

## 8th Annual Symposium on ‘Nutrition in Clinical Management’ Overweight and obesity: a growing concern

# Overweight, obesity and physical activity levels in Irish adults: evidence from the North/South Ireland Food Consumption Survey

S. N. McCarthy<sup>1\*</sup>, M. J. Gibney<sup>1</sup>, A. Flynn<sup>2</sup> and M. B. E. Livingstone<sup>3</sup> for the  
Irish Universities Nutrition Alliance

<sup>1</sup>Department of Clinical Medicine, Trinity Centre for Health Sciences, St James’s Hospital, Dublin 8, Republic of Ireland

<sup>2</sup>Nutritional Sciences, Department of Food Science and Technology, University College Cork, Cork, Republic of Ireland

<sup>3</sup>Northern Ireland Centre for Diet and Health (NICHE), University of Ulster, Coleraine, Co. Londonderry BT52 1SA, UK

In the present paper the prevalence of obesity (BMI  $\geq 30$  kg/m<sup>2</sup>) and current physical activity levels in Irish adults have been evaluated. The prevalence of obesity in Irish adults is currently 18%, with men at 20% and women at 16%. A further 47% of men and 33% of women are overweight (BMI 25.0–29.9 kg/m<sup>2</sup>). Since 1990, obesity has more than doubled in men from 8% to 20%, and increased from 13% to 16% in women. The highest prevalence of obesity (30%) was found in women aged 51–64 years. Defined waist circumference action levels identified 48% of the population who are in need of weight management and who also are at a 1.5–4.5 times increased risk of having at least one cardiovascular disease risk factor. Physical activity levels were low overall. Men were more active in work and recreational pursuits than women, but women were more active in household activities. Walking was the most popular recreational pursuit. However, TV viewing occupied most of the leisure time of men and women. Higher levels of activity were associated with a lower BMI and waist circumference. The results indicate the need for sensitive and individualised strategies to promote physical activity and to achieve a healthy weight status.

### Obesity: Waist circumference: Physical activity: Ireland

The present paper describes the current weight status and physical activity levels of the Irish adult population. The data were collected as part of the North/South Ireland Food Consumption Survey, which was conducted by the Irish Universities Nutritional Alliance. This survey investigated habitual food and beverage consumption, health, lifestyle and demographic information, attitudes to food and health, restrained eating patterns, physical activity and anthropometric measurements in a representative sample ( $n$  1379) of 18–64-year-old adults from the Republic of Ireland and Northern Ireland during 1997–9. This sample was representative of the population with respect to age, sex, geographical location, marital status, social class and socio-economic group. The survey was seasonally balanced with equal

sampling of subjects for winter and summer (Kiely *et al.* 2001). The findings from the survey can therefore be generalised to the population as a whole.

### Objectives

The objective of the present paper is to provide an overview of the current weight status of the Irish adult population using BMI and waist-circumference-derived action levels and an overview of physical activity levels and patterns. The association of physical activity with BMI and waist circumference is also examined using physical activity levels across categories of BMI and waist circumference. The health consequences of high BMI, high waist

**Abbreviation:** MET, activity metabolic equivalent.

**\*Corresponding author:** Sinéad McCarthy, fax +353 1 6709176, email [mccarts@tcd.ie](mailto:mccarts@tcd.ie)

circumference and low physical activity levels are also discussed.

## Methods

### *Body measurements*

Body measurements were taken using standard procedures and calibrated equipment to ensure accuracy throughout the survey (McCarthy *et al.* 2001b). In brief, body weight was measured in duplicate to the nearest 0.1 kg after voiding and in light clothing using an electronic scales, and height was measured in stocking feet to the nearest 1 mm using a portable stadiometer. Waist and hip circumferences were measured in duplicate using a flexible metal measuring tape. Waist was measured at the mid point between the lowest rib and the hip bone on the subject's left hand side at the naked site. Hips were measured over clothing at the widest part of the buttocks.

