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Assessing complex needs of UK veterans and changes in need complexity over time

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25 **Abstract**

26 Military charities suggest there is an increasing demand for complex need support among their
27 beneficiaries in recent years. However, no prior research has attempted to understand the range
28 of complex needs presented by veterans and to evaluate how complex cases have changed over
29 time. Understanding complex needs is associated with several challenges such as identifying
30 the diversity of needs, lack of data and access to the most vulnerable individuals, and a lack of
31 literature on how to evaluate the complexity of cases. The present study used the dataset
32 provided by SSAFA to assess how the complexity of beneficiaries' needs changed year on year
33 from 2014 to 2019. The grant applications for different categories of support were used as
34 indicators of different needs. The dimensions of breadth (number of different needs) and depth
35 (number of grant applications to address the need) were incorporated in the assessment of
36 complexity. Furthermore, to account for the interaction between needs, we applied the
37 methodology to estimate weights which derive from their correlations with each other.
38 Generalised linear modelling was then used to measure changes in complexity of needs and
39 number of different grant application between 2014 and 2019. The findings suggested an
40 increase in complex needs among SSAFA beneficiaries over the study period. There was an
41 increase in the grant applications for care, housing, employment, and mental health support.
42 The findings warrant a further investigation of the need complexity trends in the UK veterans
43 and the causes for these trends. The assessment of complex needs is crucial for providing
44 adequate support to the beneficiaries and should be employed widely to identify individuals at
45 risk.

46 **Key words:** veterans, complex needs, beneficiaries, composite indicators, social care

47 *What is known about this topic?*

- 48
- Some UK veterans have an increased risk of developing complex problems.

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- 49 • Those with complex needs are usually hardest to reach and support.
- 50 • To fully understand the extent of complex cases it is important to consider breadth
- 51 and depth of individual problems as well as interaction between different needs.

52 *What this paper adds*

- 53 • A method for assessing complexity of the veteran beneficiaries' needs.
- 54 • Evaluation of the trend on changes in complex needs of veteran beneficiaries over
- 55 time.
- 56 • Assessment of changes in specific needs of the beneficiaries based on grant
- 57 applications.

58 **Introduction**

59 *Overview*

60 In 2017 there were 2.4 million UK Armed Forces veterans in Great Britain, however the
61 demographic profile of the veteran population differs to the general population: 89% of
62 veterans are male; 99% are white; and 49% of veterans are aged 75 years and over (Ministry
63 of Defence, 2019a). Consequently, it is projected that by 2028, the total number of UK veterans
64 will fall to 1.6 million in Great Britain, mainly resulting from a decline in the number of
65 veterans in retirement age (i.e., 65 years and over) to 56% (Ministry of Defence, 2019b).
66 Despite the shrinking of the UK veteran population, there has been a growing demand for
67 complex need support from veteran charity sector as a result of improvements in the survival
68 rates following major trauma in recent UK combat operations in Iraq and Afghanistan,
69 advances in health care and longevity, and increasing expectations of support by individuals in
70 wider society (Penn-Barwell et al., 2015) . Approximately 14,000 service men and women
71 leave the armed forces each year and for many the transition to civilian life is unproblematic

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72 but some can experience difficulties with mental and physical impairments, homelessness, drug
73 or alcohol misuse (Gordon et al., 2020; Scullion et al., 2021). The issues can interact and
74 exacerbate each other within an individual. For example, mental health issues that some service
75 leavers experience as a result of exposure to combat events or other traumatic incidents increase
76 the risk of developing other problems such as physical illness, substance misuse, financial
77 and/or social challenges. As a result, some service leavers have a risk of developing complex
78 needs that can intensify each other leading an individual to experience several problems
79 simultaneously and require more comprehensive support and resources.

80 Rankin and Regan (2004) defined complex needs as having more than one issue in their life
81 and introduced the notions of the ‘breadth of need’ (existence of multiple needs that are
82 interconnected) and ‘depth of need’ (severity and intensity of need). Rankin and Regan (2004)
83 also used as a framework to understand and illustrate multiple interlocking health and social
84 issues, therefore emphasising that there is no generic complex needs case. More recently, the
85 All Party Parliamentary Group (APPG) on Complex Needs and Dual Diagnosis has defined a
86 person with complex needs as someone “with two or more needs affecting their physical,
87 mental social or financial wellbeing” (All Party Parliamentary Group for Complex Needs and
88 Dual Diagnosis, 2014, p. 1). The APPG (2014) also classified needs in the following categories:
89 1) physical & mental health – including support with care / mobility / medical costs; 2)
90 education/employment; 3) poverty, financial hardship and food poverty (i.e., support with
91 essential clothing / essential food / financial / household goods / support with legal costs /
92 children needs / support an individual with cost of daily living and to continue to live
93 independently); 4) living environment/housing.

