1   **Measuring the digital divide among people with Severe Mental**

2   **Ill Health using the Essential Digital Skills framework.**

4   Word count

5   Abstract: 286 Text: 3,952

6   **<u>Abstract</u>**

7   **Aims:** Amidst the vast digitalisation of health and other services during the pandemic,

8   people with no digital skills are at risk for digital exclusion. This risk might not abide by the

9   end of the pandemic. This paper seeks to understand whether people with severe mental

10   ill health (SMI) have the necessary digital skills to adapt to these changes and avoid digital

11   exclusion.

12   **Methods:** 249 adults with SMI across England completed a survey online or offline. They

13   provided information on their digital skills based on the Essential Digital Skills (EDS)

14   framework, sociodemographic information, and digital access. This is the first time the

15   EDS is benchmarked in people with SMI.

16   **Results:** 42.2% had no Foundation Skills and 46.2% lacked skills for daily life (lacking

17   Foundation or Life Skills). 23.0% of those working lacked skills for professional life (lacking

18   Foundation or Work Skills). The most commonly missing skills were handling passwords

19   and using the device settings (Foundation Skills) and online problem solving (Skills for

20   Life). People were interested in learning more about approximately half of the skills they

21   did not have. People were more likely to lack Foundation Skills if they were older, not in

22   employment, had a psychosis-spectrum disorder, or had no Internet access at home.

23 **Conclusion:** A significant portion of people with SMI lacked Foundation Skills in this

24 objective and benchmarked survey. This points to a high risk for digital exclusion and the

25 need for focused policy and tailored health sector support, to ensure people retain access

26 to key services and develop digital skills and confidence. To our knowledge this is the first

27 time this has been described using the Essential Digital Skills (EDS) framework. Services,

28 including the NHS, need to be aware and mitigate the risks.

29 **<u>Introduction</u>**

30 During the COVID-19 pandemic, restrictions have been applied to movement and social

31 contact, to contain the spread of the virus [1,2]. Many daily activities (e.g. shopping,

32 entertainment, and contacting friends and family) shifted from face-to-face to remote

33 delivery, often via the Internet. The UK National Health Service (NHS) experienced a

34 similar shift, both in mental [3-5] and general health care [6-8].

35 These changes increased the demand for digital skills and led to more people using the

36 Internet for longer, leading to estimations that in one year the UK made five years' worth

37 of progress in digital engagement [9]. However, this situation also highlighted the pre-

38 existing digital divide (i.e. inequalities in digital access and engagement in the population)

39 and the health inequalities that may derive from it [10]. People lacking digital skills might

40 experience negative outcomes in relation to health, wellbeing, and social support, as they

41 might struggle to access health services, Government and local authority services, and

42 support network activities that are online [11].

43 It remains unknown whether people with severe mental ill health (SMI; e.g., a diagnosis of

44 Bipolar or Psychosis-spectrum disorder) have the digital skills to adapt to this new

45 digitalisation of services [12]. Finding the Internet too difficult or too complex to understand

46 have been commonly reported among people with SMI as a barrier to use the Internet,

47   both before [13-15] and during the pandemic [16]. It is important to gain a deeper

48   understanding of this issue, as digital exclusion in people with SMI might widen existing

49   health and social inequalities. For example, people with SMI are at greater risk for long-

50   term physical health conditions [17] and at greater need for regular health care appointment

51   to monitor their conditions (e.g. the annual physical health check, [18]). They might also be

52   more likely to experience feelings of loneliness [19]. Lack of skills to use the Internet might

53   obstruct access to important sources of support (e.g., video-calls with health professionals

54   or friends and family, accessing health and community related information online, and

55   participating in online community activities). It is important to note that the risk of

56   exclusion due to lack of skill will probably not abate at the end of the pandemic,

57   considering that the pandemic accelerated plans for digital healthcare to become a

58   mainstream option in the NHS [20]

59   The Essential Digital Skills (EDS) framework which has been adopted by the UK

60   Department of Education defines the skills that people would need to have to fully benefit

61   from using the Internet and digital devices[9], and sets the standards for all formal digital

62   skills training programs in the country. The framework includes three domains:

63   Foundation Skills, Skills for Life and Skills for Work. The Foundation Skills domain concerns

64   basic pre-requisite knowledge (e.g., knowing how to use the settings in a device, or how to

