

The Association of Various Food Group Consumption with Overall Health Ratings: A Survey of 55,570 United Kingdom Respondents

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Abstract An on-line survey of 55,570 United Kingdom respondents analysed the association between overall health scores and frequency of consumption of specific food groups. Comparison of the chances of a respondent being in optimal health, or in poor health, versus frequency of specific food groups shows a consistent and highly statistically significant relationship between increased consumption of sugar-based snacks, sugar, salt, red meat, refined foods, caffeinated drinks, wheat and dairy and increased likelihood of a poor health rating and, conversely, decreased likelihood of an optimal health rating. Increased consumption of nuts and seeds, fresh fruit, vegetables and salad, water and oily fish was found to increase the likelihood of an optimal health rating and, conversely, to decrease the likelihood of a poor health rating.

Introduction

Almost all of the 21st century's pandemic diseases – Alzheimer's, cancer, cardiovascular disease, diabetes and obesity – are now well established to be diet related.¹ This survey, the largest ever comprehensive health and diet survey in the United Kingdom (UK), uniquely examines the differences between the dietary intakes of those in robust health versus those with multiple symptoms of poor health. It is in this latter subset of people that the risk of developing serious illness is most likely.

Neither medical expenditure nor numbers of doctors per capita predicts the healthy lifespan of a country's population,^{2,3} a strategy oriented towards prevention is a worthy pursuit in the face of increasing morbidity from conditions such as obesity, diabetes and heart disease. Prevention tackles underlying

triggers of disease before a disease is established: therefore health screening should find those in the early stages of risk, not disease. The opportunity to examine the associations between dietary intake and level of health across a variety of areas of health, from immune health to mental health, is therefore important. This survey provides data about the food groups associated with increasing or decreasing risk of overall health and a variety of health factors as well as a basis for defining health, not merely as the absence of disease but as the presence of wellness.

Method

The "100% Health Survey" is an online health questionnaire available at www.patrickholford.com provided as part of the online 100% Health Club. Potential respondents are made aware of the questionnaire through

various media including radio programmes, books, newspaper articles, seminars and word of mouth. The questionnaire comprised 148 questions, including 119 about symptoms and 16 and 13 concerning diet and lifestyle respectively. Between March 2001 and October 2008, 55,570 UK based respondents fully completed the online health questionnaire and the data was collectively analyzed. Non-UK respondents' data was excluded from the analysis. Of the respondents, 45,247 were female, 9,969 were male and 0.69% did not report their gender. Ninety-six percent were between the ages of 18 and 55 years. Based on their weighted responses to all the symptom based questions, individuals were rated as being in optimum, moderate, poor or very poor health. Comparisons were made between the increasing consumption of each food group and the percentage of respondents with an 'optimum' overall health score and the increasing consumption of each food group and the percentage of respondents with 'poor' or 'very poor' overall health scores.

Results

Of the 55,570 respondents, 3,346 (6%) were rated as being in optimal overall health, defined as a health score of 80% or more, with minimal symptoms of sub-optimal health. Conversely, 47% were rated as being in poor or very poor overall health, defined as a health score below 60%, with multiple symptoms of sub-optimal health. The majority of respondents experienced frequent symptoms concerning the areas of energy (75% of respondents), stress (72%), hormonal health (61%) and mental health (59%). A strong and highly significant association between these types of symptoms and health issues and a diet high in certain food groups was found, demonstrating that some staple foods and drinks in the UK diet, including wheat and dairy products, along with refined sugar, caffeinated drinks and red meat have negative associations with health. Strong relationships between the increased consumption of certain food groups and increased poor or good health were observed. Although association does not prove cause, this finding is important as it supports the concept that even small changes in diet may improve or worsen health. It was also

observed that increased consumption of some food groups increased the likelihood of being in optimum health but, in many cases, this was not as marked as the adverse impact of increased consumption of negative foods.

The strongest predictor of poor or very poor health was the consumption of sugar-based snacks. The strongest predictors of optimum health were the consumption of nuts, seeds, fruit and vegetables. In almost all cases the beneficial effects of the "positive" foods including fresh fruit, vegetables and water were vastly outweighed by the adverse effects of the "negative" foods.

