NSW Food Authority

safer food, clearer choices

Domestic Fridge Survey

Summary

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Domestic fridge survey

In 2009, the Authority recorded the temperatures of 57 different domestic refrigerators over the course of a normal weekend, midnight Friday through to midnight Sunday.

The aim of this survey was to investigate the temperature range of domestic refrigerators in NSW and to provide actual use data for consumer education material.

A temperature data logger was placed on the middle shelf of the refrigerator and recorded the air temperature every ten minutes. Each time the door was opened, the time and reason for opening was recorded. Different characteristics of each refrigerator were also recorded such as:

- Age
- Capacity
- Shelf type
- Seal condition
- Distance from stove (no data collected about use of stove)
- Placement of freezer
- No of occupants per household

Information about the make and model of the refrigerator and the contents on the fridge was not collected.

Several refrigerators were also monitored during special events, such as New Year's Eve and Easter celebrations.

Normal use

The average mean, median, maximum and minimum temperature of all refrigerators surveyed over a normal weekend was calculated using excel. Temperatures were then compared on the basis of age and seal condition of the refrigerator.

Average temperatures

Overall, the average mean, median, maximum and median temperatures of the 57 refrigerators surveyed were:

- Mean temp –3.6 °C
- Median temp –3.4 °C
- Maximum temp –7.5 °C
- Minimum temp –1.2 °C

Thirteen (22.8%) refrigerators had a mean and/or median temperature greater than 5.0 °C. Five (8.8%) of these had a mean and/or median greater than 6.0 °C.

The highest recorded mean and median temperature for an individual refrigerator was 9.5 and 9.0, respectively.

Ten (17.5%) refrigerators had temperatures greater than 5 °C for at least two consecutive hours or more. Two of these (3.5%) had temperatures greater than 5 °C for the duration of the monitoring.

Initial analysis of data gathered indicated that age and seal condition had the most influence on the temperature of a fridge. These two characteristics will be discussed in this report.

Age comparison

Of the 57 refrigerators surveyed, 47 provided data on the approximate age of the refrigerator. A summary of the performance of each age category is presented in Table 1. Details of individual refrigerators per age bracket are presented in Figures 1-3.

Table 1: Comparison of refrigerators based on age

age category (years)	number surveyed		age (years)	mean C°	median C°	min C°	max C°
5 years or younger	15	average	2.8	2.6	2.5	0.4	5.5
		range	0.5 to 5	1.0 to 4.7	1.0 to 4.5	–5.0 to 3.5	3.0 to 9.0
between five and ten years	16	average	8.3	3.5	3.3	0.8	7.9
		range	6-10	0.1 to 9.5	0.0-9.0	–4.5 to 8.5	1.0 to 20.5
older than ten years	16	average	15.9	4.3	4.2	1.9	8.1
		range	11 to 24	1.2 to 9.5	1.0 to 8.5	–4.0 to 7.5	3.0 to 20.0

