

Supermarket sales data: a tool for measuring regional differences in dietary habits

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Submitted 15 November 1998; Accepted 8 March 1999

Abstract

Objective: To assess how well supermarket sales data from a major supermarket chain can reflect on regional differences in dietary behaviour by comparing the sales data with the results provided by the annual health behaviour surveys.

Design: Cross-sectional observational study.

Setting: The study was carried out in six Finnish cities situated in different parts of Finland. For the study supermarket sales data of milk, sour milk, fats and oils for 1 month, September 1997, were obtained from eight supermarkets. Proportional sales of different types of dairy products were calculated as well as mean salt and fat per cent and the proportion of saturated fat to total fat. The health behaviour surveys from spring 1995, 1996 and 1997 provided information about dietary habits of the adult population in the cities. The reported use of dairy products was compared with the percentage sales.

Results: The proportional sales of dairy products varied between the cities. In Pori in western Finland the sale of milk fat was highest in all food groups. In Oulu, northern Finland, the sale of non-fat milk was high. In the capital region the sale of oil was highest. Regional differences could also be seen in the survey data. The similarity between the two different datasets was high.

Conclusions: The use of supermarket sales data for assessing regional differences in health behaviour is feasible. The challenge will be to get supermarket managers willing to provide sales data on a routine basis for monitoring and research.

Keywords
Dietary fat
Dietary salt
Sales data
Supermarkets

The main dietary problem in Finland, as in other developed countries, is an excess intake of fat, especially saturated fat, and salt (NaCl) and a too low intake of dietary fibre, fruits and vegetables^{1,2}. In the 1970s Finland had the highest coronary heart disease mortality in the world³. The Finnish diet was then very high in saturated fat (21% of energy) and low in vegetables. Also, the intake of salt was high with a daily intake of 14 g among men and 11 g among women⁴. Finland's high rates of cardiovascular disease (CVD) began to alert public concern; research findings drew particular attention to eastern Finland. This led in 1972 to the onset of the North Karelia Project, a community-based health promotion project aiming to reduce cardiovascular mortality in the population. Since the start of the project a major decline in CVD risk factors has been observed⁵ which has led to a remarkable decline in mortality, first in the province of North Karelia and thereafter in all Finland⁶.

However, the rates of CVD are still high in Finland compared to other European countries. The intake of saturated fat and salt are still above recommended levels. In 1997 the intake of saturated fat was 13% of

energy and the daily intake of salt was 10.5 g among men and 7.2 g among women⁷, while the latest nutrition recommendations, the Finnish Nutrition Recommendations⁸ as well as the Nordic Recommendations⁹, state that the intake of hard fat (calculated as the sum of saturated and trans-fatty acids) should be limited to approximately 10% of energy intake and that the intake of sodium should be reduced to an intake corresponding to 5 g salt per day.

The dietary habits of the Finnish population have been monitored by the National Public Health Institute since 1972 when the first population survey was accomplished. Since then surveys have been done at 5-year intervals. From 1982 to 1992 these surveys were part of the international WHO MONICA project which aims to study the risk factors for chronic disease in the adult population¹⁰. The monitoring system is now called Finrisk and the latest survey was done in 1997¹¹. The National Public Health Institute has, in addition, annually monitored health behaviour of the adult Finnish population since 1978. Among central objectives of this monitoring are dietary habits¹². The surveys also provide information on

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regional differences in behaviour. These surveys, together with the *Nutrition Reports*¹³, that have been produced by the Finnish National Nutrition Surveillance System, offer important knowledge about the dietary habits of the Finnish population.

Another way to get knowledge about the dietary habits of the population are the annual balance sheets for food commodities¹⁴. These balance sheets are compiled in accordance with the classification of the Food and Agricultural Organization of the United Nations. They contain information on annual and daily consumption per capita of the country's most important food commodity groups. The balance sheets contain reliable information especially about food consumption trends for the whole population but they are unable to produce information about regional differences in food consumption.

