Research Report
On

The dietary intake and body weight status of adolescent psychotropic substance abusers in Hong Kong – an explorative study for improving drugs rehabilitation programme

香港青少年吸毒者的攝食及體重狀況 –

改善戒毒服務的探索性研究

Submitted to

Research Advisory Group

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BACKGROUND

Previous studies showed that drug abuse adversely affects nutritional status.(1, 2) Substance use may affect functioning in the brain to cause mood disorder, which may worsen the appetite.(3) It may affect oral health such as poor chewing strength and thus causes indigestion.(4) A previous study showed that over two thirds of the sampled drug addicts exhibited different levels of anorexic symptoms, and that the mean caloric intakes among both male and female addicts were below 50% of the recommended daily intake.(5) Severe substance abuse was found to be associated with low dietary intakes of vitamin B6, vitamin B12, selenium and zinc.(6) It is not surprising that 76.1% of the hospitalized drug poisoned patients presented unsatisfactory nutritional status.(7) Nutritional deficiency in combination with drug abuse increases the risk of developing metabolic syndrome (or Syndrome X) due to the reduction in energy and antioxidant potential of the body cells.(2) This chronic metabolic disorder has been found to be a risk factor for developing chronic diseases such as diabetes and cardiovascular diseases. Poor dietary intake brings about irreversible harms on the cognitive and physical development among adolescents.(8)

The position statement made by the American Dietetic Association draws attention to improving food and nutrition intake in drug rehabilitation programs, claiming that it would enhance quality sobriety and prevent relapses.(9) Long term nutrition impairment damages the liver and the brain, hence enhances craving responses.(9) It is warranted to provide nutrition education and food nourishment within treatment and rehabilitation programs, especially those providing residential services. It is

warranted to investigate nutritional status among different types of substance users. Previous nutritional studies focused on dietary intakes mainly among Methamphetamine abusers.(2, 10, 11); this study includes other types of substance users.

OBJECTIVES

The study has two objectives:

(1) To investigate and to compare the prevalence of participants' dietary intakes meeting (for beneficial nutrients) or not exceeding (for potentially harmful nutrients) the recommended references and participants being underweight among three groups of adolescents (current substance abusers, institutionalized abstainers and a control group of never-users), after adjusting for background variables.

(2) To investigate factors associated with nutrients intakes, including gender, ketamine use, lifestyle behaviors, weight status and self-perceived health and nutritional status, adjusting for background variables.

RESEARCH HYPOTHESIS

It is hypothesized that current substance users as compared to institutionalized abstainers and members of the control group, would have less ideal nutrient intakes since psychotropic substances may induce a poor appetite. It is further hypothesized that ketamine users would have poorer nutrient intake levels as compared to other

types of substance users due to its influence on taste sensation. Hypothesis whether poor nutrient intake is associated with gender, other life style behavior, self-perceived health and nutritional status and being underweight were also tested.

METHODLOGY

Participants and data collection

There are three groups of participants: current psychotropic substance users who self-reported having used psychotropic drugs for at least once per week during the previous month, institutionalized abstainers and a control group of adolescents who self-reported never having used psychotropic substances. Psychotropic substances considered in this study included Ketamine (K Jai), Methylamphetamine (Ice), Cocaine (Coke), Cannabis (Grass), Ecstasy (E Jai), Nimetazepam (5 Jai), Flunitrazepam (Cross), Triazolam (Blue Gremlin), Midazolam (Blue), Zopiclone (White Seed), LSD (Black Sesame) and Codeine (Robo). Inclusion criteria for all the three groups included being Chinese and of aged not older than 18 years old at the time of the first interview.

A total of 219 eligible adolescent psychotropic substance abusers who were clients of the outreach social workers of three collaborating NGOs which serve youths with behavioral problems were invited by the social workers to join the study. With consent, these participants met twice with our field worker at the activity centers of the participating NGOs. The fieldworker was experienced in social research and was

trained by one of the investigators (TY) on how to collect dietary data. In the first meeting, participants were briefed about the study and granted their written informed consent; face-to-face interview, which included the first dietary assessment was then conducted by the fieldworker at a place with privacy ensured, in the absence of any other people. Body weight and height were measured on-site. The second meeting took place about one week afterwards to complete the second dietary assessment (see Measure) and to clarify any unclear responses obtained from the first interview. To improve reliability, the first dietary assessment was based on a week day and the second one was based on a weekend day.

Seventeen participants completed the first but not the second interview – a total of 202 substance abusers hence completed both interviews and their data were analyzed. Upon completion of the second interview, participants were given a supermarket coupon of HK$150 in value. The interview was anonymous. Participants were guaranteed that the obtained data would be used only for research purpose, and would not be disclosed to any other parties, including the social workers. It was ensured that participation is totally voluntary. Research ethics approval was obtained from the ethics committee of the Chinese University of Hong Kong.

Members of the control group (never-users) were also clients of the social workers of the same three NGOs. Similarly, social workers assisted us to recruit the participants. The consent and interview procedures and setting were the same as those previously described for the group of substance user. With informed consent, a total of 100 controls joined both the first interview and the second interview. They received a

HK$20 cash coupon as a token of appreciation.

Participants of the abstainer group were recruited from three institutionalized drug rehabilitation centers (two centers for males and one for females). There were about twenty abstainers in the female center and respectively 30 and 60 abstainers in the two male centers. In these centers, the course of rehabilitation usually lasts for six to nine months. Some but not all participants entered the center voluntarily; all of them had been admitted to the centers for at least 4 weeks. Fifty abstainers were invited by the staff of the centers to join this study on a voluntary basis; all of them consented to do so and complete both interviews. Participants were told that refusal to join the study would not affect the services they were going to receive at the centers. Similar consent procedures and briefing were provided to the participants by our fieldworkers. No incentives were provided to this group.

Measures

Socio-demographic data were obtained. Participants were asked about types of substance used, their living and dining arrangement and lifestyle behaviors including physical activity, smoking and alcohol drinking. They were also being asked about their self-perceived health and nutritional and weight status and indicated whether they were trying to increase or reduce their body weight.

Participants' dietary intakes were assessed by two separate 24-hour recalls, involved a weekday and a weekend day. Previous studies showed that such a measure has

advantages over the food frequency method and the 3-day food diary on assessing dietary intakes among drug abusers. (12) The body weight status was measured by a portable electronic balance, whilst participants' height was measured by a stadiometer, using standardized procedures.

