

6. Composite indices and dashboards

This chapter provides guidance to NSOs and other statistical producers who wish to construct a composite index of well-being. Section 6.1 discusses the main issues that need to be considered before an index can be constructed. This concerns the advantages and disadvantages as well as the assumptions and limitations that are involved. Section 6.2 gives a general overview of the methodological steps that are involved. This overview builds on the existing guidelines of the OECD and UNECE, and aims to ensure a degree of international comparability and methodological consistency. Section 6.3 provides descriptive examples of relevant composite indexes and scoreboard approaches. The aim is to help users find the right approach for their purposes and to identify the appropriate methods and techniques. Section 6.4 provides helpful suggestions for ways to present and summarise the results of well-being measurements that do not involve a composite index.

Why do we have a chapter entirely focused on composite indices? Sharpe (2004) describes the challenge well: *“The aggregators believe there are two major reasons that there is value in combining indicators in some manner to produce a bottom line. They believe that such a summary statistic can indeed capture reality and is meaningful, and that stressing the bottom line is extremely useful in garnering media interest and hence the attention of policy makers. The second school, the non-aggregators, believe one should stop once an appropriate set of indicators has been created and not go the further step of producing a composite index. Their key objection to aggregation is what they see as the arbitrary nature of the weighting process by which the variables are combined.”*

When attempting to visualize well-being the question is how to strike a balance between delivering a simple metric, which is easy for users to digest and apply, and presenting the diversity of the underlying data and the varying trends in the underlying data sources. A dashboard answers this question one way, whilst a composite index takes a very different approach. In a dashboard (or scoreboard) approach the entire set of indicators is presented in such a way that the reader can (and indeed must) deduce developments and comparative levels of well-being from the visualization or database. In a composite index the indicators for dimensions of well-being are weighted into a single number.

These two approaches have different positives and negatives that should be carefully considered under the use conditions:¹

- The dashboard places the onus on the policy-user to consider the trade-offs between the variables, but ensures they have a sight of all the key variables. However, key data may be obscured in the complexity of the presentation.
- A composite index can be a useful tool to simplify and communicate complicated results, but can run the risk of obscuring data variables which may be showing very different trends, or if they are omitted from the composite, exclude them entirely. Both of these risks are most likely to be determined by mis-specification of the weights.

Composite indices and dashboards can also be (and often are) used side-by-side. Also, composites may include subsidiary composites and dashboards can contain composite indices.

6.1 Definitions

¹ An overview of the pros and cons of composite indicators is presented by Saisana and Tarantola (2002) and can be found in the OECD Guidelines (OECD, Eurostat & Joint Research Centre 2008, pp. 13-14).

A dashboard or scoreboard approach requires a model to select relevant dimensions and the associated indicators. The difference is that the statistical results are made accessible and understandable using visualization techniques (and/or a background database) rather than by reducing the information to a single composite index.

A composite index is an index constructed by aggregating multiple individual indicators that together measure a complex, multidimensional phenomenon (OECD, Eurostat & Joint Research Centre 2008, p. 13. UNECE 2019, pp. 67-68). Well-being is an example of such a phenomenon.

Again, assuming a formative framework, whereby the different data items are drivers of well-being, the selection and aggregation of indicators requires a model that explains how different components combine to deliver an understanding of the complex, multidimensional phenomenon. A well-being framework is such a model: it separates the entire phenomenon into constituent dimensions, explains how each dimension is (causally) related to the aggregate outcome (well-being), and identifies the indicators that are to be aggregated into a composite index.

Weights are required to combine individual indicators into an aggregate number. A weight indicates how much an indicator or theme contributes to the aggregate outcome. When all the components of a composite index are assigned equal weights, this does not mean that the composite is an unweighted index. All components are assumed to be equally important.

6.2 Background and approaches regarding the use of composite indices

Different stakeholders and other users have different needs. Some users and some purposes are better served by the dashboard model, whilst other users and purposes benefit more from a composite index. Both may be useful in different contexts. A composite index can be an effective way to communicate the results of a complex, multi-indicator dashboard to the media, politicians and policymakers, but this can depend heavily on individuals and their preferences. Politicians and policymakers may have different preferences and interests and in their debates and decisions they inevitably have to make trade-offs and understand the synergies between different aspects of well-being.