In supermarkets the relative shelf space of healthier products has been used as an environmental indicator in nutrition interventions¹⁵. Sales data from supermarket chains have provided useful information on regional differences in fat consumption¹⁶ and proportional sales data have been proposed as a possible indirect assessment for population salt and fat intake¹⁷.

The aim of this study was to assess how well supermarket sales data from a major supermarket chain could reflect on regional differences in dietary behaviour by comparing the sales data with the results provided by the annual health behaviour surveys.

Material and methods

Six cities that are situated in different parts of Finland were chosen for the study. Some basic characteristics of these cities are presented in Table 1. In Vantaa, situated next to Helsinki, the population is younger than in the other cities and there are less unemployed. In Pori, a major part of the work force is employed by industry and the education level is rather low. Oulu as well as

Jyväskylä and Joensuu have their own universities and the education level in these cities is higher, particularly in Oulu. Oulu is a growing high technology city in the north of Finland, as can be seen for example from a smaller rate of unemployment than in the other cities outside the capital region. Joensuu is the capital of the North Karelia province and is the heart of the North Karelia project³. Mikkeli is the smallest of the six cities.

In all these cities, supermarkets belonging to the Prisma chain—one of the two leading supermarket chains in Finland—were invited to take part in the study. In two of the cities, Jyväskylä and Vantaa, there were two Prisma supermarkets. In all cities the market shares of Prisma were between 30% and 50%. In Oulu and Vantaa the customers were mainly living in the cities while in the other cities a notable proportion of the customers were from the surrounding municipalities.

For the study, supermarket sales data of milk, sour milk, fats and oils for 1 month, September 1997, were obtained from all eight supermarkets. The food items were identified by their European article number¹⁸. All foods included in the study were sold in prepackaged form; thus the size of the package, the salt and fat per cent and the content of saturated fat could be read from the packages. Missing information was obtained from the manufacturer of the product. Proportional sales of different types of milk, sour milk and fats were calculated as well as the mean salt and fat per cent and the proportion of saturated fat to total fat. As far as possible the sales statistics were grouped in a way that would match the data obtained from the health behaviour surveys. In the two cities with two supermarkets, the sales statistics were combined.

The health behaviour surveys from spring 1995, 1996 and 1997 provided information about dietary habits of the adult population in the six cities. Answers to the questions presented in Table 2 were used. The

Table 1 Demographic characteristics of the six cities in the study

	Joensuu	Jyväskylä	Mikkeli	Oulu	Pori	Vantaa
Area	North Karelia	Central Finland	Eastern Finland	Northern Finland	Western Finland	Capital region
Inhabitants	50 980	76 194	32 847	113 567	76 566	171 297
Age distribution (%)						
0–14 years	18	18	17	19	17	21
15–64 years	69	70	68	70	67	71
65+ years	13	13	15	11	16	8
Education (%)						
any degree	70	70	67	71	60	64
middle degree	53	50	51	50	49	48
higher degree	17	20	16	21	12	16
Work force (%)						
service	72	70	72	72	62	71
industrial	18	21	18	20	28	17
Unemployed (%)	23	21	21	18	23	13

Table 2 The number of respondents, in each city, to different dietary behaviour questions from the annual health behaviour survey

	Joensuu	Jyväskylä	Mikkeli	Oulu	Pori	Vantaa	Total
<i>Questions about fat per cent and type of fat</i>							
What type of fat do you <i>mostly</i> spread on your bread?	97	140	53	205	142	315	952
What type of fat do you <i>mostly</i> use when cooking?	106	163	64	244	154	353	1084
What type of fat do you <i>mostly</i> use for baking?	105	160	60	237	152	344	1058
If you drink milk, what type of milk do you usually drink?	85	125	45	181	121	248	809
<i>Questions about salt</i>							
Do you usually use lightly salted, normally salted or extra salted butter or margarine?	103	154	59	206	145	333	1010

questions had precoded answers and the respondent was asked to check one of the given options. The three annual surveys were pooled together in order to get large enough samples from the six cities. The reported use of different types of milk and fats was then compared with the percentage of sales of the same foods. In addition, regional differences in the use of foods was tested with the chi-square test. The sales of spreads was compared to reported use of spreads on bread; the sales of fats and oils was compared to the reported use of fats and oils in baking and cooking; and the sales of different types of milk was compared to the reported use of milk as a drink. Finally, the sales of fats with different salt percentages was compared to the reported use.

