A practical approach to monitoring nutrient supplement intake of Australian adults

Mark A. Lawrence, Ingrid H.E. Rutishauser and Janine L. Lewis

Abstract The adoption, in mid-1995, of the revised food Standard A9, which permits the more liberal addition of nutrients to a range of food products, highlighted the need to obtain information on nutrient intake from supplements to complement the 1995 National Nutrition Survey data on nutrient intake from food. This paper describes the method used to obtain quantitative information on nutrient supplement intake and reports on the prevalence of supplement use in different subgroups of the Australian population. Information on supplement intake was obtained in two Australian Bureau of Statistics Population Survey Monitor surveys in August 1995 and February 1996 using the Therapeutic Goods Administration (TGA) registration numbers to identify individual products. Approximately 18% of men and 29% of women aged 18 years and over reported consuming a nutrient supplement on the day before the survey and these proportions increased to 25% and 35% respectively for consumption during the two weeks before the survey. The prevalence of supplement intake increased with age, education level, socioeconomic status, employment status and with fruit and vegetable intake. The substantial proportion of Australian adults who consume nutrient supplements, and the rapidly changing composition of the Australian food supply in response to changes in food regulation, indicate that there is a need for regular monitoring of nutrient intake from supplements. The use of TGA registration numbers to identify supplements provides a practical way to address this need. (Aust J Nutr Diet 2001;58:98–103)

Key words: nutrient supplements, vitamins, minerals, food regulation, monitoring

Introduction

A fundamental purpose of nutrition monitoring activities is to describe the nutrient intake and sources of nutrients in populations. Such description has relevance for informing public health recommendations, clinical guidelines and food regulation. To fulfill their purpose, monitoring activities need to be conducted on a sufficiently regular basis to detect change in dietary behaviour and the effects of revisions to changes in food standards. The accurate description of the nutrient intake and sources of nutrients in populations requires that monitoring activities account for the contribution of nutrients from both food and supplements. In 1995 when revised food Standard A9, which regulates the addition of vitamins and minerals to general purpose food products on sale in Australia, came into effect (1) the then National Food Authority (NFA), now the Australia New Zealand Food Authority (ANZFA), identified the need to put in place a mechanism to collect baseline nutrient intake to provide a basis for evaluating the impact of the regulatory changes. Previous data from national surveys of Australians’ nutrient supplement behaviour (2,3) indicate that a substantial proportion of Australians consume nutrient supplements and that supplement consumption is not uniformly distributed throughout the population, but provide no quantitative data on the contribution of nutrient supplements to the nutrient intake of the Australian population. In addition the National Nutrition Survey (NNS), which was in progress during 1995 and 1996, was designed to provide quantitative data only on nutrient intake from foods and not from nutrient supplements.

In order to document the contribution of nutrient supplements to total dietary intake and to provide a ‘baseline’ for the monitoring and evaluation of revised food Standard A9, a supplement survey to complement the NNS was needed. As a consequence, the NFA commissioned some questions on nutrient supplement use by adults in two Australian Bureau of Statistics (ABS) Population Survey Monitor (PSM) surveys. The PSM provided a vehicle to obtain nutrient supplement intake data ‘contemporary’ with the food intake data collected by the 1995 NNS and before the adoption of revised food Standard A9 had influenced the nutrient composition of the food supply. For the purpose of the present paper nutrient supplements are defined as supplements that contain one or more vitamins or minerals.

Determination of nutrient intake from vitamin and mineral supplements requires a detailed knowledge of the ingredient and nutrient composition of specific supplements. In Australia, vitamin and mineral supplements are classified as therapeutic goods and regulated under the auspices of the Therapeutic Goods Administration (TGA). Most of these products, with a small number of exemptions, must be included in the Australian Register of Therapeutic Goods (ARTG) (4). Products included in the ARTG have an ‘AUST L’ (listed), or an ‘AUST R’ (registered) number which depends on the ingredients as listed on the package. These numbers provide a unique identifier for more than 25 000 dietary supplement products in the ARTG and can, therefore, be used to determine their ingredient and nutrient profile (5). The availability of the AUST L and AUST R numbers provided the opportunity to collect, for the first time, quantitative as well as qualitative data on nutrient supplements in a representative sample of Australian adults.

