Sales data of a supermarket – a tool for monitoring nutrition interventions

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Abstract

Objective: The aim of the study was to examine the daily variations in sales data for individual food items in a supermarket and to assess the usefulness of the computerized sales data of supermarkets for reliable monitoring and evaluation of shopping behaviour.
Design: Longitudinal observational study.
Setting: The study was carried out in one supermarket in Mikkeli, Finland. Seventy-nine packed food items from food groups important for salt and fat intake were monitored. In all food groups both 'healthier' and 'reference' products were included for assessment of both direct sales and proportional sales. The sales data were collected daily for 2 months in May and September 1996 by reading the European Article Numbering (EAN) codes of the packed foods.
Results: The proportional sales turned out to be a more stable and useful measure than the direct sales data and the variation remained the same when the monitoring time was increased from 1 week to 1 month.
Conclusion: Proportional sales data are proposed as a tool for measuring the effect of nutrition interventions and also as a possible indirect assessment for population salt and fat intake.

Keywords
Sales data
Supermarket
Dietary salt
Dietary fat

A number of disease prevention and health promotion programmes have tried to reduce the risk of non-communicable diseases such as cardiovascular diseases and cancer[1]. Community-based interventions are an important part of these efforts since the intervention targets, i.e. certain risk-related life-styles, relate to people's social and physical environment[2,3]. Environmental indicators have therefore been suggested as part of these programmes. However, it has not been as easy to find appropriate environmental evaluation measures as it has been to find individual measures, e.g. by surveys.

In supermarkets the relative shelf space of healthier products has been shown to be a useful environmental indicator in nutrition interventions[4–6]. Also, the types and prices of healthier products might be used as an environmental measure[7]. A more specific environmental measure for recording the intake of different foods that could be used in supermarkets would be their sales data.

Sales data have been used in some studies to measure the effect of community intervention programmes[8] and also as an indirect measure of the population intake of saturated fat[9]. Although sales data from computerized supermarkets could provide useful information on the consumption of salt and fat in the community, there are several difficulties[10]: supermarkets might not be willing to give confidential information, and seasonal and daily variation in sales data can make the interpretation of sales data complicated, especially in intervention trials aimed at changing shopping habits.

The primary aim of this study was to examine the daily variations in sales data for individual food items in one supermarket. Another aim was to determine how to collect sales data in order to get reliable information on shopping behaviour.

Material and methods

The study was carried out as an observational study in one supermarket in Mikkeli, a town with approximately 30,000 inhabitants situated in eastern Finland approximately half-way between Helsinki, the capital of Finland, and Joensuu which is in the centre of North Karelia. The size of the supermarket was 6200 m^2. For the study 79 food items, packed by the food industry and belonging to food groups important for their salt and fat content (especially saturated fat), were chosen to be monitored. For the analysis the food items were pooled into 17 groups. Some food items were used in two different groups. In all food groups both 'healthier' and 'less healthy' choices of the same food were monitored in order to get information both of the direct sales (number of items sold or sales in kilograms)

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Table 1 Packed foods of which sales data were measured and grouped into healthier and standard products. A total of 79 products were included in this survey, formed into 17 groups (some products appear in more than one group)

Food groups	N_1*	Food items and package size	Whole group/ same brand	Classification criteria	Reference for 'healthier' product
Milk	5	Pasteurized milk (1 and 1.5 l)	Same brand	Fat %	0 g 100 g^{-1} fat
Yoghurt	26	Fruit yoghurt (1 l)	Whole group	Fat %	0.5 g 100 g^{-1} fat
Ice-cream	3	Vanilla ice-cream (1 l)	Whole group	Type of fat	Vegetable fat based product
Cheese (15 products)					
Cheese 1	4	Hard cheese	Same brand	Fat %	15 g 100 g^{-1}
Cheese 2	2	Hard cheese	Same brand	Fat %	15 g 100 g^{-1}
Cheese 3	5	Vegetable fat cheese	Whole group	Fat %	17 g 100 g^{-1}
Cheese 4	6	Cream cheese	Whole group	Type of fat	Vegetable fat
Fats (18 products)					
Fat 1	4	Spreadable margarine	Same brand	Fat %	60 g 100 g^{-1}
Fat 2	2	Spreadable margarine	Same brand	Fat %	40 g 100 g^{-1}
Fat 3	9	Butter and blend	Same brand	Fat %	40 g 100 g^{-1}
Fat 4	3	Shortening	Same brand	Type of fat	10% saturated fat of total fat
Fat 5	4	Spreadable margarine	Same brand	Salt %	0.8 g 100 g^{-1}
Fat 6	5	Blend	Same brand	Salt %	0.9 g 100 g^{-1}
Fat 7	2	Half-fat blend	Same brand	Salt %	0.7 g 100 g^{-1}
Sausage	2	Frankfurters	Same brand	Fat %	13 g 100 g^{-1}
Bread	3	Crisp bread	Whole group	Salt %	1.7 g 100 g^{-1}
Salt	7	Salt and mineral salt (min. 250 g)	Whole group	Salt %	57 g 100 g^{-1}

N_1* number of products in each group.