Results

Table 3 presents proportional sales of milk, sour milk and different types of fats and oils. In Oulu, northern Finland, the sales of non-fat milk and low-fat spread was high. Also the sales of lightly salted spreads was high, thus giving Oulu a rather favourable sales profile. In Pori, representing western Finland, on the other hand, the sales of non-fat milk was the smallest and the sales of whole milk was highest—11% of all milk sold. In addition, the sales of butter for cooking and baking and butter–oil spread was highest; 51% and 38%, respectively. For the butter–oil mixture, the proportional sales in Pori were more than twofold compared to the other cities. The proportional sales of oil was highest in Vantaa, representing the capital region. The sales of sour milk did not follow the same pattern as milk. In the smaller rural cities, Joensuu and Mikkeli,

the sales of non-fat sour milk were higher than in the bigger cities. In Pori the sales of the fattiest type of sour milk was, however, highest.

With regard to salt per cent, Mikkeli had the most unfavourable sales profile. The sales of lightly salted spreads and fats was lowest in Mikkeli and, in addition, the 13% sales of extra salted fats for cooking and baking was twice as high as in the other cities.

The differences in the proportional sales between the supermarkets situated in the same cities were small compared to the differences between the cities. In Table 4 the sales data are summarized to mean salt and fat per cent and per cent saturated fat of total fat. Pori's large sales of fattier milk, butter and butter–oil mix can be seen as the highest mean fat per cent of milk and highest per cent of saturated fat of total fat. In the same way the higher sales of non-fat milk in Oulu and oil in Vantaa can be seen as a low mean fat per cent of milk and a lower proportion of saturated fat among fats and oils. Mikkeli's divergent salt profile is clearly visible.

According to the health behaviour surveys there were regional differences in the consumer habits of all the foods. In Fig. 1 the sales data of milk are compared to the data obtained by the annual surveys. The sales of different types of milk follow the same pattern as the reported drinking of milk, although the reported use of non-fat milk is somewhat higher than the proportional sales in all cities. In Joensuu, situated in the middle of North Karelia, the reported use of non-fat milk was, however, considerably higher than the actual sales in the supermarket.

The sales of different types of spreads are compared to the reported use of spreads on bread in Fig. 2. There are discrepancies between reported use and actual

Table 3 Percentage sales of different foods in the eight supermarkets. The sales of the 'healthiest' alternative in each food group are presented as percentage sales of the whole food group

Food group	Joensuu	Jyväskylä (1)	Jyväskylä (2)	Mikkeli	Oulu	Pori	Vantaa (1)	Vantaa (2)
Non-fat milk/All milk	30	30	35	34	51	25	31	33
Non-fat sour milk/All sour milk	61	52	50	56	46	44	41	42
Low-fat spread/All spreads	26	35	35	20	50	26	25	27
Oil/All cooking and baking fats and oil	28	24	28	18	18	17	31	30
Lightly salted spreads/All spreads	41	44	45	32	54	39	39	41
Lightly salted cooking and baking fats/All cooking and baking fats	45	40	43	31	30	32	46	52

Table 4 Mean salt per cent, fat per cent and mean per cent of saturated fat of total fat of the foods sold in the different supermarkets

Food group	Joensuu	Jyväskylä (1)	Jyväskylä (2)	Mikkeli	Oulu	Pori	Vantaa (1)	Vantaa (2)	Total
Milk: fat %	1.24	1.15	1.04	1.13	0.86	1.27	1.10	1.07	1.11
Sour milk: fat %	0.64	0.82	0.88	0.69	0.86	1.09	1.11	1.07	0.86
Fats and spreads: salt %	1.18	1.18	1.15	1.26	1.16	1.19	1.17	1.15	1.19
Spreads: salt %	1.15	1.12	1.10	1.22	1.04	1.13	1.15	1.14	1.14
Fats*: salt %	1.27	1.30	1.26	1.37	1.35	1.31	1.26	1.18	1.30
Fats and oils: saturated fat/total fat	35.3	37.5	35.5	40.5	40.6	42.0	33.7	33.9	37.9
Spreads: saturated fat/total fat	32.7	32.8	32.7	30.9	31.2	34.6	31.8	32.0	32.3

