The Main Indicators of Gender (in)Equality

Enrico di Bella and Christian Suter

1 A Brief Overview of Gender (in)Equality Measurement

The topic of gender (in)equality[1] is increasingly at the centre of international debate due to its numerous implications on our society's socioeconomic context. Indeed, gender equality is one of the determinants of economic growth, human capital development, and more generally, a sustainable development model (Kabeer & Natali, 2013; Moorhouse, 2017; Profeta, 2017; Maceira, 2017). Several initiatives have been undertaken at the international level to support greater gender equality. In 2015, the W20 group was established at the summit of the world's top 20 economies (G20) with the primary objective of empowering women by ensuring that they play a prominent role in the G20 process. Another noteworthy initiative was the inclusion of gender equality among the 17 Sustainable Development Goals (Goal #5) identified by the UN in Resolution A/RES/70/1 on 25 September 2015:

> Gender equality is not only a fundamental human right, but a necessary foundation for a peaceful, prosperous and sustainable world... .Providing women and girls with equal access to education, health care, decent work, and representation in political and economic decision-making processes will fuel sustainable economies and benefit societies and humanity at large.

[1] The term '(in)equality', which is used in this chapter, serves to highlight the different approaches used to measure gender inequality. Some indicators emphasise the gender difference or gap that is to be reduced, while others set the goal of gender equality that is to be achieved.

E. di Bella (✉)
Università di Genova, Genova, Italy
e-mail: enrico.dibella@unige.it

C. Suter
Université de Neuchâtel, Neuchâtel, Switzerland
e-mail: christian.suter@unine.ch

E. di Bella et al. (eds.), *Measuring Gender Equality*, Social Indicators Research Series 87, https://doi.org/10.1007/978-3-031-41486-2_3

To plan effective policies and act consciously, it is essential to have appropriate measurement and monitoring tools. While the first gender (in)equality indicators were developed at the national level in the 1970s and the 1980s (e.g. United States Commission on Civil Rights, 1978; Sugarman & Straus, 1988),[2] corresponding measures were not implemented at the international and global levels until the mid-1990s. Currently, a wide range of comparative gender (in)equality indicators are available, developed, and promoted by scientific research and academic institutions, international organisations (e.g. the United Nations, the World Economic Forum, etc.), civil society associations, official (national) bodies, and private companies. However, these indicators often refer to specific areas (e.g. the fields of education, health, or economic power), and there are only a few measures that attempt to provide a systemic and multidimensional view of the phenomenon (see Plantenga et al., 2009; Barnat et al., 2019 and Cascella et al., 2022, for more in-depth reviews).

The development of gender (in)equality indicators at the international level began in the early 1980s with the publication of several studies and reports on the situation of women by UN agencies. The two reports Compiling Social Indicators on the Situation of Women (United Nations, 1984a) and Improving Concepts and Methods for Statistics and Indicators on the Situation of Women (United Nations, 1984b) are particularly important milestones. On the one hand, these reports provide a stock-taking of existing data, methodologies, and indicators on the relative status of women. On the other hand, they outline a research agenda for developing and improving gender-related indicators and measures in several domains, notably families and households, education, labour force participation, income, health, socioeconomic status, and social mobility.

The UNDP Gender Development Index (GDI), launched in 1995, is the first global multidimensional measure of gender (in)equality. This measure, inspired by and based on the Human Development Index (HDI), was, however, still restricted to selected societal spheres—those included in the HDI, that is, health, education, and standard of living. Similarly, the Gender Inequality Index (GII), which combines the three dimensions of reproductive health, female empowerment, and the labour market, published by the UNDP yearly since 2013, follows—and is limited to—the traditional HDI approach. Only in the 2000s were more comprehensive measures capable of capturing the complexity of gender (in)equality at an international (global) level. The most widely used comprehensive global measure is the Global

[2]The Gender Equality Index proposed by Sugarman and Straus (1988) and updated by Di Noia (2002) is a multidimensional measure including 24 indicators aggregated into three sub-indices (economic, political, and legal equality indices) and computed for each of the 50 US states. Within the context of the present study, other comparative sub-national (regional, state) measures are also worth mentioning, notably the Gender Equality Index of Mexican States suggested by Frias (2008), the Synthetic Index of Gender Inequality of Spanish regions of Bericat and Sánchez (2008), the Regional Gender Equality Monitor for the EU regions by the Joint Research Center (Norlen et al., 2019), the Regional Gender Equality Index (R-GEI) of di Bella et al. (2021), and the Extended Regional Gender Gaps Index (eRGGI) of Cascella et al. (2022) for the Italian regions.

Gender Gap Index (GGGI) of the World Economic Forum (WEF), developed by Hausmann et al., in 2006. This index covers the four dimensions of economic participation and opportunity, educational attainment, health, and political empowerment, and is measured by 14 variables. GGGI is available for approximately 150 countries worldwide and is updated annually. Another more recent measure with a similar broad coverage is the SDG Gender Index launched in 2018 by Equal Measures 2030. This index is directly related to the Sustainable Development Goals framework, which includes 56 indicators covering 14 of the 17 Sustainable Development Goals (EM2030, 2022).[3] A final global measure, slightly more focused than the measures discussed above, is the Women's Economic Opportunity Index (WEO), published in 2009 and 2011[4] by The Economist Intelligence Unit, covering five dimensions: labour policy and practice; access to financing, education, and training; women's legal and social status; and general business environment, measured by 31 indicators (EIU, 2010).

In addition to these global measures, two indices of gender (in)equality have been developed, specifically for European countries. First, the European Gender Equality Index (EGEI), suggested by Bericat (2012), focuses on access to structural resources (determining the social status of women and men) and is calculated for 27 European countries. The index is composed of three dimensions or sub-indices (education, work, power) measured by 18 indicators employing ratios of female/male achievement rates of the respective resources. The index, initially calculated for 2009, was updated by Bericat and Sánchez-Bermejo (2016) for 2000–2011.[5] Second, the Gender Equality Index (GEI) developed by the European Institute for Gender Equality (EIGE) addresses gender gaps in various domains that are policy-relevant at the EU level. Its conceptual framework distinguishes eight domains, of which six (work, money, knowledge, time, power, and health) are covered by the overall index. The six domains are composed of 14 subdomains, measured using 31 indicators. The GEI was published for the first time in 2005 and has been updated regularly every 2 or 3 years since then.

Although the development of such comprehensive gender (in)equality measures is quite recent, the origins of gender (in)equality measures and analyses date back to the early postwar period. There is a long social sciences tradition of conceptualising and measuring gender (in)equality. Research on social stratification and social mobility (e.g. Grusky, 2008) and ascriptive inequalities (e.g. Reskin, 2003) in particular have contributed to developing various gender (in)equality indicators and measures shedding light on the complex interplay of inequality mechanisms operating at different levels (individual, interpersonal, institutional, organisational,

[3] The 2018 pilot version was restricted to six countries. The first complete global version including 129 countries was published in 2019. The most recent update is the 2022 report with data and analyses for 144 countries.

[4] Unfortunately, no more recent updates of the WEO seem to be available.

[5] Since then, however, this index has not been updated.

national, and global) and in different societal spheres (economic, social, political, legal, and cultural) for a long time.