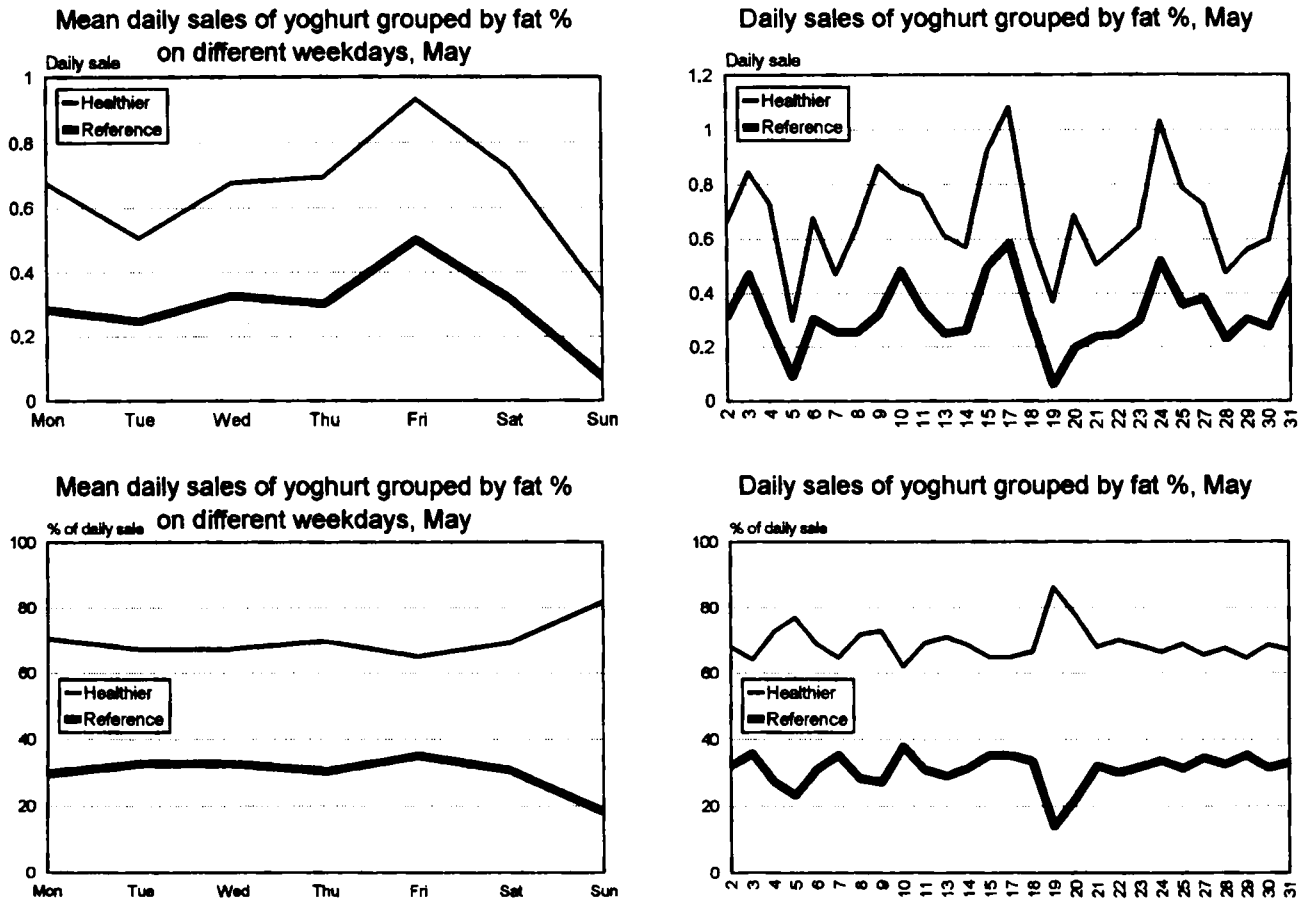

Fig. 1 Daily sales of yoghurt in May

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Table 2 Variations in daily sales data of healthier products in different time spans. The sales data are presented both as direct sales in kilograms and as percentage sales compared to reference products. The variation is measured as coefficient of variation (CV = SD m^{-1})

