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STATISTICS ON FOOD QUALITY

Invited paper submitted by Statistics Denmark*

Summary

In this paper, attention is focussed on two areas in which conducting statistical surveys is considered to be expedient.

Providing statistical data on objective factors concerning food quality is a natural feature of agricultural statistics, which describe the different production processes. There are naturally numerous boundaries. For example, including sections of the statistics on health is essential - not least supervisory authorities collecting a multitude of data, which are ready to be made available in, e.g the form of statistics.

Similarily, there are fluid boundaries with respect to the environmental statistics and questions of pesticides must be considered to be one of the most important factors in connection

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with food quality. These statistics are produced partly in the agricultural statistics, partly in the environmental statistics and partly in the health statistics.

Although the production of physical statistics providing factual information is considered to be of the greatest importance in many contexts, monitoring the population's attitude to food quality is an essential parameter for both producers of food and for the production of statistics as it must be assumed that boundaries are being shifted.

If analyses are to establish if dietary habits have an impact on the population's state of health, data must be compiled at the level of individuals and it thus follows that conducting general statistical surveys will be inadequate and will have to be supplemented by dietary surveys, incorporating major representative population sections in order to enable data comparability between eating habits and statistics on sickness.

To produce up-to-date statistics it is imperative to keep "one's finger on the pulse". Questions that can be asked in this context are:

- Which surveys should be conducted internationally and which are considered to be of more local interest?

- Is it necessary, and if so, to achieve cohesion between agricultural, industrial, health and environmental statistics? and how?

Introduction

1. Specifying/defining quality in a slightly broader sense than in everyday language is endeavoured in this brief paper on food quality.

2. A "high" quality is frequently used in describing our requirements with respect to food quality - but this is a term which is useless. Nevertheless, this term is used by many experts and is perhaps especially used politically.

3. In describing food quality and particularly in describing food quality in relation to the statistics and the possibilities of describing quality by means of statistics, objective clarifications and definitions are imperative to make it possible to measure quality.

Definitions

4. Defining quality is a complex matter and people will regard the same quality differently.

5. A number of quality objectives are listed below - the objectives are not exhaustive and there is some overlap between individual subjects, as they might be two sides of the same coin.

Objective quality

6. Factors concerning quality which can be measured - all factors are not equally measurable.

Nutrient quality. Raw material content, which constitutes the "basic" nutrition.
Protein content
Fat content
Caborhydrates
Vitamins, etc.

Hygienic quality. A question of food safety.
Bacteria, etc.
Pesticide residues (also natural ones)
Pharmaceuticals - growth promoters - hormones, etc.

Consumption quality. The more emotional factors.
Appearance
Taste
Odour
Consistency
Digestibility
Technical qualities
Food preparation quality

Environmental quality

Is understood to mean impact on the external environment.
Intensive livestock farming
Fertilizer production/area
Working environment

Intangible quality

Can be regarded as emotional - ethical - attitude.

Production without the use of additives
Livestock welfare solutions - free-range grazing, ecological, etc.
Ethical aspects
Tradition/culture

Quality of service

The quality fulfilling the population's expectations.
Price guarantees
Supply guarantees
"Freshness"
Cold chains
Delivery speeds (from soil to table)

Description

7. As part of the findings from a dietary survey conducted by the National Consumer Agency of Denmark information on the distribution of energy intake is presented below:

Average energy distribution in our diet

	Children 1-6 years	Children 7-14 years	Adults 15-80 years
		%	
Fat	35	35	37
Carbohydrates	52	51	44
Protein	13	14	14
Alcohol	0	0	5
Persons covered by the survey	551	710	1 837

Source: Veterinary and Food Directorate

8. For example, a maximum energy intake consisting of 30% fat, 55-60% carbohydrates and 10-15% protein is recommended. The above table shows that the Danish population's diet composition differs from that recommended by today's experts.

9. Although the quality of the diet composition is poor, this is not, however, what is regarded as food quality. The quality of every foodstuff used may be excellent, whereas the ideal composition has not been achieved. Composing and advising people about their diet is the job of dieticians, whereas analysts in the food and health sector and statisticians should co-operate in describing food quality.

