

1 RESEARCH

2 An analysis of the impact of visual impairment on  
3 Activities of Daily Living and Vision-Related Quality of  
4 Life in adults with visual impairment

5 Nabila Jones BSc Optometry, MCOptom\*

6 Affiliations Ophthalmic Research Group, School of Life & Health Sciences, Aston University,  
7 Birmingham, B4 7ET, UK\*

8 Correspondence; Nabila Jones. Vision Sciences Department, Aston University, Aston Triangle,  
9 Birmingham, B4 7ET, UK. Tel.: +44 0121 204 4135 Fax: +44 0121 204 4048.

10 n.jones5@aston.ac.uk

11

12 Hannah Elizabeth Bartlett\* PhD, MCOptom

13 Affiliations Ophthalmic Research Group, School of Life & Health Sciences, Aston University,  
14 Birmingham, B4 7ET, UK\*

15

16 <sup>1</sup>Richard Cooke, PhD

17

18 **Conflict of interests**

19 All authors declare they have no conflict of interest or financial interest.

20

21 **Funding**

22 This research received no specific grant from any funding agency in the public, commercial, or  
23 not-for-profit sectors

24

25 **ACKNOWLEDGEMENTS**

26 We would like to acknowledge the employees and participants from the organisations  
27 Aston University Low Vision Clinic, Focus Birmingham, Macular Society, New  
28 Outlook, RNIB, and Sight concern, whose contribution made this research possible.

29

---

<sup>1</sup> Affiliations Institute of Psychology Health and Society, University of Liverpool. Liverpool, L69 3BX

30

31

32 **Background:** Previous research has shown that people with visual impairment are more  
33 likely to be malnourished and have reported to have difficulty shopping for, preparing  
34 and eating food. They are also reported to have a poor quality of life. The present study  
35 aims to investigate the impact of visual impairment on activities of daily living and  
36 Vision-Related Quality Of Life (VR-QoL) in a sample of adults with visual impairment  
37 who are living in the UK.

38 **Method:** A 37 question survey evaluating the nutritional status and the activities of daily  
39 living; cooking and shopping was disseminated to adults with visual impairment who  
40 were 18 years and older. VR-QoL was also assessed using the validated, Questionnaire  
41 of Vision-Related Quality Of Life Measure (VCM1).

42 **Results:** Participants reported that being visually impaired made it difficult to shop for,  
43 prepare, and cook meals and this correlated significantly with level of visual impairment.  
44 The VCM1 score of  $\geq 2.1$  was reported by 74% of people with visual impairment revealing  
45 vision related quality of life is more than a little of a concern for most of the participants.  
46 The mean VCM1 score for females was  $2.9 \pm 0.98$  and  $2.5 \pm 1.1$  for males. Level of visual  
47 impairment was not found to influence the VCM1 scores. This indicates even those with  
48 visual impairment below the level required for sight impairment registration, report a  
49 reduced VR-QoL.

50 **Conclusion: It is the responsibility and duty of society to support people with visual**  
51 **impairment or other disabilities rather than blaming them for not ‘integrating’.**  
52 **Among other things this can be done by incorporating norms into the marketing.**  
53 **These norms might help to raise and increase the awareness of suppliers to the needs**

54 **of consumers with visual impairment. Furthermore, such norms may contribute to**  
55 **our ongoing efforts for a more inclusive and accessible environment.**

56

57

## 58 **Key Words**

59 Visual impairment, Activities of Daily Living, Vision-Related Quality of Life, Nutritional  
60 status, Shopping, Cooking

61

## 62 **Introduction**

63 In the United Kingdom there are almost two million people living with sight loss.  
64 (choices, 2015). Of these there are 360,000 people registered severely sight impaired or  
65 sight impaired (representing a prevalence of one in thirty) (RNIB, 2016b). Nearly two  
66 thirds of those that are living with sight loss in the UK are female (RNIB, 2016a).

67 Visual impairment has been shown to impact on individuals' nutritional status (Acil &  
68 Ayaz, 2015; Baker, 2006; Bilyk, Sontrop, Chapman, Barr, & Mamer, 2009; de Faria, da  
69 Silva, & Ferreira, 2012; Gladstone et al., 2017; Gopinath, Liew, Burlutsky, & Mitchell,  
70 2014; Jones & Bartlett, 2018; Kostyra, Zakowska-Biemans, Sniegocka, & Piotrowska,  
71 2017; Magdalena, Urzedowicz, Motylewski, Zeman, & Pawlicki, 2016; Montero, 2005;  
72 Muurinen et al., 2014; Nakamura et al., 1999; Pardhan, Latham, Tabrett, & Timmis, 2015;  
73 Roebathan, 1999; Smyth, Spicer, & Morgese, 2014; Vági, Deé, Lelovics, & Lakatos,  
74 2012). For example, females with sight loss are more likely to be undernourished than  
75 females without visual impairment (Muurinen et al., 2014; Stevens R., 2015) and have  
76 reported being unsure about what foods they should consume for optimal eye health  
77 (Stevens R., 2015). Males and children have been reported to be overweight (Acil &

78 Ayaz, 2015; Magdalena et al., 2016; Roebbothan, 1999). The cost of malnutrition in the  
79 UK is reported to be 19.6 billion pounds annually (Trust, 2017), with 16 billion pounds  
80 being related to being overweight or obese (foundation, 2017). Malnourished adults  
81 account for 30% of hospital admissions and 35% of care home admissions in the UK  
82 (Trust, 2017). Nutritional interventions save the National Health Service 172.2-229.2  
83 million pounds due to reduced health care use (Trust, 2017).

84 Poor nutritional status is often linked to problems with buying, preparing, and eating  
85 nutritionally rich foods. Past research shows that people with visual impairment have  
86 difficulties with both shopping for (Bilyk et al., 2009; Kostyra et al., 2017; Yu, Tullio-  
87 Pow, & Akhtar, 2015) and eating meals(Pardhan et al., 2015) and they also have an  
88 aversion to cooking (Bilyk et al., 2009; Kostyra et al., 2017). It has been reported that  
89 this restriction may directly impact reports of life satisfaction as well as nutritional status.  
90 (Kostyra et al., 2017).

91 It has been reported visual impairment significantly affects QoL (Brown & Barrett, 2011;  
92 Esteban et al., 2008; Tseng, Liu, Lou, & Huang, 2018; Vu, Keeffe, McCarty, & Taylor,  
93 2005). There is no universally accepted definition of QoL and its meaning can very much  
94 depend on the context it is used in; for example, in the field of economics it can refer to  
95 how wealthy a person is, or their standard of living. In medicine it has been described as  
96 the ratio of health to illness (Susniene & Jurkauskas, 2009). The World Health  
97 Organisation (WHO) refers to QoL “as an individual's perception of their position in life  
98 in the context of the culture and value systems in which they live and in relation to their  
99 goals, expectations, standards and concerns. It is a broad ranging concept affected in a  
100 complex way by the person's physical health, psychological state, personal beliefs, social  
101 relationships and their relationship to salient features of their environment”(Organisation,  
102 1995).

