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New and Emerging Methods

Standardisation and Statistics

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Abstract

An infinite amount of data and a variety of ways to use it promise an individualisation of statistics; the tools, algorithms and (artificial) intelligence of data science are available to everyone. The age of statistics is being replaced by the data era. There is a promise in this, similar to that for the internet as a whole, of an equal and thus democratically organised basis of technology and access to quantitative information, and perhaps even knowledge. The article deals with the question of whether and to what extent this individualisation is beneficial or detrimental to the democratic discourse. For this objective, the concept of information quality is introduced and used, which is oriented towards the principle that statistical products should be fit for purpose. It is shown that individualisation and standardisation are two alternative approaches to statistics, the choice of which ultimately depends on the application and its intended function. As a language for public discourse, standardisation is of vital importance.

Keywords: Standardisation, official statistics, quality, epistemology, facts, public discourse

1 Introduction

The question of what statistics actually is would probably be answered by most people with a mixture of respect and fearful distance on the one hand and a good portion of cynicism on the other. If given the choice of the alternatives presented in Figure 1, their gaze and preference would probably oscillate back and forth.

It would certainly be worthwhile to explore the views on the relationship between reality and statistics among professional statisticians and among data scientists. Unfortunately, we have not come across any empirically valid findings on this; all that remains, therefore, is anecdotal observation. However, it is not unreasonable to fear that only a few have dealt with this question in depth and even fewer will attach a significance to it on the basis of which a scientific debate is required. However, this is a mistake for two reasons: Firstly, one must address this topic if one wants to understand the core of statistics, its nature and DNA. Secondly, addressing this issue and answering the questions it raises is a prerequisite for seriously and successfully tackling the issues of our time, such as the rejection of expertise and science and the questioning of facts or the juxtaposition of so-called “alternative facts”.

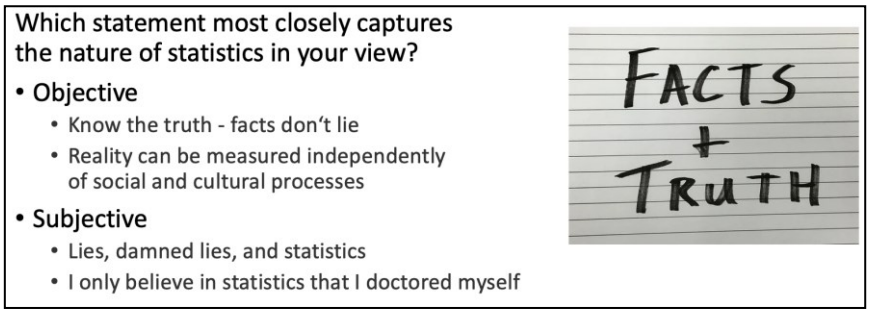

Figure 1: *Statistics: the truth or only lies?*

The solution to the puzzle is that statistics are not actually reality itself, but merely provide images of it, which of course have to depict reality undistorted and as accurately as possible. When dealing with model-like images, however, we have to ask ourselves which influences affect the model itself in such a way that it is of good quality, which in turn raises the core question of what we mean by quality. In summary, statistics is not about the dichotomy between truth and falsehood, but about good or bad quality of the quantitative image of reality, and of course only a section of it at a time.

Statistical information is a product that is designed, produced and "sold". Such products are not wrong or right. In the best case, they meet pre-established and openly communicated minimum standards, such as methodological or ethical standards (a guarantee for users), and they must be measured against international best practice (also openly visible). In addition, the crucial question is whether the product portfolio as a whole provides an adequate (caution: not "right"!) answer to the question of social progress, Sustainable Development, and so on.

2 Quantification, quality and statistical evidence

2.1 Quantification of social phenomena

What is it that characterises the relation of statistics to reality and truth (This is an extract from "Official Statistics 4.0" (Radermacher, 2020b))? The answer to this question leads to fundamental disputes between positions and schools of thought in the philosophical and sociological sciences. Can our knowledge and understanding of reality be considered objective or does it depend on the construction of the models we need in order to form a picture of natural or social phenomena? To what extent does science as a whole carry us with its findings and where are the limits? (Latour, 1987; Benessia et al., 2016) Figure 2 gives us an overview of different epistemological positions.

