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Knowledge and cardiovascular disease risk perception from the perspectives of prisoners and staff in a Scottish prison

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Published in:
International Journal of Prisoner Health

DOI:
[10.1108/IJPH-05-2021-0037](https://doi.org/10.1108/IJPH-05-2021-0037)

Publication date:
2022

Document Version
Peer reviewed version

[Link to publication in Discovery Research Portal](#)

Citation for published version (APA):

Mohan, A. R. M., Thomson, P., Haw, S., Leslie, S. J., & McKay, J. (2022). Knowledge and cardiovascular disease risk perception from the perspectives of prisoners and staff in a Scottish prison: a qualitative study. *International Journal of Prisoner Health*, 18(4), 335-349. <https://doi.org/10.1108/IJPH-05-2021-0037>

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Knowledge and cardiovascular disease risk perception from the perspectives of prisoners and staff in a Scottish prison: a qualitative study

Journal:	<i>International Journal of Prisoner Health</i>
Manuscript ID	IJPH-05-2021-0037.R2
Manuscript Type:	Research Paper
Keywords:	cardiovascular disease, knowledge, risk perception, education, health behaviours, Health promotion

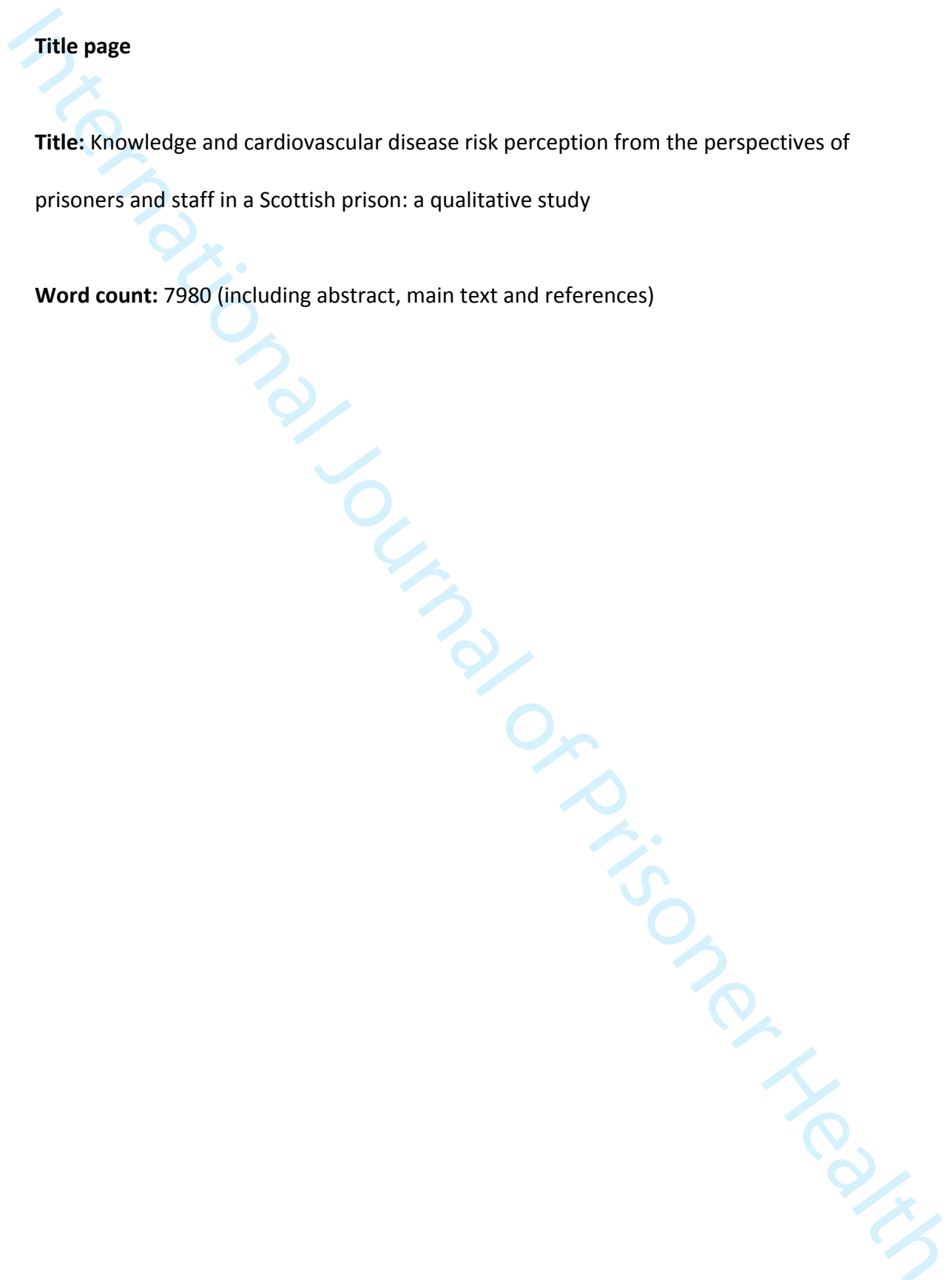
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Manuscripts

