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1 **Improving the nutritional quality of charitable meals for homeless and vulnerable**
2 **adults: A mixed method study of two meals services in a large English city.**

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10

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14

1 **ABSTRACT**

2 Inadequate nutrition may contribute to poor health in homeless and vulnerable adults.

3 Charitable meals are critical to this group's nutrition.

4 The nutrient content of charitable meals at two organisations was assessed.

5 Ethnography investigated organisational practice; semi-structured interviews explored
6 influences on meal provision.

7 Meals were adequate for energy and the majority of nutrients, but exceeded thresholds
8 of saturated fat, salt and sugars and lacked vitamin D and selenium in both
9 organisations.

10 Organisations were constrained by budget, equipment, food donations, volunteer
11 capabilities and time. Organisational values influenced meal provision; strategies to
12 reduce fat, salt and sugar content may be resisted because of an ethos of hospitality and
13 overprovision.

14

15

16 **Introduction**

17 Poor nutrition due to food insecurity is endemic in homeless populations around the
18 world ¹⁻³ and is thought to be germane to health inequalities ⁴. A UK study recently
19 reported that homeless adults had inadequate intakes of energy, non-starch
20 polysaccharides (NSP), vitamin A and several minerals ⁵. However energy and
21 micronutrient intakes were greater on days where charitable meals were consumed,
22 and participants described '*depend[ing] on these services fully, completely*' ⁵. The
23 importance of charitable meals has been demonstrated in other homeless populations
24 ^{3,6}. While most research has examined charitable meals in relation to people who are
25 homeless, a spectrum of vulnerable adults (drug and alcohol addicts, probation clients,
26 asylum seekers and refugees) also makes use of, and depends on such services ⁷.
27 Homeless and other vulnerable people have a poor health profile ^{4,8}.

28 The nutritional quality of charitable meals has been criticized. Tse and Tarusuk ⁹
29 concluded that charitable meals in Toronto were insufficient to meet nutritional needs
30 of vulnerable people, while others argue that such meals may actively contribute to
31 poor health in homeless people ¹⁰. The literature on nutritional quality of charitable
32 meals is sparse. One study in Toronto noted that charitable meal providers had little
33 capacity for meal improvement, particularly in organizations constrained by funding
34 and staff ¹¹. Indeed a cost-to-nutrient analysis of nutrient provision amongst homeless
35 people in Paris found that intake could not be improved using local foodstuffs, therefore
36 researchers chose to develop a fortified street food product ¹².

37 This study sought to examine charitable meal provision in two small organizations that
38 offered a weekly free meal to their local community in a large English inner city.
39 Specific objectives were to analyze the nutritional composition of meals served, to

40 investigate influences and constraints on meal provision, and if possible to develop
41 recommendations to improve meals' nutritional quality.

42

43 **Method**

44 This research was conducted from a 'critical realist' perspective ¹³. Mixed methods,
45 namely immersive ethnography augmented by interviews with volunteers and
46 quantitative nutritional analysis of meals served, were employed to capture the
47 complexity of the phenomena ^{14,15}. The University of Sheffield Ethics Committee
48 granted ethical approval.

49 **Ethnography**

50 Each week between April-August 2013 the research team (CJF and SPB) worked as
51 volunteers helping with meal provision. Initially they helped with food preparation and
52 service, and in July and August they took the role of catering managers in Organization 1
53 having responsibility for menu planning from existing recipes and food acquisition.
54 Meal information was collected during their initial role. Both researchers completed a
55 reflective report. Information from food purchase receipts, committee meeting minutes,
56 personal communications and organizational websites augmented understanding.

57 **Interviews**

58 Semi-structured interviews were conducted with a purposive sample of volunteers
59 (n=6) who represented various food preparation and service roles within each
60 organization, including the catering manager and session leader. The questions
61 pertained to the following topics: operational practice within the organization, the
62 participants' history and current role within the organization, their experience of
63 cooking, understanding of a healthy diet, and their perceptions of guests' food
64 preferences. The 40-minute interviews were held in convenient locations. Informed
65 consent was obtained verbally and recorded as part of the interview. The audio-

66 recording was transcribed *verbatim*. Thematic analysis ¹⁶ identified key influences on
67 meal provision.