It is important to be aware of and transparent about the underlying assumptions and limitations. In general, carefully considering the assumptions and limitations involved in constructing a composite index, facilitates responsible use of that index by the users of official statistics.

Box 6.1 Be transparent about methods, assumptions and limitations

“The absence of an “objective” way to determine weights and aggregation methods does not necessarily lead to rejection of the validity of composite indicators, as long as the entire process is transparent. The modeller’s objectives must be clearly stated at the outset, and the chosen model must be tested to see to what extent it fulfils the modeller’s goal.” (OECD Guidelines, p. 33)

This chapter provides a general overview of the methodological steps that are involved in constructing a composite index of well-being. This overview builds on the guidelines of the OECD and UNECE. The aim is to ensure a degree of international comparability and methodological consistency. The explanation is deliberately not technical so that countries with less sophisticated statistical systems can also apply them. Producers who need more advanced methods and techniques can find detailed explanations in the existing technical handbooks.

The existing guidelines divide the process of constructing a composite index into ten steps (OECD, Eurostat & Joint Research Centre 2008, pp. 20-21. UNECE 2019, pp. 70):

1. Developing a conceptual framework, as the basis for the selection and combination of variables into a meaningful composite indicator.
2. Selection of data, based on the analytical soundness, measurability, country coverage, and relevance of the indicators to the phenomenon being measured and relationship to each other.
3. Preparation of data and imputation of missing data, in order to provide a complete dataset.
4. Multivariate analysis, to study the overall structure of the dataset, assess its suitability, and guide subsequent methodological choices, such as weighting and aggregation.
5. Normalisation of data, to render the variables comparable.
6. Weighting and aggregation, along the lines of the underlying theoretical framework.
7. Uncertainty and sensitivity analysis, to assess the robustness of the composite indicator in terms of the mechanism for including or excluding an indicator, the normalisation scheme, the imputation of missing data, the choice of weights, and the aggregation method.
8. Evaluating plausibility and validity, to examine whether the composite indicator gives a good and reliable measure of the phenomenon it is intended to represent.
9. Links to other statistics, to correlate the composite indicator (or its dimensions) with existing (simple or composite) indicators as well as to identify linkages through regressions.
10. Communication and visualisation, to help users make correct interpretations of the composite index and help avoid misunderstandings.

For details about each of the ten steps, we refer to the guidelines.

The use of an international framework as the model for the selection of dimensions and indicators is recommended. Well-being should be measured systematically and comprehensively. When constructing a composite indicator all dimensions should be included, without a priori selection.

Aggregation of indicators into a composite index should be done step-by-step following the structure of the underlying model. Sustainable and inclusive well-being is a layered framework: it contains different perspectives in time and space (well-being 'here and now', 'later', and 'elsewhere' as outlined in the CES Recommendations), each perspective contains multiple dimensions (e.g., health and subjective well-being in well-being 'here and now'), and most dimensions are measured using multiple indicators (for example, to measure both objective and subjective aspects of well-being). Stiglitz, Sen and Fitoussi note that well-being 'here and now', 'later', and 'elsewhere' should never be aggregated into a single composite index. For each component, indicators should first be aggregated into a composite index for individual dimensions and only then into a composite index for all dimensions together (e.g., for well-being 'here and now').

6.3 The use of weights in composite indicators

The most important assumption concerns the weights that are assigned to index components. Constructing a composite index requires information on the weights of the individual dimensions of well-being. There are various statistical and participatory methods to identify weights (OECD, Eurostat & Joint Research Centre 2008, pp. 31-33; UNECE 2019, pp. 75-78).

The question of weights is a question of dealing with the concept of value. It can be considered desirable for components of greater value to be given greater weight, whether one is designing a composite index or a dashboard. The necessity is to find a mechanism to expose, across a society, the relative value that people as a collective place on different outcomes or outputs in an unbiased fashion. There are three possible mechanisms

to expose people's preferences in a format that is not subject to the importation of a bias or a priori opinions from the collecting body or agent.