103 In fields of research such as optometry and ophthalmology Vision-Related Quality of  
104 Life (VR-QoL) is evaluated. VR-QoL is defined as the patients subjective reports of  
105 concern about their QoL in the presence of eye disease (Ang, Man, Fenwick, Lamoureux,  
106 & Wilkins, 2018; Roh, Selivanova, Shin, Miller, & Jackson, 2018; Xu, Gupta, Bae, &  
107 Sharma, 2018; Yildiz, Toklu, & Vural, 2018).

108 Researchers have reported that sight loss affect an individual's independence and  
109 mobility (Vu et al., 2005; Welp A, 2016) as well as their ability to carry out activities of  
110 daily living (Pardhan et al., 2015; Welp A, 2016). Those with sight loss are also more  
111 likely to report depressive symptoms and be functionally impaired than those that have  
112 normal vision (Vu et al., 2005).

113 The aim of this study is to carry out an analysis to determine if visual impairment impacts  
114 the activities of daily living; shopping and cooking. VR-QoL in this sample of adults with  
115 visual impairment will also be evaluated.

## 116 **METHODS**

### 117 **Sample size**

118 There are two million people living with visual impairment in the UK, of these 360000  
119 are registered sight impaired and severely sight impaired (choices, 2015). A confidence  
120 level of 95% and confidence interval of 10 was set for this study. A sample size of 96  
121 participants was required for this study.

122

### 123 **Participant recruitment and setting**

124 101 people with visual impairment were recruited from October 2017 to January 2018  
125 from across the United Kingdom. Advertisements were placed with the Macular Society,  
126 the Royal National Institute for the Blind (RNIB), and Visionary: a membership

127 organisation for sight loss charities. Participants were recruited by being approached at  
128 Focus, Aston, low vision clinics, and Sight Concern in the West Midlands. They were  
129 also recruited from New Outlook, a sheltered accommodation in Birmingham, designed  
130 specifically for people with visual impairment. Individuals who were interested in the  
131 study were invited to participate in a thirty minute structured telephone survey.

132

### 133 **Inclusion criteria**

134 Participants that were not driving due to poor sight when fully corrected (visual acuity  
135  $\geq 6/12$ ) were eligible for the study. Those that were eligible to be registered as sight  
136 impaired or severely sight impaired, as certified by an ophthalmologist were also invited  
137 to take part. In the UK, certification for visual impairment is determined by an  
138 Ophthalmologist. A VA of less than 6/60 with reduced visual field is the guidance for  
139 certification as severely sight impaired or blind (RNIB, 2016c) . A VA of less than 6/18  
140 but better than 6/60 is the guidance for certification as sight impaired or partially sighted.  
141 It has been reported that 1.3 million have a visual acuity of less than 6/12 but better than  
142 6/18, below certification level and yet their vision still significantly affects day-to-day  
143 activities (RNIB, 2016c). Participants that were aged 18 years old and over were eligible  
144 to take part in the study.

### 145 **Exclusion criteria**

146 Those that had particular dietary restrictions, such as people restricting their intake of  
147 gluten due to coeliac disease were not eligible for the study. Those that were unable to  
148 communicate in English, or unable to hear well over the telephone were also excluded.

### 149 **Ethics**

150 The procedures followed were in accordance with the ethical standards of the Aston  
151 University Ethics Committee on human experimentation that conform to the Declaration  
152 of Helsinki 1975.

153

#### 154 **Survey design**

155 Following a review of the literature (Jones & Bartlett, 2018) and using relevant items  
156 selected from previous studies (Gopinath et al., 2014; Kremer, Holthuysen, & Boesveldt,  
157 2014; Stevens R., 2015), we designed a cross-sectional survey with 37 questions to  
158 evaluate the impact of visual impairment on nutritional status. The survey was designed  
159 to be administered over the telephone to a sample of people living with visual impairment  
160 in the UK. As the questionnaire was exploratory it had both open questions where  
161 participants were able to talk about their experiences such as shopping and cooking and  
162 closed questions where responses were graded. The survey covered participants' age,  
163 gender, employment status, and ethnicity. The survey also asked participants about their  
164 abilities to carry out activities of daily living i.e. shop for, cook, and prepare meals. A  
165 three day food diary was included in the survey as part of nutritional intake analysis.  
166 Participants' eating habits i.e. what foods they ate and why they liked or disliked the foods  
167 they did were explored. These questions and the food-diary data are beyond the scope of  
168 this article and are discussed in a future article.

169 The questionnaire was validated through face and content validity by being piloted on in  
170 a focus group of six people who were registered as either sight impaired or severely sight  
171 impaired. This form of 'face and content validity' was the only means of establishing  
172 validation due to lack of other instruments to compare the results with (Stevens, Bartlett,  
173 Walsh, & Cooke, 2014; Stevens R., 2015). The focus group took part in two stages. First  
174 the participants answered the questions of the survey. A moderated and voice recorded

175 informal discussion then took place whereby participants commented on the clarity,  
176 relevance and wording of question items. The participants responses were transcribed  
177 and coded through a process of thematic analysis (Rabiee, 2004) and the questionnaire  
178 was then refined according to participant responses. Redundant question items were  
179 removed, new questions were added and existing question item measures were expanded  
180 to ensure all possible answers to the questions were covered. Wording of items was also  
181 changed to improve clarity. The questionnaire was then disseminated to the cohort.

182

### 183 Questionnaire of Vision-Related Quality Of Life Measure (VCM1)

184 Vision-Related Quality of Life (VR-QoL) was assessed using the validated (de Boer et  
185 al., 2004) Questionnaire of Vision-Related Quality Of Life Measure (N. A. Frost et al.,  
186 1998) (VCM1).

187 The VCM1 (Frost et al, 1998, 2001) is designed for persons with visual impairment. The  
188 findings of (de Boer et al., 2004) was that in the category of questionnaires for people  
189 with visual impairment, out of 31 questionnaires, the VCM1 showed high psychometric  
190 properties with good content validity and reproducibility (de Boer et al., 2004).

191 The VCM1 composite score acts as a global measure of concern about vision and is  
192 strongly correlated with responses to a wide range of quality of life issues such as  
193 mobility, reading, and leisure. The VCM1 was derived primarily from patients own  
194 definition of quality of life; it was developed through consultation with people with visual  
195 impairment, professionals and a literature review (A. Frost et al., 2001). It evaluates two  
196 dimensions: psychological (cognitive function, emotional status, well-being, satisfaction  
197 and happiness) and social (social contact and interpersonal relationships) of the four QOL  
198 scales distinguished by (Aaronson, 1988); the other two being functional (self-care,  
199 mobility, activities of daily living) and physical (disease symptoms and their treatment).



200 Generic QOL questionnaires usually include items in all four domains: however,  
201 disease-specific QOL instruments usually do not (de Boer et al., 2004).