68 **Nutritional assessment**

69 Quantitative information on food served was collected over a 9-week period at
70 Organisation 1 and over an 8-week period at Organization 2. Descriptive detail of all
71 food items served including brand and cooking method was recorded. Portion size was
72 determined by weighing each meal component to the nearest gram using digital scales
73 (Salter, model: 1100UJDR). Portions for weighing were served by the kitchen staff at the
74 organization. Weighing of food took place after guests had been served; at least two
75 portions of each item were weighed. Food items that were routinely served were not
76 weighed on more than four occasions.

77 Where direct weighing was not possible, if all available food was served to guests,
78 portion size was estimated using packet weights or imputed weights for similar items.
79 During the study period the catering manager at Organization 1 developed new meals;
80 nutrient content data of these meals were obtained through recipe analysis. For self-
81 service items (sugar, salt, cereals), which were available to guests *ad libitum*, weights
82 were obtained for these items at the start and end of each session. The net weight used
83 over the session was calculated and intake per guest per meal calculated. The self-
84 service items were not used for other purposes. Nutrient content of meals was
85 generated using NetWisp 3.0 (Tinuviel Software, Warrington). Meal and recipe items
86 were entered into the software as the most similar food available; in two instances a
87 new food was created to match manufacturers' nutrition information. Average energy
88 and nutrient content of meals was compared to a goal of one-third of the UK Estimated
89 Average Requirement (EAR) and Reference Nutrient Intake (RNI), respectively.

90 Population Average Values were used for NSP, fat energy and Non-Milk Extrinsic Sugars
91 (NMES) energy ^{17,18}. Extrinsic sugars are the sugars that are not contained within the
92 cellular structure of food. NMES exclude sugars in milk and milk products. NMES
93 include sugars added to food e.g. sucrose, glucose and fructose, and sugars naturally
94 present in fruit juice e.g. glucose and fructose. Non-starch polysaccharides are the major
95 fraction of dietary fibre, comprising cellulose and non-cellulose polysaccharides (e.g.
96 arabinogalactans, arabinoxylans, gums, mucilages) ¹⁷.

97

98 **Results and Discussion**

99 Both organizations utilized church halls for delivery of their services and operated an
100 'open-door' policy; as such no information was collected on the housing status of those
101 in attendance. Organization 1 considered its clients to be exclusively homeless or
102 vulnerable. Organization 2 was open to anyone, but recognized a high proportion of
103 homelessness among attendees. The number of guests in attendance fluctuated over
104 the observation period, but was typically between 60 and 80 at Organization 1 and 40 to
105 50 at Organization 2.

106 Organization 1 provided a Sunday lunch and Organization 2 a weekday breakfast with
107 additional items for guests to take away. Both organizations also provided self-service
108 items. Table 1 details the constituent food items of the meals. [TABLE 1 HERE]

109

110 **Nutrient composition of meals served**

111 Table 2 shows the nutrient composition of meals served at both organizations. The
112 meals served met nutritional targets (33% of DRV) with the exception of vitamin D and
113 selenium at both organizations and NSP at Organization 1. Several nutrients exceeded
114 the DRV. Adversely, the sodium and NMES content of meals at both organizations was
115 greater than the DRV; at Organization 2 the breakfast exceeded the recommended
116 maximum daily intake for sodium. The fat and saturated fat content of the meals in both
117 organizations was high; these bordered daily DRV limits, whilst saturated fat exceeded
118 the limit at Organization 2.

