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Exploring service users' and Healthcare Professionals' experience of digital and face-to-face Health Checks in England: A qualitative study

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Abstract

Introduction: In England, eligible adults aged 40 to 74 years of age are invited to attend a face-to-face (F2F) NHS Health Check appointment every 5 years. A digital version of the Health Check was introduced by a local authority as an alternative for those hesitant or less able to attend a face-to-face appointment.

Objectives: This qualitative study aimed to understand service users' and Healthcare Professionals' (HCPs) experiences and opinions of F2F Health Checks and digital Health Checks (DHC), identify barriers and facilitators of the pathways, and recommend potential improvements.

Design: A qualitative study, involving interviews with a purposive sample of participants.

Participants and setting: A sample of 30 service users and 8 HCPs was recruited in the London Borough of Southwark.

Methods: Semi-structured interviews were conducted which included questions on understanding why service users chose a type of Health Check, their experiences of the service and suggestions for improvement. HCP interviews covered HCP experiences of providing both services, including any impact on workload. The Framework method of thematic analysis was used to analyse the data.

Results: Service users identified benefits for the DHC service including its convenience, ease of use and access. Both service users and HCPs acknowledged the limitations of the DHC including self-reporting physical measures (such as blood pressure and cholesterol levels) or difficulties going elsewhere to measure them, and the lack of opportunity to discuss health with a professional. Service users and HCPs both noted the lack of available appointments and time constraints as barriers associated with the F2F service.

Conclusions: Both HCPs and service users perceive that in its current form, the DHC has benefits and barriers to its use. If these are adequately addressed, the DHC may help to address the demand and pressure within GP clinics.

Registration: This study was registered on the Open Science Framework: https://osf.io/ y87zt

Article Summary

Strengths and limitations of this study

- A strength of the study is the focus on service users' real experience of the Digital Health Check and the Face-to-face Health Check.
- Semi-structured qualitative interviews used a topic guide to ensure data collection was rigorous and robust.
- Data were collected in the London Borough of Southwark that was examining the use of Digital Health Check as a form of innovation in NHS Health Check provision.
- A limitation of this study was that only one Healthcare Professional was aware of and had experience of the Digital Health Check service.
- The majority of service users interviewed were of White ethnicity, which limits the generalisability of the findings.

Introduction

Integrating digital technology into healthcare systems has been identified as important to improve efficiency and equity of access[1]. The UK National Health Service (NHS) has been focusing on implementing digital technology in primary care since 2015[2]. The term 'digital-first primary care' refers to when patients can access treatment and advice remotely, via online consultation or symptom checking[3]. The 2019 NHS Long Term plan committed to offering individuals the right to access primary care through digital means by 2023/2024[4]. This was supported by GP practices which were required to offer patients online consultations by 2021[5].

While the move to digital technologies in healthcare is not a new idea, there is a lack of research evaluating the efficacy of digital technologies used in conjunction with standard care. A rapid evidence synthesis was conducted in 2018 to inform NHS England policy on digital-first primary care[6], which reported several potential advantages to offering alternatives to in-person care delivery, including providing more control and convenience to patients, particularly those with decreased mobility. Remote consultations were also thought to be preferable to patients who are apprehensive about in-person medical encounters. Digital communications provide a feeling of greater privacy, which may overcome sociocultural barriers such as embarrassment and stigma around health seeking behaviours. Since the COVID-19 pandemic, the use of online tools and services have become more extensively used[7]. Patients can now do a range of tasks virtually such as prescription requests, scheduling appointments, checking test results, discussing health issues etc, that would previously have involved a visit to a GP practice. With the rising levels of demand for appointments paired with the ongoing shortage of health care practitioners (HCPs)[8], there is a clear need for an acceptable model of general practice that combines digital and face-to-face delivery. It is estimated that 40% of appointments at a GP clinic could be either transferred ed to other locations or completed by a HCP who is not a GP[9]. Using a model of care that utilises both digital and standard care approaches may allow for greater flexibility[10] and quicker navigation through the care system as well as alleviate pressure in GP practices.

It is important to note that the 2019 NHS review highlighted that digital and other forms of remote care tended to be used by younger people, women, those with English as their first language and those with higher incomes and education levels[6]. These findings raise concerns that a shift to more digital and remote delivery may increase health inequalities by further

limiting access to older adults and socioeconomically disadvantaged groups. Clinicians have also expressed concern that important cues and symptoms may be missed in remote delivery, which could help explain findings that GPs engage in more 'safety-netting' practice (such as inappropriate antibiotic prescribing) when they assess patients remotely[6]. Although the review found some evidence to suggest that digital triage tools could alleviate pressure from primary care services, allow for greater flexibility in schedules for HCPs and even provide economic advantages compared to traditional standard care[6], the potential impact of this digital method on staff workload is unknown. Other barriers highlighted by this review and other research include poor infrastructure and lack of staff training in digital services delivery within the NHS[6,11,12]. Ensuring staff members are trained appropriately to use these technologies is imperative, not only for accuracy, but also for staff buy-in and confidence. Understanding the benefits and barriers of the use of digital tools from both a service user and HCP perspective is crucial to implementing them effectively within the healthcare system.

This paper reports the evaluation of a digital version of the NHS Health Check, developed by Southwark Council, a local authority in the southeast of England. The NHS Health Check programme aims to detect early signs of cardiovascular disease, type 2 diabetes, kidney disease, stroke and dementia every five years in 40 to 74 year olds in England[13]. Adults over 40 are invited to attend a face-to-face (F2F) Health Check appointment, usually in their local GP practice. The Health Check uses a structured template to assess the top seven risk factors for non-communicable diseases: physical inactivity, excess weight, tobacco smoking, excess alcohol consumption, high blood pressure, high cholesterol and impaired glucose processing. If necessary, the Health Check is followed up by further clinical assessments and individuals are offered behavioural support to help with healthy lifestyle changes to reduce risk of disease. The NHS Health Check service intends to promote the early identification and management of behavioural and physical risk factors as well as aiming to reduce inequalities in the prevalence and burden of behavioural risk factors and non-communicable diseases. Although a recent review reported that there are inconsistent results for health checks overall the body of evidence suggests that they are associated with increase detection of risk factors[13]. The Health Check programme is commissioned by local authorities in England[14]. Health Checks are standardised to ensure the quality and safety of the programme[14] but local authorities do have some flexibility over how they are delivered, for example, prioritising invitations to 'high risk' individuals.

The digital version of the NHS Health Check (DHC) evaluated here, operates like an online survey where users answer a series of questions about their health and behaviours, as they would in a F2F Health Check. Following completion of the DHC, users are provided with immediate feedback on the DHC website, highlighting aspects of their health or behaviour that could be improved. The results from the DHC are sent to the individual's GP practice and, if concerning risk factors are detected, they will be instructed to schedule a F2F appointment. If users proceed to the advice section, they are encouraged to choose health priorities to focus on and gain personalised advice on these. For example, health priorities could be choosing to find out any physical measures they did not have the values for (e.g., getting their blood pressure, cholesterol or blood sugar measured at either a pharmacy, GP clinic, leisure centre or an at home blood test), or choosing to focus on other aspects of their health and be signposted to sources of support for adopting healthier behaviours. The DHC process may present a more acceptable alternative that still enables the delivery of preventive advice and the identification of early-stage disease. See Figure 1 for a flow diagram of the digital and the F2F Health Checks.

This qualitative study aimed to understand service users' and Healthcare Professionals experiences and opinions of F2F Health Checks and DHCs, identify barriers and facilitators of the systems, and recommend potential improvements.

Figure 1: Flow diagram of DHC and F2F Health Checks

[Insert Figure 1 here]

Methods

Study design

A qualitative design was adopted for this research using one-to-one semi-structured interviews with a purposive sample of service users (invited to either Health Check) and Healthcare Professionals (HCPs) from the target area. This qualitative study was part of a wider evaluation study to compare the uptake of NHS Health Checks between those invited to the DHC and those invited to the F2F Health Check. Detailed methods for the evaluation study are reported elsewhere[15]. This project has received ethical approval from the East Midlands (Nottingham 1) NHS Research Ethics Committee (ref: 22/EM/0280). The Standards for Reporting Qualitative Research (SRQR) were used to guide reporting[16].

Supplementary Table 1 presents the checklist. The original protocol for the study is included in the Supplementary Materials section.

Participant recruitment

The setting for the evaluation study was the London Borough of Southwark in England, where invitations to complete a Health Check were sent out to 9000 eligible service users randomly selected from EMIS, the electronic patient health record system in North Southwark. Service users were invited to either the F2F Health Check (n=3000) or the DHC (n=6000). Service users who received an invite to the DHC were able to book a F2F Health Check at their GP practice if they preferred, service users who received the F2F Health Check invite were not given the option to complete the DHC.

For the current qualitative study, the service user participant group was recruited using the market research company, Leftfield. An invitation was sent by an external company (iPlato) via SMS to all service users who were invited to a Health Check (both digital and F2F) between January and March 2023. Leftfield screened responding service users to recruit a sample of participants to represent a range across the following criteria: Health Check completion status (i.e., completion of F2F Health Check, the DHC or did not complete a Health Check), gender, age, ethnic groups, and area of residence. Selected participants were sent an electronic consent form. When consent had been given, telephone/online interviews between participants and a researcher were organised.

All GP practices in the target area were sent invitations for HCPs to take part in an interview. Invitations were sent on behalf of the research team by the GP Federation to GP practice managers, who were asked to forward the invitation to relevant HCPs. The invitation directed the HCP to an online form where a full participant information sheet was available to read and download before completing a consent form, a demographic survey and a contact details form. The research team then contacted the HCP to arrange a suitable time for an interview.

Procedure

All interviews took place via telephone or videocall, according to participant preference and were conducted by experienced qualitative researchers (LG and TJ). Interview schedules for service user and HCP interviews were co-developed by the whole project team, with input from the Public and Patient Involvement group (see 'Patient and Public Involvement'). Briefly, service user interviews sought to understand why service users chose either a F2F

Health Check or Digital Health Check or neither, their experience of the service and in what ways the service could be improved. Interviews with HCPs covered their experience of providing the combined Health Check service, including any impact on workload for them and their colleagues, any concerns or perceived benefits of the service, and any suggestions for improvements. Interview schedules for both service users and HCPs are presented in the Supplementary Materials section. The interviews were semi-structured, which allowed the researcher to adapt the questioning according to the participant's earlier responses and prompt for further information if relevant novel issues were raised[17]. Participants completed an online consent form prior to the interview, but the researcher checked their understanding of the interview procedure and how their data would be used at the start of their meeting. Interviews lasted approximately 30 minutes and were audio recorded using an encrypted digital recorder then fully transcribed verbatim. Participants were offered a £50 Love2Shop gift voucher for taking part.

Patient and Public Involvement

When designing this research, we consulted a Patient and Public Involvement (PPI) group, recruited from the local borough's Healthwatch network and comprising eight residents aged between 40 and 59 years. The majority of the group was female and of Black ethnicity. Through an online meeting the group provided feedback and suggestions on the proposed protocol and research materials. Two members of the group joined the project steering committee, to provide ongoing advice and oversight from a service user perspective.

Analysis

Interview transcripts were analysed using the Framework method of thematic analysis[17]. Separate analyses were conducted for service user and HCP interviews. After reading all transcripts, draft thematic frameworks for HCPs and service users were developed by CF and TJ including themes and sub-themes that were driven by the data but were also relevant to the research objectives. The draft frameworks were used to code a sub-sample of the transcripts by CF and TJ, then they were reviewed and amended as necessary to ensure the frameworks captured all the pertinent information for this study. The coding frameworks were entered in NVivo software[18] and applied to all transcripts. Analysis was an iterative process – the team regularly reviewed and revised the frameworks to ensure it remained a good 'fit' for the data. The final thematic frameworks are available in the Supplementary Materials. When all transcripts were coded a framework matrix was developed with columns to represent each

sub-theme and rows for each participant. Cells were populated with quotations, data summaries and the researcher's analytic notes. This 'charting' method created an accessible dataset through which themes and subthemes could be explored by respondent type. A summary of the data under each sub-theme was developed to inform the next stage of the analysis, moving up the analytical hierarchy to explore patterns and associations between themes in the data[19,20].

Results

Thirty service users and eight HCPs completed semi-structured interviews. Table 1 describes the sample characteristics. A summary of the main themes and sub-themes for both service user and HCP interviews are described in Table 2.

Table 1: Sample Characteristics

	Service user sample	HCP sample
Gender		
Male	40%	13%
Female	57%	88%
Age group		
Under 60 years	30%	100%
60+ years	70%	0%
Ethnicity		
White ethnicity	70%	50%
Other ethnicity (Black African, Black other, Asian, Other)	30%	50%
Health Check type attended (service users)		
Completed DHC	50%	
Completed F2F	37%	
Unsure	3%	
Completed None	17%	
DHC experience (HCPs)		13%

(Percentages used due to small numbers in groups leading to potential loss of anonymity).

Table 2: Summary of Themes and Sub-themes for Service Users and HCP Interviews

Themes	Sub-themes Service Users	Sub-themes HCPs
F2F Barriers	Challenging booking process Lack of available appointments	Time constraints during appointments
F2F Benefits	Ability to discuss health in person	Ability to discuss health in person
DHC Barriers	Lack of health discussions Can't add individual context to lifestyle question responses	Lack of health discussions Accuracy of responses and measures

	Physical measures (mixed responses) Can't discuss results DHC advice too general	DHC follow up
DHC Benefits	Easy to use website Convenience Avoid GP clinic Health ownership Remote benefits (privacy etc)	Awareness of health checks Convenience

The findings are presented according to the benefits and barriers of both types of Health Checks (DHC and F2F). Anonymised quotations are included for service users (SU) and HCPs (HCP). Service users' Health Check status is described (F2F, DHC, both or none) and whether they have experience with DHCs for HCPs.

1. Benefits of F2F Health Check

The majority of the benefits identified by both HCPs and service users for the F2F Health Check were items that were identified as barriers for the DHC, described below, including being able to discuss health with a trained professional, adding context and individual factors to questionnaire responses, receiving immediate feedback and answers and scheduling follow-ups immediately if necessary.

2. Barriers of F2F Health Check

The most prominent barrier to the completion of F2F Health Checks for service users was the difficulty making an appointment and long wait-times in busy GP practices.

"What bothered me is going to the GP physically, queuing there for I don't know how long. Then, even if you have a slot where you should be, they always overflow time wise. And my issue is I don't have time. With three kids, working full time, I don't have… Sorry, I can't spare a minute left or right." (SU12, DHC)

HCPs also expressed that the lack of available appointments was a major barrier to F2F Health Checks. In addition to this, HCPs perceived the time they have allocated for a F2F Health Check (according to interview findings some HCPs noted around 15 to 30 minutes, depending on the practice) is sometimes not enough time to complete the lifestyle questions (i.e., smoking, physical activity and risk factors), the physical measures (height, weight, cholesterol, blood pressure and diabetes check), and then go through the results and the

follow-up advice with patients. HCPs report that Health Checks vary by person, and for some patients they need to go over the allocated time in order to adequately perform the service. They will also email the follow-up advice and services to patients when they do not have the information at hand.

"I have to say that we're getting less time to do them. So, it has to be quite short in terms of- So, say if somebody came with a list of issues, you would have to signpost them and deal with that. But you can't- Unfortunately, I feel like in the old days, I think we had half an hour. Then they cut it to 20 minutes." (HCP04, No DHC experience)

3. Benefits of the DHC

Service users identified many benefits of the DHC. Notably, those who completed a DHC were able to identify more benefits of the service than those who had not. However, those who completed a F2F Health Check felt that the inclusion of an online option would improve the service.

One of the main benefits mentioned was that the DHC was straightforward and easy to use. Service users noted that it matched the presentation of other NHS online surveys and forms which was helpful as it was recognisable. Service users noted all questions in the survey were easy to understand and were easy to understand.

The DHC was also convenient, as service users did not need to arrange an appointment with their GP practice. Most identified this as a clear benefit. It could be completed any time of day and service users could take their time going through it. It was also noted that the text message link was easy to access for service users.

"It's convenience online, at least I can do it from the comfort of my home." (SU05, DHC)

Some service users mentioned that we are in a '*digital age'* and that the DHC adapts to that and gives people more options. The risk of contracting COVID-19 meant some service users view not having to attend the GP clinic as a key benefit of the DHC service. Additionally, as GP clinics are currently experiencing severe pressure to accommodate appointments, having the option of doing things online removed service users from experiencing the frustration of making an appointment and partly alleviated the pressures within GP clinics and the NHS. Further, as service users were doing the survey independently, it led to them taking ownership of their health and understanding it more, giving service users an active instead of passive role in this process.

"... if I have to do something for myself then I'm actually more aware of what I'm doing and why I'm doing it rather than just go to the doctors and then forget about it." (SU26, F2F)

Other notable benefits reported by service users included that the DHC was helpful for those who are introverted as they do not need to talk to other people about sensitive topics. The DHC was helpful if there is a language barrier as service users can take their time with the survey and look up anything they are unsure of. Finally, some users noted that there is no perceived judgement with the DHC as there might be when completing the lifestyle questions with a HCP. Service users felt they were not 'confessing' anything.

The main benefits of the DHC identified by HCPs included that it was another way to raise awareness of Health Checks in general. When individuals receive an invite to the DHC they can choose to do it online, or they may choose the option to do it the standard way in a GP clinic. Regardless, it increases awareness and provides another method of completing the Health Checks.

