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NUTRITION SCREENING SURVEYS IN CARE HOMES IN THE UK

A report based on the amalgamated data from the four Nutrition Screening Week surveys undertaken by BAPEN in 2007, 2008, 2010 and 2011

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on behalf of BAPEN and collaborators

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The four surveys and audits on nutritional screening were undertaken by BAPEN during 2007 - 2011 in collaboration with the British Dietetic Association and the Royal College of Nursing and with support from the Welsh Government, the Scottish Government, the Chief Nursing Officers for England and Northern Ireland and the Patient Safety, Domain 5, NHS England (who have taken on responsibilities of the former National Patient Safety Agency).

BAPEN
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Royal College of Nursing

BDA The Association of UK Dietitians

British Association for Parenteral and Enteral Nutrition (BAPEN)

BAPEN is a charitable association that raises awareness of malnutrition and works to advance the nutritional care of patients and those at risk from malnutrition in the wider community. Its membership is drawn from doctors, dietitians, nurses, patients, pharmacists and the health policy, industry, public health and research sectors.

- BAPEN works to achieve its mission by raising awareness of the prevalence and impact of malnutrition, raising standards in nutritional care and developing appropriate pathways to prevent malnutrition
- BAPEN researches and publishes the evidence on malnutrition, and provides tools, guidance, educational resources and e vents for all health and social care professionals to support the implementation of nutritional care across all care settings and according to individual need.
- BAPEN works in partnership with its membership, its core specialist groups and external stakeholders to embed excellent nutritional care into the policy processes and practices of all health and care settings.
- The Nutrition Screening Week Surveys have been conducted as part of the activities of the Malnutrition Action Group, a standing committee of BAPEN.

For membership details, contact the BAPEN office or log on to the BAPEN website www.bapen.org.uk

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KEY POINTS

- 'Malnutrition' (medium + high risk according to the 'Malnutrition Universal screening Tool' ('MUST') for adults) was found to be a major social health problem, affecting 35% of care home residents. Most residents with 'malnutrition' were underweight (BMI <20 kg/m^2), and at high risk, which requires treatment.

- Underweight (BMI < 20 kg/m^2) was distinctly more common among care home residents than the general population (30% in residents v 4% in the general population; P <0.001) and obesity was less common (9% in residents v 28% in the general population; P <0.001). Underweight among care home residents increased with age, while obesity decreased with age. These differences, which are significant both from clinical and statistical points of view, reflect the extent to which the polar ends of weight status spectrum need to be tackled in care homes and the general population.

- There was considerable intra-individual variation in weight change between weight on admission and weight at the time of the survey (mean 0.2 kg; 95% range, -10.0 kg to 9.7 kg), which was largely unexplained. Nutritional status was found to be the single most important explanatory variable: subjects found to be at risk of 'malnourished' at the time of the survey were more likely to be underweight on admission and lose further weight during their residency, while' non-malnourished' subjects gained weight. Most residents who were underweight on admission remained underweight at the time of the survey, which took place up to 6 months after admission. Further investigations to understand the mechanisms responsible for the variability in weight change could help improve the nutritional care of the residents.

- 'MUST' was used in the majority of care homes. Among care homes using a screening tool (>90% of the total), 96% used 'MUST' (92% as the only tool) at the time of the 2011 survey). Unlike several other tools it can be used in other care settings and in all adult age groups, facilitating nutritional care during journeys within and between care settings.

- Over the period of the Nutrition Screening Week surveys there were significant trends reported by the participating care homes showing increased access to dietetic services, availability of policies to undertake nutritional screening and recording height on admission. However, there was room for improvement in some aspects of nutritional care, such as awareness of the existence of weighing scale standards (55% reported in 2011 survey) and auditing of nutritional screening (reported to take place in 73% of care homes in 2011).

EXECUTIVE SUMMARY

1. Between 2007 and 2011 four Nutrition Screening Week Surveys (NSW) of UK hospitals, care homes and mental health units were undertaken, each in a different season of the year. The surveys aimed to establish the prevalence of 'malnutrition' in the different care settings, to document current screening practice and identify problems that needed addressing and to provide feedback to local centres so their results could be benchmarked against those of the UK as a whole. The current report, which is based on the amalgamated data from UK care homes that participated in the four surveys, provides new information on the trends in nutritional care over time, factors affecting the prevalence of 'malnutrition' and weight change during residency. It also reports on the way in which the anthropometry of residents admitted to care homes differs from those of the general population.

2. The four NSW surveys involved a total of 474 care homes in the UK (75-148 per survey) and 3971 adult residents (577-1610 per survey). The majority of data were provided from England and to a progressively smaller extent from Scotland, Wales and Northern Ireland. To overcome difficulties associated with non-responses to certain questions the data were subjected to three sensitivity analyses: one in which all the non-respondents were placed in one of two alternative categories, such as 'yes' and 'no'; another in which they were all placed in the other category; and the third in which all were placed in the two categories in the same proportion as the respondents.

3. Most care homes reported having policies on nutritional screening (82-92%), weighing and recording of weight on admission (91-99%) and at intervals during residence (99-100%). The vast majority also reported linking the results of screening to a care plan (91-96%). The overall non-response (including 'don't know') to questions about these items ranged from <1% to 5%.

4. Trend analysis (with sensitivity analysis) of consecutive surveys indicated significant improvements in the availability of policies on recording height on admission, and access to dietetic services. No significant trends (with consistent results from sensitivity analyses) were observed for recording of weight on admission and during stay, which already had high baseline rates, and other items, such as those related to proportion of residents screened on admission, frequency of nutritional screening, and awareness of weighing scale standards, which were accompanied with a non-response rates of 15-39%.

5. There was room for improvement in some aspects of nutritional care, such as awareness of the existence of weighing scale standards (55% in 2011 survey in association with no response in 22%) and undertaking audits on nutritional screening (73% in 2011 with no response in 16%).

6. In care homes that reported using a nutrition screening tool (>90% of the total) 'MUST' was the commonest. In the 2010 survey 86% of care homes used it (84% as the only tool) and in 2011 survey 96% used it (92% as the only tool), with an overall significant increase between the two surveys. The use of the consistent 'MUST' criteria within and between care homes and in multiple other care settings can facilitate continuity of nutritional care.

7. Among care home residents (mean age of 83 ± 10 years, body mass index (BMI) 23.1 kg/m^2), who had been admitted in the previous 6 months, the prevalence of 'malnutrition' (medium + high risk according to 'MUST') was 35% and it remained high in various subgroup analyses (next point).

8. The prevalence of 'malnutrition' did not differ significantly between countries (England, Scotland, Wales and Northern Ireland), but it was lower (27%) in residents who had been admitted into exclusively residential care homes than all other types of care homes (38%), and it was also lower in those admitted from their own homes (30%) than from hospitals (39%) and other care homes (37%). In contrast it was found to be higher in women (38%) compared to men (30%), who were about four years younger than women, and in older than younger residents (27% in those <75 years, 39% in those 70-84 years, and 39% in those ≥85 years). It varied with disease category, and was higher in residents with cancer than those without and in those suffering from multiple rather than a single major condition.

9. The mean body mass index (BMI) of the residents was more than 4 units lower than that of the general population before (23.1 ± 5.6 kg; care home residents) and after adjustment for age and sex, and also after adjustment for age and sex when only subjects aged ≥65 years were considered. This large difference reflects the prevalence of underweight (BMI < 20 kg/m^2), which was distinctly higher among care home residents than the general population (30% v 4%; P <0.001) and obesity which was distinctly lower (9% v 28%; P <0.001). Underweight among care home residents increased with age, while obesity decreased with age.

10. The average intra-individual weight change in those who had been admitted in the previous 6 months was small, but the variability was large (mean 0.2 kg; median 0.1 kg; 95% range, -10.0 kg to 9.8 kg). 'MUST' categorisation at the time of the surveys was found to be the most important single explanatory variable for the weight change. Those who were 'malnourished' (mostly underweight on admission and at the time of the surveys), lost weight, whereas those who were not 'malnourished' gained weight. The weight change was not significantly affected by duration of residency or gender. However, it was found to be significantly affected by age (older people were more likely to lose weight) but together with other variables explained no more than 4% of the variability (14% when 'MUST' categorisation was included in the analysis). Most of the variability in weight change remained unexplained. There is a need to understand the mechanisms responsible for these weight changes, since they could influence the nutritional management of the residents.

INTRODUCTION

The four Nutrition Screening Week (NSW) surveys[1-4], undertaken in the UK between 2007 and 2011, provided an array of local results, which were fed back to the participating centres for benchmarking against the national data, as part of the audit process. The surveys helped to establish the burden of 'malnutrition' in hospitals, care homes and mental health units, and they facilitated care planning and estimation of the clinical and economic burden of 'malnutrition'[5-7]. They also increased awareness about the need to combat 'malnutrition', which continues to be under-detected and under-treated. With accumulation of data over successive surveys it became possible to examine trends over time within the hospital setting, not only within the UK[8] as a whole but also within the individual constituent nations[9-12]. These nations, which have become devolved since 1999, have been increasingly developing their own healthcare systems[13].

This report, based on the amalgamated data obtained from the four care home surveys, aimed to examine trends over time, particularly in relation to aspects of 'malnutrition' and in the organisational infrastructure for improving nutritional care. Previously, the results for the care home setting from individual NSW surveys have been reported separately, making it difficult to undertake trend analysis. To do this type of analysis it is necessary to combine the data from the four surveys, take into account the effects of confounding variables, and perform sensitivity analyses to examine uncertainty. The cumulative sample size increased substantially with each additional survey, allowing the results to be reported with more confidence and to undertake trend analysis. Almost 80% of the care home data from the UK were obtained from England, which meant that data from other nations (Wales, Northern Ireland and Scotland) originated from less than 1000 subjects or a mean of less than 100 subjects per country for each survey). Such limited data prevented a detailed and confident analysis to be carried out within each country, especially since many questions were often not fully answered. Therefore, only two amalgamated care home reports have been produced: one for the UK as a whole (this report) and the other for England. This contrasts with the five NSW hospital reports, one for each country and one for the UK as a whole, which were made possible by the availability of ten-fold more subject data than those for care homes.

The amalgamated care home reports, like those for hospitals, aimed to characterise the populations studied by comparing the data with those obtained from the general population. This included a comparison of body mass index and age distribution obtained from health surveys and population census surveys. In some cases 'raw' data from health surveys undertaken in the same country (England, Wales and Scotland) over the same time period as the NSW surveys, were merged to establish a more representative UK sample. Unfortunately, health survey data from Northern Ireland could not be identified and so they could not be merged with those from the other countries.

The two care home reports from this series, the five reports from the hospital series, and the individual NSW survey reports, containing data on hospitals care homes and mental health units, can be obtained from BAPEN (www.bapen.org.uk).

GENERAL FEATURES OF SURVEYS

The table below shows the general features of the Nutrition Screening Week (NSW) surveys which were undertaken in different seasons of the year. They involved a total of 474 care homes and 3971 adults, who were admitted in the previous 6 months. Children were not included.

TABLE 1 General features of the four Nutrition Screening Week Surveys†

Survey number	Year of survey	Date of survey	Season†	Number of care homes	Number of subjects††
1	2007	27-29 September	Autumn	173	1610
2	2008	1-3 July	Summer	75	777
3	2010	12-14 January	Winter	148	1007
4	2011	5-7 April	Spring	78	577
Total				474	3971

† The surveys were undertaken at 0.75 (autumn), 0.50 (summer), 0.04 (winter) and 0.26 (spring) of the way through the year

†† Not all questions were completed on all subjects

The first part of each survey involved gathering information about the care homes (Form 1a) and the second part about the residents (Form 2a). The forms used in individual surveys can be found in the previous reports [1-4] but the ones used in the last survey are included in Appendix 1. The forms differed slightly from year to year, mainly by the inclusion of a few more questions in the more recent surveys. For example, only the last two surveys included questions on the types of screening tool used by care homes, educational and training methods used for nutritional screening and awareness of standards for weighing scales.

In this report, the risk of malnutrition was assessed using the 'Malnutrition Universal Screening Tool' ('MUST') criteria [8], with 'medium + high risk' referred to as 'malnutrition'.

Results from the four surveys were amalgamated into one database in order to establish the mean results for each of the four surveys and trends over time. Statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS Chicago, USA (versions 22)). A P value (P value <0.05 was considered to be significant) is used to indicate statistical differences between groups or years, and P (trend) to indicate linear trends over time (see Appendix 2 (Glossary of statistical terms)).

A proportion of centres responded to certain questions with 'don't know' (DK) or 'no answer' (NA), which were amalgamated as 'don't know/no answer' ('DK/NA'). However, the proportion of 'DK/NA' responses varied from year to year creating difficulties in assessing trends over time or differences between seasons. Therefore the following three types of sensitivity analysis were carried out in which different proportions of the DK/NA group was assigned to the two alternative categories involved in the trend:

a) all the care homes in the 'DK/NA' category were assigned to one of the two alternative categories (e.g. those responding 'yes')

b) all the DK/NA were assigned to the other alternative category (e.g. those responding 'no')

c) all the DK/NA responses were assigned to the two alternative categories in the same proportions as those reported for that question.

The first two sensitivity analyses involve extreme assumptions. However, if the results of these two analyses as well as that of the third are consistent in showing significant trends or differences in the

same direction, they would indicate substantial confidence in the conclusions. If the results from these analyses were inconsistent by showing different trends, it would become difficult to establish a conclusion with confidence.