Sugar-based Snacks

Half as many people who ate one sugar-based snack per day were in optimum health compared to those who ate none ($p<0.001$). Increased consumption to two and three or more sugar-based snacks per day was associated with a corresponding decrease in optimum health and increase in poor or very poor health (Figures 1 and 2, p.120). The relationship between sugar snack consumption and poor health was very strong. Sixty-five percent of those who ate three or more sugar based snacks per day were in poor or very poor health compared to 32% of those who ate none ($p<0.001$). In some cases this may be due to a "feedback cycle." For example, while excessive consumption of sugar-based snacks may contribute to energy problems, the presence of energy problems may encourage compensatory consumption of sugar-based snacks. Nonetheless the relationships were very clear and the consistent correlations in categories for which there was unlikely to be this feedback cycle (immunity, skin, and digestion) suggested that the foods were having increasingly negative association in line with volume of consumption.

Symptoms which showed the greatest correlation with increased sugar snack consumption included gaining weight, feeling apathetic and unmotivated, difficulty concentrating, becoming confused and low energy in the morning.

Salt

Adding increasing amounts of salt reduced the likelihood of being in optimum health. Those who added very low amounts of

salt were three times as likely to have optimum health as those who added salt three or more times per day ($p<0.001$) (Figure 3, p.120). Adding salt once a day reduced the likelihood of being in optimum overall health by a third, while high salt consumers were 50% more likely to suffer from poor overall health (Figure 4, p.120). Symptoms which became more prevalent with increased salt consumption included indigestion and heartburn, weight gain, bad breath and irritability.

Wheat

The minimum option offered to respondents was 0-2 portions of wheat per day, so it was not possible to observe the impact of nil wheat consumption, only low consumption. However 3% of people who had at least five portions of wheat per day were in optimum health, compared to 9% of people who ate two portions or less per day and reported optimum health (Figure 5, p.120). Increasing wheat consumption to three portions per day had little effect on either optimum or poor/very poor overall health (Figure 6, p.120). However, wheat consumption above three portions per day significantly impacted health. Sixty-two percent of those who consumed at least five portions of wheat per day were in poor health, compared to 41% who ate two portions per day or less ($p<0.001$). Symptoms most correlated with increased wheat consumption included weight gain, difficulty loosing weight, feeling apathetic and unmotivated and low energy.

Added Sugar

The relationship between added sugar (mainly added to drinks) and health was less powerful than the relationship of sugary snacks with health, and also less than either salt or wheat in terms of both decreased optimum and increased poor health. However both relationships remained strong and nearly linear in each case (Figures 7 and 8, p.121). While 7% of those who added no sugar were in optimum health, 3% of those who added seven or more teaspoons of sugar per day were in optimum health ($p<0.001$).

Dairy

Increased consumption of dairy products correlated with decreased prevalence of optimum health (Figure 9, p.121). While 8% of those who consumed less than two portions of dairy per day were in optimum health, 3% of those who consumed four or more portions of dairy per day were in optimum health ($p<0.001$). More than two portions of dairy per day markedly increased the likelihood of poor or very poor health (Figure 10, p.121). Symptoms most correlated with increased dairy consumption included gaining weight, craving tea and coffee, headaches and migraine, waking up tired and needing something to get going in the morning.

Refined Foods

There is a direct positive relationship between increased refined food consumption and increased poor health (Figure 12, p.121). Highly refined food users show a significantly greater propensity to report more symptoms than abstainers. Eleven percent of those who consumed no refined foods such as white rice and white bread were in optimum health, while 4% of those who ate at least four portions of refined foods per day were in optimum health ($p<0.001$) (Figure 11, p.121). The symptoms which correlated most strongly with increased consumption of refined foods included feeling apathetic and unmotivated, difficulty losing weight, and frequent infections.

Caffeinated Drinks

High caffeinated drink consumers were much more likely to be in poor or very poor health than those who avoided caffeinated drinks (Figures 13 and 14, p.122). Eleven percent of those who consumed no caffeinated drinks per day were in optimum health, while 4% of those who consumed six or more cups of caffeinated drinks per day were in optimum health ($p<0.001$). It was difficult to quantify the feedback effect. Did those in poor health need to use caffeinated drinks to keep going, rather than the caffeinated drinks causing poor health? However, the relationship was clear. Increased caffeinated drink intake correlated with the likelihood

of poor health while complete abstention improved the likelihood of better health. Symptoms which correlated most strongly with increased consumption of tea, coffee and cola included menopausal symptoms, loss of energy, loss of sex drive and joint stiffness.