Nutritional analysis

Data of the two separate 24-hour recalls were analyzed by using the software "The Food Processor Nutrition Analysis V8.0 (ESHA Research, Salem, OR, USA)". Additional recipes were added to the original database to analyze local food items. All resultant nutrients obtained from the two rounds of recall were averaged for data analysis. In this study, the recommended energy intake level was derived from the age-fit and gender-fit Schofield equation, which adjusted for participants' activity level. (13) In addition, five beneficial nutrients (dietary fibre, protein, iron, calcium and vitamin C) and four potentially harmful nutrients (fat, saturated fatty acid, cholesterol and sodium) were considered in assessing participants' dietary intakes. The selection of these items was based on the Diet Quality Index-International (DQI-I) (14) and the Hong Kong population-based food consumption survey conducted during 2005 to 2007. (15) The recommended levels of these nutrients were derived from the age and gender specific US Dietary Reference Intakes values (DRI). (16) The intake of beneficial nutrients was to meet the minimum DRI requirement, whilst potentially harmful nutrients should not exceed the recommended limits.

Statistical analysis

The chi-square test was used to compare differences between males and females. Univariate logistic regression models were fit to investigate the associations between status of substance use (substance users versus controls and substance users versus abstainers) and 1) whether meeting or exceeding the energy or nutrient recommendations, 2) underweight status, 3) self-perceived weight status and whether trying to gain or lose weight. Multiple logistic regression models, adjusting for gender, age, employment status and family income were also fit. Statistical tests were considered significant if $p<.05$. Statistical analysis was performed using SPSS version 16.0 (SPSS Inc., Illinois, US).

RESULTS

Background characteristics

The results are summarized in Table 1. A total of 352 participants completed the two interviews. Amongst the sampled substance users, 75.7% used ketamine; 91.7% were between 13-18 years old; 63.1% were students; 70.4% and 41.8% were current smokers and drinkers respectively and 36.4% of the respondents were underweight.

Participants' intakes of energy and nutrients

The results are shown in Table 2. Only respectively 26.4 % of the males and 21.9% of the females met the recommended energy requirement. Percentages of participants

meeting the recommended level of beneficial nutrient intakes only ranged from 7.1% (dietary fibre) to 61.9% (protein) for males, and from 10.3% (iron) to 42.6% (protein) for females. The percentage of participants keeping their intakes of potentially harmful nutrients below the recommended limit ranged from 37.6% (sodium) to 71.1% (saturated fat) for males and from 57.4% (sodium) to 81.3% (cholesterol) for females. Further breakdowns for the levels of energy and nutrient intakes by various background factors are shown in Table 3 and Table 4.

Comparing dietary intakes and body weight among the three groups of participants

Comparisons between substance users and never-users (controls)

Male substance users were less likely than the male controls to meet the energy intake (20.8% versus 42.6%) and protein intake (46.7% versus 85.2%) standards; the differences were of statistical significance ($p<.05$). The other comparisons made among males and all comparisons made among females, including those for both beneficial and potentially harmful nutrients, were not of statistical significance (Table 5 and 6).

Female substance users as compared to the female controls were more likely to be underweight (56.1% versus 34.8%), though the differences was only of marginal significance (Adjusted OR = 2.06, 95%CI 0.92-4.62; Table 5). Male substance users and male controls did not differ significantly in percentage being underweight (30.0%

versus 35.2%). Among those substance users who were underweight, only respectively 50% and 32.6% of the males and the females perceived themselves to be underweight, whilst 5.6% of the males and 52.2% of the females was even trying to lose weight (Table 5 and 6). There were even 2.8% of the underweight males and 23.9% of the underweight females in the substance user group perceiving themselves to be overweight.

A significantly higher percentage of male controls, as compared to male substance users, perceived themselves to be overweight (30.2% versus 21.7%). No significant between-group difference was found in the percentage of participants trying to lose weight (33.3% versus 25.0% for male controls and male substance users respectively). Female substance users and female controls did not differ significantly in their prevalence of self-perceived weight status and attempts to lose weight (Table 5 and 6).

Comparisons between substance users and institutionalized abstainers

Institutionalized abstainers, as compared to substance users, tended to have higher likelihoods to meet the required standard with respect to beneficial nutrients [females: energy intake (33.3% versus 15.9%), dietary fibre (51.9% versus11.0%), protein (77.8% versus 29.3%), iron (18.5% versus 6.1%), calcium (44.4% versus 8.5%) and Vitamin C (55.6% versus 18.3%); males: protein (87.0% versus 46.7%) and calcium (60.9% versus 13.3%)]. In contrast, lower percentages of abstainers kept their level of harmful nutrients within the recommended limit as compared to the group of substance users [females: cholesterol (74.1% versus 85.4%) and sodium (33.3%

versus 64.6%); males: sodium (8.7% versus 41.7% of abusers)]. The aforementioned comparisons were of statistical significance ($p<.05$) (Table 5 and 6).

Female substance users as compared to female abstainers were more likely to be underweight (56.1% versus 14.8%). Male substance users and abstainers did not differ significantly in percentage being underweight (30.0% versus 30.4%).

As compared with female substance users, a higher percentage of female abstainers perceived themselves to be overweight (65.0% versus 37.8%). No significant differences were found in the percentage for trying to lose weight between these two groups. Male substance users and abstainers did not differ significantly in self-perceived weight status and attempts to lose weight.

Factors associated with energy and nutrients intake among substance abusers

As seen from Table 7, female substance users were more likely than male substance users to keep their cholesterol (85.4% versus 65.8%) and sodium (64.6% versus 41.7%) levels within the recommended limit. In contrast, male substance users were more likely than female substance users to have adequate intakes of protein (46.7% versus 29.3%) and iron (27.5% versus 6.1%). No significant differences were found in percentages meeting the recommendation for intakes of energy, dietary fibre, calcium, vitamin C, total fat and saturated fat when male and female substance users were compared.

Ketamine users, as compared to other substance users, were less likely to meet the requirement for intakes of protein (37.3% versus 46.9%) and iron (16.3% versus 26.5%), but were more likely to have their cholesterol level kept within the recommended limit (75.8% versus 67.3%), after adjusting for background variables. There were no statistical between-group differences regarding the percentage meeting energy requirement and other comparisons made in Table 8.

Adjusted analysis showed that amongst substance users, a higher physical activity level was associated with a lower percentage of keeping cholesterol intake within the recommended limit, whilst alcohol drinking was associated with a higher percentage meeting the iron intake requirement. Smoking was not significantly associated with intakes of energy and nutrients (Table 9). Neither actual nor perceived body weight status was significantly associated with the variables on energy and nutrient intakes (Table 10).