10. The principal task of our diet is to supply the requisite nutrients, which generally speaking consist of the basic components: Protein, carbohydrates and fat, but also vitamins and minerals are important.

11. In addition to statistics on quantities used, the most frequently available statistics in the context of food relate to the content of the above-mentioned components. For example, in the following form:

An example of statistics on nutrient content

Nutrient content in grams

	Protein	Fat	Carbohydrate
Bread	4.100	1.00	24.65
Butter	0.025	4.06	0.03
Cheese	4.720	5.06	0.16
Juice	1.200	0.20	19.80
Total	**10.045**	**10.32**	**44.64**
Energy content (kj)	**170.000**	**391.4**	**758.20**

For example, breakfast: 150 g Graham bread: 20 g cheese 45+, 5 g butter and 200 g juice.
Source: Veterinary and Food Directorate

12. It must be assumed that the current statistical surveys of total intake of important foodstuffs based on estimated food quantities are instrumental in assessing the population's total consumption. The more targeted statistical data by selected population groups call for direct consumer surveys or indirect estimates based on observations.

Hygienic quality

13. What we are concerned with here is particularly food safety, implying especially unwanted bacteria, pesticide residues, pharmaceuticals, etc.

Bacteria and the like

14. One of the most hotly debated subjects concerns surveys of the content of salmonella bacteria. With respect to data on diseases related to foodstuffs and distributed by micro-organisms, the most prevailing cause is salmonella bacteria, and consequently plans of action to reduce these bacteria in foodstuffs have been initiated in Denmark. Statistics on the developments in salmonella bacteria will thus show if our efforts have been successful.

Salmonella in poultry

15. The small table below shows a number of surveys of Danish-produced and imported poultry, respectively. The analyses covered a large number of countries, which have been omitted for reasons of space.

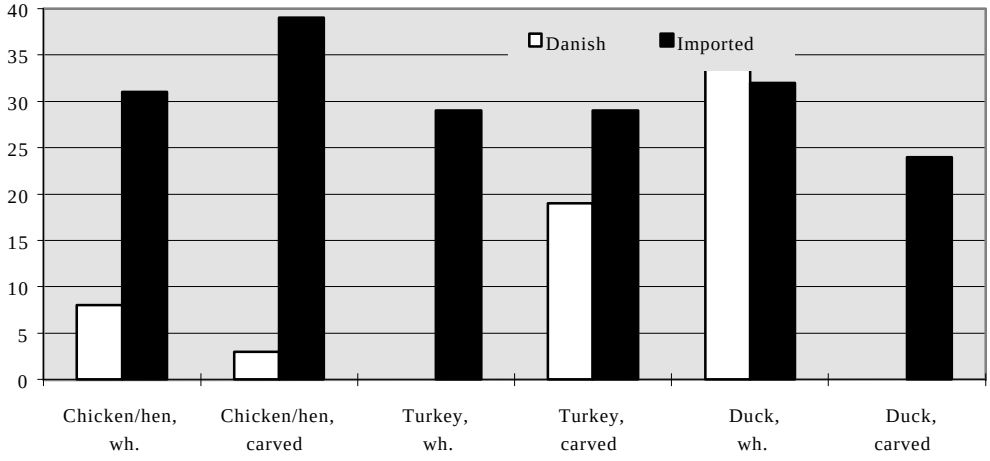
Data example

Salmonella in Danish and imported poultry 1997/98

	Chicken/ hen, whole	Chicken/ hen, carved	Turkey, whole	Turkey, carved	Duck, whole	Duck, carved	Samples, total
	% of samples with salmonella						no.
Danish	8	3	-	19	36	-	275
Imorted	31	39	29	29	32	24	884

Source: Veterinary and Food Directorate

%.



16. Similar analyses are being undertaken for a wide range of other bacteria and viruses, and how to gain benefits, as widely as possible, from the statistics must depend on the local factors.

Pesticides

17. Pesticide residues in food are exclusively to be understood as residues from crop-spraying in agriculture. However, it should also be taken into account that large concentrations of natural toxics are contained in several foodstuffs. For example, nicotine is notorious for being considered noxious, but substances in coffee may also appear in doses that are many times more cancerous than in the toxic substance DDT, which we do not allow to be used in Denmark. Similarly, there are also many natural toxic substances in

condiments. In consuming food it is expedient to avoid the most noxious substances - whether they appear naturally or as "foreign substances".