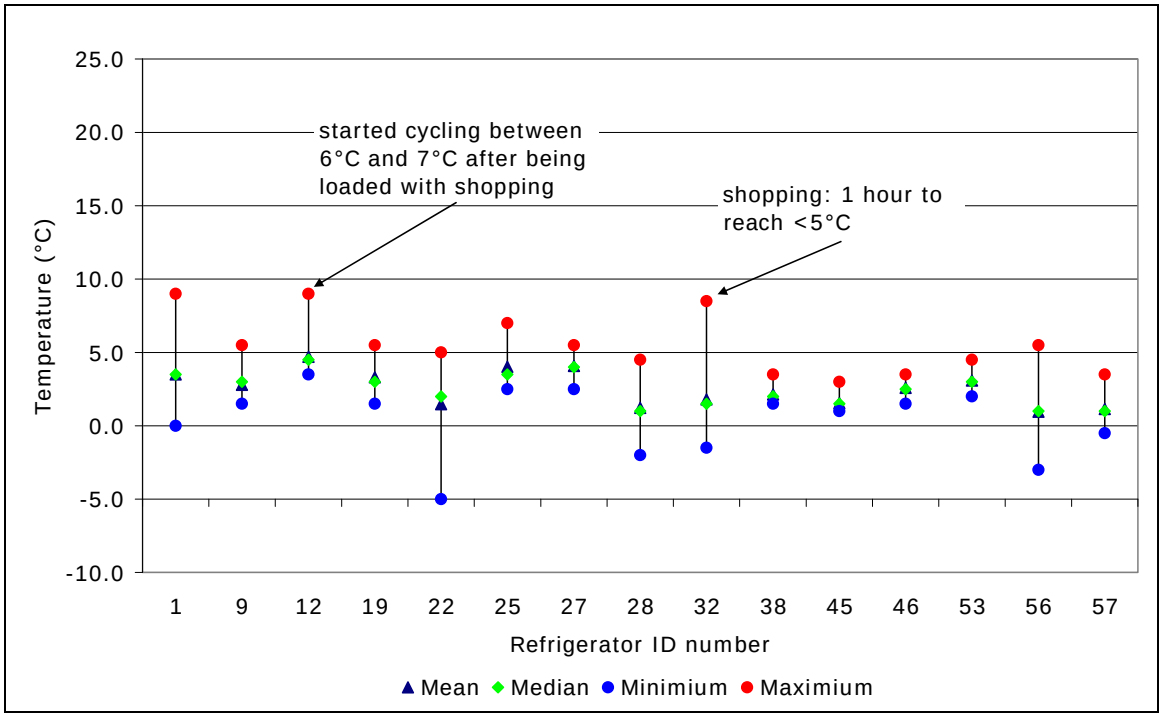

Figure 1: Temperature data for refrigerators five or less years old

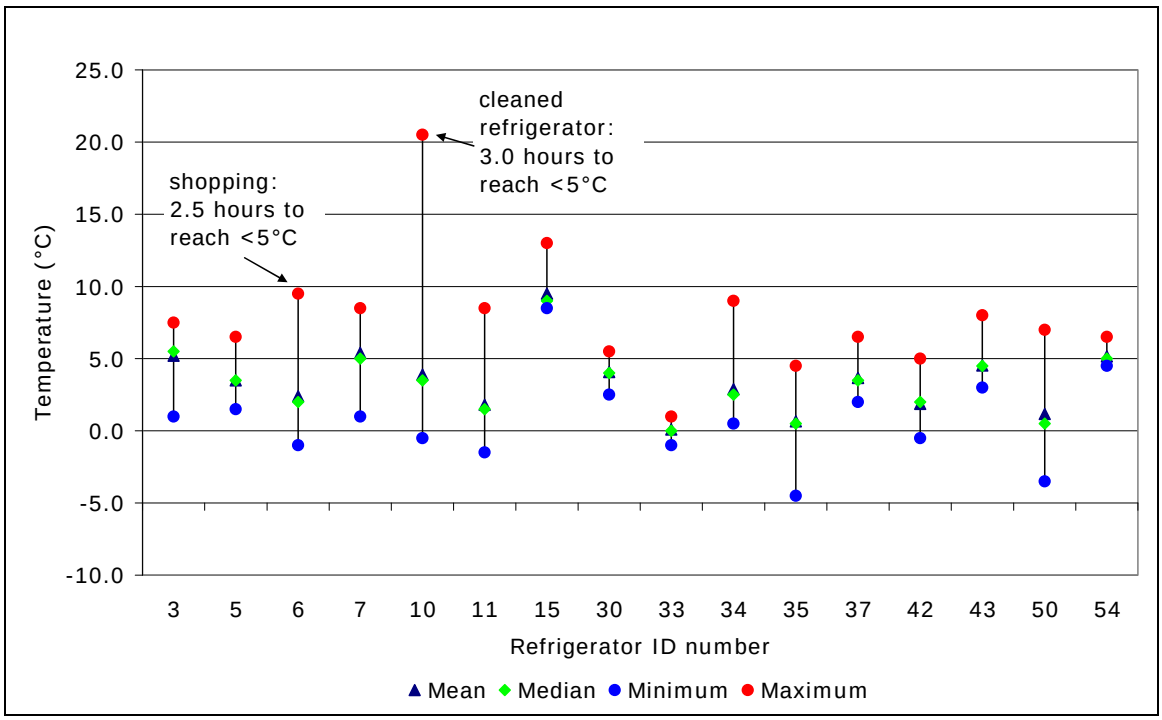

Figure 2: Temperature data for refrigerators between five and ten years old

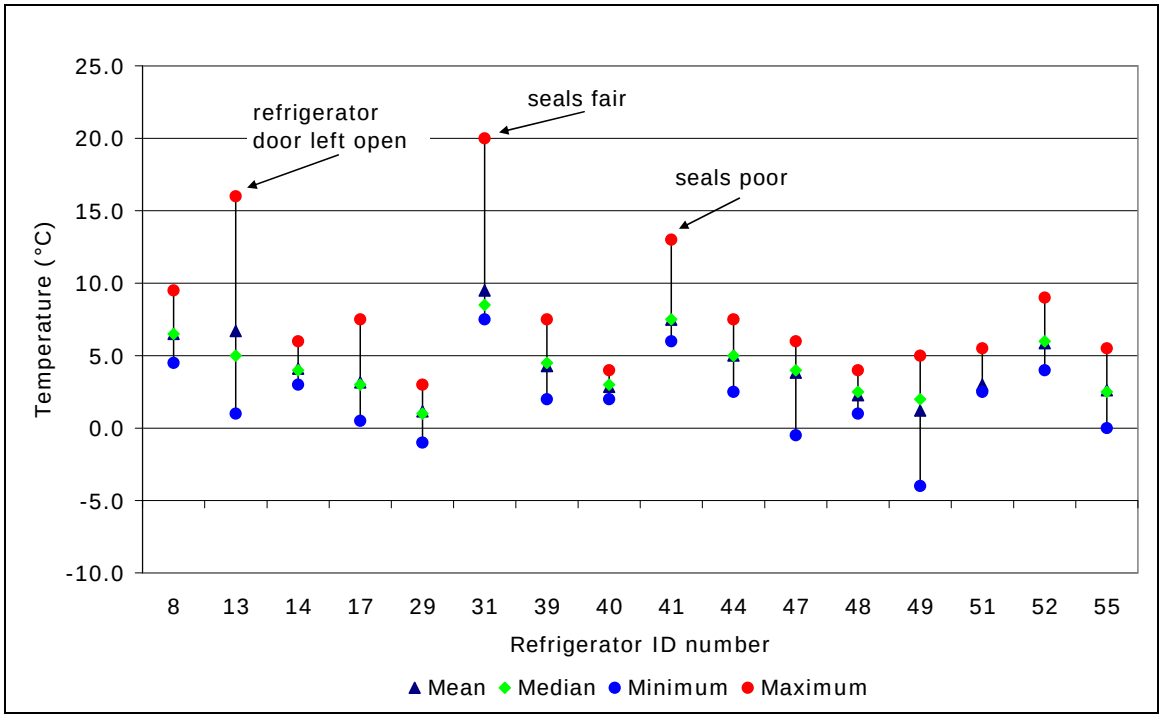

Figure 3: Temperature data for refrigerators more than ten years old

Seal condition

Respondents were asked to indicate whether they thought the seals on their refrigerator were in a good, fair or poor condition. Of the 57 refrigerators surveyed, 48 provided an indication of the condition of their seal. A summary of the numbers and performance of each seal category is presented in Table 2. Details of individual refrigerators according to seal condition, is presented in Figures 4 and 5.

Table 2: Comparison of refrigerators based on seal condition

Category	Number surveyed		age (years)	mean C°	median C°	min C°	max C°
good seals	38	average	8.1	3.4	3.3	1.2	6.7
		range	0.5 to 20	1.1 to 9.5	0.5 to 9.0	–5.0 to 8.5	3.0 to 16
poor or fair seals	10	average	12.7	3.8	3.6	0.8	9.3
		range	5-24	0.1 to 9.5	0.0 to 8.5	–4.5 to 7.5	1.0 to 20.5