Substance users with good perceived health were more likely than others to meet the recommended levels for intakes of dietary fibre (OR = 4.77) and protein (OR = 3.91) but were less likely than others to keep their cholesterol (OR=0.23) and sodium (OR=0.24) levels within the recommended limits. Similar associations were found between good perceived nutritional status and intakes of energy (OR=6.09), dietary fibre (OR=8.95), protein (OR=4.69), cholesterol (OR=0.28) and sodium intake (OR = 0.13) (see Table 11).

DISCUSSION

One of the main findings is that only respectively 20.8% and 15.9% of the male and female substance users met the daily energy intake requirement. Among male substance users, the level of energy intake was significantly lower than that of the control group (42.6%). Such significant differences were not found among female substance users and female controls (26.1%), possibly because female adolescents might also be keen to control their body weight by eating less. Moreover, only less than half of the male substance users met the protein intake requirement, as compared to 85.2% among the male controls. In addition, only 29.3% of the female substance users met the protein intake requirement, as compared to 45.7% among the female controls though such a comparison was not statistically significant. These comparisons adjusted for background variables, suggesting that substance use may result in inadequate intakes of energy and protein.

Adolescents are undergoing an accelerated phase of physical, intellectual, and emotional development, which requires an adequate supply of energy and nutrients. (17) Protein is particularly essential in the formation of growth hormones and antibodies, which are extremely important to the growth of adolescents. Long-term inadequacy in the levels of energy and protein intake not only would retard adolescents' growth, but would also increase the risk of developing chronic diseases later in their adulthood (18, 19). Such nutritional problems may also enhance the harms caused by substance use.

The poor nutritional status among substance users can be reflected by the high percentages of participants being underweight (56.1% for female substance users and 30% for male substance users). Though such percentages were not significantly different from those of the controls, they warrant our attention. It is seen that respectively 61.0% and 25.0% of the female and male substance users reported that they were trying to lose weight. Among those who were underweight, only respectively 32.6% and 50% of the female and male substance users perceived that they were underweight, and respectively 52.2% and 5.6% were even trying to lose weight. Many substance users were hence unaware of their being underweight, and many underweight female substance users were trying to lose weight, which would result in worse underweighting. Whilst only 6.5% of our female participants were physically overweight, 46.6% of them perceived themselves subjectively to be overweight and 64.2% were actually trying to lose weight. It has been reported that many female adolescents were dissatisfied about their body image – that seems to apply also to female substance users. Previous studies have reported that substance use had been adopted as a means of weight control among some adolescent girls (20). This interpretation of the high percentage of underweighted participants in the substance user group has very important implications for anti-drug campaigns. Future studies to investigate the relationship between body weight, food intake and perceived body image are warranted.

Intakes of other nutrients were also found inadequate. Only 6.1% of the female substance users and 27.5% of the male substance users met the standard for iron intake. Iron deficiency anaemia is extremely common among adolescent girls in Hong

Kong and in other affluent societies. (21, 22) It increases the risk of infection and adverse pregnancy outcomes.(23) Our finding on the low level of dietary iron intake among the female respondents was consistent with those reported in some previous studies. (24, 25) The percentages of male and female substance users meeting the standard of calcium intake were also very low (13.3% and 8.5% respectively). Low calcium intake increases the risk of osteoporosis later in their life and long term deficiency of calcium also causes other health problems such as colorectal cancer (26). Moreover, only 11% and 5% of the female and male substance users met the standard for fibre intake, whilst less than 20% of them met the standard for vitamin C intake, reflecting a very low level of fruits and vegetables consumption. An inadequate fibre intake is associated with a higher risk of colorectal cancer and hyperlipidaemia (27-29). The substance user group and the control group did not differ significantly in the level of intakes for iron, calcium, dietary fibre and Vitamin C, possibly because the control group was also clients of social workers, who were likely to have behavioral problems and unhealthy life styles, resulting in poor nutritional practices. The low levels of nutrient intakes may or may not represent direct effects of substance use but the observations are very much noteworthy, as such inadequacies may aggregate the harmful effects of substance use (2).

In contrast, the institutionalized abstainers were more likely than the substance users to fulfill energy and nutrient intake requirements. Such trends were observed for all energy and beneficial nutrient intakes among females and for the levels of protein and calcium among males. Being institutionalized ensures a good food supply and better dietary habits. Protein intake among abstainers improves substantially as 87% and

77.8% of the male and female abstainers reach the standard for protein intake. It suggests that nutritional problems among substance users are modifiable and could be much improved easily with proper arrangements. Large improvement seems apparent regarding intakes of calcium, dietary fibre, and vitamin C among female abstainers and for calcium intake among male abstainers. There are however, still rooms for improvements as the percentages meeting the standard for fibre, iron and vitamin C, were still very low even among male abstainers. Nevertheless, there is a concern for excessive consumption of potentially harmful nutrients among the abstainers. For instances, sodium and cholesterol intake levels were found to be higher among female abstainers than among substance users. The institutions may be supplying foods of lower nutritional quality to the abstainers. Input of dieticians is warranted. Health literacy on nutritional needs may also need to be improved through health promotion.

Ketamine users, as compared to other substance users, were found to have a lower intake of protein, iron and cholesterol. Ketamine continues to rank on the top of the most commonly used psychological substances in Hong Kong and in other countries (30, 31). To our knowledge, there was no previous study investigating such associations. It is possible that ketamine damages users' taste sensations, causing them to eat less meat, which are sources of protein, iron and cholesterol. (32) Future studies are warranted to look at the impact of different types of psychoactive substances on nutritional problems.

CONCLUSION

This study revealed that adolescent substance users are having inadequate intakes of beneficial nutrients. Energy and protein intakes among male substance users were significantly less than those of the control group. Female substance users are very commonly under-weighted. It is warranted to find out whether substance use has been adopted by some female adolescents as a mean of weight control. Inadequate intakes of other nutrients such as iron and calcium are also prevalent among both male and female substance users. There are worries that the poor nutrition would enhance the harmful effects of substance use.

The institutionalized abstainers were more likely than the substance users to meet the requirements for intakes of beneficial nutrients. This is an encouraging news as it implies that nutritional intakes among substance users are modifiable. Institutions give a steady supply of food and the abstainers improved their dietary intakes. However, the quality of dietary intakes among abstainers could be improved as many of them exceeded the limits of intakes of potentially harmful nutrients, such as cholesterols and sodium. Special attentions should also be given to ketamine users, who tended to have lower intakes of nutrients coming from animal sources. Substance users seem to be aware of their nutritional problems as poorer intakes were associated with poorer self-perceived health and nutritional status.