- Subjective, albeit generally expert-led processes to derive weights. Obviously, under the definition above these are discarded as being too open to the perception of bias, even if the experts are able to derive an optimised system.
- 'Objective' weights drawn from within the dataset, using 'endogenous' methods based on statistical methods such as Principal Component Analysis (PCA), as well as frequency-based weights. It should be noted that research on multidimensional poverty measures (Dutta, Nogales, and Yalonetzky 2021) demonstrates that the resulting indices may violate two fundamental properties: **monotonicity** and **subgroup consistency**. Monotonicity states that if the experience of an individual worsens in any indicator, then the overall experience of the society to which this individual belongs, should not improve.² Subgroup consistency requires that changes in the overall population should reflect the changes happening at the smaller population subgroup level. For instance, if the outcome of interest in a particular region of a country improves, while all other regions remain unchanged, then subgroup consistency implies that the overall outcome metric in the country should not decrease.³ In short, it is possible to observe instances where, for example, poverty in a group may increase, but if the weights move by a relatively larger factor towards groups observing constant poverty rates, this can result in the poverty metric appearing to improve. Given these concerns, the recommendation in this guideline is to use exogenous objective methods.⁴
- 'Objective' exogenous weights which allow a clear line of sight on unbiased preferences. There are two broad methods that reveal people's view either through their actions (revealed preference) or directly reported through some selection methodology, and which can act as a numeraire. Five possible mechanisms are: the use of **prices** as a numeraire, the use of **time** as a numeraire, the use of **voting or surveys** to directly report⁵, the use of **legislative and regulatory decisions** as a proxy for social preferences, and finally placing the value in terms of a **common numeraire** derived for this purpose such as a quality-adjusted life year (QALY) or wellbeing adjusted life year (WELLBY) (as per Layard and De Neve (2023) and using the change in these metrics multiplied by the monetary value given to these as the weights.

In the absence of a valid weighting structure, applying a neutral regime of equal weights (the La Place approach) may appear to have some advantages. A neutral weighting regime does not disproportionately over-weight some aspects through the subjective choices made. It obviously has equal and opposite costs, in that it disproportionately over-weights other factors by omission. The allocation of even weights is in itself a subjective choice, one which may be deliberately omitting any information from data actually possessed. Except in the the singular case where all weights are truly equal, a neutral weighting regime cannot be correct.

The problem of value judgements applies particularly to the aggregation of composite indices for different dimensions of well-being into a single composite index for aggregate well-being. The aggregation of different indicators within a particular dimension into a composite index for that dimension is much less problematic.

Another assumption is that of compensability or substitutability of dimensions and indicators. In a composite time series that combines two indicators (A and B), the implicit assumption is that an increase in A can be offset by a decrease in B. For example, if A is household income and B is air pollution, the assumption is that a decline

² This is a particular instance of the concept of suppression described above – where the framework does not just suppress the signal contained in a particular data series, but through the application of the weighting system derive a perverse outcome where it appears the situation improves whilst it is actually getting worse.

³ Again, this is the same instance of suppression, but viewed via the geographical axes rather than the individual data series.

⁴ Additional research by the same authors suggest hybrid (combining exogenous and endogenous) approaches may also present challenges.

⁵ Noting Arrow's impossibility theorem.

in environmental quality can be offset by an increase in material well-being. This may not necessarily be the case or may be unacceptable to some users. The recommendation is therefore that composite indices should be accompanied by dashboards (or other visualizations or scoreboards) that give information about the development in the underlying components.

6.4 Suggestions for possible composite indicators

This section provides descriptive examples of relevant composite indexes and scoreboard approaches. The aim is to help users find the right approach for their purposes and to identify the appropriate methods and techniques. The examples should be useful, relevant, not too technical, describing composite time series as well as composites for interregional comparison.

Portugal: Well-being index of Portugal (since 2013)

The Well-being Index (WBI), introduced by Statistics Portugal in 2013, serves as a tool to monitor several dimensions of well-being within the country. Its inception responds to a growing international consensus recognizing the limitations of traditional economic indicators like GDP in capturing the complexities of human well-being. The index is structured around two primary perspectives: Material living conditions and Quality of life, each encompassing a range of domains reflecting various aspects of societal welfare.