Of course, it is not the case that this topic is of great importance in the daily work of statistics. Once the design and the measurement regime are decided for one statistic, i.e. when it is known which nomenclature is used, which population is included in the survey, how the sample is drawn, etc., then a technical-methodological orientation is in principle sufficient for the conduct of a high-quality production process. Whenever new information needs to be poured into new statistical form or when the design of existing statistics is changed, when statisticians are faced with *"situations marked by controversy, crisis, innovation, and changes in economic, social and administrative contexts,"* (Desrosières, 2001: p 349) decisions must be taken that ultimately require awareness and profound knowledge of the epistemological issues mentioned. In the design process (as well as in communication), it is part of the statistician's professionalism to be aware of the limitations of measurability, to reflect on the impact of statistics on society and to develop a basic understanding of complexity (and the role of statistics).

"Therefore, it is imperative for a student or a researcher of science to differentiate between the computational tool and what it computes, to distinguish the map from the territory it represents. 'The

map is not the territory', remarked Alfred Korzybski. There are multitudes of maps that we use to 'represent' the reality out there. They differ both in form and substance. The scientist in this sense resembles a cartographer. Only a cartographer knows how hard it is to represent a map of the earth on a sheet of paper. Every step towards perfecting the map involves a sacrifice – adding some feature to the map that does not have any intuitive or direct correspondence with the territory or ignoring many complexities of the territory." (Wuppuluri, and Doria, 2018: p vii)

Epistemological position	Key questions
Naïve realism: Reality is an objective phenomenon that exists and can be measured independently of social and cultural processes. Perceptions of reality may be distorted or biased through social and cultural frameworks of interpretation	What realities exist? How should one measure and manage them? How should information about realities be effectively communicated to the public? How to reduce 'bias' in the responses? How do people respond to questionnaires? What worldviews shape their responses?
Critical realism: Reality is an objective phenomenon, the measurement of which is inevitably mediated through social and cultural processes and can never be known in isolation from these processes	What is the relationship of reality and the measurement of reality to the structures and processes of 'late modernity'[3]
Relativism: Nothing is a reality in itself – what we understand to be a 'reality' is the product of historically, socially and culturally contingent 'ways of seeing'	How do the discourses and practices around reality operate in the construction of subjectivity, embodiment and social relations? How does reality operate as part of governmental strategies and rationalities?

Figure 2: *Epistemological approaches in social sciences (adapted from Lupton (2013: p 49-50))*

In the following, a middle course between realism and relativism is chosen (i.e. critical realism), on the one hand recognising a reality that exists independently of our perception, on the other emphasising that direct access to this reality is not possible, but requires methods of quantification, which inevitably contain simplifications and decisions. Statistical information is produced with two main ingredients: methodology and conventions. On the one hand, *"the notion of statistics as a primarily mathematical discipline really developed during the 20th century, perhaps up to around 1970, during which period the foundations of modern statistical inference were laid."* (Hand, 2009) On the other, the final products of statistical processes depend essentially on their conceptual design, which, as for other (manufactured) products, depends on whether the questions raised by stakeholders can be answered by statistics and whether they are answered in a satisfactory manner.

In order to be prepared for the following explanations with the necessary terms and their definitions, Desrosières is followed, who separates three *"aspects of statistics, 1) that of quantification properly speaking, the making of numbers, 2) that of the uses of numbers as variables, and finally, 3) the prospective inscription of variables in more complex constructions, models."* (Desrosières, 2010: p 114) Interestingly, the verb "to quantify" is here defined and used differently from that of the verb to "measure". *"The idea of measurement, …, supposes implicitly that something real, already existent, analogous to the height of the Mont Blanc can be "measured" ... In contrast, the verb to quantify implies a translation, i.e. a transformative action, resulting from a series of inscriptions,*

codifications and calculations, leading to the making of numbers. This contributes to expressing and giving existence to, in a numerical form, something that before was only expressed by words and not by numbers." (Desrosières 2010: p 115)

2.2 Conventions and evidence for decision-making

Statistical analysis begins by examining an issue and developing an adequate methodology for quantifying it. In a learning cycle, this ideally leads to applications for decisions and communication, which in turn are used for design improvements, and so on (see figure 3).