4. Barriers of the DHC

There was a range of responses regarding barriers of the DHC from both service user and HCP perspectives. Half of HCPs interviewed had only recently heard of the DHC; the remaining half were not aware of the DHC. One HCP had experience of a patient who had used the DHC then returned to the clinic for follow ups. Once the interviewer mentioned the DHC, most staff members were interested to know more about it and how the physical tests were measured. Half of the service users interviewed had experience of the DHC.

A recurring theme in the data was that service users could not communicate with a health professional immediately during the DHC. This was seen as a concern for a range of reasons, for example; inability to ask questions and discuss health issues, inability to request additional assessments, inability to add context to answers in the health assessment; difficulty scheduling follow up appointments; and lack of opportunity for HCPs to detect other health issues such as mental health symptoms, (for clarity; the F2F Health Check does not test for symptoms of ill mental health or provide additional tests, however service users have the potential to request additional tests or discuss health concerns during the F2F appointment, which is not possible during the DHC and would need to be addressed as an additional option following on from the digital service).

"Well, it's a completely different experience when you see a doctor in person than online. Online you just follow what they offer you, but in person you can ask questions." (SU07, F2F)

Similarly, many of the HCPs expressed concern at the lack of opportunity to assess the service users themselves and give them positive feedback on lifestyle changes.

"Yes, we still say, "So, this is good. It could be because you probably exercise a lot, or if someone is slim but admits to bad diet, can warn them that this might be precursor to high cholesterol. Would this happen online?" (HCP01, No DHC experience)

Another barrier to care from the DHC was the forced response nature of the online survey. Not being able to justify answers was frustrating for some service users. Similarly, service users found getting their results online worrying as they do not have the opportunity to discuss their results with someone immediately, to ensure understanding. Examples of results given from the DHC are displayed in the Supplementary Materials section.

"I found it quite general and a bit anxiety-inducing, because it did come back with quite harsh results. It categorised me as someone who will have premature heart problems or likely to have heart problems or other issues that surprised me. Yes. I don't think are justified with my general lifestyle." (SU28, Both)

"So I'm 75, so if I've got the heart of an 85-year-old, does that mean I'm totally knackered already, I better watch out? I don't know what it meant." (SU18, DHC)

Some HCPs were unsure if the data entered by service users into the DHC would be accurate, due to lack of understanding, human error or even potentially dishonest reports. HCPs have no way of verifying the information when it is completed remotely. Further, HCPs were not confident in the accuracy of the physical measures if completed by service users at home rather than professionals.

"You can kind of tell when somebody is not being wholly honest in an appointment. You can't tell that from someone inputting information."(HCP02, No DHC experience)

The physical measures were also perceived as a barrier for HCPs and there were different attitudes towards them from the service users' perspectives. In the DHC service users are asked if they know their blood pressure, blood sugar, height, weight and cholesterol levels and then they are required to input the measurements. If they do not know their

measurements, they can proceed, and their risk scores are calculated from national average values. This was seen as a barrier to completing the DHC survey as some service users interpreted the initial question as meaning they would not be able to finish the survey as they did not know their measurements, thus leading to early drop-off and failure to finish the survey. Most service users did not see the physical assessments themselves (i.e., doing the tests at home via postal kit, at a leisure centre, pharmacy or GP clinic) as a barrier to the DHC (see quotes below). However, in this sample only one service user chose to do the tests at home using a kit and postal service; they found it very difficult to complete as a high degree of dexterity was required. Other service users were asked their opinion on using the kits and some said it would not be an issue but perceived that it could be for others. One service user reported that they were directed to buy a device to measure blood pressure (possibly indicating that the web link they were sent to order a blood test kit misdirected them or that the user misunderstood the instructions) and mentioned going to a pharmacy to do the tests costs money, (potentially referring to travel costs as the actual test is free for the user), which was a barrier. Physical measures present an additional step that service users need to take in order to fully complete a Health Check following the DHC survey, which would be completed as part of the F2F Health Check.

"Oh wow, okay, that's a new concept. I've never ever taken my own blood and taken it to the wherever. I've always gone to the hospital to have my blood done. I've never ever, oh my goodness. Alright, but I wouldn't do that, I would not go, you know. You would have to send me to get my blood done. I'm not going to take my own blood. (Laughter)" (SU01, None)

"Because we can all do a blood pressure check, we could do a finger prick check, you know, it's not exactly hard to do, do our weight and height, we could do that and send that through and put the stats on our own record. But I understand I would probably be more proactive with using the app and stuff like that. I mean I'm quite okay to be proactive in that way." (SU26, F2F)

HCPs were not convinced that users would fully engage with the DHC process as there are many stages where drop-out could occur (i.e., waiting for blood kit, sending bloods, waiting for results, then follow-up appointments), whereas everything is completed in one appointment in the F2F Health Check, or a follow up scheduled at the initial appointment.

"I feel like people would then just be put off from doing it but if they just know that they can have it all done in the one go, it's just going to take 25 minutes of your time, rather than

completing this survey, sending it off… It then takes a couple of weeks, you know."(HCP06, DHC experience)

HCPs also queried whether the DHC would save time, as service users completing the DHC without up-to-date physical measurements, and who want to get these measured, would still be advised to attend the GP clinic/pharmacy/leisure centre. Additionally, those who are identified as 'high risk' would also be advised to schedule a follow-up appointment at a GP clinic. One HCP reported a patient came in to get their bloods taken after completing the DHC, but as a staff member did not understand their results from the DHC, they completed the Health Check again with the patient.

"I feel like it's a good idea, but it could be improved. I think I feel like more… Like I said, I don't know what information is going into the digital Health Check because it's not filtering down to me when they come back to see me for a blood test. No, I mean there're things going onto there but I… You know, they end up with a Q risk, they end up with a Health Check thing, but there's no breakdown of what's been… I don't actually know. They just come up to me and then I end up having to do a full Health Check, basically." (HCP06, DHC experience)

Several service users had issues trying to recall the results of their DHC and were unsure where to locate them. Additionally, if users completed a home blood test (which was conducted by a third party provider commissioned by the local authority) they received their results in an email directly from the provider, this also caused confusion with information received following the DHC. Similarly, if a user completed a physical measure through a separate provider, users were worried the results would not be communicated back to their GP or uploaded to their medical records. Service users who completed the DHC also struggled with the 'medical jargon' included in the report. Many users commented on being unsure how to interpret the results. In contrast, users who attended the F2F Health Check were able to recall and interpret their results. Not being able to take the service user through their results to ensure they understand and know the follow-up steps and what is available to them was a disadvantage of the DHC from the HCP perspective.

Other barriers to the DHC included the behavioural advice given following DHC completion. Many users found the advice was not individualised enough to their personal situation. As an example, the DHC did not give advice on financial help for healthy living to users struggling financially. It must be noted the DHC asks users to highlight perceived barriers to healthy

behaviours to give them personalised advice based on this. For example, in terms of financial and access barriers to healthy eating, there are two options individuals can highlight, 'I cannot afford to eat well' and 'I do not have access to healthy food'. If these are selected, then the individual will be signposted to advice tailored to these barriers (including NHS Eat Well for Less schemes and food access services in the area). Additionally, the advice given at a F2F appointment is similar to the DHC, the difference is it is typically delivered by a HCP with opportunity for discussion with the user. Regardless, users still felt the advice given was too general in the DHC.

Discussion

To our knowledge, this is the first qualitative study exploring HCP and service user experiences and opinions of DHC and F2F Health Checks. This study found similar benefits and barriers to using digital services in more general primary care[6], such as convenience and ease of use of the Health Checks as benefits, and the lack of human contact as a perceived barrier. Service users also noted key barriers to the F2F Health Checks, mainly stemming from lack of available appointments and HCPs noted pressure with completing the Health Check during the allocated time. The DHC may present a potential supplementary option to the standard Health Check system in this area.

A concern identified throughout the interviews was that the NHS is under pressure, evidenced by patients experiencing long waiting times and staff not having adequate time or resources available to conduct the Health Checks appropriately. In the United Kingdom, GPs are experiencing unsustainable workloads[21]. Also adding to the pressures on GP clinics is the lack of adequate staff and resources allocated to the service as the population grows, and increases in patient consultations and as people are living longer with complex health needs[22]. These issues present a considerable source of challenge for all and frustration for both HCPs and patients. The majority of participants interviewed acknowledged these issues and expressed a desire to help to alleviate the pressure. Even participants who were unaware of the DHC suggested that the inclusion of an online option to attempt to target these wait times at GP clinics could be a potential solution. This suggests that both service users and HCPs may be open to the DHC, which may aid with implementation of the service.

There were a range of benefits noted for the DHC service. Participants stated one of the prominent benefits is the convenience. It can be completed at any time and it does not need to be completed in one sitting. This is a direct contrast to the long and frustrating experiences

patients and staff alike noted while trying to secure an appointment at a GP clinic. Additionally, service users mentioned that the DHC survey was straightforward and easy to navigate. No users mentioned any issues with understanding the lifestyle questions making it a viable option to complete the lifestyle questions without the help of a HCP thus relieving pressure on the NHS system.

In its current design, issues arose throughout the DHC particularly with the physical measures, as service users identified these as the first roadblock of the service. If service users do not have their results at hand, they need to organise measurements themselves and return to update their results. The service prompts users to do this, if they select it as a priority, it provides links to book the tests and links that direct them to the page where they can update their results. This begins the patient-driven nature of the DHC that is distinct from the F2F Health Check's more passive approach. Additionally, HCPs identified that there are many steps to completing the DHC beyond simply clicking the link and completing a survey. Service users need to initiate every step and read a report of their results online, whereas with the F2F Health Check usually patients are led through the appointment by the HCP and have their results and follow-up advice explained, if time permits. Service users need to be motivated to properly engage with the DHC, their results and their suggested follow-ups. This suggests that potentially the DHC is suitable for health-conscious, motivated individuals and could be offered alongside F2F Health Checks as an alternative model that suits individuals more. Additionally, DHCs could be targeted to those who potentially would not attend a F2F appointment due to barriers in F2F (such as time constraints, introversion, perceived judgement, language barriers etc) and in turn increase Health Check uptake.

One of the issues identified with the DHC was the lack of human contact with a HCP. Conversely, this was one of the key benefits of the F2F Health Check. This was perceived as a crucial part of the Health Check, as individuals want to be reassured that their health is given the utmost standard of care. This was also seen through the interviews as some service users and HCPs worried that not physically seeing individuals in-person may potentially miss underlying conditions that are not part of the DHC screening. Effective communication between service users and HCPs is crucial for the provision of care and recovery[23-28]. Many staff and service users mentioned they preferred a F2F appointment when discussing results and advice. A key factor to the successful implementation of technological interventions in healthcare is that it helps to facilitate discussions with patients[12]. This element of care is absent from the current DHC service.

HCPs and service users both expressed some form of concern surrounding the accuracy of the physical tests if they are completed by someone who is not a HCP. Doing these measures may be considered a high stakes activity that will impact on health results and thus some users indicated they would prefer a professional to do the tests for them. Also involving third party providers for physical tests presented a challenge in collating all updated metrics back into the system for the user. Service users are concerned that this needs to be fed back to the GP, so they can assess the level of risk. This adds to the points made in the previous paragraph about F2F communication being an important factor for patient care, some service users need the reassurance of HCPs to be confident in their results and next steps.

Finally, only one HCP that was interviewed had experience of the DHC, indicating a clear lack of awareness and understanding of the service. All practices involved in the study area were sent interview invitations and would have been expected to be aware of the DHC. This awareness of the program was not seen with the interviewed HCPs, perhaps this indicates poor communication within practices potentially between management and staff. Regardless, this had an impact on the acceptance and trust for the idea of the DHC service among interviewed staff. Further, from the single HCP who was aware of the service, there appeared to be a disconnect between the F2F Health Check patient record system and the DHC system, which led to additional work for the HCP. It is unclear whether this was a failure of the system or a lack of understanding on part of the HCP. The potential disconnect between the F2F Health Check record system and the DHC system was a concern echoed by staff and service users alike. These findings are supported by a systematic review conducted on the facilitators and barriers to implementing technological interventions in healthcare[12]. The review found that if staff perceive the intervention to increase workload, cause disruption and need additional staff members, this acted as a barrier to implementation. Facilitators were factors such as adequate training, pilot testing, links to relevant clinical and patient information, endorsement from senior peers and if the system supported a known organizational challenge[12]. These facilitators should be taken into account in future implementation of DHC programmes.

The strengths of the study are the focus on service users' real experience of the DHC and the F2F Health Check and the provision of new information about innovation in healthcare practice. This study is limited by a smaller number of interviews with HCPs than intended. We faced difficulties recruiting HCPs who had experience of the DHC being used in their practice and who had experience of patients who had completed the DHC. As a result, this

may present a limited view of the DHC as other HCPs interviewed expressed their assumptions as opposed to real-life experiences of the service. The majority of service users interviewed were of white ethnicity, which may affect the generalisability of the findings. Finally, the period of time between when the Health Check was undertaken, and the interviews may have presented with difficulty in recalling the experience.

Overall, there is a need for a digital solution to address the demand and pressure within GP clinics. In its current form, the DHC has benefits and barriers to its use according to both HCPs and service users. The DHC appears to be acceptable for lifestyle questions but not for physical tests due to concerns surrounding accuracy, confidence and removing the apparent convenience of the DHC. Recommendations to improve the DHC include: to communicate problematic results and advice in person, to provide an opportunity for discussion; and to raise awareness among HCPs of the DHC as a complementary service to the F2F Health Checks and its potential to address the challenges experienced by GP clinics. This may increase acceptability of the intervention overall and facilitate its implementation in the healthcare system.

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Competing Interests: Two authors (RH and PS), are current and past employees in Southwark local council and were responsible for the Health Check commission (both digital and face-to-face) in the borough of Southwark.

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Author contributions: The project was designed by LG, RJ, RC, FdV and TJ who developed the study protocol. Data were collected by LG and TJ. Data were analysed by CF

and TJ and discussed with RJ, LG. The first draft of the paper was written by CF, LG and TJ. All authors have edited and reviewed the manuscript for intellectual content.

Patient consent form: NA

Data Sharing Statement: At the end of the project anonymised data will be added to the University of Bristol Data Repository (data.bris) and will be shared under a restricted access agreement upon reasonable request.

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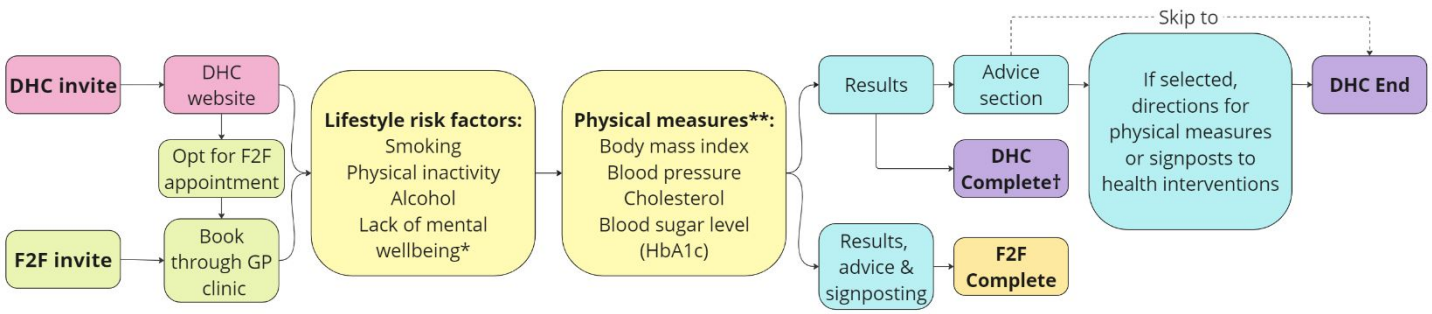
Figure 1: Flow diagram of DHC and F2F Health Checks



*Only included in Digital Health Check
**For Digital Health Check if values of physical measures are known from last 6-months they are inputted here, if not a population average it used. For face-to-face, physical measures can be taken either during appointment or at a follow-up appointment.
†A complete DHC is interpreted as reaching the results page with or without physical measures

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Supplementary Table 1: SRQR Checklist

Standards for Reporting Qualitative Research (SRQR): a synthesis of recommendations

All topics and numbers of this checklist are directly cited from Table 1 in: O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. Acad Med. 2014;89(9):1245-1251.

	Topic	Part of manuscript information can be found	Page numbers*
1	Title	Title	1
2	Abstract	Abstract	2
3	Problem formulation	Introduction	4-6
4	Purpose or research question	Introduction	6
5	Qualitative approach and research paradigm	Methods	9
6	Researcher characteristics and reflexivity	Methods	9
7	Context	Methods	7
8	Sampling strategy	Methods	7
9	Ethical issues pertaining to human subjects	NA	
10	Data collection methods	Methods	7
11	Data collection instruments and technologies	Methods	8
12	Units of study	Results	10-16
13	Data processing	Methods	9
14	Data analysis	Methods	9
15	Techniques to enhance trustworthiness	NA	

16	Synthesis and interpretation	Results	10-16
17	Links to empirical data	Results	10-16
18	Integration with prior work, implications, transferability, and contribution(s) to the field	Discussion	16-19
19	Limitations	Strengths and limitations	19
20	Conflicts of interest	Competing interests	20
21	Funding	Funding	20

*All page numbers refer to pages in the submitted manuscript file

Supplementary Materials - Interview Schedule for Service Users

Patient experience of the Southwark NHS Health Check service – interview schedule

Thank you for agreeing to take part in this project. As you'll have read in the information document, we are interested in your experience and views of the new Health Check service in Southwark. So, in this call, I'll ask you some questions about this – it does not matter if you did not complete a Health Check and there are no right or wrong answers, we're just interested in your opinions. I'll record what is said in this call so that it can be typed up later, but any information that could identify you, such as names of people or places, will be removed. If at any time during the call you would like to stop, just let me know, and you do not have to answer any questions that you do not feel comfortable with.