Weight and height were used to calculate BMI (wt (kg)/height (m)<sup>2</sup>), which was categorised according to World Health Organization (1998) recommendations. Two risk categories of waist circumference were used to identify subjects who were in need of weight management and also at an increased risk (men  $\geq 94$  cm, women  $\geq 80$  cm) or a high risk (men  $\geq 102$  cm, women  $\geq 88$  cm) of having at least one major cardiac risk factor (Han *et al.* 1995; Lean *et al.* 1995). The database from the earlier Irish National Nutrition Survey (see Lee & Cunningham, 1990) was also re-analysed for 18–64 year olds and World Health Organization (1998) categories of BMI, thus allowing for direct comparisons with the current study.

### *Patterns of physical activity*

Physical activity was assessed using a questionnaire, and has been described in detail elsewhere (Livingstone *et al.* 2001). In brief, levels of customary physical activity were assessed by a self-administered questionnaire, which was developed at the Institute of Public Health, University of Cambridge, Cambridge, UK. The questionnaire consisted of three sections: activity at home; work; recreation. Under household pursuits the amount of time spent sleeping, TV viewing and related activities, stair climbing, shopping, cooking, cleaning and care giving were queried in detail. Subjects were questioned in detail on their occupation, the number of hours spent working per week and the levels of intensity of this work, e.g. sitting, walking, standing, and the amount of time spent at these activities. In addition, subjects were asked about frequency of stair climbing, kneeling and squatting as well as mode of travel to and from work. In the recreational section respondents were asked to identify the frequency and duration of their participation in thirty-six named recreational pursuits, including sports and gardening activities. For each activity respondents indicated the number of times they performed the activity in the past year, from never or less than once per month to every day, and the average duration per episode.

The intensity of all self-reported physical activity in work, household and recreational activities was expressed as an activity metabolic equivalent (MET) index by assigning a

multiple of resting metabolic rate (MET score) to each activity. MET scores were obtained for each activity from the compendium of physical activities developed by Ainsworth *et al.* (1993). The time spent at each activity was multiplied by the appropriate MET score and subsequently summed for all activities to yield an overall estimate of MET (h/week). This value represents both the amount and relative intensity of physical activity during the week for each subject.

### *Statistical analysis*

All statistical analyses were carried out using SPSS® Base 10.0 (SPSS Inc., Chicago, IL, USA). Cross tabulation identified the percentage of subjects in each of the BMI categories and the percentage of subjects in each of the waist circumference action levels.

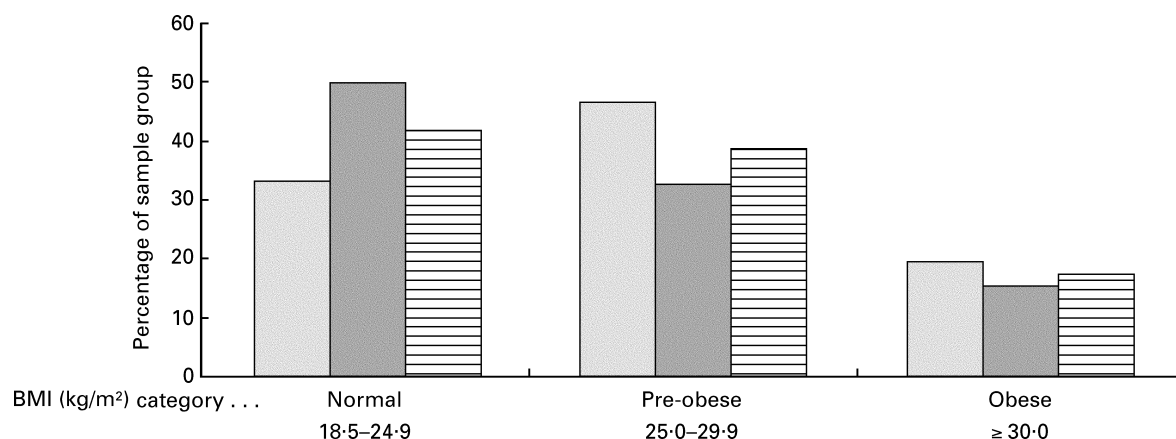
ANOVA was used to test for significant differences in physical activities across BMI categories and waist circumference action levels. Significance was defined as  $P < 0.05$ . When ANOVA tables identified significant differences between groups, the Scheffe *post-hoc* test was employed to identify which groups were significantly different (Coakes & Steed, 1999).