Food item		Mean daily Sales	CV% (1 week)	CV% (2 weeks)	CV% (3 weeks)	CV% (1 month)
Non-fat milk	kg	1801	22	27	39	38
	%	29	7	5	5	4
Non-fat yoghurt	kg	586	20	22	27	27
	%	69	6	6	8	7
Vegetable fat ice-cream	kg	32	39	32	37	36
	%	49	14	14	16	15
Light cheese 1	kg	13	24	36	41	40
	%	85	4	15	15	14
Light cheese 2	kg	4	35	57	51	59
	%	50	21	38	34	37
Light vegetable cheese	kg	1	34	49	44	72
	%	18	53	59	62	85
Vegetable fat cheese	kg	1	90	96	84	73
	%	2	76	97	90	143
Light spreadable margarine 1	kg	25	34	38	43	46
	%	13	20	15	18	19
Light spreadable margarine 2	kg	6	45	45	46	51
	%	51	29	24	27	31
Light spreadable milk fat	kg	49	18	21	34	36
	%	39	8	8	7	7
Liquid shortening	kg	3	50	55	56	57
	%	7	43	42	48	50
Light frankfurter	kg	6	41	45	52	51
	%	42	18	20	19	22
Lo salt spreadable margarine	kg	44	23	47	53	50
	%	25	12	31	26	23
Lo salt spreadable blend	kg	24	38	37	40	37
	%	32	19	15	14	15
Lo salt spreadable half fat blend	kg	16	34	28	40	39
	%	32	18	20	17	17
Lo salt sour crisp bread	kg	9	36	31	43	42
	%	47	14	16	15	16
Mineral salt	kg	6	42	54	50	51
	%	18	29	40	44	43

and the proportional sales (sales as a percentage of the group). Food items and classification criteria are presented in Table 1.

In supermarkets all food items are coded by the European Article Numbering (EAN) system[11]. The automatic cash monitoring system registers the sales by reading the EAN code of the foods. For packed foods with a standard weight the number of products

Table 3 Daily sales data of milk products in two different months. The sales data are presented both as direct sales in kilograms and as percentage sales of the whole group. The variation is measured as coefficient of variation (CV = SD m^{-1})

Food item		Mean daily sales in May	Mean daily sales in September	CV% 1 month: May	CV% 1 month: September
Non-fat milk	kg	1801	1806	38	29
	%	29	29	4	9
Milk (1% fat)	kg	523	496	37	32
	%	8	8	10	9
Milk (1.5% fat)	kg	3211	3233	37	27
	%	52	52	5	5
Milk (3.5% fat)	kg	682	679	43	28
	%	11	11	22	12

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sold are registered, and for those packed foods with variable weights the sales are registered per kilogram.

The sales data were collected daily from the supermarket's computer for 1 month (1–31 May 1996) on all of the days that the supermarket was open. The data were collected for each food item by reading the EAN code of the product. For each food item included in the study the sales in kilograms or number of food items sold, and the price in Finmarks kg^{-1} was collected daily. In addition the sales data of the same milk products were collected in the same way later in the year (1–30 September 1996). In September the number of customers buying the food items was also assessed daily. The prices of the products remained unchanged throughout the study. May and September were used for data collection because during these months there are no festivals that might alter shopping behaviour. In addition, Finns are rarely on vacation during these months.

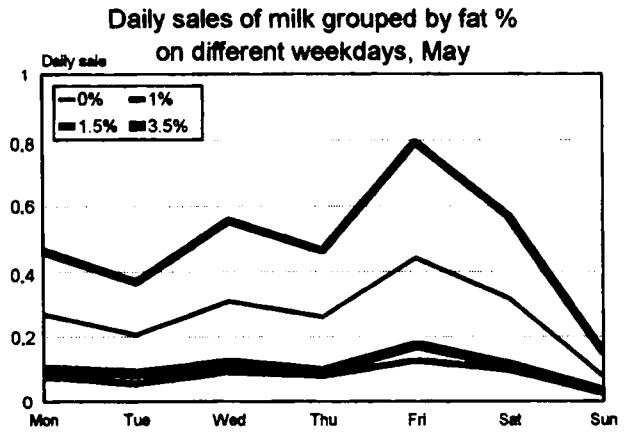
The data were collected by one person (Närhinen). For those products where sales were recorded as the number of food items sold, the data were transformed into kilograms by multiplying by the standard weight of the food items. Means, standard deviations and coefficients of variations were run from the data.