Among the first (in)equality indices established by academics and social science scholars, we find segregation measures that were discussed as early as the beginning of the twentieth century. Among them is the classical index of dissimilarity suggested by Duncan and Duncan (1955) in their methodological analysis of the strengths and weaknesses of different segregation indices. Since the 1960s, the dissimilarity index has become the most widely used measure of (gender) segregation. A good example is Jacobs's (1989) study of the long-term historical trend of occupational sex segregation in the United States during the twentieth century. One of the strengths of the dissimilarity index is its simplicity—the index is easy to apply and interpret, which indicates the proportion of women or men that should be shifted (between fields of work, fields of study, occupational positions) to achieve equal ratios. Therefore, the index has also been called the index of displacement. Over the past decades, the dissimilarity index has been continuously refined and improved: for instance, the standardisation proposed by Gibbs (1965) and Jacobs (1989) to control for differences in the marginal distributions (e.g. the number and size of fields of work); the index of association suggested by Charles (1992) and Charles and Grusky (1995), allowing for field-specific comparisons; or the inclusion of homemaking and the economically inactive population by Cohen (2004) and Hook and Pettit (2016). An important advantage of segregation measures, particularly within the context of our study, is that they can be easily calculated at the regional, sub-regional, and local levels.[6] This is also due to the fact that the first studies employing segregation measures focused on patterns of residential segregation, particularly regarding race and ethnicity, such as between blacks and whites in the United States. A weakness of segregation measures is that they are domain-specific and are mostly restricted to the fields of employment and education. While they can capture important sub-areas (and are, therefore, included in the GEI as sub-indexes for work and education), segregation indicators are not able to cover the complexity and multi-dimensionality of overall gender equality.

In addition to the segregation indices, there are several other domain-specific gender (in)equality indicators. For instance, two recent promising initiatives in the legal field are the OECD Social Institution and Gender Index (SIGI) and the Global Index on Legal Recognition of Homosexual Orientation (GILRHO). The Social Institution and Gender Index was launched in 2009 and updated in 2012, 2014, and 2019. The SIGI originally covered five dimensions: discriminatory family codes, restricted physical integrity, restricted access to productive and financial resources, restricted civil liberties, and son bias. The last version of the global SIGI (published in 2019) includes four dimensions (the son bias dimension has been dropped), measured by 16 different indicators. Dimensions, sub-dimensions, and individual indicators were equally weighted and aggregated using exponential and logarithmic

[6] For a recent example, see Ravazzini and Suter (2016).

functions, allowing for partial (and varying) substitution for increases and decreases in the different (sub-) dimensions (for more details, see OECD, 2019).

The Global Index on Legal Recognition of Homosexual Orientation (GILRHO) was developed by Kees Waaldijk at Leiden University, and was first published in 2014. This measure is a simple summary index based on eight indicators covering different aspects of decriminalisation of homosexual acts, anti-discrimination legislation, and partnership and family rights for same-sex couples. Work on the GILRHO seems to be still in progress, and although the construction and aggregation of the index are quite simple and no systematic methodological validation has yet been provided, the index is interesting because it broadens the concept of gender equality to include LGBT+ issues (for more details, see Waaldijk, 2019 and Badgett et al., 2019).

In the following paragraphs, some of the most comprehensive and internationally disseminated equality, inequality, and gender gap indicators will be discussed. Specifically, the Global Gender Gap Index (GGGI) of the World Economic Forum (WEF, 2022), the Gender Development Index (GDI) of the United Nations (UNDP, 2022a; 2022b), the Gender Inequality Index (UNDP, 2022a and 2022b), and the Gender Equality Index (GEI) of the European Institute for Gender Equality (EIGE, 2017; 2022) will be analysed. All these represent a representative selection of the different approaches and calculation methods used by leading international organisations to measure gender (in)equality.

2 The Global Gender Gap Index of the WEF

The Global Gender Gap Index (GGGI) was introduced by the World Economic Forum (WEF) in 2006 as a tool to measure the extent of gender inequality, tracking its evolution over time at the country level in 146 countries (2022 edition). It explores the gender gap across 14 variables, organised into four key categories (pillars or sub-indices): economic participation and opportunity, educational attainment, health and survival, and political empowerment (Table 1).

GGGI is constructed using a four-step process (WEF, 2022):

Convert to ratios. Initially, all data are converted to female-to-male ratios to ensure that the index captures the gaps between women's and men's attainment levels rather than the levels themselves. For instance, if an indicator records 115 for men and 104 for women, the female-to-male ratio is 1.143 (120/105), thus identifying the male value as being 14.3% higher than the female value.

Data truncation at parity benchmark. Female-to-male ratios are pure numbers (i.e. without a unit of measure) that identify a parity situation if their value equals 1 (or any other stated 'equality benchmark') or an inequality condition for values that differ from the equality benchmark. Although the female-to-male ratios can record disparities above or below 1, in the GGGI, the ratios obtained above are truncated at

Table 1 GGGI pillars indicators and data sources (WEF, 2022)

Pillar	Indicator	Data sources
Economic participation and opportunity	Labour-force participation rate	International Labour Organization (ILO), ILOSTAT database, modelled estimates
	Wage equality for similar work	World Economic Forum, Executive Opinion Survey (EOS)
	Estimated earned income	International Labour Organization (ILO), ILOSTAT database; International Monetary Fund (IMF), World Economic Outlook; World Bank, World Development Indicators database
	Legislators, senior officials and managers	International Labour Organization (ILO), ILOSTAT database
	Professional and technical workers	International Labour Organization (ILO), ILOSTAT database
Educational attainment	Literacy rate	UNESCO, UIS.Stat education statistics data portal. When not available, data is sourced from United Nations Development Programme, Human Development Reports, most recent year available
	Enrolment in primary education	UNESCO, UIS.Stat education statistics data portal
	Enrolment in secondary education	UNESCO, UIS.Stat education statistics data portal
	Enrolment in tertiary education	UNESCO, UIS.Stat education statistics data portal
Health and survival	Sex ratio at birth	World Bank, World Development Indicators database
	Healthy life expectancy	World Health Organization (WHO), Global Health Observatory database
Political empowerment	Women in parliament	Inter-parliamentary Union
	Women in ministerial positions	Inter-parliamentary Union
	Years with female/male head of state (last 50)	World Economic Forum's calculations

the equality benchmark.[7] For all indicators, except for the two health indicators, this equality benchmark is considered to be 1, meaning equal values for women and men. In the case of the sex ratio at birth indicator, the equality benchmark was set at 0.944,[8] and in the case of the healthy life expectancy indicator, the equality

[7] Two scales can be considered to capture gender equality. One is a negative-positive scale that captures the extent and direction of the gender gap and penalises situations of imbalance by giving the highest score to situations of perfect equality. The second, which is the one chosen by the WEF, is a one-sided scale that measures how close women are to achieving parity with men, but does not reward or penalise countries that have a gender gap in the opposite direction.

[8] It is known that the natural value of the male/female (or sex-ratio) ratio at birth in humans is around 1.06 males born for every female. Deviations from this ratio may be indicative of the presence of

benchmark was set at 1.06.[9] As such, parity is achieved if, on average, women live 5 years longer than men do.