Before we begin, do you have any questions for me?

[Start recorder]

To start, can you tell me if you completed a Health Check, either online or at the GP practice?

[If yes – go to page 2]

[If no]

Can you remember receiving an invitation for a Health Check?

[If yes] Did you receive an text message or letter invitation? How would you prefer to receive an invitation?

What did you think when you received this invitation?

Did you receive any reminders? (Text or letter?) And what did you think of these?

Did you try to book a Health Check? Why/why not?

[If booked but not completed] What stopped you from completing/attending the Health Check?

[If no] The Health Checks aim to identify people who are at higher risk of developing long term health problems so that they can be offered help to lower their risk, for example, support with becoming more physically active or quitting smoking, or being prescribed medication. Is that something that you would be interested in?

How would you like to receive an invitation to a Health Check (text/letter)?

For those who did complete a Health Check]

What made you want a Health Check?

Did you choose the online Health Check or a face-to-face one at your GP practice?

Why did you choose this option?

Tell me about your experience of your Health Check, from booking/logging on to getting the results.

[F2F prompts] Booking appointment – convenient time? Waiting?

Consultation – assessments completed? Rapport with GP/nurse?

Results – in appointment or later? Follow up advice – able to ask questions?

[DHC prompts] Navigating site – any difficulties? Were the questions easy to answer/understandable?

Did they book a physical assessment? Tell me about this (booking, place, consultation)

Results – how received? Follow-up advice – able to ask questions?

Did your Health Check prompt you to make any changes or look for more information on your health?

[If yes] What did you look into/changes have you tried? (e.g., PA, diet, smoking, medication)

How are you getting on with [the behaviour change]?

Would you recommend that a family member or friend of a similar age to you had a health check if invited?

If yes or no probe why

Finally, is there anything that would make the Health Check service better for you, either in terms of how it was conducted or what happened afterwards?

That's all my questions, is there anything else you would like to add?

Thank them for their time and stop recorder.

Supplementary Materials - Interview Schedule for HCPs

HCP experience of the Southwark NHS Health Check service – interview schedule

Thank you for agreeing to take part in this project. As you'll have read in the information document, we are interested in your experience and views of the new Health Check service in Southwark. So, in this call, I'll ask you some questions about these – there are no right or wrong answers, we're just interested in your opinions. I'll record what is said in this call so that it can be typed up later, but any information that could identify you, such as names of people or places, will be removed. If at any time during the call you would like to stop, just let me know, and you do not have to answer any questions that you do not feel comfortable with.

Before we begin, do you have any questions for me?

[Start recorder]

To start, can you tell me how long you have been a practice nurse/healthcare assistant/practice manager?

> How much experience would you say you have with conducting Health Checks? (N.B. they started in 2009)

Can you tell me how you conduct the standard face-to-face Health Check appointments?

> What preparation, if any, would you do before the appointments?
>
> [*for nurses/HCAs*] How do you deliver advice/information to patients following the assessments? (signposting/leaflets, how long does this take?)
>
> Following the appointment, what extra tasks are involved for you or your colleagues? (e.g., to record results, organise follow-ups)

And now please can you tell me how you have found the addition of the digital Health Checks to the service?

> What work is involved for you and your colleagues when patients choose to complete a Health Check online?
>
> Has there been an impact on numbers of patients seen in person for Health Checks?
>
> [*for nurses/HCAs*] How have you found seeing people who have been identified as high risk after they have completed an online Health Check, in comparison to seeing them for the full Health Check?
>
> > Do you have all the information you need from the digital results or is extra questioning needed?

What, if anything, do you consider to be the benefits of providing digital as well as face-to-face Health Checks?

And what, if anything, are the risks?

Are there any improvements or changes that you would like to see made to the Health Check service?

Overall, do you think the addition of digital Health Checks to the service is a good idea/should be rolled out further?

Are there any other comments that you would like to make about health checks, in person or face to face?

That's all my questions, is there anything else you would like to add?

Thank them for their time and stop recorder.

Supplementary Table 2 – Revised Thematic Framework (Service Users)

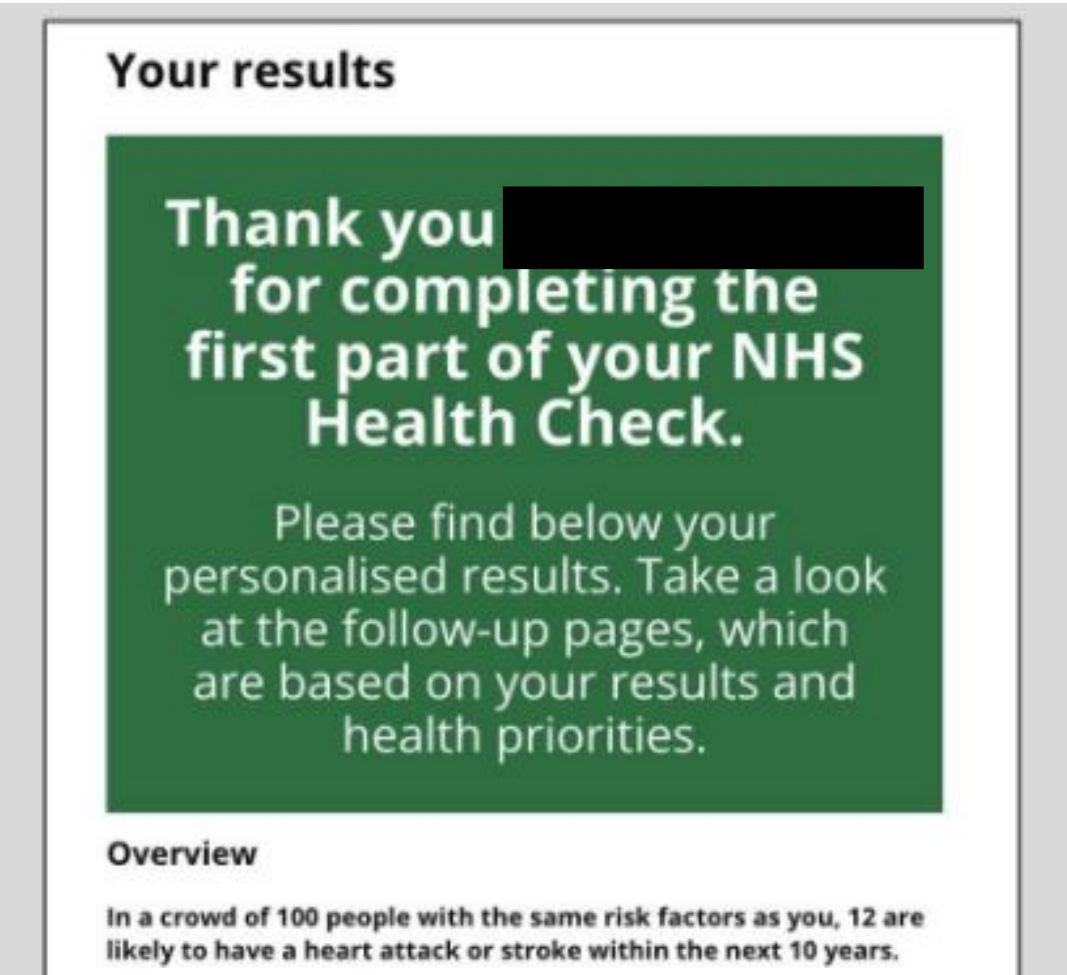
Theme	Sub-themes
Service user demographics	Age Gender Ethnicity Health Check type (digital/F2F/none) Education level Employment status
Invitation and booking	Understanding of the Health Check (awareness, what it is for etc) Invite method (text, letter etc) (and initial response to this, preference) Reminders? Choice of F2F/digital (option?/reasons for choosing) Booking process for F2F (ease, challenges etc) Starting digital Health Check (timing, ease of process etc) Other
Motivation	Perceived health Understand more about health Previous medical background Personal responsibility Prevention NHS cares (the organisation is looking after me etc) Other
F2F Health Check experience	Questions during Health Check Person completing Health Check (profession, manner) Physical tests? (yes/no/what) Timing and communication of results Asking questions

	Advice given (services, signposting etc) Benefits of F2F Health Check Other
DHC experience	Website (understanding/navigation/ease of use etc) Benefits (convenience, personality) Digital age Physical tests (any, how/where these happened etc) Barriers/problems (digital technology; doing tests, asking questions, conflicting advice etc) Timing and communication of results Advice given (referrals, services etc) Other
Behaviour change	Changes made (what, why, include services attended) Maintenance If none, why Impact of changes Other
General	Recommend Health Check (and why) Improvements to Health Check (digital and F2F) Preference for digital/standard (why, belief that everything going online etc) Other

Supplementary Table 3 Revised Thematic Framework (HCPs)

Theme	Sub-themes
Experience	Nurse/role experience (years etc) Experience with Health Check previous (training, confidence) Other
Conducting F2F Health Checks	Prepare before (and experience/opinions of this) Running the health check (general) Giving advice (signposting, delivering it, experience of it, time etc) Admin after (and experience/opinions of this) Other
Digital Health Checks	Understanding of them (awareness etc) Additional work (pre, post, follow up?) Increase in DHC attendees? (and opinions on this) DHC vs standard for high risk people (experience of this, does it work, benefits, negatives etc) Benefits of DHC (choice, convenience, workload etc) Risks of DHC (honesty, tech issues, miscommunication, results) Health Check improvements? DHC rollout opinion Other

Supplementary Materials: Example of the DHC results page– Page 1



Your results

Thank you [redacted] for completing the first part of your NHS Health Check.

Please find below your personalised results. Take a look at the follow-up pages, which are based on your results and health priorities.

Overview

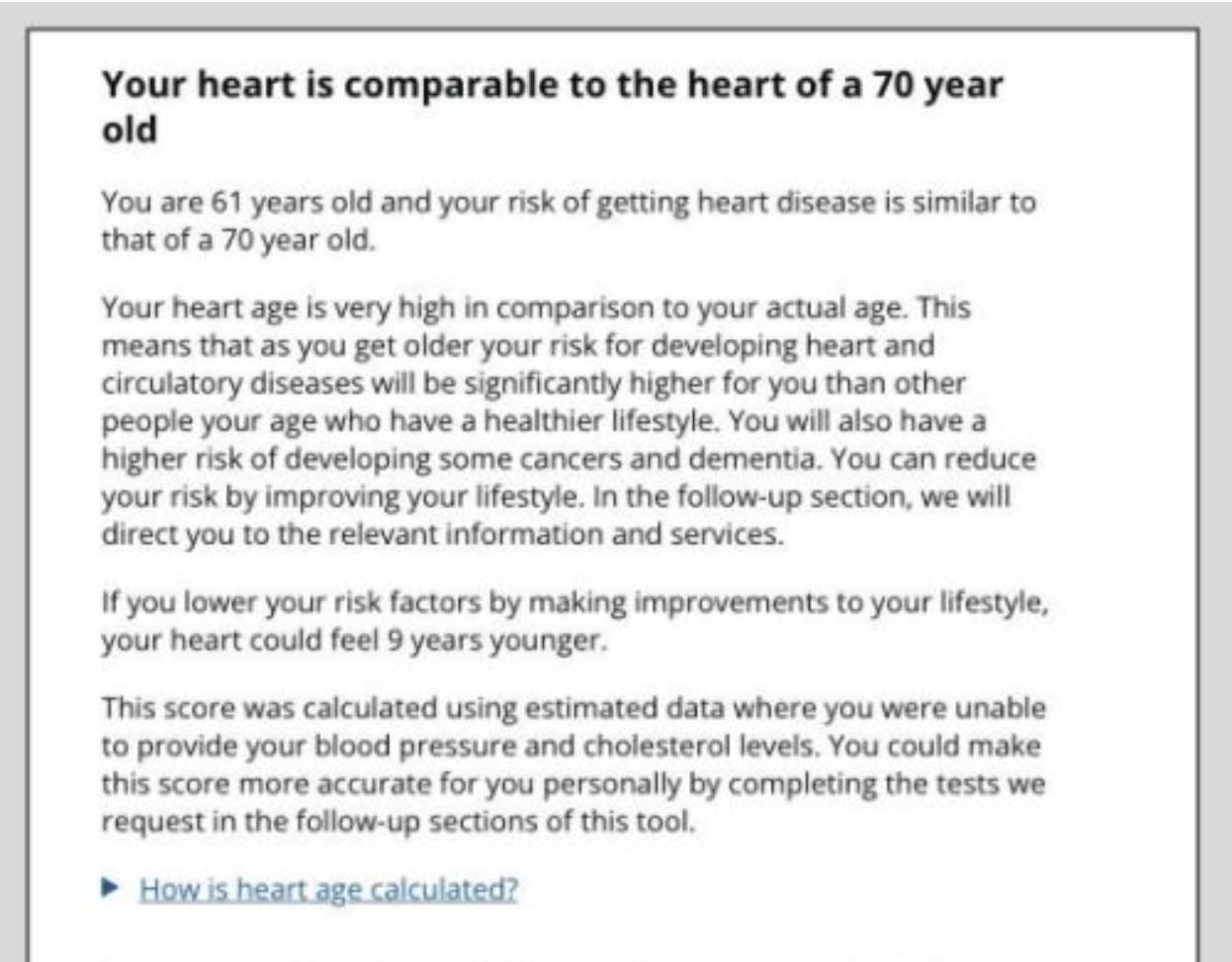
In a crowd of 100 people with the same risk factors as you, 12 are likely to have a heart attack or stroke within the next 10 years.

In other words, you have an 12% chance of having a heart attack or stroke within the next 10 years.

You have a medium risk of developing heart disease in the next 10 years. Please contact your GP clinic for a non-urgent discussion of your results and to access additional support. Your risk of getting heart and circulatory disease will increase as you get older. Your current lifestyle choices put you at high risk of developing conditions such as heart disease and cancer during your lifetime. Your risk of getting heart disease will increase as you get older, so the actions you take now to live a healthier lifestyle will impact your future health.

This score was calculated using estimated data where you were unable to provide your blood pressure and cholesterol levels. You could make this score more accurate for you personally by completing the tests we

Supplementary Materials: Example of the DHC results page – Page 2



Your heart is comparable to the heart of a 70 year old

You are 61 years old and your risk of getting heart disease is similar to that of a 70 year old.

Your heart age is very high in comparison to your actual age. This means that as you get older your risk for developing heart and circulatory diseases will be significantly higher for you than other people your age who have a healthier lifestyle. You will also have a higher risk of developing some cancers and dementia. You can reduce your risk by improving your lifestyle. In the follow-up section, we will direct you to the relevant information and services.

If you lower your risk factors by making improvements to your lifestyle, your heart could feel 9 years younger.

This score was calculated using estimated data where you were unable to provide your blood pressure and cholesterol levels. You could make this score more accurate for you personally by completing the tests we request in the follow-up sections of this tool.

▶ How is heart age calculated?

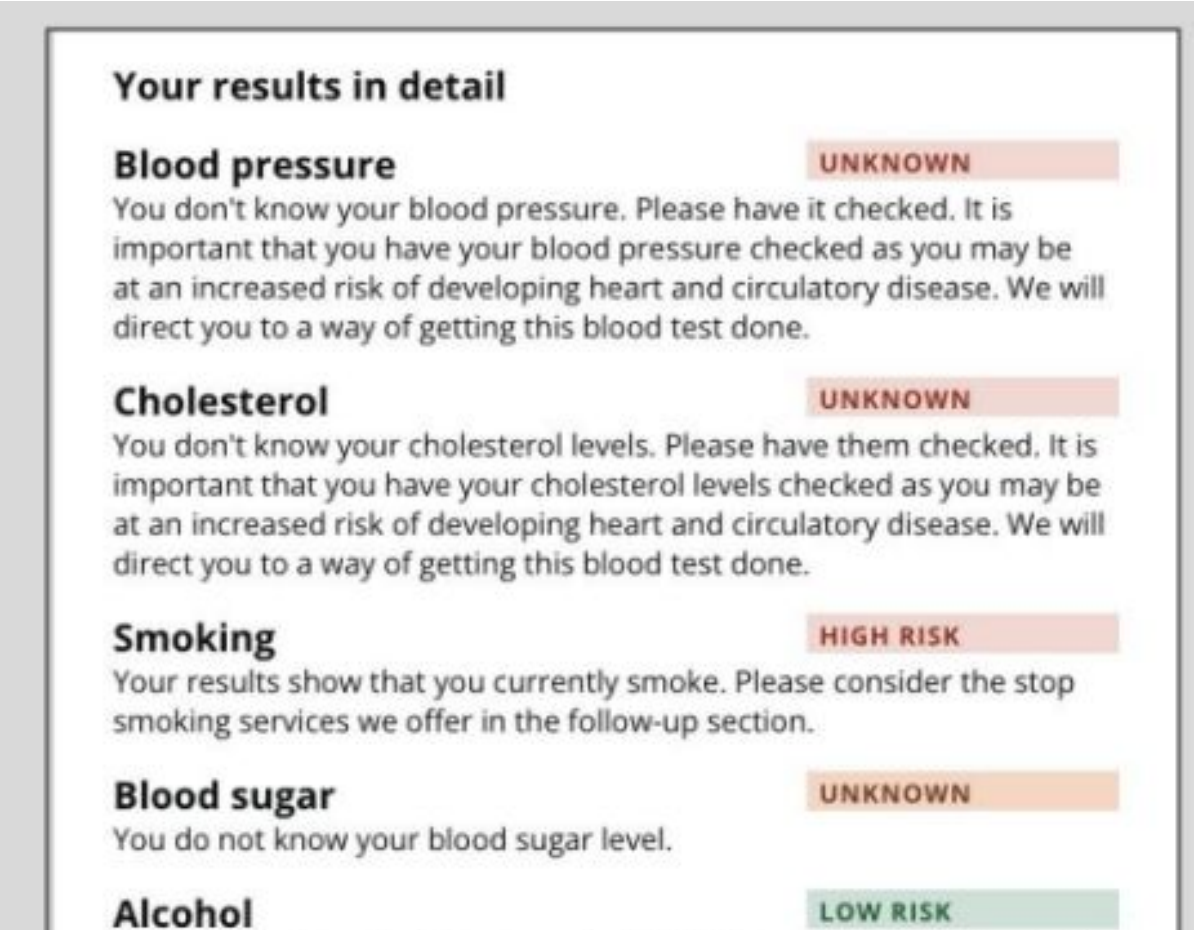
You are at low risk of developing Type 2 diabetes

In a crowd of 100 people with the same risk factors as you, 5 are likely to develop Type 2 diabetes within the next 10 years.