119 [TABLE 2 HERE]

120

121 Self-service food items made a substantial nutrient contribution at both organizations.
122 At Organization 1 these items provided 20-40% of DRV targets for energy, protein,
123 vitamin E, folate, calcium and iron, with lesser contribution for other nutrients.
124 However, self-service items also provided 17.7 g fat, 33.5g NMES and 1374.9mg sodium.
125 Similarly, at Organization 2 self-service items provided at least 70% of the DRV for all B
126 vitamins and iron and greater than the DRV for vitamin C and thiamin. Again these
127 items raised the sugar and sodium content to over the DRV target providing 49.5g
128 NMES and 1041.7mg sodium.

129 At Organization 2 take-away items (defined in Table 1) also made important
130 contributions to nutrient content. The cooked meal without take-away items plus self-
131 service items did not meet goals set for energy, vitamins C, magnesium, or potassium
132 (data not shown).

133 There are limitations to the data presented here. Firstly the nutrient content of self-
134 service items is based on average portions served and may be skewed by exceptional

135 portions. Additionally nutrient content of meals cannot be used as a proxy for nutrient
136 intake as food waste was not measured. Further error may have been introduced by
137 inaccuracies in the nutrient analysis software, especially for food items frequently
138 consumed such as bread. However, our data indicate that charitable organizations can
139 provide meals containing least one third of the dietary reference value for nearly all
140 nutrients assessed.

141 Soup kitchen meals in Michigan, USA also met nutritional standards ¹⁹. However a
142 target of 33% of daily intake may be conservative; other studies have set higher goals
143 ^{9,10}. Indeed Tse and Tarasuk ⁹ argue that a single charitable meal should meet the entire
144 DRV since this meal may be the only one consumed ^{5,6}. This argument is especially
145 pertinent in evaluation of meal provision at Organization 1 because, as far as we know,
146 this is the only service providing meals over the weekend in this city.

147 The sodium and NMES content of meals at both organizations was excessive, in large
148 part due to the salt and sugar content of the self-service items. The entire breakfast at
149 Organization 2 provided 63g NMES of which 22g was table sugar; excess dietary sugar
150 intake was previously reported in homeless adults ⁵. The provision of food *ad libitum*
151 to a food insecure population may encourage overconsumption. On the other hand self-
152 service items made an important contribution to energy, vitamin and mineral intake.
153 These benefits arose from provision of fortified flour products (breakfast cereals and
154 bread), as well as milk and fruit juice.

155 Across both organizations meals did not meet the target set for vitamin D. Similarly
156 selenium content was low at Organization 1. Intakes of selenium in the UK are
157 typically lower than the Reference Nutrient Intake (RNI), with no adverse outcomes ²⁰.
158 Nevertheless selenium is an immunostimulant and adequate intake of this nutrient may

159 protect against CVD ²¹. Thus increasing the selenium content of the meals may benefit
160 guests' health. Vitamin D intakes were also low relative to the RNI. However, it should
161 be noted that this value (10µg/d) has been suggested for elderly people (>65y) and may
162 not be wholly applicable to adults (18-64y) ¹⁷. The current study did not evaluate
163 nutritional status of the guests in attendance, but dietary intakes as estimated have
164 potentially adverse ramifications for bone and cardiovascular health ²². Strategies to
165 increase these micronutrients and reduce fat, saturated fat, salt and sugar content of
166 meals should be considered.

167 **Organisational Operations**

168 Both organizations were staffed and run by volunteers who were responsible for
169 purchasing, cooking and serving of food. In Organization 1 a volunteer had been
170 nominated to act as a part-time catering manager who had additional duties, including
171 monitoring food safety and development of menus. There was a similar mix of
172 volunteers at both organizations, including professionals, students and several retirees,
173 many of who were church members. Interviewees at Organization 1 saw this
174 heterogeneity in cooking experience and physical robustness as a potential limitation to
175 catering performance.

