

Effect of Shiftwork on Canteen Food Purchase

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Shiftwork has the potential for altering food intake patterns in ways that may be unfavorable to health. In two industrial plants in the Australian state of Victoria where food had to be brought from home or purchased on the job, the effect of shiftwork on food sources as well as the energy density of food items was assessed. In the steel plant, employees on the afternoon shift had relatively more principal eating occasions on the job than did day or night shift workers. The canteen did not cater adequately for the meal needs of employees, who used the vending machines to a greater extent when on the afternoon shift than on other shifts. In the aluminum plant, workers who depended on food from home alone ate relatively less energy-dense foods than did workers who included canteen foods in their diets. Use of lower-energy density items was greater on the day shift than on the afternoon shift, and in turn was greater on that shift than for the night shift. After a one-year nutrition education program, the use of lower-energy density items increased on the day and night shifts. Thus, it was found that food usage could be influenced not only by shiftwork, but also by the food facility available on site and by a nutrition education program.

There is a growing recognition of the potential health risks that shiftwork may pose.¹ Shiftwork can alter eating patterns in several ways. Workers may not be able to eat with their families regularly. Food and beverages may be ingested during the day and night. Access to food on the job may be more difficult, or at least different, on their various shifts. Under these circumstances, the role of the works canteen on food choice may be quite important.

In this study two metal industry plants with somewhat different systems for on-site food service were examined. Each plant was situated such that workers were required either to bring food from home or to purchase it on site

(Table 1). In both locations there were day, afternoon, and night shifts.

Methods

The steel plant employed 1,700 workers and the aluminum plant employed 1,600 workers at the time of the studies.

The types of workers at each site were similar, including semiskilled laborers, tradesmen, and technical, professional, and administrative staff. Most of the shiftworkers were employees in the first three occupational categories. Less than 10% of the study populations were women.

The continuous operations of the plants were serviced by permanent or rotating shift rosters. Overtime occurred in the event of staff shortages or increased work loads.

In the steel plant, a random selection of subjects from each of the three shifts (day, afternoon, and night) was made. Inquiry about food habits was made by questionnaire. Of 298 questionnaires completed, 267 were acceptable, resulting in a study group of 85 day, 95 afternoon, and 87 night shift employees. Workers were asked to indicate what they regarded as the principal eating occasion (PEO) for a 24-hour period.

In the aluminum plant, workers volunteered for coro-

Table 1 — Description of the Food Service Systems Operating in the Steel and Aluminum Plants

Steel Industry	Aluminum Industry
Central canteen for shift employees only	Central canteen for all employees
Food available on all shifts	Food available on all shifts
Food available for take away only	Facilities for eating in canteen or taking food away
Satellite canteen operation during day shift only	No satellite canteen available for those studied
Delivery system of food to all work areas	Delivery system of food to all work areas
Food vending facilities in three work areas	No food vending operation

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Table 2 — The Effect of Shiftwork on Food Practices in the Steel Plant

	No.	No. Who Had PEO* at Work	% of Those Who Had a PEO*	Source of PEO* Food		
				% Canteen Vended Only	% Home Only	% Home and Canteen Vended
Day shift	85	8	9	63	25	12
Afternoon shift	95	37	39	30	40	30
Night shift	87	11	13	18	55	27
χ^2 for difference between shifts	...	...	$p < .005$	NS	NS	NS

*PEO indicates principal eating occasion

Table 3 — Sources of Food Eaten at Work, Percent of Employees Who Consumed Food From Each Source — Home, Canteen, Vending Machine (Steel Plant)

	No.	Home, %	Canteen, %	Vending Machine, %
Day shift	85	67	44	18
Afternoon shift	95	68	31	38
Night shift	87	82	21	30
χ^2 for difference between shifts	...	NS	$p < .025$	$p < .05$

nary risk factor assessment. Questionnaires were completed by 118 employees who consumed home food only and 67 who partly or exclusively used the canteen. This enabled the relative frequency of use of higher- and lower-energy density foods in these two categories to be examined. Furthermore, canteen users on each of three shifts were surveyed twice, and the purchase of higher- and lower-energy density foods on different shifts was documented. One year later, following a nutrition education program directed at weight control and hyperlipidemia, use of canteen foods on different shifts was again assessed.

Energy density grading was a reflection of the energy level of the meal or food item and of its fat content, since fat is the most energy-dense macronutrient. Meals were defined as episodes of eating that occurred at set times; other eating was regarded as snacking. A main meal was defined as an episode of eating with a core item (meat,

fish, poultry, or egg) and a salad or vegetable. Other meals were described as minor meals. A high-energy core item was one containing either more than 1,057 kJ (kilojoule) or 257 kcal (kilocalorie) or more than 17 g of fat.