94 As discussed, there remains a proportion of veterans who continue to experience multiple and
95 complex health, financial, and social needs. Based on the APPG classification, we will outline
96 different challenges and needs that veterans might experience and how these issues can interact.

97 *Veterans' needs*

98 **Physical and Mental Health.** It is evident that common health problems that veterans
99 experience include depression, anxiety, stress, physical limitations, cognitive impairment and
100 pain (Herritty et al., 2011). Moreover, social problems (i.e. isolation, loneliness, difficulties
101 with existing relationships and adjusting to civilian life) can exacerbate physical and mental
102 health conditions (Herritty et al., 2011). As previously mentioned, a large proportion of the
103 veteran population are in retirement age and similar to the needs of older people in the
104 general population, they have additional needs for self-care to continue to live independently
105 (Kingston et al., 2018). A recent review on the literature of care and support of older people
106 showed that older people face a range of physical, social and psychological challenges as a
107 result of living with chronic conditions and require support with social activities, mental
108 health, and activities related to mobility, self-care and to maintain living independently at
109 home (Abdi et al., 2019). There is an increase in the concentration of older people who have
110 diseases such as dementia, cancers, and cardiovascular disease in the UK. Multiple chronic
111 diseases, referred to as multimorbidity, are also increasing relative to people with a single
112 disease (Whitty, 2020). In addition, findings from the Map of Need study illustrated that there
113 is a strong association between veterans with service injury or disability and demand for
114 charitable support (Kiernan et al., 2021).

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115 **Education / Employment.** The most recent figures published by the MOD on employment
116 status of veterans following transition to civilian life reported that 84% of service leavers
117 were employed, 7% were unemployed, and 9% were economically inactive (Burdett et al.,
118 2019). Service leavers that were medically discharged were less likely to be employed (74%),
119 than those who were not medically discharged (86%) (Ministry of Defence, 2019a). Overall,
120 there are no differences in employment status of working aged veterans compared to non-
121 veterans (Ministry of Defence, 2019a). Nevertheless, despite the introduction of Armed
122 Forces Champions at Job Centre Plus locations to help veterans access services and welfare
123 support, working age veterans are significantly less likely than working age non-veterans to
124 visit a job centre when looking for work (4% vs 21%) (Ministry of Defence, 2019a).

125 Research conducted on a cohort of recent leavers from the UK armed forces, illustrated that
126 those claiming unemployment benefits were less likely to have obtained educational attainment
127 beyond GCSE, had experienced childhood adversity, and more likely to have received
128 unemployment support prior to service (Burdett et al., 2019). Moreover, veterans that ended
129 service at a lower rank, served for a shorter period of time, and served in the Army (compared
130 to veterans from RAF or Navy) were more likely to seek welfare support (Burdett et al., 2019).

131 Whilst there is a lack of research on the welfare support needs of ex-service personnel in the
132 UK, recent research undertaken by Scullion et al (2019) identified that ongoing physical and
133 mental conditions (including alcohol or drug dependency) affected veterans' ability to maintain
134 employment. Moreover, research from the US, illustrate that veterans joining the workforce
135 post-service experience lower levels of employment and earnings compared to non-veterans
136 (Shepherd et al., 2021). Factors that shape their experience of transitioning to civilian life and
137 securing employment include trauma experienced during military service, characteristics of the
138 individual that led them to choose armed forces, military socialisation, and discrimination
139 based on veteran status (either positive or negative) (Shepherd et al., 2021).

140 **Poverty, financial hardship, and food poverty.** Whilst there are various definitions and
141 measurements of poverty, the UK, similar to many western countries, adopts an income-
142 based approach to the measurement of relative poverty: a household in the UK is considered
143 to be in relative poverty if total household income is less than 60% of the UK median income,
144 equivalent to £435 per week (after housing costs have been subtracted) for a couple with two
145 children in 2018/19 (Department for Work and Pensions, 2021). The most recent Household
146 Below Average Income (HBAI) figures, published by the Department for Work and Pensions
147 in March 2020, indicate that 14.5 million people were living in relative poverty in the UK in
148 2018/19 (Department for Work and Pensions, 2021).

149 Food insecurity is an aspect of poverty and whilst there is no official definition of household
150 food insecurity in the UK, the Food and Agriculture Organisation (FAO) of the United Nations
151 describes food insecurity as “the inability to acquire or consume an adequate quality or
152 sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able
153 to do so” (Food Agriculture Organization of the United Nations, 2015, p. 53). The FAO
154 describes four dimensions of food insecurity: economic and physical access to food; food
155 availability; food supply stability; and the ability of individuals to utilise food to meet
156 nutritional needs. The ability to afford and access food that constitutes a healthy diet illustrates
157 the risk of low socioeconomic groups experiencing food insecurity (Department for Health,
158 2005).