Mohan, Andrea R. M. et al. "Knowledge and cardiovascular disease risk perception from the perspectives of prisoners and staff in a Scottish prison: a qualitative study". *International Journal of Prisoner Health*. 2021. <https://doi.org/10.1108/IJPH-05-2021-0037>

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6 **Title page**
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10 **Title:** Knowledge and cardiovascular disease risk perception from the perspectives of
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12 prisoners and staff in a Scottish prison: a qualitative study
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16 **Word count:** 7980 (including abstract, main text and references)
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Abstract

Purpose

Prisoners have an increased risk of cardiovascular disease (CVD) compared to the general population. Knowledge and risk perception of CVD can influence engagement in preventative behaviours that lower an individual's CVD risk. This study aimed to explore prisoners' knowledge of CVD, and prisoners and staff's perceptions of prisoners' CVD risk.

Design

This was a qualitative study in which semi-structured interviews were conducted with 16 prisoners and 11 prison and National Health Services staff in a Scottish prison. Data were analysed thematically using the framework method.

Findings

Most prisoners had limited knowledge of CVD as they could not describe it or could only identify one or two risk factors or cardiovascular events. Both prisoners and staff viewed prisoners' CVD risk as either pertaining to one individual, or pertaining to the general prisoner population. Unhealthy behaviours that were believed to increase CVD risk were linked to three perceived consequences of imprisonment: mental health problems, boredom and powerlessness.

Originality

This is the first study to explore the CVD knowledge of prisoners, and perceptions of CVD risk from the perspectives of prisoners and prison staff. Findings from our study indicate that CVD education needs to be a priority for prisoners, addressing knowledge of CVD, its risk and risk perceptions. Additionally, our findings indicate that individual and socio-environmental factors linked to prisoners' CVD risk need to be targeted to reduce this risk. Future research should focus on socio-environmental interventions that can lead to reducing the CVD risk of prisoners.

Keywords (4 -5): cardiovascular disease, knowledge, risk perception, education, health behaviours

Introduction

Cardiovascular disease (CVD) is a major public health problem, accounting for nearly 17.9 million deaths worldwide every year; 85% of these are due to heart attack and stroke (World Health Organization, 2017). In high-income countries, there is an inverse relationship between four markers of socioeconomic status (SES), i.e. income level, educational attainment, employment status, and neighbourhood socioeconomic factors, and CVD risk (Schultz *et al.*, 2018). Prisoners mostly come from areas of low SES (Europe, 2014) and have low educational attainment (Natale, 2010; Prisoners' Education Trust, 2015), therefore in many countries, they have an increased risk of CVD compared to the general population. CVD is a major cause of death in prisons in the USA (Noonan and Ginder, 2013), Russia (Bobrik *et al.*, 2005) and England and Wales (Fazel and Benning, 2006). In an integrative review on CVD risk factors in prisoners, CVD accounted for 35% of health conditions, making it the third most prevalent condition in this population (Arries and Maposa, 2013). Further, prisoners in many high-income countries have a higher prevalence of common CVD risk factors compared to the general population (Fazel and Baillargeon, 2011; Wang *et al.*, 2017; Packham *et al.*, 2020).

The risk of developing CVD (i.e. CVD risk) can be reduced by encouraging people to engage in preventative health behaviours such as regular physical activity and healthy eating (World Health Organization, 2020). A person's knowledge and risk perception of CVD can influence their engagement in these preventative behaviours (Webster and Heeley, 2010). Risk