65   connect to a secure Wi-Fi network), while the other two domains concern five skill types in

66   everyday life and in work environments, respectively: a) Being safe, legal and confident

67   online, b) Communicating, c) Problem solving, d) Transacting and e) Handling information

68   and content. Although EDS is mapped with the general UK population annually through

69   the Lloyds Bank UK Consumer Digital Index, it has never been benchmarked in people with

70   SMI specifically.

71   This paper reports on the Skills and Proficiency in Digital Essential Requirements study

72   (SPIDER) which assesses the digital skills of a sample of people with SMI amidst the COVID-

73   19 pandemic, based on the EDS framework. The primary objectives were to understand

74   the extent to which people with SMI have essential digital skills and how they compare to

75   the general population, as well as to identify the areas of greatest deficit in skills and their

76   association with key sociodemographic and health factors.

77

78   **Methods**

79   **Design and Procedures**

80   The SPIDER study recruited participants from a clinical cohort that participated in the

81   Optimising Wellbeing in Self Isolation (OWLS) study. The cohort included people that were

82   18 years old or over and had a documented diagnosis of schizophrenia or

83   delusional/psychotic illness (ICD 10 F20.X & F22.X or DSM equivalent) or bipolar disorder

84   (ICD F31.X or DSM equivalent). The methods of recruitment to the OWLS study are

85   outlined in the supplementary material (S1). To be eligible for SPIDER, participants had to

86   have consented during OWLS to be contacted about future surveys. Participants were

87   recruited to SPIDER from January 2021 to March 2021.

88   Interested participants were provided with an information sheet (read over the phone, or

89   send by email, text message, or post) and those consenting to participate were given the

90   option to complete the survey online via a link, or offline (over the phone with a

91   researcher or in a hard copy survey sent by post.) Offline options were provided to ensure

92   inclusion of people that were not digitally engaged.

93

94 **Measures**

95 All variables and analysis reported here have been pre-registered [21] in Open Science

96 Framework (OSF).

97 *Essential Digital Skills*

98 Participants were asked whether they could complete a series of tasks related with using

99 the Internet and digital devices, on their own if they ever need to (responses were yes or

100 no). For those answering "no", they were asked if they would be interested in learning

101 more about them (yes/no). The tasks were derived from the Lloyds UK Consumer Digital

102 Index 2020 [22] and the Scottish Council for Voluntary Organisations (SCVO) Essential Digital

103 Skills Toolkit [23]. The complete list of tasks used in SPIDER is available at

104 https://mfr.osf.io/render?url=https://osf.io/keumd/?direct%26mode=render%26action=d

105 ownload%26mode=render.

106

107 Participants were considered as having or not having a given skills domain according to

108 the EDS framework [22]. For Foundation Skills, participants would need to report they could

109 complete all task from a list of eights basic tasks (e.g., using a device setting to make its

110 use easier, or connecting to a secure and safe Wi-Fi network).

111

112 For Skills for Life, we used a list of 30 tasks, grouped in five skill-types: Communicating

113 (e.g., I can set up an email account), Handling information (e.g., I can use search engines to

114 find information and make use of search terms to generate better results), Transacting

115 (e.g., I can safely buy things online), Problem solving (e.g., I can use the Internet to find

116 how to do something online), and Being safe and legal online (I am careful with what I

117 share online as I realise that the information I put online stays there and could be

118   accessed in the future by other people). To be considered as having Skills for Life,

119   participants should be able to complete at least one task from each skill-type. Only

120   participants who had Foundation Skills were assessed for Skills for Life.

121

122   For Skills for Work, we used a list of 14 tasks, grouped in the same skill-types as in Skills for

123   Life. The difference was that the tasks in each skill-type were more relevant to a working

124   environment (e.g., I can set up and manage an account on a professional online

125   network/community, or I can organise, store and share work-related information on

126   different computers, tablets or phones). To be considered as having Skills for Work

127   participants should be able to complete at least one task in each skill-type. Only

128   participants who had Skills for Life and were in employment were assessed for Skills for

129   Work.

130   *Digital access*

131   In the initial OWLS survey, participants were asked if they owned a digital device

132   (smartphones, computers, laptops or tablets - yes/no), and whether they could access the

133   Internet from home (yes/no). In the SPIDER study we also asked whether people have

134   used the Internet in the last 12 months (yes a lot, yes a little, or not at all) and if in the last

135   12 months they ever experienced not having enough data available to access the Internet

136   as much as they would need (data poverty - yes/no).