Underpinning the development of the WBI are international guidelines and frameworks advocated by organizations such as the United Nations, OECD, and Eurostat. Notably, the European Commission's "Beyond GDP" initiative and the Stiglitz-Sen-Fitoussi report have provided pivotal insights into complementing economic metrics with comprehensive well-being indicators. Furthermore, programmes like the OECD's Better Life Initiative have contributed valuable insights into selecting relevant domains and indicators.

The WBI comprises ten domains, incorporating 78 baseline indicators from administrative data and statistical operations. These indicators range from the Material living conditions perspective (Economic well-being, Economic vulnerability and Employment) to the Quality of life perspective (Health, Work-life balance, Education, Social relations, Civic participation, Personal security and Environment). To ensure the comparability and coherence of these indicators, Statistics Portugal employs normalization methods, such as the goalpost method, which accounts for variations in data sources and units of measurement.

Addressing the challenge of missing data, Statistics Portugal adopts imputation techniques, including linear interpolation and exponential smoothing, to fill information gaps. The aggregation of indicators within each domain is carried out using arithmetic means. The Perspective and the overall Well-being Index are computed using geometric means to limit the compensation effect. In both cases, equal weighting is assigned to each indicator and each domain. This methodological approach ensures that no single domain or indicator disproportionately influences the overall index.

By providing a holistic well-being assessment, the index facilitates a nuanced understanding of societal progress beyond purely economic metrics. Its regular annual dissemination promotes transparency and accountability in governance, empowering stakeholders to evaluate policy effectiveness and advocate for positive societal change.

Statistics Portugal also publishes the individual indicators and, in this way, provides information both to those users that are only interested in the overall development and those that want to know about the underlying indicators.

UK: money-weighted composites alongside GDP

Gross Inclusive Income (GII) and its net sibling Net Inclusive Income (ONS 2023) are composite indices drawn from the same methodology as the National Accounts use to produce Gross Domestic Product (GDP) and Net National Disposable Income (NNDI). In relation to the two methods issues raised above – the which variables to include and the weighting method, GII and NII utilise well-established approaches, drawing from a theoretical framework based around the National Accounts principles of the asset and production boundary. The National Accounts define a set of assets (productive capital) which lie within a specified ‘asset boundary’. Alongside these, all the resultant flows which result from human interaction with these assets deliver the sum of flows of output, income and expenditure within the ‘production boundary’.

Using this method, the Inclusive Income indices expand the asset boundary to account for human and natural capital, and commensurately expands the production boundary to align to the output arising from this wider class of assets. As these flows of benefits are not all strictly ‘output’ the framework is re-conceptualised to align to the concept of consumption and proxied by equivalent income flows commensurate with the flow of consumption from the results of these assets interaction with human activity or as part of natural actions.

Importantly these indices, under this regime, forms a strong theoretical match for the concept of economic welfare, that is the absolute total of the flows of benefits received from humanity’s interaction with the economy and the other structures and ecosystems, primarily unpaid work and the environment which deliver flows of benefits which can be conceptualised in such a framework. Factors such as subjective wellbeing and purely social factors may not be best considered within such a framework and as such are excluded.

With regards to weighting, the Inclusive Income indices are weighted using market price money metrics. This is not to say that alternative money price metrics could not be considered; as proposed by Dasgupta (2021), accounting prices, loosely defined as shadow prices taking account of externalities, would potentially be a superior alternative numeraire in the Inclusive Income framework, and indeed, Dasgupta would argue a more appropriate one.

The value of this methodology is, whilst dashboards deliver great value by exposing users to many different types of data, bringing this range of information into a single measure is, if appropriately weighted, capable of quickly revealing the trade-offs between components of the headline metric. So, if GDP increases but at a cost to the environment and the services it delivers citizens, this can be seen by the growth rate being lower than that of GDP, and maybe even negative. Equally it can reveal the importance of the market economy within a wider measure of economic welfare.

Canada: Quality of life statistical framework (since 2021)

As discussed throughout this chapter, some quality of life frameworks aggregate performance across indicators to produce a single summary measure of overall well-being. Based on consultation with experts and intended policy applications domestically, the Government of Canada instead uses a dashboard of indicators for its Quality of Life Framework, selected based on evidence of the determinants of life satisfaction. Overall evaluations of life satisfaction and the eudaimonic measure “sense of meaning and purpose” are the central measures of the framework, reflecting this underpinning logic.