The present paper provides a description of the method used in the supplement survey and its limitations in identifying specific supplements. Also, we present the

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findings of a descriptive analysis to profile the prevalence of overall supplement use among population subgroups. This analysis did not attempt to identify ‘predictive factors’ associated with supplement use. Quantitative information on the use of specific supplements, e.g. folic acid and vitamin B12, is provided in a separate paper (6).

Methods

Sampling

In 1995 and 1996 the PSM was conducted by the ABS as an Australia-wide, user-funded, quarterly household-based survey. In addition to the specific data on the commissioned questions, users received data on a set of core socio-demographic variables for the household member interviewed for the survey. In the present survey the questions about nutrient supplement intake and knowledge regarding folate were asked of a randomly selected member of the household aged 18 years or over.

The data in this paper were obtained from a total of 5422 randomly selected households in two surveys conducted during August 1995 and February 1996 (7,8). Both surveys took place during the data collection period for the 1995 NNS (9). The August 1995 survey was the first PSM survey scheduled after the adoption of revised food Standard A9. The questions in the February 1996 survey were commissioned in order to try to capture seasonal variation in nutrient supplement use and to ensure that the sample was large enough to permit reliable comparisons of supplement use in population sub-groups. Fortuitously the two PSM surveys used for the supplement survey also included questions on fruit and vegetable intake commissioned as part of an Australian Institute of Health and Welfare project to develop and evaluate indicators for national food and nutrition monitoring (10). As a consequence, the data from the supplement survey could also be analysed in relation to information about fruit and vegetable intake based on responses to questions about the number of serves of fruit and vegetables usually eaten each day.

The PSM covers rural and urban areas across all states and territories of Australia except sparsely settled areas. All usual residents in private households are included in the sampling frame for the PSM but persons living in non-private dwellings are excluded. For the August 1995 survey, 3267 households were visited and completed questionnaires were obtained from 66.2%. In the February 1996 survey form. Before the introduction of the ARTG in 1993, supplement container(s) so that the interviewer could record the AUST L or AUST R number of the product(s) on the survey form. After the introduction of the ARTG in 1993, products purchased overseas and unregistered products did not have an AUST L or AUST R number. For products without an AUST L or AUST R number on the container, the brand name and other relevant product information were recorded. If the container was not available the interviewee was asked to describe the brand and name of the product. Subjects were then asked how many

Data collection

The PSM obtains information from adult members of selected households, in face-to-face interviews, conducted by trained interviewers who have extensive experience in conducting household surveys. Prior to the data collection the user-funded questions are pilot tested on a small sample of the population.

At the initial visit, a household form is completed from information provided by an adult member of the household aged 18 years or over. This form contains questions about the basic demographic characteristics of the household and establishes those persons within the household who are within the scope of the survey (i.e. eligible for specific questions).

In order to obtain a personal interview with appropriate respondents, interviewers make appointments to call-back as necessary. Every effort is made to contact the occupants of selected dwellings. Interviewers make at least three attempts to call back in rural areas and five in urban areas before a dwelling is classified as ‘non-contact’. All interviews are conducted face-to-face either in private or in the presence of other household members according to the wishes of the respondent.

Supplement use

Interviewees were asked: ‘Yesterday, did you take any vitamin or mineral supplements in tablet, capsule or drop form?’ and ‘In the last two weeks have you taken any vitamin or mineral supplements?’ The first of these questions had been included in the 1995 NNS and the second in the 1995 National Health Survey (NHS). The purpose of asking the same questions in the PSM was firstly, to establish comparability with these surveys, and secondly to enable comparisons of other data from these surveys to be made for groups with similar levels of supplement use.