Red Meat

Fifty-six percent of those who consumed red meat at least eight times per week were in poor or very poor health while 44% of those who consumed red meat twice per week or less were in poor or very poor health ($p<0.001$) (Figure 16, p.122). However, above five portions per week the difference in overall optimum and poor/very poor health was minimal (Figure 15, p.122). To realize a significant benefit from altering the red meat consumption of a diet, consumption should be dropped to twice per week or less, but above this gains made are small. For those in poor digestive and skin health high red meat consumption had a greater impact than implied by this relationship. Symptoms which correlated most strongly with increased consumption of red meat include menopausal symptoms, reduced libido/loss of sex drive, fertility problems and weight gain.

Fresh Fruit

Twelve percent of those who ate five or more pieces of fresh fruit per day were in optimum health, while 4% of those who ate no fresh fruit were in optimum health ($p<0.001$) (Figure 17, p.122). However the association between eating no fruit with poor or very poor health diminished as the amount of fruit increased (Figure 18, p.122). Relatively, greatly increased fruit consumption had a stronger association with optimum health than it did with poor/very poor health.

Vegetables and Salad

There is a clear direct correlation between eating more vegetables and decreased likelihood of poor or very poor health (Figure 20, p.123). Ten percent of those who ate at least five servings of vegetables or salad daily were in optimum health, while 5% of those who ate no vegetables or salad were in optimum health ($p<0.001$) (Figure 19, p.123).

Water

Nine percent of those who drank at least eight glasses of water per day were in optimum health compared to 5% of those who drank less than a glass of water per day ($p<0.001$) (Figure 21, p.123). There appeared to be a particular benefit to drinking at least eight glasses of water (1.5 litres) per day. The relationship between water consumption and poor health was less marked but nevertheless consistent (Figure 22, p.123).

Oily Fish

Eleven percent of those who ate oily fish more than three times per week were in optimum health; however, there was no obvious relationship between oily fish consumption and optimum health amongst those who ate it less than three times per week (Figure 23, p.123). Thirty-seven percent of those who ate oily fish three or more times per week were in poor or very poor health compared to 48% of those who ate it only once per week ($p<0.001$) (Figure 24, p.123).

Nuts and Seeds

While there was a clear relationship between the increased consumption of nuts and seeds and improved health, the impact was greatest when more than two portions per day were consumed (Figure 25, p.124). Fifteen percent of those who ate fresh, raw nuts and seeds at least three times per day were in optimum health, while 5% of those who ate no nuts and seeds per day were in optimum health ($p<0.001$). Consuming only one portion of nuts or seeds per day had very little effect on the prevalence of symptoms (Figure 26, p.124).

Alcohol

Unlike most of the other food groups, the relationship between alcohol consumption and health did not present a simple picture (Figures 29 and 30, p.124). The relative risk of optimum health given high alcohol consumption was 1.01, in other words, alcohol consumption of up to around seven drinks or units per week had a negligible impact on the probability of being in optimum overall health. However, for those in very poor health, the consumption of more than three units of alcohol per week reduced the

likelihood of very poor health ($p<0.001$). The consumption of seven or more units of alcohol per week reduced the likelihood of being in very poor health even more effectively than the consumption of vegetables, fruit, water or oily fish (Figure 27, p.124). Regarding high alcohol consumption and individual health factors, a more complex pattern emerged. Alcohol consumption had a positive impact on those with very poor health in all categories, and particularly on those with poor mind and mood health (Figure 28, p.124). However, for those in optimum health, "high" alcohol consumption had a detrimental effect on all individual health factors except mind and mood health.

The maximum option offered to respondents was seven+ units per week, which equates only to half a glass of wine per night, so the effect of truly high alcohol consumption was not surveyed, neither was information gathered about the type of alcohol consumed.