The following comments were included in the [discussion paper](#) released with Canada’s Quality of Life framework alongside Budget 2021.

“A single summary measure is convenient to assess overall performance; which is appealing for communication and promotion with media and the general public. However, determining a valid aggregation methodology and set of weights can be difficult, controversial, and challenging to explain. Composite indicators introduce normative weighting of their constituent parts, which can affect how

trends are interpreted. Even when these weights are entirely transparent, the assumptions that undergird them are not necessarily universally agreed-upon. Even an accurate summary index is less useful for guiding action, because it doesn't point to specific policies or challenges, and it may obscure important challenges that smaller subpopulations face—for example, in terms of health outcomes and mortality rates for different education levels. Such an index is also limited to the set of indicators included in the framework, and may fail to match the lived experiences of the people it purports to measure.”

Overall, the design of Canada's Quality of Life framework reflects the broad consensus discussed throughout this report on the importance of well-being, inclusion, and sustainability.

- **Well-being:** The framework's 84 indicators to assess multi-dimensional well-being are arranged into five domains (prosperity, health, environment, society, and good governance), each of which has several subdomains. A subset of 20 of these indicators are headline measures which receive greater profile. They include poverty, greenhouse gas emissions, health-adjusted life expectancy and self-rated mental health, sense of belonging to local community, and confidence in institutions. Headline indicators provide a high-level summary assessment of Canadian quality of life that can be communicated relatively simply; offering some of the benefits of an index. The indicators in the framework are tightly mapped to, and closely aligned with the Canadian Indicator Framework for the SDGs and other key policy frameworks in Canada.
- **Inclusion:** Canada's Quality of Life Framework handles inclusion and sustainability as cross-cutting considerations, which apply across all domains. This is discussed further in Chapter 2. The fairness and inclusion lens focuses on distribution of outcomes among different sub-populations, often through the use of disaggregated data. In addition to these cross-cutting elements, some indicators are included within the framework dashboard that deal directly with equity considerations for particular groups, such as Indigenous self-determination, early learning and child care and representation in senior leadership.
- **Sustainability:** The sustainability and resilience lens considers the trajectory of these indicators over time as well as risk factors that could negatively influence this trajectory and protective factors that could positively influence resilience. In addition to these cross-cutting elements, some indicators are included within the framework dashboard that deal directly with longer term sustainability considerations such as emissions, debt-to-GDP ratio, and health-adjusted life expectancy.

In terms of indicator selection, the Canadian framework includes both objective and subjective measures, as well as a mix of determinants and outcomes. The framework was originally developed to serve as a tool for budgeting and policy development. It is meant to help policymakers consider the complex relationships between policy, determinants and outcomes, but does not currently attempt to explicitly explain those relationships in a systematic way, though this may be attempted in the future. It is used to monitor trends on these indicators for diagnostic purposes to set policy and budget priorities, for budget 'tagging' of the high level expected outcomes of each budget initiative, and for departmental planning and reporting on outcomes achieved.

One important application of the dashboard indicator set is to support a scorecard approach to assessing multi-dimensional trade-offs, opportunities for synergies and potential unintended risks to mitigate in developing budget proposals. Having visibility of the different component parts of the framework is important in this context. Expected quality of life outcomes from each budget measure are communicated publicly in [the Budget Impacts Report](#). Two examples of this in practice from Budget 2024 are provided below. This Quality of Life analysis of the nature of expected impacts at a high level complements a Gender-Based Analysis Plus (GBA Plus) approach, which looks at the differential impacts of each budget measure (benefits and risks to mitigate)

for different population groups. For a small subset of indicators there is a more advanced capability to model expected trajectories for expected quality of life outcomes and effect size from specific policy proposals.

Advancing National Flood Insurance

This measure will continue advancing work to help protect Canadians against the costs of natural disasters, which disproportionately impact Indigenous people, women, seniors, Black and racialized people, newcomers, 2SLGBTQI+ people, and persons with disabilities. The extent to which this measure helps address the financial vulnerabilities of these groups will depend on the final design of the insurance program, though will likely benefit homeowners (who have a higher income on average) more directly.

