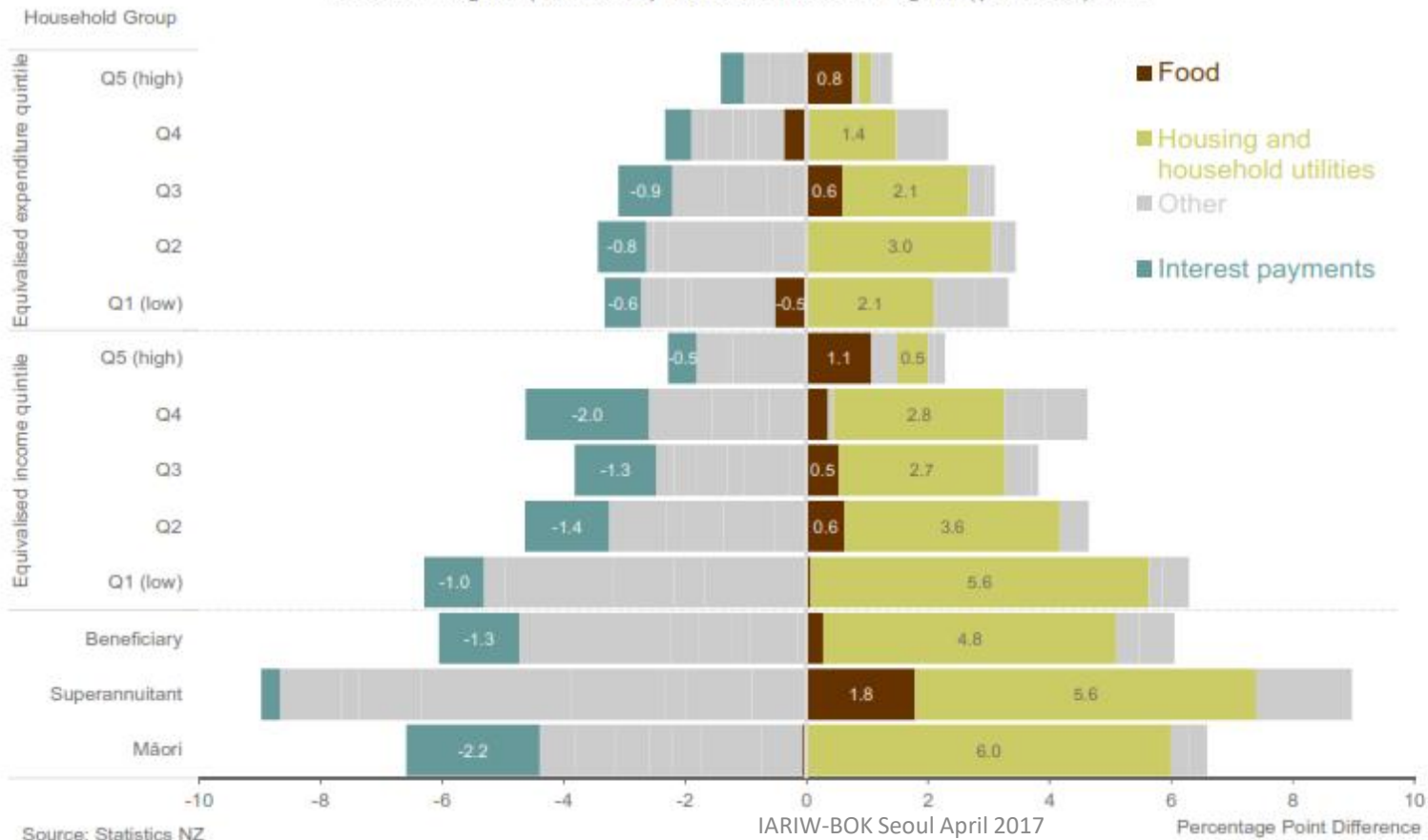
- suppose the domains for well-being are
  - air to breathe
  - water to drink
  - clothing and shelter to maintain body temperature
  - food to eat
  - people with whom to converse
- linear aggregation implies that when there is no air to breathe, but lots of convivial friends, we can have quite high levels of well-being

**Ridiculous!**

unless all measures have values in a part of the space where non-linearities are unimportant, e.g. (maybe) CPI, where variations in expenditure baskets may be ignorable, and/or price changes all highly correlated

# Why Aggregate – Data Visualization (I)

**Differences in expenditure weights**  
household weighted ('democratic') less household-sector weighted ('plutocratic'), 2014

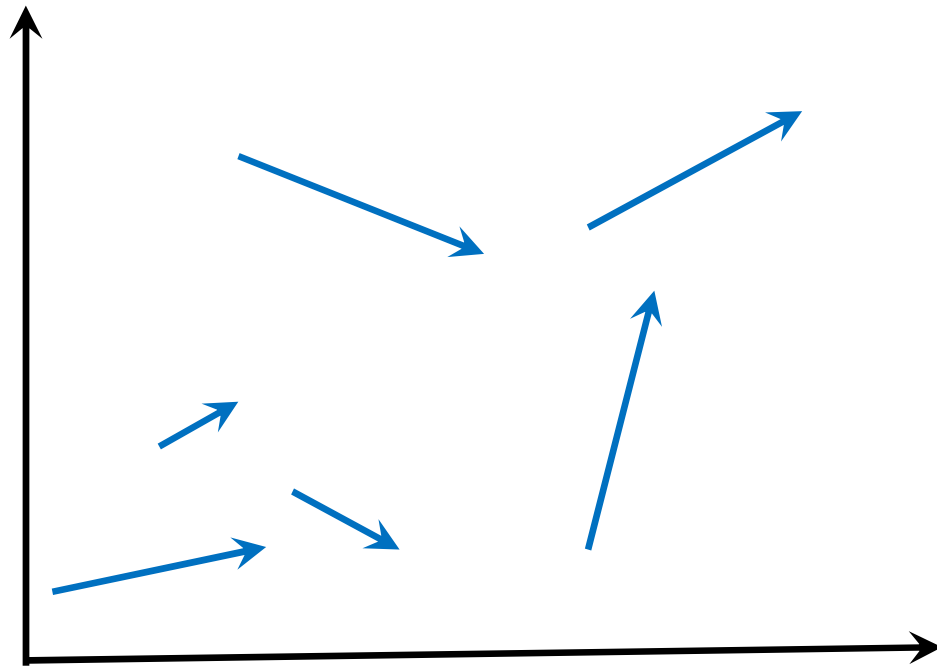


Source: Statistics NZ

IARIW-BOK Seoul April 2017

Percentage Point Difference

# Why Aggregate – Data Visualization (II)



- one arrow per state (in this e.g.)
- think scatter plot matrix to handle multiple dimensions  $> 2$
- distinguish data analysis (exploratory data analysis = EDA)
  - use richly detailed info
- and data presentation
  - select summary presentation to highlight most salient findings
  - likely not unique across all analyses to come
- so again, **why aggregate?**