Discussion

Understanding what healthy or very unhealthy people eat is useful when considering the appropriateness of national dietary guidelines. Those respondents with the highest health rating consistently reported the consumption of less sugar, refined foods, caffeinated drinks, wheat, dairy products and salt, and with the consumption of more fresh fruit, vegetables, nuts, seeds, fish and water. Assuming that these healthy respondents' diets impact their health and wellbeing, we propose the following simple recommendations:

- Eliminate sugar-based snacks (chocolate bars etc.) or limit these products to very occasional use.
- Avoid adding salt to food.
- Reduce wheat consumption to a maximum of one serving per day (bread, pasta, pizza, etc).
- Avoid adding sugar to food or drinks.
- Reduce dairy product consumption to a maximum of one serving per day.
- Eliminate tea, coffee and cola consumption or limit these to very occasional use.
- Reduce consumption of refined foods (white bread, flour, rice etc.) to a maximum of one serving per day.

- Minimize the consumption of restaurant and processed meals.
- Reduce the consumption of red meat to a maximum of two servings per week, particularly those already in poor digestive health.
- Increase consumption of fresh, raw seeds and nuts to three servings per day.
- Increase consumption of fresh fruit to five or more servings per day.
- Increase consumption of vegetables or salad to five or more servings per day.
- Increase consumption of oily fish to three servings per week.
- Increase consumption of water to eight glasses per day.

Those respondents with the very poorest health rating consistently reported high consumption of sugar snacks salt, wheat, dairy, refined foods, added sugar, caffeinated drinks and red meat. The results for dairy and wheat contradict accepted national dietary guidelines.⁴

Conclusion

This survey provides data about the association of levels of consumption of food groups with increased or decreased risk of a variety of health factors. The results challenge some of today's dietary dictums that, for example, place wheat and milk as necessary staple foods, and nuts and seeds as high fat foods to be restricted. Most of all, these results emphasize that the greater the consumption of sugary foods the greater are the odds of being in poor health. This food group stands out as having the greatest impact on health.

References

1. Fairweather-Tait, SJ: Human nutrition and food research: opportunities and challenges in the post-genomic era. *Phil Trans R Soc, Lond*, 2003; 358: 1709-1727.
2. Medawar C, Hardon A: *Medicines Out of Control? -Antidepressants and the Conspiracy of Goodwill*. Amsterdam, Netherlands. Aksant Academic Publishers. 2004; 217.
3. Oswald A: Do Doctors Work? Warwick, UK. 2002; March. Retrieved from: www2.warwick.ac.uk/fac/soc/economics/staff/academic/oswald/ #2002.
4. Food Standards Agency. Nutrient and food based guidelines for UK institutions and the eatwell plate model. London, UK. Food Standards Agency Publication. 2006. Retrieved from: www.eatwell.gov.uk/healthydiet/eatwellplate/.

Figure 1. Impact of sugar snack consumption on probability of optimum health

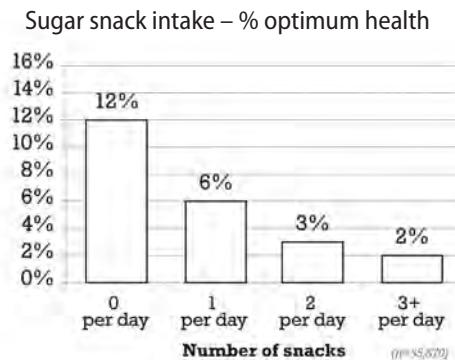


Figure 2. Impact of sugar snack consumption on probability of poor or very poor health