202 The VCM1 has 10 items and six response categories. The ten items relate to physical,  
203 social, and psychological issues, see table 1. The items are scored from 0 (does not affect  
204 my life at all), 1 ( affects my life rarely), 2 (affects my life a little of the time), 3 (affects  
205 my life a fair amount of time), 4 (affects my life a lot of the time) and 5 (affects my life  
206 all of the time). The VCM1 deals with how visual impairment evokes feelings of concern  
207 about personal safety, ability to carry out activities people enjoy (Murphy et al., 2007). It  
208 explores if visual impairment causes feelings of embarrassment, frustration, sadness and  
209 isolation and it also measures how much they feel their visual impairment interferes with  
210 their life in general.

211 Rasch analysis has shown the VCM1 reliably measures quality of life related to sight loss  
212 (de Boer et al., 2006). It is worth noting that the VCM1 is designed to be administered  
213 over the telephone, making it appropriate for use in the present study.

214 *Table 1 Question items for the Questionnaire of vision-related Quality of Life Measure (VCM1)*

In the past few months how often on a scale of 0 (vision does not affect my life at all), 1 (affects my life rarely), 2 (affects my life a little of the time), 3 (affects my life a fair amount of time), 4 (affects my life a lot of the time) and 5 (affects my life all of the time) have you....
Felt concerned about your safety outside of your home
Felt concerned about your safety inside your home
Felt your eyesight has stopped you from doing the things you want to do
Felt embarrassed because of your eyesight
Felt frustrated because of your eyesight
Felt lonely/isolated because of your eyesight

Felt sad/low because of your eyesight
Worried your eyesight might get worse
Concerned about coping with everyday life

215

216

217 **Procedure**

218 Participants that responded to the advertisements call for recruitment provided their  
219 contact details to the researcher NJ via email and telephone. NJ then called the participant  
220 and read out the participant information sheet and asked all potential participants whether  
221 they are able to drive with their current level of visual acuity. Those that had a visual  
222 acuity that met driving standards were excluded at that point. NJ then arranged a  
223 convenient time and date to deliver the telephone survey. Verbal consent was taken at the  
224 start of the telephone survey and was voice recorded. Participants were reminded that  
225 they would remain anonymous and could withdraw without giving any reason at each  
226 phone call. The telephone survey lasted on average 20 minutes including the responses  
227 for VCM1. Participants were also given the opportunity to openly elaborate on the scores  
228 they gave for each VCM1 question item and this response was recorded.

229

230

231

232

233 **Data analysis**

234 Microsoft Excel was used to collect data and produce graphs. The data was also exported  
235 into IBM SPSS, version 23 for further statistical analysis. Descriptive statistics such as  
236 means and percentages were calculated for demographic variables such as age, level of  
237 visual impairment, gender, and employment status. Chi-square analysis was used to  
238 determine if there was a significant difference between the number of males and females  
239 participating in the study as well as differences in ability to cook and shop and level of  
240 visual impairment. Kruskal-Wallis H was used was used to determine if there was a  
241 relationship between the severity of sight loss and duration. Decision tree analysis (DTA)  
242 using the chi-squared automatic interaction detection (CHAID) method was applied to  
243 determine the hierarchical influence of the composite VCM1 scores for quality of life  
244 (dependent variable) on the nominal independent variables gender, age reports of health  
245 satisfaction. Both DTA and CHAID have been previously used to carry out multivariate  
246 analyses in the field of optometry (Dunstone, Armstrong, & Dunne, 2013; Guillon &  
247 Maissa, 2005; Pancholi & Dunne, 2018).

248

249

250 **RESULTS**

251 67 females and 34 males were included into the data analysis of this study, see table 2.  
252 As the expected ratio of females to males in the UK living with visual impairment is 2:1  
253 when calculated adjusting for expected Chi-square ratio, no significant difference was  
254 found in the number of females and males participating ( $\chi^2$  0.00  $p > 0.05$ ). The mean age  
255 of participants was  $71.4 \pm 17.5$ , median 76 years old and range 19-96 years old. 58% of  
256 the participants reported they were happy with their current health.  
257 Different causes of sight loss were reported including congenital e.g. blindness due to  
258 measles, neurological causes such as stroke, retinal disease such as diabetic retinopathy  
259 and macular degeneration. Genetic causes such as macular dystrophies, and retinitis  
260 pigmentosa were also reported as well as corneal degenerations and optic nerve head  
261 disease such as glaucoma as well as sight loss due to trauma.  
262 Participants were asked to report their category of visual impairment. Those that were  
263 registered as severely sight impaired (SSI) or sight impaired (SI) were grouped  
264 accordingly. Those that were not registered were asked whether they had been told that  
265 they were eligible for registration, and were grouped accordingly. The remaining  
266 participants were asked to confirm that they were not eligible for registration, but were  
267 also experiencing a level of visual impairment that precluded driving. Therefore,  
268 participants were categorised as not driving, SI or SSI. Visual impairment duration  
269 correlated with the severity of visual impairment significantly, Kruskal–Wallis H, 14.1  
270  $p = 0.001$ .

271 *Table 2 Demographic characteristics of participants*

Characteristic	Characteristic	Percentage of participants (%)
Gender	Female	66
	Male	33

Living	Living on own	47
	Living with family	49
	Living in sheltered accommodation	5
Ethnicity	Black	2
	South Asian	8
	White	90
Level of visual impairment	Not driving due to poor sight when fully corrected (VA<6/12)	23
	Eligible for sight impaired registration	33
	Eligible for severely sight impaired registration	45
Employment	Student	2
	Unemployed	6
	Employed	15
	Voluntary Employed	17
	Retired	60

272

273

274

275 **Activities of daily living**

276 **Shopping**

277

278 Level of visual impairment significantly affected ability to shop with more severely sight

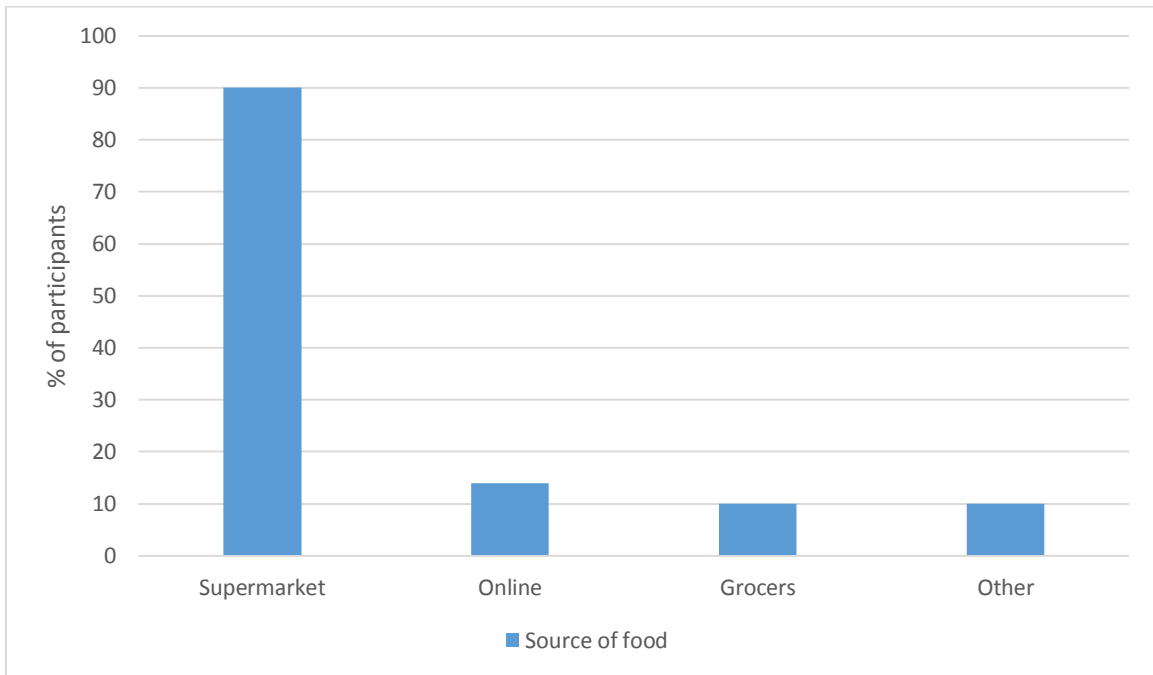
279 impaired and sight impaired people falling into the category of being unable to do so

