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Developing an index - An example of an index for agency in the food system

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Abstract

An index can simplify a complex social phenomenon by representing it with a single value. However, the quality of an index depends on the developed theoretical framework, the chosen aggregation method, and methods to assure the rationality of the index. To assess the food security status in marginalised communities in South Africa the study team successfully developed and tested an index describing the dimension of Food Security "agency".

Source: Food Agency Cape Town

Aim

The aim of an index or a composite indicator is to quantitatively represent a complex social phenomenon through computing and compiling relevant variables into a single value (= composite indicator). This displays the relative positioning of the subject of interest (e.g. of a country or social group) in the area of research.

The research team of the study in South Africa created an index to describe agency in the food system. There were several reasons for the development of a new Agency Index to explore agency. Agency was recently introduced as a new dimension of food security by the High Level Panel of Experts on Food Security and Nutrition (HLPE) (HLPE, 2020). At the same time, a large-scale household survey was planned to assess the food security status in light of the COVID-19 pandemic in marginalised communities in South Africa. This gave the team the opportunity to use the study to quantify "agency". Due to

the broader focus of the research, i.e. to explore food security status in the pandemic, the project did not solely depend on creating successful results with the index. Therefore, there was some space to take a risk with an experimental survey module to quantify agency. Next to the agency index module, the Food Insecurity Experience Scale (FIES) module was another key part of the survey and provided a high-quality variable for food security. The variables derived from the FIES gave the team the opportunity to verify the theoretical framework behind the Agency Index by applying multivariate statistical analysis and relate the agency index and the four FIES variables to each other.
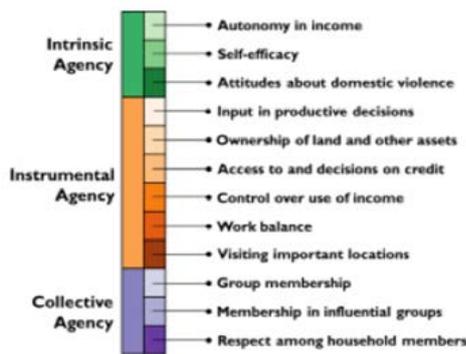

Figure 1: Agency Index Module

Description

An index can be developed as a composition of several dimensions, represented by a battery of existing indicators. This is, for example, the case of the Human Development Index (HDI) that uses national statistics on life expectancy, expected years of schooling/mean years of schooling, as well as the adjusted Gross National Income (GNI) per capita for constructing an index that measures "human development" (Roser, 2014). It is also possible to develop an index by using a set of primary data on a specific phenomenon, e.g. from household survey data. When using this approach, survey questions need to be designed in such a way that allow their translation into indicator values. By aggregating those values, an index can be created. It is possible that several variables are aggregated into one dimension, while in the next step, several dimensions are combined into one index. The Women's Empowerment in Agriculture Index (WEAI) uses such an approach (Alkire et al., 2013). The WEAI consists of ten indicators, which then result in five dimensions (figure 2). For example, the two indicators Input in productive decisions and Autonomy in production
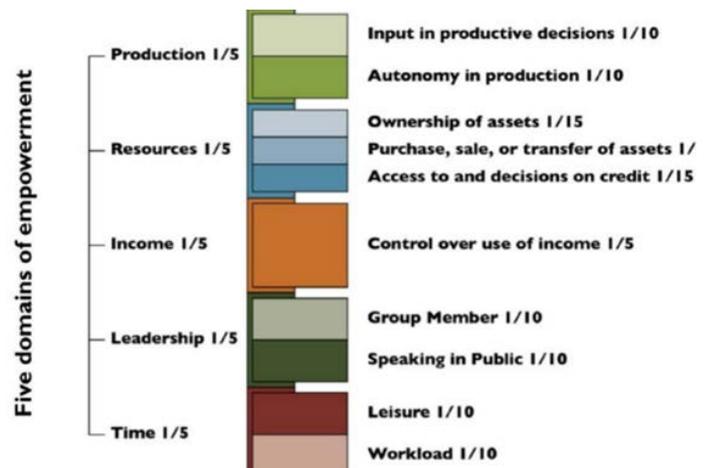
form the dimension of Production.

Figure 2: Women's Empowerment in Agriculture (WEAI) Index

Both indices, the HDI and the WEAI, provide a standardised measurement that allows the summarisation of complex and multi-dimensional phenomena in a compact manner, rather than presenting a large number of indicators to describe a complex issue. Reducing complexity with the help of an index allows targeted stakeholders (e.g., decision-makers, policy actors, civil society) to grasp a complex phenomenon relatively easily, quickly and comparably.