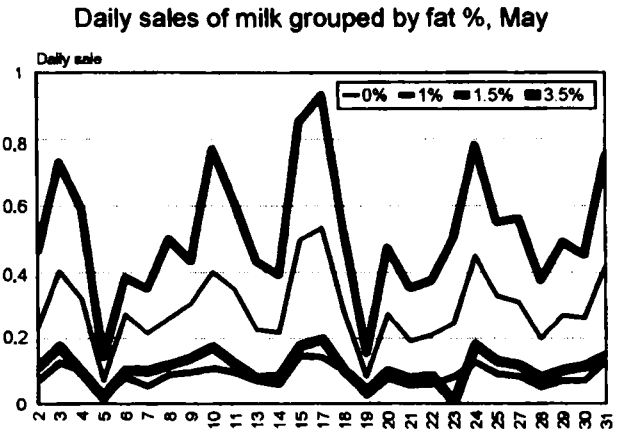
Results

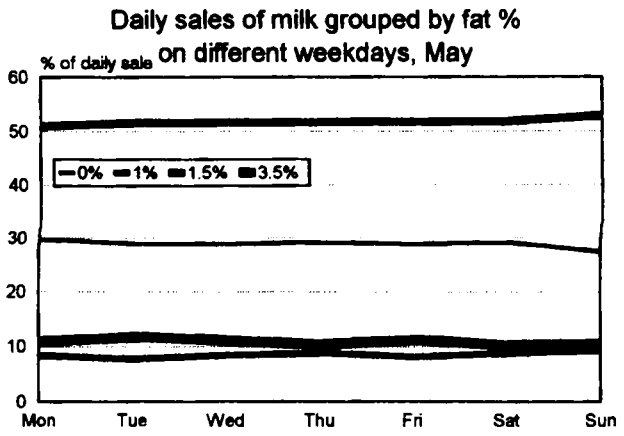
Variations in the daily sales data of the products classified as 'healthier' are presented in Table 2. The variation, measured as coefficient of variation, was generally smaller when the sales were measured as proportional sales compared to the variation in direct sales. This was especially true for those food items with large sales (milk and yoghurt), where the variation was small when measured as a percentage of sales. The variation remained unchanged when the monitoring time increased from 1 week to 1 month.

Table 3 compares the sales data of milk for May and September. The total sales were very similar as were the sales distribution between milk with different fat contents.

Fluctuations in the daily sales in May of yoghurt and milk are presented in Figs 1 and 2. In all food groups (including those not presented here) the proportional sales were more stable and the direct sales were highest on Fridays. In Finland the grocery stores are usually