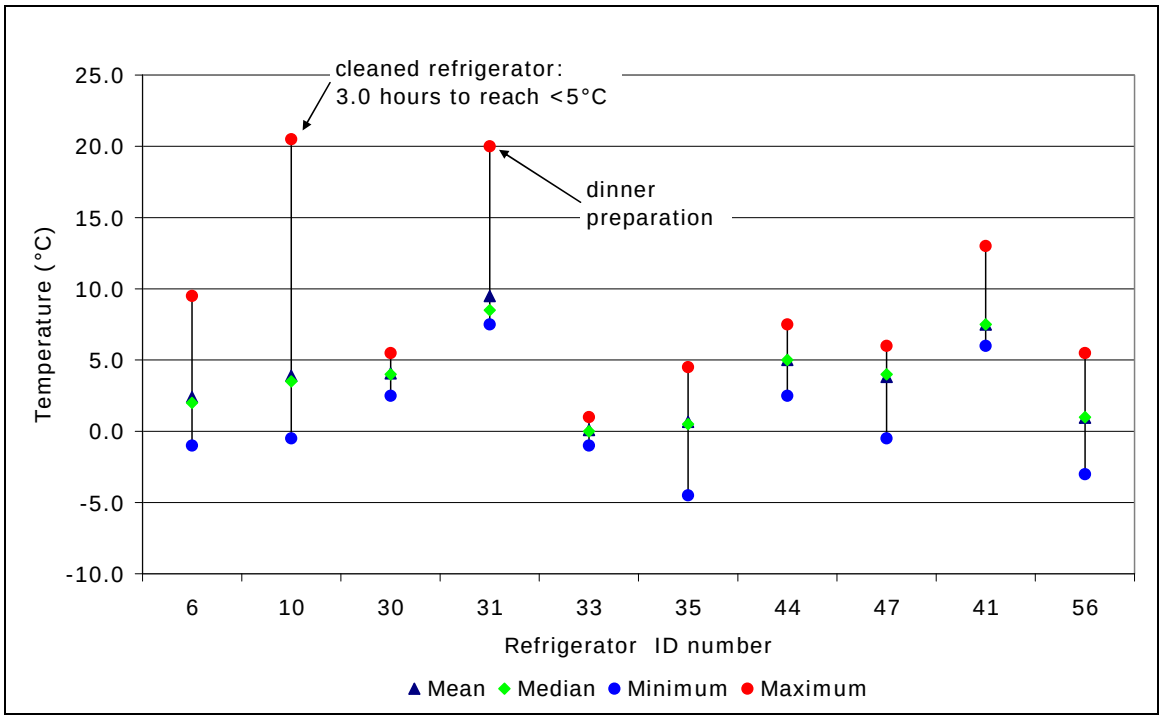

Figure 4: Temperature data for refrigerators with poor or fair seals

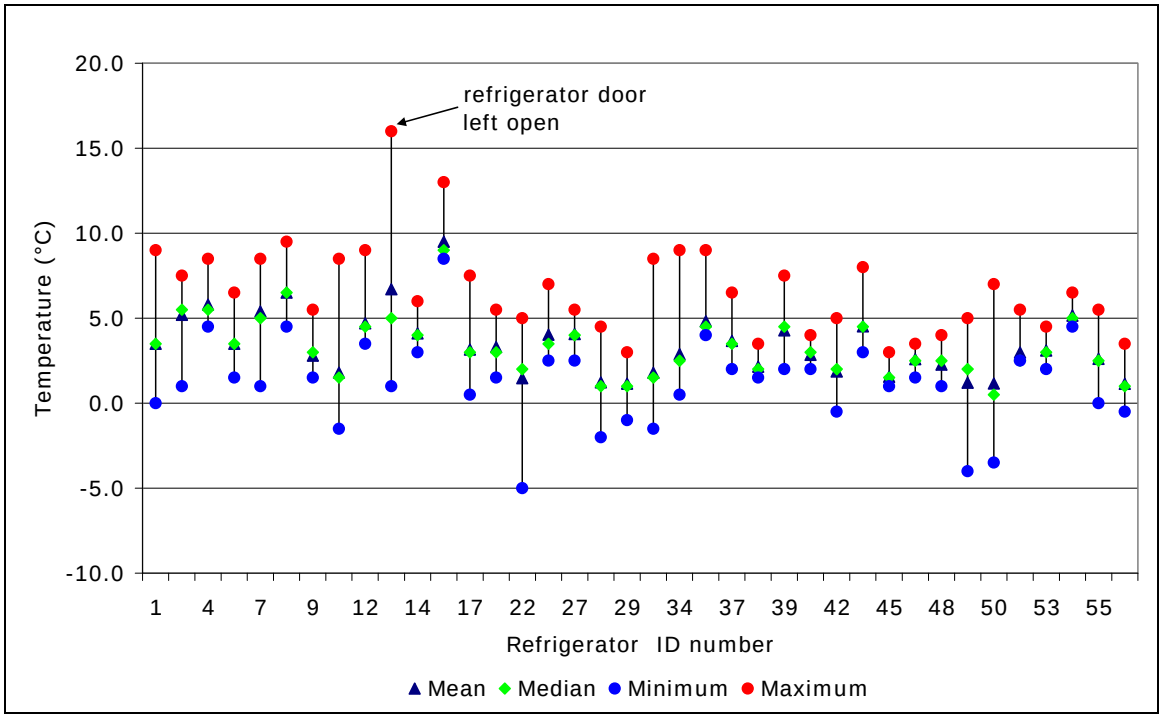

Figure 5: Temperature data for fridges with good seals

Temperature effect of different activities on refrigerators

Certain activities, such as cleaning and loading refrigerators with groceries or leftovers can raise the temperature of refrigerators. Figure 6 and Figure 7 are actual examples of the effect these activities had on refrigerators surveyed.

In Figure 6, the refrigerator featured is 10 years old, with poor seals and solid shelves. During the monitoring period the refrigerator was cycling at an ideal temperature between 3.5 °C and 4.0 °C; with a mean and median temperature of 3.9 and 3.5 respectively. At 7:30am the refrigerator is cleaned resulting in the temperature rising to 20.5 °C. After cleaning is complete, the refrigerator takes three hours to decrease back to 5.0 °C. At 1:30pm, the refrigerator is then loaded with groceries; this increases the temperature to 9.5 °C. The refrigerator then takes seven hours to cool back to 5 °C. Although the temperature of the food was not measured, this sort of poor temperature control can give rise to food being stored at temperatures greater than 5° C for several hours. This provides a window of opportunity for food spoilage and pathogenic bacteria to grow.

In Figure 7, the refrigerator featured is 16 years old, with fair seals and rack shelving. During the monitoring period the refrigerator was cycling between 8.5 °C and 9.5 °C with a mean and median temperature during monitoring was 9.5 and 8.5 respectively; a temperature range outside the ideal range of zero to 5 °C. Already food is being subjected to temperatures where bacteria can grow. At 5:00pm, dinner is prepared and the temperature of the refrigerator increases to 20.0 °C. After three hours and 40 minutes, leftovers are placed in the refrigerator and the temperature rises to 17.5 °C. Not until 5:40am the next morning, does the refrigerator return to pre-dinner temperature of 8.5 °C. Any food stored in this fridge, aside from the refrigerator running at an incorrect temperature range, has been subjected to increased temperatures for a period greater than twelve hours.