137   *Sociodemographic and health variables*

138   Using data that were available in the initial OWLS dataset, we derived participants' age

139   (grouped as 18-30, 31-45, 46-65, and 66+), gender (female, male, or transgender),

140   ethnicity (grouped as White background or Other than White), employment (grouped as

141   being in paid employment or not) and care setting (grouped as primary or secondary

142   mental health care). We also derived participants' socioeconomic deprivation index[24]

143   according to their area of residency using their post-codes. Index scores range from 1 to

144   10 with higher scores indicating less deprivation and were grouped in very high

145   deprivation (1-2), high deprivation (3-4), medium deprivation (5-6), low deprivation (7-8)

146   and very low deprivation (9-10).

147   Participants' health records were inspected for consenting participants to obtain their SMI

148   diagnosis, which was then categorised into psychosis spectrum disorders (including

149   schizophrenia, schizoaffective or any other psychotic disorder), bipolar disorder, or other

150   SMI (including participants who were eligible for OWLS on the basis of a psychosis or

151   bipolar disorder diagnosis which was later changed in their health records to something

152   different, as for example severe depressive disorder with psychotic features). For those

153   not providing consent to access their records or insufficient identifiable information (e.g.,

154   name and date of birth), diagnosis was coded as "not recorded". The "not recorded"

155   category is not reported in our pre-registered plan but was added to retain in the analysis

156   the 48 participants falling in this group.

157   **Analysis**

158   Descriptive statistics are provided for each skills domain (Foundation, Skills for Life, or

159   Skills for Work). For participants lacking a skills domain, we present descriptive statistics

160   for the most commonly missing skill types, and for interest in learning more about these

161   skill types.

162   Association of sociodemographic and health, and digital access variables (independent

163   variables) with having Foundation Skills were examined with a univariable binary logistic

164   regression model before added into a hierarchical multivariable binary logistic regression.

165   In the multivariable model all independent variables were inserted at once, with

166   sociodemographic and health variables inserted in the first block and digital access

167   variables in the second block. Statistical significance was set a p < .05 and analysis was

168   conducted with IBM SPSS 26.

169   Some of the pre-registered analysis was not possible due to very low counts in the sample.

170   Among people with Foundation Skills, only nine people reported having no Skills for Life

171   (93.0%) and four working people reported having no Skills for Work (92.0%). As a result,

172   we do not present any descriptive statistics for missing skill domains and interest in

173   learning more among those who reported having no Skills for Work. We also did not

174   explore which factors are associated with having Skills for Life or Work.

175   To test for response bias, we examined whether participants who accepted or declined

176   our invitation to the SPIDER study differed in age, gender, ethnicity, socioeconomic

177   deprivation, care setting and diagnosis. Differences were examined with a χ^2 test (or the

178   likelihood ratio if test assumptions were violated), apart for age where we used an

179   independent samples t-test instead.

180   **Results**

181   **Sample**

182   We invited 315 adults with SMI to the SPIDER study and 249 (67.8%) participated. Those

183   who accepted or declined the invitation did not differ in terms of any of the examined

184   sociodemographic characteristics (Age: t(365) = -0.45, p = .650; Gender: Likelihood Ratio

185   (2) = 4.77, p = .092; Ethnicity: χ^2 (1) = 1.44, p = .230; Deprivation: $\chi^2(4)$ = 6.47, p = .167;

186   Care setting: $\chi^2(1)$ = 0.63, p = .429; Diagnosis: $\chi^2(3)$ = 6.07, p = .108).

187   Table 1 provides the sample characteristics. Participants had a mean age of 51.7 years old

188   (range: 21-84) and the sample included 51.4% men, 46.6% women, 2% transgender, 15.6%

189   people from other than White ethnic backgrounds, and 44.6% resided in high/very high

190   deprivation areas. The primary diagnosis was psychosis-spectrum disorder (48.2%). The

191   survey was completed online by 93 (37.3%) participants and over the phone or via the

192   post by 156 (62.7%). Regarding digital access, 21.3% of the sample were non-users of the

193   Internet, 12.4% did not own a digital device, 15.3% had no access to the Internet at home,

194   and 11.2% had experienced data poverty.