RECOMMENDATIONS

The following recommendations are provided to social workers who make contacts with non-institutional substance users:

1. Social workers and other stakeholders should be made aware of the high risk of malnutrition and underweight problems among both male and female adolescent substance users. They should be backed up by dieticians and nutritional scientists to serve the dietary needs of their clients better. Social workers should identify such risky cases proactively. Gross observation of the body build-up and outlook appearance is useful in assessing the likelihood of suffering from malnutrition. A sudden drop in body weight (e.g. a drop of five kilograms within two to three months) indicates at least a moderate level of protein-energy malnutrition. Other indicators such as sunken nails and pale and dry hairs should be given attention. Special attention should also be given to males who are not eating enough (low energy intake) or not eating enough proteins.

2. Social workers should be given basic training on nutritional sciences, in order to serve their clients better. They should understand the functions and sources of different nutrients, as well as harms caused by inadequate intake of such nutrients. They should treat malnutrition as a potential problem frequently faced by their adolescent substance user clients. A list of resources for referrals should be made available to those social workers, so that referrals can be made to medical professionals (e.g. dieticians) if necessary.

3. Health education campaigns targeting adolescent substance users should be launched to promote healthy nutrition. The causes of nutritional problems should be explored further by the social workers to see if such could be removed via health promotion.

4. Special attention should be given to the problem of being underweight among adolescent substance users, especially among those female ones. Social workers should explore whether some of their clients are trying to lose weight by means of using substances. Attempts should be made to rectify any misconceptions spotted.

5. According to our results, the most poorly consumed nutrients among adolescent substance users were respectively iron and calcium for female and dietary fibre and calcium for male. Social workers are encouraged to provide suggestions on dietary sources on these nutrients. Health talks targeting adolescent substance users, to be delivered by nutritionists are greatly warranted.

Some suggestions are also given to rehabilitation institutions providing residential service to adolescent substance abstainers:

1. Basic nutrition education should be provided to the abstainers. Through seminars and activities, female abstainers should form correct perceptions on healthy body weight and the importance of nutrients such as iron and protein. A number of free pamphlets are available from the Department of Health.

2. Female substance users need to increase their iron and calcium intakes. Iron is crucial to blood cell formation and thus maintaining of menstrual cycle; calcium is the building block of growing bones. The institutions need to ensure a good supply of these nutrients (e.g. red meat, spinach) in the meals. Calcium mainly comes from dairy products. Low fat milk, yogurt, calcium fortified soy milk and some calcium rich vegetables such as broccoli and cauliflower should be included into the meals.

3. Institutions should keep an eye on the amount of cholesterol and sodium in the meals. Moderately use of salt effectively cut down overall sodium consumption. This can be achieved by a gradual reduction of added salt during food marinating. It is possible to replace salt by other condiments (e.g. vinegar, lemon juice, ginger and garlic). The amount and choice of cooking oil affect cholesterol intake. It is advised that less than two teaspoons of oil should be used per person per meal, including oil used for marination and frying. Oil of plant origin should be used to minimize cholesterol.

4. Amongst male adolescent substance users, the importance of sufficient energy and protein intakes should be emphasized. Energy supplies from food are crucial to male adolescents in view of their growth spurt. Meal time in institution is usually fixed. Supply of between-meal snacks may be considered. Health education should also include learning the short-term and long-term health consequences of inadequate fibre intake and the promotion of eating more fruits and vegetables. Fresh fruits could be provided as a good choice for snack to increase fibre intake. A good supply of

vegetables in main meal is equally important. The meals should also ensure a good supply of both animal and plant proteins by provision of lean meat and soy (soy bean or other soy products), which could minimize dietary fat intake.

LIMITATIONS

There are a few limitations in this study. First, the hidden nature of substance users makes random sampling not feasible. The convenient sampling method introduced selective bias to the sample. Second, the cross-sectional design of this study makes it difficult to assess the causal relationship between some variables. For instance, it is difficult to tell whether better self-perceived health status affect dietary intake of the participants or the other way round. Third, there was no measurement of body composition and biochemical indicators which provide a more comprehensive picture of nutritional status. Fourth, only a few rehabilitation centers were involved and the sample size was very small. Moreover, the control group was also recruited via convenience sampling and may not be comparable to the group of substance users, though statistical adjustments were made.

REFERENCES

1. Virmani A, Binienda ZK, Ali SF, Gaetani F. Metabolic syndrome in drug abuse. Ann N Y Acad Sci2007 Dec;1122:50-68.

2. Virmani A, Binienda Z, Ali S, Gaetani F. Links between nutrition, drug abuse, and the metabolic syndrome. Ann N Y Acad Sci2006 Aug;1074:303-14.

3. Thompson PM, Hayashi KM, Simon SL, Geaga JA, Hong MS, Sui Y, et al. Structural abnormalities in the brains of human subjects who use methamphetamine. J Neurosci2004 Jun 30;24(26):6028-36.

4. Mann JI. Nutrition recommendations for the treatment and prevention of type 2 diabetes and the metabolic syndrome: an evidenced-based review. Nutr Rev2006 Sep;64(9):422-7.

5. Santolaria-Fernandez FJ, Gomez-Sirvent JL, Gonzalez-Reimers CE, Batista-Lopez JN, Jorge-Hernandez JA, Rodriguez-Moreno F, et al. Nutritional assessment of drug addicts. Drug Alcohol Depend1995 Apr;38(1):11-8.

6. Forrester JE, Tucker KL, Gorbach SL. Dietary intake and body mass index in HIV-positive and HIV-negative drug abusers of Hispanic ethnicity. Public Health Nutr2004 Oct;7(7):863-70.

7. Kolarzyk E, Olas J, Janik A, Adamska-Skula M, Pach D. Assessment of nutritional state of alcohol abusers and drug poisoned patients. Przegl Lek1999;56(6):433-7.

8. Freeman HE, Klein RE, Townsend JW, Lechtig A. Nutrition and cognitive development among rural Guatemalan children. Am J Public Health1980 Dec;70(12):1277-85.

9. Anonymous. Position of the American Dietetic Association: nutrition intervention in treatment and recovery from chemical dependency. J Am Diet Assoc1990 Sep;90(9):1274-7.