18. To mention an example, the following table shows analyses and pesticide residues in a number of selected products. It is possible to access similar data for all edible products.

Pesticide residues

Pesticide residues in Danish and imported products 1996

	Apples		Pears		Strawberries		Potatoes		Lettuce	
	no samples	Pest. residue In %	no. samples	pest. residue in %	no. samples	pest. residue in %	no. samples	pest. residue in %	no samples	pest. residue in %
Danish	52	12	14	7	25	48	43	2	29	7
Imported	44	48	19	42	36	64	25	8	32	47

Source: Veterinary and Food Directorate

19. Despite the occurrence of pesticide residues in food products, it should be mentioned that the quantities are very small, and "only" about 2% exceed the marginal values recommended. In the context of historic data, it should be borne in mind that knowing the exact "interfacial quantities" is essential, as the methods of analysis are becoming more and more sensitive, and may give misleading results, unless some limit values are defined.

Removing pesticides

20. Pesticide residues in foodstuffs are generally undesirable, and different measures have been taken to reduce or remove pesticides from food production. The most radical step is to ban the use of pesticides, which will not result in the production of statistics. For some of the most toxic substances a ban has been put on their use in Denmark.

21. An alternative solution is to reduce consumption. In this respect, a Danish plan of action has been prepared to reduce the use of pesticides in agriculture.

Pesticide consumption

Average dosage

	Avg. of 1981-85	1988	1991	1994	1995	1996	1997
	kg active substa. per ha per treatment						
Pesticides, total	**1.06**	**0.79**	**0.63**	**0.69**	**0.60**	**0.83**	**0.63**
Herbicides	1.41	1.03	0.89	0.92	0.83	0.98	0.70
Growth regulators	0.67	0.70	0.86	0.92	0.87	0.85	0.92
Fungicides	0.94	0.75	0.68	0.74	0.79	0.72	0.73
Insecticides	0.30	0.13	0.08	0.07	0.07	0.07	0.07

Source: National Agency of Environmental Protection

Pesticide sales

Quantities of pesticides sold according to groups of pesticide

	Avg. of 1981-85	1988	1991	1994	1995	1996	1997
	kg active substa. per ha						
Pesticides, total	**2.68**	**2.06**	**1.83**	**1.72**	**2.10**	**1.58**	**1.55**
Herbicides	1.79	1.48	1.13	1.18	1.43	1.26	1.16
Growth regulators	0.09	0.10	0.07	0.11	0.13	0.03	0.05
Fungicides	0.69	0.42	0.56	0.39	0.46	0.27	0.34
Insecticides	0.12	0.06	0.06	0.04	0.07	0.02	0.02

Source: National Agency of Environmental Protection

22. These statistics on pesticides appear to be well suited for keeping track of developments and thus enabling the underlying statistics to provide data on the probability of fulfilling the political plans of action that have been adopted. Showing this type of statistics over a number of years is important, as data for some years may appear atypical, which out of a context provide information that contradicts the trend, which is the most important thing.

23. Another way of removing pesticides is by ecological food production, which will be discussed later.

Pharmaceutical residues

24. Similarly, both for bacteria and pesticides it is widely possible to compile corresponding statistics on pharmaceutical residues. For example, antibiotic residues in food are undesirable, if they cause health hazards to human beings. The residues are frequently the outcome of growth promoters used in animal breeding - these substances are gradually being removed from food production. Similarly, the use of hormones in Denmark is not allowed, as is, e.g. the case for beef production in the United States. However, it has not been possible to prove any effects, and they must therefore be considered to reflect one's attitude to these factors.

Ecological production

25. To avoid some of the undesirable effects in connection with conventional agricultural production, ecological agricultural production is assumed to be an option for ensuring food quality, concurrently with achieving environmental benefits.

26. Objectively speaking, the most significant improvement is a reduction of pesticide residues, in light of the ban on using pesticides in the production process. There is also a ban on the use of artificial fertilizers, but this is a factor which is presumably of minor importance. However, we may benefit from fewer pharmaceutical residues in food products.