176 *'...but y'trouble is you've not got the consistency, they'll be chefs and cooks who*
177 *come in all sorts and sizes, you've gotta have kind of a fairly standard procedure*
178 *involved.'* (Volunteer 1, Organisation 1)

179 *"They're all brilliant cooks... but [it's] difficult to know whether they would want to*
180 *go down[stairs]... stirring giant pots and things, and lifting great big heavy pots, I*
181 *mean, some of the volunteers are very elderly,'* (Volunteer 2, Organization 1)

182 Facilities were comparable between to two organizations; both utilized an eight-ring
183 stove with a double oven and had cold, dry and frozen storage facilities, although these
184 were somewhat *'limited'* (Volunteer 3, Organization 1). Equipment was stored
185 separately away from the food preparation area as dictated by the building layout in
186 Organization 1 and transfer of equipment was time-consuming. Whilst Organization 1
187 had cooking equipment sufficient *'to get the job done'* the volunteers felt that they were
188 *'restrained'* particularly by the capacity of the stove and ovens (Volunteer 1,
189 Organization 1). Such difficulties were compounded by the limited time available for
190 preparation; *'You know, you're at the limit because those potatoes are only just ready'*
191 (Volunteer 1, Organization 1). The physical space and equipment at Organization 2
192 were appropriate for its current menu operation, but there was limited potential to
193 expand the menu to provide more complex meals.

194 Both organizations received food donations. The poor nutritional quality of donated
195 food has previously been highlighted ²³. Whilst donations were valued, volunteer 2 at
196 Organization 1 described having to reject donations of *'high risk'* food items, such as
197 cakes with fresh cream, which the organization did not have capacity to store in line
198 with food safety regulations. Donations of bread at Organization 1 and cereals at
199 Organization 2 adversely contributed to salt and sugar intakes, respectively.

200 Both organizations had a budget sufficient for the purchase of the majority of food
201 items, and as such they had a degree of autonomy in food acquisition. The approximate
202 ingredient cost per meal was £1.20 (\$2.03) at Organization 1 and £2.05 (\$3.47) at
203 Organization 2; these budgets were substantially greater than cited elsewhere ²⁴.
204 Indeed a volunteer at Organization 2 felt their funding was ample. At Organization 1
205 Volunteer 2 described financial uncertainty. Difficulties were associated with providing

206 sufficient food within budget, although the revised meals were seen as more
207 economical; *'instead of a hundred pounds [the revised meals] have come in at just over 70*
208 *pounds,'* (Volunteer 2, Organization 1). The research team experienced the limitations of
209 budget, equipment and facilities through personal experience. This lack of material
210 resources is in keeping with studies of charitable organizations in Canada, which were
211 seen to labor under similar constraints ^{11,24}.

212 Supplies are typically purchased from supermarkets, which was *'convenient'* as part of
213 volunteers' domestic *'weekly shopping'* (Volunteer 4, Organization 2). At Organization 1
214 a supermarket delivery service was used to ensure sufficient food arrived fresh, but
215 'bulk' items could not always be ordered and the quality of certain items delivered was
216 seen as poor. Alternatively a wholesale retailer was utilized; however this involved
217 making special advance arrangements to access the hall.

218 **The Meaning of Food Provision**

219 The primary function of both organizations was food provision; this presents a contrast
220 to 'faith-based' organizations observed in other studies ^{9,24} where food distribution was
221 secondary to religious or educational objectives. There were some differences between
222 Organization 1 and 2 in ethos.

223 Organization 1 valued social interaction and time was allotted for this prior to the meal,
224 in order to make the social aspect distinct. In this setting the purpose of the meal itself
225 was clearly to fulfil physiological requirements (for energy) and alleviate hunger. This
226 stance of aiming to "fill bellies" was also noted in an analysis of charitable meal services
227 in Canada ²⁴. It is notable that promoting health beyond providing energy was not a

228 consideration in meal provision at either organization (with the notable exception of a
229 volunteer at Organization 1).