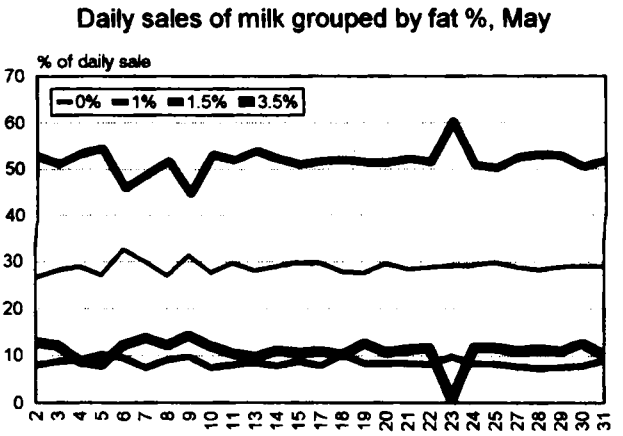


Fig. 2 Daily sales of milk in May

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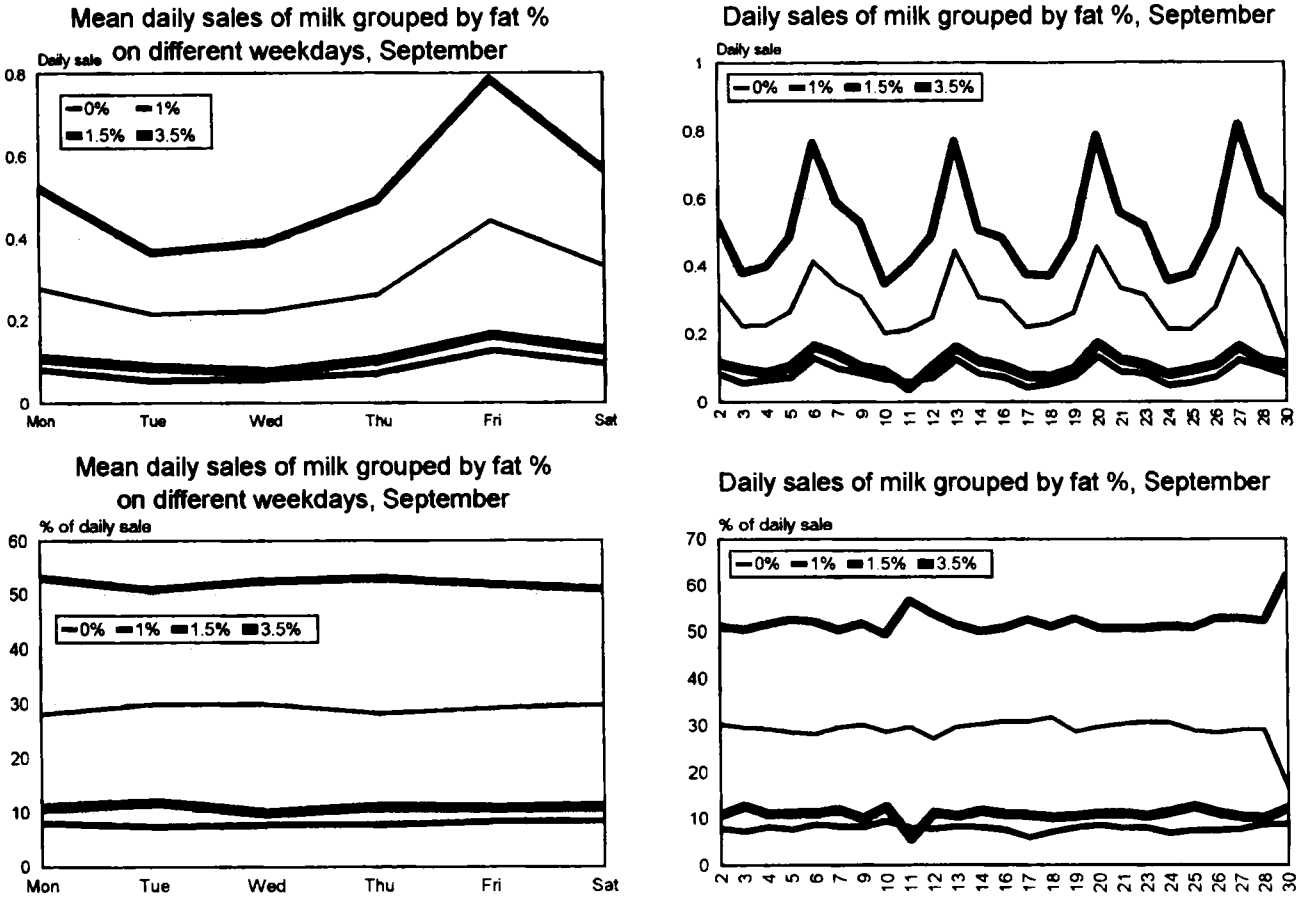

Fig. 3 Daily sales of milk in September

closed on Sundays (though this supermarket was open on Sunday 5 and 19 May).

Figure 3 presents the data for sales of milk in September, when the supermarket was closed on all Sundays. In this month the weekly pattern with the largest sales on Fridays can clearly be seen. The proportional sales in the 2 months also look very similar.

Figure 4 shows the amount of milk each customer purchased in September. The amount was stable except for a slight increase towards the end of the week.