Data Sources: Canada Mortgage and Housing Corporation; Statistics Canada; Federal Emergency Management Agency; Canadian Red Cross

Quality of Life Impacts



- Prosperity** – Protection from income shocks; Acceptable housing
- Health** – Self-rated mental health
- Environment** – National disasters and emergencies; Climate change adaptation
- Good Governance** – Household emergency preparedness

Target Population: All Canadians

GBA Plus Timing: Early Later Existing

Expected Benefits

- Gender: Man Women
- Income: Low High
- Age cohort: Youth Senior
- Additional Characteristics: People in High-Risk Areas for Natural Disasters

National School Food Program

This measure would benefit elementary and high school students by supporting provinces, territories and Indigenous partners in expanding access to school food programming. School food programming can reduce food insecurity, support better health and educational outcomes, and help foster connections with culture and traditional food systems. More broadly, this measure would provide greater financial relief to low-income families who may struggle to access nutritious food.

Data Sources: Statistics Canada; International Organizations, Academic Research

Quality of Life Impacts



- Prosperity** – Food security; Financial well-being; Child, student, and adult skills
- Health** – Fruit and vegetable consumption/healthy eating environments; Children vulnerable in early development
- Good Governance** – Indigenous self-determination

Gender Results Framework Objective:

Fewer women and children living in food-insecure households

Target Population: Low-Income Children and Families

GBA Plus Timing: Early Later Existing

Expected Benefits

- Gender: Man Women
- Income: Low High
- Age cohort: Youth Senior
- Additional Characteristics: Indigenous Students

Some features of the Quality of Life Framework are still under development, and the indicator set is meant to remain evergreen. This includes further definition of the sustainability and resilience lens, work to better reflect Indigenous perspectives and close the socioeconomic gap between Indigenous and non-Indigenous populations, and continuing efforts to more fully integrate the framework into policy development.

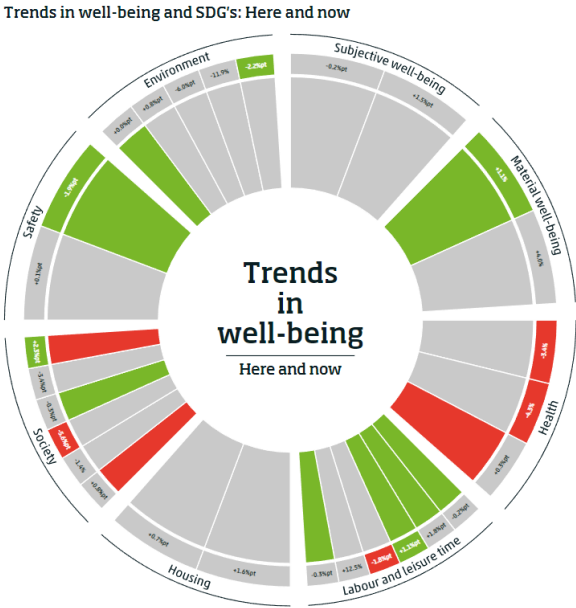
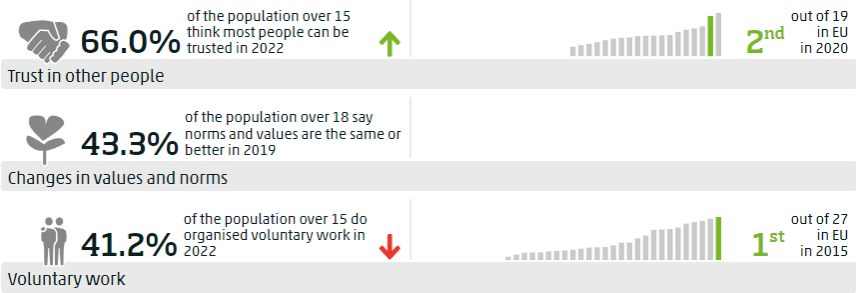
Netherlands: Monitor of Well-being and the Sustainable Development Goals (since 2018)

The Monitor of Well-being and the Sustainable Development Goals uses a dashboard approach. The Monitor measures sustainable and inclusive well-being based on the CES Recommendations on Measuring Sustainable Development (UNECE 2014), distinguishing the three dimensions of well-being ‘here and now’, ‘later’, and ‘elsewhere’. It was clear from the recommendations of Stiglitz, Sen & Fitoussi that a composite index should never aggregate the three dimensions into one index. When it was developed in 2017 one of the questions was whether or not a composite index should be produced for each of the dimensions of well-being.

