The digital divide: Examining socio-demographic factors associated with health literacy, access and use of internet to seek health information

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Conflict of interests

None declared.

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Abstract

This paper aims to examine the socio-demographic characteristics associated with access and use of internet for health-related purposes and its relationship with health literacy. Data were drawn from a health literacy survey (N=1046) and analysed using logistic regression. Results show a strong association between health literacy, internet access and use. Socio-demographic characteristics particularly age, education, income, perceived health and social isolation also predict internet access. Thus, in addition to widening access, the movement towards digitisation of health information and services should also consider digital skills development to enable people to utilise digital technology more effectively, especially among traditionally hard-to-reach communities.

Health information and services are becoming more accessible online. It has been argued that making health information and services available online can improve patient experience by enhancing shared decision making by promoting informed choice (Gann & Grant, 2013). Internet use has also been associated with health promoting behaviours (Xavier, et al, 2013), better mental health (Forsman & Nordmyr, 2015) and improved financial decision making (James, et al, 2013).

Although it has its merits, concerns have been raised on how the proliferation of internet-based health information and services could reinforce existing social inequities in health (McAuley, 2014). While the internet has been used by patients to gather information, gain support and to make sense of one's health condition (Ziebland, 2004), those who are in the greatest need of health information are least likely to have access to new technologies (Aydın, Kaya, & Turan, 2015). Previous research from North America and Europe reflect a 'digital divide', whereby socio-economic and demographic factors such as age, income, education and health status were able to predict people's likelihood to access and use the internet to seek health information (Kontos, et al., 2014). In Great Britain, while the internet was accessed either every day or almost every day by 78% of adults (39.3 million) in 2015, only about 49% used it to look for health-related information (ONS, 2016). Barriers to access and internet use included financial restrictions (i.e., equipment and internet access costs are too high), medical and disability-related constraints (i.e., the technology is not easily accessible for some patients), and digital complexity (i.e., accessing and navigating the internet is too complex) (Connolly & Crosby, 2014).

While efforts are being made to widen the reach and accessibility of internet technology, the general population still needs to keep up with the growing amount of health-related information and services online. Just as the readability of health information needs to match the literacy skills of its users (Rowlands, et al., 2015), so does the readability of health information and services online. In England, around 11 million people lack basic digital literacy, with around 7 million having never used the internet (ONS, 2016). Information and services online need to consider the knowledge and skills of its target audience. In other words, it needs to consider the health literacy of its current and potential users.

Health literacy can be defined as 'the personal characteristics and social resources needed for individuals and communities to access, understand, appraise and use information and services to make decisions about health' (WHO, 2015). Health literacy is important in the digital context since adequate knowledge and skills are necessary to enable people to access and use digital technology to look for health information and to make sense of it (Aydin, et al., 2015). In the US, internet use has been associated with health literacy, such that those with better health literacy skills were more likely to

search for health-related information online (Levy, et al., 2015). People need health literacy skills when using the internet -- not only to enable them to read health information -- but also to know where and how to look for reliable information, and to decide whether to use these or not.

It is important to consider the socio-economic and demographic factors and the health literacy needs associated with access and use of the internet to seek health information. Doing so could help to assess whether a 'digital divide' exists in the UK and how the movement towards the digitisation of health information and services could impact upon service users with diverse health literacy needs and backgrounds.

In this paper, we aim to address the following research questions:

> (1) What is the relationship between health literacy and the use of the internet to seek health information?

> and

> (2) What are the socio-demographic characteristics of people who use the internet to seek health information?

We hypothesised that health literacy will be positively associated with access and use of the internet to seek health information and that internet access and use will also be associated with age, sex, ethnicity, income, education, lifestyle, perceived health status, deprivation and social isolation.