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6 perceptions are people's subjective judgments about chances of experiencing negative
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8 occurrences such as diseases (Paek and Hove, 2017), and are important in determining how
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10 people feel about and deal with these diseases. Risk perception is influenced by how much
11
12 people know and feel about risks (Paek and Hove, 2017). The concept of risk perception
13
14 features in some behaviour change models, such as the Health Belief Model (Champion and
15
16 Skinner, 2008) and Protection Motivation Theory (Tunner, Day and Crask, 1989); these
17
18 theorise that people need to consider themselves vulnerable to a health threat, for example
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20 CVD, in order to take action to reduce that threat.
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27 National surveys of the general population show that most people have inadequate
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29 knowledge about CVD and/or its risk factors (Potvin, Richard and Edwards, 2000; Reiner,
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31 Sonicki and Tedeschi-Reiner, 2010; Awad and Al-Nafisi, 2014). Socio-demographic factors
32
33 such as increasing age, greater social deprivation and lower educational attainment are
34
35 associated with less knowledge about CVD and/or its risk factors (Potvin, Richard and
36
37 Edwards, 2000; Reiner, Sonicki and Tedeschi-Reiner, 2010; Awad and Al-Nafisi, 2014;
38
39 Boateng *et al.*, 2017). Studies exploring the perceptions of people with a high CVD risk found
40
41 that most believed their risk of an event such as a heart attack was low; this was often due
42
43 to insufficient knowledge of CVD and perceived good health (Meischke *et al.*, 2000; Choi *et*
44
45 *al.*, 2008; Diaz *et al.*, 2012; Boo *et al.*, 2017).
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52 While knowledge and risk perceptions of CVD in the general population and high-risk groups
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54 have been explored, little is known about these in prison. Prisoners higher prevalence of
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56 CVD risk factors and higher mortality due to CVD (Bobrik *et al.*, 2005; Fazel and Benning,
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58 2006; Wang *et al.*, 2009; Arries and Maposa, 2013) means it is important to explore what
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5 they know about CVD, and how they perceive their CVD risk. Such understanding will help to
6 inform targeted interventions to reduce prisoners' CVD risk and improve their overall health
7 and wellbeing. This study aimed to explore prisoners' knowledge of CVD, and prisoners and
8 staff's perceptions of prisoners' CVD risk in a Scottish prison.
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17 **Methods**

21 ***Study design and setting***

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25 This was a qualitative, exploratory study that involved semi-structured interviews with
26 prisoners, prison staff and National Health Service (NHS) staff in a male prison in Scotland
27 between August 2015 to January 2016. This study took place before a smoking ban was
28 introduced to all Scottish prisons in November 2018 (Brown *et al.*, 2020). The prison housed
29 up to 500 men, aged 18 years and over, who were either: 1) on remand (awaiting trial); 2)
30 serving a short-term sentence (less than four years); 3) serving a long-term sentence (four
31 years or more); or 4) serving a life sentence (no set end point). The NHS provided a primary
32 healthcare service to prisoners where they provided general lifestyle advice and there were
33 special clinics for prisoners with more complex needs including those with long-term
34 conditions such as CVD and type 2 diabetes. Additionally, there were several health
35 promotion activities/facilities for prisoners including smoking cessation services, facilities for
36 indoor and outdoor exercise and exclusive fitness sessions for prisoners 40 years and over.
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Sampling and Recruitment

Prisoners

We aimed to purposefully recruit a sample of 15-20 prisoners who varied in terms of engagement in health behaviours; this number was thought to be large enough to capture a range of perspectives in qualitative research (Green and Thorogood, 2014). As increased physical activity frequency is associated with increased motivation to engage in positive health behaviours (Biddle and Mutrie, 2008), we used this parameter to obtain our sample. Self-reported exercise frequency (days of exercise per week) was used as an estimate of physical activity frequency, classified as: high (five or more days); medium (three to four days); low (zero to two days per week). Prisoners were eligible to participate in the study if they were interested in taking part and met the prison's requirements of current good behaviour. They were excluded if they were on remand, housed in the segregation unit or were non-English speaking.

Prisoners were recruited through advertisements posted in communal areas and by word of mouth. Three prisoners regarded as peer coaches in the prison were recruited by word of mouth via the study steering group to publicise the study to other prisoners with whom they had regular contact. Anyone interested in participating gave their names confidentially to a key contact in the prison, who then passed on these details to the main researcher. The key

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5 contact distributed participant information sheets and arranged an interview time.
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8 Participating prisoners were given a dental pack as a gesture of thanks.
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20 We aimed to recruit prison and NHS staff who had responsibility for the health and
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22 wellbeing of prisoners. The inclusion criteria were: 1) prison officers or managers who had a
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24 role in the approval, implementation or delivery of health promotion initiatives or health
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26 education classes; and 2) NHS nurses, doctors and allied health professionals who delivered
27
28 healthcare or HP services to prisoners. Invitation letters were sent to the prison and NHS
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30 staff by the study steering group. Interested staff contacted the main researcher via email or
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32 the prison contact. The main researcher/prison contact sent staff a participant information
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34 sheet and arranged an interview time.
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41 ***Ethical considerations*** 42 43 44