195   **Table 1. Sample characteristics (N = 249)**

Variable (valid N)	N (%)
Age (249)	
18-30	28 (11.2)
31-45	64 (25.7)
46-65	100 (40.2)
66+	57 (22.9)
Gender (249)	
Female	116 (46.6)
Male	128 (51.4)
Transgender	5 (2.0)
Ethnicity (249)	
Asian	14 (5.6)
Black	4 (1.6)
Mixed	11 (4.4)
White British	200 (80.3)
White (other)	10 (4.0)
Other	10 (4.0)
Socioeconomic Deprivation (241)	
Very high	60 (24.1)
High	51 (20.5)
Medium	49 (19.7)
Low	43 (17.3)
Very low	38 (15.3)
In paid employed (248)	
Yes	61 (24.5)
No	187 (75.1)
Diagnosis (249)	
Bipolar disorder	83 (33.3)
Psychosis spectrum disorder	120 (48.2)

Other SMI	16 (6.4)
Not recorded	30 (12.0)
Care setting (247)	
Primary care	95 (38.2)
Secondary care	152 (61.0)
Using the Internet	
A lot	137 (55.0)
Just a little	58 (23.3)
Not at all	53 (21.3)
Owning any digital device (245)	
Yes	214 (85.9)
No	31 (12.4)
Access to the Internet at home (246)	
Yes	208 (83.5)
No	38 (15.3)
Ever felt not having enough data? (248)	
Yes	28 (11.2)
No	177 (71.1)
N/A (Not using the Internet)	43 (17.3)

196

Essential Digital Skills

Table 2 presents the EDS framework descriptive results. Out of the total sample (N = 249),
105 participants (42.2%) reported no Foundation Skills. They were unable to complete on
average 3.64 (±2.50) tasks out of eight in total but were interested in learning more about
on average 2.22 (±2.80) of them. The tasks that people who reported no Foundation Skills
were most often unable to perform were updating and changing passwords (68.6%) and
using the device settings to improve its usability (e.g. change font sizes, screen brightness,
screen contrasts, etc.) (61.9%). The least frequent skill deficit was not knowing how to
turn on a device (17.1%) (Figure 1).

208 **Table 2. Essential Digital Skills Framework**

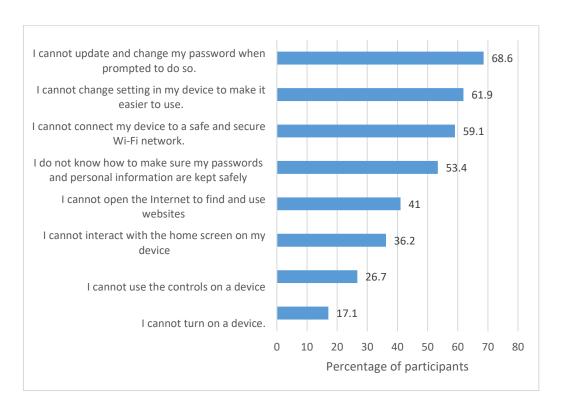|	N (%)
Skills Domains	
Foundation Skills [a]	
Yes	142 (57.0)
No	105 (42.2)
Skills for Life [b]	
Yes	132 (93.0)
No	9 (6.3)
Skills for Work [c]	
Yes	46 (92.0)
No	4 (8.0)
Overall	
Essential skills for daily life [a]	
Yes (having Foundation AND Life Skills)	132 (53.4)
No (Lacking Foundation OR Life Skills)	114 (46.2)
Essential skills for professional life [d]	
Yes (Having Foundation AND Work Skills)	46 (75.4)
No (Lacking Foundation OR Work Skills)	14 (23.0)

209 a. Out of total sample N = 249. b. Out of those having Foundation Skills, n = 142. c. Out of those

210 being in paid employment and having Skills for Life, n = 50. d. Out of those being in paid

211 employment, n = 61.