Calculation of subindex scores. The third step in the process is to calculate the weighted arithmetic average of the indicators within each sub-indicator to derive the corresponding summary scores. First, the sub-indicator scores were normalised to equalise their standard deviations.[10] Next, the scores of each sub-indicator are aggregated into a single value through a weighted average whose weights are determined by the ratio of 0.01 to the standard deviation of each indicator. This determines how much the indicator has to vary in relation to its standard deviation, resulting in a one percentage point change in the indicator. These four values are then expressed as weights that sum to one to calculate the weighted average of the four indicators.[11]

Calculation of final scores. For all sub-indices, the highest possible score is 1 (or 100%, i.e. perfect gender equality or gender gap closure), and the lowest possible score is 0 (or 0% or maximum inequality), thus tying the scores between inequality and baseline equality. A simple arithmetic average of each subindicator score was used to calculate the Global Gender Gap Index. This final value also varies between 1 and 0, thus allowing for a comparison of ideal standards of equality as well as relative country rankings.

The latest available data on the GGGI (WEF, 2022) indicate a closing of the gender gap worldwide of 68.1%. Looking at the evolution of the index over time since the first edition in 2006 for the 102 countries featured in all reports, a steady and generalised increase in gender equality can be observed. However, according to the WEF Working Group's calculations, full equality between men and women (i.e. complete closure of the gender gap) will only be achieved in 132 years. Although no country in the world, among the 146 considered in the 2022 edition of the report has achieved gender parity, some are closer to closing the gender gap: Iceland (90%), Finland (86%), Norway (84.5%), and Sweden (82.2%). Besides these Scandinavian countries, the areas of the globe that are most close to closing the gender gap are North America (with an average score of 76.9%), Europe (76.6%), and Latin America and the Caribbean (72.6%). The region where the gap is widest is South Asia, with Pakistan and Afghanistan having the lowest parity scores worldwide (56.4% and 43.4%, respectively). In general, however, each area of the globe presents very different situations with much higher/lower than the mean values for

factors related to gender inequality such as sex-selective abortions, infanticide or birth registration problems.

[9]This ratio is obtained by comparing the maximum life expectancy for women reported in the UN Gender Related Development Index of 87.5 years and the corresponding value for men of 82.5.

[10]The arithmetic mean of the different non-standardised indicators would implicitly give more weight to the measure with the greatest variability (i.e. with the highest standard deviation value).

[11]For example, if the three indicators of a sub-domain had standard deviations of 0.10, 0.14, and 0.20, the corresponding ratios of 0.01 to the standard deviations would be 0.10, 0.07, and 0.05. The corresponding weights are obtained by relating each of these values to their total (0.10 + 0.07 + 0.05 = 0.22): 0.10/0.22 = 0.45; 0.07/0.22 = 0.32; 0.05/0.22 = 0.23.

some countries: Rwanda (Sub-Saharan Africa), for example, has a GGGI score of 81.1% and Nicaragua (Latin America and the Caribbean area) of 81.0%, ranking sixth and seventh in the world, respectively.

3 The United Nations Gender Development Index

The Gender Development Index (GDI) is a macroeconomic development indicator published in 1995 by the United Nations Development Programme (UNDP) to assess the quality of life of member countries (UNDP, 2022a). It measures gender inequalities concerning the achievement of three fundamental aspects of human development: an individual's health status (long and healthy life), education level (knowledge), and living conditions (standard of living). The GDI is an indicator derived from the Human Development Index (HDI), as it is given by the ratio of HDI indices calculated separately according to gender, and represents the HDI for the female gender as a percentage of the HDI for the male gender. The indicator was calculated for 174 countries (2021/22 edition), grouped into five groups based on the achieved level of gender equality.[12] To understand how the GDI is calculated, it is necessary to first specify a method for calculating the HDI (UNDP, 2022a).

3.1 The United Nations Human Development Index

The Human Development Index (HDI) measures average achievement in key dimensions of human development. According to the UNDP, necessary prerequisites for a person to fulfil themselves in life are: a long and healthy life, knowledge, and a decent standard of living (UNDP, 2020). Achieving high levels of HDI for a country means ensuring optimal conditions for its citizens to freely make their own life choices. The HDI considers three dimensions, each measured through a specific index and one global index, the HDI (Table 2). The long and healthy life dimension is measured by the life expectancy index, which is based on life expectancy at birth. The knowledge dimension is described by the education index which is derived from two elementary indicators (expected years of schooling and mean years of schooling). A decent standard of living is assessed using the gross national income index

[12]The five groups are identified on the basis of the absolute deviation of the Gender Development Index from gender equality, $100 \cdot |GDI - 1|$. Countries with values less than or equal to 2.5% are considered countries with high equality in HDI index results between women and men and are classified as group 1. Group 2 identifies countries with high average equality between the HDI indices of the two genders (values between 2.5% and 5%); Group 3 includes countries with average equality between the HDI indices of women and men (values between 5% and 7.5%); Group 4 identifies countries with low average equality of indicators (values between 7.5% and 10%); finally, Group 5 includes countries with low equality of HDI gender indicators (values above 10%).

Table 2 HDI dimension, indicators and data sources (UNDP, 2020)

Dimension	Dimension index	Indicator	Description	Minimum	Maximum	Data sources
Long and healthy life	Life expectancy index	Life expectancy at birth	Average number of years a newborn can expect to live based on the mortality rates recorded in the year in question	20 years	85 years	United Nations Department of Economic and Social Affairs (UNDESA)
Knowledge	Education index	Expected years of schooling	Average number of years of education a school-age child can expect to receive based on current enrolment rates	0 years	18 years	United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics; ICF Macro Demographic and Health Surveys; United Nations Children's Fund (UNICEF); Multiple Indicator Cluster Surveys; Organisation for Economic Co-operation and Development (OECD)
		Mean years of schooling	Average number of years of education an individual can expect to receive after the age of 25	0 years	15 years	UNESCO Institute for Statistics, Barro and Lee (2018), ICF Macro Demographic and Health Surveys, UNICEF Multiple Indicator Cluster Surveys and Organisation for Economic Co-operation and Development (OECD)
A decent standard of living	GNI index	Gross National income per capita	Gross National income per capita at purchasing power parity	100 USD	75,000 USD	World Bank, International Monetary Fund, United Nations Statistics Division

which is based on gross national income per capita in USD at parity of purchasing power (PPP). All three dimension indices were combined into the Human Development Index.

The HDI was constructed using a two-step process (UNDP, 2022b):

Calculation of indicators for each dimension. The life expectancy at birth indicator, the expected years of schooling indicator, and the mean years of schooling indicator are firstly normalised to a range between 0 and 1 through the min-max transformation:

$$ {}_jI_i^N = \frac{{}_jI_i - \min\left({}_jI\right)}{\max\left({}_jI\right) - \min\left({}_jI\right)} $$

being ${}_jI_i$ the score for the j-th indicator for the i-th country, $\max({}_jv)$ and $\min({}_jv)$ are the maximum and the minimum score for each indicator (goalposts) defined on the basis of realistic expectations and empirical evidence (Table 3). The life expectancy index corresponds exactly to the normalised life expectancy at birth indicator, whereas the education index is the arithmetic mean of the two normalised expected years of schooling and mean years of schooling indicators. To account for the marginally decreasing effect of higher income values, the GNI is obtained by normalising the natural logarithm (ln) of the actual, minimum, and maximum values of the GNI per capita at PPP:

$$ \mathrm{GNI}_i^N = \frac{\ln(\mathrm{GNI}_i) - \ln(100)}{\max(75{,}000) - \min(100)} $$

Aggregation of size indices to obtain the HDI index. Finally, the human development index results from the geometric mean of the three-dimensional indicators:

$$ \mathrm{HDI} = \left(I_{\text{Life Expectancy}} \cdot I_{\text{Education}} \cdot I_{\text{GNI}}\right)^{1/3} $$

The equal weighting of the three-dimensional indices in the calculation of the synthetic HDI index stems from the consideration that the three dimensions (long and healthy life, knowledge, and a decent standard of living) contribute in a balanced manner to human development. The use of a geometric mean instead of a simple arithmetic mean is linked to considerations regarding the lower compensatory effect of this aggregation method (OECD & JRC, 2008).