280 compared to those whose vision precluded driving Fishers Exact Test 11.895 p= 0.017.

281 90% of participants reported that they found shopping difficult due to their visual

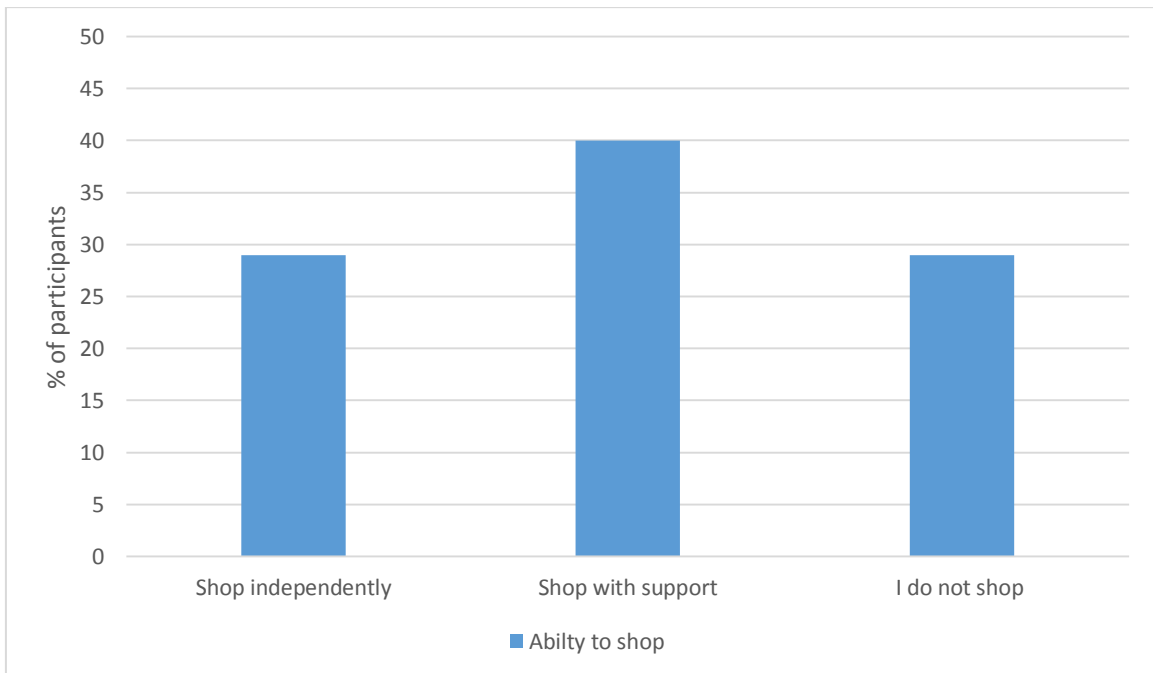
282 impairment. Living arrangements did not affect ability to shop  $\chi^2$  9.8 p=2.7. Participants

283 mainly shopped for food at the supermarket, online or at the local grocer, other sources  
284 given were butchers, markets or using home grown foods, see figure 1. A third shopped  
285 independently with over two thirds requiring some support or not being able to shop, see  
286 figure 2. A third did not shop with either family, friends, neighbours or carers shopping  
287 for them.



288  
289

Figure 1 where participants (%) sourced their food



290  
291  
292

Figure 2 Ability of participants (%) to shop

293

294 Participants stated that they learned or memorised a shopping routine. They went to the  
295 same shops, used the same brands, from the same aisles. They stated they found it  
296 extremely disorientating when large supermarkets changed a shop layout, which they  
297 reported occurred frequently. They also disliked when well-known brand items were  
298 rebranded. The layout of shops was problematic particularly when every-day items were  
299 on top or bottom shelves and not at eye-level.

300 They stated shops had such poor lighting, that they resorted to taking torches along with  
301 them when shopping. Labels were a particular obstacle with people stating they used  
302 magnifiers. Some stated they felt that the labels were such poor contrast, to the point they  
303 felt that they were discriminated against. An example of this given was foods on offer  
304 with red writing against a white background. They also stated writing on labels and  
305 packaging particularly related to nutritional information, expiry dates and weights of  
306 products did not cater for people with visual impairment. Participants, for example, would  
307 buy long life milk or avoid buying fresh foods and dairy because they could not see  
308 expiration dates.

309 They reported that sighted people could be ignorant to their presence and they felt at risk  
310 of being knocked over or falling. Participants also planned shopping by calling stores  
311 ahead of when they were going shopping. This was to ensure the shops would cater to  
312 their needs i.e. calling up for assistance. Despite doing this, they still found the experience  
313 of shopping frustrating. They reported the shop assistants assigned to help them did not  
314 seem to have any training or were unaware of their needs. Participants stated the assistants  
315 were incapable of supporting them. The shop assistants shopped too fast and participants  
316 reported feeling rushed by the assistants. Handling money in shops was also highlighted  
317 as an obstacle; with people unable to differentiate one coin from another or being unable  
318 to identify notes. They also stated cash machines in banks and card machines in stores

319 were difficult to see, card machines of screens which have a background colour to it such  
320 as brown were reported as particularly challenging. They reported online shopping as  
321 difficult due, simple things such as lack of support to help change size of print on screens  
322 as well as lack of support available to help participants engage with, and be  
323 knowledgeable about technological advancements limited their food choice.

324 Over 75% of participants made food choices based on preference, almost a third stated  
325 they made food choices depending on how the food affected health, a quarter stated cost  
326 of food played an important part in their food choices. Other reasons given were how  
327 practical the food was to cook and how predictable it was to acquire, for example, if foods  
328 a person would normally purchase were moved to a different location they would not buy  
329 that food on that particular occasion.