In other words, you have a 5% chance of developing Type 2 diabetes within the next 10 years.

Everyone has some level of risk for developing Type 2 diabetes. Some risk factors cannot be controlled, such as your age or ethnicity. Other risk factors, such as your weight and physical activity levels, can be changed, which is why maintaining a healthy lifestyle is important

Supplementary Materials: Example of the DHC results page– Page 3



Your results in detail

Blood pressure — UNKNOWN

You don't know your blood pressure. Please have it checked. It is important that you have your blood pressure checked as you may be at an increased risk of developing heart and circulatory disease. We will direct you to a way of getting this blood test done.

Cholesterol — UNKNOWN

You don't know your cholesterol levels. Please have them checked. It is important that you have your cholesterol levels checked as you may be at an increased risk of developing heart and circulatory disease. We will direct you to a way of getting this blood test done.

Smoking — HIGH RISK

Your results show that you currently smoke. Please consider the stop smoking services we offer in the follow-up section.

Blood sugar — UNKNOWN

You do not know your blood sugar level.

Alcohol — LOW RISK

Your results show that the amount of alcohol you drink is at a low-risk level. It's important to keep your alcohol consumption as low as possible.

Weight — LOW RISK

Your results show that you are a healthy weight.

Diabetes — LOW RISK

Your results show that you are at a low risk of developing diabetes.

Physical activity — LOW RISK

Your results show that you are physically active. Well done!

BMJ Open

Exploring service users' and Healthcare Professionals' experience of digital and face-to-face Health Checks in England: A qualitative study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2024-090492.R1
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Exploring service users' and Healthcare Professionals' experience of digital and face-to-face Health Checks in England: A qualitative study

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Abstract

Introduction: In England, eligible adults aged 40 to 74 years of age are invited to attend a face-to-face (F2F) NHS Health Check appointment every 5 years. A digital version of the Health Check was introduced by a local authority as an alternative for those hesitant or less able to attend a face-to-face appointment.

Objectives: This qualitative study aimed to understand service users' and Healthcare Professionals' (HCPs) experiences and opinions of F2F Health Checks and digital Health Checks (DHC), identify barriers and facilitators of the face-to-face and digital Health Check pathways, and recommend potential improvements.

Design: A qualitative study, involving interviews with a purposive sample of participants.

Participants and setting: A purposive sample of 30 service users and 8 HCPs were recruited by an external market service company, in the London Borough of Southwark.

Methods: Semi-structured interviews were conducted which included questions on understanding why service users chose a type of Health Check, their experiences of the service and suggestions for improvement. HCP interviews covered HCP experiences of providing both services, including any impact on workload. The Framework method of thematic analysis was used to analyse the data.

Results: Service users identified benefits for the DHC service including its convenience, ease of use and access. Both service users and HCPs acknowledged the limitations of the DHC including self-reporting physical measures (such as blood pressure and cholesterol levels) or difficulties going elsewhere to measure them, and the lack of opportunity to discuss health with a professional. Service users and HCPs both noted the lack of available appointments and time constraints as barriers associated with the F2F service.

Conclusions: Both HCPs and service users perceive that in its current form, the DHC has benefits and barriers to its use. If these are adequately addressed, the DHC may help to address the demand and pressure within GP clinics.

Registration: This study was registered on the Open Science Framework: https://osf.io/ y87zt

Article Summary

Strengths and limitations of this study

- A strength of the study is the focus on service users' real experience of the Digital Health Check and the Face-to-face Health Check.
- Semi-structured qualitative interviews used a topic guide to ensure data collection was rigorous and robust.
- Data were collected in the London Borough of Southwark that was examining the use of Digital Health Check as a form of innovation in NHS Health Check provision.
- A limitation of this study was that only one Healthcare Professional was aware of and had experience of the Digital Health Check service.
- The majority of service users interviewed were of White ethnicity, which limits the generalisability of the findings.

Introduction

Integrating digital technology into healthcare is key to improving efficiency and equity of access[1]. Since 2015, the UK National Health Service (NHS) has prioritized digital-first primary care[2], enabling remote consultations and symptom checks[3]. The 2019 NHS Long Term Plan aimed to provide digital access to primary care by 2023/24[4], with GP practices mandated to offer online consultations by 2021[5].

The integration of digital technologies in healthcare is not new, but their efficacy alongside standard care remains under-researched. A 2019 evidence review for NHS England highlighted benefits of offering alternatives to in-person care, such as greater convenience, improved access for those with mobility issues, and reduced stigma through increased privacy[6]. Since the COVID-19 pandemic, online tools have become widely adopted for tasks like prescription requests, scheduling, and consultations[7]. With rising demand for appointments and a shortage of healthcare practitioners (HCPs)[8], there is a clear need for a hybrid model combining digital and face-to-face care. It is estimated that 40% of appointments at a GP clinic could be either transferred to other locations or completed by a HCP who is not a GP[9]. Using a model of care that utilises both digital and standard care approaches may allow for greater flexibility[10] and quicker navigation through the care system as well as alleviate pressure in GP practices.

The 2019 NHS review found that digital and remote care is primarily used by younger, female, individuals with English as their first language, higher incomes and education levels[6], raising concerns about increased health inequalities for older adults and disadvantaged groups. Clinicians worry that remote delivery may miss important cues and symptoms, leading to more 'safety-netting' practices like unnecessary antibiotic prescribing[6]. While digital tools may ease pressure on primary care, improve flexibility, and offer economic benefits[6], their impact on staff workload is unclear. Barriers include poor infrastructure and lack of staff training[6,11,12], which is essential for accuracy, confidence, and adoption. Understanding benefits and challenges from both patient and staff perspectives is vital for effective implementation.

This paper reports the evaluation of a digital version of the NHS Health Check, developed by Southwark Council, a local authority in the southeast of England. The NHS Health Check programme, commissioned by local authorities, aims to identify and manage early signs of cardiovascular disease, type 2 diabetes, kidney disease, stroke, and dementia every five years

for adults aged 40–74[13]. Traditionally conducted face-to-face (F2F) in GP practices, the Health Check assesses seven key risk factors of non-communicable diseases: physical inactivity, excess weight, smoking, alcohol consumption, high blood pressure, high cholesterol, and impaired glucose processing. It offers follow-up clinical assessments and behavioural support to reduce disease risk and address health inequalities. Despite mixed reviews on the overall effectiveness of health checks, evidence suggests they improve detection of risk factors[13]. Health Checks are standardised to ensure the quality and safety of the programme[14] but local authorities do have some flexibility over how they are delivered, for example, prioritising invitations to 'high risk' individuals.

The digital version of the NHS Health Check (DHC) replicates the F2F process as an online survey where users answer health and behaviour-related questions. Upon completion, they receive immediate feedback, with results sent to their GP. If concerning risk factors are identified, users are advised to schedule a F2F appointment. Users can also select health priorities and receive personalised advice, such as measuring physical measures (e.g., getting their blood pressure, cholesterol or blood sugar measured at either a pharmacy, GP clinic, leisure centre or an at home blood test) or accessing support for adopting healthier behaviours. The DHC process may present a more acceptable alternative that still enables the delivery of preventive advice and the identification of early-stage disease. For a full breakdown of the DHC service please see Salway and colleagues 2024[15]. See Figure 1 for a flow diagram of the digital and the F2F Health Checks.

This qualitative study aimed to understand service users' and Healthcare Professionals experiences and opinions of F2F Health Checks and DHCs, identify barriers and facilitators of the F2F and DHC pathways, and recommend potential improvements.

Figure 1: Flow diagram of DHC and F2F Health Checks

[Insert Figure 1 here]

Methods

Study design

A qualitative design was adopted for this research using one-to-one semi-structured interviews with a purposive sample of service users (individuals who had been invited to either F2F or DHC Health Check) and relevant Healthcare Professionals (HCPs) from the

target area identified by GP practice managers. This qualitative study was part of a wider evaluation study to compare the uptake of NHS Health Checks between those invited to the DHC and those invited to the F2F Health Check. Detailed methods for the evaluation[16] and a full service evaluation of the uptake and effectiveness of the DHC pathway are reported elsewhere[15]. Original project protocol is presented in the Supplementary Materials section. This project has received ethical approval from the East Midlands (Nottingham 1) NHS Research Ethics Committee (ref: 22/EM/0280). The Standards for Reporting Qualitative Research (SRQR) were used to guide reporting[17]. Supplementary Table 1 presents the checklist.

Participant recruitment

The setting for the evaluation study was the London Borough of Southwark in England, where invitations to complete a Health Check were sent out to 9000 eligible service users randomly selected from EMIS, the electronic patient health record system in North Southwark. Service users were invited to either the F2F Health Check (n=3000) or the DHC (n=6000). Service users who received an invite to the DHC were able to book a F2F Health Check at their GP practice if they preferred, service users who received the F2F Health Check invite were not given the option to complete the DHC. Overall, 20% of patients completed a Health Check. Of those assigned to DHC, 21% completed the DHC Health Check, and a further 3% chose to complete a F2F Health Check, compared to 11% of those assigned to F2F who completed a F2F Health Check. Those who completed any type of Health Check included higher proportions of women, those with a family history of CVD and those from less deprived areas. Those who completed a DHC compared to a F2F health check included more men, those from white ethnicity and those with low diabetes risk and fewer with overweight or obesity. A full breakdown of demographic information of those involved in the service evaluation is reported elsewhere[15].

For the current qualitative study, the service user participant group was recruited using the market research company, Leftfield. An invitation was sent by an external company (iPlato) via SMS to all service users who were invited to a Health Check (both digital and F2F) between January and March 2023. Leftfield screened responding service users to recruit a sample of participants to represent a range across the following criteria: Health Check completion status (i.e., completion of F2F Health Check, the DHC or did not complete a Health Check), gender, age, ethnic groups, and area of residence. Selected participants were

sent an electronic consent form. When consent had been given, telephone/online interviews between participants and a researcher were organised.

All GP practices in the target area were sent invitations for HCPs to take part in an interview. Invitations were sent on behalf of the research team by the GP Federation to GP practice managers, who were asked to forward the invitation to relevant HCPs. The invitation directed the HCP to an online form where a full participant information sheet was available to read and download before completing a consent form, a demographic survey and a contact details form. The research team then contacted the HCP to arrange a suitable time for an interview. The study aimed to recruit 30 service users and 10 HCPs.

Procedure

All interviews took place via telephone or videocall, according to participant preference and were conducted by experienced qualitative researchers (LG and TJ). The interviews were semi-structured, which allowed the researcher to adapt the questioning according to the participant's earlier responses and prompt for further information if relevant novel issues were raised[18]. Participants completed an online consent form prior to the interview, but the researcher checked their understanding of the interview procedure and how their data would be used at the start of their meeting. Interviews lasted approximately 30 minutes and were audio recorded using an encrypted digital recorder then fully transcribed verbatim. Participants were offered a £50 Love2Shop gift voucher for taking part.

Materials

Interview schedules for service user and HCP interviews were co-developed by the whole project team, with input from the Public and Patient Involvement (PPI) group (see 'Patient and Public Involvement'). Interview schedules were created based on the intervention logic model and study research aims. Briefly, service user interviews sought to understand why service users chose either a F2F Health Check or Digital Health Check or neither, their experience of the service and in what ways the service could be improved. Interviews with HCPs covered their experience of providing the combined Health Check service, including any impact on workload for them and their colleagues, any concerns or perceived benefits of the service, and any suggestions for improvements. The research team revised the schedules based on the progress of early interviews (e.g., including more information about the DHC

for HCPs who were not aware of them). The final interview schedules for both service users and HCPs are presented in the Supplementary Materials section (Supplemental File 3 and 4).

Patient and Public Involvement

When designing this research, we consulted a PPI group, recruited from the local borough's Healthwatch network and comprising eight residents aged between 40 and 59 years. The majority of the group was female and of Black ethnicity. Through an online meeting the group provided feedback and suggestions on the proposed protocol and research materials. Two members of the group joined the project steering committee, to provide ongoing advice and oversight from a service user perspective.

Analysis

Interview transcripts were analysed using the Framework method of thematic analysis[18,19]. Separate analyses were conducted for service user and HCP interviews. After reading all transcripts, draft analytical frameworks for HCPs and service users were developed by CF and TJ including themes and sub-themes that were driven by the data but were also relevant to the research objectives. In the Framework method a qualitative code book is referred to as an analytical framework. This is created when the researchers have coded the first few transcripts independently and then meet to compare labels and agree on a set of codes to apply to all subsequent transcripts. These codes can be grouped into categories and are clearly defined[19] **.** The draft analytical frameworks were used to code a sub-sample of the transcripts by CF and TJ, then they were reviewed and amended as necessary to ensure the frameworks captured all the pertinent information for this study. The analytical frameworks were entered in NVivo software[20] and applied to all transcripts. Analysis was an iterative process – the team regularly reviewed and revised the frameworks to ensure it remained a good 'fit' for the data. The final analytical frameworks are available in the Supplementary Materials (Supplemental File 5 and 6). When all transcripts were coded a framework matrix was developed with columns to represent each sub-theme and rows for each participant. Cells were populated with quotations, data summaries and the researcher's analytic notes. This 'charting' method created an accessible dataset through which themes and subthemes could be explored by respondent type. A summary of the data under each sub-theme was developed to inform the next stage of the analysis, moving up the analytical hierarchy to explore patterns and associations between themes in the data[21,22].

Results

Thirty service users and eight HCPs completed semi-structured interviews. Table 1 describes the sample characteristics. A summary of the main themes and sub-themes for both service user and HCP interviews are described in Table 2.

Table 1: Sample Characteristics

	Service user sample n=30	HCP sample n=8
Gender*		
Male	12	1
Female	17	7
Age group		
Under 60 years	9	8
60+ years	21	0
Ethnicity		
White ethnicity	21	4
Other ethnicity (Black African, Black other, Asian, Other)	9	4
Health Check type attended (service users)		
Completed DHC	15	
Completed F2F	11	
Unsure	1	
Completed None	5	
DHC experience (HCPs)		1

*Excluding other, refused or not reported.

Table 2: Summary of Themes and Sub-themes for Service Users and HCP Interviews

Themes	Sub-themes Service Users	Sub-themes HCPs
F2F Barriers	Challenging booking process Lack of available appointments	Time constraints during appointments
F2F Benefits	Ability to discuss health in person	Ability to discuss health in person
DHC Barriers	Lack of health discussions Can't add individual context to lifestyle question responses Physical measures (mixed responses) Can't discuss results DHC advice too general	Lack of health discussions Accuracy of responses and measures DHC follow up
DHC Benefits	Easy to use website Convenience Avoid GP clinic Health ownership	Awareness of health checks Convenience

	Remote benefits (privacy etc)

The findings are presented according to the benefits and barriers of both types of Health Checks (DHC and F2F). Anonymised quotations are included for service users (SU) and HCPs (HCP). Service users' Health Check status is described (F2F, DHC, both or none) and whether they have experience with DHCs for HCPs.

1. Benefits of F2F Health Check

The majority of the benefits identified by both HCPs and service users for the F2F Health Check were items that were identified as barriers for the DHC, described below, including being able to discuss health with a trained professional, adding context and individual factors to questionnaire responses, receiving immediate feedback and answers and scheduling follow-ups immediately if necessary.

2. Barriers of F2F Health Check

The most prominent barrier to the completion of F2F Health Checks for service users was the difficulty making an appointment and long wait-times in busy GP practices.