A higher-energy density minor meal or snack was one containing either more than 1,642 kJ or 388 kcal or more than 17 g of fat. These assessment figures were based on a distribution of food energy between meals and snacks desirable for a weight reduction and/or lipid-lowering diet.

Results

Steel Plant — The number of employees who had their PEO at work differed significantly between shifts. Thirty-nine percent of afternoon shift workers had their PEO at work, compared with 9% of day shift and 13% of night shift workers (Table 2).

Food was purchased from the canteen by a greater proportion of employees on the day shift than employees on the afternoon shift or on the night shift. More afternoon and night shift employees used a food vending service than did day shift workers (Table 3).

Aluminum Plant — In the aluminum plant, higher-energy density food items were purchased from the canteen more frequently than lower-energy density items. However, higher- and lower-energy density foods were used similarly among home-prepared foods. The use of higher-energy density foods was more evident among canteen purchases than among home-prepared foods, and the reverse was found to be true of lower-energy density foods (Table 4).

After a one-year nutrition education program in the aluminum plant, for both day and night shifts, a significant change away from consumption of higher-energy density

Table 4 — Choice of Higher- and Lower-Energy Density Foods by Consumers of Home Foods and Canteen Users in the Aluminum Plant

Energy Density	Home-Prepared Food, %	Canteen-Purchased Food, %	χ^2 * for Difference Between Home Prepared and Canteen Food Usage
Higher	43	82	$p < .005$
Lower	57	18	$p < .005$

* χ^2 for difference in frequency of use of higher- and lower-energy density foods

Table 5 — Effect of a Nutrition Education Program on Canteen Food Choice in the Aluminum Plant: Percentage Distribution of Lower- and Higher-Energy Density Food Choices Before and After a Nutrition Education Program

Shift	Before Program			After Program			χ^2 Analysis for Difference Between the Years
	No. of Items per 2 Days	Higher Energy, %	Lower Energy, %	No. of Items per 2 Days	Higher Energy, %	Lower Energy, %	
Day, 12.00-12.30 hours	336	68	32	371	59	41	$p < .005$
Afternoon, 17.00-18.30 hours	98	82	18	156	77	23	NS
Night, 6.00-7.30 hours	26	100	0	51	80	20	$p < .005$
χ^2 analysis for difference between shifts	...	NS	$p < .005$	...	$p < .05$	$p < .005$	...

food items and towards the lower category was observed (Table 5).

Discussion

Principal Eating Occasion — The afternoon shift was associated with the greatest frequency of a PEO. This presumably reflects the reduced availability of main meals at home to those working this shift and the desire for identification of such an occasion.

Source of Food Eaten at Work — It is clear that in the steel plant, irrespective of shift, most food items are brought from home. However, for the day shift, the canteen is the next most important source of food after home and more important than for the afternoon or night shift. For the afternoon shift, the vending machine is the next most important source of food after home and more important than for day or night shift. These findings presumably reflect the continuing importance of home foods to men at work and also the influence of the availability of canteen and vending facilities during different shifts. Any program seeking to influence on-the-job food practices would need to take these factors into account.

Energy Density of Foods Eaten at Work — The further importance of consumption of home-prepared foods on the job is borne out by data from the aluminum plant. Higher-energy density foods are used much less frequently when food is brought from home than when it is purchased at the canteen. Of course, this phenomenon may well depend on the kinds of foods available from the canteen.

In the aluminum plant, day shift workers consumed lower-energy density food items in the canteen more fre-

quently than did afternoon shift workers, who, in turn, consumed these items with greater frequency than did night shift workers. In this respect, the night shift worker is the most vulnerable to the types of food available in the canteen.

Effect of Nutrition Education Program — In the aluminum plant an effort was made to help workers control body weight and elevated blood lipid levels through a nutrition education program. After one year of this program, relatively more lower-energy density foods were consumed by employees on the day and night shifts, but no significant change was seen for those on the afternoon shift.

In terms of main meal practice, dependence on vending machines and ability to respond to a nutrition education program, afternoon shift workers seem more vulnerable than those on other shifts.

Footnote

Following these studies, both plants made favorable modifications to their canteen services, in accordance with recommendations made by the consultant.

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Reference

1. Shift Work in Australia — A Study of Its Effects, Department of Science and Technology report. Canberra: Human Relations Branch, Commonwealth of Australia, 1980.