To compare the anthropometry and the age distribution of residents participating in the NSW surveys with those of the general population, raw data from 11 national surveys were obtained from the national archive centre at Essex University (now available from http://ukdataservice.ac.uk/): four from England (Health Surveys for England 2007, 2008, 2009 and 2010; see reference[14] for reports); four from Wales (Welsh Health Surveys 2007, 2008, 2009 and 2010; see reference[15] for report; and three from Scotland (Health Surveys for Scotland 2008, 2009 and 2010; see reference[8] for reports). These overlapped temporally with the NSW surveys. Health Surveys for Northern Ireland could not be identified and nor could a Health Survey for Scotland for 2007. A secondary analysis of these surveys was undertaken using only adult data (≥ 18 years) which was subsequently split into 10 year age bands, and sometimes less than 10 year age bands, for age specific comparisons with care home residents. In the case of the Welsh Health Surveys, which reported the age of the subjects in 5 year age bands, only those aged ≥20 years were used. When the results for two or more countries were involved in comparisons between the general population (Health Surveys) and subjects admitted to care homes (NSW surveys), the data from each country were weighted (for each type of survey separately) to establish proportional representation of the population (see Appendix 2 (Glossary of statistical terms) for weighting procedures) using the mid-2010 population estimates provided by the Office of National Statistics as reference[10].

CARE HOME AND SUBJECT CHARACTERISTICS

Care home characteristics

In the section that follows, the raw results are shown in a table, which may be followed by another table that summarises the results of sensitivity analyses.

Presence of a nutrition screening policy

TABLE 2 Distribution of care homes according to presence of nutrition screening policy

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Yes	82	89	92	91	430	88	88
No	12	5	3	65	24	7	6
DK/NA	7	5	5	4	430	5	5
Total	101*	99	100	100	474	100	99*
Number of care homes (N)	*173*	*75*	*148*	*78*	*474*	*474*	*475***
P value†			***0.088*** ***0.149(adj)***				

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* Results do not add up to 100% due to rounding of the component values to the nearest 1%
** The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Chi squared test

TABLE 3 Sensitivity analyses of care homes according to presence of nutrition screening policy

Type of sensitivity analysis*	% yes				P value	
	2007	2008	2010	2011	P	P(trend)†
Model a	88	95	97	95	0.026	0.010
Model b	82	89	92	91	0.024	0.006
Model c	88	95	97	95	0.015	0.006

* In model a) all DK/NA assigned to 'yes'
In model b) all DK/NA assigned to 'no'
In model c) all DK/NA assigned to 'yes' and 'no' in the same proportion as respondents
† Chi squared (P) and Chi squared for trend (P(trend))

Sensitivity analyses involved two categories only ('yes' (presence of nutrition screening policy) and 'no' (absence of nutrition screening policy)). The results indicate significant changes in the proportion of care homes reporting that they have a nutrition screening policy.

Audit of nutritional screening

TABLE 4 Distribution of care homes according to audit on nutritional screening

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Yes	68	60	65	73	315	66	66
No	18	17	20	15	85	18	18
DK/NA	14	23	15	12	74	16	16
Total	100	100	100	100	474	100	100
Number of care homes (N)	*173*	*75*	*148*	*78*	*474*	*474*	*474*
P value†			***0.547*** ***0.302(adj)***				

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
† Chi squared test – the P values should be interpreted with caution since the assumptions of the test were not met

TABLE 5 Sensitivity analyses of care homes according to audit on nutritional screening

Type of sensitivity analysis*	% yes				P value	
	2007	2008	2010	2011	P	P(trend)†
Model a	82	83	80	85	0.887	0.874
Model b	68	60	65	73	0.360	0.607
Model c	79	77	77	82	0.831	0.848

* In model a) all DK/NA assigned to 'yes'
In model b) all DK/NA assigned to 'no'
In model c) all DK/NA assigned to 'yes' and 'no' in the same proportion as respondents
† Chi squared (P) and Chi squared for trend (P(trend))

Sensitivity analyses involved two categories only ('yes' (audit on nutritional screening) and 'no' (no audit on nutritional screening)). The overall results indicate no significant change in the proportion of care homes reporting that they audit nutritional screening practice.

Frequency of nutritional screening audit

The question on the frequency of nutritional audit appeared only in the last three surveys

TABLE 6 Distribution of care homes according to frequency of nutrition screening audit

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Every year	-	59	53	68	175	58	60
Every 2 years	-	0	5	1	8	3	2
Every 3 or more years	-	0	1	0	1	<1	<1
DK/NA	-	41	42	31	117	39	38
Total	-	100	101*	100	301	100	100
Number of care homes (N)	-	75	148	78	301	301	*301*
P value†			***0.133*** ***0.046(adj)***				

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* Results do not add up to 100% due to rounding of the component values to the nearest 1%
† Chi squared test – the P values should be interpreted with caution since the assumptions of the test were not met

TABLE 7 Sensitivity analyses of care homes according to frequency of nutrition screening audit

Type of sensitivity analysis*	% yes				P value	
	2007	2008	2010	2011	P	P(trend)†
Model a	-	100	95	99	0.048	0.666
Model b	-	41	42	31	0.233	0.176
Model c	-	100	89	96	0.003	0.364

* In model a) all DK/NA assigned to 'every year'
In model b) all DK/NA assigned to 'not every year'
In model c) all DK/NA assigned to 'yes' and 'no' in the same proportion as respondents
† Chi squared (P) and Chi squared for trend (P (trend)) – the P values for model a should be interpreted with caution since the assumptions of the test were not met

Sensitivity analyses involved two categories only ('every year' (audit undertaken (at least) once a year) and 'not every year' (less frequently than once a year')). The results indicate no significant change in the proportion of hospitals undertaking audits on nutritional screening every year.

Access to dietetic services

TABLE 8 Distribution of care homes according to access to dietetic services

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Yes	84	96	93	95	430	92	92
No	10	0	3	3	24	4	4
DK/NA	5	4	4	3	20	4	4
Total	99*	100	100	101*		100	100
Number of care homes (N)	*173*	*75*	*148*	*78*	*474*	*474*	*473***
P value†			***0.006*** ***0.003(adj)***				

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* Results do not add up to 100% due to rounding of the component values to the nearest 1%
** The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Chi squared test – the P values should be interpreted with caution since the assumptions of the test were not met

TABLE 9 Sensitivity analyses of care homes according to access to dietetic services

Type of sensitivity analysis*	% yes				P value	
	2007	2008	2010	2011	P	P(trend)†
Model a	90	100	97	97	0.001	0.002
Model b	84	96	93	95	0.004	0.003
Model c	89	100	97	97	<0.001	0.001

* In model a) all DK/NA assigned to 'yes'
In model b) all DK/NA assigned to 'no'
In model c) all DK/NA assigned to 'yes' and 'no' in the same proportion as respondents
† Chi squared (P) and Chi squared for trend (P(trend))

Sensitivity analyses involved two categories only ('yes' (access to dietetic services) and 'no' (no access to dietetic services)). These results indicate significant changes in the proportion of care home with access to dietetic services.

Policy for weighing residents on admission

TABLE 10 Policy for weighing on admission

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Yes	98	96	91	99	453	96	96
No	1	4	3	0	9	2	2
DK/NA	1	0	7	1	12	2	2
Total	100	100	101*	100	474	100	100
Number of care homes (N)	*173*	*75*	*148*	*78*	*474*	*474*	*474*
P value†			***0.002*** ***0.002(adj)***				

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* Results do not add up to 100% due to rounding of the component values to the nearest 1%
† Chi squared test – the P values should be interpreted with caution since the assumptions of the test were not met

The proportion of care homes reporting that they had a policy for weighing residents on admission was over 90% in all individual surveys and over 96% in those that responded with a 'yes' or 'no'.

TABLE 11 Sensitivity analyses of care homes according to policy for weighing residents on admission

Type of sensitivity analysis*	% yes				P value	
	2007	2008	2010	2011	P	P(trend)†
Model a	99	96	97	100	0.230	0.884
Model b	98	96	91	99	0.003	0.153
Model c	99	96	97	100	0.230	0.230

* In model a) all DK/NA assigned to 'yes'
In model b) all DK/NA assigned to 'no'
In model c) all DK/NA assigned to 'yes' and 'no' in the same proportion as respondents
† Chi squared (P) and Chi squared for trend (P(trend)) – The P values for models a and c should be interpreted with caution since the assumptions of the test were not met

Sensitivity analyses involved two categories only ('yes' (policy for weighing on admission) and 'no' (no policy for weighing on admission)). However, only about 3 % of reporters did not know if they had a policy for weighing residents on admission or did not respond to the question. The results indicated that with consecutive surveys there was no significant trend in the proportion of care homes that had a policy for weighing residents on admission.

Regular weighing during stay

TABLE 12 Regular weighing during stay

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Yes	100	99	99	99	470	99	99
No	0	1	1	0	2	<1	<1
DK/NA	0	0	0	1	2	<1	<1
Total	100	100	100	100	474	100	100
Number of care homes (N)	*173*	*75*	*148*	*78*	*474*	*474*	*475**
P value†			***0.491*** ***0.291(adj)***				

Total (adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Chi squared test – the P values should be interpreted with caution since the assumptions of the test were not met

In all surveys 99-100% of care homes undertook regular weighing of residents during their stay.

Recording height on admission

TABLE 13 Recording of height on admission

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Yes	71	65	82	90	364	77	77
No	23	23	16	6	87	18	18
DK/NA	6	9	2	4	23	5	5
Total	100	99*	100	100	474	100	100
Number of care homes (N)	*173*	*75*	*148*	*78*	*474*	*474*	*473***
P value†			***0.002*** ***<0.005(adj)***				

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* Results do not add up to 100% due to rounding of the component values to the nearest 1%
** The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Chi squared test

The proportion of care homes recording height on admission was less than those recording weight. The proportion recording height on admission generally appeared to increase over the period of the four surveys.

TABLE 14 Sensitivity analyses of care homes according to recording height on admission

Type of sensitivity analysis*	% yes				P value	
	2007	2008	2010	2011	P	P(trend)†
Model a	77	75	84	94	0.004	0.001
Model b	71	65	82	90	<0.001	<0.001
Model c	76	72	84	94	0.001	<0.001

* In model a) all DK/NA assigned to 'yes'
In model b) all DK/NA assigned to 'no'
In model c) all DK/NA assigned to 'yes' and 'no' in the same proportion as respondents
† Chi squared (P) and Chi squared for trend (P(trend))

Sensitivity analyses involved two categories only (recording of height on admission and not recording of height on admission). All three models showed that with consecutive surveys there was a significant trend towards measurement of height in a greater proportion of admissions.

Awareness of weighing scale standards

A question on awareness of standards on weighing scales was introduced in the 2010 survey and was also used in the 2011 survey.

TABLE 15 Proportion aware of weighing scale standards

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Yes	-	-	51	55	118	52	53
No	-	-	27	24	59	26	26
DK/NA	-	-	22	21	49	22	21
Total	-	-	100	100	226	100	100
Number of care homes (N)	-	-	*148*	*78*	*226*	*226*	*226*
P value†			***0.815***				
			0.800(adj)				

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
† Chi squared test

TABLE 16 Sensitivity analyses of care homes according to weighing scale standards

Type of sensitivity analysis*	% yes				P value	
	2007	2008	2010	2011	P	P(trend)†
Model a	-	-	73	74	0.664	-
Model b	-	-	51	55	0.524	-
Model c	-	-	66	69	0.575	-

* In model a) all DK/NA assigned to 'yes'
In model b) all DK/NA assigned to 'no'
In model c) all DK/NA assigned to 'yes' and 'no' in the same proportion as respondents
† Chi squared (P) and Chi squared for trend (P(trend))

The sensitivity analyses involved only two groups ('aware of the weighing scale standards' and 'not aware of weighing scale standards). The results provide no evidence of a significant change between the 2010 and 2011 surveys.

Proportion of residents screened on admission

TABLE 17 Proportion of residents screened on admission

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
0-25%	0	0	1	1	2	1	1
26-50%	1	1	1	0	5	1	1
51-75%	1	5	6	1	15	3	3
76-100%	76	83	80	85	379	80	81
DK/NA	22	11	12	13	73	15	14
Total	100	100	100	100		100	100
Number of care homes	*173*	*75*	*148*	*78*	*474*	*474*	*475**
P value†			***0.042***				
			0.078(adj)				

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Chi squared test – the P values should be interpreted with caution since the assumptions of the test were not met

TABLE 18 Sensitivity analyses of care homes according to proportion residents screened on admission

Type of sensitivity analysis*	% in 76-100% screening category				P value	
	2007	2008	2010	2011	P	P(trend)†
Model a	98	93	92	97	0.032	0.179
Model b	76	83	80	85	0.413	0.410
Model c	98	92	91	97	0.018	0.221

* In model a) all DK/NA assigned to '76-100% screening'
In model b) all DK/NA assigned to '0-75% screening'
In model c) all DK/NA assigned to 'yes' and 'no' in the same proportion as respondents
† Chi squared (P) and Chi squared for trend (P(trend))

Sensitivity analyses involved two categories only (% screened 76-100% and 0-75%). Two of the models indicated significant differences between surveys but none of them indicated a significant trend over time.

Linking screening results to a care plan

A question on linking screening results to a care plan was included in the last three surveys only.

