Scientific Advisory Committee on Nutrition

2nd MEETING

14 September 2005, Conference Room 2, Aviation House

125 Kingsway, London, WC2B 6NH

FINAL MINUTES

Chairman:	Professor Alan Jackson
Members:	Dr Anthony Williams
	Professor Chris Riddoch
	Professor Andrew Prentice
	Dr Anita Thomas
	Professor Marinos Elias
	Professor Christine Williams
	Stella Walsh
Secretariat:	Dr Alison Tedstone (FSA)
	Dr Peter Sanderson (FSA)
	Gillian Swan (FSA)
	Dr Clifton Gay (FSA)
Apologies:	Professor Prakesh Shetty
	Professor Joe Millward
	Dr Sheela Reedy (DH)
	Professor Ian Macdonald

Chairs' introduction and welcome

1. The Chair welcomed members to the second meeting of the SACN Working Group on Energy. The Chair reminded the Committee of their obligations, such as the need for minutes and papers to be available for public scrutiny and the need for Members to declare any conflicts of interest.

Minutes from previous meeting – SACNenergy/05/min01

2. The Committee were invited to comment on the minutes of the previous meeting. The following changes were requested:

3. The words ‘could lead to’ in the last sentence of paragraph 11 be changed to ‘was associated with’.

4. The wording in paragraph 13 ‘being careful with points 3 and 4’ should be clarified.

5. The word ‘possible’ be changed to possibly’ in paragraph 23.

6. The last sentence in paragraph 27 be deleted.

7. That ‘it’s’ be changed to ‘its’ and ‘fitness’ to activity’ in the last sentence of paragraph 34.

8. The fourth sentence in paragraph 36 be deleted.

Action: Secretariat

Amended Terms of Reference – SACNenergy/05/08

9. The role of the UK Dietary Reference Values (DRV) for energy was discussed, as was the mismatch between the National Diet and Nutrition Survey (NDNS) energy intakes and the estimated average requirements. It was noted that there was a need to determine the extent to which the different methodological processes involved contributed.

10. The Committee discussed the revised Terms of Reference (ToR). It was debated whether the term ethnicity should be included in point 3 and whether the ToR should define population subgroups more clearly. It was suggested that while population subgroups should be considered, this may not necessarily need be stated in the ToR. The need to be pragmatic and focus on maintaining health in normal populations was discussed. A point of reference for the determination of DRVs was the assumption of normal individuals in normal health. There was a need to consider what normality was and what the exceptions to this were; in so doing, principles could be established for population subgroup considerations.

11. It was noted that the recommendations needed to relate to older people, where senescence could affect energy requirements; equally, growth was a factor in the young that could affect energy requirements. Overweight people were also identified as a population subgroup for consideration. It was noted that the primary consideration needed to be normal individuals in normal health, although, certain population subgroups would need subsequent consideration.

12. The remit of the Committee was discussed. It was noted that the primary objective was to review the DRVs for energy. The DRVs for energy needed to be UK specific, but would draw on international evidence. It was agreed that the ToR would not be amended at this time, as the population subgroups discussed were implicit in term subgroup in point 3; however, the Committee would consider this issue later in the risk assessment process if it was felt necessary.

Reported energy intakes from NDNS compared with estimated average requirements - SACNenergy/05/09

13. The analyses of the NDNS data requested at the previous meeting were presented to the Committee. It was noted that the paper focused on people aged 19-64 years. The average energy intakes were below estimated average requirements (EAR); these were obtained using basal metabolic rates

(BMR) based on a modified Schofield equation and body weight measures, which were then multiplied by estimates of physical activity levels (PAL) from seven-day physical activity diaries.

14. It was noted that the average PAL values obtained from a sample of subjects, using the doubly labelled water technique, were similar to the average values obtained from the seven-day physical activity diaries. It was also noted, however, that at the different activity levels there was less agreement between the two data sets.

15. A bimodal distribution in the percentage of subjects at different activity levels was observed in the male subjects, from both experimental and diary data. It was requested that this should be further investigated.

Action: Secretariat

16. The correlation between energy expenditure measures obtained from physical activity diaries and those obtained from doubly labelled water measurements was discussed. It was noted that in the NDNS sample 26% of women had a PAL value of between 1.5-1.7, while 65% of women had a PAL value in this range according to data obtained from physical activity diaries of the whole survey. A similar inconsistency was observed for men. The need to understand these discrepancies was highlighted.