3.2 The United Nations Gender Development Index

The Gender Development Index (GDI) is derived from the HDI and is expressed as the ratio of the HDI of the female gender to that of the male gender. Although the

Table 3 HDI dimension, indicators, and data sources (UNDP, 2020)

Dimension	Dimension index	Indicator	Description	Data sources
Health	Female reproductive health index	Maternal mortality ratio (MMR)	Number of maternal deaths per 100,000 births in a given period due to complications of pregnancy or childbirth. The MMR is used to measure women's access to health care	World Health Organization (WHO), United Nations International Children's Emergency Fund (UNICEF), United Nations Population Fund (UNFPA), World Bank Group and United Nations Population Division
		Adolescent birth rate (ABR)	Number of births to women aged 15–19 per 1000 women in that age group. The ABR index measures early fertility, which poses health risks to mothers and children, as well as a lack of higher education	United Nations Department of Economic and Social Affairs (UNDESA)
Empowerment	Female/male empowerment index	Female and male population with at least secondary education (SE)	Proportion of women and men aged 25 years and over with at least a secondary school degree	United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics, Barro and Lee (2018)
		Female and male shares of parliamentary seats (PR)	Represents the representation of women in parliaments	Inter-Parliamentary Union (IPU)
Labour market	Female/male labour market index	Labour force participation rate (LFPR)	Share of the working age population, aged 15–64, of a country that is actively engaged in the labour market	International Labour Organization (ILO)

dimensions considered by the GDI are the same as those of the HDI, its calculation requires a gender breakdown of the four elementary indicators.

The main technical problem in calculating gender-specific indicators relates to the estimated earned income produced by women compared with that produced by men. The female wage bill share is calculated as follows (UNDP, 2020):

$$S_f = \frac{W_f/W_m \cdot EA_f}{W_f/W_m \cdot EA_f + EA_m}$$

where W_f/W_m is the ratio of female-to-male wages, EA_f represents the female share of the economically active population, and EA_m is the male share. The male share of salary is calculated as follows:

$$S_m = 1 - S_f.$$

The estimated female per capita income $\left(\text{GNI}_{pc_f}\right)$ is obtained from the Gross National Income per capita (GNI_{pc}) first multiplied by the female wage share S_f and then divided by the female share of the population, $P_f = N_f/N$:

$$\text{GNI}_{pc_f} = \text{GNI}_{pc} \cdot S_f/P_f.$$

The estimated male per capita income is obtained in the same way:

$$\text{GNI}_{pc_m} = \text{GNI}_{pc} \cdot S_m/P_{m.}$$

where $P_m = 1 - P_f$ is the male population share.

The indicators were normalised separately by gender using the same procedure described in the previous paragraph and using the same minimum and maximum values as those used for the construction of the HDI, except for life expectancy at birth, whose goalposts are set at 22.5–87.5 for females and 17.5–82.5 for males. The values of the female and male HDI indices are given by the geometric mean of the size indices for each sex:

$$\text{HDI}_f = \left(I_{\text{Health}_f} \cdot I_{\text{Education}_f} \cdot I_{\text{Income}_f}\right)^{1/3}$$

$$\text{HDI}_m = \left(I_{\text{Health}_m} \cdot I_{\text{Education}_m} \cdot I_{\text{Income}_m}\right)^{1/3}$$

and the Gender Development Index is expressed as the ratio of the HDI of the female gender to that of the male gender:

$$\text{GDI} = \frac{\text{HDI}_f}{\text{HDI}_m}$$

It may occur (and in practice, it does) that the GDI takes values greater than 1 (or 100%) if $\text{HDI}_f > \text{HDI}_m$.

The latest GDI report (UNDP, 2022a) reports a global value of 95.8% and identifies 'Latin America and the Caribbean' as the region with the highest GDI with a score of 98.6%, followed by 'East Asia and the Pacific' with 97.8%, 'Europe and Central Asia' with 96.1%, 'Sub-Saharan Africa' with 90.7%, 'Arab States' with 87.1%, and 'South Asia' with 85.2%.

4 The United Nations Gender Inequality Index

The Gender Inequality Index (GII) is another indicator promoted by the United Nations to assess the development of member countries (UNDP, 2022a). It represents an index of inequality that measures gender-based disadvantages with respect to three fundamental dimensions of human development: health, empowerment, and labour market. The GII is derived from the Inequality-adjusted Human Development Index (IHDI), an indicator given by the geometric mean of the previously analysed dimensional indices but adjusted for inequality (UNDP, 2022b). The GII provides a better explanation for the differences in the distribution of the results of the basic indices between men and women. The GII varies between 0 and 1: the higher its value, the greater the gender inequality and loss in human development.

Each of the dimensions mentioned above can be expressed through appropriate indicators that are necessary for the calculation of GII (Table 4).

GII is constructed using a five-step process (UNDP, 2022b):

Treatment of zeros and extreme values. The GII extensively uses geometric and harmonic means to construct synthetic measures of elementary indicators because of the peculiar characteristics of these methods (OECD and JRC, 2008). Because it was not possible to calculate the geometric mean with zero values, a minimum value of 0.1% was set for all the sub-indicators listed above. In addition, the maximum value for the maternal mortality ratio was set at 1000 deaths per 100,000 births and the minimum value at 10. This choice stems from the fact that it is reasonable to assume that countries with maternal mortality ratios above 1000 deaths do not differ in their ability to create more or less favourable conditions for maternal health. Similarly, in countries with 10 or fewer deaths, the differences can be attributed to chance.

Aggregating across dimensions within each gender group, using geometric means. Indicators were aggregated for each sex by using the geometric mean. For females, the aggregation is derived from the following formula:

$$G_F = \sqrt[3]{\left(\frac{10}{\text{MMR}} \cdot \frac{1}{\text{ABR}}\right)^{\frac{1}{2}\cdot(PR_F \cdot SE_F)^{\frac{1}{2}\cdot \text{LFPR}_F}}},$$

while for the male gender, the formula is:

Table 4 List of indicators of the Gender Equality Index (EIGE, 2022)

Domain	Sub-domain	No	Indicator and reference population	Description	Source
Work	Participation	1	Full-time equivalent employment rate (%, 15+ population)	The FTE employment rate is a unit to measure employed people in a way that makes them comparable even though they may work a different number of hours per week. A full-time worker is counted as one FTE, while a part-time worker gets a score in proportion to the hours they work	Eurostat, EU LFS, EIGE's calculation using microdata
		2	Duration of working life (years, 15+ population)	The duration of working life indicator measures the number of years a person aged 15 is expected to be active in the labour market throughout their life	Eurostat, EU-LFS (lfsi_ dwl_a)
	Segregation and quality of work	3	People employed in education, human health and social work activities (%, 15+ workers)	Percentage of people employed in education and in human health and social work economic activities out of total employed (based on NACE rev. 2)	Eurostat, EU-LFS (lfsa_ egan2)
		4	Ability to take an hour or two off during working hours to take care of personal or family matters (%, 15+ workers)	Percentage of people who consider it 'very easy' to take an hour or two off during working hours to take care of personal or family matters	Eurofound, EWCS, EIGE's calculation using microdata