330

331

332

333

334



335 **Meal preparation and cooking abilities**

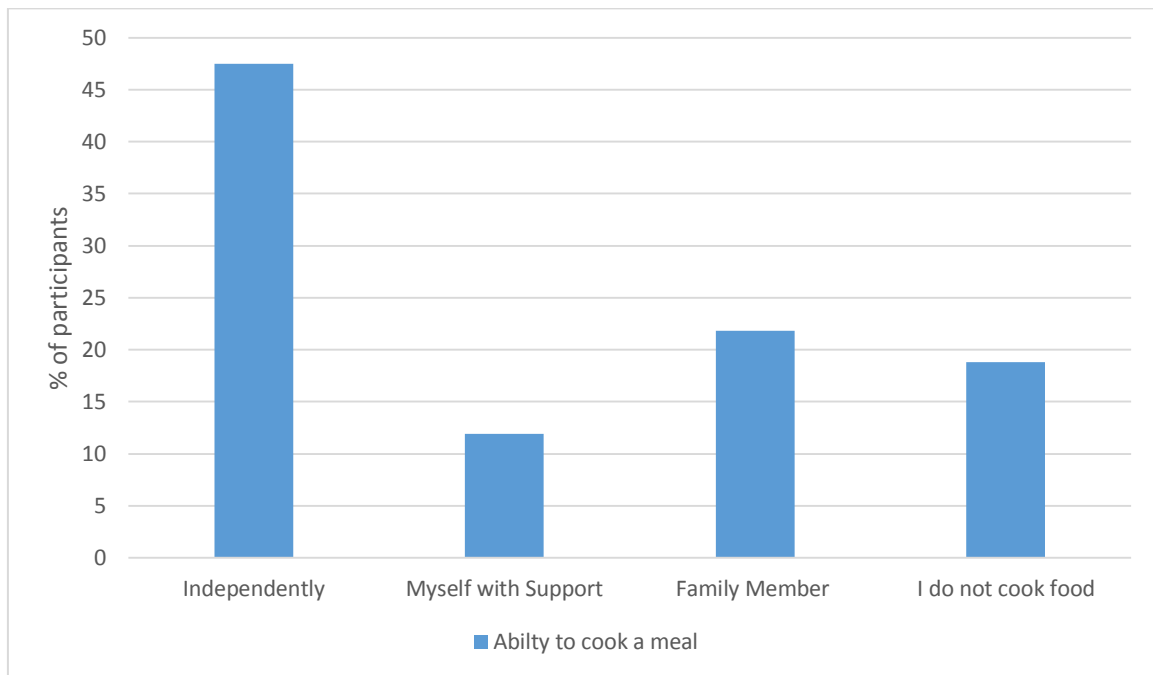
336 Ability to cook was also significantly correlated with level of visual impairment with a  
337 higher frequency of those being registered severely sight impaired being unable to cook  
338 Fishers exact test 15.76,  $p \geq 0.01$ .

339 65% of participants stated that their visual impairment made cooking difficult. Other  
340 reasons for not cooking or not wanting to cook were physical impairment, motivation,  
341 practicality and convenience. For example if someone was living by themselves they  
342 lacked motivation and felt it was impractical or inconvenient to cook for themselves only.

343 Ability to cook was affected significantly by living arrangements with those living in  
344 sheltered accommodation and with family being unable to cook or not cooking compared  
345 to those who lived on their own Fishers exact test 54.7  $p = 0.01$ .

346 Participants reported that they lacked confidence and were concerned about their safety  
347 when cooking because of their visual impairment. Reasons given were a lack of spatial  
348 awareness and depth perception i.e. when cutting. They reported boiling and cutting tasks  
349 to be dangerous and difficult. They were worried about hygiene, i.e. not being able to see  
350 dirt on vegetables, expiry dates, and mouldy foods and undercooking meats. They used  
351 visual aids when cooking such as magnifying glasses to read the display on the  
352 microwaves. Some also stated they memorised how to use the kitchen utilities and where  
353 cooking utensils were.

354 19% reported they would be unable to cook a hot meal if it was required or would only  
355 be able to do so with support. Over a half of the participants stated they cooked with help  
356 from a family member or other help i.e. a carer or friend or they did not cook. Of these  
357 over a third stated that a family member cooked or they did not cook, but ate in  
358 restaurants, pubs and purchased takeaways or ready meals instead, see figure 3.



359

360

*Figure 3 Ability of participants (%) to cook*

361

362 In particular, relating to restaurants over a third of participants stated they actively  
 363 avoided drinking and they ate less when eating out. This was mainly because they had  
 364 trouble getting to the bathroom on time or had difficulties locating bathroom facilities due  
 365 to signage they were unable to see. Over a third replied they had difficulty getting to the  
 366 bathroom on time. Bathroom locations in pubs and restaurants were a great obstacle,  
 367 particularly if participants had to climb flights of stairs. They did not report having  
 368 difficulty toileting in their own homes and this did not affect food or drink consumption  
 369 as they were familiar with their surroundings.

370

### 371 **Knowledge of healthy eating**

372 Knowledge of healthy eating was explored through the question “Can you name the five  
 373 food groups for a balanced diet” only 17% of participants were able to do so. Over 30%  
 374 reported they were unable to and the remaining replied they could but when asked to  
 375 name them were unable to do so. 17% of participants stated that they disagreed that the  
 376 foods we eat affect our health.

**378 Vision-Related Quality of Life (VR-QoL)**

379 The validated VCM1 which was designed to assess vision-related quality of life was used  
380 to measure VR-QOL. The items are scored from 0 ( does not affect my life at all), 1  
381 (affects my life rarely), 2 (affects my life a little of the time), 3 ( affects my life a fair  
382 amount of time, 4 (affects my life a lot of the time) and 5 (affects my life all of the time).

383 Cronbach's alpha was calculated to check the reliability of the questionnaire for the  
384 current sample. Alpha was considered acceptable  $\alpha=0.82$ , so, scores were averaged to  
385 give a composite score for each participant.

386 QoL scores in this study ranged from 0.3 to 4.90. The mean score was  $2.72 \pm 1.12$ , and  
387 median of 2.7. The QoL score of  $\geq 2.1$  was reported by 71% of people with visual  
388 impairment, this reveals vision related quality of life is more than a little of a concern in  
389 the majority of the people in this sample. The mean score for females was  $2.9 \pm 1$  and  
390  $2.5 \pm 1.1$  for males. Females in particular reported vision affects their quality of life a fair  
391 amount of the time. The mean QoL score for those that did not drive when fully corrected  
392 was  $2.5 \pm 0.99$ , those that were sight impaired had an average score of  $2.75 \pm 1.0$  and those  
393 that were severely sight impaired had a slightly higher average score of  $2.81 \pm 1.2$ . The  
394 results convey that level of visual impairment does affect quality of life although this was  
395 not statistically significant. The median age of 76 years old was used to separate  
396 participants into two categories older and younger. Those  $>76$  years old were designated  
397 older and those  $<76$  years old were designated younger. Older participants living with  
398 visual impairment reported a lower average QoL score of  $2.6 \pm 1.0$  and those younger  
399 reported an average score of  $2.9 \pm 1.2$ . Those living with family reported a better QoL  
400 score  $2.68 \pm 1.1$  than those living on their own  $2.7 \pm 1.1$  or those living in sheltered  
401 accommodation  $3.00 \pm 1.5$ . Decision tree analysis was used to determine if the independent

402 variables age, gender, reports of health satisfaction, influenced QoL however no  
403 correlation was found.