17. It was noted that PAL values obtained from the NDNS, from experimental and diary data, were comparable to those reported in Shetty *et al*. (1996). Average PAL values were similar between experimental and diary data, but individual data were less so; however, the differences between males and females were broadly similar in both sets of data, which suggests that the diaries are, to a certain extent, representative of physical activity levels. The level of agreement between the two methods was noted as being due to the large proportion of individuals' time being spent in sleeping and sedentary activities. A PAL of 1.4 was suggested of being likely to underestimate energy requirements.

18. It was noted that thermogenesis was not specifically accounted for in the assessment of energy expenditure; however, it was implicit in the PAL values, where subjects were not in a fasted state. It was suggested that resting energy expenditure rather than BMR was what was determined. It was noted that BMR incorporates a component of thermogenesis. The need to be careful with terminology, clearly and explicitly defining its meaning and any assumptions involved, was highlighted.

19. It was requested that the energy expenditure data from the Health Survey of England (HSE) be compared with the NDNS data. It was noted that the HSE data is from a larger number of subjects and the NDNS PAL values were higher then expected. It was suggested that there might have been self-selection of subjects in the NDNS who were more active than average subjects. The HSE also has PAL data for subjects aged 65 years, although it does not include a detailed dietary assessment.

Action: Secretariat

20. The Committee highlighted the need to determine the level of confidence in the NDNS data, as well as the basis for the components of the equations used in the determination of energy requirements.

21. It was commented on that the National Cultural Survey data would report in a next year or two, and

that this contained information on people's leisure time, as determined by questionnaire. The survey had been developed by Sport England and funded by the Department of Health. It was suggested that physical activity levels may have changed, possibly in a bimodal fashion, in recent years, e.g. in certain population subgroups but not others.

22. It was noted the energy costs for growth were small, except in very young children, and that metabolic tables for children were being considered in the USA. The effect of smoking and ambient temperature on BMR values was discussed. Smoking has been observed to have a short effect, while humans' ability to thermoregulate with the use of clothes and central heating meant that climate only had a small effect on BMR, and this was within the normal range of values observed.

23. It was noted that differences in body shape, size and mass could affect considerations in the predictive equations for energy requirements. Increased body size due to increased adiposity would affect requirements differently from increased body size without increased adiposity. The question of how to characterize an average population, e.g. sedentary or active, was raised. It was noted that the FAO report recommendations were based on aspirational targets rather than actual physical activity levels.

24. It was noted that the doubly labelled water experiments that originally suggested the population to be sedentary reported a PAL of 1.46; subsequent experiments, however, have reported higher PAL values. It was suggested that the original work may have been an underestimation and PAL values since that time may have increased.

25. The Committee discussed estimated energy intake data and its importance to public health in relation to the increasing adiposity of the UK population. The perception of energy intakes by individuals was also discussed and the large underestimations in perceptions were noted. The observation that energy expenditure did not conform to a normal distribution was highlighted in relation to the need to examine data beyond average values, and look at the distribution and differential risk of individuals.

26. It was noted that there was far more discrepancy between the energy intake and requirement data for free living people aged 65 years and over, than for those who were in institutions. The Committee requested further analyses of the NDNS data: the distribution and correlation of doubly labelled water data with physical activity diary data; subject characteristics, e.g. height and weight, of those in the doubly labelled water experiment; energy intakes as a percentage of the EAR for doubly labelled water experiment subjects, especially those with PALs greater than 2.0

Action: Secretariat

Commentary on the adult BMR analysis – SACNenergy/05/10

27. The extent to which the Schofield equation was applicable to different population was discussed. It was suggested that the Italian population upon whom the equation was based had a high energy expenditure and, therefore, might have led to the overestimation of energy expenditure for populations to which it was applied. The representativeness to different population subgroups was questioned; however, if this data set was not used with its limitations acknowledged, other smaller data sets would have to be used.

28. The papers presented to the Committee by Cole using different models based on the Oxford data set were discussed. It was noted that this approach introduced different variables and the author suggested that this was a more accurate predictive equation. The estimate of BMR was lower than the Schofield prediction using this approach, which would result in lower energy expenditure predictions overall. The correction factors employed in this approach for certain population, such as the Italian study population, and its applicability to the UK population was discussed. The studies of Italian subjects were pre-war and closed circuit in design, leading to a five percent increase in estimations. The need to compare the approach adopted in these papers with other approaches was noted.