TABLE 19 Linking screening results to a care plan

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Yes	-	96	91	96	282	94	95
No	-	3	1	1	5	2	2
DK/NA	-	1	7	3	14	5	4
Total	-	100	99*	100		101*	100
Number of care homes	-	*75*	*148*	*78*	*301*	*301*	*301*
P value†			***0.217***				
			0.147(adj)				

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* Results do not add up to 100% due to rounding of the component values to the nearest 1%
† Chi squared test – the P values should be interpreted with caution since the assumptions of the test were not met

TABLE 20 Sensitivity analyses of care homes according to linking results to a care plan

Type of sensitivity analysis*	% yes				P value	
	2007	2008	2010	2011	P	P(trend)†
Model a	-	97	99	99	0.734	0.507
Model b	-	96	91	96	0.222	0.950
Model c	-	97	99	99	0.734	0.507

* In model a) all DK/NA assigned to 'yes'
In model b) all DK/NA assigned to 'no'
In model c) all DK/NA assigned to 'yes' and 'no' in the same proportion as respondents
† Chi squared (P) and Chi squared for trend (P(trend)) – the P values should be interpreted with caution since the assumptions of the test were not m

The sensitivity analyses involved two categories only ('linking results to a care plan' and 'not linking results to a care plan).With most care homes already linking the results of screening to a care plan none of the models showed a significant trend towards further improvement.

Type of screening tool used

TABLE 21 Type of screening tool used

	2007	2008	2010	2011	Total	Total(adj)
			%	%	%	%
'MUST'	-	-	76	86	80	82
'MUST'+ local tool	-	-	2	1	2	1
'MUST' + other tool	-	-	0	1	0	0
NRS	-	-	2	0	1	1
'MUST'+NRS	-	-	0	1	1	0
NRS + other tool	-	-	0	0	0	0
NRS + local tool	-	-	0	0	0	0
Other tool	-	-	0	1	0	0
Local tool	-	-	11	3	8	7
Local +other	-	-	0	0	0	0
Local+ other+ NRS	-	-	0	0	0	0
No tool	-	-	2	3	2	2
No answer	-	-	7	4	6	5
Total	-	-	100	100	100	98*
Number of care homes	-	-	148	78	226	224**

Total (adj) = equal weighting for each year (equivalent to equal sample size each year)
'MUST' = The 'Malnutrition Universal Screening Tool'; NRS = Nutrition Risk Score 2002
* Results do not add up to 100% due to rounding of the component values to the nearest 1%.
** The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure

The type of screening tools used in care homes was assessed only in the 2010 and 2011 surveys. In both surveys the 'Malnutrition Universal Screening Tool' ('MUST') was the most commonly used tool. In 2010 'MUST' was reported to be used in 78% of all care homes (76% as the only tool) and 90% in the 2011 (86% as the only tool). The second most commonly used tools were local screening tools.

However, among those care homes that reported using a screening tool, 'MUST' was used in 86% of care homes (84% as the only tool) in 2010, and 96% in 2011 (92% as the only tool) (P <0.05 for increased overall use between 2010 compared to 2011).

Training of staff in nutritional screening

TABLE 22 Method of training staff in nutritional screening

	2007	2008	2010	2011	Total	Total(adj)
			%	%	%	%
Workbook	-	-	6	3	5	4
Lecture/workshop	-	-	44	44	44	44
Lecture/workshop + workbook	-	-	7	14	9	11
E-learning	-	-	0	3	1	1
E-learning + lecture/workshop	-	-	1	3	1	2
E-learning + workbook	-	-	0	0	0	0
E-learning + lecture/workshop + workbook	-	-	0	0	0	0
E-learning + other	-	-	0	1	0	0
E-learning + lecture/workshop + other	-	-	0	1	0	0
Other	-	-	22	6	17	14
Other + lecture/workshop	-	-	4	13	7	8
Other + workbook	-	-	0	3	1	1
No training	-	-	10	8	9	9
No answer	-	-	6	3	5	4
Total	-	-	100	102*	99*	98**
Number of care homes	-	-	*148*	*78*	*226*	*226*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year)
* Results do not add up to 100% due to rounding of the component values to the nearest 1%
** The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure

The most common method of training was a combination of a lecture and workshop, accounting for about 44% of all care homes. The use of e-learning rose, either alone or in combination with other training methods, rose from 1% of all care homes in 2010 to 8% in 2011. Overall about 9% indicated that no training was provided (about 10% among those who responded to the question).

Subject characteristics

Gender

TABLE 23 Residents according to gender

	Number						%					
	2007	2008	2010	2011	Total	Total(adj)	2007	2008	2010	2011	Total	Total(adj)
Male	515	235	316	206	1272	1284	32	30	31	36	32	32
Female	1095	542	691	369	2697	2683	68	70	69	64	68	68
NA	0	0	0	2	2	3	0	0	0	<1	<1	<1
N	*1610*	*777*	*1007*	*577*	*3971*	*3970**	*100*	*100*	*100*	*100*	*100*	*100*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), NA = No answer
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure

Age

TABLE 24 Residents according to age (years) and gender

	2007	2008	2010	2011	Total	Total(adj)
Male						
Mean ± sd	81.0 ± 10.6	81.4 ± 8.3	81.4 ± 10.0	77.1 ± 12.6	80.5 ±10.5	80.2 ± 10.6
Median (IQ)	83 (77-87)	83 (76-88)	83 (77-88)	80 (70-87)	83 (76-87)	82 (75-87)
N	*504*	*235*	*316*	*206*	*1261*	*1261*
Female						
Mean ± sd	84.4 ± 8.7	85.5 ± 8.1	83.8 ± 9.5	82.2 ± 11.0	84.1 ± 9.2	84.0 ± 9.4
Median (IQ)	86 (80-90)	87 (81-91)	85 (80-89)	85 (78-89)	85 (80-90)	85 (80-90)
N	*1066*	*535*	*691*	*369*	*2661*	*2661*
Male + female						
Mean ± sd	83.3 ± 9.5	84.2 ± 8.4	83.0 ± 9.7	80.4 ± 11.8	83.0 ± 9.8	82.7 ± 10.0
Median (IQ)	85 (79-89)	85 (80-90)	84 (79-89)	83 (75-89)	85 (79-89)	85 (78-89)
N	*1570*	*770*	*1007*	*577+*	*3924*	*3924*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year)
IQ= Interquartile range
† Includes two subjects whose sex was not specified

The mean age was 83.0 (sd ±9.8) years and median age 85 (IQ 79 -89) years. Figure 1 shows that the age distribution is skewed to the left.

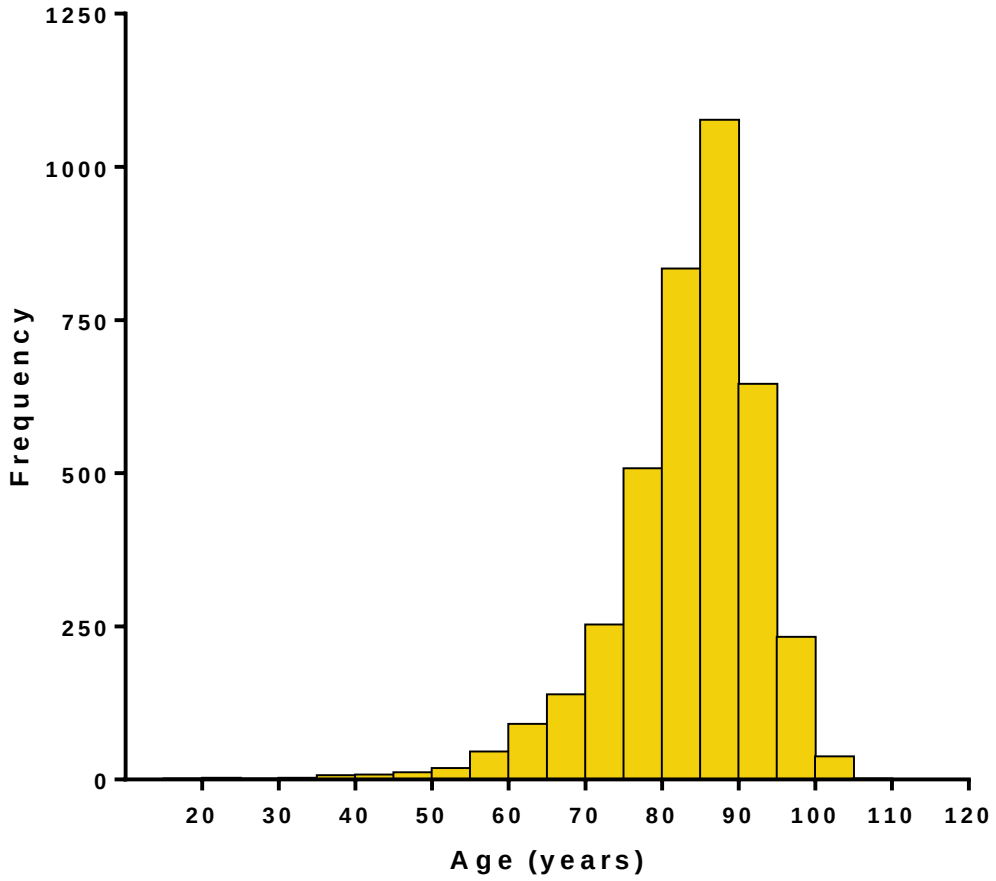

FIGURE 1 Histogram of age distribution of adults (≥18 years) participating in the four NSW surveys (N = 3924). The frequency refers to the number of subjects in individual 5 year age bands.

Body mass index

TABLE 25 Body Mass Index (BMI) (kg/m^2)

	2007	2008	2010	2011	Total	Total(adj)
Mean ± sd	23.4 ± 5.5	22.7 ± 5.7	23.0 ± 5.4	23.2 ± 5.8	23.1 ± 5.6	23.1 ± 5.6
Median (IQ)	22.7 (19.6-26.2)	22.1 (19.1-25.1)	22.4 (19.2-25.8)	22.5 (19.3-26.2)	22.5 (19.3-25.9)	22.5 (19.3-25.9)
N	*1423*	*584*	*820*	*522*	*3349*	*3349*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), IQ= Interquartile range

The mean BMI was 23.1 (sd ± 5.6) kg/m^2 and the median BMI 22.5 (IQ 19.3-25.9) kg/m^2. Figure 2 shows that the BMI distribution is skewed to the right.

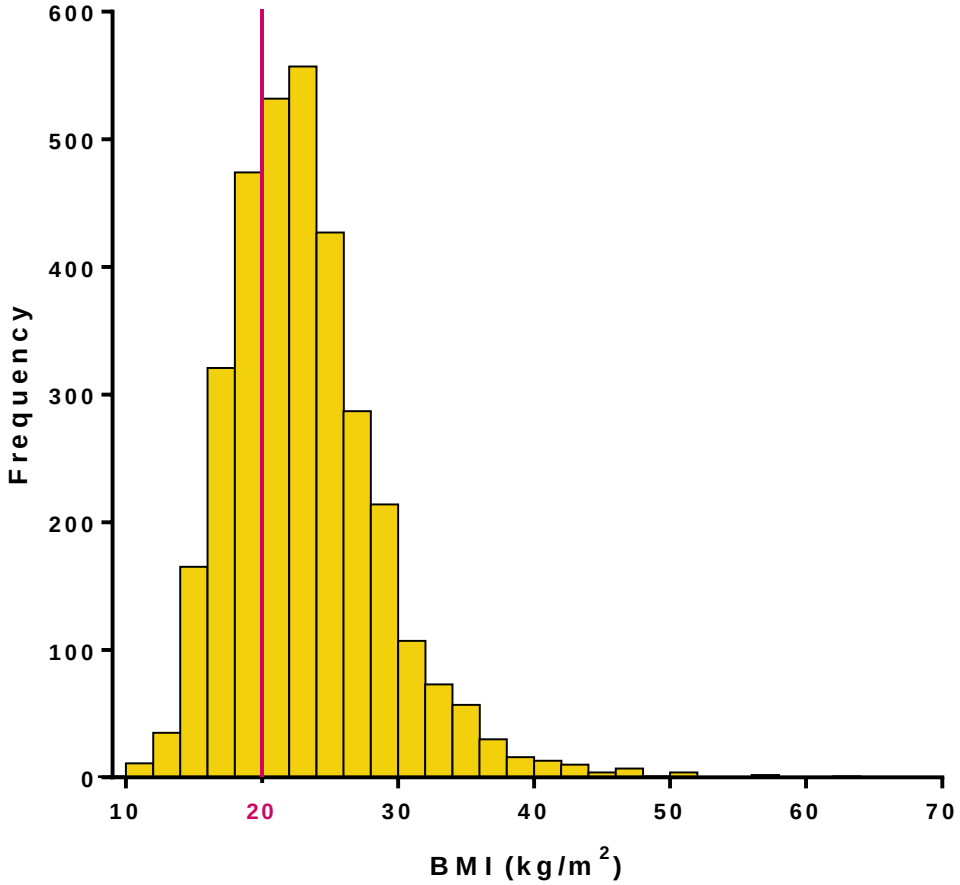

FIGURE 2 Histogram of the BMI distribution of adults (≥18 years) participating in the four NSW surveys (N = 3349). The frequency refers to the number of subjects in individual 2 kg/m^2 BMI band (individual bar). The red vertical red line corresponds to a BMI of 20 kg/m^2.

TABLE 26 BMI categories

kg/m^2	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
<18.5	18	22	20	20	648	19	19
<20.0	28	33	31	32	1013	31	31
20.0-24.9	40	42	39	39	1320	39	39
≥25.0	32	25	30	32	1016	30	30
≥30.0	10	9	9	11	524	10	10
N	*1423*	*584*	*820*	*522*	*3349*	*3349*	*3352**

Total(adj) = equal weighting for each year (equivalent to equal sample size each year)
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure

Comparison of current BMI (survey BMI) and admission BMI

The weight on admission to care homes was reported in most subjects participating in the surveys, and with the information on height obtained in the survey the admission BMI was calculated. A strong correlation coefficient was found between admission and current (survey) BMI (r = 0.942; standard error of the estimate 1.81 kg/m^2). The cross tabulation in Table 27, the same that as that obtained using the BMI categories of 'MUST', shows a strong agreement between admission and current BMI categories (the diagonals shaded in blue indicate 87.7% agreement). Of the subjects who were underweight on admission 73% remained underweight at the time of the survey. Nevertheless, 1 in 8 of all subjects changed categories, about half from a lower to a higher BMI category and the other half from a higher to a lower category. This explains why the proportion of underweight (BMI <20 kg/m^2) on admission (30.4%) was essentially the same as that found at the time of the survey (29.9%). Further discussion on the determinants of the intra-individual weight changes can be found at the end of this section.