Method

Data collection

Data were drawn from a city-wide health literacy survey (N=1046) in Stoke-on-Trent, England. The survey was conducted face-to-face in 2013 and included questions to determine demographics, self-rated health, measure of social connectedness [Health Education Monitoring Survey (HEMS)], self-rated lifestyle, internet access and use of the internet to seek health information. Health literacy was measured using the UK version of the Newest Vital Sign (NVS). Ethical approval was obtained from the Keele University Ethics Research Panel. Further details on survey design and sampling strategies are published elsewhere (Protheroe, et al., 2015)

Data analysis

Stata/MP 14.1 (Stata Corporation, College Station, TX, USA) was used for data analyses. Unadjusted and adjusted logistic regression were used to determine the association between internet access and health literacy and also between internet use to seek health information and health literacy, adjusting for socio-demographic characteristics (age, gender, ethnicity, education, income, index of multiple deprivation, perceived health, perceived lifestyle, social isolation and health literacy). Levels of health literacy were categorised according to the scoring guidance recommended by Rowlands, et al (2013). Respondents who scored 0–1 on the NVS were categorised as having low functional health literacy, 2–3 as having marginal health literacy and a score of 4–6 as adequate. Unadjusted logistic regression was also performed for each of the socio-demographics factors, estimating their association with internet access and internet use to seek health information.

Results

Descriptive statistics

Table 1 summarizes the key demographic characteristics of the survey participants. From the 1046 respondents, 1042 (99.6%) answered the question concerning internet access and were included in the analyses. From this sample, 801 (76.9%) had access to the internet, of which 615 (76.8%) used the internet to seek health information.

The demographics were broadly representative of the population of Stoke-on-Trent with slightly fewer male participants (46.5%) than the adult population of Stoke-on-Trent (49.5%). The sample had a slightly older demographic than the general population with 27.1% aged 18–34 (vs. 31.2%), 46.2% aged 35–64 (vs. 47.8%) and 26.7% aged over 65 years (vs. 21.0%).

INSERT TABLE 1 HERE

The majority of the respondents were white, educated to GCSE level or less, and (amongst those prepared to state their income) currently earning £20 000 or less. Almost 70% perceived their general health to be good or very good, and over 76% perceived their lifestyle to be very or fairly healthy. Of the 972 respondents who completed the measure of health literacy (NVS), 277 (28.5%) had low health literacy, 228 (23.5%) had marginal health literacy and 467 (48.0%) had adequate health literacy.

Inferential statistics

Unadjusted and adjusted odds ratios for the association between health literacy and internet access and health literacy and internet use to seek health information are given in Table 2. Unadjusted odds ratios showed that the odds of having access to the internet were over 10 times higher (OR (95%CI): 10.75 (7.08, 16.33)) and the odds of using the internet to seek health information were over 2 times higher (2.35 (1.53, 3.60)) for respondents who had adequate levels of health literacy compared to those with low health literacy. After adjusting for demographic factors, adequate health literacy was still significantly associated with internet access (3.56 (2.12, 5.98)), but not with use of the internet to seek health information (1.40 (0.84, 2.32)).

From unadjusted analyses, there were 96% reduced odds of having access to the internet in respondents 65 years or older (unadjusted OR (95% CI): 0.04 (0.02, 0.07)) compared to those aged 18-34. There were also reduced odds of having internet access in respondents with lower education level (none: 0.09 (0.06, 0.15), GCSE's or equivalent: 0.40 (0.24, 0.69)) compared to being educated beyond A-level, with lower income (<£10k: 0.09 (0.05, 0.19), £10-20k: 0.25 (0.12, 0.52)) compared to earning £20000 or above, in those perceiving their health to be poor (0.17 (0.10, 0.29)) compared to very good and in respondents who were socially isolated (0.59 (0.35, 0.97)) (Table 2). Non-white British were also two and half times more likely to have internet access (2.58 (1.36, 4.91)) than white British, although this factor could have been confounded by age as nearly 95% of the non-white participants were under 65 years old whereas only 71% of white British participants were under 65. Similar differences were found in the respondents' likelihood to use the internet to seek health information, except for perceived poor health and social isolation (Table 2).