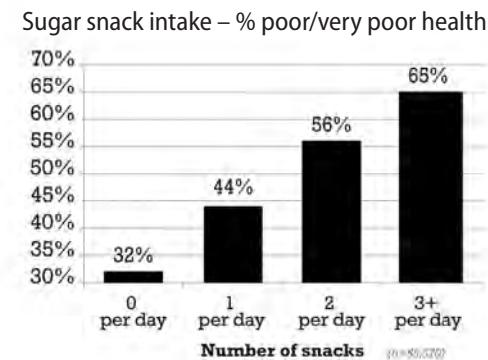


Figure 3. Impact of salt consumption on probability of optimum health

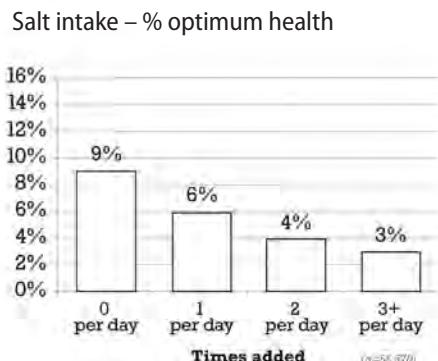


Figure 4. Impact of salt consumption on probability of poor or very poor health

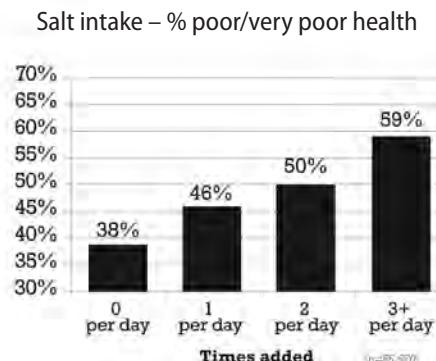


Figure 5. Impact of wheat consumption on probability of optimum health

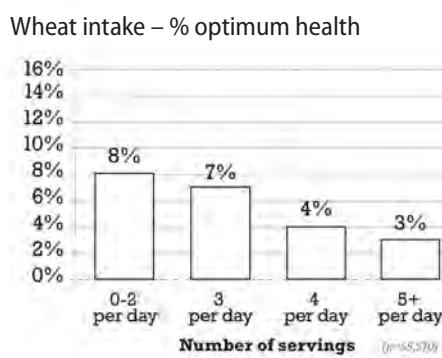


Figure 6. Impact of wheat consumption on probability of poor or very poor health

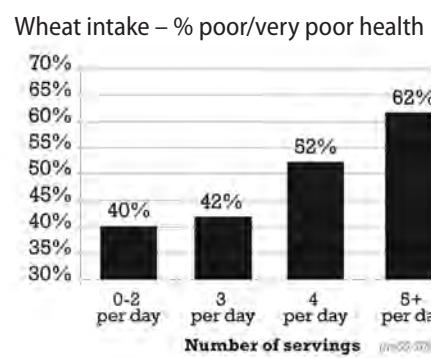


Figure 7. Impact of added sugar consumption on probability of optimum health

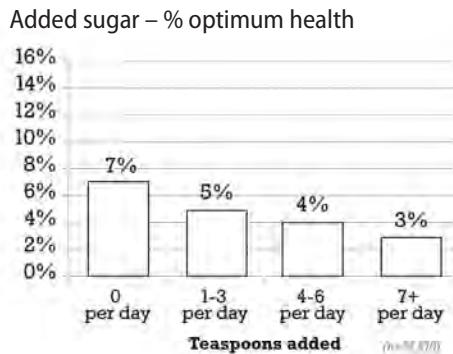


Figure 8. Impact of added sugar consumption on probability of poor or very poor health

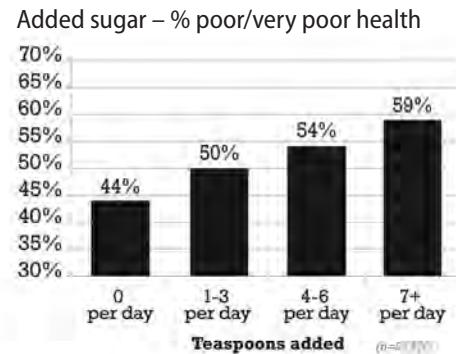


Figure 9. Impact of dairy consumption on probability of optimum health

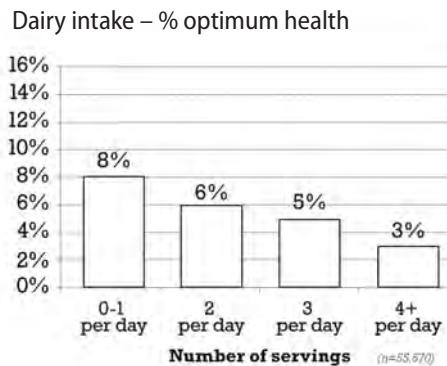


Figure 10. Impact of dairy consumption on probability of poor or very poor health