Figure 3: *Data informed decision-making cycle (Schüller, 2020: p 16)*

This phase of the cycle is of great importance for the later statistical product and its quality. Here the course is set for whether the most important facts are approached with the right questions, whether the collection or evaluation of existing data is methodologically well planned, and so on. This is where it is decided whether the product that will be provided with the statistical analysis will be fit for purpose (see figure 4).

In view of this great importance, it is at least surprising that comparatively little can be found in the statistical library about this design process itself.

In any case, a very important consequence of what has been said so far is that there are, or at least can be, several and alternative solutions and results for statistics, which do not have to be better or worse, wrong or right, but are each in themselves the result of a different kind of convention.

We have been able to follow this for some time in the discussion on the use of other data sources instead of data generated by the statistical institutions themselves through surveys. Particularly in the case of the population census, but also concerning the potential use of so-called "big data", it is a matter of weighing up all the criteria mentioned in order to best meet them under new framework conditions. If one opts for a new mixture in comparison to the traditional one, a different convention, this may bring advantages in terms of timeliness and repeatability, but for which one has to accept losses in terms of the regional granularity of the information, breaks in time series and other aspects. Even the headline figures and main aggregates and indicators may change as a result of a change in the convention.

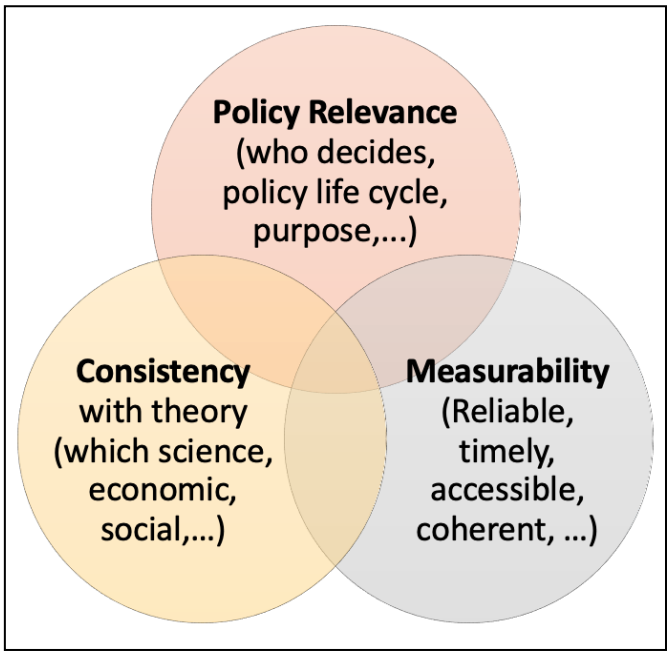

Figure 4 *Quality: fitness for purpose*

In principle, there may be different backgrounds and purposes for the aim of a statistical analysis:

- Statistics for individual information and decision making
- Statistics for information and decision making in a company, municipality etc.
- Statistics for the public discourse

Depending on the purpose, it may be helpful or even necessary to commit to certain parameters in advance when defining the design, so that time series can be established, comparability nationally and internationally is ensured, etc.

2.3 Statistics – language for the public discourse

In the Corona pandemic, it has become clear how important reliable statistics are for political debates and decisions. Since its onset, the crisis has been accompanied by an "infodemic", a flood of data, some of varying quality, that confuses rather than informs the layperson. In the past, a crisis would have led to new information needs being directed towards official statistics as the preferred provider. This seems to have changed. On the one hand, reference is made to the opportunities presented by data revolution, data-sciences and learning algorithms (so-called AI) as an alternative to official statistics (which are perceived as too slow, too inflexible, and too expensive). On the other hand, after decades of austerity policies, official statistics find themselves in a similarly defensive situation as the health sector. There is a lack of financial reserves, personnel, competences and know-how for much-needed innovations.