INSERT TABLE 2 HERE

Discussion

Findings from this study suggest that there is a strong association between health literacy and internet access. Results have shown that individuals with adequate levels of health literacy were more likely to access the internet and also use it to look for health information. Socio-demographic characteristics particularly age, education, income, perceived health and social isolation are also associated with having access to the internet, which implies that a 'digital divide' exists in the sample of participants surveyed in this study. These findings are consistent with other studies, particularly in relation to internet access and use among older adults (Choi & Dinitto, 2013).

Widening internet access, especially among traditionally hard-to-reach communities is important. However, as our findings suggest, health literacy also plays a significant role in enabling people to access and use the internet for health-related purposes. Therefore, it is important that widening internet access is coupled with the provision of digital skills development to enable individuals to utilise digital technology more effectively. Locally, this is reflected in the Stoke-on-Trent Health Literacy strategy, whereby digital inclusion and health literacy skills development are included in the action plan. Furthermore, additional resources are being introduced to enable people to improve their health literacy skills. For example, the Haywood Foundation in Stoke-on-Trent has introduced a Patient Information and Education Resource Centre. The centre is staffed by volunteers who have health literacy training and provide peer support for patients to access and understand health information.

Nationally, NHS England's Widening Digital Participation programme also aimed to reach those who are at most risk of poor health by helping them to manage their health and healthcare with the aid of digital technology. By July 2016, the programme has trained over 220,000 individuals to use digital health resources, with vast improvements reflected on learners' access and use of online health information, their confidence and general health and well-being (Tinder Foundation, 2016).

Findings from this study have important implications for digital health research and practice. For example, health literacy levels could impact on people's willingness and ability to participate in research that requires engagement with digital technologies. Furthermore, it is also important to take health literacy into consideration when designing, implementing and evaluating digital health interventions.

In conclusion, widening digital access is important in promoting health as it can help to improve self-care and patient experience. However, there is a risk of widening existing social and health inequalities if care is not taken. As this study shows, improving digital health literacy by developing people's skills and confidence to use the internet, or including resources to support access to digital health information is crucial, especially among those who are traditionally marginalised. Considering that the NHS plans to promote online services through programmes such as Patient Online and the Digital First initiatives, there is a danger that some patient groups, especially those who are most vulnerable, could be left behind as the move towards the digitization of information and services progresses.

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Table 1. Demographic characteristics according to internet access and use of internet to seek health information