159 Household food insecurity goes beyond feelings of hunger and is known to have a negative
160 impact on a range outcomes in terms of physical and mental health, including stress, anxiety,
161 and risk of overweight and obesity (Garthwaite et al., 2015; Marmot, 2020; Stuff et al., 2004;
162 Yau et al., 2020).

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163 Whilst there is a paucity of research on the food security status of ex-service personnel in the
164 UK, research exists on food security among military veterans in the US. A recent study
165 conducted by Brostow et al. (2017) highlighted that US veterans were less likely to report
166 hunger or seek nutrition assistance compared to non-veterans in the US. Nevertheless, veterans
167 at risk of food insecurity were more likely to be younger, suffer from mental health issues, or
168 report difficulty with physical health compared to food secure veterans (Brostow et al., 2017;
169 Widome et al., 2015). Furthermore, recent research conducted in the US illustrated that
170 challenges associated with transitioning to civilian life (i.e., securing housing and employment)
171 alongside existing mental and physical issues can increase the risk of veterans experiencing
172 food insecurity (Kamdar et al., 2020). Low income veterans experienced challenges with
173 sourcing a healthy diet as a result of their physical or mental health conditions and their eating
174 habits varied daily depending on their mental health status (Kamdar et al., 2020).

175 **Living environment/housing.** Findings from the Map of Need study illustrated that veterans
176 seeking financial support from military charities were located in areas of high deprivation and
177 experienced similar challenges to that of the wider population in these areas including high
178 unemployment, poor health conditions, barriers to housing and services, crime, and poor
179 living environments (Kiernan et al., 2021; Ministry of Housing Communities & Local
180 Government, 2019)).

181 People living in the most socioeconomically deprived areas of England have higher premature
182 mortality rates: the gap in life expectancy of people living in the most deprived compared to
183 the least deprived areas of England is 9.5 years for males and 7.7 years for females (Marmot et
184 al., 2020). Moreover, people living in England's most deprived areas are more likely to spend
185 a larger proportion of their life in ill health compared to those in least deprived areas (for males,
186 30%, 15% respectively) (Marmot et al., 2020).

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187 The quality of a neighbourhood can affect the health of residents. Residents of deprived areas
188 are more likely to be victims of crime or anti-social behaviour compared to wealthier areas of
189 England (Marmot et al., 2020). The result of not feeling safe or in control in their local
190 communities can impact on the physical and psychological health of residents (Marmot et al.,
191 2020). In addition, poor air quality is an issue of deprived areas and air pollution is linked to
192 heart disease, stroke, pulmonary disease, cancer and asthma (Marmot et al., 2020).

193 As well as poor neighbourhood environment, poor quality housing harms the physical and
194 mental health of individuals (Marmot et al., 2020). It is evident that poorer families spend a
195 higher percentage of their income on housing compared to their more affluent peers.
196 Furthermore, exposure to cold, damp homes can affect their physical health (for example, an
197 increased risk of respiratory conditions, cardiovascular disease, transmission of communicable
198 diseases) as well as mental health (stress and depression) (Marmot et al., 2020).

199 *Assessing complexity*

200 Despite the vast negative impacts of complex needs on individuals, society, health and social
201 care, there is paucity of research on populations in the UK at risk of complex needs. Even
202 though military charity sector suggested a growing demand for complex need support, no
203 research has attempted to evaluate changes in complex cases over time and what these complex
204 needs present. Understanding complex needs presents a few challenges due to the diversity of
205 their nature, difficulties of accessing/lack of information, and because individuals with
206 complex needs often are hardest to reach (Kuluski et al., 2017). Furthermore, there is a lack of
207 literature on how to evaluate the complexity of cases.

208 In response to the latter challenge, the assessment solution should derive from the
209 understanding of what complex needs are. As per definitions by Rankin and Regan's (2004),
210 one of the dimensions of complex needs is breadth, which is presented by the range or number

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211 of needs an individual has. Another dimension is depth or level of needs. The depth of need is
212 potentially harder to measure and compare, as its assessment is due to subjective individual
213 and service measurements. However, as an individual interacts with support services, an
214 indicator of severity could include the amount of time required to manage a case, the number
215 of requests for support, and/or number of interventions required to address the needs over time.
216 Additionally, Rankin and Regan's emphasised the importance of assessing the interaction
217 between needs to understand their complexity. This is aligned with complexity theory that
218 recognises connectivity and interdependence between factors in a system. The principles of
219 complexity and the importance of considering multimorbidity and interacting sociocultural
220 influence have been more widely acknowledged in contemporary health and social care
221 (Greenhalgh & Papoutsi, 2018). Therefore, the interaction or correlation between needs should
222 be taken into account when assessing the complexity.