## Results

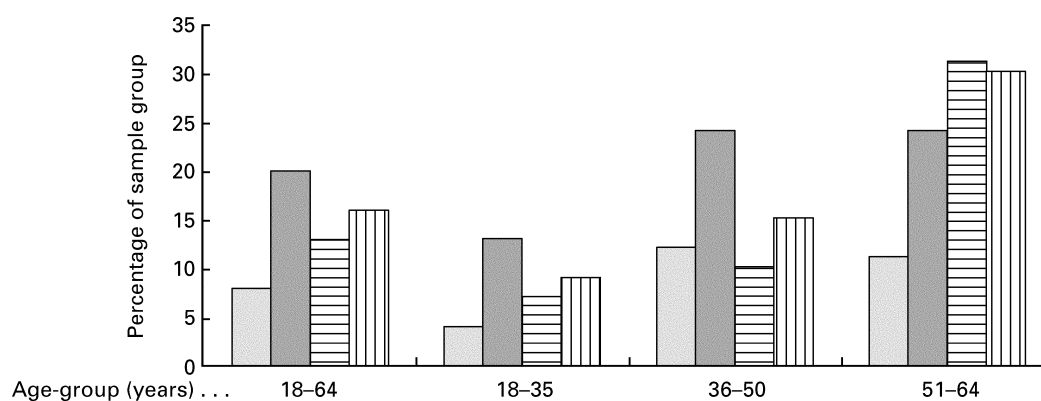
Fig. 1 presents the percentage of the total sample and of men and women separately in each of the BMI categories. Underweight subjects were excluded from these analyses because they accounted for less than 2% of the total population. One-third of the men and half the women were of normal weight (BMI 18.5–24.9 kg/m<sup>2</sup>). In the pre-obese or overweight category (BMI 25.0–29.9 kg/m<sup>2</sup>), approximately half the men and one-third of the women were overweight. Overall, 20% of the men and 16% of the women were obese (BMI  $>30.0$  kg/m<sup>2</sup>).

Fig. 2 illustrates the differences in the prevalence of obesity by age-group and changes in prevalence over the last 10 years in men and in women. Obesity has more than doubled in men from 8% to 20% (2.5-fold increase), with the greatest increase (3-fold) found in the young men aged 18–35 years. Overall, the highest prevalence of obesity (24%) was found in 36–64-year-old men. In contrast, the highest prevalence in women (30%) was found in the 51–64-year-old age-group: this pattern has not changed over the last decade. For women, the greatest increase in obesity was found in the 36–50-year-old age-group, which increased 1.5-fold.

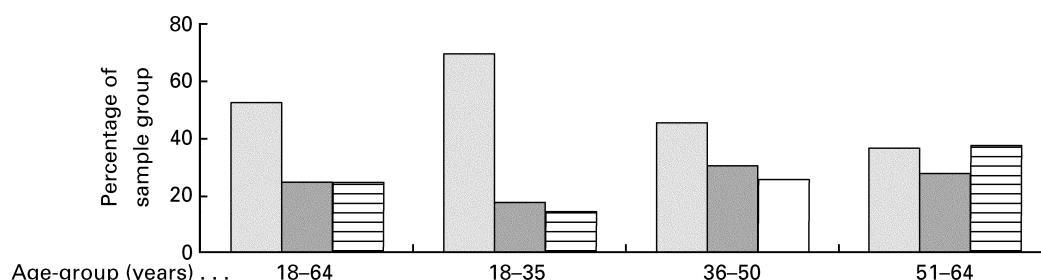
Fig. 3 shows the percentage of the population in each of the waist circumference action levels (as defined by Lean *et al.* 1995). These waist circumference action levels have been defined as action level 1 ( $\geq 94.0$  cm men,  $\geq 80.0$  cm women) and action level 2 ( $\geq 102.0$  cm men,  $\geq 88.0$  cm women), which give an indication of increasing and high health risks respectively from being overweight. For the total population, 52% were below action level, 24% were at action level 1, with a further 24% at action level 2. The percentage of the population below action level decreased with increasing age, with 69% of 18–35 year olds and 36% of 51–64 year olds below action level. Similarly, the percentage of the population above action level 2 increased