To develop an index or a composite indicator, the formulation of questions in a survey instrument or the chosen indicators must be based on a thorough literature review and methodological framework. This assures that the index makes sense and the aggregation and the weighting of indicators is transparent (European Commission, 2008).

If the index is based on a questionnaire, the survey instrument should not solely be based on a literature review but supported by strong qualitative data to control for the context in which data is collected (e.g. key informant interviews, focus group discussions) and to eliminate potential "blind spots" of the researcher. The questions that are included in the questionnaire for computing the index need to be reflected and further contextualised, as well as the values attached to the answer options.

Qualitative data might be included in the answer options. The final draft of the questionnaire must be discussed within the research team and with (local) partners and pre-tested in the field. The pre-test informs researchers: whether all questions are phrased comprehensively; the mathematical approach for computing the index works out technically; and whether the computed index makes sense.

Advantages	Disadvantages
Can simplify a complex social phenomenon for communication purposes to decision-makers and broader public by reducing the responses of a large set of questions.	Relies substantially on the methods for its construction used by the researcher and can therefore be subject to intentional or unintentional manipulation. Especially the weighting of variables is prone to be based on political agenda
Allows for advanced statistical analysis such as regressions	Can potentially oversimplify a complex topic and lead to misleading conclusions
Can be used as a tool to monitor the development of a social phenomenon over time	Can hide variables/dimensions with extreme values that are aggregated in the index which would need targeted policy interventions
Can be used to compare progress in different geographical locations against each other	Relies on a transparent selection of variables. A weak theoretical framework can lead to under- or overreporting of the phenomenon of interest.
Allows to incorporate different dimensions that are relevant to a certain phenomenon instead of reducing it to a single variable	

Figure 3: Assessment of advantages and disadvantages of index development

Apart from formulating suitable survey questions and using the right indicators, their normalisation, aggregation, and weighting is important for creating a meaningful index. At first, the values attached to the questions need to be normalised to adjust values measured on different scales into a scale that has the same unit of measurement. There are different normalisation methods that can be used accordingly (e.g. ranking, standardisation, Min-Max, for detailed description see European Commission, 2008). Afterwards the aggregation and weighting of indicators is possible. There are numerous statistical and participatory methods for weighting and/or aggregating single indicators or whole dimensions into a single index value. The method to be chosen should be in line with the theoretical framework and described in a transparent way.

An index is the result of the researchers' selection of indicators, their normalisation, aggregation, and weighting methods. Therefore, it might be necessary to readjust the index during one or more of the described steps. Looking closely at the statistical properties of the index and referring back to the theoretical framework can verify that the index fits the rationality of the theoretical framework.

For example, a Pearson Correlation Test can be applied to analyse the correlation between the individual indicators that are part of the index to be aware of double counting. Scatter plots can visualize the distribution of the index's values by respondents to visualise if answers are skewed.

Specifics of data and data collection

Indices that measure social phenomena are based on survey data. When the index is applied for the first time, a large sample size is needed to be able to zoom into different properties of the index. Indices are sensitive to the quality of the data used to calculate them; therefore, additional quality control of the survey data is recommended. Most importantly, an index has a very limited interpretability, which means that the survey must contain disaggregated data (e.g. age, gender, location, employment) and other relevant variables to relate it to the index.

Limitations and challenges

It is important to reflect if the social phenomena that the index is supposed to assess should or can be represented quantitatively. The development of an index requires a thorough literature review, a large sample size, and the willingness to take a risk in the household survey since the outcome remains unclear. Furthermore, an index needs to be contextualised and/or statistically related to other meaningful variables, otherwise it is hard to interpret a newly developed index. Finally, the success of a research should not be based on the index alone since the index might not work out like expected (see disadvantages above).