223 With regards to accessing information on individual cases, a more reliable and comprehensive
224 approach is to use the information from organisations that address various needs of the veterans
225 and collect data on multiple cases. Military charities provide a broad range of services and
226 support in different domains (e.g., financial, housing, health) to the veteran community.
227 Charities differ in terms of their vision and aims, as well as a specific beneficiary groups. These
228 can be small organisations supporting a niche target group or a large charity with a broad range
229 of services, support and beneficiaries, the latter can be preferable for assessing complex needs.
230 Additionally, charities collect and store information on their beneficiaries and the type of
231 support delivered over time, which can be used in assessment of complexity and for tracking
232 changes in complex needs year on year.

233 This research evaluated the complexity of needs in UK veterans and assessed how the
234 complexity changed year on year from 2014 to 2019 using the data provided by a military
235 charity.

236 **Methods**

237 *Study population*

238 The study population comprised SSAFA benefit recipients between 2014 and 2019. All
239 beneficiaries included in this study were UK veterans (N=35,208). SSAFA represents and
240 collects beneficiary data on behalf of over 110 military charities. This study measured SSAFA
241 benefit cases and number of beneficiaries applied for grant support through a yearly average
242 count.

243 *Variables*

244 To explore the complexity of cases, we were guided by the definitions provided by the APPG
245 on Complex Needs and Dual Diagnosis and Rankin and Regan (2004). The “breadth” of needs
246 was represented by the number of various needs each beneficiary had. As a proxy measure of
247 veterans’ needs we used the data on their applications for different types of grants (e.g.,
248 Mobility Fixtures) from SSAFA. The grants were categorised in needs in accordance with the
249 dimensions suggested by the APPG (Table 1). The number of applications for different types
250 of support by beneficiaries over time was used to represent the “depth” of need.

251 *Insert Table 1 here*

252 *Estimating needs weights*

253 As needs tend to interact with and exacerbate each other (Rankin & Regan, 2004), some may
254 have a greater “importance” in terms of their likelihood to cause other problems and
255 subsequently lead to complex cases. Therefore, accounting for this inter-relationship between
256 needs is an important step in measuring needs complexity, and we applied the methodology to
257 estimate weights which derive from their correlations with each other. One way of estimating
258 weights based on their correlations with each other is to apply principal component analysis

259 (PCA). PCA has been used as a weighting method in the development of composite indicators
260 (Nardo et al., 2005). Composite indicators are widely used in different areas of research to
261 summarise information about multi-dimensional phenomena in a single number (Greco et al.,
262 2019). PCA calculates the weights of variables that contribute to the multi-dimensional
263 phenomena by capturing the multiplicity of related variables and the largest proportion of the
264 variance in the original variables (Nardo et al., 2005).

265 *Data analysis*

266 In the present study, PCA was applied to measure the weights of different needs (e.g., financial,
267 housing, physical health). Each need category incorporated various grants that SSAFA
268 beneficiaries applied for (Table 1). The need categories and classification of grants were based
269 on the nature of the problems for which the grants were given and the discussion with the
270 charity. The grant applications that belonged to the same need categories were aggregated
271 together. The needs were then aggregated by beneficiary service number and date of birth to
272 account for the complexity of needs within individuals and used as variables in PCA.

273 Prior to the analysis, the variables were normalised using Min-Max transformation.
274 Multicollinearity check was then performed using the Kaiser-Meyer-Olkin (KMO), which is
275 measure of sampling adequacy and the Bartlett's test of sphericity. PCA was used as the
276 extraction method and the components were rotated with the varimax technique, which
277 minimised the number of indicators with high loadings on each component. The factor loadings
278 of all the retained factors were considered, which enabled the preservation of the largest
279 proportion of the variation in the original dataset (Nicoletti et al., 2000).

280 The calculated weights and the number of grant applications over the study period were then
281 used as multipliers for corresponding needs, which were aggregated to calculate a total
282 complex need score (Equation 1).

283

284

$$CNS_i = \sum_{v=1}^v W_{PCA_n} SVI_{iv}$$

285

(1)

286 Where CNS_i is the complex needs score for an individual 'i', W_{PCA_n} is the weight of the CNS_i

287 sub indicator or need category obtained from the PCA, SVI_{iv} is a number of grant applications

288 for each need category 'n' for an individual 'i'.

289 Additionally, we measured how different needs and complexity of needs changed over time.

290 The trends of these changes were assessed using generalised linear models with complex needs

291 score CNS_i , total number of grants, and different grant categories being entered as dependent

292 variables. The time (measured in years) when grant application(s) from each beneficiary were

293 made was entered as a continuous predictor variable. The data with CNS_i as an outcome

294 variable were modelled using gamma distribution. For the count data on the number of grants

295 Poisson distribution with log link was assumed (Crawley, 2012).

296 **Results**

297 *Determining weights of complex needs*

298 The selected variables were normalised using Min-Max transformation (see Equation 2) before

299 proceeding with the next steps of the analysis.