27. The greatest benefits are probably emotional, as livestock welfare is part of the conceptual framework, where livestock is guaranteed the best possible space, is free-range grazing, etc.

Ecological farming

Ecological farms and area

	1988	1990	1992	1994	1995	1996	1997	1998
Hectares	5 881	11 581	18 653	21 145	40 884	46 171	63 120	98 120
Farms - no.	219	523	669	677	1 050	1 166	1 636	2 246
Ecological farms as % of total number	0	1	1	1	2	2	3	4

Source: Danish Plant Directory

28. The small table above shows developments in the number of agricultural farms in Denmark. There is apparently a heavy increase in the number of ecological farms. However, this increase should be seen in relation to the total number, which is shown in the last line.

29. In the following tables, some examples of statistics, which might be of great interest, are given. Some statistics can be generalised and compared

with developments in other countries, while other statistics are of a more "local" character.

Ecological milk

Ecological milk production - number of farms and weighing in per dairy year

	Unit	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Farms	no.	55	63	81	122	132	140	147	329	430	672
Weighing in	mio. kg	15	18	24	33	39	47	50	129	183	333
Share of total weigh.	%	0	0	1	1	1	1	1	3	4	7

Ecological vegetables

Vegetables and potato production

	1988	1989	1990	1991	1992	1993	1994	1995	1996
					mio. kg				
Potatoes	4	-	-	4	4	5	5	6	8
Carrots	-	-	-	-	3	5	6	7	7
Not specified	6.5	10	10	7	5	6	7	6	8
Total	**10**	**10**	**10**	**11**	**12**	**16**	**18**	**19**	**23**

Source: Council of Organic Farming

30. For other products, which are not presented in the tables, eggs account for the largest share comprising 6% of the production, while for pigs the production is under 1 per mille, and pig meat is stored course little demand.

31. In comparing the actual information with the results from the subsequent tables, showing the attitudes among consumers, as expressed in interview-based surveys, the general impression thus given is that attitudes concerning ecology are more positive than those reflected in production and purchases shopping patterns.

32. However, it is the production of ecological products that have to be compared in relation to the total production which is used for consumption in Denmark, as these products are not yet being exported. This implies that there is a greater share of ecological products for consumption than the share for total consumption. The share for milk, which is the most successful product, accounts for about 20% of total milk for human consumption.

33. In the two following tables some results from a representative interview-based survey of the Danish population are presented.

Purchases of ecological goods

Ecological goods bought by families

	Yes, always	Yes, frequently	No, newer	Do not know	Total
		%			
Does your family buy ecological vegetables	16	47	36	1	100
Does your family buy ecological dairy products	25	35	40	0	100
Does your family buy ecological meat	8	32	59	1	100
Does your family buy other ecological goods	10	15	75	1	100