10. Virmani A, Gaetani F, Binienda Z. Effects of metabolic modifiers such as carnitines, coenzyme Q10, and PUFAs against different forms of neurotoxic insults: metabolic inhibitors, MPTP, and methamphetamine. Ann N Y Acad Sci2005 Aug;1053:183-91.

11. Nazrul Islam SK, Jahangir Hossain K, Ahsan M. Serum vitamin E, C and A status of the drug addicts undergoing detoxification: influence of drug habit, sexual practice and lifestyle factors. Eur J Clin Nutr2001 Nov;55(11):1022-7.

12. Sahni S, Forrester JE, Tucker KL. Assessing dietary intake of drug-abusing Hispanic adults with and without human immunodeficiency virus infection. J Am Diet Assoc2007 Jun;107(6):968-76.

13. De Lorenzo A, Bertini I, Puijia A, Testolin G, Testolin C. Comparison between measured and predicted resting metabolic rate in moderately active adolescents. Acta Diabetol1999 Sep;36(3):141-5.

14. Kim S, Haines PS, Siega-Riz AM, Popkin BM. The Diet Quality Index-International (DQI-I) provides an effective tool for cross-national comparison of diet quality as illustrated by China and the United States. J Nutr2003 Nov;133(11):3476-84.

15. The Chinese University of Hong Kong Department of Biochemistry. Hong Kong Population-Based Food Consumption Survey 2005-2007 Final Report2010.

16. Dietary Reference Intakes Tables. United States Department of Agriculture; Available from: http://fnic.nal.usda.gov/nal_display/index.php?info_center=4&tax_level=3&tax_subject=256&topic_id=1342&level3_id=5140.

17. Spear BA. Adolescent growth and development. J Am Diet Assoc2002 Mar;102(3 Suppl):S23-9.

18. Klesges RC, Klesges LM, Eck LH, Shelton ML. A longitudinal analysis of accelerated weight gain in preschool children. Pediatrics1995 Jan;95(1):126-30.

19. Moller JH, Taubert KA, Allen HD, Clark EB, Lauer RM. Cardiovascular health and disease in children: current status. A Special Writing Group from the Task Force on Children and Youth, American Heart Association. Circulation1994 Feb;89(2):923-30.

20. Cochrane C, Malcolm R, Brewerton T. The role of weight control as a motivation for cocaine abuse. Addict Behav1998 Mar-Apr;23(2):201-7.

21. Eicher-Miller HA, Mason AC, Weaver CM, McCabe GP, Boushey CJ. Food insecurity is associated with iron deficiency anemia in US adolescents. Am J Clin Nutr2009 Nov;90(5):1358-71.

22. Chan SM, Nelson EA, Leung SS, Li CY. Postnatal iron status of Hong Kong Chinese women in a longitudinal study of maternal nutrition. Eur J Clin Nutr2001 Jul;55(7):538-46.

23. Dallman PR. Iron deficiency and the immune response. Am J Clin Nutr1987 Aug;46(2):329-34.

24. Foo LH, Khor GL, Tee ES, Prabakaran D. Iron status and dietary iron intake of adolescents from a rural community in Sabah, Malaysia. Asia Pac J Clin Nutr2004;13(1):48-55.

25. Hoppe M, Sjoberg A, Hallberg L, Hulthen L. Iron status in Swedish teenage girls: impact of low dietary iron bioavailability. Nutrition2008 Jul-Aug;24(7-8):638-45.

26. Huncharek M, Muscat J, Kupelnick B. Colorectal cancer risk and dietary intake of calcium, vitamin D, and dairy products: a meta-analysis of 26,335 cases from 60 observational studies. Nutr Cancer2009;61(1):47-69.

27. Mekki N, Dubois C, Charbonnier M, Cara L, Senft M, Pauli AM, et al. Effects of lowering fat and increasing dietary fiber on fasting and postprandial plasma lipids in hypercholesterolemic subjects consuming a mixed Mediterranean-Western diet. Am J Clin Nutr1997 Dec;66(6):1443-51.

28. Jensen CD, Haskell W, Whittam JH. Long-term effects of water-soluble dietary fiber in the management of hypercholesterolemia in healthy men and women. Am J Cardiol1997 Jan 1;79(1):34-7.

29. Dahm CC, Keogh RH, Spencer EA, Greenwood DC, Key TJ, Fentiman IS, et al. Dietary fiber and colorectal cancer risk: a nested case-control study using food diaries. J Natl Cancer Inst2010 May 5;102(9):614-26.

30. Narcotics Division SB, The Government of the Hong Kong Administrative Region. Newly/previously reported drug abusers by age group by common type of drugs abused (T3). Available from: <http://www.nd.gov.hk/statistics_list/doc/en/t3.pdf>.

31. Bobo WV, Miller SC. Ketamine as a preferred substance of abuse. Am J Addict2002;11(4):332-4.

32. Aguado L, San Antonio A, Perez L, del Valle R, Gomez J. Effects of the NMDA receptor antagonist ketamine on flavor memory: conditioned aversion, latent inhibition, and habituation of neophobia. Behav Neural Biol1994 May;61(3):271-81.

Table 1. Background characteristic of the respondents by gender

Factors	Female (%) (n=155)	Male (%) (n=197)	Overall (%) (n=352)	p for $\chi 2$
Type of respondents				
Drug use status				
Abuser	52.9	60.9	57.4	0.21
Control	29.7	27.4	28.4	
Abstainer	17.4	11.7	14.2	
Type of drug use (among abusers)				
Ketamine abusers	68.3	80.8	75.7	0.04
Non-ketamine abusers	31.7	19.2	24.3	
Socio-demographics				
Age				
9-12	9.0	7.6	8.2	0.53
13-15	43.2	38.6	40.6	
16-18	47.7	53.8	51.1	
Employment status				
Student	63.2	62.9	63.1	0.02
Unemployed	28.4	19.8	23.6	
Working	8.4	17.3	13.4	
Family monthly income				
<$10,000	11.6	12.2	11.9	0.01
$10,001-30,000	20.4	34.8	28.4	
>$30,000	0.0	3.9	2.1	
CSSA	8.2	4.4	6.1	
Don't know	59.9	44.8	51.5	
Body weight status and appetite				
Underweight	42.6	31.5	36.4	
Normal	51.0	51.8	51.4	0.01
Overweight	6.5	16.8	12.2	
Current appetite				
Poor	31.0	24.4	27.3	0.37
Average	38.1	43.1	40.9	
Good	31.0	32.5	31.8	
Daily living arrangement				
Living arrangement				
With family	78.7	83.2	81.2	0.53
In abstainers' centre	16.8	12.7	14.5	
Others	4.5	4.1	4.3	
Cooking arrangement				
Cooking for oneself	9.7	11.2	10.5	0.66
Meal prepared by family member	55.5	59.4	57.7	
Dining out / take away	18.7	18.3	18.5	
Abstainers' centre	14.8	9.6	11.9	