* Fats = butter and margarine used in cooking and baking.

sales. In Mikkeli, especially, the reported use of low-fat spread was considerably higher than the actual sales. Pori's high use of butter–oil mix is, however, very consistent.

The proportional use of fats and oils for baking differed from the proportional use for cooking, according to the health behaviour surveys. Thirty to 40% of the respondents reported using oil in cooking, while in baking the use was below 10%. In Pori the reported use of oil in cooking was lowest. In baking, hard margarine was most frequently used in all cities. Comparing these results with the sales turned out to be difficult as the sales data measure all fats and oils sold, giving no information for what purpose they had been purchased. A consistent finding in both the survey and the sales data was Pori's high proportion of butter–oil mix.

When comparing the sales of fats, classified according to their salt per cent, with the actual sales of lightly, normally and extra salted fats, the figures matched in four of the cities but in Oulu and Mikkeli there were differences. In Oulu the reported use of extra salted fats was 13% while the sales were only 3%; while in Mikkeli the reported use of lightly salted products, 53%, was much higher than the actual sales of 32%.

Discussion

The results of the survey data were based on interviews of random population samples while the sales data were obtained from one supermarket chain. The sales data are a measure of total sales of foods for any

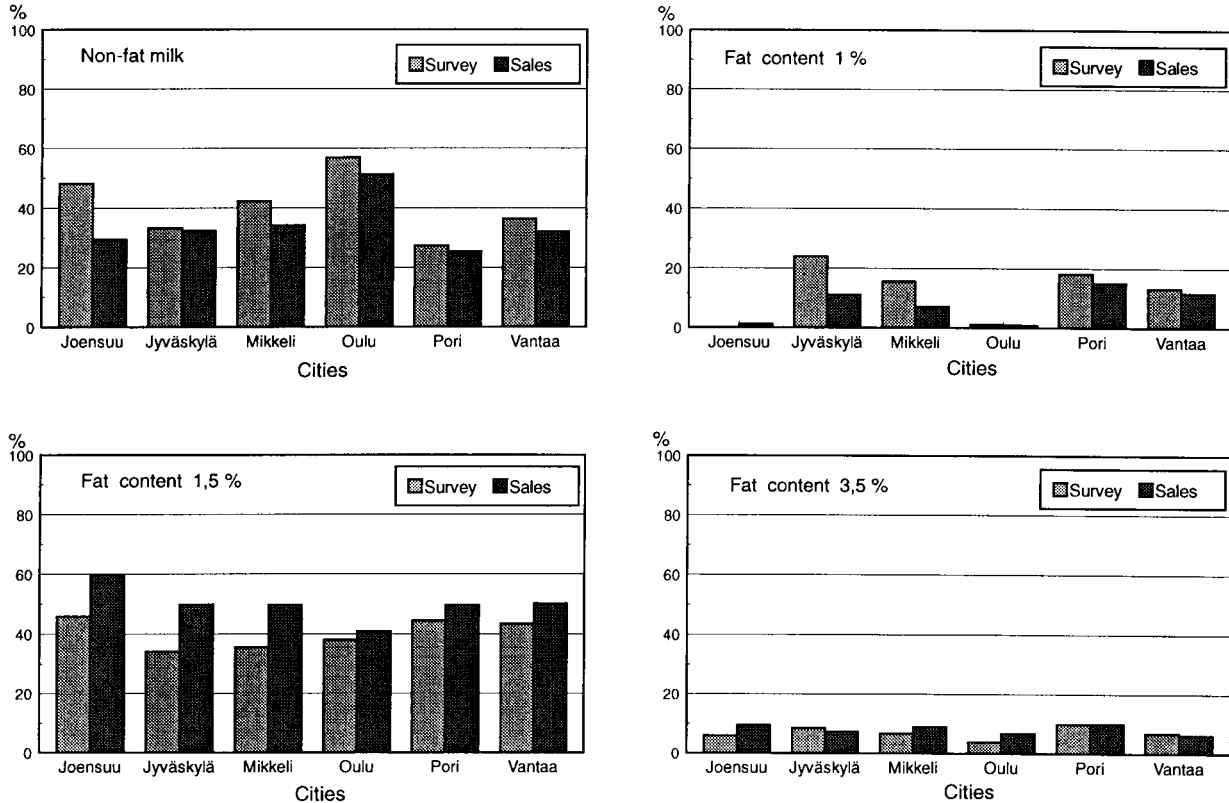


Fig. 1 Proportional (%) use of different types of milk in six Finnish cities according to the health behaviour surveys (data combined for the years 1995, 1996 and 1997) and supermarket sales data

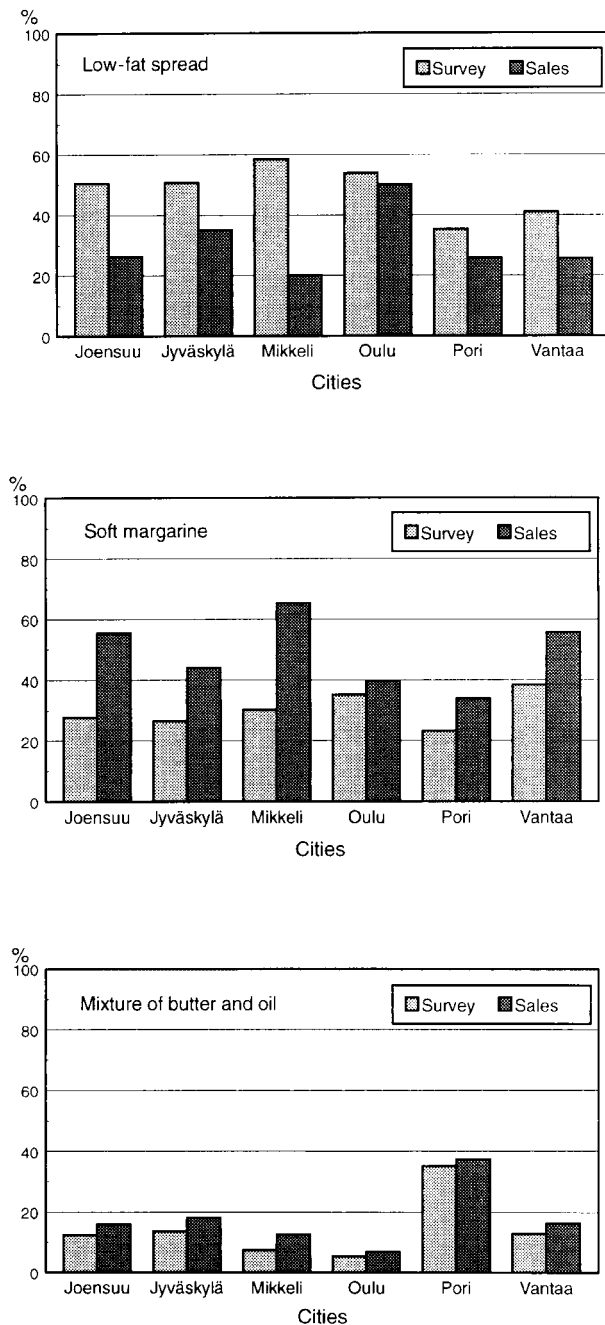


Fig. 2 Proportional (%) use of different types of spreadable fats in six Finnish cities according to the health behaviour surveys (data combined for the years 1995, 1996 and 1997) and supermarket sales data

purpose, while the survey data provide information on reported use of different kinds of foods among the adult population. Keeping this in mind, the similarity between the two different datasets was, in fact, surprisingly high.