TABLE 27 Cross-tabulation of current (survey) BMI with admission BMI categories (kg/m^2)†

		Admission BMI category			Total
		<18.5	18.5-<20	≥20	
Current BMI	<18.5	15.7%	2.2%	1%	18.9%
	18.5-<20.0	2.2%	6.1%	2.8%	11.0%
	≥20	1.1%	3.3%	65.7%	70.1%
Total		18.9%	11.6%	69.5%	100%

† Total N = 2604

Comparison of the age and BMI distribution of adults admitted to care homes with those of the general population

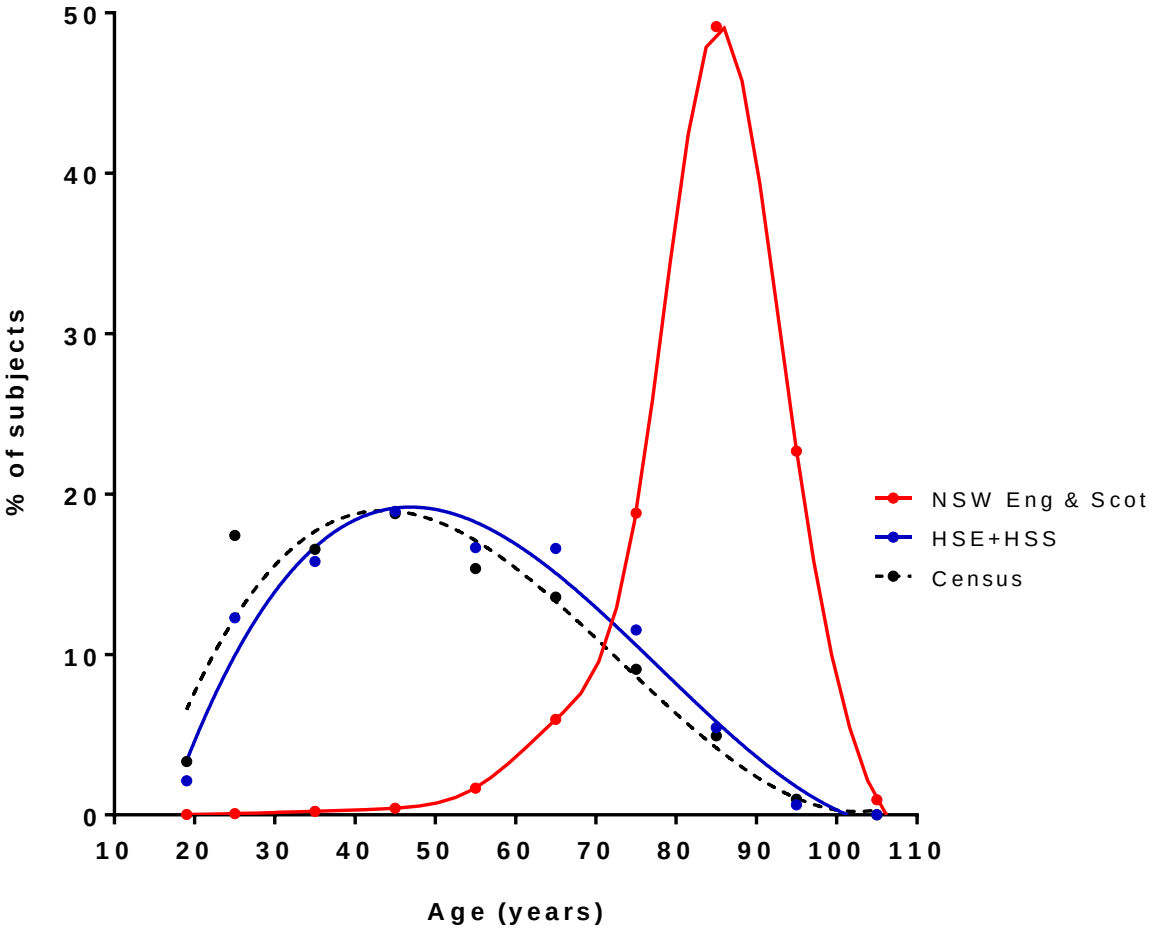

FIGURE 3 A comparison of the age distribution of adult subjects (≥18 years) admitted to care homes (NSW(Eng and Scot); red line) with that of the general population according to a population census of England and Scotland combined (black dotted line) and Health Surveys for England (HSE) and Health Survey Scotland (HSS) combined (blue line). The data from the four Health Surveys for England (2007, 2008, 2009 and 2010) were amalgamated with each other and with the three Scottish Health Surveys. The data of subjects admitted to English and Scottish care homes (NSW surveys 2007, 2008, 2010 and 2011; total N = 3924) were also amalgamated (Elia unpublished). In combining datasets for England and Scotland weighting factors were applied to establish proportional representation of the population according to the mid-2010 census, as reported by the Office of National Statistics.[15] Each data point represents the proportion of adult subjects(≥18 years) within 10 year age bands starting from 10 years (first data point is for subjects aged 18 and 19 years only). The curves were constructed using third order (cubic) polynomials (HSE + HSS; population census) and cubic spline (NSW Eng & Scot).

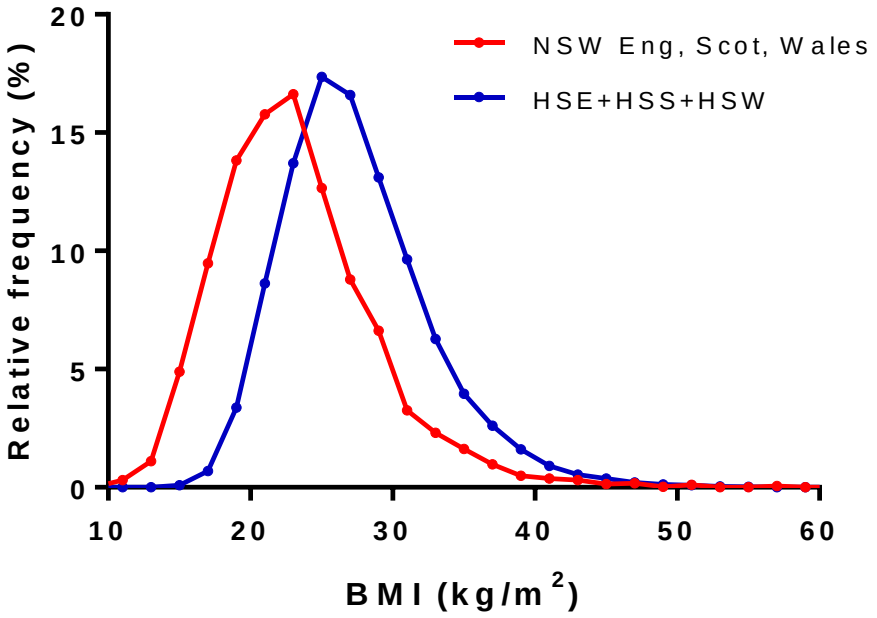

FIGURE 4 Relative frequency polygon of the body mass index (BMI) of adults participating in the NSW surveys in England, Scotland and Wales (N = 3,090) (red line), and of the combined health surveys of England, Scotland and Wales (blue line). Each point represents the percent of subjects within 2 kg/m^2 band widths (i.e. ± 1 kg from the centre of each point. The health surveys are weighted so that each country makes the same contribution to the total as in the NSW surveys.

Thirty percent of the subjects participating in NSW surveys in three of the devolved nations (England, Scotland, Wales) had a BMI <20 kg/m^2 compared to 5% of the general population (Health Surveys). The NSW data for England and Scotland were virtually identical to those for England, Scotland and Wales, because Wales accounted for only 1.9% of the BMI entries. Health survey data from Northern Ireland were not included in the analysis because corresponding national health survey data undertaken over the time frame of the NSW surveys could not be identified.

The mean BMI of adults (≥ 18 years) admitted to care homes (England and Scotland) in the previous 6 months was lower than that of the general population of England and Scotland by more than four BMI units (23.2 v 27.6 kg/m^2; P <0.001)). It remained lower after adjustment for age and sex (23.4 v 27.6 kg/m^2; P < 0.001) and also after adjustment for age and sex among those aged ≥65 years (23.3 v 28.1 kg/m^2; P <0.001) (Since the Welsh Health Survey provided one category for all those aged over 75 years, Wales was excluded from the analysis).

The data for the general population are based on an amalgamation of results from national surveys and those for care homes on an amalgamation of data from the four Nutrition Screening Week surveys (see legends to figures; Elia unpublished).

The BMI of the care home residents tended to decrease through most of the age ranges (although only about 8% were <70 years) whereas the BMI of the general population tended to decrease only after the age of about 60-70 years (Figure 5).

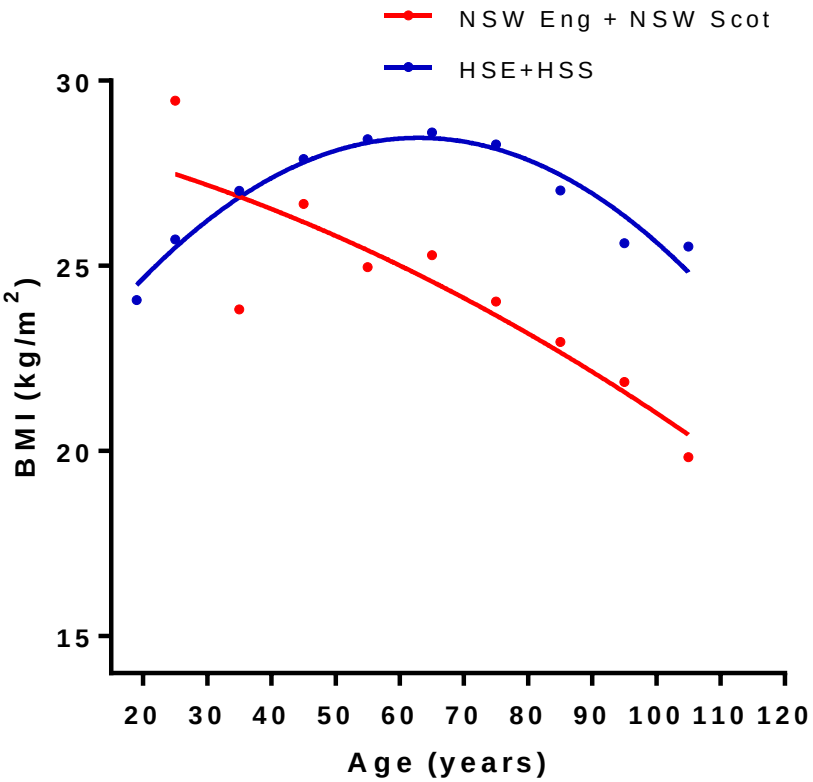

FIGURE 5 The effect of age on the BMI distribution of subjects admitted to care homes in the previous 6 months (NSW (Eng + Scot); red line) and the general population (HSE + HSS; blue line). The data for the general population are based on an amalgamation of results from four Health Surveys for England (HSE) (2007, 2008, 2009 and 2010); N = 28,917) and the three Health Surveys for Scotland (HSS) (2008, 2009, 2010; N = 17,361) (total N = 46,278). The two health survey datasets are weighted to ensure that the contribution of two countries is the same as in the NSW surveys. Each data point represents the mean results of adult subjects in 10 year age bands (the age band 10-19 only includes adults aged 18 and 19 years). Two subjects from the NSW (one aged <20 years and the other >110 years) are not included in the curve estimations which were established using second order (quadratic) polynomials.

The proportion of subjects admitted to care homes with a BMI of <20 kg/m^2 at the time of the NSW surveys (England and Scotland) was 30%, and it progressively increased with age. In contrast, the proportion with obesity (BMI ≥ 30 kg/m^2) decreased with age. The health surveys of the general population (≥ 18 years) differed from the NSW surveys in that the proportion of underweight in the general population (BMI <20 kg/m^2) was lower (4% v 30%), and that for obesity (BMI ≥30kg/m^2; 28% v 9%) and severe obesity (BMI ≥40 kg/m^2; 2.4% v 1.1%) were higher. In addition, the variation in underweight and overweight with age was less pronounced in the general population than in the population of home care residents.