(continued)

Table 4 (continued)

Domain	Sub-domain	No	Indicator and reference population	Description	Source
		5	Career prospects index (points, 0–100)	The Career Prospects Index combines the indicators of employment status (self-employed or employee), type of contract, prospects for career advancement as perceived by the worker, perceived likelihood of losing one's job and experience of downsizing in the organisation. It is measured on a scale from 0 to 100, where the higher the score is, the higher the job quality is	Eurofound, EWCS, EIGE's calculation using microdata
Money	Financial resources	6	Mean monthly earnings (PPS, working population)	Mean monthly earnings in PPS, in the sectors of industry, construction and services (except public administration, defence, compulsory social security) (NACE_R2: B-S_X_O, total age group, working in companies of 10 employees or more)	Eurostat, SES (earn_ses10_20), (earn_ses14_20), (earn_ses18_20)
		7	Mean equivalised net income (PPS, 16+ population)	Equivalised disposable income in PPS is the total income of a household, after tax and other deductions, available for spending	Eurostat, EU-SILC (ilc_di03)

(continued)

Table 4 (continued)

Domain	Sub-domain	No	Indicator and reference population	Description	Source
				or saving, divided by the number of household members converted into equalised adults	
	Economic situation	8	Not at risk of poverty,[3] 60% of median income (%, 16+ population)	Reverse indicator of 'at-risk-of-poverty rate'.	Eurostat, EU-SILC (ilc_li02)
		9	S20/S80 income quintile share (16+ population)	Calculated as 1/'S80/S20 income quintile share ratio' × 100	Eurostat, EU-SILC, Eurostat calculations at EIGE's request
Knowledge	Attainment and participation	10	Graduates of tertiary education (%, 15+ population)	Educational attainment measures the share of people with a high level of education among men and women. People with tertiary education as their highest successfully completed level (levels 5–8), percentage of total 15+ population	Eurostat, EU-LFS, EIGE's calculation using microdata
		11	People participating in formal or non-formal education and training (%, 15+ population)	Percentage of people participating in formal or non-formal education and training out of total 15+ population	Eurostat, EU-LFS, EIGE's calculation using microdata
	Segregation	12	Tertiary students in the fields of education, health and welfare, humanities and the arts (tertiary students) (%, 15+ population)	Percentage of people who are studying F01—education, F02—arts and humanities and F09—health and welfare, in ISCED 5–8 levels of education	Eurostat, education statistics (educ_enrl5), (educ_uoe_enrt03)

(continued)

Table 4 (continued)

Domain	Sub-domain	No	Indicator and reference population	Description	Source
Time	Care activities	13	People caring for and educating their children or grandchildren, elderly people, or people with disabilities, every day (%, 18+ population)	Percentage of people involved in at least one of these caring activities outside of paid work every day: care for children, grandchildren, elderly people, or disabled people	Eurofound, EQLS, EIGE's calculation using microdata
		14	People doing cooking and/ or housework, every day (%, 18+ population)	Percentage of people involved in cooking and/ or housework outside of paid work, every day	Eurofound, EQLS, EIGE's calculation using microdata
	Social activities	15	Workers doing sporting, cultural or leisure activities outside of their home, at least daily or several times a week (%, 15+ workers)	Percentage of working people doing sporting, cultural or leisure activities at least every other day (daily + several times a month out of the total)	Eurofound, EWCS, EIGE's calculation using microdata
		16	Workers involved in voluntary or charitable activities, at least once a month (%, 15+ workers)	Percentage of working people involved in voluntary or charitable activities, at least once a month	Eurofound, EWCS, EIGE's calculation using microdata
Power	Political	17	Share of ministers (% of women, men)	Share of ministers	EIGE, Gender Statistics Database, WMID
		18	Share of members of parliament (% of women, men)	Share of members of parliament	EIGE, Gender Statistics Database, WMID
		19	Share of members of regional assemblies (% of women, men)	Share of members of regional assemblies	EIGE, Gender Statistics Database, WMID
	Economic	20	Share of members of boards in largest quoted companies, supervisory board or board of	Share of members of boards in largest quoted companies	EIGE, Gender Statistics Database, WMID

(continued)

Table 4 (continued)

Domain	Sub-domain	No	Indicator and reference population	Description	Source
			directors (% of women, men)		
		21	Share of board members of central bank (% of women, men)	Share of board members of central bank	EIGE, Gender Statistics Database, WMID
	Social	22	Share of board members of research funding organisations (% of women, men)	Members of the highest decision-making bodies of research funding organisations	EIGE, Gender Statistics Database, WMID
		23	Share of board members in publicly owned broadcasting organisations (% of women, men)	Share of board members in publicly owned broadcasting organisations	EIGE, Gender Statistics Database, WMID
		24	Share of members of highest decision- making body of the national Olympic sport organisations (% of women, men)	Share of members of highest decision-making body of the 10 most popular national Olympic sport organisations	EIGE, Gender Statistics Database, WMID
Health	Status	25	Self-perceived health, good or very good (%, 16+ population)	Percentage of people assessing their health as 'very good' or 'good' out of total	Eurostat, EU SILC (hlth_ silc_01)
		26	Life expectancy in absolute value at birth (years)	Life expectancy at a certain age is the mean additional number of years that a person of that age can expect to live	Eurostat (hlth_hlye)
		27	Healthy life years in absolute value at birth (years)	Healthy life years measures the number of remaining years that a person of a specific age is expected to live without any severe or	Eurostat (hlth_hlye)

(continued)

Table 4 (continued)

Domain	Sub-domain	No	Indicator and reference population	Description	Source
				moderate health problems	
	Behaviour	28	People who do not smoke and are not involved in harmful drinking (%, 16+ population)	Percentage of people who are not involved in risk behaviour, i.e. don't smoke and are not involved in heavy episodic drinking	Eurostat, EHIS. Eurostat calculations at EIGE's request
		29	People doing physical activities and/or consuming fruit and vegetables (%, 16+ population)	Percentage of people who are physically active for at least 150 minutes per week and/ or consume at least five portions of fruit and vegetables per day	Eurostat, EHIS. Eurostat calculations at EIGE's request
	Access	30	Population without unmet needs for medical examination (%, 16+ population)	Self-reported unmet needs for medical examination	Eurostat, EU SILC (hlth_ silc_08)
		31	People without unmet needs for dental examination (%, 16+ population)	Self-reported unmet needs for dental examination	Eurostat, EU SILC (hlth_ silc_09)

$$G_M = \sqrt[3]{1 \cdot (PR_M \cdot SE_M)^{½ \cdot \mathrm{LFPR}_M}}$$

Aggregation between gender groups, using the harmonic mean. The female and male indices were aggregated using the harmonic mean to create an equally distributed gender indicator:

$$\mathrm{HARM}(G_F, G_M) = \left[\frac{(G_F)^{-1} + (G_M)^{-1}}{2}\right]^{-1}$$

Using the harmonic mean of within-group geometric means captures the inequality between women and men and adjusts for the association between dimensions, that is, it accounts for the overlapping inequalities in dimensions.