If the person interviewed reported having taken one or more vitamin or mineral supplements during the previous day they were asked, if possible, to provide the supplement container(s) so that the interviewer could record the AUST L or AUST R number of the product(s) on the survey form. Before the introduction of the ARTG in 1993, products purchased overseas and unregistered products did not have an AUST L or AUST R number. For products without an AUST L or AUST R number on the container, the brand name and other relevant product information were recorded. If the container was not available the interviewee was asked to describe the brand and name of the product. Subjects were then asked how many

Table 1. Survey response and sources of sample loss. Values are n (%)

<table>
<thead>
<tr>
<th></th>
<th>August 1995</th>
<th>February 1996</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refusals</td>
<td>367 (11.2%)</td>
<td>457 (9.9%)</td>
</tr>
<tr>
<td>Vacant dwellings</td>
<td>405 (12.4%)</td>
<td>472 (10.2%)</td>
</tr>
<tr>
<td>Uncontactable</td>
<td>250 (7.7%)</td>
<td>340 (7.4%)</td>
</tr>
<tr>
<td>Death, illness or</td>
<td>81 (2.5%)</td>
<td>98 (2.1%)</td>
</tr>
<tr>
<td>language problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed interviews</td>
<td>2164 (66.2%)</td>
<td>3258 (70.4%)</td>
</tr>
<tr>
<td>Total initial sample</td>
<td>3267</td>
<td>4625</td>
</tr>
</tbody>
</table>
Supplement intake
tablets, capsules, drops or spoons of the supplement they had taken yesterday.

Data analysis
All percentages presented in the figures, tables and the text of this paper are population-weighted estimates for the relevant response categories. Estimates have been calculated for the Australian population (18 years and over) as a whole and for demographic subgroups for which differences in supplement intake have previously been reported in the literature (sex, age, location, education and socioeconomic status in terms of quintiles of the index of relative socioeconomic disadvantage (socioeconomic indexes for areas, SEIFA). The SEIFA index is designed to have an average value of 1000 across all collection districts in Australia and a standard deviation of 100 index points (11). In addition, the prevalence of supplement consumption is reported in relation to the usual frequency of intake of fruit and vegetables.

In general, analysis has been limited to population subgroups with a minimum size of 500 individuals in the survey sample. The 95% confidence interval for a proportion based on 500 persons ranges from approximately 3% for proportions close to 15% to approximately 4% for proportions close to 30%. In the tables 95% confidence intervals are shown for all estimates.

Results

Prevalence of nutrient supplement use
Data on the proportion of Australian adults who took one or more nutrient supplements during the day before the survey and during the previous two weeks, by season, are presented in Table 2. Overall 23.8% of the adult population had taken at least one nutrient supplement on the day before the survey and 30.0% had taken at least one supplement during the two weeks before the survey. During winter a slightly higher proportion of the adult population took a supplement, both on the day before the survey and in the two weeks before the survey, than in summer but significantly different from the overall prevalence was for the most disadvantaged group, those in quintile 1 of the index of relative disadvantage, who had the lowest prevalence of supplement intake.

Of the 1349 interviewees who reported consuming a supplement during the day before the survey, there were 541 instances (40.0%) when, despite the use of AUST L and AUST R numbers, additional follow-up was required to identify the nutrient profile of the supplement. In 254 instances (18.8%) it was not possible to identify the nutrient profile of the nutrient supplement reported by the interviewee. Although this problem does not influence the prevalence data because the questions were directly comparable with previous surveys (in which there was no attempt to identify the supplement) it is relevant to the estimation of the contribution of supplements to the total nutrient intake.

The prevalence of supplement consumption increased both with increasing score for an area-based index of relative disadvantage (SEIFA) (Table 4) and with increasing intake of fruit and vegetables (Table 5). In the case of SEIFA, while the trend was for supplement intake to increase with increasing score the only statistically significant difference from the overall prevalence was for the most disadvantaged group, those in quintile 1 of the index of relative disadvantage, who had the lowest prevalence of supplement intake.

The prevalence of supplement intake was least, and significantly different from the average prevalence, both in those who reported the lowest intake of fruit and in those who reported the lowest intake of vegetables (Table 5). Those who usually consumed four or more serves of vegetables each day had a significantly higher than average prevalence of supplement intake but this was not the case for fruit.