300

301

$$TX_i = \frac{X_i - X_{iMin}}{X_{iMax} - X_{iMin}}$$

302

(2)

303 Where TX_i is the transformed value of the original variable X_i , X_{iMax} and X_{iMin} are the maximum
304 and minimum values of the original variable X_i respectively.

305 Before applying FA, multicollinearity check should be performed. The calculated KMO value
306 of 0.59 results of the KMO which is above the accepted cut-off point of 0.50 and the Barlett's
307 Sphere Test ($\lambda^2 = 12410.377$; $df = 78$; $p < 0.0001$) indicate the suitability of PCA.

308 To determine the total number of principal components to be extracted for the dataset in PCA,
309 the parallel analysis was implemented as a more accurate alternative (Franklin et al., 1996) to
310 the Kaiser's (1960) rule. The parallel analysis suggested that five components will be sufficient.
311 The components were then extracted using varimax rotation. Table 2 presents factor loadings
312 of the needs.

313 Following the Nicoletti et al., (2000) approach, the factor loadings were squared and scaled to
314 unity sum. The final weights were then calculated using the absolute values of the squared
315 loadings of the variables on each dimension (Table 2).

316 These weights were then put in the Equation 1 to calculate the complexity need score for each
317 individual. The distribution of scores for the SSAFA beneficiaries in 2014-2019 is presented
318 in the Figure 1. The higher score indicates a greater complexity of needs.

319 *Insert Figure 1 here*

320 To check the robustness, the uncertainty of the model was quantified by calculating the
321 confidence intervals for the aggregated complex need scores. The bootstrapping method was
322 utilised to calculate the confidence intervals for the CNSs Level BCa 95% (Table 3) (Endo et
323 al., 2015).

324 *Insert Table 3 here*

325 ***Measuring trends in complex needs over time***

326 Using estimated weights based on PCA (Table 2) and the Equation 1, medians, means and SD
327 for total complex need score were calculated for the SSAFA beneficiaries year on year between
328 2014 and 2019 (Table 4). Additionally, the average number of grant applications per
329 beneficiary and the total number of grants for each need category were measured (Table 4 &
330 5).

331 *Insert Table 4 here*

332 *Insert Table 5 here*

333 The results of GLM analyses for trends in changes of needs and their complexity are presented
334 in Table 6. The findings suggested a significant increase in complex needs between 2014 and
335 2019. A total number of grant applications also significantly increased as well as the grant
336 applications in the following categories: care, mental health, mobility, employment, housing,
337 household, essential food, and children needs. However, the number of applications for
338 financial and legal support significantly decreased over the study period.

339 *Insert Table 6 here*

340 **Discussion**

341 The study evaluated the complexity of needs in the SSAFA veteran beneficiaries from 2014 to
342 2019 year on year. The assessment of needs complexity incorporated the breadth of complex
343 cases, the depth of problems, and the interdependencies between needs.

344 The results suggest an increase in complexity of needs in the SSAFA beneficiaries over 2014-
345 2019. There were rising trends in certain needs including care, mental health, housing, and
346 employment. However, there was a drop in the number of grant applications from
347 financial/debt and legal support categories.

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348 The findings support the suggestions that there is a rising demand for complex needs support
349 from veteran charity organisations, which potentially indicate the increasing severity of health
350 and social problems that some service leavers might experience. The increasing number of
351 grant applications in certain need categories also provide interesting insights on the nature of
352 problems. Particularly, a growth in care and mobility needs might reflect the increasing average
353 age of the UK veterans similarly to the general population (Abdi et al., 2019). Care needs and
354 mobility support can be related to health status of veteran beneficiaries. Importantly, unlike
355 accessing services provided by the NHS, care support needs to be paid for by many UK
356 residents. Therefore, increasing number of health conditions that affect beneficiaries' quality
357 of life and independence would primarily result in growing applications for care and mobility
358 support.