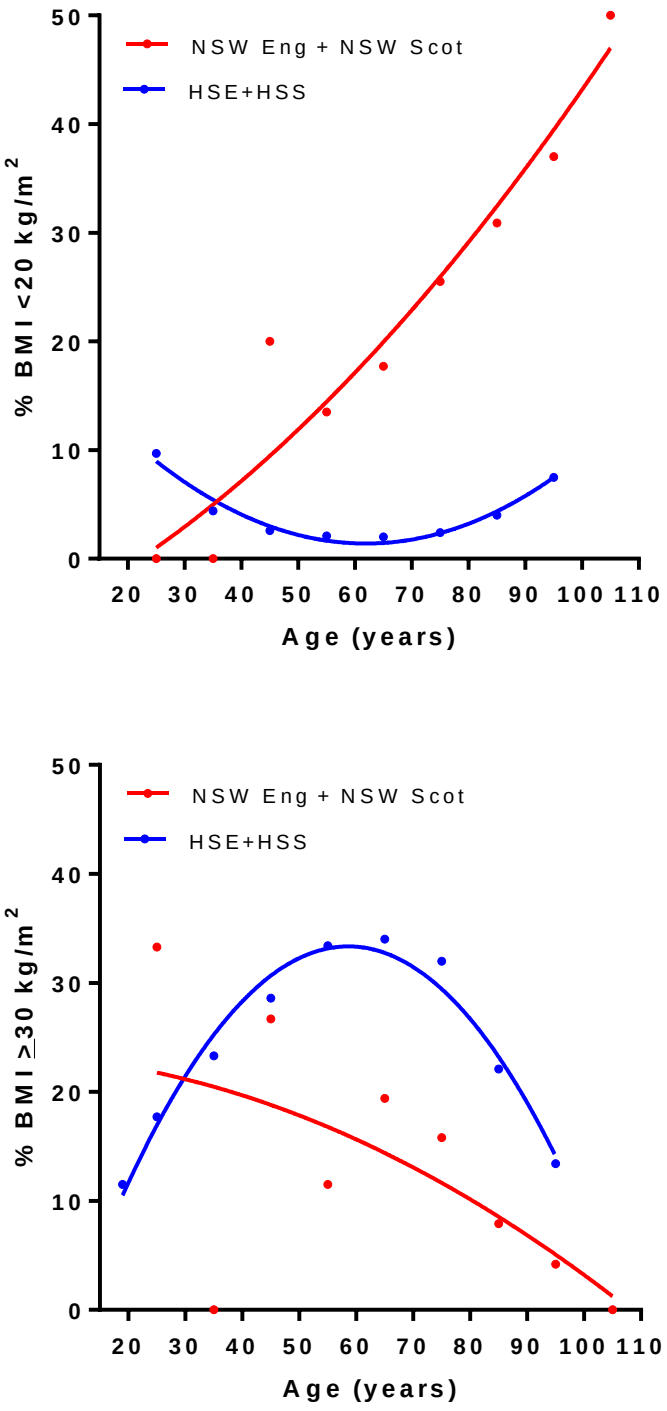

FIGURE 6 A comparison of the effect of age on the proportion of subjects with a BMI <20 kg/m^2 (upper figure) and BMI ≥30 kg/m^2 *(lower figure)* admitted to care homes during the NSW surveys in England and Scotland (NSW (Eng + Scot); red line) and those in the general population (Health Survey England (HSE) and Scotland (HSS); (blue line)) based on the sources indicated in the legend to the previous figure (Elia unpublished). Each point represents the proportion for 10 year age bands (10-100 years), with the lowest band (10-19 years) involving only subjects aged 18 and 19 years. The curves were drawn using second order polynomials.

Weight change

There were 3160 residents for which a weight change could be calculated during the period (up to 6 months) between admission and the time of the survey. On average there was little weight change but the variation was large. Expressed in kg the results were as follows: mean ± sd, 0.25 ± 4.91 kg; median 0.1 kg; 95% range, -10.0 kg to 9.7 kg (N = 3160). The corresponding results expressed in percentages were: mean ± sd, 0.7 ± 8.4%; median 0.2%, 95% range, -16.4% to 18.0%. Figure 7 shows a histogram of the distribution of this weight change. These intra-individual changes in weight were not significantly affected by duration of stay (0.02 kg 0.29 kg and 0.32 kg for those in residence for 0-1.9 months, 2.0-3.9 months, and 4.0-5.9 months respectively)(P = 0.453, analysis of variance of the three groups). There was also no significant difference between groups when the weight changes were adjusted for age, sex, type of care home, source of admission and presence of cancer and nutritional status. However, the variability in weight change (sd) was substantially greater in the group that had been in residence for 4-6 months than in the groups that had been in residence for less than 4 months (P <0.001).

TABLE 28 Intra-individual weight changes according to length of stay in care home†

Length of residence (time since admission) (months)	Number of subjects	Weight change (mean ± sd) (kg)	P value††
0.0-1.9 months	570	0.023 ± 3.56	0.877
2.0-3.9 months	1043	0.289 ± 3.63	0.010
4.0-5.9 months	1534	0.320 ± 5.98	0.037
All periods	3160*	0.246 ± 4.91	0.005

† Although the changes in weight are intra-individual changes, the three groups involve different residents.
†† Paired t-test
* Includes 13 subjects, whose exact duration of stay within the 0-6 month period was not available

The subjects who were 'malnourished' at the time of the survey had a lower admission BMI than those who were not 'malnourished' (admission BMI (19.3 ± 4.2 (sd) kg/m^2 v 25.1 ± 4.8 kg/m^2)(P <0.001). They also had lower admission weight (51.47 ± 12.41 kg v 65.68 ± 14.51 kg) and lost weight during their stay, in contrast to those without 'malnutrition' at the time of the survey, who had higher admission weight and gained weight (-1.79 kg (high risk) v +1.38 kg (low risk); R^2 = 0.095, p <0.001, N = 3048).

Another potential explanation for the variability weight loss was the admission BMI, which was inversely related to weight loss (-0.15 kg per unit increase in admission BMI (R^2 = 0.025; P <0.001). Those who were underweight on admission (BMI < 20kg/m^2) gained a mean of 1.22 kg while those who were not underweight (BMI ≥ 20 kg/m^2) maintained their body weight (-0.02 kg) (R^2 = 0.014; P <0.001). In contrast to the 'MUST' categories (low risk v medium + high risk) obtained at the time of the survey which explained 9.5% of the variability of the weight change since admission, admission BMI categories (<20 kg/m^2 v ≥ 20 kg/m^2) explained only 1.4% of the variability (bivariate analysis).

Other factors were found to be much less important in explaining the variability in weight change, but age had a small significant negative influence (-0.020 kg per year increase in age; R^2 =0.001, P= 0.032). Among the other factors examined were source of admission (other care home -0.03 kg, hospital +0.39 kg and own home +0.11 kg (R^2 = 0.001, P = 0.153)); type of care home (residential +0.70 kg, EMI -0.03 kg nursing home +0.12kg, other +0.13kg (R^2 =0.002, P= 0.060)), presence of other conditions (yes +0.15 kg; no +0.46 kg.(R^2 = 0.001; P = 0.098)) and presence of cancer (with

cancer -0.36 kg, without cancer+0.06 kg; (R^2 < 0.001 P = 0.351)). Sex, country and duration of stay were also not significantly related to weight change.

In multivariate analysis involving all the above variables (except admission BMI which caused multi-collinearity problems), only 14.3% of the variability in weight change (R^2 = 0.143; P <0.001) was explained, the dominant explanatory variable being the presence of 'malnutrition' (P <0.001). The source of admission (P =0.003) and the presence of other conditions (P = 0.025) were the only other two variables that had significant independent effects. Without inclusion of 'MUST' in the model (but with all the other variables indicated above) the other variables explained only 1.4% of the total variability when no interactions were included in the model, and about 4% of the variability when 2-way interactions were included in the model.

Future work should explore in detail the causes of the variability in weight changes. Among the factors to consider are the existence of specific strategies to deal with both the causes and consequences of the weight changes, and particularly large weights losses which affect health and well-being and the activities of daily living. Prospective longitudinal measurement of weight changes in weight and their relationship to underlying disease processes, survival time and end of life care, would be valuable. They could not only help understand their contribution to the variability in weight change, but also actions that need to be taken to alleviate suffering from underweight and malnutrition.

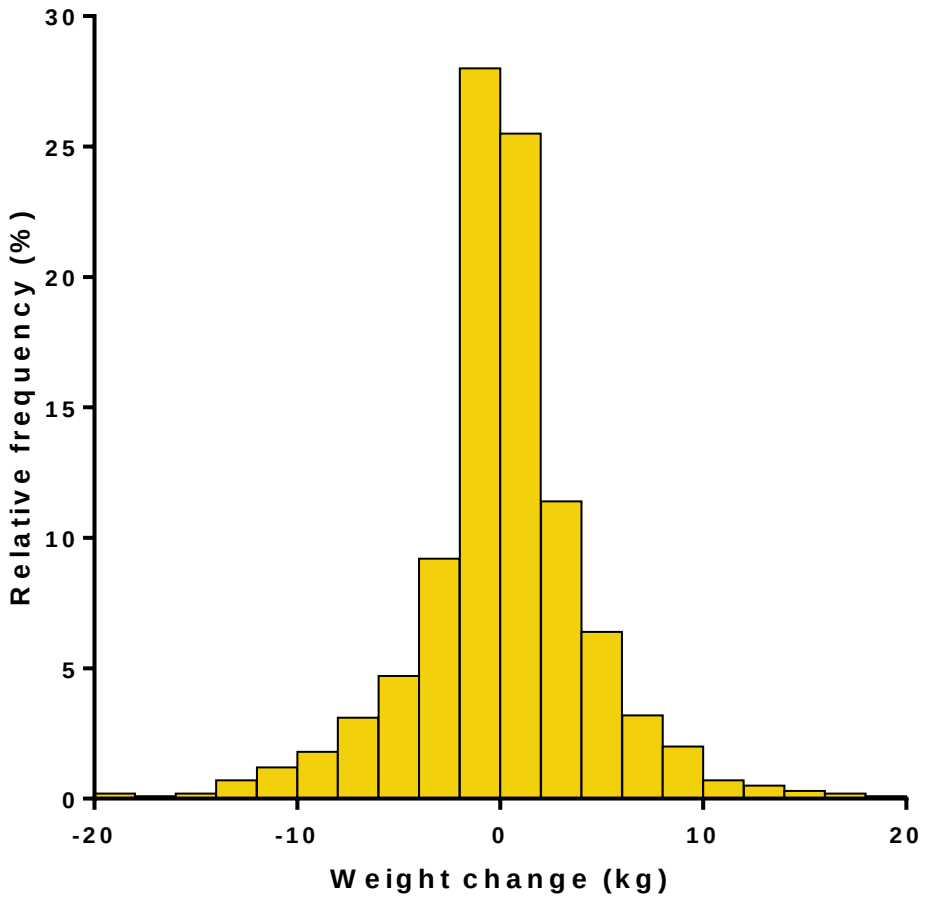

FIGURE 7 Weight change in care home residents during periods up to 6 months following admission (N = 3160; 0.5% outside the range of ± 20kg)

Diagnostic categories

TABLE 29 Proportion of residents according to diagnostic categories

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Musculoskeletal	9	6	8	4	285	7	7
Gastrointestinal (GI)	2	1	2	2	67	2	2
Cardiovascular (CVD)	6	7	6	3	228	6	6
Respiratory	4	3	3	3	135	4	3
Genito/Renal	2	3	2	1	82	2	2
Neurological (CNS)	50	51	59	61	2053	54	55
Frail elderly	18	18	15	10	617	16	15
Mental Health	9	4	5	10	273	7	7
Sensory impairment	0	1	0	1	13	<1	<1
Other	0	5	0	5	64	2	2
Total	100	99*	100	100	3817	100	100
N	*1587*	*773*	*891*	*566*	*3817*	*3817*	*3816***

Total(adj) = equal weighting for each year (equivalent to equal sample size each year)
* Results do not add up to 100% due to rounding of the component values to the nearest 1%
** The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure

More than half of the residents had neurological conditions, including dementia, Parkinson's disease and motor neurone disease.

PREVALENCE OF 'MALNUTRITION' (MEDIUM + HIGH RISK USING 'MUST')

'Malnutrition' according to risk category and country

'Malnutrition' risk categories

TABLE 30 'Malnutrition' according to risk category (medium + high risk)

Malnutrition risk	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Low	69.8	58.3	62.7	59.2	2306	64.6	62.5
Medium	10.0	11.4	14.5	15.9	433	12.1	12.9
High	20.2	30.3	22.8	24.9	829	23.2	24.5
Medium + High	30.2	41.7	37.3	40.7	1262	35.4	37.5
N	*1610*	*614*	*821*	*523*	*3568*	*3568*	*3569**

Total(adj) = equal weighting for each year (equivalent to equal sample size each year)
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
Among those with medium and high risk 66% were at high risk. Medium and high risk accounted for 35% of all residents.
The proportion of 'malnourished' subjects (medium + high risk) differed significantly between survey years (P <0.001; Chi squared test)

Overall, a BMI of <20 kg/m^2 was present in 30% of residents and 82% of those with 'malnutrition' (medium + high risk of malnutrition).

'Malnutrition' according to country

TABLE 31 'Malnutrition' in the UK according to country

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
England	30	42	37	41	2744	35	37
Wales	27	33	0‡	-	70	27	29
Scotland	29	43	45	41	512	39	41
Northern Ireland	35	23	31	29	242	33	32
Mean(UK)†	*30*	*42*	*27*	*37*	*41*	*35*	*37*
N	*1610*	*614*	*821*	*523*	3568	3568	3570*
P value††	*0.553*	*0.443*	*0.059*	*0.794*		*0.163*	*0.054*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year)
† There was a significant difference in prevalence between the four surveys (P < 0.001)
†† Chi squared test for differences between countries in the UK
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
Overall, 77% residents at risk were admitted to care homes in England, 2% to care homes in Wales, 14% to care homes in Scotland, 7% to care homes in Northern Ireland

There were no significant differences in the prevalence of 'malnutrition' between countries, and no significant difference between England and other parts of the UK.