In January 2017, six months after the Brexit referendum and at the beginning of Donald Trump's presidency, William Davies published a widely acclaimed article "How statistics lost their power - and why we should fear what comes next". In it, he expresses his concerns that nothing less than the end of a statistical era has arrived, with serious consequences for public discourse, trust in experts as well as politics, and with options for populist politicians to use this for their purposes. With ubiquitous amounts of data and almost infinite possibilities of use, informational ecosystems are fundamentally changing; statistical logic is being replaced by data logic. *"With the authority of statistics waning, and nothing stepping into the public sphere to replace it, people can live in whatever imagined community they feel most aligned to and willing to believe in. Where statistics*

can be used to correct faulty claims about the economy or society or population, in an age of data analytics there are few mechanisms to prevent people from giving way to their instinctive reactions or emotional prejudices." (Davies, 2017).

The term "statistics" has the same linguistic roots as "state". Since the Enlightenment, statistics has been closely married to the nation state, to democracies of various kinds and, unfortunately, also to dictatorships. In the neo-liberal governmentality that has prevailed since Margaret Thatcher came to power, and at the latest since the fall of the Berlin Wall, official statistics find themselves in the paradoxical position that the appetite for facts for evidence-based decision-making is steadily increasing, while at the same time they have fallen into disrepute with all state actors. When official statistics appear in the front ranks of political priority, it is mainly when it comes to reducing supposedly useless bureaucracy or saving money in the public sector.

For some years now, a resistance to evidence-based governance has been growing; scepticism towards all forms of experts does not stop at scientists or statisticians. Coupled with a lack of statistical literacy and the impression of being at the mercy of the representatives of a supposed technocratic regime, the counter-position is forming in which the existence of neutral facts is negated or relativised. The reduction of social and economic questions to numerical aggregates and averages no longer seems acceptable, unless the results come from one's own calculations and correspond to the 'truths' that demagogues deliver about what is going on in society.

After a year in a state of pandemic emergency, it is time to return to the discussion initiated by William Davies. Obviously, there are still and again government services that seemed to have disappeared from our radar screen. These include - along with public health care - the provision of statistical information of sound quality, comprehensibility, and trustworthiness. It is necessary to ask the fundamental question, as we did after the fall of the Berlin Wall, whether we need official statistics as the backbone of democratic decision-making, and if so, what their tasks are and how they should be financed and anchored in the political system.

Statistical information, in the sense of the "*Économie des Conventions*" (Diaz-Bone, and Salais, 2011), are artefacts that are designed and produced. The same rules apply to such informational products as to other products: their design must be suitable to provide factual answers to users' questions; they must be produced with good quality; educated clientele with a sense for quality is a prerequisite. The public infrastructure that provides society, politics and the economy with elementary facts is official statistics. Where would we be without GDP, inflation rates, mortality tables, population figures, etc.? Facts on the basis of which momentous political decisions are made are based on international methodological standards (e.g., consumer price index for Central Banks' monetary policy). Official statistics must perform their tasks with great efficiency and continuity: they work with long lead times, industrial production lines, international standards and democratically decided work programmes. In this way, internationally, nationally, and temporally consistent indicators of high quality are provided (Radermacher, 2020b).

Let us use the example of transport: data strategies aim at promoting and regulating individual (data) mobility. In addition, there is public rail transport with data and statistics, which must also be made fit for the future. This requires investments, because new areas are to be established on which modern high-speed trains are to run. Individual data use alone can be inefficient and ineffective. In the 1960s, we thought that promoting individual transport was the best option. Today we know that this one-sidedness has led us into congested cities and roads because rail expansion was not pushed with enough verve. If the infrastructure of public statistics is not modernised, geared to new technologies (high-speed statistics) and new terrains are not opened up (COVID, biodiversity, ...), there will be parallel infrastructures in both the public and private sectors that will develop their own

standards. Or, more precisely: We will have an outdated, unattractive public (data) railway with multiple rail widths (partly public, partly private) and incompatible industry standards; a setback for trust, transparency, and public discourse. To prevent such a situation, the integration of a country's different producers under one roof into a well-coordinated statistical system is crucial. Roles must be assigned, responsibilities defined, so that citizens can rely on the highest quality standards being met. To make it easy for users to obtain information, a certificate should be introduced that provides trustworthy information about the quality profile of an information product. Certification requires a neutral and trustworthy institution that sets and verifies quality standards.