359 An increasing trend in mental health needs could be associated with several factors. First,
360 evidence suggests that mental health needs of the UK veterans are in line with or even lower
361 than in the UK general population, with depression and anxiety being among the most prevalent
362 conditions (Samele, 2013). Recent research suggests a substantial increase in general
363 practitioner consultations for generalised anxiety and depression in the UK population over the
364 last two decades, and this increase coincided with the economic crisis of 2008 and introduction
365 of austerity policies (Slee et al., 2021). Economic and environmental factors such as
366 unemployment, housing problems, homelessness, and food poverty have well-documented
367 effects on mental health (Dooley, 2003; Singh et al., 2019; Tefft, 2011; Vostanis et al., 1998),
368 and notably there were increasing demands for both housing and employment support from the
369 beneficiaries as well. Furthermore, the recent report by Marmot (2020) demonstrated widening
370 inequalities in the UK over the last ten years, with an increase in the number of families with
371 children who do not reach the minimum income standard and significant growth in food
372 insecurity. Therefore, increasing demand for mental health support as well as rising housing,

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373 household, employment, children support needs, and food insecurity among veterans might
374 mirror the problems of the wider population.

375 Veterans also have some more unique mental health conditions such as PTSD (Xue et al., 2015)
376 and excessive alcohol consumption (Kiernan et al., 2018), and according to recent evidence
377 there were increasing rates of PTSD among service leavers deployed in Iraq and Afghanistan
378 (Stevellink et al., 2018) that can in turn exacerbate alcohol misuse. Additionally, reducing
379 stigmatisation and increasing knowledge about mental health might lead to an increased use of
380 the support services (Knaak et al., 2017). Therefore, a growing demand for mental health
381 support in veterans could be a result of increasing mental health awareness.

382 It is also worth noting that due to the nature and tendency of complex need to deepen and
383 exacerbate each other, it is possible that the increase in complexity and number of needs
384 observed in the study was partially attributed to the deterioration of needs of some long-term
385 SSAFA beneficiaries year on year. Job loss (Reeves et al., 2013), increase in poverty (Loopstra
386 et al., 2015) and deterioration of health (Katikireddi et al., 2012) observed in recent years tend
387 to significantly affect people who are already in more disadvantaged positions (Cookson et al.,
388 2016; Gasior, 2013). This might ultimately lead to deepening of health and social problems
389 and increases in complexity of needs.

390 Additionally, those with complex needs are usually hardest to identify and support, which
391 contributes to their need deterioration (Kuluski et al., 2017). Proper assessment of health
392 problems and risks including non-medical factors followed by a potentially broad range of
393 tailored services is warranted to meet complex needs (Turcotte et al., 2015; Vrijhoef & Thorlby,
394 2016). Comprehensive support requires financial and time resources, multidisciplinary staff,
395 appropriate training, and careful consideration of policy levers and organisational
396 arrangements (Vrijhoef & Thorlby, 2016).

397 ***Strengths, limitations, and recommendations for the future research***

398 To our knowledge, this is the first study that attempted to evaluate the complexity of health and
399 social needs within the UK veterans. Anecdotal evidence suggested that the demand of
400 complex needs support among UK veteran population had increased, yet the trends had not
401 been assessed.. The present study used a sample from one of the largest UK military charities,
402 which administers beneficiary funding on behalf of a further 110 military charities, over a five-
403 year period. Importantly, the assessment of complex needs incorporated a broader range of
404 needs including both medical and non-medical.

405 However, the study did not measure the veterans' needs directly but used grant applications for
406 various types of support as an indicator of needs. It is important to note that the demand for
407 support might not always directly indicate actual need but for example an increased awareness
408 of the available support. The study also relied on the data collected by charity workers, and the
409 accuracy of the collected information was not possible to verify. Furthermore, whilst this study
410 included non-medical needs in the evaluation, the data on potential predictors of complex needs
411 such as health behaviours (i.e., alcohol consumption) were not available.

412 As such, the future assessments of veterans' needs should consider using direct measurements
413 of needs and predictors, for example the questionnaires on health status, food insecurity, and
414 substance abuse. It is also recommended to expand the study population, for example to include
415 beneficiaries of other charities or different service receivers. Arguably, it remains a challenge
416 to identify UK veterans and explore their needs. Therefore, information from charity sector
417 remains a valuable source of information that allows tracking changes over time.

418 ***Implications***

419 The study demonstrated an increase in the UK veterans seeking support from military charities,
420 which might be due to worsening of the socioeconomic situation of the UK residents and/or

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421 veterans' specific factors. For example, increase in care support may follow general trend of
422 the ageing population (Abdi et al., 2019). Growth in mental health support applications can
423 mirror a wider population trend but also can be attributable to some service-specific issues such
424 as due to recent military campaigns. Additionally, the increased complexity in beneficiaries'
425 needs might indicate the lack of appropriate management over cases, for example if only more
426 superficial problems are addressed instead of the core underlying reasons (Turcotte et al.,
427 2015). Exploring the reasons for the observed trends is beyond the scope of this study, but the
428 findings warrant more investigations of the causes.

429 The study also described an assessment method for veterans' needs, which can be potentially
430 further employed to evaluate the distribution of complex needs among veterans, measure
431 changes in complexity over time, and identify geographic regions with more complex cases.
432 This can inform and improve the work of the service providers, charities, and the governments.
433 Particularly, the assessment can be used as a screening method to understand which individuals
434 are at higher risk of complex needs and require more comprehensive support.