'Malnutrition' according to type of care home and care home characteristics

TABLE 32 'Malnutrition' according to type of care home

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Nursing homes	35	46	45	46	1000	41	43
Elderly Mentally Ill homes	13	59	26	40	113	26	33
Residential homes	22	36	30	41	818	27	30
Other homes*	34	41	36	39	1637	37	38
N	*1610*	*614*	*821*	*523*	*3568*	*3568*	*3570***
P value†	*<0.001*	*0.185*	*0.002*	*0.666*		*<0.001*	*<0.001*

Total (adj) = equal weighting for each year (equivalent to equal sample size each year)
* Other homes include those providing a combination of nursing, elderly mentally ill and residential accommodation
** The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Chi squared test

Exclusively residential care homes had a significantly lower prevalence of 'malnutrition' (27%; N = 818) than all other types of care homes (38%, N = 2750) (P <0.001; Chi squared test). The small number of subjects in care homes restricted to the elderly mentally ill (N = 113 over the 4 surveys) were associated with large fluctuations in the prevalence of 'malnutrition' between surveys.

'Malnutrition' according to number of care home beds

TABLE 33 'Malnutrition' according to categories of care home bed numbers

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
1-24 beds	26	61	39	47	281	39	43
25-49 beds	28	39	32	40	1387	33	35
50-74 beds	29	37	47	41	961	35	37
75-99 beds	29	0	31	26	196	30	30
100+ beds	37	55	41	43	363	44	46
DK/NA	39	31	31	39	380	38	37
N	*1610*	*614*	*821*	*523*	*3568*	*3568*	*3568*
P value†	*0.016*	*0.005*	*0.019*	*0.683*		*0.001*	*<0.001*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
† Chi squared test

Although in three of the surveys the prevalence of 'malnutrition' was significantly influenced by the number of beds, the results within each bed category varied substantially from year to year and were not associated with a linear trend in prevalence as the number of beds increased.

'Malnutrition' according to source of admission

TABLE 34 'Malnutrition' according to source of admission

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Home	24	37	30	40	1259	30	32
Hospital	35	45	43	40	1628	39	41
Other care home	31	44	42	44	621	37	40
DK	19	31	40	20	60	27	28
N	*1610*	*614*	*821*	*523*	3568	*3568*	*3565**
P value†	*<0.001*	*0.205*	*0.004*	*0.691*		*<0.001*	*<0.001*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Chi squared test
Overall, 46% were admitted from hospital, 35% from their own homes, 17% from another care home, and 2% from an uncertain setting (DK).

The prevalence of 'malnutrition' according to source of admission during the previous 6 months varied significantly. It was lower among those admitted from their own homes (30%) than from hospitals (39%) and other care homes (37%).

Malnutrition according to length of stay in care homes

TABLE 35 'Malnutrition' according to length of stay in care home

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
0-1 month	27	35	36	31	761	30	32
2-3 months	32	34	37	42	1098	35	36
4-6 months	31	48	38	42	1695	38	40
DK/NA	0	-	-	54	14	50	49
N	*1610*	*614*	*821*	*523*	3568	*3568*	*3568*
P value†	*0.334*	*0.005*	*0.861*	*0.228*		*0.004*	*<0.001*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
† Chi squared test
Overall, 48% had been admitted 4-6 months previously 31% 2-3 months previously and 21% 0-1 month previously

Although three out of the four surveys showed a non-significant rise in the prevalence of 'malnutrition' with increasing duration of residential stay, the amalgamated results showed a significant increase.

'Malnutrition' according to nutrition screening policy

TABLE 36 'Malnutrition' according to nutrition screening policy

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Yes	31	41	37	41	2845	36	38
No	23	75	42	35	180	32	36
DK/NA	31	44	35	44	543	34	37
N	1610	614	821	523	3568	3568	3567*
P value†	*0.260*	*0.054*	*0.831*	*0.715*		*0.473*	*0.915*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Chi squared test
Overall, 80% of residents were admitted to care homes with a screening policy, 5% to care homes without a screening policy and 15% to care homes where it was uncertain if there was a screening policy.

The prevalence of 'malnutrition' according to screening policy varied non-significantly.

TABLE 37 Sensitivity analyses of 'malnutrition' according to nutrition screening policy

Type of sensitivity analysis*	% 'malnourished'				P(year)†	P (screening policy)†
	2007	2008	2010	2011		
Model a: Screening policy present	31	41	37	41	<0.001	0.393
Screening policy absent	23	75	42	35		
Model b: Screening policy present	31	41	37	41	<0.001	0.846
Screening policy absent	30	50	39	41		
Model c: Screening policy present	31	41	37	41	<0.001	0.434
Screening policy absent	25	69	41	35		

* In model a) the results in the DK/NA category were assigned to care homes with a screening policy
In model b) the results in the DK/NA category were assigned to care homes without a screening policy
In model c) the results in the DK/NA category were assigned to care homes with and without a screening policy in the same proportions as originally reported
† Analysis undertaken using binary logistic regression with 'year' and 'screening policy' as categorical variables

Although the prevalence of 'malnutrition' fluctuated significantly between survey years, none of the three models showed a significant effect of screening policy.

'Malnutrition' according to proportion of residents screened

TABLE 38 'Malnutrition' according to proportion of residents screened

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
0-25%	-	-	-	0	5	0	0
26-50%	38	0	-	0	9	33	33
51-75%	0	45	41	60	67	37	41
76-100%	31	42	36	41	2720	36	36
DK/NA	29	39	63	41	767	34	37
N	*1610*	*614*	*821*	*523*	*3568*	*3568*	*3570**
P value†	*0.141*	*0.815*	*0.001*	*0.239*		*0.356*	*0.192*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Ci squared test - the P value for year 4 and for 'Total' and 'Total(adj) should be interpreted with caution since the assumptions of the test were not met
Overall, of the residents screened 76% were in care homes that screened 76-100% of their clients, 2% were in care homes that screened 26-75% and the remainder in care homes that were uncertain about the proportion of residents screened or did not answer the question.

The prevalence of 'malnutrition' according to proportion of residents screened in routine care was not found to vary significantly

'Malnutrition' according to subject characteristics

'Malnutrition' according to gender

TABLE 39 'Malnutrition' according to gender

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Male	27	34	30	31	1148	30	31
Female	32	45	41	46	2418	38	41
N	*1610*	*614*	*821*	*523*	*3568*	*3568*	*3570**
P value†	*0.066*	*0.013*	*<0.002*	*0.003*		*<0.001*	*<0.001*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year)
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Chi squared test
Overall, women accounted for 68% of the residents and men 32%

Females, were older than males by a mean of 4 years (see Table 24) and had a higher prevalence of 'malnutrition' (P<0.001), which was significant both before and after adjustment for age. Using binary logistic regression the odds ratio (OR) before adjustment for age was 1.466 (95%CI, 1.261 - 1.795) and after adjustment for age (OR 1.401 (95% CI 1.200 - 1.634)). Adjustment for other

variables, such as type of care home, length of residency, source of admission had little or no effect on the difference between men and women.

'Malnutrition' according to age

TABLE 40 'Malnutrition' according to age categories

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
<70 years	26	36	22	26	332	27	27
70-84 years	29	37	36	41	1403	34	36
≥85 years	32	46	41	46	1790	39	41
DK/NA	25	0	-	-	43	23	22
N	*1610*	*614*	*821*	*523*	*3568*	*3568*	*3569**
P value†	*0.313*	*0.062*	*0.011*	*0.004*		*<0.001*	*<0.001*

Total (adj) = equal weighting for each year (equivalent to equal sample size each year)
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Chi squared test
Among those whose age was reported 51% were aged 85 years and over, 41% between 70 and 84 years and only 8% were <70 years

The prevalence of 'malnutrition' generally increased with age (Table 40 and Figure 8).

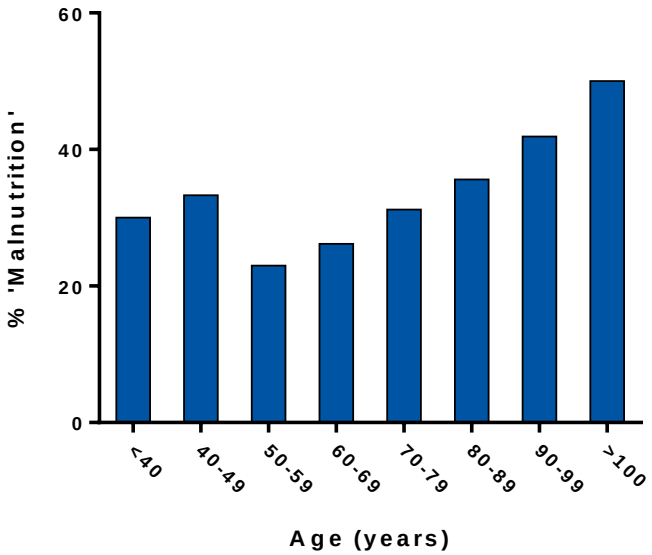

FIGURE 8 The prevalence of 'malnutrition' according to age. The age categories are in 10 year age bands with the exception of those aged <40 years, who accounted for only 0.3% of the total, and those ≥100 years, who accounted for only 1.1% of the total.

'Malnutrition' according to primary diagnostic category

TABLE 41 'Malnutrition' according to diagnostic category

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Neurological (CNS)	30	43	41	41	1873	37	39
Gastrointestinal (GI)	42	83*	38	67*	61	49	54
Respiratory	43	39	52	44	118	44	44
Cardiovascular (CVD)	28	35	37	27	211	32	33
Genito/Renal	43	31	44	57	71	42	43
Musculoskeletal	27	38	41	52	264	33	37
Frail elderly	35	43	35	44	544	37	39
Mental health	21	44	15	27	257	23	25
Sensory impairment	-	14*	-	20	12	17	16
Other	-	40	-	33	44	36	37
DK/NA	15	100*	23	59	113	26	28
N	*1610*	*614*	*821*	*523*	*3568*	*3568*	*3568*
P value†	*0.005*	*0.442*	*0.006*	*0.220*		*<0.001*	*<0.001*

Total (adj) = equal weighting for each year (equivalent to equal sample size each year)
* Small number of subjects ranging from 1 to 9
† Chi squared test
Overall, 56% patients screened had Neurological (CNS) diseases which included dementia, stroke, and Parkinson's disease, 15 % were frail elderly, and the others were in categories that accounted from 0.5% to 7%.

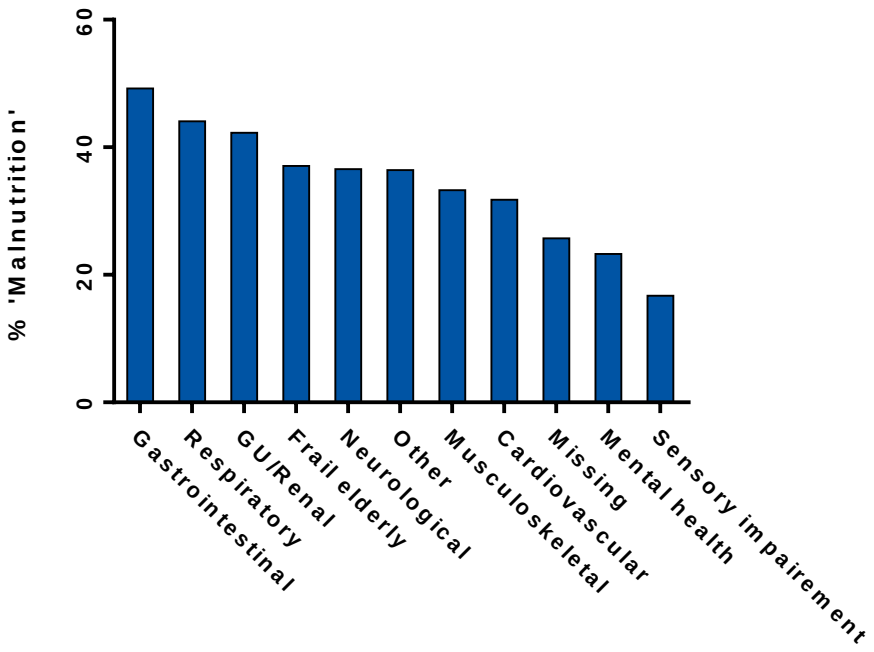

FIGURE 9 'Malnutrition' according to primary diagnosis (N = 3568; P <0.001 (Chi squared test)

The prevalence of 'malnutrition' varied by as much as two-fold according to the diagnostic category. It was highest in the gastrointestinal and respiratory categories, and lowest in the sensory impairment and mental health categories.

'Malnutrition' according to presence of other conditions

TABLE 42 'Malnutrition' according to presence of other conditions

	2007	2008	2010	2011	Total	Total	Total(adj)
	%	%	%	%	N	%	%
Yes	31	43	39	42	2383	37	39
No	29	38	33	39	1120	32	34
DK/NA	37	50	25	40	65	37	38
N	*1610*	*614*	*821*	*523*	*3568*	*3568*	*3566**
P value†	*0.364*	*0.469*	*0.241*	*0.882*		*0.036*	*0.036*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Chi squared test – the p values for years 2008 and 2010 should be interpreted with caution since the assumptions of the test (≤25% cell with less than 5 expected counts) were not met.
Overall 67% of residents were reported to have other conditions, 31% were reported not to have other conditions and 2% did not know or did not respond.

TABLE 43 Sensitivity analyses of 'malnutrition' according to presence of other conditions

Type of sensitivity analysis*	% 'malnourished'				P(year)†	P (other conditions)†
	2007	2008	2010	2011		
Model a: Other conditions present	31	43	39	41	<0.001	0.027
No other conditions	28	38	33	39		
Model b: Other conditions present	31	43	39	41	<0.001	0.039
No other conditions	29	38	33	39		
Model c: Other conditions present	31	43	39	41	<0.001	0.034
No other conditions	29	38	33	39		

* In model a) the results in the DK/NA category were assigned to the with 'other conditions' category
In model b) the results in the DK/NA category were assigned to the without 'other conditions' category
In model c) the results in the DK/NA category were assigned to the two categories in the same proportions as originally reported
† Analysis undertaken using binary logistic regression with 'year' and 'other conditions' as categorical variables

The prevalence of 'malnutrition' fluctuated significantly between survey years, and it was significantly increased by the presence of other conditions (all three models).