230 *'...if some of them are out in all weathers they need some... calories in, they need*
231 *some sort of stodge stuff, don't they'* (Volunteer 3, Organization 1)

232 *It is about the meal and I don't think we're setting ourselves up to change people's*
233 *behavior. I think we're setting ourselves up to offer a breakfast.'* (Volunteer 5,
234 Organization 2)

235 Organization 2 developed as a means to *'get people together'* (Volunteer 4 Organization
236 2), and the emphasis on social interaction persisted. Two longstanding volunteers
237 described how physical space had been manipulated through introduction of trestle
238 tables to facilitate this objective. Furthermore the social element of volunteering was
239 cited as a prominent reason for involvement. Value was also placed on the inclusive
240 nature of the organization; *'...I like the fact that we don't ask questions at the door, erm,*
241 *except what you'd like for your breakfast'* (Volunteer 5, Organization 2). Indeed the
242 service was patronized not only by homeless and vulnerable adults, but also by a small
243 number of local professionals. Social interaction was presumed to motivate guest
244 attendance at Organization 2; *'... some would continue to come, because they'd like the*
245 *atmosphere and the friendliness'* (Volunteer 5 Organization 2). Yet whilst many guests
246 clearly enjoyed the social element, remaining to chat to friends and other guests long
247 after they had finished eating, others displayed a more perfunctory attitude. For a
248 minority it was clear that maximizing food consumption was paramount - taking extra
249 milk out of sight of volunteers or claiming untruthfully they lacked certain items
250 exemplified this attitude. These observations concur with previous study of homeless
251 adults for whom food represented survival rather than enjoyment ⁵.

252 The second aspect of organizational ethos pertinent to meal provision at Organization 2
253 is the demonstration of hospitality; providing a meal is an expression of the Christian
254 ideal, and therefore had an intrinsic moral component that was valued. To demonstrate
255 hospitality the meal must do more than meet basic requirements.

256 *“There’s that element of hospitality which I think the church is all about but also*
257 *what meal times potentially are all about.’ (Volunteer 5, Organization 2)*

258 *‘It’s an important message the churches want to give. Hospitality is important...*
259 *and we’re not just giving people a little, we’re giving them more than they need*
260 *really, and I actually think that’s... a good thing to do.’ (Volunteer 5, Organization*
261 *2)*

262 At Organization 2 it was clear that hospitality was central and non-negotiable and thus
263 organizational ethos may act as a barrier to provision of healthy meals. Volunteer 5
264 perceived that improving the meal’s nutritive value would entail ‘remov[ing] the meat’
265 and animal foods; as such improving health was associated with giving less and thus
266 directly opposed the organization’s objectives. This attitude was unexpected; the
267 researchers had not previously considered the purpose of food beyond gastronomic
268 enjoyment, satiation or its nutritional value. Indeed the social aspects of sharing food
269 may just be important for the physical health of guests as balances of food and
270 nutrients; it has been documented that social inclusion is associated with lower disease
271 risk^{25,26}.

272 An adjunct to the notion of hospitality is the concept of ‘*homeliness*’. Homeliness
273 extends to the physical environment at Organization 2, where having breakfast is like
274 ‘*meeting around someone’s kitchen table*’ (Volunteer 5, Organization 2) and is reflected

275 in the rhetoric of both organizations where instead of ‘service users’ those attending the
276 meal are known as ‘*guests*’ or ‘*breakfasters*’ (Volunteers, Organization 1 and 2). There
277 was an indication that the meal (or certain items) also connotes homeliness.

278 *‘There’s something... already very homely about a full English breakfast that’s been*
279 *cooked as well as if by their mother’* (Volunteer 5, Organization 2)

280 Such connotations are known to prevail across cultures ^{27,28}. The familial and homely
281 aspects of food are likely to be absent in the lives of many guests and from this she
282 infers the value of the meal for them; *‘they don’t get treated like a client group. They’re*
283 *having breakfast as if they’re at someone’s home really’* (Volunteer 5, Organization 2). A
284 sense of pride was apparent in this volunteer; this homeliness was part of what made
285 the breakfast ‘*special*’ (Volunteer 5, Organization 2). Again homeliness was associated
286 with plenty; *‘...if we took off the plate some of the things that we currently serve them ... it*
287 *would become slightly less... homely’* (Volunteer 5, Organization 2). Again it appears that
288 adaptation of the breakfast towards a reduction in any component is problematic within
289 Organization 2.