Others	1.3	1.5	1.4	
Lifstyles				
Physical activity level				
Sedentary	9.0	5.6	7.1	<0.001
Light	69.0	40.6	53.1	
Moderate	18.7	36.0	28.4	
Heavy	3.2	17.8	11.4	
Current smoker	67.1	73.6	70.4	0.18
Yes	32.9	26.4	29.3	
No				
Current drinker				
Yes	39.4	43.7	41.8	0.42
No	60.6	56.3	58.2	
Health-related perceptions				
Self-perceived health status				
Poor	37.8	29.8	33.4	0.30
Average	50.0	55.2	52.9	
Good	12.2	14.9	13.7	
Self-perceived nutritional status				
Poor	41.2	33.7	37.1	0.28
Average	48.6	51.9	50.5	
Good	10.1	14.4	12.5	
Self-perceived weight status				
Underweight	14.2	22.2	18.6	<0.001
Normal	39.2	53.9	47.3	
Overweight	46.6	23.9	34.1	
Action on body weight management				
Gaining weight	12.8	27.1	20.7	<0.001
No particular action	23.0	45.9	35.6	
Losing weight	64.2	27.1	43.8	

missing ≤24

Table 2. Energy and nutrient intakes of respondents by gender

	Female (n=155)	**Male (n=197)**	**Overall (n=352)**	**p for $\chi 2$**
Energy (% meeting the reference intake)	21.9	26.4	24.4	0.33
Beneficial nutrients (% meeting the reference intake)				
Dietary fibre	16.8	7.1	11.4	0.01
Protein	42.6	61.9	53.4	<0.001
Iron	10.3	24.9	18.5	<0.001
Calcium	15.5	19.8	17.9	0.30
Vitamin C	24.5	13.7	18.5	0.01
Harmful nutrients (% not exceeding the reference intake)				
Total fat	61.9	58.4	59.9	0.50
Saturated fat	76.1	71.1	73.3	0.29
Cholesterol	81.3	65.0	72.2	0.01
Sodium	57.4	37.6	46.3	<0.001

Table 3. Percentage of respondents meeting the recommendation (energy and beneficial nutrients) and being underweight by background factors

Factors	Being Underweight (%)	Energy (%)	Dietary fibre (%)	Protein (%)	Iron (%)	Calcium (%)	Vitamin C (%)
Socio-demographics							
Age							
9-12 (n=29)	51.7	37.9*	17.2	75.9*	27.6	17.2	17.2
13-15 (n=143)	35.0	28.7	11.2	56.6	18.9	16.1	18.2
16-18 (n=180)	35.0	18.9	10.6	47.2	16.7	19.4	18.9
Occupation							
Student (n=222)	38.3	24.8	11.3	54.5	16.2	18.9	20.3
Unemployed (n=83)	33.7	21.7	12.0	53.0	20.5	16.9	19.3
Working (n=47)	31.9	27.7	10.7	49.0	25.5	14.9	8.5
Family income							
<$10,000 (n=39)	43.6	17.9	2.6	33.3*	15.4	7.7	12.8
$10,001-30,000 (n=93)	37.6	33.3	16.1	63.4	24.7	12.9	16.1
>$30,000 (n=7)	14.3	28.6	0.0	71.4	28.6	14.3	0.0
CSSA (n=20)	50.0	35.0	10.0	55.0	25.0	30.0	25.0
Don't know (n=169)	34.3	20.1	8.9	47.3	16.0	12.4	17.2
Daily living arrangement							
Living arrangement							
With family (n=286)	37.8	23.8	8.7***	49.0***	19.9	12.2***	16.4**
In abstainers' centre / other arrangement (n=66)	30.3	27.3	22.7	72.7	12.1	42.4	27.3
Cooking arrangement (exclude abstainer's centre)							
Cooking for oneself (n=30)	43.3	35.1	16.2**	54.1**	24.3	32.4***	35.1**
Meal prepared by family member (n=202)	40.6	23.2	6.4	49.8	16.7	13.3	14.3
Dining out / take away /others arrangement (n=70)	31.4	21.4	12.9	45.7	21.4	8.6	12.9

*p<0.05; **p<0.01; ***P<0.001 for chi square test; other comparisons were statistically non-significant

Table 4. Percentage of respondents not exceeding the reference intake (harmful nutrients) by background factors

Factors	Total fat *(%)*	Saturated fat *(%)*	Cholesterol *(%)*	Sodium *(%)*
Socio-demographics				
Age				
9-12 (n=29)	44.8	51.7*	79.3	62.1
13-15 (n=143)	61.5	76.9	67.8	43.4
16-18 (n=180)	61.1	73.9	74.4	46.1
Occupation				
Student (n=222)	60.4	75.7	72.5	45.9
Unemployed (n=83)	57.8	68.7	69.9	50.6
Working (n=47)	61.7	70.2	74.5	40.4
Family income				
<$10,000 (n=39)	53.8	74.4	79.5**	46.2
$10,001-30,000 (n=93)	59.1	72.0	60.2	40.9
>$30,000 (n=7)	42.9	42.9	42.9	57.1
CSSA (n=20)	75.0	70.0	75.0	70.0
Don't know (n=169)	58.6	73.4	78.7	50.9
Daily living arrangement				
Living arrangement				
With family (n=286)	60.1	73.4	73.1	50.3**
In abstainers' centre / other arrangement (n=66)	57.6	72.7	68.2	28.8
Cooking arrangement (exclude abstainer's centre)				
Cooking for oneself (n=30)	64.9	73.0	59.5	32.4**
Meal prepared by family member (n=202)	57.6	71.9	74.9	48.8
Dining out / take away /others arrangement (n=70)	64.3	77.1	70.0	58.6

*p<0.05; **p<0.01 for chi square test; other comparisons were statistically non-significant

Table 5. Adjusted odds ratios for nutrient intakes and body weight factors by drug use status (among female respondents)