**Fig. 1.** Percentage of the total population (▨), men (▧) and women (▩) in each of the BMI categories (classified according to World Health Organization, 1998) for a representative sample (*n* 1379) of 18–64-year-old Irish adults during 1997–9. For details of procedures, see p. 4.



**Fig. 2.** Changes in the prevalence of obesity in adult Irish men (▨, ▧) and women (▩, ▪) by age-group between 1990 (re-analysed data based on the earlier Irish National Nutrition survey (see Lee & Cunningham, 1990); ▨, ▩) and 2000 (present study; ▧, ▪).



**Fig. 3.** Waist circumference action levels (as defined by Lean *et al.* 1995) for a total representative sample (*n* 1379) of Irish adults during 1997–9 and by age-group. (▨), Below action level; (▧), action level 1 (≥94.0 cm men, ≥80.0 cm women); (▩), action level 2 (≥102.0 cm men, ≥88.0 cm women). For details of procedures, see p. 4.

with increasing age, from 13 at 18–35 years to 37 at 51–64 years, whereas in action level 1 there was an increase up to 50 years, with a slight decrease thereafter.

In general, men were more active than women, but there was an overall decline in all types of activities with increasing age in both men and women. When mean MET of physical activity were compared, men were twice as active as women in work and recreational activity (139.7

(SD 83.9) h/week v. 68.5 (SD 49.8) h/week), while women were three times more active than men in household pursuits (65.9 (SD 58.7) h/week v. 22.6 (SD 24.6) h/week). Men spent more time in vigorous recreational pursuits than women (1.7 (SD 2.7) h/week v. 1.0 (SD 1.7) h/week). TV viewing and related pursuits occupied most leisure time activity (19 h/week) for men and women, and there was no apparent age-related trend. Approximately 25% of

**Table 1.** Time spent in different physical activities across categories of BMI in a representative sample (*n* 1379) of Irish adults (18–64 years) during 1997–9

Time spent in activity (h/week)	BMI category*		
	Normal	Pre-obese	Obese
TV viewing	17.3 <sup>a</sup>	19.3 <sup>a</sup>	19.9 <sup>b</sup>
Total recreational activities	6.5	7.0	6.3
Vigorous recreational activities	1.4 <sup>a</sup>	1.3 <sup>ab</sup>	1.0 <sup>b</sup>

<sup>a,b</sup> Mean values in rows with unlike superscript letters were significantly different ( $P < 0.05$ ).

\* Classified according to World Health Organization (1998); normal, 18.5–24.9 kg/m<sup>2</sup>; pre-obese, 25.0–29.9 kg/m<sup>2</sup>; obese,  $\geq 30$  kg/m<sup>2</sup>.

**Table 2.** Time spent in different physical activities across categories of waist circumference action level (AL)\* in a representative sample (*n* 1379) of Irish adults (18–64 years) during 1997–9

Time spent in activity (h/week)	Below AL	AL 1	AL 2
TV viewing	18.2	19.3	19.8
Total recreational activities	7.3 <sup>a</sup>	6.4 <sup>ab</sup>	5.7 <sup>b</sup>
Vigorous recreational activities	1.6 <sup>a</sup>	1.2 <sup>ab</sup>	0.7 <sup>b</sup>

<sup>a,b</sup> Mean values in rows with unlike superscript levels were significantly different ( $P < 0.05$ ).