290 Interestingly this association between the meal and the home extends only to the
291 cooked items; the take-away items hold a different meaning. There is a discourse in the
292 literature surrounding what constitutes a meal; Volunteer 5 seems to support the idea
293 that a “proper meal... must be cooked (not raw), hot (not cold), hand-made (not brought
294 in) and eaten together” ²⁹. In stark contrast to the homeliness of the cooked breakfast
295 these cold, portable items represent a ‘*currency*’, and Volunteer 5 described practices
296 such as ‘*bartering*’ and ‘*stock piling*’.

297 *'You can't take away your breakfast but you can take away your [cereal] bar and*
298 *your banana and they're a form of currency. For some, yeah'* (Volunteer 5,
299 Organization 2)

300 *'...I suspect they're also high energy bars for the middle of the day'* (Volunteer 5,
301 Organization 2)

302 The distinction between cooked and take-away items stemmed from an understanding
303 of guests' attitudes – take-away items represented either a tradable or purely functional
304 commodity. However, these properties increase their '*desirability*' (Volunteer 5,
305 Organization 2). This insight supports other anecdotal evidence suggesting that
306 supplements distributed to a homeless population were traded rather than consumed
307 ³⁰. This raises questions about how best to provide nutritional support to this
308 population; we need to *'[be] aware of how people use the food that isn't cooked on the*
309 *plate'* (Volunteer 5, Organization 2). Although a wrapped fortified product has been
310 used to alleviate food insecurity in a homeless population ¹², if these items are traded
311 then their nutritive value is negated.

312 **Attitudes to change**

313 Organization 1 was observed during a period of substantial change as external factors
314 forced them to relocate within the building. The '*logistics*' of the '*move upstairs*' dictated
315 a change in meal format; in response to this the catering manager developed '*one-pot*
316 *meals*' that were also vehicles for '*better nutrition*' (Volunteer 2, Organization 1). The
317 locational change could not be opposed and caused systemic anxiety amongst
318 volunteers as to whether they would still be able to provide the same service. When the
319 research team discussed the notion of healthy meals it was met with some resistance.

320 This opposition seemingly stemmed from concerns as to whether such meals would be
321 acceptable to guests; there was a preconception amongst volunteers that guests would
322 not tolerate *'exotic'* (unfamiliar) flavors and might *'give the vegetables a miss if they*
323 *could'* (Volunteer 2, Organization 1). Volunteers were also concerned that provision of
324 healthier foods would not be feasible within the budget; *'[I] would like to apply that*
325 *here... but that's a constraint of money, mostly money and time"* (Volunteer 1,
326 Organization 1). This resistance we describe seemed to stem from concern for the
327 organization and its guests, as opposed to a general inertia to change, as described by
328 Piderit ³¹. Once the revised, one-pot meals were implemented modestly positive
329 attitudes were expressed.

330 *"There's obviously less stuff for the kitchen staff to do which means the kitchen staff*
331 *possibly could have a little bit more flexibility to experiment, a little bit, possibly.'*
332 (Volunteer 1, Organization 1)

333 *"...but no I don't think... there was any complaints about it...I think [the guests*
334 *have] taken to the changes very well"* (Volunteer 3, Organization 1)

335 At Organization 2 introducing additional food items, as opposed to taking away food
336 items might be acceptable to volunteers (and guests). Volunteer 5 indeed felt this would
337 be possible within the current budget, however provision of appropriate breakfast
338 foods may be limiting; *'breakfast's breakfast, isn't it'* (Volunteer 4, Organization 2). A
339 further impediment to change is the central role of hospitality within the organizational
340 ethos; reducing meal items is likely to be resisted and later abandoned, as reported by
341 others ³². Congruence between organizational values and proposed developments is
342 required to implement enduring changes to products or services. Furthermore

343 resistance from 'non-elite' members can impede their execution ³²; careful leadership is
344 required to overcome such obstacles.