404 As well as providing each statement with a score to calculate a global composite score  
405 participants were also given the opportunity to describe any concerns related to the  
406 question items and their two dimensions: psychological and social, of the VCM1 this is  
407 described below.

#### 408 Psychological dimension

409 Participants reported feeling embarrassed about their eye sight for a variety of reasons.  
410 For example, they reported not being able to recognise people when out and about and  
411 people taking offence. They felt having Charles Bonnet syndrome was embarrassing as  
412 they worried people would have concerns about their mental health or treat them  
413 differently. Participants reported using a white cane made them stand out from society  
414 and made people avoid them. They also reported being patronized or shouted at as people  
415 assumed they were deaf and dumb as well as poor sighted.

416 They reported strong feelings of frustration due to lack of employment, support and  
417 accessibility at work and in society. They also reported to not being able to do things they  
418 used to find simple such as dressing in the right coloured clothes or doing the gardening  
419 as frustrating.

420 Participants reported feeling isolated due to people paying attention and talking to their  
421 guide dogs and ignoring them. They felt reduced mobility made them able to socialise  
422 less, with reduced access to friends and family members. They reported being ignored at  
423 social events. They felt having reduced body language and facial expressions also reduced  
424 effective communication.

425 Participants reported feeling sad because they could not personally send cards and gifts  
426 to family members. They reported not being able to see grandchildren's faces, missing  
427 out socially and losing the use of employment skills as depressing. They also mentioned  
428 poor professional attitudes in the work place made them feel low.

429 Participants scored their vision affecting their life in general quite highly mainly because  
430 they reported it affected them every day in one way or another. Most reported that they  
431 did not worry about their eyesight getting worse as they were either severely sight  
432 impaired or importantly those who had a family history of a progressive disease, for  
433 example, retinitis pigmentosa reported they did not worry because they witnessed family  
434 members and therefore prepared themselves practically and mentally. They reported that  
435 preparation is key to progressive sight loss.

436

437 Social dimension

438 Participants reported feeling fearful of falling over when travelling outside of their homes,  
439 crossing roads and depths of pavements were reported as concern or when travelling  
440 somewhere new i.e. abroad.

441 Participants mostly reported feeling very safe at home as it was a familiar environment.  
442 They did however express concerns about security and inviting in people that they did  
443 not know such as builders, this was because they could not monitor them as appropriately  
444 as they would like.

445 In terms of being prevented from doing things they wanted to participants mainly  
446 expressed the loss of their driving licence as debilitating. They felt it led to loss of  
447 independence and isolation from family and friends. They reported the inability to  
448 participate in hobbies that kept them entertained such as sewing or watching TV affected

449 their lives. Those of working age reported missing work colleagues if they were no longer  
450 employed. If they were employed they felt they were treated in a condescending manner  
451 by other employees, with employees shouting, patting and making noises of sympathy.  
452 They repeatedly reported other members of society would exclude, avoid or lacked  
453 empathy in day to day situations; an example given of this was one when a person was  
454 excluded from a group holiday as other members assumed they would be unable to  
455 participate in activities.

456

457

## 458 **CONCLUSION**

459 It has been previously reported that the needs of disabled people in the UK are not being  
460 met (DisabledGo, 2014). The results of this study support these findings, the activities of  
461 daily living; shopping, online and in store and cooking are major obstacles for people  
462 with visually impairment with many being unable to do so or requiring support from  
463 family members. As reported previously in other studies (Bilyk et al., 2009; Kostyra et  
464 al., 2017) it was found UK shoppers with visually impairment also shop predictably but  
465 this study has found they are also prevented from buying items altogether if items location  
466 is changed. People with visual impairment also need help with information such as  
467 weights, amounts, and types of foods available to them. Supermarkets are the main source  
468 of food for people living with visual impairment, providing staff assistants who have been  
469 trained and who can inform the participants of food freshness, nutritional information and  
470 help to guide them with expiry dates would be ideal. Supermarkets could also evaluate  
471 the ergonomics of their stores and adapt these so they are more user friendly for those  
472 with visual impairment.

473 Skills training and rehabilitation for shopping both online and in store and cooking for  
474 people with visual impairment is also required in the UK. Currently the government does  
475 not offer cooking classes however low vision clinics and charities could perhaps help to  
476 arrange these at a local level. Skills training for shopping and cooking could contribute  
477 to encouraging diet variation and opting for healthier food choices.

478 The VCM1 has revealed that sight loss impacts QoL more than a little of the time for  
479 most participants. Participants open ended responses have also revealed lack of inclusion  
480 in society is also a key factor affecting the QoL of lives of people with visual impairment.  
481 Applying a holistic model (Raphael, Brown, Renwick, & Rootman, 1996; Renwick,  
482 Myerscough, & Schorman, 1996) to the findings of this study highlights the people with  
483 visual impairment in this study cannot 'belong' (connections with one's environment), or  
484 'become' (achieving personal goals, hopes and aspiration) and are hindered from 'being'  
485 (who one is) if society excludes them. This not only impacts the health and QoL of the  
486 individual person but society as a whole.

487 This study has found accessibility and support for people with visual impairment living  
488 in the UK is lacking. It is the responsibility and duty of society to support people living  
489 with visual impairment or other disabilities rather than blaming them for not 'integrating'.  
490 Among other things this can be done by incorporating regulations and norms into the  
491 marketing. These norms might help to raise and increase the awareness of suppliers to the  
492 needs of consumers with visual impairment or other disabilities. Furthermore, such norms  
493 may contribute to our ongoing efforts for a more inclusive, ergonomic and accessible  
494 environment.

495

496 **Strengths & Weaknesses**

497 A strength of this study is that it was nationwide; the participants were recruited from  
498 locations across the United Kingdom. Both qualitative and quantitative data were  
499 collected for this study. Although an attempt was made to include people of visual  
500 impairment of all ages and ethnic backgrounds, very few participants under the age of 55  
501 years old, not Caucasian or not retired volunteered. Future studies should evaluate the  
502 BMI and activity levels of people living with visual impairment.