Calculation of the geometric mean of the arithmetic means for each indicator. The standard to be used for the calculation of gender inequality is obtained by aggregating the female and male indicators using equal weights (i.e. treating both genders equally) and aggregating the indices across dimensions:

$$G_{\overline{F},\overline{M}} = \sqrt[3]{\overline{\text{Health}} \cdot \overline{\text{Empowerment}} \cdot \overline{\text{LFPR}}}$$

where:

$$\overline{\text{Health}} = \left(\sqrt{\frac{10}{\text{MMR}} \cdot \frac{1}{\text{ABR}}} + 1 \right) / 2,$$

$$\overline{\text{Empowerment}} = \frac{\sqrt{PR_F \cdot SE_F} + \sqrt{PR_M \cdot SE_M}}{2}$$

$$\overline{\text{LFPR}} = \frac{\text{LFPR}_F + \text{LFPR}_M}{2}$$

The $\overline{\text{Health}}$ index is not given by the average of the corresponding male and female indices but should be interpreted as half the distance to the standards set for the reproductive health sub-indicators: fewer maternal deaths and fewer teenage pregnancies.

Calculation of the GII Index. Finally, the GII is given by:

$$\text{GII} = 1 - \frac{\text{HARM}(G_F, G_M)}{G_{\overline{F},\overline{M}}}$$

The GII can take values from 0 (lowest degree of inequality) to 1 (highest degree of inequality).

In the latest available edition of the index (UNDP, 2022a), the global score is 0.465, and the countries with the lowest GII are Denmark (0.013), Norway (0.016), Switzerland (0.018), Sweden (0.023), the Netherlands (0.025), and Finland (0.033). The countries with the highest scores are Chad (0.652), the Central African Republic (0.672), Afghanistan (0.678), Nigeria (0.680), Papua New Guinea (0.725), and Yemen (0.820). At the regional level, the ranking was as follows: Europe and Central Asia (0.227), East Asia and the Pacific (0.337), Latin America and the Caribbean (0.381), South Asia (0.508), Arab States (0.536), and Sub-Saharan Africa (0.569).

5 The Gender Equality Index of the European Institute for Gender Equality

The Gender Equality Index (GEI) of the European Institute for Gender Equality (EIGE) assesses progress in gender equality relative to the EU policy context. Specifically, the EIGE's GEI measures the distance between the EU and its member states to achieve gender equality. The theoretical framework of the GEI considers eight dimensions, but only six are used to construct the synthetic indicator of gender equality: work, money, knowledge, time, power, and health. In addition, the violence domain describes gender-based violence and the Intersectional Inequalities domain studies gender inequality within specific population groups (people with disabilities, migrants, etc.), but these two domains are not directly considered in the GEI calculation. The 31 variables used to measure the GEI originate from seven data sources, five sample surveys, and two official Eurostat databases:

- European Union Labour Force Survey (EU-LFS, source: Eurostat)
- European Working Conditions Surveys (EWCS, source: Eurofound)
- European Quality of Life Survey (EQLS, source: Eurofound)
- European Union Survey on Income and Living Conditions (EU-SILC, source: Eurostat)
- European Health Interview Survey (EHIS, European Health Survey, source: Eurostat)
- Education statistics database (source: Eurostat)
- Women and men in decision-making (WMDM, source: EIGE, Gender Statistics Database)

The 31 variables define 31 sub-indicators, divided into 14 sub-dimensions representing the 6 main dimensions (Table 1) of EIGE's GEI, synthesised in a single indicator. EIGE's GEI was constructed using a four-step process (EIGE, 2017):

Calculation of Gender Gaps The first step in constructing EIGE's GEI is to calculate the gender gaps $\Upsilon_{(X_{it})}$ for each country and variable:

$$\Upsilon_{(X_{it})} = \left| \frac{\tilde{X}_{it}^{W}}{\tilde{X}_{it}^{a}} - 1 \right|$$

The calculation is carried out for a variable X relative to an i-th country in the time period t, in order to obtain scores for women $(\tilde{X}_{it}^{W})$ compared to the average of the values taken by the same variable for women and men $(\tilde{X}_{it}^{a})$ or the total $\left(\tilde{X}_{it}^{T}\right)$ in the same country and reference period.

The absolute value of the gender gap is taken into account in such a way as to avoid offsetting effects between women and men. In fact, a country might score high on gender equality only because the negative performance of women in one variable is compensated for by the equally low performance of men in another variable. For

reasons of interpretability, the indicator is subsequently reversed by considering its complementary value: $1 - \Upsilon_{(X_{it})}$. The gender gap is a relative indicator in the range [0,1], where 1 indicates the achievement of complete gender equality, and any value below 1 expresses some degree of inequality between women and men.

Calculation of the Correction Coefficient The correction coefficient $\propto_{(X_{it})}$ represents a further element of transformation of the original variables that makes it possible to consider the specific country context by comparing the scores countries have achieved for each indicator. These coefficients make it possible to contextualise the gender equality results that each country achieved in comparison to other European countries. Given a time interval (e.g. scores for indicators for 2005, 2010, 2012, and 2015, as in the case shown below), the correction coefficient for a given indicator can be formulated as follows:

$$\propto_{(X_{it})} = \left(\frac{\tilde{X}_{it}^{T}}{\max\left\{ \tilde{X}_{i2005}^{T}, \tilde{X}_{i2010}^{T}, \tilde{X}_{i2012}^{T}, \tilde{X}_{i2015}^{T} \right\}} \right)^{1/2}$$

where $\max\left\{ \tilde{X}_{i2005}^{T}, \tilde{X}_{i2010}^{T}, \tilde{X}_{i2012}^{T}, \tilde{X}_{i2015}^{T} \right\}$ the maximum values observed for the indicator in the years considered in relation to the various EU-28 countries.

Correction coefficients were applied to most of the variables. Indicators in the power domain were not corrected because they represent percentages. This means, for example, that perfect equality is only achieved when women and men are equally represented.

Calculation of Initial Metrics The metric combining the values of each variable for women and men, $\Gamma_{(x_{it})}$, can be expressed as:

$$\Gamma_{(X_{it})} = 1 + \left[\propto_{(X_{it})} \cdot \left(1 - \Upsilon_{(X_{it})} \right) \right] \cdot 99$$

This metric has no measurement units and a range of variation between 1 and 100. A value of 100 indicates the achievement of gender equality, whereas a value of 1 denotes the presence of absolute inequality between women and men. Therefore, the metric removes any distortions arising from the presence of different scales or units of measurement, making all indicators comparable to the various domains, sub-domains, countries, and time considered in the analysis.

Calculation of sub-domain, domain, and GEI indices. The procedure proposed by the EIGE involves aggregating the indices at the subdomain level through an unweighted arithmetic mean. The synthesis of the sub-domain indicators into domain indicators is obtained through an unweighted geometric mean, whereas the GEI index is obtained as a weighted geometric mean of the domain indicators with a vector of weights, determined by a panel of experts, equal to work = 0.19, money = 0.15, knowledge = 0.22, time = 0.15, power = 0.19, health = 0.10. The final GEI metric for i-th ($i = 1, \ldots, 27$) country in s given year t is

$$\mathrm{GEI}_i^t = \prod_{d=1}^{6} \left(\prod_{s=1}^{ns_d} \left(\frac{1}{nv_{s_d}} \sum_{v=1}^{nv_{s_d}} \Gamma(X_{itv}) \right)^{\frac{1}{ns_d}} \right)^{w_{\mathrm{AHP}_d}}$$

where d is the identifier of the six domains, s is the subdomain identifier per domain, ns_d is the number of subdomains in the d-th domain, nv_{s_d} is the number of indicators in the s-th subdomain of the d-th domain, v is the identifier of the v-th variable, and w_{AHP_d} is the expert-defined weight for the d-th domain. EIGE's GEI can take values from 0 (lowest degree of equality) to 100 (highest degree of equality).