Willingness to pay more for ecological goods

The willingness of families to pay more for ecological goods

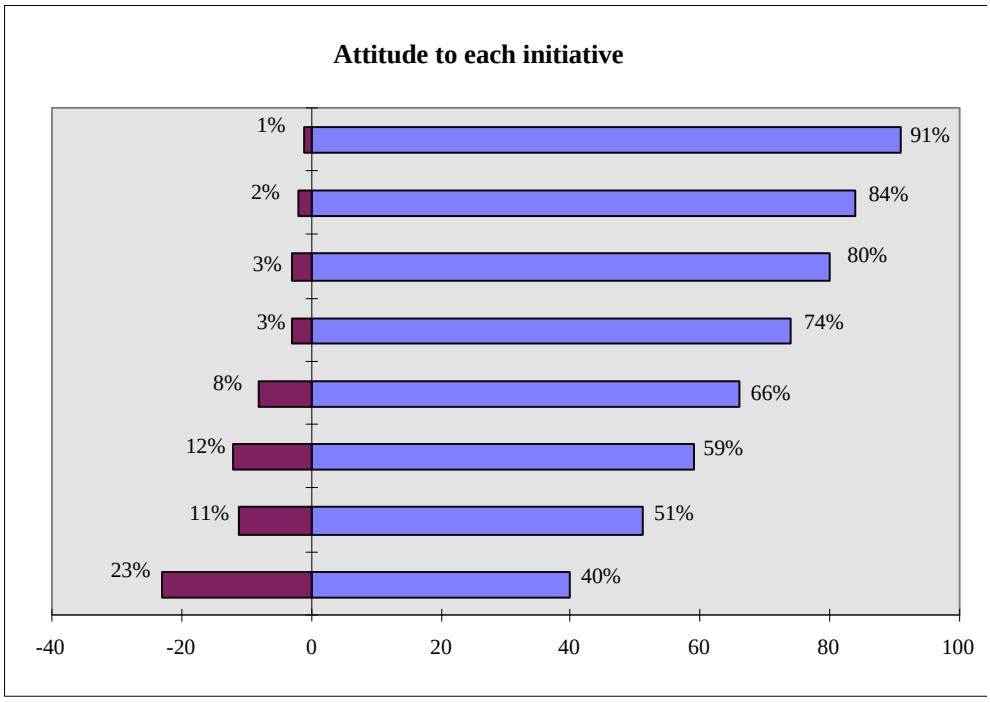
	Do not buy ecological goods	Yes, up to 10 % more	Yes, up to 30 % more	Yes, up to 50 % more	No willing-ness to pay more	Do not know	Not stated	Total
				%				
Total	**28**	**39**	**18**	**5**	**9**	**1**	**0**	**100**
Copenhagen	18	45	27	4	4	2	0	100
Copenhagen Suburbs	17	44	21	9	6	3	0	100
Zealand and the Islands	28	42	19	5	6	0	0	100
Funen	39	35	9	2	13	0	1	100
Jutland	33	34	16	4	11	1	0	100

34. As expected, the two tables containing information on the population's attitudes show that people are more positive towards what is presently "trendy" than what is reflected in their actual actions. People are even ready to pay considerably more for ecological goods - this is difficult to observe in practice. For example, 8% always buy ecological meat and 32% frequently, but today's available supply of ecological meat for sale is not able to meet this demand for ecological meat.

35. However, it is obvious that the interest in buying ecological goods is greater in the Copenhagen suburbs, where the level of education and income is higher.

An attitude survey

36. To obtain an overview, the Danish Council of Technology has conducted an interview-based survey of the initiatives on which consumers would place emphasis, with a view to determining an official food policy. The main results from this survey are presented in the figure below.



Source: Council of Technology

37. The questions and thereby the replies seem partly to reflect a popular attitude among consumers. However, some factors cover the same. A great majority of consumers would like to see complete product information and labelling to ensure "safe food" and to ensure a "high quality" of food products.

38. It is a basic attitude that without any comprehensive descriptions of the food products, it is impossible to choose on the basis of one's own wishes and thereby as political consumer, to have an impact on the supply of goods that is considered to be desirable.

39. The findings from many surveys indicate that attitudes to the composition of food widely depend on one's knowledge of the food products. In many contexts, the unknown is considered as adverse qualities of food products.

40. Genetically engineered products are examples of emotional factors, where work on directly improving the genes are regarded as more dangerous than if they were all changed by nature itself in the desired direction.

41. Irradiated food is also an emotional factor - in other contexts the effects of irradiation are considered to be fatal.

42. In many cases, additives are quite harmless, but some few substances may be noxious, and this is considered sufficient for a general condemnation.

Purposes of the statistics

43. One of the most significant purposes of the statistics is to provide objective information for monitoring food consumption; and the quality of the consumption is concretized in areas that are possible to measure in order to achieve the best possible basis for consumers to be able to choose according to objective criteria and to minimise the emotional factors.

44. Another important purpose is to show an objective trend in food production and to communicate this, so that the decisions taken by the authorities are based on specialist statistical data and are thus not too emotionally inclined, which seems to be a tendency when subjects such as food and the environment are being discussed or when legislation relating to theses areas is being adopted.

References

In addition to data material from Statistics Denmark, the other data sources used are particularly from:

1. National Consumer Agency of Denmark

Ministry for Food and associated institutions, especially the veterinary and food directorate

Agricultural Council of Denmark

2. National Agency of Environmental Protection

Council of Technology

Council of Ecological Farming.