29. The other papers on BMR analysis presented to the Committee were discussed. It was noted that approach used by Cole didn't have different equations for different aged groups within the population and was a seamless analysis.

30. The differences between the Oxford and Cole data were discussed. It was noted that there was a discrepancy between the data sets in subjects with a BMI above 30. In the Schofield data set it was noted that there were few subjects who were obese or aged over 65 years. The need to examine the population characteristics was highlighted. Some approaches included adjustments for population subgroups within the equation, whereas other approaches gave separate equations.

31. The high prevalence of overweight and obese subjects in the UK population and the need for predictive equations to be relevant to this population was noted. It was suggested that relevant population subgroups could be analysed using the different predictive equations to determine which best fitted for the data. It was noted that the Schofield equation had been shown to be inappropriate for use with obese subjects [DN – Graham Holden paper? Check].

32. It was commented on that the FAO energy recommendations used aspirational PALs, but not aspirational BMIs. The UK population is a changing entity, but there needs to be a notional sense of what is desirable in terms of physical activity, BMI and energy consumption. The need to approach this assessment one piece at a time was highlighted, as was the need for data to be derived from relevant populations.

33. The Cole analysis required further investigation. The importance of height was mentioned with regard to adjusting for the obese, but coefficients also needed to control for height throughout all age groups. It was noted that application of the data was problematic for obese and overweight females. Underlying physiological processes change throughout life and there was a need to determine the degree of errors introduced for different age groups, e.g. children, obese.

34. The Committee requested that Cole be invited to breakdown the data into different age groups: less than 5 years old; 5-18 years old; and older than 18 years. This would enable comparisons between the split and non-split data and determine whether bias in the data relates to specific age groups or physical characteristics.

35. It was noted that the Oxford equation provided the best fit for males; whereas, the Cole equation provided the best fit for females. The physiological state of the females involved was not clear, although the Cole equation used a reference population of 20 year old females on which all other age groups were based. The need to explore the limitations of the different data sets was emphasized. The approach would probably be employed was described as one based on BMR and PAL values that had been validated with doubly labelled water experiments.

36. It was commented on that Cole was developing a method rather than suggesting his equations should be used as the basis for predicting energy requirements. It was requested that Cole be invited to apply his equations to different population subgroups. The need to further develop the accuracy of this equation and consider a piece-wise regression to improve the model was highlighted.

Action: Secretariat to liaise with Andrew Prentice and Marinos Elias on requesting subgroup analyses

37. The Committee considered physiological differences in difference populations that could affect variability within models, e.g. whether differences observed between different ethnic populations were due to factors such as body composition. It was noted that the body composition for the same weight and height varied between different population subgroups, e.g. Asians have a higher fat to lean body mass composition. The influence of maternal and child nutrition on body composition considered. It was commented on that since comparisons between different ethnic populations were diasporic, it was unknown whether these comparisons were relevant to ethnic populations within the UK. It was suggested that although population subgroups were relevant to the Committee's considerations, these should be regarded as exceptions to the norm.

Draft outline of the report – SACNenergy/05/12

38. It was suggested that the introduction could be difficult, as this would set out the issues to be examined in the subsequent report chapters. The introduction would need to define a framework and should be a chapter in itself. The subsequent chapters would then expand on the issues outlined in the framework. It was requested that significant population subgroups be given separate consideration.

39. It was commented on that a chapter would be required to consider breastfeeding and formula-feeding in the first year of life, using the new international standards on infant growth. Discussion of the impact of different physical activity levels was also highlighted. The need for the Committee to produce clear recommendation was emphasized.

40. It was requested that a risk-assessment of the health aspects of physical activity be included and that the physical activity categories be described in detail. It was noted that this should be in behaviours rather than numbers, e.g. PAL values.

41. It was requested that the energy requirement recommendations relate to dietary intakes of different macro and micronutrients.

42. It was noted that while energy requirements for the first few months of life were different from the norm, it was unclear which other age ranges should be considered separately. It was commented on that while a single descriptor for all ages would be advantageous it needed to be accurate. The need to determine whether a single approach was feasible was highlighted.

43. It was suggested that separate meetings on discrete issues could be convened. It was agreed that a conceptual framework for the report would be developed over the next few meetings. The Committee requested the option of inviting relevant specialists if required.

Shetty PS, Henry CJK, Black & Prentice AM. Energy requirements of adults: an update on basal metabolic rates and physical activity levels. *Eur J Clin Nutr*. 1996, **50**: (suppl) S11-S23.