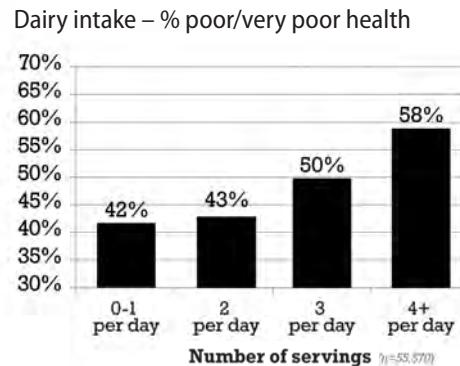


Figure 11. Impact of refined food consumption on probability of optimum health

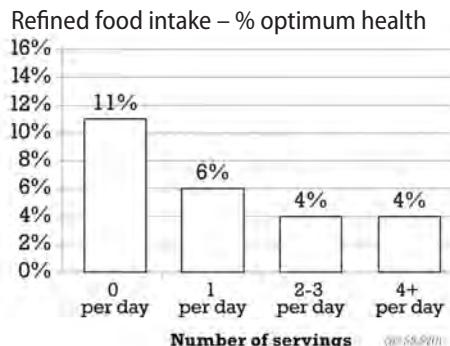


Figure 12. Impact of refined food consumption on probability of poor or very poor health

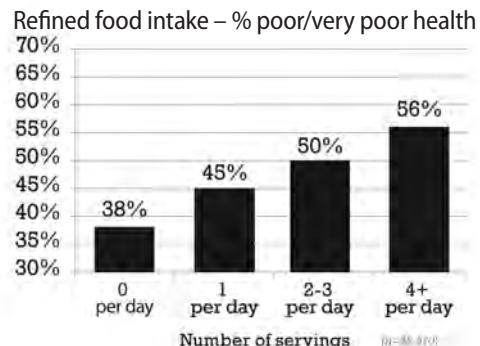


Figure 13. Impact of caffeinated drink consumption on probability of optimum health

Tea, coffee, cola intake – % optimum health

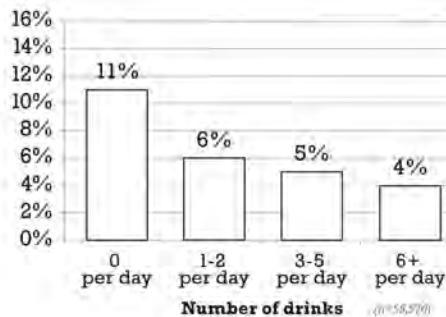


Figure 14. Impact of caffeinated drink consumption on probability of poor or very poor health

Tea, coffee, cola intake – % poor/very poor health

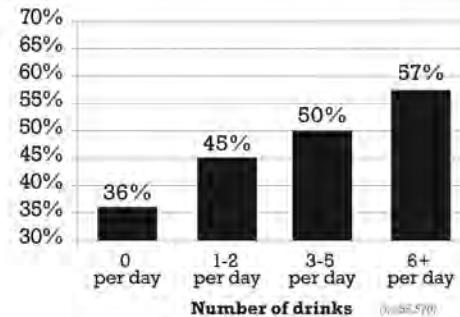


Figure 15. Impact of red meat consumption on probability of optimum health

Red meat intake – % optimum health

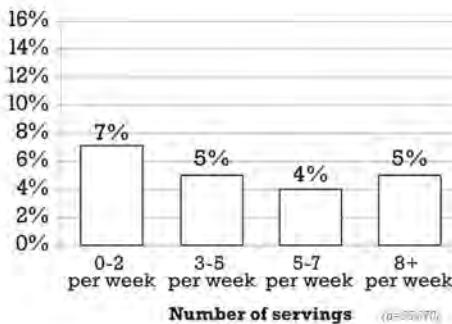


Figure 16. Impact of red meat consumption on probability of poor or very poor health