Prerequisites of analysis

It is mandatory to have knowledge or the willingness to learn basic calculation commands, descriptive statistics, and multivariate regressions on a statistical software (e.g. SPSS, STATA, R+). Good time management and patience is recommended because programming, testing, and readjusting the aggregation methods is time-consuming. There are online tutorials, but it might be necessary to ask for expert advice if the analysis becomes too demanding.
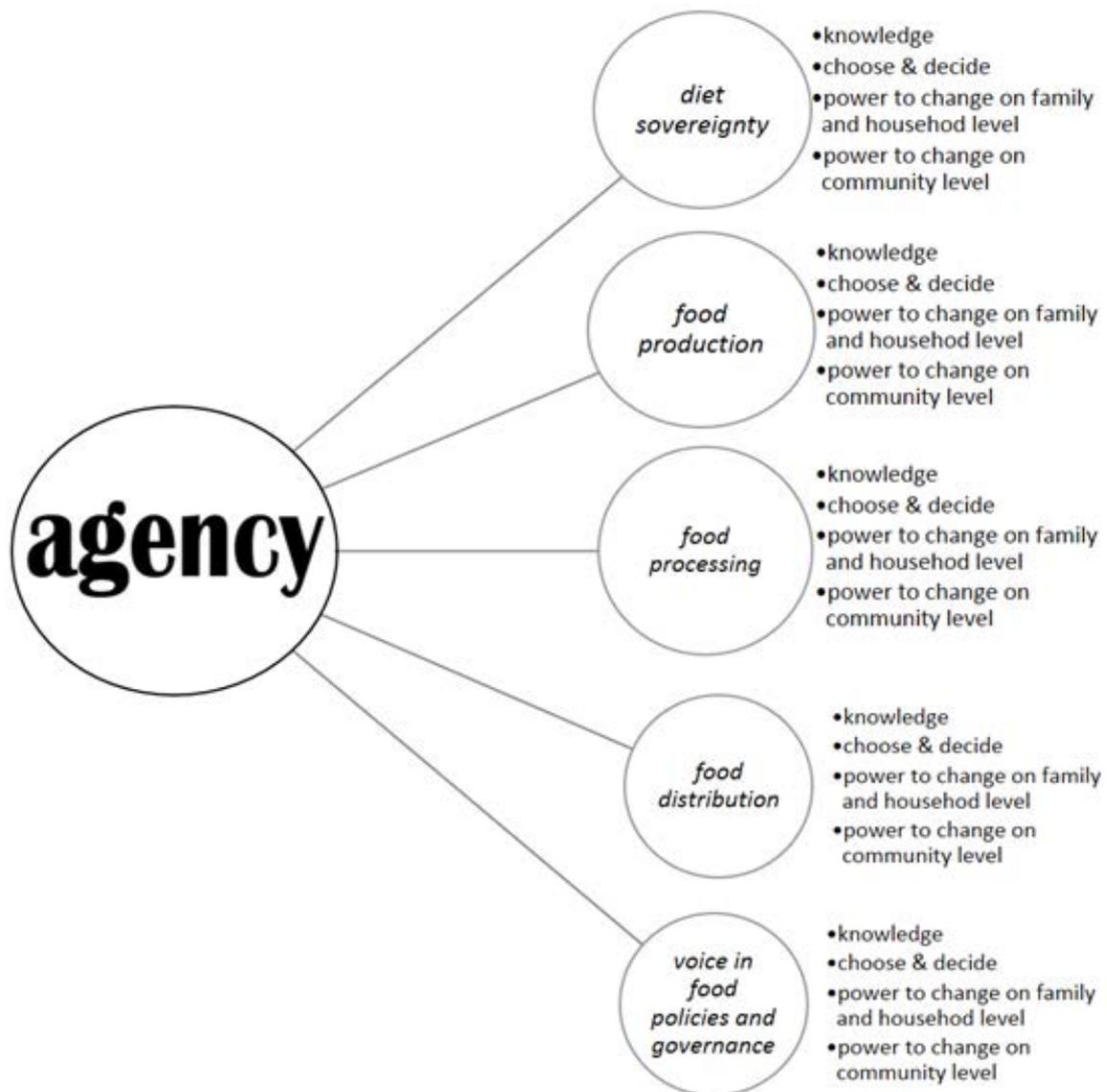
Figure 4: The Agency Module

Lessons learned

In general, developing an index takes time and might result in a survey with a large number of questions. As always, it is advisable to assess if there is an already existing way to obtain the needed information about the social phenomenon of interest. However, it is also possible to simplify an index by using less indicators and only focus on a specific fragment of a social phenomenon and/or by only using the index for targeted descriptive purposes.

In the case of the SLE research team in South Africa, the novel term "Agency" in the context of food security was a challenge because the term and the concept is not very catchy and understandable. The meaning of agency and the underlying theoretical framework made the concept interesting for a specialised academic audience but less communicable to decision-makers and civil society actors. This was solved by using (sub)-indices of single dimensions

(figure 4) and having a clear(er) definition of agency before presenting the research results.

Values, and therefore indices, have limited meaning and offer a broad space for interpretation for the recipients. Thus, it is important not to forget the realities that those numbers suppose to represent. The research results should be given back to the communities who participated in the research. To hear their voices and opinions regarding the results as local experts is key to contextualising the index but also to do solution-oriented research.