In the latest available edition of the index (EIGE, 2022), the average GEI score for the EU is 68.6, grown by 5.5 points since 2010. The countries with the highest scores were Sweden (83.9), Denmark (77.8), the Netherlands (77.3), Finland (75.4), and France (75.1), whereas those with the lowest scores were Greece (53.4), Romania (53.7), and Hungary (54.2). The countries that improved most of their scores since 2010 were Luxemburg (+10.2), Italy (+11.7), and Malta (+11.2), whereas lower improvements were recorded for the Czech Republic (1.6), Hungary (+1.8), and Finland (+2.3). The domain of power is the driving force for gender equality in almost all Member States. In 15 Member States it has determined more than 60% of the progress made since the 2021 Index. Luxembourg (+ 6.3 points), Lithuania (+ 6.1 points), and Belgium (+ 6.0 points) made the most headway to gender balance in decision-making.

6 Conclusions

In this chapter, we concisely present the long process that led to the definition of gender (in)equality measures and some of the most significant internationally used indicators. The review proposed here is not exhaustive, but has been constructed to provide an understanding of the most common approaches to measuring gender (in)equality to date. At the end of this discussion, some interesting insights emerged.

Firstly, it can be observed that the indicators herein discussed are sex-based rather than gender-based indicators. Sex refers to the set of biological attributes of humans and animals. Gender refers to the socially constructed roles, behaviours, expressions, and identities of girls, women, boys, men, and gender-diverse people. Recently, attempts have been made to measure gender-and non-sex-based (in)equalities. However, since sexual identity is an aspect that is part of people's personal and subjective spheres, it is difficult to find data, especially on international scales, that allow for the actual quantification of such a form of (in) equality.

The second point is related to the common feature of the indicators presented herein using systems of indicators that are subsequently aggregated into synthetic indicators. Using batteries of indicators is a crucial element for measuring the different components of gender equality. Each indicator provides information on gender (in)equality, which is related but different from that provided by the other indicators. The use of articulated sets of indicators also allows for a better assessment

of progress in reducing inequalities, thereby avoiding the risk of policies aimed at the specific improvement of a few key indicators. A common adage often used in this context is the 'Goodhart's Law', which, in its 1997 version by Strathern (1997), quotes 'When a measure becomes a target, it ceases to be a good measure'. Goodhart was a British economist who, in 1975, commented on some of the Thatcher government's policies and pointed out the error in defining policies to be monitored based on specific targets. In other words, policy actions should improve the context in which the indicators are measured and not make up the indicator. Typical examples include indicators of women's political empowerment. Legislation mandating equal representation of women in legislative assemblies is common in several countries, and undoubtedly brings benefits in terms of gender equality. However, the corresponding indicator shows parity dictated by normative impositions and not a social context leading to equal gender representation in legislative bodies. The loss of the index's indicating capacity becomes evident when one looks at side indicators to those that have become a target, such as 'women presidents of parliamentary commissions', which, in most countries with law-enforced gender parity in the number of parliamentary seats, reveals that the gender gap in political empowerment still persists. Therefore, the target seems to have been reached, but the problem of unequal gender-based political empowerment is not solved, and the 'good' indicator loses most of its original meaning.

Another relevant point concerns the object of measurement, which is not always the same for all indicators presented here. In some cases, the intention is to measure some degree of inequality (e.g. GGGI and GEI); in other cases, an attempt is made to assess the existence of equal opportunities for women and men (e.g. GDI and GII). Equal opportunities are now a fundamental standard for measuring (in)equalities (see, among others, Sen, 1995). However, the idea that equality between men and women is reached when women make choices identical to men is as forced as believing that there is equality if all boys play football and none play basketball. When we examine the gender (in)equality picture in a broader way, it can be seen that these indicators focus on the output of inequality rather than its causes. In an ideal world, everyone should have the same opportunity to freely make choices that could even result in a legitimate difference between men and women. Gender inequality stems from cultural problems and long-established stereotypes about the roles of women and men in society. Cultural change is slow, taking generations to accomplish, and it is not surprising that the timeframe for closing the gender gap is secular; we have to wait for the prejudices of current generations to be overcome by future generations. Therefore, one has to wonder whether today's society feeds or fights these prejudices and whether we are building a world where boys and girls are freer to make their own choices than their parents and grandparents. The perpetuation of gender prejudice and stereotypes is one of the main limitations of cultural renewal. The family context is undoubtedly the most critical one, but besides this, consider two other socially relevant environments: virtual social media and real social media. Algorithms that define what content to show to social media users follow commercial principles that reaffirm established prejudices in mass culture and feed a strongly gender-biased market. What ethical criteria do the algorithms follow?

Is it possible to imagine a way of exploiting them to prevent stereotypes from being repeated, and hence perpetuating the conditions that have led to today's gender inequality? Even the working environment can perpetuate gender inequality. In a masculinist organisational system, decision-making is heavily centralised, and the chain of command is highly hierarchical. The prolonged absence of a key member from this system (e.g. for parenthood) becomes a problem for the company. A feminist organisational system envisages a diffuse distribution of competencies in which all employees are important, but the absence of a member, even for prolonged periods, can be easily dealt with, and the company structure itself simplifies the reintegration of the employee after parental leave. If women are left with the burden of caring for their homes and children, and if the organisational model is a masculinist one, it is clear that they are disadvantaged. A question that can be asked is whether the reduction of a gender wage gap indicator corresponds to an improvement in women's opportunities in the labour market or whether women make an additional effort to achieve better results in an environment that is hostile to them. These indicators do not tell us, or do so only in part. The indicators proposed in the literature fail to measure something more complex than the output of gender (in)-equality or to capture those aspects of the genuine progress of society towards a condition of equal opportunity between men and women. In other words, these indicators do not try to understand whether a cultural change leading to gender inequality reduction is taking place or the strength of the power of gender stereotypes and prejudices in society. It is clearly a measurement problem, a technical limitation for the construction of indicators, linked to our inability to know the choices that each person would like to take, in contrast with the one that they make.

A third point that emerges from the review of the indicators presented here concerns the completeness of the construct 'gender (in)equality' definition. Although it is theoretically possible to develop the concept across different domains, the operationalisation process leading to the identification of the indicators to be used to measure this concept is severely limited by data availability. The presence of the Eurostat in the EU has allowed the development of a homogeneous system of statistics in member countries that makes complex comparative analyses possible. It should, therefore, come as no surprise that an analysis conducted in a limited area such as the EU can go into much greater detail than when the study area is the whole world. When the focus is moved to a global scale, with countries that do not possess solid national statistical offices, the number of indicators that can be used to describe gender (in)equality is limited.