212

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219 **Figure 1. Prevalence of skills deficiency among participants with no Foundation Skills (N**

220 **= 105)**

I cannot update and change my password when prompted to do so. — 68.6
I cannot change setting in my device to make it easier to use. — 61.9
I cannot connect my device to a safe and secure Wi-Fi network. — 59.1
I do not know how to make sure my passwords and personal information are kept safely — 53.4
I cannot open the Internet to find and use websites — 41
I cannot interact with the home screen on my device — 36.2
I cannot use the controls on a device — 26.7
I cannot turn on a device. — 17.1

Percentage of participants

221

222 Among those who reported having Foundation Skills (N = 142, 57.0%), almost everyone (n

223 = 132, 93.0%) reported having Skills for Life. Among the few people that reported not

224 having Skills for Life (n = 9), five (55.6%) reported having no Problem Solving skills and four

225 (44.4%) no Transacting Skills. No deficiency was reported in Communication, Handling

226 Information, and Being safe and legal online (0% were missing these skill-types).

227 Participants that reported not having Skills for Life were unable to complete on average

228 14.6 (±6.5) tasks out of 30 overall but were interested in learning more about 7.7 (±7.4) on

229 average. Among those who reported having Skills for Life and were in paid employment (N

230 = 50), almost everyone (n = 46, 92.0%) reported having Skills for Work.

231   Overall, 114 participants from the total sample (45.7%) did not have the essential digital

232   skills for daily life, lacking either Foundation Skills or Skills for Life. Among the working

233   population in our sample (N = 61), 14 participants (23.0%) did not have the essential

234   digital skills for professional life, lacking either Foundation Skills, Skills for Life, or Skills for

235   Work.

236   **Sociodemographic associations with Foundation Skills.**

237   A multivariable binary logistic regression model (Table 3) demonstrated that reporting

238   having Foundation Skills was eight and four times more likely among the 18-30 and 31-45

239   age groups respectively (compared to 66+), three times more likely among those in paid

240   employment, and four times more likely in those with a bipolar disorder diagnosis

241   (compared to psychosis-spectrum). It was also found that participants with no Internet

242   access at home were seven times less likely to report they had Foundation Skills.

243   **Table 3. Association of having Foundation Skills with sociodemographic and digital**

244   **access variables.**

Variables (Valid N)	Have Foundation Skills	Univariable Model		Multivariable Model (N = 229)	
	N (%)	OR	95% CI	AdjOR	95% CI
Age (247)					
18-30	24 (85.7%)	10.29**	3.14 – 33.72	7.56*	1.75 – 32.66
31-45	45 (70.3%)	4.06**	1.90 – 8.68	3.60*	1.22 – 10.57
46-65	52 (53.1%)	1.94	0.99 – 3.78	1.93	0.75 – 4.97
66+	21 (36.8%)	1		1	
Gender (242)					
Male	74 (58.3%)	1.07	0.65 – 1.79	1.78	0.89 – 3.53
Female	65 (56.5%)	1		1	
Ethnicity (247)					
Other than White	22 (56.4%)	1.05	0.53 – 2.10	1.05	0.43 – 2.60
White	120 (57.7%)	1		1	

Socioeconomic deprivation (239)					
Very high	29 (49.2%)	0.63	0.28 – 1.44	0.65	0.22 – 1.97
High	26 (52.0%)	0.71	0.30 – 1.66	0.44	0.14 – 1.36
Medium	34 (69.4%)	1.48	0.61 – 3.60	1.37	0.44 – 4.23
Low	24 (55.8%)	0.82	0.34 – 2.00	0.56	0.18 – 1.73
Very Low	23 (60.5%)	1		1	
In paid employment (247)					
Yes	50 (83.3%)	5.16**	2.47 – 10.79	2.67*	1.07 – 6.66
No	92 (49.2%)	1		1	
Diagnosis (247)					
Not recorded	19 (63.3%)	1.94	0.85 – 4.44	1.40	0.48 – 4.07
Other SMI	9 (60.0%)	1.69	0.57 – 5.04	1.43	0.40 – 5.17
Bipolar	58 (69.9%)	2.61*	1.45 – 4.71	3.67*	1.56 – 8.64
Psychosis spectrum	56 (47.1%)	1		1	
Care setting (245)					
Secondary care	86 (57%)	0.94	0.56 – 1.58	1.15	0.55 – 2.38
Primary care	55 (58.5%)	1		1	
Device ownership (243)					
No	2 (6.5%)	0.04**	0.01 – 0.16	0.26	0.04 – 1.70
Yes	138 (65.1)	1		1	
Internet access at home (244)					
No	3 (7.9%)	0.04**	0.01 – 0.15	0.14*	0.03 – 0.70
Yes	137 (66.5%)	1		1	