<table>
<thead>
<tr>
<th>Season</th>
<th>n</th>
<th>Consumed a nutrient supplement yesterday</th>
<th>Consumed a nutrient supplement in the last two weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter (August 1995)</td>
<td>2164</td>
<td>25.1 (23.3–26.9)</td>
<td>31.4 (29.4–33.4)</td>
</tr>
<tr>
<td>Summer (February 1996)</td>
<td>3258</td>
<td>22.5 (21.1–23.9)</td>
<td>28.6 (27.0–30.2)</td>
</tr>
<tr>
<td>Total</td>
<td>5422</td>
<td>23.8 (22.7–24.9)</td>
<td>30.0 (28.8–31.2)</td>
</tr>
</tbody>
</table>

(a) Subgroups for which the prevalence was statistically significantly different from the overall prevalence are shown in bold.
There was no consistent trend for the prevalence of nutrient supplement consumption with level of education. In those who had a tertiary degree or diploma the prevalence was significantly higher than average while the prevalence was lowest in those who had a trade certificate and not in those without any tertiary qualification (Table 6). The proportion taking supplements was significantly lower than average in the unemployed and significantly higher in those employed part-time (Table 7). Individuals born outside Australia had a significantly lower prevalence of supplement intake than those born in Australia (Table 8). No statistically significant differences in the prevalence of supplement intake were observed with marital status or state of residence. The proportion who consumed a nutrient supplement the day before the survey was 23.9% for those who were married or living in a de facto relationship (n = 1100), and 22.2% for those who had never been married (n = 1069). The proportion of residents in each state who consumed a nutrient supplement the day before the survey was 27.8% (n = 721) in Queensland, 25.8% (n = 681) in South Australia, 24.5% (n = 666 and 502) in Western Australia and Tasmania respectively, 23.1% (n = 971) in New South Wales, 21.8% (n = 542) in the Australian Capital Territory, 21.5% (n = 964) in Victoria and 20.8% (n = 375) in the Northern Territory.

**Discussion**

The findings from the present survey indicate that nearly one in four Australian adults consumed a nutrient supple-

<table>
<thead>
<tr>
<th>SEIFA quintile</th>
<th>n</th>
<th>Consumed a nutrient supplement yesterday</th>
<th>Consumed a nutrient supplement in the last two weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (&lt;932)</td>
<td>1166</td>
<td>19.8 (17.5–22.1)</td>
<td>25.0 (22.5–27.5)</td>
</tr>
<tr>
<td>2 (&gt;932–989)</td>
<td>969</td>
<td>20.8 (18.2–23.4)</td>
<td>26.2 (23.4–29.0)</td>
</tr>
<tr>
<td>3 (&gt;989–1035)</td>
<td>1062</td>
<td>25.7 (23.1–28.3)</td>
<td>32.4 (29.6–35.2)</td>
</tr>
<tr>
<td>4 (&gt;1035–1080)</td>
<td>985</td>
<td>26.1 (23.4–28.8)</td>
<td>33.0 (30.1–35.9)</td>
</tr>
<tr>
<td>5 (&gt;1080)</td>
<td>1240</td>
<td>26.5 (24.0–29.0)</td>
<td>33.2 (30.6–35.8)</td>
</tr>
</tbody>
</table>

(a) Subgroups for which the prevalence was statistically significantly different from the overall prevalence are shown in bold.

**Table 5. Percentage of prevalence and 95% confidence interval for nutrient supplement intake by fruit and vegetable intake**

<table>
<thead>
<tr>
<th>Number of serves per day</th>
<th>Vegetable</th>
<th></th>
<th>Fruit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Consumed a nutrient supplement yesterday</td>
<td>Consumed a nutrient supplement in the last two weeks</td>
<td>n</td>
</tr>
<tr>
<td>One or less</td>
<td>1954</td>
<td>19.3 (17.6–21.0)</td>
<td>26.3 (24.3–28.3)</td>
<td>2655</td>
</tr>
<tr>
<td>Two to three</td>
<td>2587</td>
<td>25.4 (23.7–27.1)</td>
<td>31.5 (29.7–33.3)</td>
<td>2338</td>
</tr>
<tr>
<td>Four or more</td>
<td>879</td>
<td>28.8 (25.8–31.8)</td>
<td>33.4 (30.3–36.5)</td>
<td>427</td>
</tr>
<tr>
<td>No data</td>
<td>2</td>
<td>–</td>
<td>–</td>
<td>2</td>
</tr>
</tbody>
</table>