\* As defined by Lean *et al.* (1995); AL 1,  $\geq 94.0$  cm men,  $\geq 80.0$  cm women; AL 2,  $\geq 102.0$  cm men,  $\geq 88.0$  cm women.

the population spent at least 25 h/week watching TV. Walking was the most popular recreational pursuit, with 41% of the men and 60% of the women participating at least once per week, followed by gardening and floor exercises.

The amount of time spent watching TV, participating in total recreational activity and more specifically participation in vigorous recreational activities across categories of BMI and waist circumference action levels are shown in Tables 1 and 2 respectively. In general, time spent watching TV increased as BMI and waist circumference action level increased, while time spent in recreational and vigorous activities decreased as BMI and waist circumference action level increased. The subjects of normal weight spent significantly less time watching TV and significantly more time in vigorous pursuits compared with obese subjects ( $P < 0.05$  in both cases). Similarly, subjects below action level spent significantly more time in recreational and vigorous pursuits than subjects who were above action level 2 ( $P < 0.05$  in both cases).

## Discussion

Overweight and obesity are now major public health problems in many countries. Obesity is a major risk factor for many metabolic disorders and non-communicable diseases such as diabetes, cardiovascular disease and certain types of cancer (World Health Organization, 1998). The alarming increase in the prevalence of obesity that has occurred over the last decade indicates that the health

service sector may be faced with an epidemic of type 2 diabetes in the near future. These results from a representative sample of Irish adults have highlighted that certain groups of this population require more focused attention for weight management. Men in particular, and especially young men, must be targeted in order to identify the factors that precipitated a high increase in the prevalence of obesity. It is of particular interest that the prevalence of obesity in Irish men has increased more rapidly than that in women, with the prevalence of obesity in men (20%) now exceeding that in women (15.9%). On a worldwide scale the prevalence of obesity is generally higher among women compared with men, with the exception of Finland and The Netherlands (World Health Organization, 1998). However, this higher prevalence of obesity in men was also observed in another study on elderly Irish adults (Corish *et al.* 2000). Although no changes in the prevalence of obesity over 10 years were observed in women aged 51–64 years, nevertheless, they have the highest prevalence of obesity of any of the subgroups of the adult population in Ireland.

The North/South Ireland Food Consumption Survey is the first survey in Ireland to have measured waist and hip circumferences in a representative sample of adults. Fat deposited in the central area of the body, as measured by waist circumference, is closely associated with risk factors for cardiovascular disease. These risk factors include elevated blood pressure, raised plasma total cholesterol and low plasma HDL-cholesterol. Waist circumference action levels, as a means of identifying the need for weight management were proposed by Lean *et al.* (1995). Action level 1 ( $\geq 94.0$  cm men,  $\geq 80.0$  cm women) represents the point where weight gain should be stopped and subjects encouraged to lose weight. Action level 2 ( $\geq 102.0$  cm men,  $\geq 88.0$  cm women) signals the point where medical advice should be sought for weight management. These action levels have a high sensitivity and specificity in identifying those in need of weight management in Irish adults (McCarthy *et al.* 2001a). These action levels were used by Han *et al.* (1995) to predict the risks for cardiovascular disease risk factors in a population. The risk factors measured included high blood pressure, high plasma total cholesterol and low plasma HDL-cholesterol. The relative risk of having at least one of these adverse cardiovascular risk factors was identified using odds ratios adjusted for lifestyle factors, with a reference below action level 1. The risk or odds ratio increased significantly with increasing action level (Han *et al.* 1995). At action level 1 there was a 1.5–2 times increased risk and at action level 2, there was a 2.5–4.5 times increase risk.

Using these findings by Lean *et al.* (1995) and Han *et al.* (1995) 24% of the adult population have a 1.5–2 times increased risk of having at least one of the cardiovascular disease risk factors and should be encouraged to lose weight. In addition, a further 24% of the population are at a 2.5–4.5 times increased risk and need to seek professional advice for weight management.