345 To summarize, there was well-meaning resistance to change, which was overcome by
346 the influence and determination of a key organizational member (the catering manager)
347 and improved menus were introduced. Further menu adaptations may be possible at
348 Organization 1. Substitution of breakfast items for low-salt or fortified products might
349 be acceptable at Organization 2, but they have limited potential to embrace change due
350 to restrictions imposed by the nature of the meal itself, as well as the organizational
351 ethos of hospitality.

352 **Conclusion**

353 This was a small study, and its findings are not generalizable; however it is encouraging
354 to report that charitable meals can provide at least 50% of the DRV for most nutrients.
355 There are key nutritional challenges to be addressed; at both organizations selenium
356 and vitamin D contents of meals were lacking, whilst fat, salt and sugar content should
357 be reduced without compromising the energy and micronutrient content of the meal.
358 Although we interviewed a small sample of volunteers, this study provides an in-depth
359 insight into the factors that influence meal provision. We conclude that organizational
360 ethos, volunteer attitudes and practical constraints, such as equipment, finance and
361 food donations, may limit menu alterations.

362 Guests' food preferences were not evaluated here; whilst menu alterations were readily
363 accepted at organization 1 this might not always be the case. The issue of lowering fat
364 and sugar content of meals may be particularly difficult. We recommend that charitable
365 organizations test menu changes for acceptability and uptake. It would also be useful to

366 address how food served at other charitable services across the city dovetails to meet
367 DRV targets. Ideally coordination in meal provision could address possible gaps to
368 provide a better balance of macronutrients. Future research should investigate not
369 only the feasibility of such coordination, but also its dietary impact for homeless and
370 vulnerable adults.

371

372

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- 447

448 **Table 1** Food items comprising menus at both organisations

Organisation 1	Organisation 2
Standard Meal	Standard Meal
<p>Cooked items comprised two variations on a chicken and vegetable stew and two variations on a minced beef dish containing pulses and frozen vegetables.</p> <p>Mashed potatoes accompanied meals.</p>	<p>Cooked items available were a pork sausage, a slice of bacon, a fried egg^a, a serving of baked mushrooms, canned chopped tomatoes and canned baked beans in tomato sauce</p> <p>Meals were accompanied by toast^b, spread with margarine.</p>
<p>Desserts comprised a variety of cake or tart, served with instant custard^c,</p>	<p>[No dessert provided]</p>
<p>[No take-away foods provided]</p>	<p>Take-away items available were a banana^d (donated) and a cereal bar.</p>
<p>Self-service items included salt and pepper, sugar and reduced-fat (semi-skimmed) UHT milk (for hot beverages), cookies^e, flavoured fruit drink, instant soup and (donated), bread^f with margarine.</p>	<p>Self-service items included several varieties of (donated) breakfast cereals, semi-skimmed milk, a glass of orange juice^f and condiments; salt, pepper, sugar, marmalade, tomato ketchup and brown sauce.</p>

449 ^a One cook poached eggs however this occurred less than once per month so was not included in
450 the analysis; ^b White and brown bread were available, brown bread infrequently chosen and
451 was not included in the analysis; ^c Custard as served was made with custard powder (dried eggs
452 and corn flour) with added water; One cook made the custard with milk, however this was not

453 the standard procedure and was not included in the analysis; ^dSmall bananas were served more
454 frequently than large bananas and were therefore included in the analysis over larger bananas
455 sometimes available; ^eCookies were served in pairs with each cup of tea or coffee taken; ^fThese
456 items were not available *ad libitum* and so a standard weighed portion was analysed.