Different users were asked about their specific needs. Scientists and journalists preferred a composite index, because it better served their particular needs. Most stakeholders – particularly politicians, policy makers, and researchers in advisory councils and public assessment offices – preferred a dashboard with individual indicators. They saw no added value in replacing GDP with another single number. Instead, users highlighted the advantages of a dashboard that provides detailed information and allows for an analysis of trade-offs and synergies. In addition to user needs, a major consideration for Statistics Netherlands in deciding not to produce a composite index is that the weights required to aggregate the indicators are inherently normative.

Three design principles were used to develop dashboards and visualisations. First, keep the visualisations sparse. A minimum of information on each individual indicator prevents users from losing sight of the overall results. Second, use colours that provide intuitive signals to users. The colours green and red are generally recognized as colours that indicate developments that are associated with (respectively) higher and lower well-being. Third, keep the language simple. Metadata were rewritten to provide more understandable descriptions of the most recent figure for each indicator.

Statistics Netherlands is continuously working to improve and innovate dashboards and visualisations. Interactive visualisations have been tested. The monitor’s website is regularly subjected to user analysis. As part of these experiments, Statistics Netherlands is also looking into the possibilities for using a composite index for communication purposes, as an additional tool rather than a substitute for the dashboard approach.



6.5 Suggestions for additional ways for aggregate analysis of well-being indicators

This section may provide helpful suggestions for ways to present and summarise the results of well-being measurements that do not involve a composite index.

- Examine research into the cognition of visualisations (composites implicit in dashboards and other visualisations)

References

- Benjamin, D. J., Heffetz, O., Kimball, M. S., & Szembrot, N. (2014). Beyond happiness and satisfaction: Toward well-being indices based on stated preference. *American economic review*, 104(9), 2698-2735.
- Decancq, K., & Schokkaert, E. (2016). Beyond GDP: Using equivalent incomes to measure well-being in Europe. *Social indicators research*, 126(1), 21-55.
- Dutta, I., Nogales, R., & Yalonetzky, G. (2021). Endogenous weights and multidimensional poverty: A cautionary tale. *Journal of Development Economics*, 151, 102649.
- Greco, S., Ishizaka, A., Tasiou, M., & Torrìsi, G. (2019). On the methodological framework of composite indices: A review of the issues of weighting, aggregation, and robustness. *Social indicators research*, 141, 61-94.
- Liberati, P., & Resce, G. (2022). Regional well-being and its inequality in the oecd member countries. *The Journal of Economic Inequality*, 20(3), 671-700.
- Mazziotta, M., & Pareto, A. (2020). Composite indices construction: The performance interval approach. *Social indicators research*, 1-11.
- OECD, Eurostat & Joint Research Centre (2008). *Handbook on constructing composite indicators: methodology and user guide*. OECD publishing: Paris.
- ONS (2023). Inclusive income: 2005 to 2019. Available at <https://www.ons.gov.uk/economy/economicoutputandproductivity/output/articles/ukinclusiveincome/2005to2019>
- Saisana, M., & Tarantola, S. (2002). State-of-the-art report on current methodologies and practices for composite indicator development (Vol. 214, pp. 4-15). Ispra, Italy: European Commission, Joint Research Centre, Institute for the Protection and the Security of the Citizen, Technological and Economic Risk Management Unit.
- Stefana, E., Marciano, F., Rossi, D., Cocca, P., & Tomasoni, G. (2021). Composite indicators to measure quality of working life in Europe: a systematic review. *Social Indicators Research*, 157(3), 1047-1078.
- UNECE (2014). *Conference of European Statisticians Recommendations on Measuring Sustainable Development*. United Nations, New York/Genève.
- UNECE (2019). *Guidelines on producing leading, composite and sentiment indicators*. United Nations: Geneva.
- Yang, L. (2018). Measuring well-being: a multidimensional index integrating subjective well-being and preferences. *Journal of Human Development and Capabilities*, 19(4), 456-476.