				Adjusted OR (95% CI)*	
	Drug abuser (n=82)	Abstainer (n=27)	Control (n=46)	Drug abuser vs Control[#]	Drug abuser vs Abstainer[#]
Energy (% meeting the reference intake)	15.9	33.3	26.1	0.65 (0.25-1.70)	**0.28 (0.09-0.83)**
Beneficial nutrient (% meeting the reference intake)					
Dietary fibre	11.0	51.9	6.5	2.17 (0.51-9.21)	**0.07 (0.02-0.24)**
Protein	29.3	77.8	45.7	0.73 (0.32-1.68)	**0.07 (0.02-0.24)**
Iron	6.1	18.5	13.0	0.70 (0.17-2.83)	**0.22 (0.05-0.95)**
Calcium	8.5	44.4	10.9	0.63 (0.16-2.42)	**0.09 (0.03-0.30)**
Vitamin C	18.3	55.6	17.4	1.32 (0.47-3.69)	**0.07 (0.02-0.26)**
Harmful nutrients (% not exceeding the reference intake)					
Total fat	63.4	66.7	56.5	1.79 (0.78-4.13)	0.74 (0.28-1.94)
Saturated fat	76.8	81.5	71.7	1.86 (0.72-4.77)	0.59 (0.19-1.90)
Cholesterol	85.4	74.1	78.3	1.06 (0.38-2.95)	**3.81 (1.10-13.14)**
Sodium	64.6	33.3	58.7	1.01 (0.45-2.30)	**5.22 (1.89-14.38)**
Body weight factor (%)					
Self-perceived underweight	20.7	10.0	4.3	4.29 (0.88-20.82)	3.67 (0.71-18.96)
Self-perceived overweight	37.8	65.0	54.3	0.57 (0.26-1.28)	**0.25 (0.08-0.82)**
Trying to lose weight	61.0	51.9	67.4	0.78 (0.34-1.79)	1.54 (0.61-3.87)
Being underweight	56.1	14.8	34.8	2.06 (0.92-4.62)	**8.85 (2.67-29.31)**
Self-perceived underweight (among those who are underweight)	32.6	33.3	12.5	2.47 (0.44-13.80)	1.53 (0.10-23.12)
Self-perceived overweight (among those who are underweight)	23.9	0.0	37.5	0.57 (0.15-2.19)	N/A
Trying to lose weight (among those who are underweight)	52.2	25.0	37.5	2.20 (0.59-8.20)	4.00 (0.35-46.25)

[#] Reference group; * Adjusted for age, employment status and family income

Table 6. Adjusted odds ratios for nutrient intakes and body weight factors by drug use status (among male respondents)

				Adjusted OR (95% CI)*	
	Drug abuser (n=120)	Abstainer (n=23)	Control (n=54)	Drug abuser vs Control[#]	Drug abuser vs Abstainer[#]
Energy (% meeting the reference intake)	20.8	17.4	42.6	**0.37 (0.16-0.87)**	1.00 (0.30-3.37)
Beneficial nutrient (% meeting the reference intake)					
Dietary fibre	5.0	4.3	13.0	0.68 (0.17-2.68)	1.03 (0.11-9.59)
Protein	46.7	87.0	85.2	**0.10 (0.04-0.28)**	**0.12 (0.03-0.45)**
Iron	27.5	8.7	25.9	0.96 (0.40-2.32)	3.21 (0.69-14.96)
Calcium	13.3	60.9	16.7	0.65 (0.23-1.89)	**0.10 (0.04-0.29)**
Vitamin C	15.8	13.0	9.3	1.69 (0.51-5.58)	1.09 (0.28-4.19)
Harmful nutrients (% not exceeding the reference intake)					
Total fat	64.2	56.5	46.3	1.55 (0.72-3.33)	1.48 (0.58-3.77)
Saturated fat	75.8	65.2	63.0	1.60 (0.70-3.65)	1.72 (0.64-4.64)
Cholesterol	65.8	60.9	64.8	1.08 (0.49-2.41)	1.33 (0.51-3.46)
Sodium	41.7	8.7	40.7	1.24 (0.57-2.68)	**7.16 (1.58-32.47)**
Body weight factor (%)					
Self-perceived underweight	25.0	14.3	17.0	1.30 (0.49-3.40)	2.53 (0.28-23.12)
Self-perceived overweight	21.7	14.3	30.2	**0.39 (0.16-0.98)**	2.17 (0.24-20.05)
Trying to lose weight	25.0	4.3	33.3	0.50 (0.21-1.19)	7.63 (0.96-60.46)
Being underweight	30.0	30.4	35.2	1.01 (0.45-2.28)	0.91 (0.33-2.51)
Self-perceived underweight (among those who are underweight)	50.0	100.0	42.1	0.74 (0.17-3.12)	N/A
Self-perceived overweight (among those who are underweight)	2.8	0.0	0.0	N/A	N/A
Trying to lose weight (among those who are underweight)	5.6	0.0	0.0	N/A	N/A

[#] Reference group; * Adjusted for age, employment status and family income

Table 7. Adjusted odds ratio for nutrient intakes by gender (among substance users only)

	Female[#] (n=82)	Male (n=120)	Adjusted OR (95% CI)*
Energy (% meeting the reference intake)	15.9	20.8	1.54 (0.72-3.30)
Beneficial nutrient (% meeting the reference intake)			
Dietary fibre	11.0	5.0	0.43 (0.14-1.28)
Protein	29.3	46.7	**2.23 (1.20-4.13)**
Iron	6.1	27.5	**6.00 (2.20-16.34)**
Calcium	8.5	13.3	1.56 (0.60-4.04)
Vitamin C	18.3	15.8	0.87 (0.41-1.86)
Harmful nutrients (% not exceeding the reference intake)			
Total fat	63.4	64.2	1.03 (0.57-1.86)
Saturated fat	76.8	75.8	0.98 (0.50-1.93)
Cholesterol	85.4	65.8	**0.29 (0.14-0.62)**
Sodium	64.6	41.7	**0.37 (0.20-0.66)**

[#] Reference group for OR; * Adjusted for age, employment status and family income

Table 8. Adjusted odds ratio for nutrient intakes by whether using ketamine (among substance users only)

	Non-ketamine abuser[#] (n=49)	Ketamine abuser (n=153)	Adjusted OR (95% CI)*
Energy (% meeting the reference intake)	22.4	17.6	0.59 (0.26-1.35)
Beneficial nutrient (% meeting the reference intake)			
Dietary fibre	10.2	6.5	0.69 (0.22-2.23)
Protein	46.9	37.3	**0.49 (0.24-0.98)**
Iron	26.5	16.3	**0.35 (0.15-0.82)**
Calcium	14.3	10.5	0.68 (0.25-1.82)
Vitamin C	20.4	15.7	0.78 (0.34-1.81)
Harmful nutrients (% not exceeding the reference intake)			
Total fat	73.5	60.8	0.56 (0.27-1.16)
Saturated fat	85.7	73.2	0.49 (0.20-1.19)
Cholesterol	67.3	75.8	**2.18 (1.01-4.70)**
Sodium	59.2	48.4	0.77 (0.39-1.53)

