TRACKING GENDER PARITY

MATHEMATICAL FOUNDATIONS OF GENDER EQUALITY INDICATORS

Gender equality is a prerequisite for sustainable development and the alleviation of poverty. Empowered women and girls contribute to the health and productivity of their families, communities, and countries. In the past few decades, global institutions have developed a range of indicators to measure and track the legal, economic, social, and cultural factors contributing to a gender gap. These composite indicators simplify complex information by mathematically aggregating individual measures into a single summary indicator. The usefulness of these composite indicators depends heavily on the underlying weighting and aggregation methods.

As codified in the 1948 Universal Declaration of Human Rights and adopted as a treaty by the United Nations General Assembly in 1979, gender equality is a fundamental human right and an essential foundation of a sustainable, peaceful, and prosperous world. However, while there has been some progress in closing the gender gap, there is still a long way to go before women and men enjoy the same rights and opportunities across all aspects of life, especially economic participation and political power.

Information on changes in gender parity is of political significance since the United Nations member states agreed to advance gender equality and the empowerment of women and girls as part of the 2030 Agenda for Sustainable Development. Such information is often provided through composite indicators, whose purpose is to simplify complex information and provide a comprehensible framework to measure, communicate, and track progress towards meeting policy goals and targets over time.

MEASURING COMPLEX PHENOMENA

Composite indicators mathematically aggregate a set of individual indicators, usually with no common unit of measurement, into a single summary indicator. Ideally, composite indicators are based on a statistical and mathematical framework that selects, combines, and weights the individual indicators to best reflect the dimensions or structure of the measured phenomena. To a large extent, the usefulness and reliability of a composite indicator depend on the underlying weighting, scaling, and aggregation methods.

For example, if the single indicators use different units of measurement or scale, small variations in larger-scale indicators contribute to more significant changes in the composite indicator score. Mathematicians and statisticians have provided guidance on averaging procedures and normalization methods that allow for meaningful composite indicator values.

Composite indicators are a widely used and popular tool for performance monitoring, benchmarking, policy analysis, and communication with decision-makers and the general public on key policy issues, such as health, the environment, and sustainability. Well-known composite indicators include the Human Development Index, the Environmental Performance Index, the Social Progress Index, and the Global Innovation Index.

DATA & GENDER EQUALITY INDICES

A number of composite indicators attempt to measure the state of gender equality, among these:

KEY MESSAGES

- ☑ Composite indicators are a mathematical aggregation of a set of individual indicators that measure multi-dimensional concepts, but usually have no common unit of measurement, They're increasingly used by global institutions to enhance public debate, benchmark performance, and analyze policies.
- ☑ Multiple composite indicators are used to measure and track the legal, economic, social, and cultural drivers of the gender gap.
- ☑ The proliferation of composite indicators for decision- and policymaking raises issues about accuracy, robustness, and reliability. Poor composite indicators can lead to poor decisions and ineffective policies.
- ☑ Mathematical approaches provide robust means to analyze the sensitivity of composite indicators and uncover which dimensions contribute most to closing the gender gap, providing the means to measure the gender gap in more accurate and reliable ways.

VALIDATING PROGRESS: CLOSING THE GENDER GAP

GGGI measures four equally-weighted dimensions: Economic participation & opportunity, educational attainment, health & survival, and political empowerment. Country rankings and index scores vary considerably depending on the choice of dimensional weights. World Economic Forum statisticians chose to weight these dimensions equally, but with a different choice of weights, the indicator scores would be quite different.

GGGI Weighting Example: Algeria & Angola

With equal weighting, the 2021 composite score for Algeria is 0.633, and for Angola, it's 0.657. If stakeholders are particularly interested in educational parity but also value health and survival, they might weight education at 50%, health at 30%, and the other dimensions at 10%. In such a case, Algeria's weighted average moves up to 0.831, and Angola moves up to 0.762. Both would have a higher GGGI score, and Algeria would now surpass Angola on gender parity. Suppose economic participation is weighted at 50%, health at 30%, and the other dimensions at 10%, In that case, Algeria's weighted average drops to 0.627, Angola's average increases to 0.717, and Angola once again surpasses Algeria on gender parity. Therefore weights are crucial and should be selected to represent the interests of stakeholders best.

Country	Algeria	Angola
Economics	0.456	0.646
Education	0.966	0.759
Health	0.958	0.979
Political	0.151	0.245
Equally-weighted Average	0.633	**0.657**
Weighted to Education (50%), Health (30%), Others (10%)	**0.831**	0.762
Weighted to Economic Participation (50%), Health (30%), Others (10%)	0.627	**0.717**

- **The Global Gender Gap Index (GGGI)** — The World Economic Forum first introduced the GGGI in 2006 as a framework for capturing gender-based disparities and tracking their progress over time. The GGGI benchmarks national gender gaps on economic, education, health, and political criteria and provides country rankings that allow for comparisons across regions and income groups.
- **Gender Inequality Index (GII)** — The United Nations Development Programme's GII is a composite measure of gender-based disadvantage in three dimensions: Reproductive health, female empowerment, and labor market participation. A higher GII value equates to more disparities between females and males and a greater loss to human development.
- **Social Institutions and Gender Index (SIGI)** — The SIGI, compiled by the Organization for Economic Cooperation and Development, measures discrimination against women in social institutions. The SIGI is an unweighted composite index comprised of four sub-indices: Discrimination in the family, restricted physical integrity, restricted access to productive and financial resources, and restricted civil liberties. A SIGI value of 0 indicates complete equality; a value of 1 indicates complete inequality. The SIGI is one of the official data sources for monitoring SDG 5.1.1.

CONCLUSIONS

Despite their popularity, composite indicators have met with some criticism, particularly around the steps of weighting and aggregation and the statistical significance of the final product. To improve the accuracy and reliability of composite indicators, mathematicians are continuing to propose new, robust approaches to their construction, including the use of interval values to measure composite indicator uncertainty based on the different assumptions used as inputs to evaluate the implicit weights of the dimensions used in the measure of the composite indicator.

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