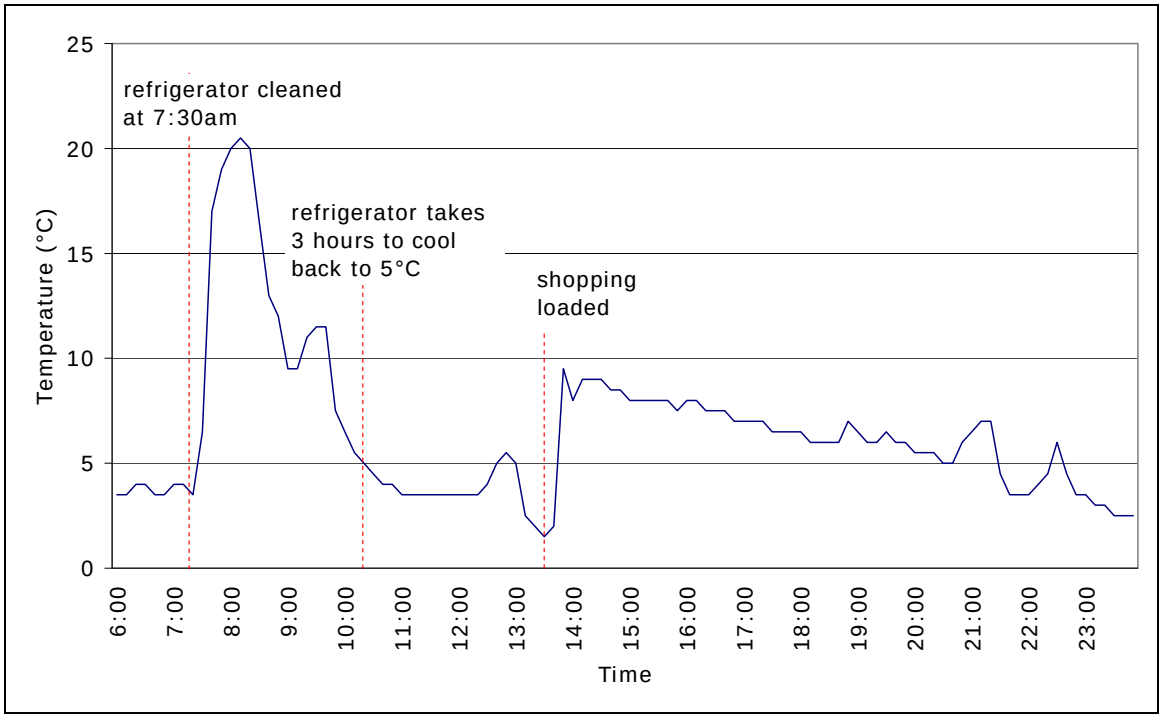

Figure 6: Cleaning and shopping

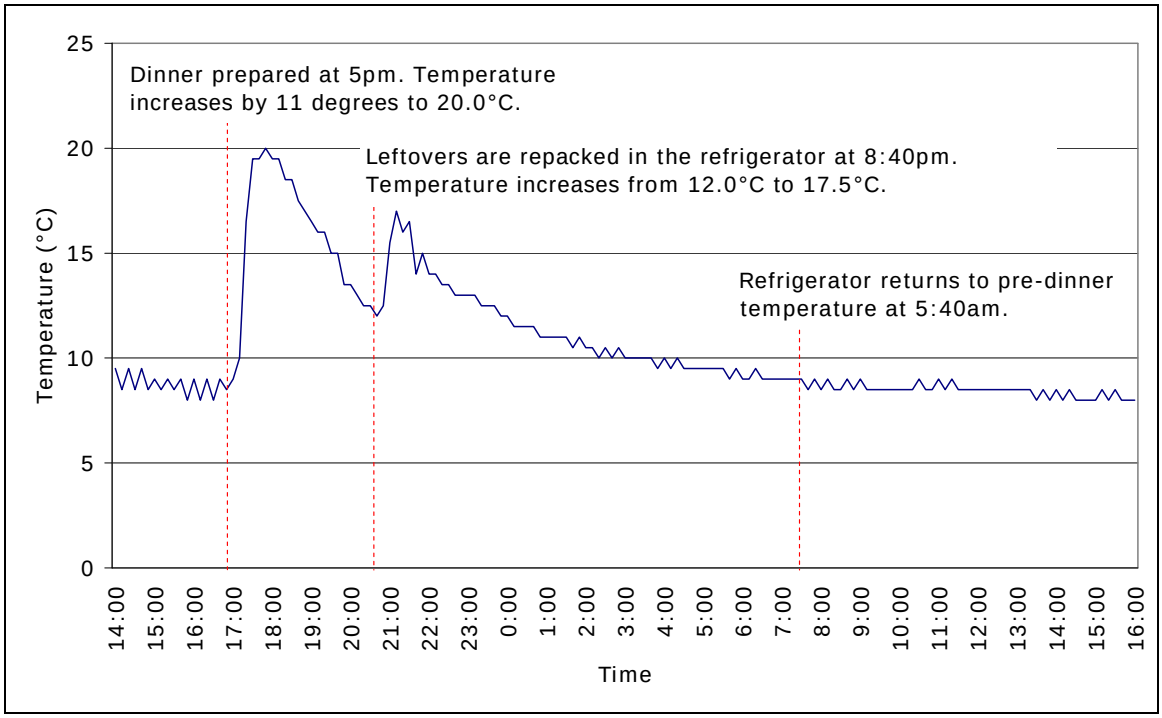

Figure 7: Dinner preparation

Special events

Eight refrigerators were monitored during a special event such as New Years Eve or Easter. Generally there is an increased amount of food placed in a refrigerator as well as an increase in use of a refrigerator during special events eg the door is opened more frequently and left open for longer. Figure 8 is an actual example of the temperature of a refrigerator during a New Years Eve celebrations.