245 * p < .05, ** p < .001

246 **Discussion**

247 We assessed digital skills in a sample of people with SMI using the Essential Digital Skills

248 framework. To our knowledge this is the first time this benchmark measure of knowledge

249 and skills has been applied in a sample of people who use mental health services. It is

250 concerning that 42% (n = 105) had no Foundation Skills, lacking pre-requisite knowledge to

251 interact with digital technologies and benefit from its use. The most problematic areas

252 were handling passwords and using device setting to improve usability. Older people,

253 those not currently in work, those with a psychosis-spectrum disorder, and those with no

254 Internet access at home were at greater risk for lacking Foundation Skills. More positively,

255 among people who had Foundation skills, almost everyone had Skills for Life and Skills for

256 Work.

257 Our results reveal a digital divide between our SMI sample and the general population.

258 People with SMI in this study where twice as likely to experience a deficit in either

259 Foundation or Life Skills (n = 114, 46.2%) compared to the general population (22% [22]).

260 During the pandemic, this might contribute to inequalities of access to digital services,

261 including but not limited to healthcare services, due to lack of familiarity or confidence

262 with technology [25]. More worryingly, these inequalities might remain beyond the

263 pandemic [26], given that transition to digital healthcare might become a more mainstream

264 option [20, 27]. Combined with the fact that most people in our study owned a digital device

265 (n = 214, 85.9%), this implies that access to digital devices on its own many not mitigate

266 for digital exclusion and that many people may use their devices only for very basic things.

267 This suggests that digital skills training programs are needed, that will be tailored to the

268 needs of people with SMI, to help close this gap (see for example Recovery Colleges at

269 https://imroc.org/resources/1-recovery-colleges/).

270 It was interesting that fewer of the working people in this study experienced a deficit in

271 skills necessary for work, lacking either Foundation or Work Skills (n = 14, 23%), compared

272 to the general population (52% [22]). This could be a sampling issue in our study and might

273 not be representative of the total SMI population. However, it may also be explained by

274 the fact that employment is less common in people with SMI, [28-30], as shown by the 75.1%

275 (n = 187) rate of unemployment in this study, and has been associated with younger age

276   and higher educational attainment [29, 31, 32], as well as less severe SMI symptoms [29, 32]. All of

277   these might help people to acquire good digital skills and this may be directly linked with

278   this study's finding that employed participants were more likely to have Foundation Skills

279   compared to those not in employment. Future studies should explore Skills for Work

280   among people with SMI who are unemployed, as an indicative factor of their employment

281   prospects and potential learning needs. Researchers should also seek to understand the

282   contribution of digital skills deficits in the high unemployment rates in people with SMI

283   (e.g., most jobs advertised online), especially in relation to other employment barriers

284   related to SMI (e.g. ill health or stigma).

285   Looking further into skills deficits, we found that people with no Foundation Skills

286   struggled the most with handling passwords and using device settings. As such, important

287   as it is to providing people with digital devices to tackle access issues (as happened a lot

288   during the pandemic; [33]), this should be combined with training and support for using

289   these devices. Moreover, creating and maintaining a password is imperative to access

290   several online services (e.g. GP services, streaming platforms, online banking and

291   Government online services, to name a few), so that deficits in that area may adversely

292   affect not only people's confidence in using these services but also to the security of their

293   information. As these skills seem to be often missing in the general population as well [22], it

294   is important for future studies to explore the specific barriers the SMI population might

295   face, and how to address these from a person-centred design perspective. Among the few

296   people who had Foundation Skills but no Skills for Life, the greatest area of deficit was

297   Problem Solving skills. Evidence suggests that lack of problem solving skills in general, not

298   just digital, is a common cognitive deficit found in people with schizophrenia [34].