Red meat intake – % poor/very poor health

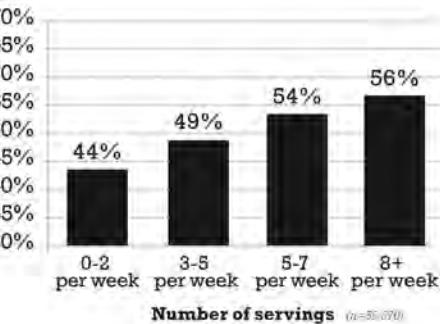


Figure 17. Impact of fresh fruit consumption on probability of optimum health

Fresh Fruit intake – % optimum health

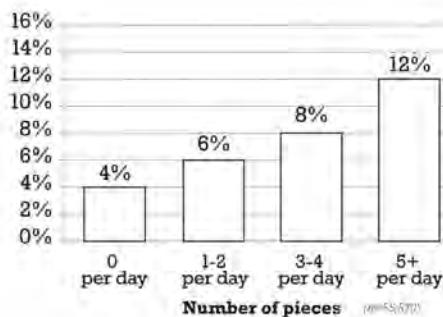


Figure 18. Impact of fresh fruit consumption on probability of poor or very poor health

Fresh Fruit intake – % poor/very poor health

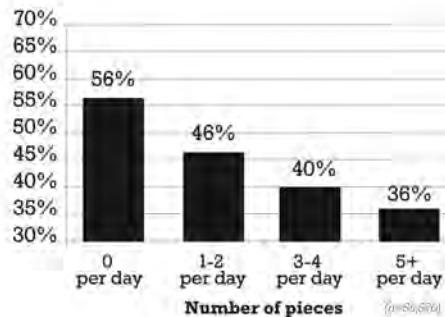


Figure 19. Impact of veg/salad consumption on probability of optimum health

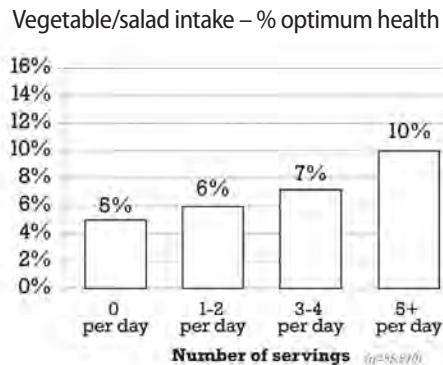


Figure 20. Impact of veg/salad consumption on probability of poor or very poor health

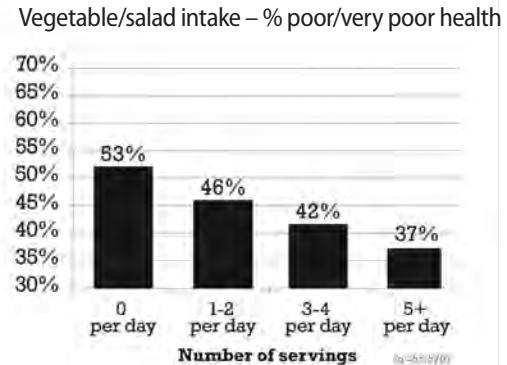


Figure 21. Impact of water consumption on probability of optimum health

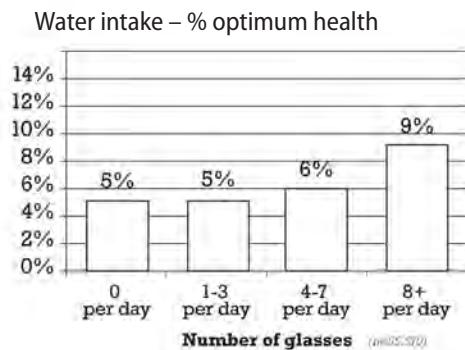


Figure 22. Impact of water consumption on probability of poor or very poor health

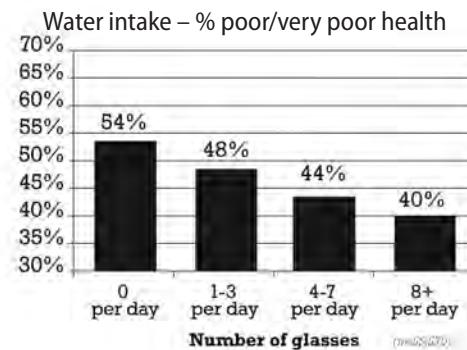


Figure 23. Impact of oily fish consumption on probability of optimum health

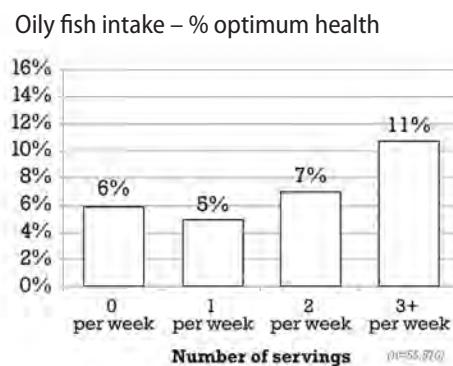


Figure 24. Impact of oily fish consumption on probability of poor or very poor health