	Total	Internet access		Internet use for health info	
		Yes	No	Yes	No
Respondents	**1042 (100)**	**801 (76.9)**	**241 (23.1)**	**615 (77.3)**	**181 (22.7)**
Health Literacy					
Low	277 (28.5)	147 (19.5)	128 (60.1)	98 (16.8)	48 (28.6)
Marginal	228 (23.5)	176 (23.3)	50 (23.5)	130 (22.3)	46 (27.4)
High	467 (48.1)	432 (57.2)	35 (16.4)	355 (60.9)	74 (44.1)
Age; mean (SD)	49.2 (19.0)	44.1 (16.7)	66.4 (16.1)	42.31 (15.9)	50.0 (18.0)
Age					
18-34	282 (27.1)	267 (33.4)	14 (5.9)	222 (36.2)	44 (24.3)
35-64	481 (46.2)	412 (51.5)	67 (28.3)	324 (52.8)	85 (47.0)
65+	278 (26.7)	121 (15.1)	156 (65.8)	68 (11.1)	52 (28.7)
Male	485 (46.5)	376 (47.0)	108 (45.0)	278 (45.3)	95 (52.5)
Ethnicity					
White British	947 (90.5)	713 (89.0)	230 (95.4)	547 (88.9)	161 (89.0)
Other	99 (9.5)	88 (11.0)	11 (4.6)	68 (11.1)	20 (11.1)
Education					
None	327 (31.5)	171 (21.5)	155 (64.9)	107 (17.5)	63 (35.6)
GCSE's or equivalent	328 (31.6)	270 (34.0)	57 (23.9)	213 (34.8)	55 (31.1)
A-Levels or equivalent	115 (11.1)	107 (13.5)	6 (2.5)	89 (14.5)	17 (9.6)
Beyond A-Level	267 (25.8)	246 (31.0)	21 (8.8)	203 (33.2)	42 (23.7)
Household Income					
< £10,000	207 (19.9)	137 (17.1)	70 (29.9)	98 (15.9)	39 (21.6)
£10,000 - £19,999	188 (18.1)	157 (19.6)	30 (12.8)	124 (20.2)	32 (17.7)
≥ £20,000	239 (23.0)	227 (28.3)	11 (4.7)	192 (31.2)	34 (18.8)
Don't know or prefer not to say	405 (39.0)	280 (35.0)	123 (52.6)	201 (32.7)	76 (42.0)
Deprivation (national IMD)					
Most deprived	520 (49.7)	390 (48.7)	127 (52.7)	291 (47.3)	98 (54.1)
2nd most deprived	235 (22.5)	181 (22.6)	54 (22.4)	144 (23.4)	37 (20.4)
3rd most deprived	164 (15.7)	133 (16.6)	30 (12.5)	108 (17.6)	22 (12.2)
4th most deprived	75 (7.2)	53 (6.6)	22 (9.1)	37 (6.0)	15 (8.3)
Least deprived	52 (5.0)	44 (5.5)	8 (3.3)	35 (5.7)	9 (5.0)
Perceived Health					
Very good	255 (24.4)	226 (28.2)	29 (12.0)	173 (28.1)	51 (28.2)
Good	467 (44.7)	375 (46.8)	90 (37.3)	296 (48.1)	76 (42.0)
Fair	222 (21.2)	142 (17.7)	78 (32.4)	106 (17.2)	36 (19.9)
Bad/Very bad	102 (9.8)	58 (7.2)	44 (18.3)	40 (6.5)	18 (9.9)
Perceived Lifestyle					
Very healthy	252 (24.1)	182 (22.7)	69 (28.9)	136 (22.1)	44 (24.3)
Fairly healthy	549 (52.6)	424 (52.9)	122 (51.1)	334 (54.3)	87 (48.1)
Neither good nor bad	180 (17.2)	148 (18.5)	32 (13.4)	117 (19.0)	31 (17.1)
Fairly/very unhealthy	63 (6.0)	47 (5.9)	16 (6.7)	289 (4.6)	19 (10.5)
Social isolation					
See/speak to close friends/family	968 (92.7)	749 (93.6)	215 (89.6)	571 (93.0)	173 (95.6)
Don't see/speak to close friends/family	76 (7.3)	51 (6.4)	25 (10.4)	43 (7.0)	8 (4.4)

Table 2. Unadjusted and adjusted Odds Ratios (95% confidence intervals) of associations between sociodemographic factors and internet access/ internet use to seek health information