435 **Conclusions**

436 The findings of the present research suggested an increase in complex needs among SSAFA
437 beneficiaries between 2014 and 2019. There was an increase in the grant applications for care,
438 housing, employment, and mental health support. The findings warrant a further investigation
439 of the need complexity trends in the UK veterans and the reasons behind these trends. The
440 assessment of complex needs is crucial for providing adequate support to the beneficiaries and
441 should be employed widely to identify individuals at risk.

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442 Table 1

443 *Grants categorisation by needs*

Grants	Need category	
Care Charges (care at home)	Care	
OT Charges		
Local Authority Social Services		
Carephone		
Maintenance Grant (all other)		
Maintenance Grant (care home)		
Maintenance Grant (all other)		
Maintenance Grant (care home)		
Respite Breaks (W+B)		
Care Homes		
Handy Van & Carephone		
Children needs		Children needs
Debt (bankruptcy fees)		
Debt (non-priority)	Financial/Debt	
Debt (priority)		
Housing (repairs and maintenance) - Grant		
Housing (repairs and maintenance) – Loan		
Housing (gardening)		
Immigration or Visa Fees		
Travel Costs (clients)		
Family & Adventure Breaks		
Insurance		
Funeral Costs		
Deposit Guarantee	Essential Clothing	
Benefits & Tax Credits		
Benefits & Money Advice		
Deposit Guarantee		
Essential Clothing		
Essential Food and Groceries		Essential Food
Foodbank		
General Needs (discretionary)		General Needs
Household Goods (brown)		
Household Goods (white)		Household
Essential Household Appliances		
Housing (damages and arrears)	Housing	
Housing (deposits and charges)		
Housing (removal expenses)		
Housing (rent)		
House purchases		
Rent Review (RAFBF only)		
Local Authority Housing		
Medical (dental charges)		
Medical (optician charges)		
Medical (other)		
National Health Service	Mobility	
Mobility Fixtures		
Mobility Home Adaptation		

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Mobility/EPV (storage and access)	
Mobility/EPV (vehicles)	
Motability Scheme Deposit	
Stairlifts (purchase)	
Stairlifts (rental charges)	
Riser/Recliner & Electric Beds	
Counselling	Mental Health
Combat Stress	
Legal Fees	Legal
Citizens Advice	
Training Costs - Fees	Education/Employment
Training Costs - Materials	
Traning Costs – Materials	
Job Centre Plus	

444

445 Table 2

446 *Factor loadings of complex needs based on principal components*

	Factor loading					Squared factor loading (scaled to unity sum)				
	1	2	3	4	5	1	2	3	4	5
Care	.12	.69	-0.04	-.01	.04	.0097	.3465	.0014	.0001	.0015
Children Needs	.47	.03	0.02	.18	.29	.1483	.0007	.0003	0.0296	.0779
Mental Health Essential	-.04	-.08	0.04	.76	.08	.0011	.0047	.0014	0.5284	.0059
Clothing	.61	-.05	-0.16	.06	.2	.2497	.0018	.0220	0.0033	.0370
Essential Food	.66	-.09	0.15	-.08	-.12	.2923	.0059	.0194	0.0059	.0133
House Rent	.1	-.38	0.49	-.12	.1	.0067	.1051	.2065	0.0132	.0093
Household	.13	-.4	-0.26	-.05	.56	.0113	.1165	.0582	0.0023	.2903
General Needs	.61	.04	0.11	-.05	-.31	.2497	.0012	.0104	0.0023	.0890
Employment/ Education	.1	-.27	-0.26	.1	-.7	.0067	.0531	.0582	0.0091	.4537
Medical	.07	.09	0.04	.66	-.14	.0033	.0059	.0014	0.3985	.0181
Mobility	-.15	.7	-0.03	0	.03	.0151	.3566	.0008	0.0000	.0008
Legal	-.03	-.02	0.45	.09	.03	.0006	.0003	.1742	0.0074	.0008
Financial/Debt	.09	.05	0.72	0	-.05	.0054	.0018	.4459	0.0000	.0023
Explained Variance	1.49	1.37	1.16	1.09	1.08					
Explained Total	.24	.22	.19	.18	.17					

447 *Note.* Estimated weights for the needs are in bold.

448 Table 3

449 *Bootstrap Statistics*

Level	BCa*
95 %	(72.04 73.08)

450 *Note.* Bias-corrected and accelerated bootstrap interval.