Malnutrition' according to presence of cancer

The question on cancer was included only in the last three surveys

TABLE 44 'Malnutrition' according to presence of cancer

	2007	2008	2010	2011		Total	Total(adj)
	%	%	%	%	N	%	%
Yes	-	56	42	55	122	49	50
No	-	41	37	40	1797	39	39
DK/NA	-	21	40	30	39	28	29
N	-	*614*	*821*	*523*	*1958*	*1958*	*1957**
P value†	-	*0.073*	*0.797*	*0.164*	*0.031*		*0.024*

Total(adj) = equal weighting for each year (equivalent to equal sample size each year), DK = Don't know, NA = No answer
* The small discrepancy between 'Total' and 'Total(adj)' is due to rounding associated with the weighting procedure
† Chi squared test
Overall, 6% of residents were reported to have cancer, 92% did not and in 2% it was not known or reported.

TABLE 45 Sensitivity analyses of 'malnutrition' according to presence of cancer

Type of sensitivity analysis*	% 'malnourished'				P(year)†	P (cancer)†
	2007	2008	2010	2011		
Model a: Cancer	-	46	41	45	0.208	0.242
No cancer	-	41	37	40		
Model b: Cancer	-	56	42	55	0.188	0.025
No cancer	-	41	37	40		
Model c: Cancer	-	54	42	53	0.190	0.033
No cancer	-	41	37	40		

* In model a) the results in the DK/NA category were assigned to the with cancer category
In model b) the results in the DK/NA category were assigned to the without cancer category
In model c) the results in the DK/NA category were assigned to the two categories in the same proportions as originally reported

† Analysis undertaken using binary logistic regression with 'year' and 'cancer' as categorical variables

The prevalence of 'malnutrition' fluctuated non-significantly between survey years, but it was found to be significantly increased by the presence of cancer using models b and c. Although model a) did not demonstrate a significant effect of cancer, the overall prevalence of 'malnutrition' in each of the surveys was higher in subjects with cancer than without.

COMMENTS

The care home NSW surveys suggest that 'malnutrition' (medium + high risk according to 'MUST') was common, and, with a prevalence of about 35% among residents admitted in the previous 6 months, it poses a substantial social care burden. The surveys also suggest there were improvements in certain aspects of the management of 'malnutrition' over the period of the surveys.

Most care homes reported having policies on nutritional screening, weighing and recording of weight on admission and also at intervals during residence, and the vast majority of care homes indicated that the results of screening were linked to a care plan. Furthermore, although most care homes reported having access to dietetic services and policies on nutritional screening at baseline (first survey in 2007), trend analysis indicated significant improvements during the subsequent surveys. The existence of policies to record height on admission also improved significantly during the period of the surveys. These trends were considered to be robust since they were subjected to sensitivity analyses to take into account the uncertainty resulting from a few non-responders (4-5%) to questions about these items. It is possible that improvements in some of the other aspects of nutritional care were not demonstrated because care homes already had very high rates of acceptable standards at baseline (e.g. recording weight on admission and during stay). It is also possible that improvements were not demonstrated because a large proportion of some questions related to nutritional care were not answered (e.g. 15% non- response/'don't know to the question about the proportion screened on admission, 22% to the question on awareness of weighing scale standards, and 39% to the question on frequency of nutrition screening audit).

The surveys indicated that the most commonly used nutrition screening tool was 'MUST'. The widespread use of 'MUST' has been facilitated by the support provided by various organisations, including National Institute for Health and Care Excellence (NICE), British Association for Parenteral and Enteral Nutrition (BAPEN), British Dietetic Association (BDA), Royal College of Nursing (RCN), the Registered Nursing Home Association (RNHA), Royal College of Physicians (RCP), Royal College of General Practitioners (RCGP) and others. It has also been facilitated by an increase in awareness about the importance of identification and treatment of malnutrition, brought about by education and training, the availability of national standards on nutritional care and inspection and regulation on nutritional care. It has also become increasingly recognised that it is clinically advantageous to use the same screening tool within and between different care settings since it facilitates continuity of care, allows meaningful audits to be carried out and permits trends to be established over time using consistent criteria for 'malnutrition'. This would not be easy to achieve if different screening tools were used within and between care setting, especially those designed for specific care settings for specific types of healthcare workers, and sometimes for specific conditions or groups of conditions[16, 17]. In order to avoid such complexities this report presents the effect of different variables on the prevalence of 'malnutrition' according to 'MUST'.

'Malnutrition' according to country

Amalgamation of data from all four surveys and all four devolved nations (England, Scotland, Northern Ireland and Wales) indicated an overall prevalence of 'malnutrition' of 35% among those who had been admitted to care homes in the previous 6 months. No significant trends were demonstrated over the period of the surveys, and no significant differences were found between countries, although this may have been due to the small number of entries from some countries (70 residents screened for 'malnutrition' in Wales, 242 in Northern Ireland and 512 in Scotland). Since the majority of the data on nutritional screening were obtained for residents in care homes in England (n = 2744; 77% of the total) they had a dominant effect on the overall results in the UK.

The national results described in this report do not necessarily apply to other countries, which operate different health and social care systems and involve different groups of care home residents in whom malnutrition may be assessed using a range of different criteria. However, even if 'malnutrition' is identified with 'MUST' the results may still vary widely. For example, using 'MUST' only 16.2% of nursing home residents in Germany[18] (n= 200 residents from 2 nursing homes) and 20.1% in Italy[19] (n= 641, 67 nursing homes), compared to 33% in Norway[20] (n=358, 21 municipal nursing homes; dementia only) and 38.2% in Hungary[21] (n= 1382, 20 nursing homes) (in the NSW surveys the overall prevalence of malnutrition in those admitted in the previous 6 months was 35.4%). None of the studies recruited representative samples, although the study from Hungary provided some support for a representative sample. There were indications that the studies differed in other ways, including the following: the ratio of high to medium risk of malnutrition, which ranged from 0.65[20] to 3.89[21] (compared to 1.91 in the NSW surveys), the mean age of the residents, which ranged from 78 years[21] to 85.5 years[18] or 85.6 years[20] (compared to 83.0 years in the NSW surveys); and ratio of women to men which ranged from 2.5[21] to 3.4[20] (not reported in one study[19]) (compared to 2.1 in the NSW surveys).

'Malnutrition' according to type of care home

'Malnutrition' was found to be significantly less common in exclusively residential homes (27%) than other types of care homes in combination (38%). This may be because residents in the other types of care homes, especially nursing homes, are expected to have more severe disease. However, the same care home may provide residential care, nursing care and specialist nursing care for the elderly mentally ill. In the absence of information on the type of care received by individual subjects, it was not possible to examine this issue further. The source of admission was another major factor that influenced the prevalence of 'malnutrition'. It was higher among those admitted from hospital (39%) and other care homes (37%) than in those admitted from the subjects' own homes (30%). Again this may reflect the type and severity of disease likely to predispose to or be the result of 'malnutrition' and *vice versa*. There was some variation in the prevalence of 'malnutrition' according to the number of care home beds, but the results were not consistent. There were no significant effects of screening policy and the proportion of residents screened on the prevalence of 'malnutrition'.

'Malnutrition' according to subject characteristics

Since women outlive men, it is not surprising that the survey registered twice as many women than men. In addition, women had a higher prevalence of 'malnutrition' (38% v 30%) and were significantly older than men by a mean of 4 years. Since age was found to be significantly related to the prevalence of 'malnutrition' some of the differences in prevalence between men and women were due to age. However, the difference in prevalence of 'malnutrition' remained significant after adjustment for age. Furthermore, adjustment for other variables such as type of care home, length of residency, source of admission had little or no effect on the gender difference. The reason for the persisting gender difference remains unclear.

No disease category was free from 'malnutrition' and so none should be dismissed as being unimportant. However, the prevalence of 'malnutrition' was found to be higher in subjects suffering from gastrointestinal (49%), respiratory (44%) and neurological conditions (37%) than sensory impairment (17%) and mental health conditions (23%). Some of these conditions and/or their treatment may restrict ability of subjects to eat independently (e.g. some neurological conditions), others may cause anorexia (various conditions), and yet others may impair absorption of food (gastrointestinal conditions). Two other disease factors were found to be significantly related to 'malnutrition': the presence of more than one condition (disease category), and the presence of cancer. There appeared to be an overall increase in the prevalence of 'malnutrition' with duration of residency, (although this was not demonstrated in three of the four NSW surveys), but this involved cross-sectional rather than longitudinal data analysis. Indeed, intra-individual changes in weight since admission tended to show a small increase rather than a decrease during residence of 0-1.9 months, 2.0-3.9 months and 4.0-5.9 months with no significant differences between duration of residency (see below). Furthermore, since only subjects who were residents at the time of the survey were included in the survey, those who had been admitted and died during the six months before the start of the NSW survey could not be included in the survey; and those who had been in residence for more than 6 months (the majority of residents) were also not included to conform with the pre-planned study exclusion criterion. In contrast, a survey in Hampshire screened all residents in care homes using 'MUST'[22] irrespective of duration of residency. This survey found no significant effect of duration or residency on the prevalence of 'malnutrition' which was 37% for the combined results. It also found that those who had been in residence for less than 6 months accounted for only about a quarter of the total resident population.

Anthropometry and weight changes

In comparison with the general population, care home residents were much more likely to be underweight (BMI <20 kg/m^2 ~ 30% v ~5%). The frequency of underweight in care home residents was also found to strikingly increase between the age of 50 and 100 years. In contrast, the prevalence of obesity was distinctly less common among care home residents than the general population (9% v 28%). An obvious explanation is that care home residents are likely to be less

healthy, suffer more diseases or more severe diseases, and more likely to have dementia and frailty than older subjects in the general population.

The mean intra-individual change in weight between admission and time of survey (residency of up to 6 months) were small (0.25 kg) and was not significantly affected by the duration of stay (the mean values for 0.0-1.9 months, 2.0-3.9 months and 4.0-5.9 months being 0.02, kg, 0.29 kg and 0.32 kg respectively). About half of all the residents lost weight after admission and the other half gained weight to an approximately equal extent as those who had lost weight. There was a strikingly large variability in intra-individual weight change following admission to care homes (95% range -7.5 to 7.3 kg; N = 3160). Most of the changes in weight occurred within the same BMI category, although 1 in 8 subjects changed BMI categories (three categories <18.5 kg/m^2, 18.5-19.9 kg/m^2, and ≥20 kg/m^2), about half from a lower to a higher category, and the other half from higher to a lower category. The most important explanatory variable for the weight change was the presence of 'malnutrition', which partly developed from it. Those with 'malnutrition' at the time of the surveys (35% of the total), who had generally been underweight both at the time of admission to the care home as well as the time of the survey (~30% of the total), and went on to lose ~1.8 kg during their residency, while those without 'malnutrition' at the time of the survey were not underweight on admission and gained weight ~1.4 kg during their residency (difference 3.2 kg). It is possible that an underlying disease (or more severe disease, either physical or psychological or both) contributed to the underweight status on admission and continued to produce further weight loss after admission.. A series of other factors are probably operating that increase body weight in some subjects and decrease it in others. For example, the admission BMI, was found to be inversely related to weight change (underweight on admission followed by weight gain), perhaps reflecting an anabolic potential in a subgroup of underweight subjects whose underlying clinical condition had been adequately controlled. However, admission BMI categorisation accounted for only 1.4% of the total variability in weight change, and most subjects remained in the same BMI category during their residency (up to 6 months).

Consideration was given to a series of other potential explanatory variables for the weight change, but these were not direct measures of nutritional status, and they were found to be generally weak at predicting weight change. One of these explanatory variables was the source of admission, since people admitted to care homes from hospitals gained weight (mean 0.39 kg), while those admitted from another care home lost weight (mean of 0.03 kg). This may be because acute and/or chronic conditions were adequately controlled before they were transferred to their new care homes. Other potential variables included the type of care home (residents gained weight in exclusively residential homes (0.70 kg) compared to the smaller weight changes observed in other types of care homes) and the presence of cancer (mean weight loss of 0.36 kg). However, all these factors in combination with others such as country, explained no more than 4% of the total variability in weight change and in combination with 'MUST' categorisation for 14% of the variability ('MUST' alone explained 9.5% of the variability). Among the other plausible factors that might help explain the majority of the variability are the following: anxiety and uncertainty about the future (which may cause weight loss); a feeling of being safe and secure after a period of feeling unsafe and insecure (which may cause weight gain); medications (some of which cause weight gain and others weight loss); confusion; the extent to which help with eating is provided to those that need it; the eating ambiance; the type and quality of food provided, and the variety of food on the menu. None of these variables were examined in the NSW surveys but they offer fruitful avenues for future investigations.

This survey has a number of limitations. The lack of data on disease severity prevented an examination of the impact of this variable on the weight status, 'MUST' categories and weight loss. Since the samples were not randomly drawn from the general population of care home residents in the UK there is a risk of selection bias. Another limitation is that that the surveys only considered residents admitted to care homes in the previous six months and so no firm overall conclusions can be made about the entire population of home care residents. Since the surveys included only subjects who had been admitted during the previous 6 months, no admission was duplicated in subsequent surveys which were undertaken about a year apart. However, some care homes were sampled more than once.