	Internet access		Internet use for health info	
	Unadjusted	Adjusted†	Unadjusted	Adjusted†
Health Literacy				
Low	1.00	1.00	1.00	1.00
Marginal	3.06 (2.07, 4.54)***	1.38 (0.84, 2.24)	1.38 (0.85, 2.24)	0.96 (0.56, 1.65)
Adequate	10.75 (7.08, 16.33)***	3.56 (2.12, 5.98)***	2.35 (1.53, 3.60)***	1.40 (0.84, 2.32)
Age				
18-34	1.00	1.00	1.00	1.00
35-64	0.32 (0.18, 0.59)***	0.32 (0.15, 0.68)**	0.76 (0.51, 1.13)	0.64 (0.39, 1.03)
65+	0.04 (0.02, 0.07)***	0.09 (0.04, 0.19)***	0.26 (0.16, 0.42)***	0.27 (0.15, 0.50)***
Male	1.08 (0.81, 1.45)	0.83 (0.55, 1.26)	0.75 (0.54, 1.04)	0.64 (0.44, 0.94)*
Ethnicity				
White British	1.00	1.00	1.00	1.00
Other	2.58 (1.36, 4.91)**	1.53 (0.62, 3.79)	1.00 (0.59, 1.70)	1.17 (0.60, 2.28)
Education				
None	0.09 (0.06, 0.15)***	0.30 (0.17, 0.56)***	0.35 (0.22, 0.55)***	0.46 (0.27, 0.79)**
GCSE's or equivalent	0.40 (0.24, 0.69)**	0.75 (0.39, 1.42)	0.80 (0.51, 1.25)	0.94 (0.56, 1.56)
A-Levels or equivalent	1.52 (0.60, 3.88)	1.05 (0.37, 2.95)	1.08 (0.58, 2.01)	0.89 (0.45, 1.74)
Beyond A-Level	1.00	1.00	1.00	1.00
Household Income				
<£10,000	0.09 (0.05, 0.19)***	0.21 (0.09, 0.49)***	0.44 (0.26, 0.75)**	0.50 (0.27, 0.91)*
£10,000 - £19,999	0.25 (0.12, 0.52)***	0.50 (0.21, 1.22)	0.69 (0.40, 1.17)	0.84 (0.46, 1.53)
≥ £20,000	1.00	1.00	1.00	1.00
Don't know or prefer not to say	0.11 (0.06, 0.21)***	0.28 (0.13, 0.63)**	0.47 (0.30, 0.73)**	0.59 (0.35, 1.00)
Deprivation (national IMD)				
Most deprived	0.56 (0.26, 1.22)	1.23 (0.44, 3.49)	0.76 (0.35, 1.64)	0.73 (0.27, 1.94)
2nd most deprived	0.61 (0.27, 1.37)	1.62 (0.55, 4.78)	1.00 (0.44, 2.26)	1.00 (0.36, 2.78)
3rd most deprived	0.81 (0.34, 1.89)	2.86 (0.91, 9.04)	1.26 (0.53, 3.00)	1.24 (0.43, 3.55)
4th most deprived	0.44 (0.18, 1.08)	1.08 (0.32, 3.61)	0.63 (0.25, 1.63)	0.73 (0.23, 2.33)
Least deprived	1.00	1.00	1.00	1.00
Perceived Health				
Very good	1.00	1.00	1.00	1.00
Good	0.53 (0.34, 0.84)**	0.50 (0.27, 0.94)*	1.15 (0.77, 1.72)	1.44 (0.90, 2.29)
Fair	0.23 (0.15, 0.38)***	0.41 (0.21, 0.80)**	0.87 (0.53, 1.42)	1.48 (0.81, 2.70)
Bad/Very bad	0.17 (0.10, 0.29)***	0.48 (0.22, 1.05)	0.66 (0.35, 1.24)	1.49 (0.70, 3.17)
Perceived Lifestyle				
Very healthy	1.00	1.00	1.00	1.00
Fairly healthy	1.32 (0.94, 1.86)	1.21 (0.72, 2.02)	1.24 (0.82, 1.88)	1.13 (0.69, 1.85)
Neither good nor bad	1.75 (1.09, 2.81)*	1.39 (0.70, 2.76)	1.22 (0.72, 2.06)	0.81 (0.43, 1.53)
Fairly/very unhealthy	1.11 (0.59, 2.09)	1.90 (0.73, 4.90)	0.48 (0.24, 0.94)*	0.46 (0.21, 1.04)
Social isolation				
See/speak to close friends/family	1.00	1.00	1.00	1.00
Don't see/speak to close friends/family	0.59 (0.35, 0.97)*	0.76 (0.37, 1.54)	1.63 (0.75, 3.53)	1.99 (0.86, 4.60)

***p<0.001; **p<0.01; *p<0.05

† Adjusted for all other factors listed in the table