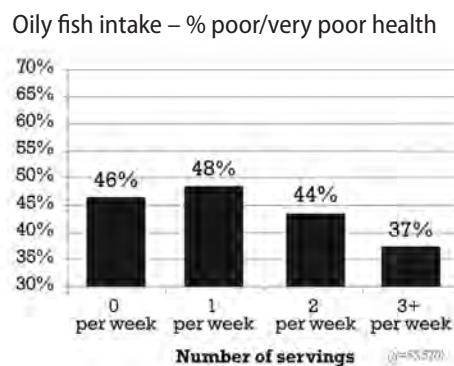


Figure 25. Impact of nut and seed consumption on probability of optimum health

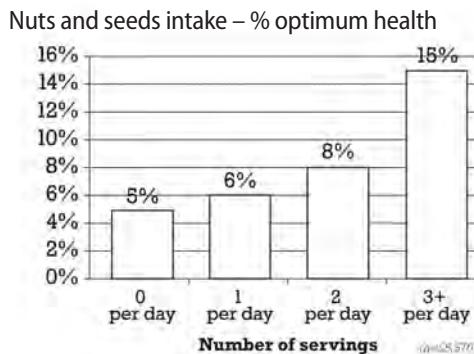


Figure 26. Impact of nut and seed consumption on probability of poor or very poor health

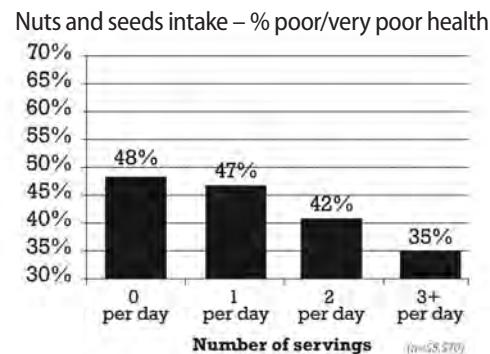


Figure 27. Relative risk of very poor health given high alcohol consumption

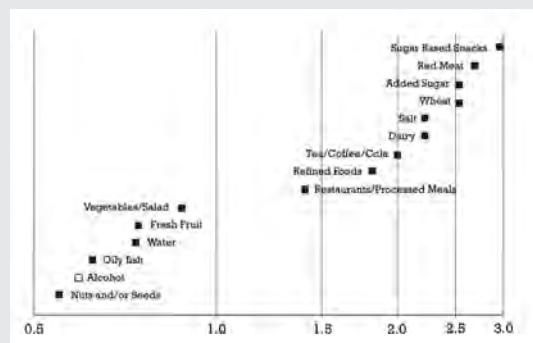


Figure 28. Impact of alcohol on health factors for those in very poor health

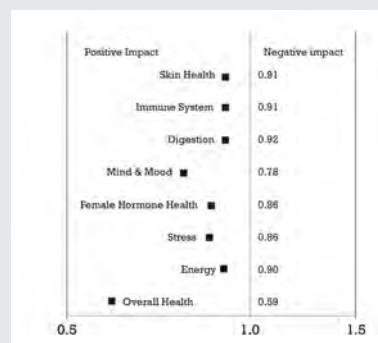


Figure 29. Impact of alcohol consumption on probability of optimum health

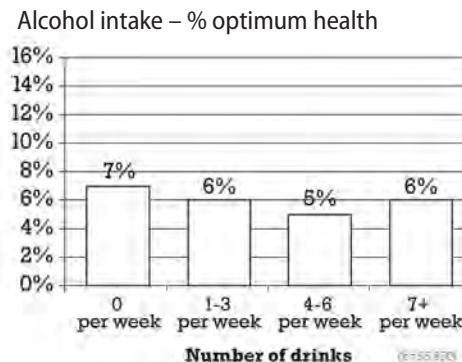


Figure 30. Impact of alcohol consumption on probability of poor or very poor health