Other critical aspects concern the interpretation of gender (in)equality indicators. Being mostly female-to-male ratios, in some cases the rankings may produce unexpected results. Consider two countries with very different levels of human development: one with a high score and the other with a low HDI score. A country with a lower HDI may have a higher rank in terms of gender (in)equality than a country with a higher HDI if the women living in the first country are, in proportion to men, less disadvantaged than women in the other country, even if they have much lower indicator scores than the latter. As a purely illustrative example, consider Country A, with an average income of $1000 for women and $1200 for men, and

Country B, with average incomes of €10,000 and €13,000 for women and men, respectively. Country A, with a female-to-male ratio of 0.83, is ranked higher than Country B, with a ratio of 0.77. Another element that needs to be considered when interpreting gender (in)equality data is how to interpret the improvement of an indicator. Of course, and it is the standard interpretation, a gender-based index may record an improvement when women's conditions ameliorate compared to men's. However, it is also possible that the improvement in the gender-based indicator is linked to a worsening of male indicators, which is greater than the worsening of female indicators. Reading and interpreting the data on indicators of gender (in)equality always requires caution.

References

Badgett, M. V. L., Waaldijk, K., & van der Meulen Rodgers, Y. (2019). The relationship between LGBT inclusion and economic development: Macro-level evidence. *World Development, 120*, 1–14.

Barnat, N., MacFeely, S., & Peltola, A. (2019). Comparing global gender inequality indices: How well do they measure the economic dimension? *Journal of Sustainability Research, 1*, e190016.

Barro, R. J., & Lee J.-W. (2018). *Dataset of educational attainment, June 2018 revision*. Available online at: www.barrolee.com.

Bericat, E. (2012). The European gender equality index: Conceptual and analytical issues. *Social Indicators Research, 108*, 1–28.

Bericat, E., & Sánchez, E. (2008). Balance de la desigualdad de género en España. Un sistema de indicadores sociales (Fundación Centro de Estudios Andalusces). *Actualidad, 23*, 4–29.

Bericat, E., & Sánchez-Bermejo, E. (2016). Structural gender equality in Europe and its evolution over the first decade of the Twentyfirst century. *Social Indicators Research, 127*, 55–81.

Cascella, C., Williams, J., & Pampaka, M. (2022). An extended regional gender gaps index (eRGGI): Comparative measurement of gender equality at different levels of Regionality. *Social Indicators Research, 159*, 757–800.

Charles, M. (1992). Cross-National Variation in occupational segregation. *American Sociological Review, 57*, 483–502.

Charles, M., & Grusky, D. B. (1995). Models for describing the underlying structure of sex segregation. *American Journal of Sociology, 100*, 931–971.

Cohen, P. N. (2004). The gender division of labor: 'Keeping house' and occupational segregation in the United States. *Gender and Society, 18*(2), 239–252.

di Bella, E., Leporatti, L., Gandullia, L., & Maggino, F. (2021). Proposing a regional gender equality index (R-GEI) with an application to Italy. *Regional Studies, 55*(5), 962–973.

Di Noia, J. (2002). Indicators of gender equality for American states and regions: Un update. *Social Indicators Research, 59*, 35–77.

Duncan, O. D., & Duncan, B. (1955). A methodological analysis of segregation indices. *American Sociological Review, 20*, 200–217.

EIGE. (2017). *Gender equality index 2017*: Methodological Report,. European Institute for Gender Equality.

EIGE. (2022). *Gender equality index 2022: The COVID-19 pandemic and care*. European Institute for Gender Equality.

EIU (Economist Intelligence Unit). (2010). *Women's economic opportunity: A new global index and ranking*. Economist Intelligence Unit Limited.

EM2030. (2022). 'Back to Normal' is not enough: The 2022 SDG gender index. Woking: Equal Measures 2030.

Frias, S. (2008). Measuring structural gender equality in Mexico: A sate level analysis. *Social Indicators Research, 88*, 215–246.
Gibbs, J. P. (1965). Occupational differentiation of negroes and whites in the United States. *Social Forces, 44*, 159–165.
Grusky, D. B. (Ed.). (2008). *Social stratification. Class, race, and gender in sociological perspective*. Westview.
Hausmann, R., Tyson, L., & Zahidi, S. (2006). The gender gap index 2006: A new framework for measuring equality. In *The global gender gap report*. WEF.
Hook, J. L., & Pettit, B. (2016). Occupational inequality: Motherhood and occupational segregation. *Social Politics: International Studies in Gender, State & Society, 23*(3), 329–362.
Jacobs, J. (1989). *Revolving doors: Sex segregation and Women's career*. Stanford University Press.
Kabeer, N., & Natali, L. (2013). Gender equality and economic growth: Is there a win-win? IDS Working Papers, 417.
Maceira, H. M. (2017). Economic benefits of gender equality in the EU. *Intereconomics, 52*(3), 178–183.
Moorhouse, E. A. (2017). The many dimensions of gender equality and their impact on economic growth. *Forum for Social Economics, 46*(4), 350–370. Routledge.
Norlen, H., Papadimitriou, E., & Dijkstra, L. (2019). *The regional gender equality monitor, EUR 29679 EN*. Publications Office of the European Union.
OECD. (2019). *SIGI 2019 global report: Transforming challenges into opportunities, social institutions and gender index*. OECD Publishing.
OECD and JRC. (2008). *Handbook on constructing composite indicators—Methodology and user guide*. OECD Publishing.
Plantenga, J., Remery, C., Figueiredo, H., & Smith, M. (2009). Towards a European Union gender equality index. *Journal of European Social Policy, 19*(1), 19–33.
Profeta, P. (2017). Gender equality in decision-making positions: The efficiency gains. *Intereconomics, 52*(1), 34–37.
Ravazzini, L., & Suter, C. (2016). Ségrégation ou intégration? L'intensité de la ségrégation sur le marché du travail neuchâtelois, romand et suisse et ses changements depuis les années 1990. In G. D'Amato (Ed.), *Identités Neuchâteloise: le canton de Neuchâtel au fil de la migration, Cahier de l'Institut neuchâtelois, n°36* (pp. 129–143). Editions G d'Encre.
Reskin, B. F. (2003). Including mechanisms in our models of Ascriptive inequality. *American Sociological Review, 68*, 1–21.
Sen, A. (1995). *Inequality reexamined*. Harvard University Press.
Strathern, M. (1997). 'Improving ratings': Audit in the British university system. *European Review, 5*(3), 305–321.
Sugarman, D. B., & Straus, M. A. (1988). Indicators of gender equality for American states and regions. *Social Indicators Research, 20*, 229–270.
UNDP. (2020). Human Development Report 2020, The Next Frontier - Human Development and the Anthropocene. United Nations Development Programme, ISBN: 9789210055161
UNDP. (2022a). Human Development Report 2021–22, United Nations Development Programme.
UNDP. (2022b). Human Development Report 2021–22, Technical Notes, United Nations Development Programme.
United Nations. (1984a). *Compiling social indicators on the situation of women. Studies in methods, Series F., No. 32*. United Nations Publications.
United Nations. (1984b). *Improving concepts and methods for statistics and indicators on the situation of women. Studies in methods, Series F., No. 33*. United Nations Publications.
United States Commission on Civil Rights. (1978). *Social indicators of equality for minorities and women*. United States Commission on Civil Rights.
Waaldijk, K. (2019). *Global index on legal recognition of homosexual orientation (GILRHO)—Provisional data 1966–2011*. Leiden University.
WEF. (2022). The global gender gap report 2022. World Economic Forum Report.