45 The study was approved by the University of Stirling's School of Health Sciences Research
46
47 Ethics Committee (SREC 14/15 – Paper No.22 – Version 1), the NHS West of Scotland
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49 Research Ethics Service Research Ethics Committee 3 (15/WS/0058) and the Scottish Prison
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51 Service Research Access and Ethics Committees between March and July 2015.
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55 56 ***Data collection*** 57 58 59 60

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6 The main researcher conducted all semi-structured, face-to-face interviews with prisoners
7 and staff. During interviews, a prison officer was located within close proximity of the
8 interview room to ensure participant and researcher safety. Before starting each interview,
9
10 the main researcher went through the information sheet to ensure each participant
11 understood what they were consenting to and that they were not coerced into participating.
12
13 After, participants signed a consent form, indicating informed consent. An interview guide
14 was used during interviews. For prisoners, questions focused on their knowledge of CVD or
15 heart disease, perceptions of theirs and other prisoners' CVD risk, and reasons for this.
16
17 Prompts in the form of a verbal and visual description of atherosclerosis were used if
18 prisoners said they knew little or nothing about the disease. For staff, questions only focused
19 on their perceptions of the prisoners' CVD risk and the reasons for this. All interviews were
20 audio-recorded and data were transcribed verbatim by the main researcher.
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36 **Data analysis**

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40 The data were thematically analysed using the framework method outlined by Richie et al.
41 2014 (Ritchie *et al.*, 2014). This method allowed researchers to compare the range of
42 perspectives within and among the prisoners and prison and NHS staff. It also enabled a
43 systematic and transparent approach to the data analysis process and facilitated reflective
44 discussions between the main researcher and two other researchers, thus ensuring the
45 trustworthiness of the study's findings (Korstjens and Moser, 2018). The main researcher
46 became familiar with the data by listening to each interview recording and reading the
47 associated transcript. Four prisoner and four staff transcripts that were judged to be the
48 most representative in terms of data coverage were independently coded by the researchers
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5 using a combined inductive and deductive approach. This involved assigning labels to data
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7 and organising labels into larger groups of sub-themes and themes, to form an initial coding
8
9 framework. This framework was reviewed to ensure that the meanings of themes were clear
10
11 and relevant to the study's aim. The main researcher applied this initial framework to the
12
13 remaining transcripts and finalised it into a final coding framework, which was agreed upon
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15 by all researchers. NVivo 11 (International, 2016) was used to manage the data and to assist
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17 with data analysis.
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24 **Results**

25 *Participant characteristics*

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29 Sixteen prisoners and 11 prison and NHS staff were interviewed. Table I shows the
30
31 characteristics of prisoners. Nine were aged 40 or over and all but one (K07IR) were serving a
32
33 long-term sentence. Five prisoners reported low exercise frequency, six reported medium
34
35 frequency and five reported high frequency. Four prisoners reported two or more health
36
37 problems; the most common being smoking (seven). Other problems reported included
38
39 being overweight (three), type 2 diabetes (two), and mental health problems (two). Four
40
41 prisoners reported having a parent who died due to CVD, indicating a possible family history
42
43 of the disease. Nine prisoners reported that their health had declined in prison, but of these,
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45 two said that their health had subsequently improved.
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6 Eleven staff members were interviewed (Table II). They comprised prison managers, health
7 care staff and health promotion staff. To ensure anonymity, the staff's specialised roles are
8 not identified.
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17 18 **Knowledge of CVD** 19

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22 When prisoners were asked about what they knew about CVD or heart disease, answers
23 were assessed as either showing limited knowledge of CVD or moderate knowledge of CVD.
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26 27 28 *Limited knowledge of CVD* 29

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32 Two-thirds (10) of the prisoners demonstrated a limited knowledge of CVD, with three being
33 unable to describe CVD. Of these, two (K12IR and K13IR) believed this was because CVD did
34 not concern them; this was despite both self-reporting at least one CVD risk factor:
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42 *"Aye, aye. Just not really gave it much thought. It's not as if it comes up or I*
43 *really need to know about it, really, you know what I mean." (K12IR, <40*
44 *years, long-term sentence)*
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51 The third prisoner (K03IR) could not describe CVD but was able to recall pieces of
52 information he had picked up from the media:
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57 *"Well disease wise, I don't know much about that ... I've heard you*
58 *can have heart attacks and you don't really know you've had one...*
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You had a wee small heart attack which maybe tends to build up to a big one which actually did the damage.” (K03IR, ≥40 years, long-term sentence)