"What bothered me is going to the GP physically, queuing there for I don't know how long. Then, even if you have a slot where you should be, they always overflow time wise. And my issue is I don't have time. With three kids, working full time, I don't have… Sorry, I can't spare a minute left or right." (SU12, DHC)

HCPs also expressed that the lack of available appointments was a major barrier to F2F Health Checks. In addition to this, HCPs perceived the time they have allocated for a F2F Health Check (according to interview findings some HCPs noted around 15 to 30 minutes, depending on the practice) is sometimes not enough time to complete the lifestyle questions (i.e., smoking, physical activity and risk factors), the physical measures (height, weight, cholesterol, blood pressure and diabetes check), and then go through the results and the follow-up advice with patients. HCPs report that Health Checks vary by person, and for some patients they need to go over the allocated time in order to adequately perform the service. They will also email the follow-up advice and services to patients when they do not have the information at hand.

"I have to say that we're getting less time to do them. So, it has to be quite short in terms of- So, say if somebody came with a list of issues, you would have to signpost them and deal with that. But you can't- Unfortunately, I feel like in the old days, I think we had half an hour. Then they cut it to 20 minutes." (HCP04, No DHC experience)

3. Benefits of the DHC

Service users identified many benefits of the DHC. Notably, those who completed a DHC were able to identify more benefits of the service than those who had not. However, those who completed a F2F Health Check felt that the inclusion of an online option would improve the service.

One of the main benefits mentioned was that the DHC was straightforward and easy to use. Service users noted that it matched the presentation of other NHS online surveys and forms which was helpful as it was recognisable. Service users noted all questions in the survey were easy to understand and were easy to understand.

The DHC was also convenient, as service users did not need to arrange an appointment with their GP practice. Most identified this as a clear benefit. It could be completed any time of day and service users could take their time going through it. It was also noted that the text message link was easy to access for service users.

"It's convenience online, at least I can do it from the comfort of my home." (SU05, DHC)

Some service users mentioned that we are in a '*digital age'* and that the DHC adapts to that and gives people more options. The risk of contracting COVID-19 meant some service users view not having to attend the GP clinic as a key benefit of the DHC service. Additionally, as GP clinics are currently experiencing severe pressure to accommodate appointments, having the option of doing things online removed service users from experiencing the frustration of making an appointment and partly alleviated the pressures within GP clinics and the NHS. Further, as service users were doing the survey independently, it led to them taking ownership of their health and understanding it more, giving service users an active instead of passive role in this process.

"... if I have to do something for myself then I'm actually more aware of what I'm doing and why I'm doing it rather than just go to the doctors and then forget about it." (SU26, F2F)

Other notable benefits reported by service users included that the DHC was helpful for those who are introverted as they do not need to talk to other people about sensitive topics. The DHC was helpful if there is a language barrier as service users can take their time with the survey and look up anything they are unsure of. Finally, some users noted that there is no perceived judgement with the DHC as there might be when completing the lifestyle questions with a HCP. Service users felt they were not 'confessing' anything.

The main benefits of the DHC identified by HCPs included that it was another way to raise awareness of Health Checks in general. When individuals receive an invite to the DHC they can choose to do it online, or they may choose the option to do it the standard way in a GP clinic. Regardless, it increases awareness and provides another method of completing the Health Checks.

4. Barriers of the DHC

There was a range of responses regarding barriers of the DHC from both service user and HCP perspectives. Half of HCPs interviewed had only recently heard of the DHC; the remaining half were not aware of the DHC. One HCP had experience of a patient who had used the DHC then returned to the clinic for follow ups. Once the interviewer mentioned the DHC, most staff members were interested to know more about it and how the physical tests were measured. Half of the service users interviewed had experience of the DHC.

A recurring theme in the data was that service users could not communicate with a health professional immediately during the DHC. This was seen as a concern for a range of reasons, for example; inability to ask questions and discuss health issues, inability to request additional assessments, inability to add context to answers in the health assessment; difficulty scheduling follow up appointments; and lack of opportunity for HCPs to detect other health issues such as mental health symptoms, (for clarity; the F2F Health Check does not test for symptoms of ill mental health or provide additional tests, however service users have the potential to request additional tests or discuss health concerns during the F2F appointment, which is not possible during the DHC and would need to be addressed as an additional option following on from the digital service).

"Well, it's a completely different experience when you see a doctor in person than online. Online you just follow what they offer you, but in person you can ask questions." (SU07, F2F)

Similarly, many of the HCPs expressed concern at the lack of opportunity to assess the service users themselves and give them positive feedback on lifestyle changes.

"Yes, we still say, "So, this is good. It could be because you probably exercise a lot, or if someone is slim but admits to bad diet, can warn them that this might be precursor to high cholesterol. Would this happen online?" (HCP01, No DHC experience)

Another barrier to care from the DHC was the forced response nature of the online survey. Not being able to justify answers was frustrating for some service users. Similarly, service users found getting their results online worrying as they do not have the opportunity to discuss their results with someone immediately, to ensure understanding. Examples of results given from the DHC are displayed in the Supplementary Materials section (Supplemental File 7).

"I found it quite general and a bit anxiety-inducing, because it did come back with quite harsh results. It categorised me as someone who will have premature heart problems or likely to have heart problems or other issues that surprised me. Yes. I don't think are justified with my general lifestyle." (SU28, Both)

"So I'm 75, so if I've got the heart of an 85-year-old, does that mean I'm totally knackered already, I better watch out? I don't know what it meant." (SU18, DHC)

Some HCPs were unsure if the data entered by service users into the DHC would be accurate, due to lack of understanding, human error or even potentially dishonest reports. HCPs have no way of verifying the information when it is completed remotely. Further, HCPs were not confident in the accuracy of the physical measures if completed by service users at home rather than professionals.

"You can kind of tell when somebody is not being wholly honest in an appointment. You can't tell that from someone inputting information."(HCP02, No DHC experience)

The physical measures were also perceived as a barrier for HCPs and there were different attitudes towards them from the service users' perspectives. In the DHC service users are asked if they know their blood pressure, blood sugar, height, weight and cholesterol levels and then they are required to input the measurements. If they do not know their measurements, they can proceed, and their risk scores are calculated from national average values. This was seen as a barrier to completing the DHC survey as some service users interpreted the initial question as meaning they would not be able to finish the survey as they

did not know their measurements, thus leading to early drop-off and failure to finish the survey. Most service users did not see the physical assessments themselves (i.e., doing the tests at home via postal kit, at a leisure centre, pharmacy or GP clinic) as a barrier to the DHC (see quotes below). However, in this sample only one service user chose to do the tests at home using a kit and postal service; they found it very difficult to complete as a high degree of dexterity was required. Other service users were asked their opinion on using the kits and some said it would not be an issue but perceived that it could be for others. One service user reported that they were directed to buy a device to measure blood pressure (possibly indicating that the web link they were sent to order a blood test kit misdirected them or that the user misunderstood the instructions) and mentioned going to a pharmacy to do the tests costs money, (potentially referring to travel costs as the actual test is free for the user), which was a barrier. Physical measures present an additional step that service users need to take in order to fully complete a Health Check following the DHC survey, which would be completed as part of the F2F Health Check.

"Oh wow, okay, that's a new concept. I've never ever taken my own blood and taken it to the wherever. I've always gone to the hospital to have my blood done. I've never ever, oh my goodness. Alright, but I wouldn't do that, I would not go, you know. You would have to send me to get my blood done. I'm not going to take my own blood. (Laughter)" (SU01, None)

"Because we can all do a blood pressure check, we could do a finger prick check, you know, it's not exactly hard to do, do our weight and height, we could do that and send that through and put the stats on our own record. But I understand I would probably be more proactive with using the app and stuff like that. I mean I'm quite okay to be proactive in that way." (SU26, F2F)

HCPs were not convinced that users would fully engage with the DHC process as there are many stages where drop-out could occur (i.e., waiting for blood kit, sending bloods, waiting for results, then follow-up appointments), whereas everything is completed in one appointment in the F2F Health Check, or a follow up scheduled at the initial appointment.

"I feel like people would then just be put off from doing it but if they just know that they can have it all done in the one go, it's just going to take 25 minutes of your time, rather than completing this survey, sending it off... It then takes a couple of weeks, you know."(HCP06, DHC experience)

HCPs also queried whether the DHC would save time, as service users completing the DHC without up-to-date physical measurements, and who want to get these measured, would still be advised to attend the GP clinic/pharmacy/leisure centre. Additionally, those who are identified as 'high risk' would also be advised to schedule a follow-up appointment at a GP clinic. One HCP reported a patient came in to get their bloods taken after completing the DHC, but as a staff member did not understand their results from the DHC, they completed the Health Check again with the patient.

"I feel like it's a good idea, but it could be improved. I think I feel like more… Like I said, I don't know what information is going into the digital Health Check because it's not filtering down to me when they come back to see me for a blood test. No, I mean there're things going onto there but I… You know, they end up with a Q risk, they end up with a Health Check thing, but there's no breakdown of what's been… I don't actually know. They just come up to me and then I end up having to do a full Health Check, basically." (HCP06, DHC experience)

Several service users had issues trying to recall the results of their DHC and were unsure where to locate them. Additionally, if users completed a home blood test (which was conducted by a third party provider commissioned by the local authority) they received their results in an email directly from the provider, this also caused confusion with information received following the DHC. Similarly, if a user completed a physical measure through a separate provider, users were worried the results would not be communicated back to their GP or uploaded to their medical records. Service users who completed the DHC also struggled with the 'medical jargon' included in the report. Many users commented on being unsure how to interpret the results. In contrast, users who attended the F2F Health Check were able to recall and interpret their results. Not being able to take the service user through their results to ensure they understand and know the follow-up steps and what is available to them was a disadvantage of the DHC from the HCP perspective.

Other barriers to the DHC included the behavioural advice given following DHC completion. Many users found the advice was not individualised enough to their personal situation. As an example, the DHC did not give advice on financial help for healthy living to users struggling financially. It must be noted the DHC asks users to highlight perceived barriers to healthy behaviours to give them personalised advice based on this. For example, in terms of financial and access barriers to healthy eating, there are two options individuals can highlight, 'I

cannot afford to eat well' and 'I do not have access to healthy food'. If these are selected, then the individual will be signposted to advice tailored to these barriers (including NHS Eat Well for Less schemes and food access services in the area). Additionally, the advice given at a F2F appointment is similar to the DHC, the difference is it is typically delivered by a HCP with opportunity for discussion with the user. Regardless, users still felt the advice given was too general in the DHC.

Discussion

To our knowledge, this is the first qualitative study exploring HCP and service user experiences and opinions of DHC and F2F Health Checks. This study found similar benefits and barriers to using digital services in more general primary care[6], such as convenience and ease of use of the Health Checks as benefits, and the lack of human contact as a perceived barrier. Service users also noted key barriers to the F2F Health Checks, mainly stemming from lack of available appointments and HCPs noted pressure with completing the Health Check during the allocated time. The DHC may present a potential supplementary option to the standard Health Check system in this area.

A concern identified throughout the interviews was that the NHS is under pressure, evidenced by patients experiencing long waiting times and staff not having adequate time or resources available to conduct the Health Checks appropriately. In the United Kingdom, GPs are experiencing unsustainable workloads[23]. Also adding to the pressures on GP clinics is the lack of adequate staff and resources allocated to the service as the population grows, and increases in patient consultations and as people are living longer with complex health needs[24]. These issues present a considerable source of challenge for all and frustration for both HCPs and patients. The majority of participants interviewed acknowledged these issues and expressed a desire to help to alleviate the pressure. Even participants who were unaware of the DHC suggested that the inclusion of an online option to attempt to target these wait times at GP clinics could be a potential solution. This suggests that both service users and HCPs may be open to the DHC, which may aid with implementation of the service.

There were a range of benefits noted for the DHC service. Participants stated one of the prominent benefits is the convenience. It can be completed at any time and it does not need to be completed in one sitting. This is a direct contrast to the long and frustrating experiences patients and staff alike noted while trying to secure an appointment at a GP clinic. Additionally, service users mentioned that the DHC survey was straightforward and easy to

navigate. No users mentioned any issues with understanding the lifestyle questions making it a viable option to complete the lifestyle questions without the help of a HCP thus relieving pressure on the NHS system.

In its current design, issues arose throughout the DHC particularly with the physical measures, as service users identified these as the first roadblock of the service. If service users do not have their results at hand, they need to organise measurements themselves and return to update their results. The service prompts users to do this, if they select it as a priority, it provides links to book the tests and links that direct them to the page where they can update their results. This begins the patient-driven nature of the DHC that is distinct from the F2F Health Check's more passive approach. Additionally, HCPs identified that there are many steps to completing the DHC beyond simply clicking the link and completing a survey. Service users need to initiate every step and read a report of their results online, whereas with the F2F Health Check usually patients are led through the appointment by the HCP and have their results and follow-up advice explained, if time permits. Service users need to be motivated to properly engage with the DHC, their results and their suggested follow-ups. Motivation and attitudes has been highlighted in previous studies as an important factor for benefiting digital services[25-27]. This suggests that potentially the DHC is suitable for health-conscious, motivated individuals and could be offered alongside F2F Health Checks as an alternative model that suits individuals more. Additionally, DHCs could be targeted to those who potentially would not attend a F2F appointment due to barriers in F2F (such as time constraints, introversion, perceived judgement, language barriers etc) and in turn increase Health Check uptake.

One of the issues identified with the DHC was the lack of human contact with a HCP. Conversely, this was one of the key benefits of the F2F Health Check. This was perceived as a crucial part of the Health Check, as individuals want to be reassured that their health is given the utmost standard of care. This was also seen through the interviews as some service users and HCPs worried that not physically seeing individuals in-person may potentially miss underlying conditions that are not part of the DHC screening. A qualitative study with GPs found one of the key concerns with using digital, artificial intelligence systems with patients was losing the doctor-patient relationship[28]. Effective communication between service users and HCPs is crucial for the provision of care and recovery[29-34]. Many staff and service users mentioned they preferred a F2F appointment when discussing results and advice. A key factor to the successful implementation of technological interventions in healthcare is that it

helps to facilitate discussions with patients[12]. Previous research on digital healthcare, particularly for mental health services where this doctor-patient relationships are vital, found this lack of interaction with HCPs in the digital sphere a big challenge[35-37]. This element of care is absent from the current DHC service.

HCPs and service users both expressed some form of concern surrounding the accuracy of the physical tests if they are completed by someone who is not a HCP. Doing these measures may be considered a high stakes activity that will impact on health results and thus some users indicated they would prefer a professional to do the tests for them. Also involving third party providers for physical tests presented a challenge in collating all updated metrics back into the system for the user. Service users are concerned that this needs to be fed back to the GP, so they can assess the level of risk. This adds to the points made in the previous paragraph about F2F communication being an important factor for patient care, some service users need the reassurance of HCPs to be confident in their results and next steps.

Finally, only one HCP that was interviewed had experience of the DHC, indicating a clear lack of awareness and understanding of the service. All practices involved in the study area were sent interview invitations and would have been expected to be aware of the DHC. This awareness of the program was not seen with the interviewed HCPs, perhaps this indicates poor communication within practices potentially between management and staff. Regardless, this had an impact on the acceptance and trust for the idea of the DHC service among interviewed staff. Further, from the single HCP who was aware of the service, there appeared to be a disconnect between the F2F Health Check patient record system and the DHC system, which led to additional work for the HCP. It is unclear whether this was a failure of the system or a lack of understanding on part of the HCP. The potential disconnect between the F2F Health Check record system and the DHC system was a concern echoed by staff and service users alike. These findings are supported by a systematic review conducted on the facilitators and barriers to implementing technological interventions in healthcare[12]. The review found that if staff perceive the intervention to increase workload, cause disruption and need additional staff members, this acted as a barrier to implementation. Facilitators were factors such as adequate training, pilot testing, links to relevant clinical and patient information, endorsement from senior peers and if the system supported a known organizational challenge[12]. These facilitators should be taken into account in future implementation of DHC programmes.

The strengths of the study are the focus on service users' real experience of the DHC and the F2F Health Check and the provision of new information about innovation in healthcare practice. This study is limited by a smaller number of interviews with HCPs than intended. We faced difficulties recruiting HCPs who had experience of the DHC being used in their practice and who had experience of patients who had completed the DHC. As a result, this may present a limited view of the DHC as other HCPs interviewed expressed their assumptions as opposed to real-life experiences of the service. The majority of service users interviewed were of white ethnicity, which may affect the generalisability of the findings. Finally, the period of time between when the Health Check was undertaken, and the interviews may have presented with difficulty in recalling the experience.

Overall, there is a need for a digital solution to address the demand and pressure within GP clinics. In its current form, the DHC has benefits and barriers to its use according to both HCPs and service users. The DHC appears to be acceptable for lifestyle questions but not for physical tests due to concerns surrounding accuracy, confidence and removing the apparent convenience of the DHC. To improve the implementation of the DHC in the future, the following recommendations have been suggested based on the study findings: communicate problematic results and advice in person, provide an opportunity for discussion; and raise awareness among HCPs of the DHC as a complementary service to the F2F Health Checks and its potential to address the challenges experienced by GP clinics. These recommendations may increase acceptability of the DHC overall and facilitate its implementation in the healthcare system.

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Competing Interests: Two authors (RH and PS), are current and past employees in Southwark local council and were responsible for the Health Check commission (both digital and face-to-face) in the borough of Southwark. All other authors have no competing interests to declare.

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Author contributions: The project was designed by LG, RJ, RC, FdV and TJ who developed the study protocol. Data were collected by LG and TJ. Data were analysed by CF and TJ and discussed with RJ, LG. The first draft of the paper was written by CF, LG and TJ. All authors have edited and reviewed the manuscript for intellectual content. CF is the guarantor.