At 1:20pm drinks, which were previously stored at room temperature, were placed in the refrigerator. This resulted in the refrigerator temperature rising from 3.5 °C to 14.5 °C. At 5:40pm the refrigerator had returned to a temperature of 5 °C. Any food being stored in the fridge during this period might have reached temperatures greater than 5 °C albeit for a short period of time.

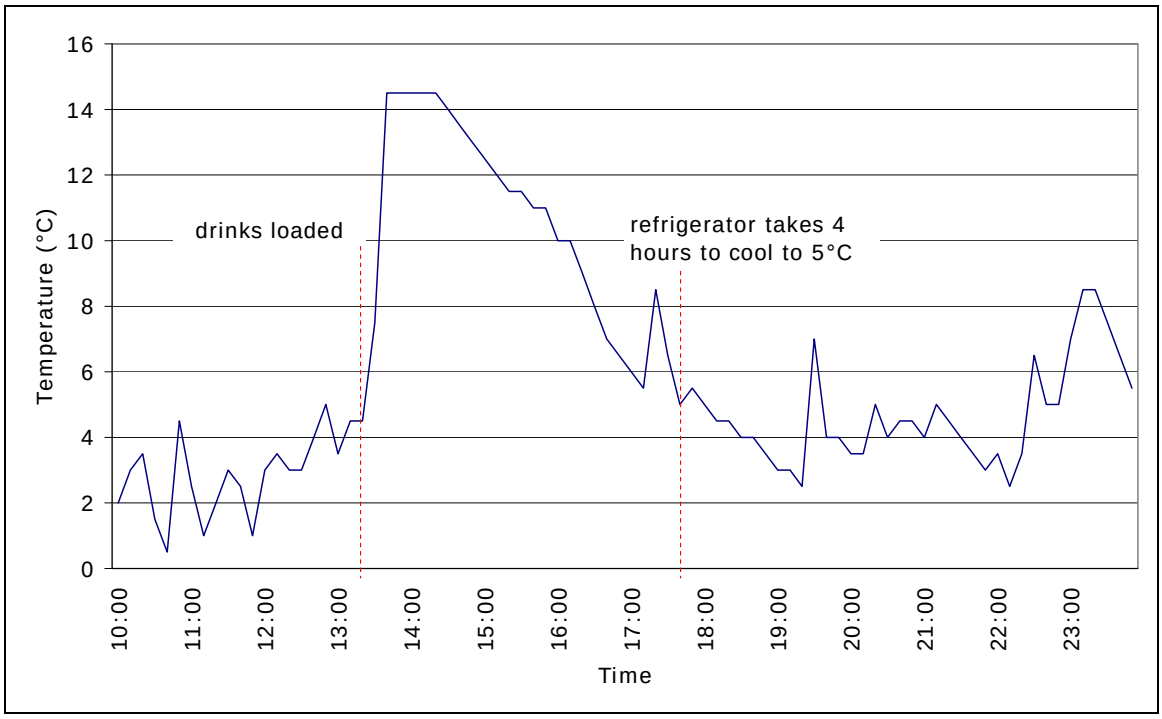

Figure 8: Drinks cooling in the refrigerator for a New Year's Eve party

Concluding comments

Microorganisms can multiply very quickly if food is not stored appropriately. By holding food at temperatures below 5 °C (or above 60 °C) the growth of most microorganisms is slowed or stopped. It is encouraging that the majority of refrigerators surveyed were operating at 5 °C or less during normal household use.

The survey highlighted that under certain conditions such as the loading of groceries into the fridge or during cleaning temperatures can increase and then take several hours to return to the correct operating temperature. Although such activity is unavoidable, limiting the duration or frequency of opening the refrigerator can minimise its impact on temperature rises.

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