Regarding milk, the slightly higher reported use of non-fat milk than the actual sales, might be explained by the fact that the survey asked only about what kind of milk a person drank and not what kind of milk was

used in baking and cooking, while the sales data are a combination of all milk sold. Fattier milk is used more often in baking and cooking than for drinking. The difference in data in Joensuu may be partly explained by the fact that approximately 40% of the customers live outside Joensuu (e.g. farmers) while the survey data concerns only people living in the city.

The similarity of the two different datasets makes it possible to draw several conclusions. Sales data could in the future serve as one possible validation tool for the health behaviour surveys. On the other hand, the good concordance between the two datasets indicates that it might be possible to draw some conclusions on health behaviour by using sales data alone. Supermarket sales data might be especially important in local work among smaller populations because the large health behaviour survey datasets cannot produce reliable data on local health behaviours. In this study, data from 3 years' surveys were combined. Despite the combination, for Mikkeli, the smallest of the cities with 33 000 inhabitants, the number of respondents remained small. Sales data on the other hand are not based on random samples but real statistics on what the people actually buy and presumably consume.

The high consumption of milk fat in Pori could be seen in both datasets. One possible explanation for the high use might be the socioeconomic characteristics of the city¹⁹. In Pori the education level was the lowest and the proportion of industrial workers the highest. In addition, many of the supermarket's customers came from rural municipalities outside Pori. In Oulu the supermarket customers were, on the other hand, mainly people living within the city. In addition, Oulu is the dynamic centre of northern Finland with growing high technology industry which could explain Oulu's favourable health profile. Both phenomena have also been seen in previous surveys¹². The high sales of salty fats in Mikkeli was, on the other hand, a novel finding. One possible explanation for the high sales of salty fats in Mikkeli might be that older people buy saltier fats. As the health behaviour surveys concern only the adult population they are unable to detect this possible phenomenon. Before drawing further conclusions repeated sales data from various food groups and possibly from different supermarkets should be obtained. Despite these limitations, the finding was interesting and can serve as an example of how local supermarket sales data can provide information on how to target local health promotion efforts.

The sales data, of course, do not tell us who consumes the goods bought by the customers. Surveys are needed to produce information on differences in health behaviour among different groups within the population. However, sales data could perhaps in the future also be collected in a way that would identify

different types of customers. Today about 1.5 million Finns have bonus cards for the supermarket chain investigated in this study, which is almost one-third of the whole population. By showing the membership card at the checkouts the customer gets extra bonus. At the same time the automatic cash registering systems registers what this particular customer has bought. When a person becomes a member of the supermarket chain he/she usually fills in a form that contains much information on his/her background, e.g. sex, age, education, profession and number of children. This background data, combined with customer-specific sales data, could produce interesting information about people's behaviour. Obviously before using this kind of data ethical questions and the question of confidentiality, both regarding the customers and the supermarkets, have to be solved. It is an issue for further research to study if and how this kind of data could be used.

In this study data from only one supermarket chain were used. It is possible that the customers of this chain were not representative of the population. In the future it would be interesting to compare supermarkets situated in the same city, but belonging to different chains, to see how big the differences in the proportional sales are between different chains. Also, if sales data in the future are to be used for obtaining information on dietary behaviour, it could be useful to create some simple indicators. Some of the figures presented in Table 4 might be used in this way. With regular follow-up time trends could be produced for monitoring changes.

In conclusion, this study showed that the use of supermarket sales data for assessing regional differences in health behaviour is feasible, although further work is needed. The sales data were in concordance with that of the surveys. The challenge for health promoters will be to get supermarket managers willing to provide sales data on a more routine basis for monitoring and research purposes, and also to inspire supermarkets to incorporate health as part of their own marketing strategy.

Acknowledgements

Thanks are given to the University of Kuopio, Department of Public Health and General Practice. This work was supported by an unrestricted educational grant from Merck & Co., Inc., Whitehouse Station, New Jersey, USA.

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