[#] Reference group for OR; * Adjusted for gender, age, employment status and family income

Table 9. Adjusted odds ratios for nutrient intakes by lifestyle factors (among substance users only)

	Physical activity			Current smoker			Current drinker		
	Sedentary/ light[#] (n=140)	Moderate/ heavy (n=62)	Adjusted OR (95% CI)*	No[#] (n=7)	Yes (n=195)	Adjusted OR (95% CI)*	No[#] (n=84)	Yes (n=118)	Adjusted OR (95% CI)*
Energy (% meeting the reference intake)	16.4	24.2	1.45 (0.64-3.27)	28.6	18.5	0.63 (0.12-3.49)	20.2	17.8	0.96 (0.46-2.00)
Beneficial nutrient (% meeting the reference intake)									
Dietary fibre	8.8	4.8	0.65 (0.16-2.62)	0.0	7.7	N/A	10.7	5.1	0.46 (0.16-1.38)
Protein	34.3	51.6	1.61 (0.83-3.13)	42.9	39.5	0.94 (0.20-4.45)	34.5	43.2	1.54 (0.84-2.84)
Iron	14.3	29.0	1.65 (0.75-3.64)	28.6	18.5	0.48 (0.08-2.83)	11.9	23.7	**2.66 (1.14-6.22)**
Calcium	9.3	16.1	1.94 (0.73-5.17)	28.6	10.8	0.24 (0.04-1.40)	10.7	11.9	1.04 (0.42-2.57)
Vitamin C	17.1	16.1	1.01 (0.42-2.44)	14.3	16.9	1.19 (0.14-10.37)	13.1	19.5	1.66 (0.75-3.67)
Harmful nutrients (% not exceeding the reference intake)									
Total fat	67.9	54.8	0.52 (0.27-1.02)	85.7	63.1	0.27 (0.03-2.33)	58.3	67.8	1.50 (0.83-2.69)
Saturated fat	76.4	75.8	1.00 (0.46-2.14)	85.7	75.9	0.51 (0.06-4.41)	77.4	75.4	0.89 (0.45-1.75)
Cholesterol	81.4	56.5	**0.40 (0.19-0.81)**	85.7	73.3	0.39 (0.04-3.49)	75.0	72.9	0.83 (0.42-1.62)
Sodium	53.6	45.2	1.08 (0.56-2.10)	28.6	51.8	2.69 (0.48-15.08)	51.2	50.8	0.97 (0.54-1.74)

[#] Reference group for OR; * Adjusted for gender, age, employment status and family income

Table 10. Adjusted odds ratios for nutrient intakes by body weight factors (among substance users only)

	Body weight status			Self-perceived weight status		
	Not overweight[#] (n=184)	Overweight (n=18)	Adjusted OR (95% CI)*	Not overweight[#] (n=145)	Overweight (n=57)	Adjusted OR (95% CI)*
Energy (meeting the reference intake)	20.1	5.6	0.20 (0.03-1.64)	22.1	10.5	0.47 (0.18-1.22)
Beneficial nutrient (meeting the reference intake)						
Dietary fibre	7.6	5.6	1.00 (0.12-8.60)	8.3	5.3	0.56 (0.15-2.13)
Protein	39.1	44.4	1.04 (0.38-2.86)	39.3	40.4	1.35 (0.70-2.63)
Iron	17.9	27.8	1.17 (0.37-3.68)	20.0	15.8	1.05 (0.44-2.54)
Calcium	11.4	11.1	0.80 (0.17-3.85)	12.4	8.8	0.69 (0.24-2.00)
Vitamin C	17.9	5.6	0.27 (0.03-2.11)	16.6	17.5	1.00 (0.43-2.28)
Harmful nutrients (not exceeding the reference intake)						
Total fat	63.6	66.7	1.12 (0.40-3.19)	61.4	70.2	1.48 (0.75-2.89)
Saturated fat	76.6	72.2	0.76 (0.25-2.34)	75.9	77.2	1.00 (0.48-2.12)
Cholesterol	73.4	77.8	1.74 (0.53-5.76)	71.0	80.7	1.31 (0.60-2.88)
Sodium	52.2	38.9	0.75 (0.27-2.10)	50.3	52.6	0.86 (0.45-1.65)

[#] Reference group for OR; * Adjusted for gender, age, employment status and family income

Table 11. Adjusted odds ratios for nutrient intakes by health-related perceptions (among substance users only)

	Self-perceived health status			Self-perceived nutritional status		
	Poor / average[#] (n=188)	Good (n=14)	Adjusted OR (95% CI)*	Poor / average[#] (n=188)	Good (n=14)	Adjusted OR (95% CI)*
Energy (meeting the reference intake)	17.6	35.7	2.39 (0.72-7.89)	16.5	50.0	**6.09 (1.90-19.58)**
Beneficial nutrient (meeting the reference intake)						
Dietary fibre	6.4	21.4	**4.77 (1.10-20.68)**	5.9	28.6	**8.95 (2.15-37.20)**
Protein	37.2	71.4	**3.91 (1.14-13.43)**	37.2	71.4	**4.69 (1.37-16.10)**
Iron	17.6	35.7	2.51 (0.73-8.66)	17.6	35.7	2.75 (0.80-9.43)
Calcium	11.2	14.3	1.37 (0.28-6.71)	10.6	21.4	2.12 (0.54-8.37)
Vitamin C	17.0	14.3	0.90 (0.19-4.28)	17.0	14.3	0.82 (0.17-3.89)
Harmful nutrients (not exceeding the reference intake)						
Total fat	64.9	50.0	0.56 (0.19-1.67)	64.9	50.0	0.53 (0.18-1.59)
Saturated fat	76.1	78.6	1.33 (0.35-5.08)	77.1	64.3	0.54 (0.17-1.72)
Cholesterol	76.1	42.9	**0.23 (0.07-0.74)**	75.5	50.0	**0.28 (0.09-0.88)**
Sodium	53.2	21.4	**0.24 (0.06-0.91)**	53.7	14.3	**0.13 (0.03-0.61)**

[#] Reference group for OR; * Adjusted for gender, age, employment status and family income