In summary, the present report indicates that 'malnutrition' in care homes is a major health and social care burden. While care homes are generally funded to provide social care, the boundaries between social and healthcare are ill defined and sometimes problematic, suggesting that more integrated health and social care strategies to combat the problems would be beneficial. The care home surveys suggest that there have been some improvements in the operational infrastructure for the management of 'malnutrition', but there is still room for further improvement, in line with the conclusions of the Dignity and Nutrition Inspections of care homes undertaken by the Care Quality Commission[23].

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APPENDICES

Appendix 1: Forms used in NSW11

This section includes:

1. The form used to gather data about care homes including their policies on aspects of nutritional care
2. The form used to gather data from residents
3. Guidance notes

Nutrition Screening Week NSW11

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SHEET 1(b) FOR CARE HOMES **INFORMATION ABOUT YOUR HOME**

Care Home Name: …… Code Number: ……...

Location:

☐ **England** ☐ **Scotland** ☐ **Wales** ☐ **N. Ireland** ☐ **ROI**

Please complete by putting an **X** in the appropriate boxes. Please use **black** ink.

1. What type of Care Home are you? (please tick all that apply)

   ☐ Nursing ☐ Elderly Mentally Ill ☐ Disabled ☐ Residential

2. How many beds? Please state **number** ……

3. Do you have access to a Nutrition and Dietetic service? ☐ Yes ☐ No ☐ ?

4. Is it your policy to weigh residents on admission? ☐ Yes ☐ No ☐ ?

5a. Are residents weighed regularly during their stay? ☐ Yes ☐ No ☐ ?

5b. **If you have answered 'Yes' to 5a, please indicate how often:**

   ☐ Monthly ☐ As required ☐ Other, please **state** ……..

6. Are you aware of any standards regarding the type of and maintenance requirements for weighing scales used in your Home? ☐ Yes ☐ No ☐ ?

   If yes, please specify which standard you are aware of/following:

   .....

7. Is the height of residents recorded on admission? ☐ Yes ☐ No ☐ ?

8. Do you have a Nutrition Screening Policy? ☐ Yes ☐ No ☐ ?

9a. Do you know what % of residents are screened on admission? ☐ Yes ☐ No ☐ ?

9b. **If you have answered 'Yes' to 9a, please indicate that %:**

   ☐ 0 - 25% ☐ 26-50% ☐ 51-75% ☐ 76-100%

10. Which nutrition screening tool is routinely used in your care home?

☐ 'MUST' ☐ MNA ☐ NRS ☐ Local tool

☐ No tool used ☐ Other (please specify).....

11. How are staff trained on nutritional screening? (please tick all that apply)

☐ Lecture /workshop ☐ Workbook ☐ No training provided

☐ e-learning ☐ Other: please specify details: .....

12a. Is the practice of nutrition screening audited? ☐ Yes ☐ No ☐ ?

12b. If yes, how often?

☐ Every year ☐ Every 2 years ☐ Every 3 or more years ☐ ?

13. Do you have a care plan for the management of residents identified as at risk of malnutrition / underweight? ☐ Yes ☐ No ☐ ?

14a. Have you participated in previous Nutrition Screening Week Surveys? ☐ Yes ☐ No ☐ ?

14b. If yes, which ones? (please tick all that apply)

☐ 2007 ☐ 2008 ☐ 2010

Thank you

Care Home Sheet 2(b) Client data

To be collected for residents admitted during past 6 months

Nutrition Screening Week NSW11

Code Number:

Country:
(England, Scotland, Wales, N. Ireland, ROI)

Name of Care Home/Unit:

Date:

Have the scales on your unit been calibrated within the last 12 months? Y es ☐ No ☐ ? ☐

Client/Resident Number	Age	Sex	Where admitted from*	When admitted**	Primary clinical problem***	Other current medical conditions	Is the primary clinical problem/diagnosis cancer?	Oedema present on admission?	Weight on admission (kg) Insert NA if not available	Current Weight (kg) Insert NA if not available	Oedema present now?	Height (m). If not available calculate from Ulna length			Unintentional weight loss (past 3-6mths)	Food intake over past 5 days			Likely food intake over next 5 days		
	Yrs	M/F	1-3*	1-3**	1-10***	Y/N	Y/N/DK	Y/N/DK	Kg	Kg	Y/N	Actual	Recalled	Calculated	Kg	Normal	Less than normal	v little or none	Normal	Less than normal	v little or none

*** Where Admitted From**

1. Home, **2.** Hospital, **3.** Other Care Home

**** When Admitted**

1. Up to 1 mth ago, **2.** 2-3mths ago, **3.** 4-6 mths ago

***** Primary Clinical Problem**

1. CNS(e.g stroke, dementia, Parkinson's Disease, Alzheimers, MS), **2.** GI Disease, 3. Respiratory Disease, 4. Cardio-vascular Disease, **5.** Genito/ Renal Disease, 6.Musculoskeletal (including orthopaedic) conditions e.g. post #NOF, 7. Frail Elderly (various reasons), 8. Mental health disorders (e.g. anxiety, depression, psychosis), 9. Sensory impairment (e.g. of sight, hearing, balance), 10. other

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The British Dietetic Association

Royal College of Nursing

Irish Nutrition & Dietetic Institute www.indi.ie

NHS National Patient Safety Agency

Guidance Notes: Care Homes

Thank you for participating in Nutrition Screening Week 2011. The aim of this survey is to establish the prevalence of malnutrition risk in patients and clients admitted to hospitals, care homes and mental health units across the United Kingdom and Republic of Ireland (ROI) in the spring season, to complete and complement data already collected from previous screening weeks held in the summer (NSW08), autumn (NSW07) and winter (NSW10) and to provide additional information on nutritional care practice across the UK and ROI.

Preliminary results will be presented at the BAPEN Conference in Harrogate, 29 -30 November 2011. Additionally we will analyse and send you the results of your data to enable you to report the scale of the problem in your locality and to compare your data with the national picture. This is the final screening survey that will be carried out. Following the NSW11 results, the data from all 4 surveys will be compiled to produce the most comprehensive picture of prevalence of malnutrition in the UK and Ireland ever undertaken, which will also consider any seasonal variation in numbers. Participating in the Nutrition Screening Week will help demonstrate how you are striving to achieve nutritional standards and your commitment to meeting the nutritional needs of your residents or clients.

The survey is based on 2 questionnaires, a general questionnaire about your Care Home and practice of nutritional screening (Sheet 1(b)) and a client data collection sheet (Sheet 2 (b)). Please read the following guidance notes carefully before completing the forms.

Sheet 1(b): You will be issued with a code number for the Home, please write it in the space on the form. Please document the name of your Care Home clearly and tick in which country it lies. If you don't know the answer to any question, please put an X in the box with a question mark beside it.

In the question regarding screening tools used in your Care Home, please tick all that apply if more than one tool is used. The tools are defined as follows:

'MUST': 'Malnutrition Universal Screening Tool'

MNA: Mini Nutritional Assessment

NRS: Nutrition Risk Score

Other: to be specified.

Sheet 2(b) Resident / Client data:

Please collect the information requested for all residents / clients who were admitted to your Care Home in the last 6 months (including those admitted on 5th – 7th April) *and who are still resident*. Those admitted for respite care, who are not resident on the survey days should *not* be included.

Residents who were already established on nutritional support when admitted (including oral nutritional supplements, enteral tube feeding, PEG feeding or parenteral nutrition) ***are excluded from the study and therefore should not have data recorded.*** Please add any

such residents to the form, but simply insert across the row next to their number what method of support they are on, e.g. *'002 = [excluded – PEG feeding*

Code number: Please write the same code number inserted on Sheet 1(b) onto each copy of Sheet 2(b) that you use.

Name of Care Home: Please write the name of your Care Home and /or unit in the space at the top of each Sheet 2(b) that you use.

Have your scales been calibrated in the last 12 months?: Please enter yes, no or don't know as appropriate.

Resident Number: Please number residents simply as 001, 002, 003 in the order in which their data is recorded. Please do not include residents' names.

Age: Please give age of the resident in years. There is no need to include number of months as well.

Primary Clinical Problem: Please insert appropriate number, only one number is required. If the primary diagnosis is an infection or cancer, please use the category number relating to the location of the infection/cancer, for example cancer of the colon should be recorded under diagnostic category 2 (GI disease); pneumonia or chest infection under category 3 (respiratory disease), a UTI under category 5 (genito/renal disease)

Other Medical Conditions: Please indicate whether the resident has other relevant medical conditions or problems. A yes or no answer only is sufficient – no specific category information is required here.

Cancer?: Please indicate if the primary diagnosis or any other ongoing medical condition is one of cancer. A yes, no or don't know answer is sufficient.

Oedema Present ?: Please indicate whether the patient was oedematous on admission. A yes or no answer is sufficient. If you do not know insert DK (Don't Know). Please also indicate if resident is oedematous now. A yes or no answer is sufficient.

Weight: Please state weight (in kg) of resident on admission using documented value in resident's notes. If weight on admission was not recorded, write NA (Not Available). Please state current weight (in kg) of resident in appropriate column. Write NA (Not Available) in box if for any reason it is not possible to weigh the resident.

Height: Please state height in metres in appropriate column indicating if height is an actual measurement, a height recalled by the resident or carer or a value calculated from length of the ulna (see information on measurement of ulna and conversion table). Write NA (Not Available) in box if for any reason it is not possible to obtain a height for the resident.

Recent unintentional weight loss: Please give amount of any weight lost *unintentionally* in the last 3-6mths. Do not include any weight lost due to use of diuretics. Please give value in kg (1kg =2.2lbs). If recent weights are not available in the resident's notes please ask the resident / carer if they know how much weight the resident has recently lost. If resident /carer does not know how much weight has been lost, insert DK (Don't know).

Food intake, past and future: Please tick the relevant boxes. Please use your professional judgement as to the likely food intake over the next 5 days. Please note that the very little /no food box specifically means *a few mouthfuls of food at the most,* i.e. nothing or virtually nothing. There is no need to record actual food intake.

Appendix 2: Glossary of statistical terms

Binary logistic regression

A type of regression analysis involving logarithmic transformations (the logistic or logit transformation of a proportion = log (proportion/1-proportion)) that is used when the outcome variable is binary (e.g. 'yes' or 'no'; 'malnutrition' or 'no malnutrition'). It provides results as odds ratios and it avoids potential problems that may arise when the proportion is modelled as a linear function of the prediction variables. Binary logistic regression can involve both continuous and categorical input (explanatory) variables: the overall result of the outcome variable can be said to have been adjusted for or controlled for the input variables.

Chi squared test and P values

A statistical test used to assess the independence of two variables in a contingency table, which is used to examine the observed and expected frequencies under independence. A statistically significant test, typically indicated by a probability (P value) of < 0.05, indicates that the result is significantly different from expected. The test does not assess trends (e.g. trends over time or trends associated with consecutive surveys; see next item).

Chi squared test for trend and P (trend) values

A statistical test applied to a Chi squared contingency table in which one of the variables has two categories (e.g. yes and no) and the other has more than two ordered categories (e.g. survey number to represent consecutive surveys over time). The test assesses whether there is a trend associated with the proportion of the first variable (e.g. proportion answering 'yes') in relation to the variable with ordered categories (e.g. a trend with consecutive surveys).

Mean and standard deviation (see also weighted mean and weighted standard deviation; Mean and Mean (adj))

The equations for the mean ($\bar{x}$) and standard deviation (sd) are:

$$\bar{x} = \frac{x_1 + x_2 ... + x_n}{N}$$

$$sd = \sqrt{\frac{\sum_{i=1}^{N} (x_i - \bar{x})^2}{N-1}}$$

where $x_1 + x_2 ... + x_n$ are the observations, N is the number of sample observations, and $\sum_{i=1}^{n} (x_i - \bar{x})^2$ represents the sum of the squared differences between the individual i observations and the mean ($\bar{x}$).

P value (P)

The probability of obtaining a given result, such as a difference, a correlation or a ratio, or more extreme result, assuming that for the particular result there is no difference, no correlation and that the ratio is 1.0.

Sensitivity analysis

A sensitivity analysis is used to assess the variability in a result (outcome variable) when there is uncertainty about the values of an input variable (e.g. non-responses to a question). It quantifies how changes in the values of the input variable affect the outcome variable. If extreme values are assigned to the missing data of the input variable and there is little alteration in the results of the outcome variable, the sensitivity analysis can provide more confidence in the precision of the result.

'Total' and 'Total adjusted' (Total (adj))

In this report the term 'Total' is used to indicate the mean and standard deviation of a series of observations. Surveys with larger sample sizes will contribute more to the result than those with smaller sample sizes. 'Total adjusted' (Total (adj) is used to indicate that the overall mean and standard deviation are calculated (see weighted mean and weighted standard deviation) assuming that all the individual surveys have equal weight (equivalent to equal sample size).

Weighted mean and weighted standard deviation

The equations for the weighted mean ($\bar{x}_w$) and weighted standard deviation (sd_w) are:

$$\bar{x}_w = \frac{w_1x_1 + w_2x_2 \ldots + w_nx_n}{N}$$

$$sd_w = \sqrt{\frac{\sum_{i=1}^{N} w_i(x_i - \bar{x}_w)^2}{\frac{(N'-1)\sum_{i=1}^{N} w_i}{N'}}}$$

where x_i ($x_1, x_2, \ldots x_n$) are the observations w_i are the weights and $\sum_{i=1}^{N} w_i(x_i - \bar{x}_w)^2$ represents the sum of the squared differences between the weighted individual i observations and the weighted mean ($\bar{x}_w$). N is the number of observations, N' is the number of non-zero weights and $\sum_{i=1}^{N} w_i(x_i - \bar{x}_w)^2$ is the sum of the squared differences between the weighted individual i observations and the weighted mean ($\bar{x}$).

CONFLICT OF INTEREST

No conflict of interest declared by the authors (CAR and ME).

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