Patient consent form: NA

Data Sharing Statement: At the end of the project anonymised data will be added to the University of Bristol Data Repository (data.bris) and will be shared under a restricted access agreement upon reasonable request.

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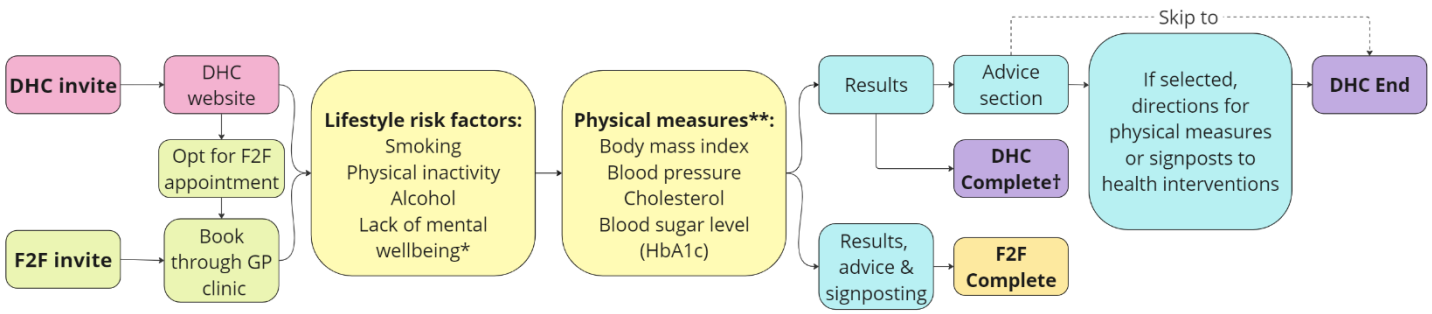
Figure 1 Legend

Figure 1: Flow diagram of DHC and F2F Health Checks

Flow diagram showing overview of Face-to-Face and Digital Health Check pathways. DHC, Digital Health Check; F2F, face-to-face

Figure 1: Flow diagram of DHC and F2F Health Checks



*Only included in Digital Health Check

**For Digital Health Check if values of physical measures are known from last 6-months they are inputted here, if not a population average it used. For face-to-face, physical measures can be taken either during appointment or at a follow-up appointment.

†A complete DHC is interpreted as reaching the results page with or without physical measures

miro

Supplementary Materials 1: SRQR Checklist

Standards for Reporting Qualitative Research (SRQR): a synthesis of recommendations

All topics and numbers of this checklist are directly cited from Table 1 in: O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. Acad Med. 2014;89(9):1245-1251.

	Topic	Part of manuscript information can be found	Page numbers*
1	Title	Title	1
2	Abstract	Abstract	2
3	Problem formulation	Introduction	4-6
4	Purpose or research question	Introduction	6
5	Qualitative approach and research paradigm	Methods	9
6	Researcher characteristics and reflexivity	Methods	9
7	Context	Methods	7
8	Sampling strategy	Methods	7
9	Ethical issues pertaining to human subjects	NA	
10	Data collection methods	Methods	7
11	Data collection instruments and technologies	Methods	8
12	Units of study	Results	10-16
13	Data processing	Methods	9
14	Data analysis	Methods	9
15	Techniques to enhance trustworthiness	NA	

16	Synthesis and interpretation	Results	10-16
17	Links to empirical data	Results	10-16
18	Integration with prior work, implications, transferability, and contribution(s) to the field	Discussion	16-19
19	Limitations	Strengths and limitations	19
20	Conflicts of interest	Competing interests	20
21	Funding	Funding	20

*All page numbers refer to pages in the submitted manuscript file

Supplementary Materials 2: Original Project Protocol

(Submitted as a separate file)

Supplementary Materials 3 - Interview Schedule for Service Users

Patient experience of the Southwark NHS Health Check service – interview schedule

Thank you for agreeing to take part in this project. As you'll have read in the information document, we are interested in your experience and views of the new Health Check service in Southwark. So, in this call, I'll ask you some questions about this – it does not matter if you did not complete a Health Check and there are no right or wrong answers, we're just interested in your opinions. I'll record what is said in this call so that it can be typed up later, but any information that could identify you, such as names of people or places, will be removed. If at any time during the call you would like to stop, just let me know, and you do not have to answer any questions that you do not feel comfortable with.

Before we begin, do you have any questions for me?

[Start recorder]

To start, can you tell me if you completed a Health Check, either online or at the GP practice?

[If yes – go to page 2]

[If no]

Can you remember receiving an invitation for a Health Check?

[If yes] Did you receive an text message or letter invitation? How would you prefer to receive an invitation?

What did you think when you received this invitation?

Did you receive any reminders? (Text or letter?) And what did you think of these?

Did you try to book a Health Check? Why/why not?

[If booked but not completed] What stopped you from completing/attending the Health Check?

[If no] The Health Checks aim to identify people who are at higher risk of developing long term health problems so that they can be offered help to lower their risk, for example, support with becoming more physically active or quitting smoking, or being prescribed medication. Is that something that you would be interested in?

How would you like to receive an invitation to a Health Check (text/letter)?

For those who did complete a Health Check]

What made you want a Health Check?

Did you choose the online Health Check or a face-to-face one at your GP practice?

Why did you choose this option?

Tell me about your experience of your Health Check, from booking/logging on to getting the results.

[F2F prompts] Booking appointment – convenient time? Waiting?

Consultation – assessments completed? Rapport with GP/nurse?

Results – in appointment or later? Follow up advice – able to ask questions?

[DHC prompts] Navigating site – any difficulties? Were the questions easy to answer/understandable?

Did they book a physical assessment? Tell me about this (booking, place, consultation)

Results – how received? Follow-up advice – able to ask questions?

Did your Health Check prompt you to make any changes or look for more information on your health?

[If yes] What did you look into/changes have you tried? (e.g., PA, diet, smoking, medication)

How are you getting on with [the behaviour change]?

Would you recommend that a family member or friend of a similar age to you had a health check if invited?

If yes or no probe why

Finally, is there anything that would make the Health Check service better for you, either in terms of how it was conducted or what happened afterwards?

That's all my questions, is there anything else you would like to add?

Thank them for their time and stop recorder.

Supplementary Materials 4 - Interview Schedule for HCPs

HCP experience of the Southwark NHS Health Check service – interview schedule

Thank you for agreeing to take part in this project. As you'll have read in the information document, we are interested in your experience and views of the new Health Check service in Southwark. So, in this call, I'll ask you some questions about these – there are no right or wrong answers, we're just interested in your opinions. I'll record what is said in this call so that it can be typed up later, but any information that could identify you, such as names of people or places, will be removed. If at any time during the call you would like to stop, just let me know, and you do not have to answer any questions that you do not feel comfortable with.

Before we begin, do you have any questions for me?

[Start recorder]

To start, can you tell me how long you have been a practice nurse/healthcare assistant/practice manager?

How much experience would you say you have with conducting Health Checks? (N.B. they started in 2009)

Can you tell me how you conduct the standard face-to-face Health Check appointments?

What preparation, if any, would you do before the appointments?

[*for nurses/HCAs*] How do you deliver advice/information to patients following the assessments? (signposting/leaflets, how long does this take?)

Following the appointment, what extra tasks are involved for you or your colleagues? (e.g., to record results, organise follow-ups)

And now please can you tell me how you have found the addition of the digital Health Checks to the service?

What work is involved for you and your colleagues when patients choose to complete a Health Check online?

Has there been an impact on numbers of patients seen in person for Health Checks?

[*for nurses/HCAs*] How have you found seeing people who have been identified as high risk after they have completed an online Health Check, in comparison to seeing them for the full Health Check?

Do you have all the information you need from the digital results or is extra questioning needed?

What, if anything, do you consider to be the benefits of providing digital as well as face-to-face Health Checks?

And what, if anything, are the risks?

Are there any improvements or changes that you would like to see made to the Health Check service?

Overall, do you think the addition of digital Health Checks to the service is a good idea/should be rolled out further?

Are there any other comments that you would like to make about health checks, in person or face to face?

That's all my questions, is there anything else you would like to add?

Thank them for their time and stop recorder.

Supplementary Materials 5 – Revised Analytical Framework (Service Users)

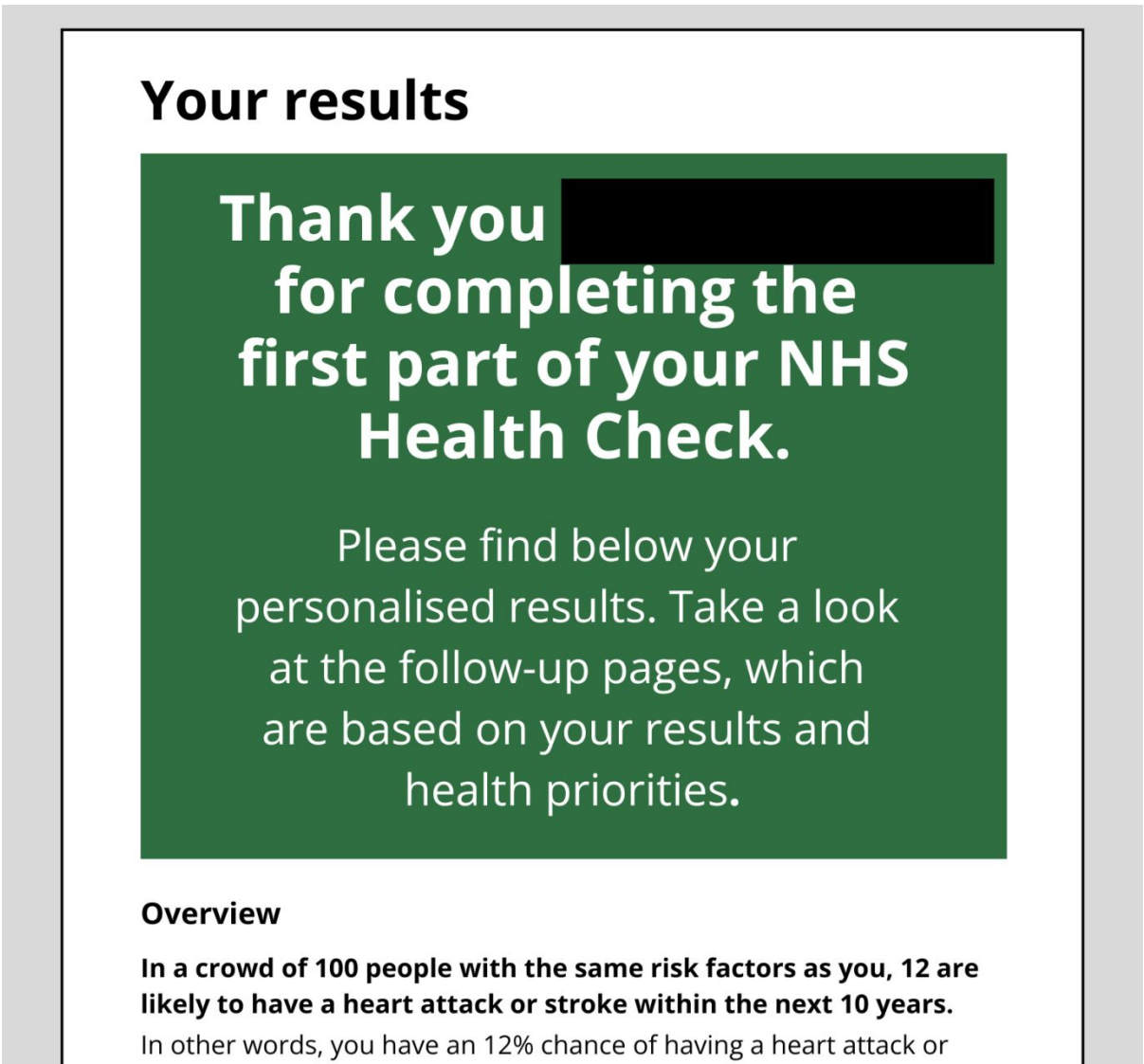
Theme	Sub-themes
Service user demographics	Age Gender Ethnicity Health Check type (digital/F2F/none) Education level Employment status
Invitation and booking	Understanding of the Health Check (awareness, what it is for etc) Invite method (text, letter etc) (and initial response to this, preference) Reminders? Choice of F2F/digital (option?/reasons for choosing) Booking process for F2F (ease, challenges etc) Starting digital Health Check (timing, ease of process etc) Other
Motivation	Perceived health Understand more about health Previous medical background Personal responsibility Prevention NHS cares (the organisation is looking after me etc) Other
F2F Health Check experience	Questions during Health Check Person completing Health Check (profession, manner) Physical tests? (yes/no/what) Timing and communication of results Asking questions

	Advice given (services, signposting etc) Benefits of F2F Health Check Other
DHC experience	Website (understanding/navigation/ease of use etc) Benefits (convenience, personality) Digital age Physical tests (any, how/where these happened etc) Barriers/problems (digital technology; doing tests, asking questions, conflicting advice etc) Timing and communication of results Advice given (referrals, services etc) Other
Behaviour change	Changes made (what, why, include services attended) Maintenance If none, why Impact of changes Other
General	Recommend Health Check (and why) Improvements to Health Check (digital and F2F) Preference for digital/standard (why, belief that everything going online etc) Other

Supplementary Materials 6 Revised Analytical Framework (HCPs)

Theme	Sub-themes
Experience	Nurse/role experience (years etc) Experience with Health Check previous (training, confidence) Other
Conducting F2F Health Checks	Prepare before (and experience/opinions of this) Running the health check (general) Giving advice (signposting, delivering it, experience of it, time etc) Admin after (and experience/opinions of this) Other
Digital Health Checks	Understanding of them (awareness etc) Additional work (pre, post, follow up?) Increase in DHC attendees? (and opinions on this) DHC vs standard for high risk people (experience of this, does it work, benefits, negatives etc) Benefits of DHC (choice, convenience, workload etc) Risks of DHC (honesty, tech issues, miscommunication, results) Health Check improvements? DHC rollout opinion Other

Supplementary Materials 7: Example of the DHC results page– Page 1



Your results

Thank you [redacted] for completing the first part of your NHS Health Check.

Please find below your personalised results. Take a look at the follow-up pages, which are based on your results and health priorities.

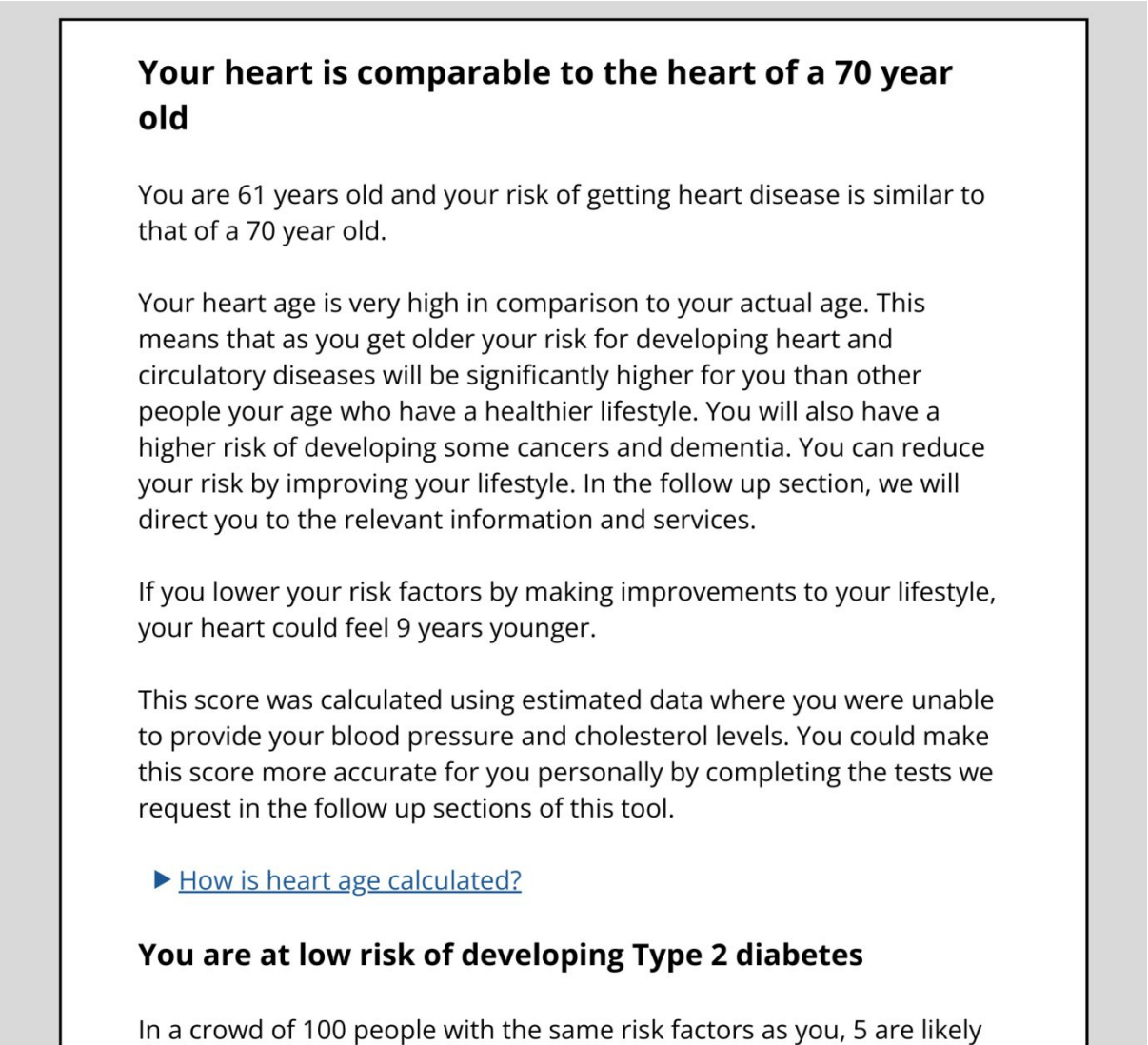
Overview

In a crowd of 100 people with the same risk factors as you, 12 are likely to have a heart attack or stroke within the next 10 years.
In other words, you have an 12% chance of having a heart attack or stroke within the next 10 years.