503

504

505

## 506 REFERENCES

507

508

509

- 510 Aaronson, N. K. (1988). Quality of life: what is it? How should it be measured? *Oncology*  
511 *(Williston Park)*, 2(5), 69-76, 64.
- 512 Acil, D., & Ayaz, S. (2015). Screening of Visually Impaired Children for Health Problems. *Asian*  
513 *Nursing Research*, 9(4), 285-290. doi:10.1016/j.anr.2015.06.004
- 514 Ang, M., Man, R., Fenwick, E., Lamoureux, E., & Wilkins, M. (2018). Impact of type I Boston  
515 keratoprosthesis implantation on vision-related quality of life. *British Journal of*  
516 *Ophthalmology*, 102(7), 878-881. doi:10.1136/bjophthalmol-2017-310745
- 517 Baker, S. M. (2006). Consumer normalcy: Understanding the value of shopping through  
518 narratives of consumers with visual impairments. *Journal of Retailing*, 82(1), 37-50.  
519 doi:10.1016/j.jretai.2005.11.003
- 520 Bilyk, M. C., Sontrop, J. M., Chapman, G. E., Barr, S. I., & Mamer, L. (2009). Food Experiences  
521 and Eating Patterns of Visually Impaired and Blind People. *Canadian Journal of Dietetic*  
522 *Practice and Research*, 70(1), 13-18. doi:10.3148/70.1.2009.13
- 523 Brown, R. L., & Barrett, A. E. (2011). Visual Impairment and Quality of Life Among Older Adults:  
524 An Examination of Explanations for the Relationship. *The Journals of Gerontology:*  
525 *Series B*, 66B(3), 364-373. doi:10.1093/geronb/gbr015
- 526 choices, N. (2015). Blindness and vision loss. Retrieved from [www.nhs.uk/conditions/Visual-](http://www.nhs.uk/conditions/Visual-impairment/Pages/Introduction.aspx)  
527 [impairment/Pages/Introduction.aspx](http://www.nhs.uk/conditions/Visual-impairment/Pages/Introduction.aspx) (last accessed 16/02/2017)
- 528 de Boer, M. R., Moll, A. C., de Vet, H. C., Terwee, C. B., Volker-Dieben, H. J., & van Rens, G. H.  
529 (2004). Psychometric properties of vision-related quality of life questionnaires: a  
530 systematic review. *Ophthalmic Physiol Opt*, 24(4), 257-273. doi:10.1111/j.1475-  
531 1313.2004.00187.x



- 532 de Boer, M. R., Terwee, C. B., de Vet, H. C. W., Moll, A. C., Volker-Dieben, H. J. M., & van Rens,  
533 G. (2006). Evaluation of cross-sectional and longitudinal construct validity of two  
534 vision-related quality of life questionnaires: The LVQOL and VCM1. *Quality of Life*  
535 *Research*, 15(2), 233-248. doi:10.1007/s11136-005-1524-9
- 536 de Faria, M. D., da Silva, J. F., & Ferreira, J. B. (2012). The visually impaired and consumption in  
537 restaurants. *International Journal of Contemporary Hospitality Management*, 24(4-5),  
538 721-734. doi:10.1108/09596111211237264
- 539 DisabledGo. (2014). DisabledGo Study 2014. Retrieved from  
540 [http://www.disabledgo.com/blog/2014/12/disabledgo-study-shocks-the-government-](http://www.disabledgo.com/blog/2014/12/disabledgo-study-shocks-the-government-with-evidence-of-inaccessible-british-high-streets/#.WJNnZeKLTIU)  
541 [with-evidence-of-inaccessible-british-high-streets/#.WJNnZeKLTIU](http://www.disabledgo.com/blog/2014/12/disabledgo-study-shocks-the-government-with-evidence-of-inaccessible-british-high-streets/#.WJNnZeKLTIU) (accessed  
542 29/01/2017)
- 543 Dunstone, D., Armstrong, R., & Dunne, M. (2013). Survey of habits and attitudes to retinoscopy  
544 by optometrists in the UK. *Optometry in Practice*, 14(2), 45-54.
- 545 Esteban, J. J. N., Martinez, M. S., Navalon, P. G., Serrano, O. P., Patino, J. R. C., Puron, M. E. C.,  
546 & Martinez-Vizcaino, V. (2008). Visual impairment and quality of life: gender  
547 differences in the elderly in Cuenca, Spain. *Quality of Life Research*, 17(1), 37-45.  
548 doi:10.1007/s11136-007-9280-7
- 549 foundation, T. f. (2017). UK and global malnutrition the new normal. Retrieved from  
550 [https://foodfoundation.org.uk/wp-content/uploads/2017/07/01-Briefing-](https://foodfoundation.org.uk/wp-content/uploads/2017/07/01-Briefing-Malnutrition.vF.pdf)  
551 [Malnutrition.vF.pdf](https://foodfoundation.org.uk/wp-content/uploads/2017/07/01-Briefing-Malnutrition.vF.pdf)
- 552 Frost, A., Eachus, J., Sparrow, J., Peters, T. J., Hopper, C., Davey-Smith, G., & Frankel, S. (2001).  
553 Vision-related quality of life impairment in an elderly UK population: Associations with  
554 age, sex, social class and material deprivation. *Eye*, 15, 739. doi:10.1038/eye.2001.241
- 555 Frost, N. A., Sparrow, J. M., Durant, J. S., Donovan, J. L., Peters, T. J., & Brookes, S. T. (1998).  
556 Development of a questionnaire for measurement of vision-related quality of life.  
557 *Ophthalmic Epidemiol*, 5(4), 185-210.
- 558 Gladstone, M., McLinden, M., Douglas, G., Jolley, E., Schmidt, E., Chimoyo, J., . . . Lynch, P.  
559 (2017). 'Maybe I will give some help.... maybe not to help the eyes but different help':  
560 an analysis of care and support of children with visual impairment in community  
561 settings in Malawi. *Child: Care, Health and Development*, n/a-n/a.  
562 doi:10.1111/cch.12462
- 563 Gopinath, B., Liew, G., Burlutsky, G., & Mitchell, P. (2014). Age-related macular degeneration  
564 and 5-year incidence of impaired activities of daily living. *Maturitas*, 77(3), 263-266.  
565 doi:10.1016/j.maturitas.2013.12.001
- 566 Guillon, M., & Maissa, C. (2005). Dry eye symptomatology of soft contact lens wearers and  
567 nonwearers. *Optom Vis Sci*, 82(9), 829-834.
- 568 Jones, N., & Bartlett, H. (2018). The impact of visual impairment on nutritional status: A  
569 systematic review. *British Journal of Visual Impairment*, 36(1), 17-30.  
570 doi:10.1177/0264619617730860
- 571 Kostyra, E., Zakowska-Biemans, S., Sniegocka, K., & Piotrowska, A. (2017). Food shopping,  
572 sensory determinants of food choice and meal preparation by visually impaired  
573 people. Obstacles and expectations in daily food experiences. *Appetite*, 113, 14-22.  
574 doi:10.1016/j.appet.2017.02.008
- 575 Kremer, S., Holthuysen, N., & Boesveldt, S. (2014). The influence of olfactory impairment in  
576 vital, independently living older persons on their eating behaviour and food liking.  
577 *Food Quality and Preference*, 38, 30-39. doi:10.1016/j.foodqual.2014.05.012
- 578 Magdalena, W., Urzedowicz, B., Motylewski, S., Zeman, K., & Pawlicki, L. (2016). Body mass  
579 index and waist-to-height ratio among schoolchildren with visual impairment A cross-  
580 sectional study. *Medicine*, 95(32). doi:10.1097/md.0000000000004397
- 581 Montero, P. (2005). Nutritional assessment and diet quality of visually impaired Spanish  
582 children. *Ann Hum Biol*, 32(4), 498-512. doi:10.1080/08014460500142744

583 Murphy, C., Greiner, K., Heissigerova, J., Andrew Frost, N., Forrester, J., & Dick, A. (2007).  
584 *Validity of using vision-related quality of life as a treatment end point in intermediate*  
585 *and posterior uveitis* (Vol. 91).