299   We also found that people with no Foundation Skills were interested in learning more

300   about half of the tasks they could not perform. Given that lack of interest is a commonly

301 reported barrier to digital engagement [9], this suggests that people with SMI might have

302 the motivation to learn new skills if appropriate support becomes available. Efforts to

303 reduce the digital divide in the SMI population could include tailored training in digital

304 skills along with confidence-building measures and measures to increase the motivation to

305 address digital exclusion[35]. Reducing the digital divide has the potential to reduce health

306 inequalities. Future studies should seek to consult with those with lived experience to

307 explore motivation in beginning and sustaining digital skills training, preference for

308 training mode and setting, as well as barriers to engaging with web-based resources

309 specifically related to SMI conditions (e.g. fluctuating levels of wellness, low energy and

310 motivation, paranoid thoughts, suspiciousness and concerns about privacy and difficulty

311 processing information; [36]), in order to develop accessible skills training programs tailored

312 to the needs of this population

313 Older people in this study were less likely to have Foundation Skills, as also found in the

314 general population [22]. This is unsurprising, as age is traditionally associated with less digital

315 engagement in SMI [14-16] and general population [37, 38] alike. People with psychosis-spectrum

316 disorders were at greater risk for not having Foundation Skills compared to those with

317 bipolar disorder, after adjusting for people's age or employment status. This supports our

318 previous findings that during the pandemic restrictions people with bipolar disorder were

319 more likely to use the Internet a lot for their daily activities compared to people with

320 psychosis [16]. Cognitive and occupational disfunctions that are common in schizophrenia

321 [39]might not facilitate development of digital skills. It might also be that specific SMI-

322 related barriers to digital engagement (e.g. reduced concentration, hallucinations, or

323 paranoid ideas; [13, 40]) are more common in people with psychosis than bipolar disorder.

324 Digital exclusion is becoming increasingly concentrated in vulnerable populations

325 (including older people with SMI who are likely to be heavier users of healthcare services)

326   leading to worse health outcomes through both direct and indirect routes[41]. The

327   increasing use of digital technology in the delivery of health services will directly affect

328   those who are digitally excluded as they will not be able to access services which could

329   benefit them. This could range from accessing appointment booking systems to health

330   promoting services or applications, along with accessing video appointments. Given the

331   current drive towards comprehensive digital healthcare within in the NHS [20], the

332   importance of digital inclusion for health and social care should, and to some extent is,

333   being acknowledged[42]. The particular needs and barriers experienced by people with SMI

334   should inform this wider policy context.

335

336   The SPIDER study is not free of limitations. The sample size may have been underpowered

337   for the estimate of the logistic regression, but this analysis was exploratory. We used a

338   non-random sample that might lead to respondent biases and limited generalisability,

339   although the use of a sampling framework increases our confidence that we were

340   recruiting across a good spread of the SMI population. Skills were self-evaluated by

341   participants rather than completing objective tests. Self-evaluation might be susceptible

342   to other fluctuating factors (e.g. current mood), as well as response and social desirability

343   bias (e.g. n = 134, 53.8% of the sample completed the survey over the phone with a

344   researcher). It should be noted though that organising objective tests, especially in the

345   context of the pandemic restrictions, would present several practical challenges.

346   Participants were also assessed on the basis of pre-determined tasks, rather than

347   personalised tasks related to the specific activities they want/need to complete in their

348   everyday lives. However, that would affect the comparability of results across different

349   populations and existing datasets. Regarding digital access, we did not examine whether

350   the devices that people owned were current enough or had to be shared with other

351   members of the household, as it often happened during the pandemic [43]. Despite the high

352   rates of device ownership in our sample, real unobstructed access might be undermined

353   by obsolete technologies or multi-usership. Lastly, in this study we examined generic

354   digital skills rather than skills and factors that may be more pertinent to this population

355   and their use of digital health services (e.g. e- health literacy, online help-seeking and

356   service use), which should be considered in future research.

357   **Conclusion**

358   This study highlighted deficits in digital skills in the SMI population that are worse than in

359   the general population. This might suggest that an already socially disadvantaged

360   population are at risk for further exclusions due to digital skills deficits, as many health

361   services and social connections have moved to digital platforms during 2020 / 2021.

362   Importantly and worryingly this includes vital health services many of which might

363   continue to operate digitally into the future. Services including the NHS need to be aware

364   and have a responsibility to actively and immediately accommodate for those with SMI

365   who would prefer face-to-face rather than online contact, and whose health will likely

366   suffer through the digital divide. Additionally, further funding is needed for research into a

367   widely available, person-centered, accessible training program, co-produced with end

368   users to identify and remove barriers related to lack of digital skills.

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382   **Conflicts of Interest**

384   **Funding**

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391   <u>**References**</u>

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