451 Table 4

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452 *Complex needs by beneficiaries*

Year	Mean (SD) for CNS	Median for CNS	Grants per beneficiary	Beneficiaries	Total N of grants
2014	.62 (.37)	.5	1.91	6,333	12,125
2015	.64 (.39)	.54	1.95	6,612	12,924
2016	.63 (.38)	.54	1.94	6,661	12,940
2017	.63 (.38)	.58	1.96	6,626	12,970
2018	.67 (.41)	.58	2.06	6,398	13,204
2019	.67 (.41)	.58	2.08	6,400	13,322

453

454 Table 5

455 *Total number of grants by category*

	2014	2015	2016	2017	2018	2019
Financial/Debt	2,553	2,532	2,399	2,343	2,416	2,347
Care	966	1,233	1,309	1,367	1,400	1,503
Children Needs	134	169	248	237	268	247
Mental Health	7	8	19	17	27	34
Essential clothing	317	342	316	308	284	308
Essential food	463	436	440	430	458	532
Housing	1,467	1,572	1,599	1,515	1,683	1,656
Household	3,143	3,276	3,252	3,489	3,337	3,290
General Needs	1,279	1,255	1,273	1,183	1,275	1,242
Medical	134	151	142	141	149	134
Mobility	1,252	1,544	1,470	1,482	1,403	1,533
Legal	50	53	41	35	28	26
Employment	408	406	441	414	462	473

456 *Note.* Significant changes in bold.

457 Table 6

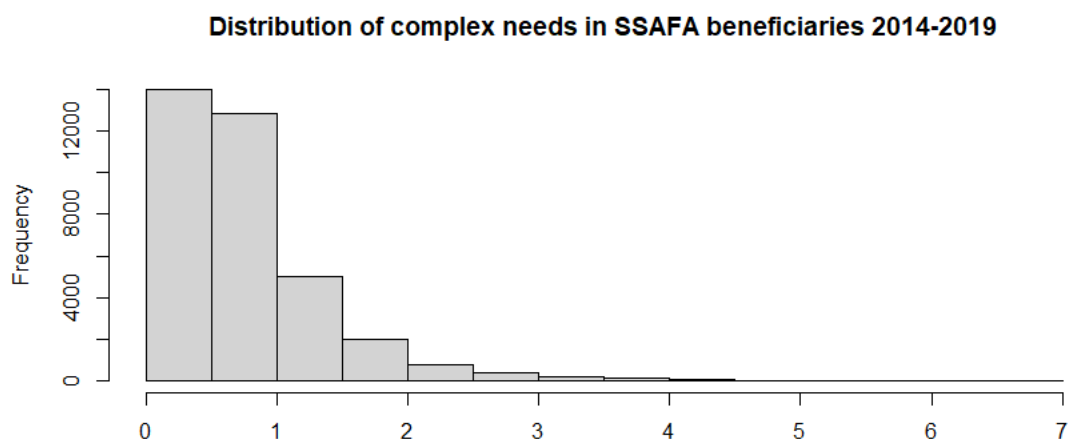
458 *Results of the generalised linear modelling predicting changes in complex needs estimates, total number*
 459 *of grants, and grant categories over years between 2014 and 2019*

Outcome		<i>B</i>	<i>SE</i>	<i>t</i> value
Complex Needs Grants	Intercept	-30.992***	3.655	-8.479
	Time	.015***	.002	8.356
Care	Intercept	-33.425***	3.653	-9.149
	Time	.017***	.002	9.337
Mental Health	Intercept	-153.4***	13.63	-11.26
	Time	.075***	.007	11.14
Essential Clothing	Intercept	-657.439***	123.075	-5.342
	Time	.323***	.061	5.295
Essential Food	Intercept	33.087	27.260	1.214
	Time	-.018	.013	.185
Mobility	Intercept	-45.438**	15.447	-2.942
	Time	.022**	.008	2.844
Employment	Intercept	-70.898**	24.962	-2.840
	Time	.034**	.012	2.732

Essential	Intercept	-59.320**	22.368	-2.652
Food	Time	.028*	.011	2.533
Financial	Intercept	27.804**	9.365	2.969
	Time	-.014**	.005	-3.074
Children	Intercept	-240.931***	33.588	-7.173
Needs	Time	.118***	.017	7.072
Housing	Intercept	-51.115***	14.240	-3.59
	Time	.025***	.007	3.49
Household	Intercept	-26.008**	9.170	-2.836
	Time	.013**	.005	2.762
General	Intercept	3.091	12.589	.246
Needs	Time	-.002	.006	-.377
Medical	Intercept	-2.774	42.710	-.065
	Time	-.001	.021	-.025
Legal	Intercept	298.594***	79.514	3.755
	Time	-.151***	.039	-3.819

460 Note. * = $p < .05$, ** = $p < .01$, *** = $p < .001$; significant changes in bold.

461 Figure 1.



462

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