Seven prisoners were able to provide some descriptions of CVD, mainly in relation to one or two risk factors (“*It’s like smoking, isn’t it? I’m a heavy smoker as well, very heavy smoker*” K14IR, ≥40 years, long-term sentence), or knew that it was related to the heart and associated blood vessels (“*I think straight away the heart, something with the veins, the arteries*” K05IR, ≥40 years, long-term sentence). Three of these seven prisoners were able to go a step further, and describe, albeit in basic terms, the process of atherosclerosis (the condition that could lead to CVD), without being prompted:

“It’s [CVD] the heart, ain’t it? It’s all the arteries and veins and things going to the heart. And it’s the build-up of fatty deposits, ain’t it? And that’s about it, ain’t it?” (K02IR, <40 years, long-term sentence)

Moderate knowledge of CVD

One third (six) of the prisoners knew more and were able to describe risk factors, cardiovascular events and CVD symptoms. They acquired their knowledge through educational courses in the prison, such as fitness qualifications. Despite demonstrating having more knowledge compared to those with limited knowledge, these prisoners were

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5 not able to fully articulate the differences between CVD symptoms and cardiovascular
6 events:
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12 *“Well it comes under, well a lot of categories come under one. You’ve*
13 *got like angina, high blood pressure, heart attacks, also it’s to do with*
14 *your cholesterol levels...” (K071R, <40 years, short-term sentence)*
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21 Further evidence of limited understanding came from one prisoner who misunderstood
22 what the word ‘cardiovascular’ meant:
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26
27 *“Heart and lungs. Cardio is your heart and vascular is your lung. I’ve*
28 *seen stuff like that ... cardiovascular disease just means bad heart*
29 *and bad lungs.” (K041R, <40 years, long-term sentence)*
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34 35 36 ***Prisoner and staff perceptions of prisoners’ CVD risk*** 37

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40 Regardless of their CVD knowledge, all prisoners were able to say whether they or other
41 prisoners were at risk of developing CVD and why. All staff also provided reasons why they
42 thought prisoners were at risk. In comparing participants’ responses, three themes were
43 identified: 1) CVD risk as personal/individual; 2) CVD risk as general; and 3) CVD risk linked to
44 perceived consequences of imprisonment. Overall, these responses demonstrated that
45 participants’ understanding of CVD and CVD risk was limited.
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56 *CVD risk as personal/individual*
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6 Some prisoners believed they were personally at risk of CVD and generally attributed this to
7
8 a single CVD risk factor; this was despite some reporting more than one risk factor. Only a
9
10 few prisoners expressed concern over and a desire to reduce their CVD risk, but lacked
11
12 specific knowledge of how to do so:
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17 *“I know I am [at risk of CVD] because my cholesterol’s high and I’ve*
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19 *been trying to get that down. I don’t know much about how to get*
20
21 *that down. But don’t eat certain things, I know that. But the last time*
22
23 *I checked it, it was up at five or six. So, I need to do deal with that.”*
24
25
26 *(K02IR, <40 years, long-term sentence)*
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31 Other prisoners were less concerned about their personal CVD risk and did not express a
32
33 desire to reduce it. This was linked to a few factors, the most prominent being perceived
34
35 health status, i.e. how healthy they were. Several prisoners viewed their health as good
36
37 because they engaged in healthy behaviours (mainly physical activity) on a regular basis. A
38
39 few recalled that in the past, they were more conscious of engaging in healthy behaviours,
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41 but factors such as increasing age and boredom reduced their motivation to do so currently:
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47 *“My old man, my father, he died of a heart attack and I know it runs*
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49 *in my family so I’m always a wee bit self-conscious about that. I think*
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51 *that’s maybe why I used to try and keep myself fit all the time. But as*
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53 *I said, I’m getting older and I’m losing interest.” (K12IR, <40 years,*
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55 *long-term sentence)*
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6 Another factor that limited concern for personal CVD risk was a fatalistic attitude,
7
8 i.e. a belief that one was destined to die of CVD because family members also died
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10 of the disease:
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14 *"It [CVD] is in my family ... Cancers and strokes and stuff like that.*

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16 *Aye, my mother died young, my father and all, all my grandparents.*