The fact that initiatives to improve data literacy are gaining momentum, supported not only by business but also by politics and science, is very welcome. Data literacy serves to promote maturity in a modern digitalised world and is important for all people - not just specialists. This education, like other education, is about several competence dimensions: Knowledge, skills, and values (Schüller, 2020). However, a broad, balanced, and situational approach is rarely found in practice. Rather, the focus seems to be on teaching technical skills of data science, mathematics, and IT, reminiscent of the do-it-yourself wave of the 1970s, in which screwing, repairing, and constructing by anyone was propagated, sometimes even in cases where a good craftsman would have done the job better and cheaper than an amateur. For the citizen, the entrepreneur, the teacher, the student who wants to understand and apply the indicators of public statistics, sophisticated skills of data science (e.g., own analysis of raw data, knowledge of algorithms) are just as irrelevant as in-depth knowledge in the mathematical field of stochastics. Rather, they should know enough about the informational product and its properties to be able to assess its quality regarding personal application goals and questions. This requires basic mathematical knowledge as well as experience in dealing with quantitative information; knowledge of descriptive statistics and its application in the processes of economic and social statistics is required. What the consumer price index says (or doesn't say) about inflation should be taught in school and adult education; everyone should understand the indicators of sustainable development. For advanced users, microdata are also available as “public use files” to experiment with their own statistical evaluations and gain experience (e.g. https://ec.europa.eu/eurostat/web/microdata/public-microdata).

Official statistics require an adequate policy framework because they embody a public infrastructure maintained by public institutions with a public mandate financed by taxpayers' money. Most countries have statistical governance, consisting of a body of laws, rules, principles, codifications, and work programmes. The European Statistics Code of Practice defines: *“Institutional and organisational factors have a significant influence on the effectiveness and credibility of a statistical authority developing, producing and disseminating European Statistics. The relevant Principles are professional independence, coordination and cooperation, mandate for data collection, adequacy of resources, quality commitment, statistical confidentiality, impartiality and objectivity.”* (Eurostat, 2018) For official statistics to develop successfully, the preconditions in terms of finances, personnel, organisation must be right. Beyond the canon of already existing criteria of the current Code of Practice, future demands arise, e.g., those regarding the introduction of quality labelling and certification of statistical information as well as with regard to initiatives to improve statistical education.

Compliance with these quality standards goes beyond the statistical institutions’ own sphere of influence. If there is a lack of political attention and will to address this issue, public statistics will sooner or later fall behind and will no longer be able to meet the requirements. The “Tragedy of the Commons” particularly affects public infrastructure. If bridges, roads, sewers (and public statistics) are not maintained for a certain period, it is hardly noticeable at first. In the long term, however, the resulting damage and repair costs are all the higher.

3 Summary: Individualisation vs. standardisation – a question of purpose

For statistical products, in a similar way as for other products, there are arguments for or against industrial production as well as for customised craft production (see Figure 5).

Individual Statistical Analysis	Standardised Statistical Analysis
Pro • Flexibility in the design and choice of methods • Quality responsibility and sovereignty • Relevance for the individual information need • Competence through acquired factual knowledge	**Pro** • Homogeneity through standards • Comparability (time, region) and consistency with scientific frameworks • Efficiency, sustainability • Quality standards • Low level of statistical literacy required (equality)
Contra • Heterogeneity of solutions • Costs • Risk of inequality due to digital and social gaps • Comparability and consistency with other analysis not guaranteed	**Contra** • Industrialised production, small room for customisation to individual needs • Fixed statistical programme and methods, slow adaptation and limited flexibility • Technocratic power limiting transparency and participation

Figure 5: *Benefits and limitations of individualisation and standardisation*

Which of the two variants is preferred, depends on the circumstances and purposes. In all cases, however, the aim must be to soften and reduce the contrasts by creating transitions and intermediate measures, such as smaller and flexible experimental statistics in addition to the standardised but cumbersome official statistics (Radermacher, 2020a).

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