Using indices might be of increasing interest for future overseas studies of the SLE that have a quantitative component in their study design. An index provides strong evidence to represent a (social) challenge and a solid foundation for solution-oriented focus group discussions.

Theoretical framework

Agency has only recently been introduced in the definition of food security (HLPE 2020). However, to our knowledge, agency as a dimension of food security has not yet been quantified or operationalised in a survey. It is defined as:

> "the capacity of individuals or groups to make their own choices about what foods they eat, the foods they produce, how that food is produced, processed and distributed within food systems, and their ability to engage in processes that shape food system policies and governance" (HLPE, 2020, XV)

While an individual person may experience a low capacity of influencing how food is processed, the same person might have a high capacity of making choices how his or her food is produced. Ibrahim & Alkire (2007) therefore propose a domain-specific measurement of agency, which is also applied here. In line with HLPE, five domains were identified for the operationalisation of agency in the food system: diet sovereignty, food production, food processing, food distribution, and voice in food policies and governance.

For each domain we developed a set of questions that corresponded to the type of empowerment an individual can have within a domain. An increase would potentially translate into a higher level of empowerment, in the respective domain (see figure 4).

Aggregation and weighting

With the Agency Module, it was possible to calculate the sub-indices for each domain and the overall Agency Index. Each question had answer options that were coded into values from 1 to 5 or 0 to 2 for knowledge-based questions (Table 1). It was also possible to answer the question with "this is not important to me", since not all questions and domains might be important for a respondent. This does not mean that the respondent lacks agency but that he or she actively decides that it is not relevant for him or her (Sen, 1985).

Dimension	Question for "knowledge"	Answer option with attached value
Voice in food policies and governance	These days, I know where and how to voice my food related concerns and wishes.	I don't know (1)
		I am not really sure (2)
		I have an idea (3)
		I am fairly sure (4)
		I am sure (5)

Table 1: Example of a question from the Agency Module

	n	FIES (in %)	Mean of agency
St. Helena Bay	*343*		
Food secure	34	9.9	0.381
Food insecure	309	90.1	0.224
Gugulethu	259		
Food secure	85	32.8	0.446
Food insecure	174	67.2	0.422
Mitchell's Plain	288		
Food secure	213	74	0.47
Food insecure	75	26	0.354

Table 2: Agency in relation to the food security status in South African communities

In a further step, each domain was weighted by a representative focus group from each research site for the calculation of the Agency Index. The importance of each domain of perceived agency can vary for any context due to the unique socio-economic, political, and environmental situation of a community or research site. In our research, only one focus group discussion was conducted to weight each domain regarding its importance relatively to the other domains.

We used a mathematical approach, similar to the Women's Empowerment in Agriculture Index (Alkire et al., 2013) to calculate a value between 0 to 1 to describe the agency of an individual within the food system as an index. Additionally, we calculated the sub-indices for each domain of agency. In all sub-indices and in the index itself 0 is the lowest and 1 the highest possible result.

Evaluating the meaning of the Agency Index

As a last step we compared the generated index with the theoretical framework and assessed its statistical properties and the results' rationality. We looked at its statistical distribution of responses, intra-correlation, conducted multiple regressions with the

FIES as outcome variables, and disaggregated the data (e.g. by gender, research site) (Table 2). Then we presented the results back to the research sites for in-depth discussions with the communities.

References

Alkire, S., Chatterjee, M., Conconi, A., Seth, S., & Vaz, A. (2014). Global Multidimensional Poverty Index 2014. University of Oxford. https://doi.org/10.35648/20.500.12413/11781/ii039

Alkire, S., Meinzen-Dick, R., Peterman, A., Quisumbing, A. R., & Seymour, G. (2013). The women's empowerment in agriculture index. Oxford Poverty & Human Development Initiative. http://www.ophi.org.uk/wp-content/uploads/ophi-wp-58.pdf?cda6c1 European Commission, Organisation for Economic Co-operation and Development, & Source OECD (Online service) (Eds.). (2008). Handbook on constructing composite indicators: Methodology and user guide. OECD.

HLPE. (2020). Food security and nutrition: Building a global narrative towards 2030. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome.

Ibrahim, S., & Alkire, S. (2007). Agency and empowerment: A proposal for internationally comparable indicators. Oxford Development Studies, 35(4), 379–403.

Roser (2014). https://ourworldindata.org/human-development-index

Sen, A. (1985). Well-Being, Agency and Freedom: The Dewey Lectures 1984. The Journal of Philosophy, 82(4), 169. https://doi.org/10.2307/2026184

United Nations (Ed.). (1990). Human development report 1990. Published for the United Nations (New York) Development Programme. Oxford Univ. Press.