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18 *They all died in their early 50s. It's looking like it's all going to be on*
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20 *the cards [for me]." (K14IR, >40 years, long-term sentence)*
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26 Most NHS staff believed there were individual prisoners who had a personal CVD risk; this
27
28 was similar to prisoners' perceptions of personal risk. These NHS staff thought prisoners' risk
29
30 was due to engaging in unhealthy behaviours in prison, and 'pre-disposing' factors prisoners
31
32 brought with them from the community:
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37 *"I'm thinking about one chap ... He's 50 years of age, and he's serving*
38
39 *his first sentence and he has been a dependent drinker for probably*
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41 *as long as he can remember ... With the alcohol use, I'm sure that has*
42
43 *had some impact on his cardiovascular health." (K06NS, NHS staff)*
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48 *CVD risk as general*

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52 A few prisoners perceived CVD risk in 'general' terms, where prisoners as a group were
53
54 thought to be at risk of CVD due to being physically inactive, eating unhealthily, being
55
56 overweight or appearing physically unfit. Most prisoners who viewed CVD risk in this way
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5 suggested that other prisoners were personally responsible for falling into these 'at risk'
6 categories:
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12 *"A few [men are at risk] ... Well the fact that, the size of them for a*
13 *start. You always know about being overweight and you never do*
14 *anything about it."* (K071R, <40 years, short-term sentence)
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21 Most prison staff also viewed prisoners' CVD risk as general. Similar to prisoners, these
22 prison staff mostly linked CVD risk to their perceptions of prisoners' health status and
23 physical appearance. Most prison staff shared a belief that prisoners who lacked concern for
24 their health would not engage in preventative behaviours, thus increasing their CVD risk.
25 Perceived lack of concern for health was mainly determined by how often the prisoners
26 attended the prison gym:
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37 *"I think there are prisoners who are at risk, but there is also like a lot*
38 *of prisoners who take their health quite seriously and they spend a lot*
39 *of time in the gym. So, for them guys, I'd say no, it's not a problem.*
40 *But for all the other guys that just don't use the gym, that just sit*
41 *about, then aye, they're probably at risk."* (K08PS, prison staff)
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51 One member of the prison staff who knew that CVD risk was linked to certain behaviours
52 believed that prisoners who engaged in these behaviours both in and out of prison, had a
53 high CVD risk:
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6 “*Well I mean I don’t have a medical background but I guess, if you*
7
8 *think about it ... something like 70 or 80% of prisoners smoke ... and*
9
10 *some have prior extensive use of alcohol. I’m guessing those are all*
11
12 *contributing factors to CVD.” (K09PS, prison staff)*
13
14

15 16 17 *CVD risk linked to perceived consequences of imprisonment* 18

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21 Evident in the findings so far is that prisoners’ CVD risk was linked to behavioural risk factors,
22
23 particularly smoking, physical inactivity and unhealthy eating. Overall, participants believed
24
25 these factors were strongly linked to the perceived consequences of imprisonment. These
26
27 are presented as three sub-themes below: mental health problems, boredom and
28
29 powerlessness.
30
31

32 33 34 35 Mental health problems 36

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39 Although only two prisoners reported a mental health problem, several others mentioned
40
41 experiencing worsening mental health while imprisoned. Most prisoners and staff believed
42
43 that imprisonment either caused mental health problems to develop or exacerbated pre-
44
45 existing ones. Reasons for this included being ‘stuck’ in prison, having a monotonous daily
46
47 routine and receiving bad news while imprisoned. The most commonly mentioned mental
48
49 health problems were stress, anxiety and depression. Several prisoners said that comfort
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51 eating and smoking helped them cope with these problems. Most knew these behaviours
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53 were harmful to their health and expressed frustration, regret or guilt, for engaging in these:
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"I never used to smoke before I came into jail. I think that it's through stress I smoke. I smoke about 20 to 30 [a day]. It's stupid ... I wish I didn't smoke. I suppose it's a wee bit of depression, isn't it? Stuck in jail." (K16IR, ≥40 years, long-term sentence)

Similarly, staff reported that prisoners experiencing poor mental health tended to stop engaging in the social aspects of prison life and isolated themselves to cope with these problems:

"I'm not like clued up too much [about CVD], but certainly from a lot of the guys that I've worked with, potentially yeah [they are at risk of CVD] ... Mental health wise as well, they'll fall maybe sort of into depression, sort of regress into themselves so they'll just tend to spend their time sort of lying in their cells.." (K05NS, NHS staff)

Boredom

Another perceived consequence of imprisonment linked to CVD risk was boredom. The lack of activities and the monotony of the daily routine were often given as reasons why prisoners engaged in unhealthy behaviours. Again, many prisoners knew these behaviours were harmful to health, but felt unable to give them up because there would be nothing else for them to do. In this way, boredom led to a lack of motivation to engage in preventative behaviours:

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"I keep saying I'm going to stop [smoking] ... It's just in here because there's nothing else to do. You've got a lot of free time on your hands. It's either I smoke or eat all sorts of rubbish, one of the two." (K12IR, <40 years, long-term sentence)

While most prisoners believed there was lack of activities in the prison, a few admitted that it was not being able to participate in their usual physical activities before imprisonment, such as walking and fishing, which led to boredom. The absence of such suitable alternatives in prison led to general demotivation to engage in any type of available physical activity:

"I know there's a small gym up on the wing up there ... I have no interest in it. My sport outside is fishing, so we'd walk ... In here, you're hanging about the wing there and there's nothing to do. There's intent basically, intent to do nothing." (K14IR, ≥40 years, long-term sentence)

All prisoners acknowledged that comfort eating was often triggered by boredom. Unhealthy snacks such as sweets and crisps were readily available in the prison canteen and many prisoners regularly ate these to pass the time, particularly at night when they were confined to their cells. As with other behaviours, prisoners knew that comfort eating was harmful to health, but it was accepted as part of the prison culture:

"But here it's just so easy just to go in your cell at night time, just kick back and relax and don't do anything ... Comfort eating, boredom."

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When that door gets locked, that's you." (K10IR, ≥40 years, long-term sentence)

Similarly, most staff acknowledged that the lack of activities in the prison led to boredom, which led to unhealthy eating habits:

"They have nothing else to do with their time, but sit in the tip, watch tele and eat rubbish ... what do they instead? Eat crisps and chocolate and general rubbish." (K01NS, NHS staff)

Powerlessness

Prisoners and NHS staff linked mental health problems and boredom to a third perceived consequence of imprisonment, i.e. powerlessness. Most prisoners believed that restricted movement reduced their autonomy to exercise when they wanted. More poignantly, there was a seemingly unlimited availability of unhealthy food options provided by the prison, which reduced prisoners' control, often leading to impulse buying and subsequent comfort eating:

"It's (visiting the canteen) like going to an ice cream van ... We'll look through the grill gate and you've got all the shelves full of sweeties ... even if they're [prisoners] going to buy their tobacco, they come back

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with a big bag of chocolate because it's there looking at them."

(K01IR, ≥40 years, long-term sentence)

In contrast, staff had mixed views regarding the availability of unhealthy food and its influence on prisoners' control. NHS staff generally believed this availability impacted negatively on prisoners' ability to control their eating (*"they tend to fall in a trap maybe gaining a bit more weight coming in here, unhealthy eating"*, K05NS, NHS staff). While prison staff acknowledged that temptation arose from the availability of unhealthy food options, they believed that prisoners did have control over and responsibility for their own choices. These staff thought other factors such as the prisoners' background and limited knowledge of nutrition had a bigger impact on prisoners' control and choice:

"What I can say to everybody about nutrition in the jail is you could choose to be healthy. Where the problem comes is, it's very easy to have chips every day. I'm not saying every time I go to the canteen I'm always gonna take the salads, but at the same time, the lack of knowledge that some prisoners have got, whether it be their background, their upbringing, or they just don't know, that could be it." (K07PS, prison staff)

Discussion

Summary

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6 This qualitative study aimed to explore prisoners' knowledge of CVD and prisoners and
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8 staff's perceptions of prisoners' CVD risk. We found that while most prisoners had limited
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10 knowledge of CVD, a few had a moderate amount through participation in prison courses.
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12 Both prisoners and staff perceived prisoners' CVD risk as either pertaining to one individual,
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14 or pertaining to the general prisoner population. Several prisoners lacked concern for their
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16 perceived CVD risk, and the few who wanted to reduce this risk lacked the knowledge to do
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18 so. The unhealthy behaviours that participants believed contributed to increased CVD risk
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20 were linked to three perceived consequences of imprisonment: mental health problems,
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22 boredom and powerlessness. Prisoners and staff shared similar beliefs regarding the role
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24 that mental health problems and boredom played in reducing motivation to engage in
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26 preventative behaviours. However, there were differing views between NHS and prison staff
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28 over powerlessness, which was mainly discussed in relation to the availability of unhealthy
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30 food options in the prison. NHS staff believed this availability limited prisoners' control over
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32 their spending and eating habits, while prison staff believed that personal factors such as
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34 prisoners' knowledge of nutrition, impacted on control over these habits.
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44 ***Comparison with previous research***