You have a medium risk of developing heart disease in the next 10 years. Please contact your GP clinic for a non-urgent discussion or your results and to access additional support. Your risk of getting heart and circulatory disease will increase as you get older . Your current lifestyle choices put you at high risk of developing conditions such as heart disease or cancer during your lifetime. Your risk of getting heart disease will increase as you get older, so the actions you take now to live a healthier lifestyle will impact your future health.

This score was calculated using estimated data where you were unable to provide your blood pressure and cholesterol levels. You could make this score more accurate for you personally by completing the tests we

Supplementary Materials: Example of the DHC results page – Page 2



Your heart is comparable to the heart of a 70 year old

You are 61 years old and your risk of getting heart disease is similar to that of a 70 year old.

Your heart age is very high in comparison to your actual age. This means that as you get older your risk for developing heart and circulatory diseases will be significantly higher for you than other people your age who have a healthier lifestyle. You will also have a higher risk of developing some cancers and dementia. You can reduce your risk by improving your lifestyle. In the follow up section, we will direct you to the relevant information and services.

If you lower your risk factors by making improvements to your lifestyle, your heart could feel 9 years younger.

This score was calculated using estimated data where you were unable to provide your blood pressure and cholesterol levels. You could make this score more accurate for you personally by completing the tests we request in the follow up sections of this tool.

▶ How is heart age calculated?

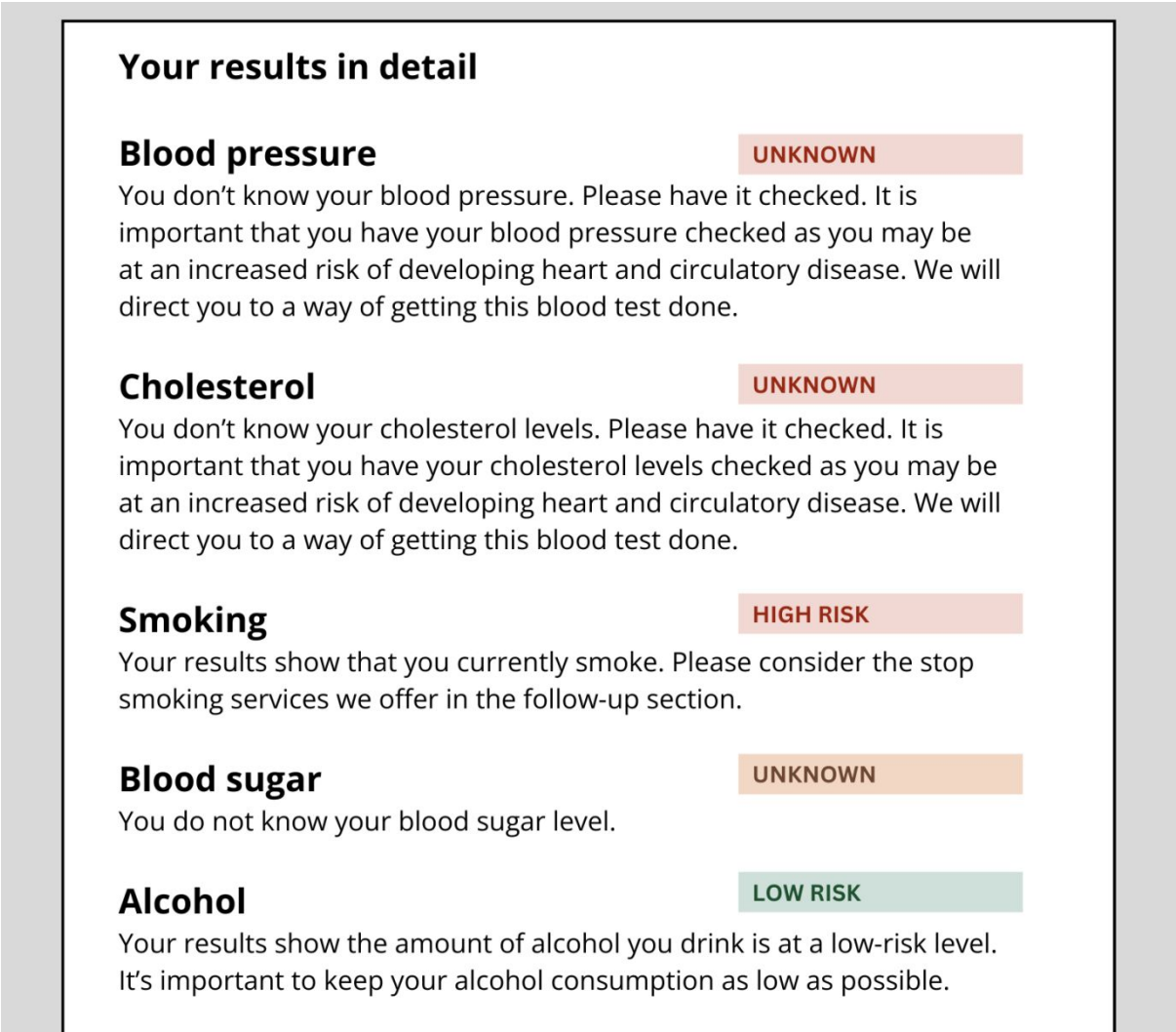
You are at low risk of developing Type 2 diabetes

In a crowd of 100 people with the same risk factors as you, 5 are likely to develop Type 2 diabetes within the next 10 years.

In other words, you have an 5% chance of developing Type 2 diabetes within the next 10 years.

Everyone has some level of risk for developing Type 2 diabetes. Some risk factors cannot be controlled such as your age or ethnicity. Other risk factors, such as your weight and physical activity levels, can be changed which is why maintaining a healthy lifestyle is important.

Supplementary Materials: Example of the DHC results page– Page 3



PHIRST Insight

Protocol for the evaluation of the Southwark NHS Health Check service

Version 3

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Funder	NIHR PHIRST
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Timeline	September 2022 – May 2024

Background

The NHS Health Check programme aims to detect early signs of cardiovascular disease (CVD), type 2 diabetes (T2DM), kidney disease, stroke and dementia in 40 to 74 year olds in England (1). Adults meeting the eligibility criteria for a Health Check are invited to attend a face-to-face appointment in their GP practice, where they are assessed for the top seven risk factors of non-communicable diseases (NCDs): physical inactivity, excess weight, tobacco smoking, excess alcohol consumption, high blood pressure, high cholesterol, impaired glucose processing. Behavioural support and, if appropriate, pharmacological treatment or further tests may then be offered to help an individual reduce their risk of disease. As well as promoting early identification and management of behavioural and physical risk factors, the Health Check programme is intended to reduce inequalities in the prevalence and burden of behavioural risk factors and NCDs. Local authorities are responsible for the commissioning and delivery of the Health Check programme and have some flexibility in this, however, to help ensure the quality and safety of the programme, the measurements conducted and actions to be taken in response to certain risk factors are standardised (1). The Office for Health Improvement and Disparities (OHID, formerly Public Health England) aspires to achieve a national uptake rate of 75% of the eligible population having a Health Check once every five years (1); to monitor progress towards this goal, all local authorities submit data to central government on the Health Checks offered and received each quarter. An evaluation of the Health Check programme delivered between 2012 and 2017 reported an average uptake rate of 52.6% across England (2), however, since 2018, the uptake trend has been decreasing (3).

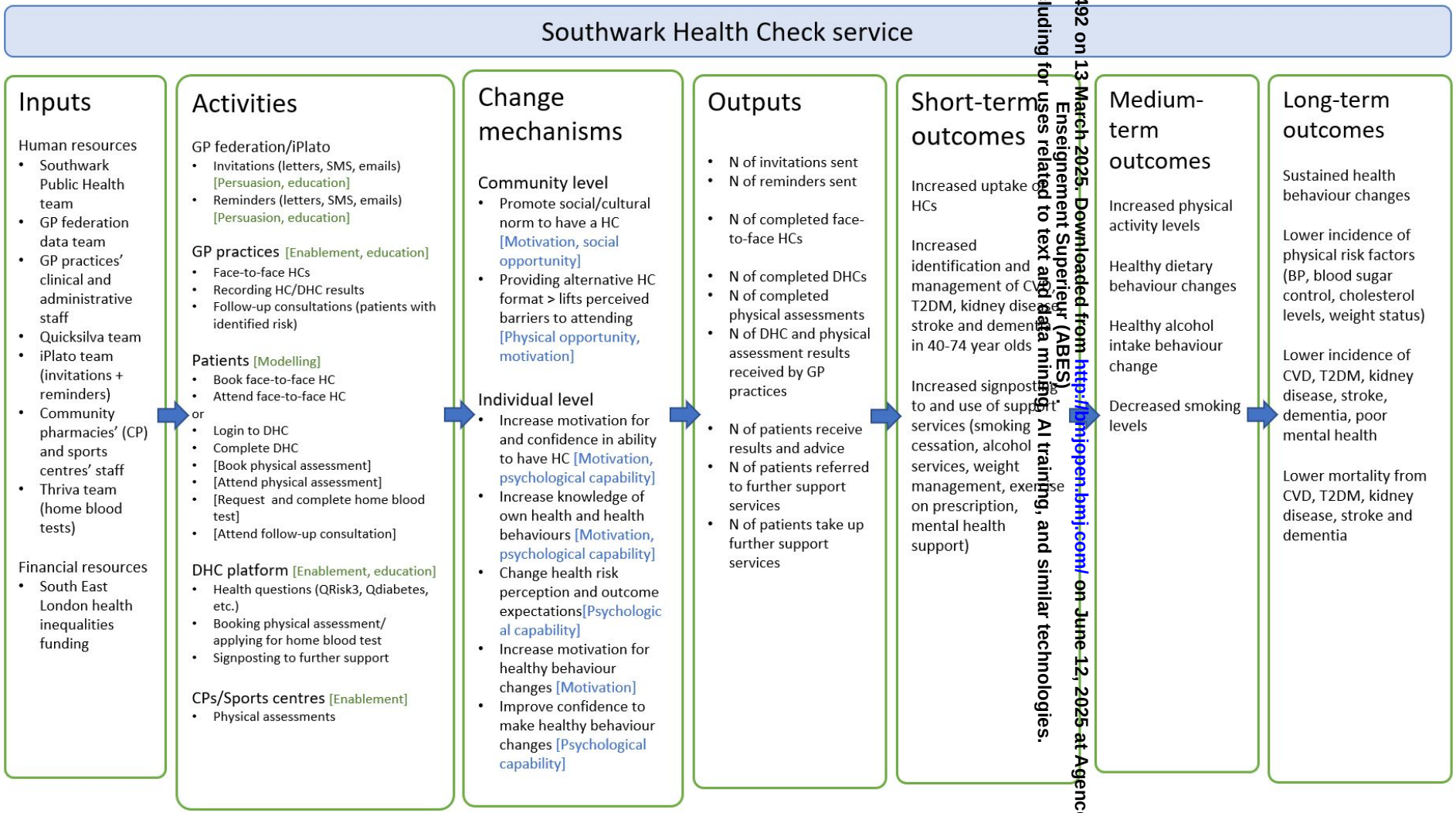
The London borough of Southwark has significant health inequalities with residents from the more deprived central areas living on average seven years less than those from the least deprived areas. At least 70% of adults in Southwark have two or more behavioural risk factors for preventable NCDs, with prevalence being greater among the more deprived communities. Looking at their Health Check data for the years 2017 – 2020, Southwark Council identified low uptake among certain groups in their population, namely those in the most deprived quintile (IMD Q1; 53% of those invited from this group attended), those aged 40-44 years (46% attendance) and men (46% attendance). These rates were despite targeting invitations at men and those living in the most deprived areas. To help reach these groups and increase impact of the Health Check programme, Southwark Council has developed a Digital Health Check (DHC), which eligible patients can complete online at a place and time convenient to them. The DHC operates like an online survey, incorporating the CVD QRisk3 and QDiabetes screening questionnaires, where users answer a series of questions about their health and behaviours, as they would in a face-to-face Health Check. Following completion of the DHC, users are invited to complete physical health assessments (e.g., blood pressure measurements) at either a community pharmacy or sports centre. The results from the DHC and physical assessments are sent to the individual's GP practice and, if early signs of disease are detected, they will be invited to attend a face-to-face appointment. If risky health behaviours or weight are detected in the DHC without early signs of disease, individuals are signposted to sources of support for adopting healthier behaviours or reducing their weight. Thus, for those reticent or less able to attend the standard face-to-face Health Check, the DHC process may present a more acceptable alternative that still enables the delivery of preventive advice and the identification of early-stage disease.

The DHC underwent final stage beta testing in primary care this February (2022) and Southwark Council plan to roll out the DHC alongside the standard face-to-face Health Checks in a pilot trial in the north and central regions of Southwark (4 GP neighbourhood areas - Bermondsey, Borough, Rotherhithe and Walworth) running from January to March (inclusive) 2023. Invitations will offer patients the choice of completing either a digital or face-to-face Health Check, thus those who wish

to complete their Health Check at their GP practice will still be able to do so. The PHIRST team at the University of Bristol have been asked to help evaluate Southwark's Health Check service. Through the evaluation we will seek to understand:

1) The extent to which the DHC is effective at engaging those groups that have not been reached by the standard Health Check
2) Whether the service overall is effective at encouraging people to take positive health actions and how the service could be improved
3) If effectiveness differs among those completing the DHC versus a face-to-face Health Check
4) Practice nurses' (PNs), healthcare assistants' (HCAs) and GP practice managers' (PMs) perceptions and experiences of both the standard and digital Health Checks and the impact on GP practices of the addition of DHCs, in terms of clinician and administrative burden.
5) The cost of the DHC as business as usual and whether it represents good value.

Logic model



Literature review

The NHS Long Term Plan (4), published in 2019, set out a vision for 'digital transformation' with the broad aims of improving patients' experience of services and increasing efficiency. NHSX was set up to drive this digital transformation, having responsibility for setting policy, overseeing implementation and allocating investment. Priority areas for NHSX (5) include: enabling safe and secure flow of digital information between care settings; creating straightforward digital access to NHS services to help patients manage their health; using digital tools to personalise services and better target eligible populations to improve service uptake; and using digital tools to 'capture data as a by-product of care', reducing administrative burden while improving the ability to plan services. Primary care services are to be a forerunner in the digital transformation, with a 'digital-first' delivery model set to be in place by 2023/24 in which all patients will have the right for their first point of contact with primary care professionals to be through digital channels (4). The 'Plan for digital health and social care' (6), published in 2022 by the DHSC, further specified aims that the NHS in England would have digital health checks and risk-based screening by 2028.

A rapid evidence synthesis conducted in 2018 to inform NHS England policy on digital-first primary care (7), reported several potential advantages to offering alternatives to face-to-face care delivery, including providing more control and convenience to patients, particularly those with decreased mobility. Remote consultations were also thought to be preferable to patients who are apprehensive about face-to-face medical encounters; digital communication giving a greater feeling of privacy, which may overcome sociocultural barriers such as embarrassment and stigma around health seeking behaviours. However, where digital and other forms of remote care were offered, they tended to be used by younger people, women, those with English as their first language and those with higher incomes and education levels. These findings raise concerns that a shift to more digital and remote delivery may increase health inequalities by further limiting access to older adults and socioeconomically disadvantaged groups. Clinicians also expressed concern that important cues and symptoms may be missed in remote delivery, which could help explain findings that GPs engage in more 'safety-netting' practice (such as inappropriate antibiotic prescribing) when they cannot see a patient face-to-face. There was some evidence to suggest that digital triage tools could divert demand away from primary care services, enable greater flexibility in working schedules for practitioners and provide cost savings compared to standard care, but results varied between interventions and outcome measures. The authors also highlighted a need for studies on the number and duration of follow-up consultations after digital consultations to fully assess impact on workload. Poor infrastructure and lack of staff training in digital services delivery within the NHS were reported as further barriers. Overall, there was little high-quality evidence available to include in the review and a particular lack of empirical data to compare the benefits and risks of digital services with standard, face-to-face primary care.