586 Muurinen, S. M., Soini, H. H., Suominen, M. H., Saarela, R. K. T., Savikko, N. M., & Pitkala, K. H.  
587 (2014). Vision impairment and nutritional status among older assisted living residents.  
588 *Archives of Gerontology and Geriatrics*, 58(3), 384-387.  
589 doi:10.1016/j.archger.2013.12.002

590 Nakamura, K., Otomo, A., Maeda, A., Kikuchi, S., Motohashi, Y., Tanaka, M., . . . Yamamoto, M.  
591 (1999). Evaluation of complex activities in daily living of elderly Japanese with visual  
592 impairment. *Aging-Clinical and Experimental Research*, 11(2), 123-129.

593 Organisation, W. H. (1995, 2018). Health statistics and information systems. Retrieved from  
594 <http://www.who.int/healthinfo/survey/whogol-qualityoflife/en/>

595 Pancholi, B., & Dunne, M. (2018). Virtual Patient Instruction and Self-Assessment Accuracy in  
596 Optometry Students. *Optometric Education*, 43(Winter-Spring).

597 Pardhan, S., Latham, K., Tabrett, D., & Timmis, M. A. (2015). Objective Analysis of Performance  
598 of Activities of Daily Living in People With Central Field Loss. *Invest Ophthalmol Vis Sci*,  
599 56(12), 7169-7178. doi:10.1167/iovs.15-16556

600 Rabiee, F. (2004). Focus-group interview and data analysis. *Proceeding of the Nutritional*  
601 *Society*, 63, 655-660.

602 Raphael, D., Brown, I., Renwick, R., & Rootman, I. (1996). *Assessing the Quality of Life of*  
603 *Persons with Developmental Disabilities: Description of a New Model, Measuring*  
604 *Instruments, and Initial Findings* (Vol. 43).

605 Renwick, R., Myerscough, T., & Schorman, A. F. (1996). The Quality of Life Model. Retrieved  
606 from [http://sites.utoronto.ca/qol/qol\\_model.htm](http://sites.utoronto.ca/qol/qol_model.htm)

607 RNIB. (2016a). Key information and statistics. Retrieved from  
608 <http://www.rnib.org.uk/knowledge-and-research-hub/key-information-and-statistics>  
609 (accessed 29/06/2017)

610 RNIB. (2016b). RNIB STATISTICS. Retrieved from [https://help.rnib.org.uk/help/newly-](https://help.rnib.org.uk/help/newly-diagnosed-registration/registering-sight-loss/statistics)  
611 [diagnosed-registration/registering-sight-loss/statistics](https://help.rnib.org.uk/help/newly-diagnosed-registration/registering-sight-loss/statistics) (accessed 31/01/2017)

612 RNIB. (2016c). State of the Nation Eye Health Report. Retrieved from  
613 [https://www.rnib.org.uk/sites/default/files/RNIB-State-of-the-Nation-2016-](https://www.rnib.org.uk/sites/default/files/RNIB-State-of-the-Nation-2016-APDF%20format.PDF)  
614 [APDF%20format.PDF](https://www.rnib.org.uk/sites/default/files/RNIB-State-of-the-Nation-2016-APDF%20format.PDF) (accessed 02/02/2017)

615 Roebbothan, B. V. (1999). Preliminary assessment of nutritional status in a group of persons  
616 with visual impairments. *Nutrition Research*, 19(12), 1731-1740. doi:10.1016/s0271-  
617 5317(99)00128-1

618 Roh, M., Selivanova, A., Shin, H. J., Miller, J. W., & Jackson, M. L. (2018). Visual acuity and  
619 contrast sensitivity are two important factors affecting vision-related quality of life in  
620 advanced age-related macular degeneration. *Plos One*, 13(5), 12.  
621 doi:10.1371/journal.pone.0196481

622 Smyth, C. A., Spicer, C. L., & Morgese, Z. L. (2014). Family Voices at Mealtime: Experiences  
623 With Young Children With Visual Impairment. *Topics in Early Childhood Special*  
624 *Education*, 34(3), 175-185. doi:10.1177/0271121414536622

625 Stevens, R., Bartlett, H., Walsh, R., & Cooke, R. (2014). Age-related macular degeneration  
626 patients' awareness of nutritional factors. *British Journal of Visual Impairment*, 32(2),  
627 77-93. doi:10.1177/0264619613519341

628 Stevens R., B. H., Cooke R. (2015). Dietary Analysis and nutritional behaviour in people with  
629 and without age-related Macular disease. *Clinical Nutrition*, Vol. 10 (3), p. e112–e117

630

631 Susniene, D., & Jurkauskas, A. (2009). *The concepts of quality of life and happiness - Correlation*  
632 *and differences* (Vol. 3).

633 Trust, U. H. S. N. F. (2017). The cost of malnutrition in the UK economic report. Retrieved from  
634 <http://uhs.nhs.uk/ClinicalResearchinSouthampton-Biomedical-Research->

- 635 [Centre/Ourresearchimpacts/impactcasestudies/ThecostofmalnutritionintheUKeconom](#)  
636 [icreport.aspx](#)
- 637 Tseng, Y. C., Liu, S. H. Y., Lou, M. F., & Huang, G. S. (2018). Quality of life in older adults with  
638 sensory impairments: a systematic review. *Quality of Life Research*, 27(8), 1957-1971.  
639 doi:10.1007/s11136-018-1799-2
- 640 Vági, Z., Deé, K., Lelovics, Z., & Lakatos, É. (2012). Nutritional status of blind and visually  
641 impaired patients. *Z Gastroenterol*, 50(05), A82. doi:10.1055/s-0032-1312436
- 642 Vu, H. T. V., Keeffe, J. E., McCarty, C. A., & Taylor, H. R. (2005). Impact of unilateral and  
643 bilateral vision loss on quality of life. *The British Journal of Ophthalmology*, 89(3), 360-  
644 363. doi:10.1136/bjo.2004.047498
- 645 Welp A, W. R., McCoy MA, et al. (2016). *Making Eye Health a Population Health Imperative:*  
646 *Vision for Tomorrow*. Washington (DC): National Academies Press (US).
- 647 Xu, K. Y., Gupta, V., Bae, S., & Sharma, S. (2018). Metamorphopsia and vision-related quality of  
648 life among patients with age-related macular degeneration. *Canadian Journal of*  
649 *Ophthalmology-Journal Canadien D Ophtalmologie*, 53(2), 168-172.  
650 doi:10.1010/j.jcjo.2017.08.006
- 651 Yildiz, E., Toklu, M., & Vural, E. T. (2018). Vision-Related Quality of Life Before and After Deep  
652 Anterior Lamellar Keratoplasty. *Eye & Contact Lens-Science and Clinical Practice*, 44(3),  
653 144-148. doi:10.1097/icl.0000000000000359
- 654 Yu, H., Tullio-Pow, S., & Akhtar, A. (2015). Retail design and the visually impaired: A needs  
655 assessment. *Journal of Retailing and Consumer Services*, 24, 121-129.  
656 doi:10.1016/j.jretconser.2015.03.001

657

658

659

660

661

662

663

664

665

666