(a) Subgroups for which the prevalence was statistically significantly different from the overall prevalence are shown in bold.
significant differences between states in the present study although the pattern of supplement use was consistent with that in an earlier Australian study (3) which found that the prevalence was higher than the national average in Queensland and lower in the Northern Territory. Evidence for significant variation in supplement use with season, as reported in some overseas studies (14,19) was also not found in the present study although there was a trend for supplement intake to be slightly higher in winter than in summer.

Despite the important contribution that nutrient supplements can make to total dietary intake, most food intake surveys do not account for nutrients from vitamin supplements (5). Surveys that collect data on nutrient supplements are often limited to qualitative information on supplement use (20). When quantitative data on vitamin supplement intake have been obtained it has been found that supplements make a major contribution to the total intake of certain nutrients, for example vitamins C and E (21). Consequently there is a need to include quantitative information on supplement intake (22,23) as well as food intake in order to determine the total nutrient intake of the population. The failure to collect quantitative data on supplement intake as part of food intake studies is mainly due to the difficulty of determining the nutrient profile and dosage of the specific supplement used from among the very large number of supplement products available in the marketplace. For example the 1995 NNS, despite recognition of the need for such information, did not attempt to quantify the nutrient intake obtained from supplements, primarily due to the additional time and financial costs this data collection would have imposed.

Decision makers in a food regulation setting are increasingly required to make decisions about many public health interventions, such as food fortification, which involve specific nutrients and other ingredients. They need accurate data to inform decision-making associated with the planning and evaluation of interventions to assess total nutrient intakes against both target levels and safety levels for nutrients. The US Food and Drug Administration has identified information on quantitative frequency of use and amount of nutrient in supplements as a priority (24). Elsewhere it has been noted that the growing data requirements of regulatory agencies for analysis related to the regulation of a rapidly changing food supply are outstripping the ability of conventional national food and nutrition surveys to meet these needs (25).

Innovative methods are required to estimate total daily nutrient intakes from food and supplements (26). We believe that the method described in the present paper provides a practical approach to the estimation of total nutrient intake although it has some limitations in relation to the identification of individual supplements.

In 40.0% of instances it was not possible to identify the specific supplement which had been taken without further information. This happened when the supplement container was not available; when the container was available but the interviewee was not sure which supplement had been consumed; when the container did not display the AUST L or AUST R number; or when the recorded AUST L or AUST R numbers did not match those recorded in the ARTG database. Just over half of these cases of missing information could be resolved with additional information. This happened when the supplement container was not available; when the interviewee was not sure which supplement had been consumed; when the container did not display the AUST L or AUST R number; or when the recorded AUST L or AUST R numbers did not match those recorded in the ARTG database. Just over half of these cases of missing information could be resolved with additional information but in approximately 18% of cases it was not possible to identify the nutrient profile of the nutrient supplement reported by the interviewee.

At the time the supplement survey was conducted the AUST L and AUST R system was still relatively new and a substantial number of products in the marketplace had yet to comply with the labelling system. If the survey were to be repeated in 2001 the number of missing AUST L and AUST R numbers would be greatly reduced. In addition, enumerators would be asked to record more detailed information for products without an AUST L or AUST R number to avoid the need for follow-up. In these circumstances the use of AUST L and AUST R numbers to identify supplements in the context of a household survey such as the PSM is likely to provide a relatively time-varying method of supplement identification.
Acknowledgments

The authors wish to acknowledge the generous assistance of the staff at the PSM unit of the ABS in Adelaide who were responsible for coordinating the data collection and providing considerable technical advice for the data analysis. In addition, staff at the TGA assisted the data analysis procedure by providing support with the accessing of the ARTG database.

References