The evidence synthesis by Rodgers and colleagues was conducted prior to the COVID-19 pandemic. To provide care amid the social distancing restrictions implemented to prevent the spread of COVID-19, public, primary and secondary health services rapidly reconfigured to deliver care remotely (8, 9). This shift was largely well-received by both clinicians and patients (10), and will likely have improved acceptance of and skills with using technology for healthcare. However, while digital technology undoubtedly helped during the peak of the pandemic, the digital delivery models implemented during this period will need to evolve now restrictions have lifted. Recent research has highlighted primary care clinicians' ongoing concerns over the increased clinical risk involved in remote care, as well as variable levels of skills and confidence in using technology among primary

care staff (10). This suggests greater guidance and training over when and how to use technology is needed. Patients' expectations for how they receive health services are also likely to have changed now restrictions have lifted and different delivery modes are available (11). Furthermore, while access to digital healthcare may have increased for the population overall, inequalities in access may have increased as those in the lowest income groups, or who are living with physical or mental disabilities, or whose first language is not English are still likely to face digital exclusion (12). Questions have also been raised over the sustainability, costs and implications for provider workloads of digital delivery models; there is some evidence to suggest that increasing access through offering digital services can lead to supply-induced demand but further research is urgently needed to better understand these factors (13).

Evaluation aims and objectives

Aims

This evaluation of Southwark's combined Health Check service aims to understand who completes the digital and face-to-face offers, why they chose either the digital or face-to-face option (or to not take up either), what they think of the service and whether it has had any impact on their health behaviours. We will also explore the costs involved in both offers and the impact on primary care providers (practice nurses (PNs), healthcare assistants (HCAs) and practice managers (PMs)) of adding digital Health Checks to the standard service.

Objectives

1. Assess the extent to which the DHC is effective at engaging those groups that have not been reached by the standard Health Check
2. Explore to what extent the service overall is effective at encouraging people to take positive health actions and how the Health Check process could be improved
3. Explore whether effectiveness, in terms of encouraging positive health actions, differs among those completing the DHC versus a face-to-face Health Check
4. Explore PNs'/HCAs' and PMs' perceptions and experiences of both the standard and digital Health Checks and the impact on GP practices of the addition of DHCs, in terms of clinician and administrative burden
5. Investigate the cost of the DHC as business as usual and assess whether it represents good value.

Methods

Design

This will be a mixed methods project that will include the following methods to address each Research Objective (RO).

1) Quantitative analysis of pseudonymised patient data and DHC analytics data (RO1). Pseudonymised patient data will be compared for all patients sent invitations to standard and digital Health Checks throughout quarter four (Jan – Mar 2023).

2) Patient survey conducted 6-months after the Health Check invitations (both standard and digital Health Check invitations) (RO1, RO2, RO3)

3) Semi-structured interviews with patients following completion (or non-completion) of the Health Checks (RO2, RO3)

4) Semi-structured interviews with PNs, HCAs and PMs (RO4)

5) Economic analysis of time and resource costs (RO5)

Figure 1 details the study methods, along with the research objectives they are intended to address, and expected timings.

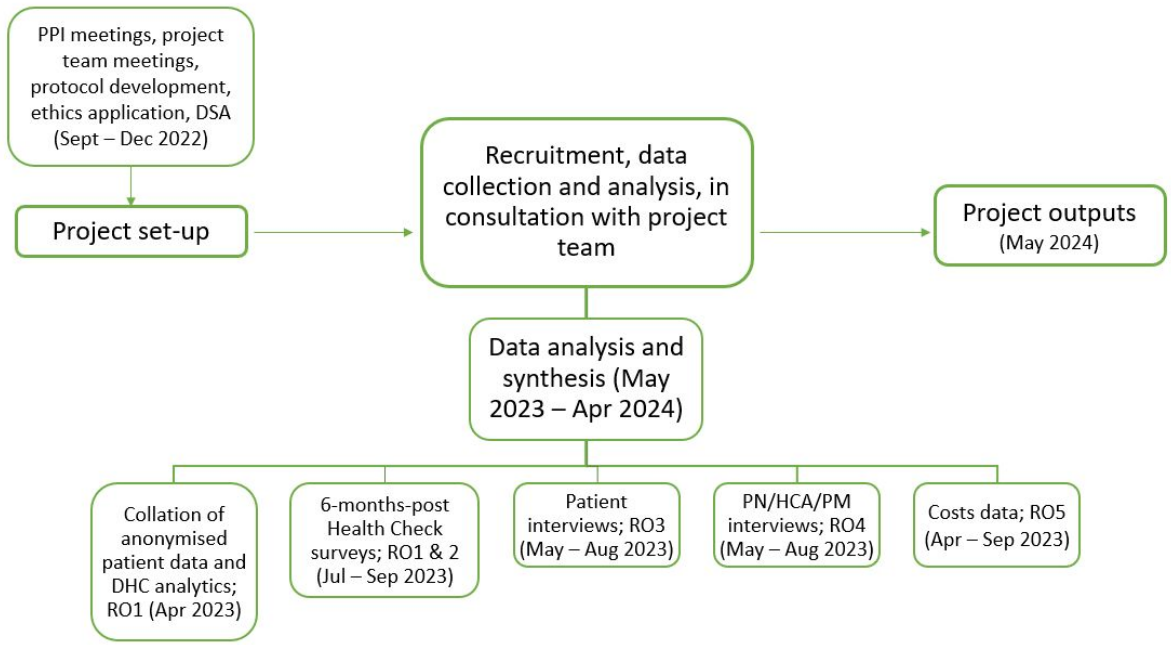


Figure 1. Overview of evaluation methods and timeline

This research protocol has been co-produced with our key partners. The protocol has been developed with input from PPI group members (recruited through community groups in Southwark), local GPs and PNs (key stakeholders) and the project team (consisting of the two PPI representatives, local GP and PN representatives, the Southwark public health team and the University of Bristol PHIRST team). We will continue to work with our PPI group throughout the project to refine recruitment strategies and research materials, and to develop a Dissemination, Impact, Involvement, Communication and Engagement (DIICE) plan to guide the outputs from this work.

Participants and recruitment

This project will involve patients in north and central Southwark (4 GP neighbourhood areas – Bermondsey, Borough, Rotherhithe and Walworth), an area with high levels of deprivation and a population of diverse ethnicities. The eligibility criteria for a Health Check, as set out in the NHS Health Check Best Practice Guidance (1), are:

- aged 40 – 74 years
- registered with a Southwark GP
- not had a Health Check in the previous 5 years
- not registered as having any of the following: coronary heart disease; chronic kidney disease (CKD), which has been classified as stage 3, 4 or 5; diabetes; hypertension; atrial fibrillation;

transient ischaemic attack; familial hypercholesterolemia; heart failure; peripheral arterial disease; stroke
- not receiving palliative care
- not currently being prescribed statins for the purpose of lowering cholesterol
- not been found (either in a previous Health Check or any other health service in England) to have a 20% or higher risk of developing CVD over the next ten years.

Among those eligible for a Health Check, patients are prioritised to receive a Health Check invitation according to the following criteria (in order): those who have not received a Health Check invitation in the past 6 months are prioritised; those belonging to a Black, Asian or ethnic minority group are prioritised; and those at higher risk for developing a cardiovascular disorder or type 2 diabetes are prioritised. Patients' risk is estimated from existing information in their health records, such as whether they have a BMI over 30 or are on a prediabetes register. The same algorithm for identifying high risk patients among the Health Check-eligible population will be used to identify patients to receive both standard and digital Health Check invitations.

In quarter four, 6000 people will be invited for a digital Health Check in the central area (the digital Health Check will only be available to people in the central area of Southwark during this evaluation). Invitations to digital Health Checks will be sent by SMS or letter, depending on the contact information the GP federation holds for the patient, and contain a link to the digital Health Check website. The invitations also state that patients can book a standard Health Check at their GP practice if they would prefer. In quarter four, approximately 3000 invitations for standard Health Checks will be sent in the study area[1]. Invitations for standard Health Checks are also sent by SMS or letter and only offer patients a Health Check at their GP practice. All invitations (for both standard and digital Health Checks) are sent on behalf of the GP federation by iPlato, a healthcare technology company. The same algorithm will be used to identify patients to be sent a digital Health Check invitation as that used for standard Health Check invitations.

Survey recruitment

Within the central area, all patients receiving an invitation in quarter four (Jan – Mar 2023) to complete either a standard or digital Health Check will be sent invitations to complete an online survey six months after their original Health Check invitation (i.e., Jul – Sep 2023). Invitations, and up to 2 reminders, will be sent by iPlato via SMS or letter (according to information available on the patient's records) and direct the reader to an online survey. Survey completion will be optional and submission of a survey will be taken as consent for the individual's data to be used for research purposes. At the start of the survey, patients will be notified of this and presented with information on the purpose of the survey and how their data will be used (i.e., for the purpose of research and service improvement). Patients taking part in the survey will be offered entry into a prize draw to win one of ten £50 shopping vouchers.

Patient interview recruitment

An external market research company, Leftfield, will recruit participants for the patient interviews. An invitation will be sent by iPlato via SMS to all patients who were invited to a Health Check (both digital and standard) between January and March 2023. Interview invitations will provide a link to the participant information sheet and a link to an online form where individuals can provide their consent and contact details and answer some demographics questions in order to be screened and

[1] Invitations for standard Health Checks are limited by the capacity of GP practices, whereas digital Health Checks take up less time and resource for GP practices and so more invitations can be sent.

contacted by Leftfield. We aim to recruit approximately 30 patients for interviews. Leftfield will screen volunteers to ensure the sample includes a range of people according to gender, age and ethnic groups, area of residence, and Health Check completion status (i.e., completion of the standard Health Check, the digital Health Check or did not complete a Health Check). Leftfield will then phone participants to check they understand what is involved in participating and are still happy to be interviewed; if so, Leftfield will send them an electronic consent form. When consent has been given, Leftfield will arrange telephone/online interviews between participants and a Bristol-based researcher.

PN/HCA/PM interview recruitment

All GP practices in the central Southwark area will be sent invitations for one of their PNs/HCAs or PMs to take part in an interview. Invitations will be sent on behalf of the University of Bristol by the Southwark public health team and direct the PN/HCA/PM to an online form where a full participant information sheet will be available to read and download before completing a consent form, a demographic survey and a contact details form. The Bristol team will then contact the PN/HCA/PM to arrange a suitable time for an interview. We aim to recruit about 10 PN/HCA/PMs for interviews, representing a range of practice sizes.

Procedure

Pseudonymised patient data will be collated from patients' records (held by the GP Federation) and shared with the University of Bristol team. The digital Health Check website developer (Quicksilva) will provide analytics data on website usage to Southwark, which will be shared with Bristol. The patient surveys will also be run by the Southwark team and pseudonymised results shared with Bristol. Surveys will contain questions on patients' health behaviours and actions taken following their receipt of a Health Check invitation.

Interviews for both patients and PN/HCA/PMs will take place via telephone or videocall, according to participant preference. Interview schedules for patient and PN/PM interviews were co-developed by the whole project team, with input from the PPI group. Briefly, patient interviews will seek to understand why patients chose either a standard face-to-face Health Check or digital Health Check or neither, what was their experience of the service and in what ways the service could be improved. Interviews with PN/HCA/PMs will cover their experience of providing the combined Health Check service, including any impact on workload for them and their colleagues, any concerns or perceived benefits of the service, and any suggestions for improvements. The interviews will be semi-structured, allowing the researcher to adapt the questioning according to the participant's earlier responses and prompt for further information if relevant novel issues are raised (14). Participants will have completed an online consent form prior to the interview, but the researcher will check their understanding of the interview procedure and how their data will be used at the start of their meeting. Interviews are anticipated to take about 30 minutes and will be audio recorded using an encrypted digital recorder then fully transcribed verbatim. Participants will be offered a £50 Love2Shop gift voucher for taking part.

Costs data associated with the development, implementation and use of the digital Health Check software will be collated by Southwark and shared with Bristol.

Analysis

Quantitative analyses

Descriptive analysis of pseudonymised patient data will be used to develop profiles of completers of face-to-face Health Checks and digital Health Checks as well as non-completers. To assess the extent of differences between the three profiles, comparative analyses (ANOVA, Pearson Chi-square, multiple regression, independent t-test or Mann-Whitney test) will be conducted as appropriate. Analytics data from the digital Health Check website and quantitative survey data will be coded to assess how patients use the service and whether and what changes to their health behaviours they make as a result. Quantitative analyses will be conducted using SPSS/STATA and Excel software.

Health Economics analysis

The survey of people six months after being invited to a face-to-face or digital Health Check in quarter four of 2022/23 will provide a basis for initial exploration of the incremental impact of the digital Health Check pathway on selected costs and outcomes. For example, the reported action of "Taking prescribed medication (e.g., statins)" to improve cholesterol levels will be costed using national reference cost data for statins (15). Reported general practice attendances will be costed using national reference cost data (16), and costs associated with reports of interventions and tests, such as weight management, will based on literature. We will request data from the Southwark public health team on costs associated with the development, implementation and use of the digital Health Check software. To inform potential future evaluation, we will explore the feasibility of using the survey data and pseudonymised patient data with the workHORSE model to estimate the long term cost-effectiveness of the digital Health Check intervention (17).

Qualitative analyses

Interview transcripts will be analysed using a thematic Framework approach (14), conducting separate analyses for patient and PN/HCA/PM interviews. After reading all transcripts, a draft coding framework will be developed including themes and sub-themes that are driven by the data but also relevant to our research objectives. The draft framework will be used to code a sub-sample of the transcripts, then reviewed and amended as necessary to ensure the framework captures all the pertinent information for this evaluation. The coding framework will be entered in NVivo software to be applied to all transcripts. Analysis will be an iterative process – the team will regularly review the framework to ensure it is still a good 'fit' for the data. When all transcripts have been coded a framework matrix will be developed with columns to represent each sub-theme and rows for each participant. Cells will be populated with quotations, data summaries and researcher's analytic notes. This 'charting' method creates an accessible dataset through which to explore themes and subthemes by respondent type. A summary of the data under each sub-theme will be developed to inform the next stage of the analysis, moving up the analytical hierarchy to explore patterns and associations between themes in the data.

Data management

The University of Bristol will be the data controller for this study. The project will generate quantitative datasets, in the form of pseudonymised patient data, patient surveys and costs data, and qualitative datasets, in the form of interview transcripts.

All patient record and survey data will be pseudonymised (names, contact details and postcodes will be removed and unique participant ID numbers assigned) by the Southwark team before being shared with the University of Bristol team. Interviews will be recorded on encrypted digital audio recorders. Audio files from interviews will be uploaded to a restricted access folder on the University of Bristol server, as soon as is reasonably possible following an interview. Once uploaded, they will be securely deleted from recorders. Transcription will be undertaken by an external transcription company that has been approved to process data subject to the Data Protection Act, for which the University is the data controller. The company has entered into a formal "Personal Data Processing Agreement" drawn up by the University Secretary's Office. The University of Bristol project team, including those who may become part of the team in the future, will have access to the study data and will be able to comment on data at the analysis stage. Access to data will be restricted to these individuals. To enable anonymity, transcripts will have a unique identifier in the filename, which will be replicated on a transcript cover sheet that will also include interview location and anonymised interviewee details. No paper copies of transcripts will be made.

All data analysis will take place on password protected University laptops. No data will be stored on laptops but instead on the University's secure Research Data Storage Facility (RDSF) accessed via the University VPN.

In accordance with Research Councils UK guidance, all consent forms will be stored securely in electronic form for a period of 10 years. After 10 years, the forms will be deleted from servers.

Anonymised data will not be destroyed following completion of the study but restricted access on reasonable request will be kept available for future research in 'data.bris' the University's publicly accessible Research Data Repository. Consent for this will be explicitly sought on participant consent forms.

Ethics

We do not believe that completing the survey or taking part in an interview will result in distress or discomfort to participants. Participants will be able to stop or pause an interview at any time, without having to give a reason. If, during an interview, a participant appears uncomfortable or upset, the researcher will either ask whether they would like to stop or decide to stop the interview and direct them to appropriate support services. We will be contracting Leftfield (an experienced market research company – leftfield.co.uk) to screen and consent participants to interviews. Leftfield specialise in recruitment to qualitative research and understand the importance of ensuring participants understand and are happy with what participating in research will involve, as well as ensuring people do not feel coerced into participating. The University of Bristol based researcher has particular experience in conducting health-related research interviews.

To minimise burden on participants, the length of the surveys and interview schedules have been kept to a minimum. Surveys can be completed at a time and place convenient to participants. Interviews will be scheduled for convenient times for the participants and will be conducted remotely to avoid travel time/expense.

Members of our PPIE group (Southwark residents, in the Health Check age range) felt the study protocol (including surveys and interviews) and study materials (e.g., information sheets) were appropriate and acceptable.

This project has been reviewed (proportionate review) by East Midlands (Nottingham 1) NHS Research Ethics Committee – it received approval on 21/12/2022 (ref: 22/EM/0280).

Outputs

We will develop and refine a Dissemination, Impact, Involvement, Communication and Engagement (DIICE) plan with the project steering group throughout the project. This is likely to include:

- Report for Southwark Council detailing study findings and recommendations
- Public-facing report and PowerPoint slides on the study findings for Southwark community groups, partner organisations, PHIRST websites and article for The Conversation
- Peer-reviewed journal article on study findings

Timeline and milestones

	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Apr 23	May 23	Jun 23	Jul 23	Aug 23	Sep 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	Apr 24	May 24
Ethics preparation and submit to REC	x	x	x																	
PPI	x																	x		
Steering group meeting				x			x			x			x		x			x		
Rollout of digital Health Checks					x	x	x													
Health record and costs data shared								x	x											
Patient and PN/HCA/PM interviews									x	x	x									
6-month survey										x	x	x								
Analysis									x	x	x	x	x	x	x					
Data synthesis and reporting																x	x	x	x	
Dissemination events																			x	x

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