Overall, the physical activity levels in the adult population in Ireland are low and a sedentary lifestyle is now the norm. Physically inactive adults are at an increased risk

of hypertension, diabetes, osteoporosis, various cancers, anxiety and depression (Livingstone *et al.* 2001). Most of the leisure time is being spent at sedentary pursuits such as TV viewing. There is an inverse association between total recreational activity and vigorous recreational activity and BMI and waist circumference in this population. There is also a clear positive association between TV viewing and BMI and waist circumference.

However, due to the cross-sectional nature of the survey, it is not possible to draw conclusions about cause or effect. Nevertheless, participation in physical activity is one of the best predictors of success in long-term maintenance of weight reduction and for attenuating weight gain over time in healthy adults. The difference of 2–2.5 h of TV viewing across the BMI categories was found to be significant ( $P < 0.05$ ). Although this difference may not appear to be substantial, if replaced with four to five 0.5 h sessions of moderate intensity activity per week such as walking, it could have a very significant impact on the weight status.

Unfortunately, there are many perceived barriers to undertaking more physical activity, most notably 'lack of time' and 'not the sporty type' (Institute of European Food Studies, 1999). These barriers suggest that time management and time allocation is an issue to tackle when advocating increased levels of recreational physical activity.

In conclusion, these findings have revealed important differences in the weight status and physical activity patterns of men and women in Ireland. These differences must be considered in the development of public health policies aimed at achieving and sustaining a healthy weight and promoting and maintaining physical activity. The results show a very clear and important public health message; simple population-focused health promotion is unlikely to offer the same long-term success as more sensitive and individualised strategies.

## References

- Ainsworth BE, Haskell WL, Leon AS, Jacobs DR, Montoye HJ, Sallis JF & Paffenbarger RS (1993) Compendium of physical activities: classification of energy costs of human physical activities. *Medicine and Science in Sports and Exercise* **25**, 71–80.
- Coakes SJ & Steed LG (1999) *SPSS without Anguish Versions 7.0, 7.5, 8.0 for Windows*. Brisbane, Australia: John Wiley & Sons.
- Corish C, Flood P & Kennedy NP (2000) Nutritional status of the Irish elderly. *Irish Journal of Medical Science* **169**, Suppl. 2, 33.
- Han TS, van Leer EM, Seidell JC & Lean MEJ (1995) Waist circumference action levels in the identification of cardiovascular risk factors: prevalence study in a random sample. *British Medical Journal* **311**, 1401–1405.
- Institute of European Food Studies (1999) *Results of a Survey on Consumer Attitudes to Physical Activity, Body Weight and Health in a Nationally Representative Sample of Irish Adults*. Dublin: Trinity College.
- Kiely M, Harrington KE, Robson PJ, Cran GW & Flynn A (2001) Sampling description and procedures used to conduct the North/South Ireland Food Consumption Survey. *Public Health Nutrition* (In the Press).
- Lean MEJ, Han TS & Morrison CE (1995) Waist circumference as a measure for indicating need for weight management. *British Medical Journal* **311**, 58–61.
- Lee P & Cunningham K (1990) *Irish National Nutrition Survey*. Dublin: Irish Nutrition and Dietetic Institute.
- Livingstone MBE, Robson PJ, McCarthy SN, Kiely M, Harrington KE, Browne P & Galvin M (2001) Physical activity patterns in a nationally representative sample of adults in Ireland. *Public Health Nutrition* (In the Press).
- McCarthy SN, Harrington KE, Gibney MJ, Kiely M & Flynn A (2001a) Specificity and sensitivity of action levels for waist circumference in a representative sample of Irish adults. *Proceedings of the Nutrition Society* **60**, 157A.
- McCarthy SN, Harrington KE, Kiely M, Flynn A, Robson PJ, Livingstone MBE & Gibney MJ (2001b) Analyses of anthropometric data from the North/South Ireland Food Consumption Survey. *Public Health Nutrition* (In the Press).
- World Health Organization (1998) *Obesity: Preventing and Managing the Global Epidemic*. Geneva: WHO.