457

458 **Table 2** Nutrient composition of total meal and self service food items in relation to Dietary Reference Values

Nutrient	<i>Organisation 1</i>		<i>Organisation 2</i>		UK DRV ^(a)
	Total Meal (% DRV)	Self Service items (% DRV)	Total Meal (% DRV)	Self Service items (% DRV)	
Energy (KJ)	6094.5(57.5)	2340.3 (22.1)	5694.9 (53.7)	1924.9 (18.2)	10600
Protein (g)	67(120.8)	12.4 (22.3)	43.6 (78.5)	12.0 (21.6)	55.5
Total fat (g)	55.5 (98.0)	17.9 (31.6)	50 (94.3)	4.9 (9.2)	≤ 35%
Saturated fat (g)	19.4 (109.1)	7.7 (43.4)	15.6 (93.6)	2.2 (13.2)	≤ 11%
Carbohydrate (g)	182.8 (100.4)	93.0 (51.1)	196.6 (115.6)	98.3 (57.8)	~ 50%
NMES (g)	72 (179.7)	33.5 (83.6)	62.9 (168.2)	49.5 (132.4)	≤ 11%
NSP ^b (g)	7.7 (42.5)	2.6 (14.4)	10.9 (60.4)	3.3 (18.3)	18
Vitamin A ^c (µg)	470.9 (67.3)	105.0 (15.0)	369.3 (52.8)	48.0 (6.9)	700
Vitamin C (mg)	28.9 (72.3)	3.4 (8.5)	62 (155.1)	44.6 (111.5)	40
Vitamin D (µg)	2.4 (23.8)	0.6 (5.6)	3.3 (32.7)	0.4 (4.0)	10
Vitamin E (mg)	4.6 (114.2)	1.5 (37.5)	2.2 (54.0)	0.7 (17.2)	4
Thiamin (mg)	0.8 (75.0)	0.2 (23.0)	1.7 (171.0)	1.1 (110.6)	1
Riboflavin (mg)	0.7 (57.2)	0.2 (19.3)	1.7 (126.9)	1.1 (82.1)	1.3
Niacin (mg)	9.9 (58.4)	2.2 (12.9)	18.8 (110.5)	12.6 (74.0)	17
Vitamin B ₆ (mg)	1.2 (87.5)	0.2 (12.8)	1.8 (130.7)	1.0 (72.7)	1.4
Vitamin B ₁₂ (µg)	2 (132.3)	0.2 (12.0)	2.5 (166.7)	1.1 (73.3)	1.5
Folate (µg)	146.1 (73.1)	56.4 (28.2)	260.5 (130.3)	170.9 (85.5)	200
Calcium (mg)	562.7 (80.4)	275.7 (39.4)	573.9 (82.0)	259.4 (37.1)	700
Iron (mg)	8.9 (102.7)	2.7 (31.3)	13.2 (151.8)	7.6 (87.4)	8.7
Zinc (mg)	8.2 (86.4)	1.4 (14.9)	5.2 (54.6)	1.8 (18.9)	9.5

Magnesium (mg)	158.2 (52.7)	48.9 (16.3)	187.9 (62.6)	70.7 (23.5)	300
Selenium (µg)	20.3 (27.1)	4.4 (5.9)	25.6 (34.2)	5.7 (7.6)	75
Potassium (mg)	1956.2 (55.9)	459.7 (13.1)	1890 (54.0)	669.1 (19.1)	3500
Sodium (mg)	2001 (125.1)	1374.7 (85.9)	2825.6 (176.6)	1042.6 (65.2)	1600

459

460 ^aFor DRV figures see ¹Department of Health . The DRVs for males of age 19-50 years have been used for comparison. Where reference nutrient
461 intakes () are available these values were employed. For fats, carbohydrates, NMES, and NSP population average values (PAV) (excluding alcohol
462 derived energy) were used. For vitamin E the safe intake was used. For the purpose of this analysis Population Average Values for percentage energy
463 derived from fats, carbohydrates and NMES have been assumed as an absolute target

464 1. Department of Health. *Report on Health and Social Subjects 41 Dietary Reference Values for Food Energy and Nutrients for the United Kingdom.*
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