Table 4 Percentage sales of healthier products and mean price of healthier and reference products ($ = US dollars)

Food group	Sales of healthier products (%)	SD	Mean price of healthier products (kg^{-1})	Mean price of reference products (kg^{-1})
Milk	29	1.3	0.56	0.57
Yoghurt	69	5.0	1.0	1.4
Ice-cream	49	7.4	1.9	2.6
Cheese 1	85	11.6	8.6	8.8
Cheese 2	50	18.7	8.9	8.9
Cheese 3	18	14.9	7.6	9.4
Cheese 4	2	2.6	9.4	7.3
Fat 1	13	2.5	2.6	2.6
Fat 2	51	15.7	4.3	4.3
Fat 3	39	2.9	3.6	5.6
Fat 4	7	3.3	3.8	2.3
Fat 5	25	5.8	2.6	2.6
Fat 6	32	4.8	4.7	5.4
Fat 7	32	5.5	3.6	3.6
Sausage	42	9.1	5.0	5.0
Bread	47	7.7	5.4	4.9
Mineral salt	18	7.8	6.2	1.2

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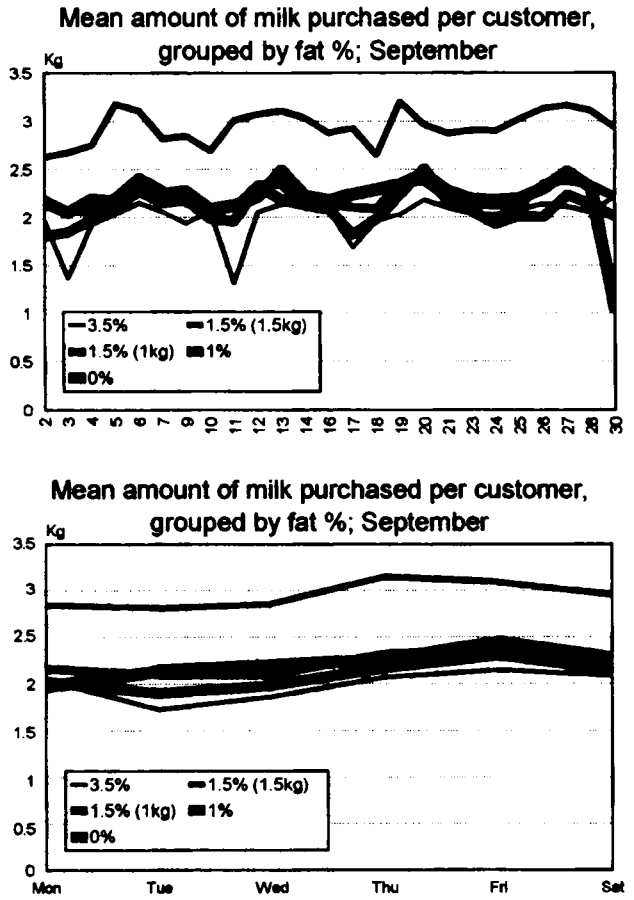

Fig. 4 The amount of milk each customer purchased in September

In Table 4 the mean prices for 'healthier' products and reference products are presented. With the exception of mineral salt compared to ordinary salt, and vegetable fat cheese compared to ordinary cream cheese (cheese 4), the 'healthier' products were somewhat cheaper, or were the same price as, the reference products.

Discussion

Previous studies have shown that sales data are a potential tool for indirect measuring of the population intake of different foods[8]. The daily and seasonal variations must also be taken into account, as well as any fluctuations in price. The price of a product strongly influences sales. Comparing different stores by using sales data has often proved rather complicated[10].

Although it is frequently reported that the sales data vary so much that small changes are usually only random variation, this study shows that when measuring food items in a supermarket the sales data, especially the percentage of sales, are in fact quite stable and follows a particular pattern. The sales data of any given week seems to provide reliable information on the sales of at least those products with significant sales. For example percentage of milk sales remained markedly unchanged over time so that, one could argue, if the percentage sales during a community-based health promotion programme changed, this change might be long lasting or even permanent. This is an issue for further research.

When using percentage of sales it is possible to control for daily and seasonal variations as well as for possible expansion or contraction of the total sales of the shop. To get a picture of the whole population intake in a certain area one would have to measure the sales data in at least all the big shops because it is possible that different shops have different types of customers who make different kinds of purchases. Measuring sales data could also provide different information on the behaviour of the community than that provided by dietary surveys, thus contributing a more comprehensive picture of the nutritional behaviour of people[12].

Sales data are usually considered strictly confidential to the supermarket. The researcher who obtained permission to collect the data was the Chief Veterinarian in Mikkeli and responsible for food control. It is likely that the fact that she was well known to the supermarket made it possible for her to gain access to the data. In future studies, cooperation with food inspection authorities might be a way of gaining access to sales data from grocery stores.

The present study shows that the proportional sales data of a supermarket could be a useful environmental measure for salt and fat intake, although further supportive work is needed. The effects of community-wide health promotion programmes or of small-scale interventions in supermarkets could also be measured by using the sales data of supermarkets.

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