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47 To our best knowledge, this is the first study to explore knowledge of CVD and CVD risk
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49 perceptions from the perspectives of prisoners and staff. One previous study explored how
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51 CVD and its risk factors were managed in recently released prisoners with diagnosed CVD, or
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53 CVD risk factors in a prison in Connecticut, USA (Thomas *et al.*, 2016). Prior research also
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55 explored how prisoners conceptualise their general health or illness experience (Smith,
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57 2002; Plugge, Douglas and Fitzpatrick, 2008; Woodall, 2010; Pulford *et al.*, 2013), but not
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5 their perceptions of CVD risk. Therefore, the findings from this study are unique and
6 contribute to gaps in the literature regarding CVD knowledge and risk perceptions in prison.
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12 Our finding that most prisoners had limited knowledge of CVD complements findings from
13 quantitative studies that explored CVD knowledge in the general public (Potvin, Richard and
14 Edwards, 2000; Reiner, Sonicki and Tedeschi-Reiner, 2010), young adults (Trejo *et al.*, 2018),
15 women (Mosca *et al.*, 2000), and high-risk groups (Choi *et al.*, 2008; Homko *et al.*, 2008;
16 Ghosh-Swaby and Kuriya, 2019); these found that most people have basic knowledge of CVD
17 or heart disease, and/or its risk factors. There are three possible reasons why most prisoners
18 had limited knowledge of CVD. First, some mentioned that they had never heard of the
19 disease, or never had to think about it prior to participating in this study. This suggests that
20 CVD may have never featured in their conversations with others, including healthcare
21 professionals. This is concerning as most prisoners reported having one or more risk factors,
22 which can increase CVD risk. Second, most prisoners did not have any 'formal' education
23 about CVD but instead gained their knowledge through other means such as the media,
24 which is a primary source for people's CVD knowledge (Ritchie, Herscovitch and Norfor,
25 1994; Pancioli *et al.*, 1998; Mosca *et al.*, 2010; Bartlo, Irion and Voorhees, 2020). It is
26 possible that when prisoners acquired knowledge this way, they may not have considered it
27 relevant at the time and would therefore be less likely to remember details; this was evident
28 through misunderstandings and misconceptions about CVD risk demonstrated in discussions
29 with prisoners. Studies on other high-risk groups similarly found that misunderstanding and
30 misconceptions of CVD and its risks are common (Webster and Heeley, 2010; Boo *et al.*,
31 2017). Third, studies show that people with lower educational attainment have less CVD
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6 knowledge (Potvin, Richard and Edwards, 2000; Lynch *et al.*, 2006; Reiner, Sonicki and
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8 Tedeschi-Reiner, 2010; Boateng *et al.*, 2017); while we did not assess the educational status
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10 of the prisoners in our study, it is widely known that most prisoners in the UK have low
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12 educational attainment (Natale, 2010; Prisoners' Education Trust, 2015).
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17 Interestingly, despite most prisoners knowing little about CVD, all were able to say whether
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19 they or others were at risk of CVD. Knowledge can be important in determining the risk of a
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21 disease (Johnson, 1993), thus people may be unable to judge the severity of a risk without
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23 adequate knowledge (Weinstein, 1999). However, other factors can contribute to subjective
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25 CVD risk assessments (Choi *et al.*, 2008; Webster and Heeley, 2010). We found that most
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27 prisoners judged theirs and others' CVD risk primarily on perceived health status. Similarly,
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29 Choi *et al.* (Choi *et al.*, 2008) found that people with type 2 diabetes who perceived their
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31 health as good, believed their risk of coronary heart disease was low. Likewise, Meischke *et*
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33 *al.* (Meischke *et al.*, 2000) found that in people with an increased risk of a heart attack,
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35 perceived good health was associated with lower perception of having a heart attack. There
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37 are dangers in assessing CVD risk based on perceived health; people with CVD or who have a
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39 high risk CVD are often asymptomatic and can appear healthy until they experience a
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41 cardiovascular event such as a heart attack or stroke (JBS3, 2014). Thus, providing accurate
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43 information to prisoners about CVD risk is important; given prisoners' focus on fitness and
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45 health, these can be used as starting points for these discussions (Saleh *et al.*, 2019).
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51 Interestingly, we also found that most staff judged prisoners' CVD risk based on perceived
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53 health status, although some NHS staff did consider individual health behaviours. This
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5 suggests that staff, both prison and NHS, may also benefit from receiving accurate
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7 information about CVD risk.
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12 In comparing the prisoners' and staff's perceptions of prisoners' CVD risk, we found that
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14 both groups mostly referred to behavioural risk factors (mainly smoking, physical inactivity
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16 and unhealthy eating), stress and family history. This supports evidence that people from
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18 general and vulnerable populations mostly identify behavioural factors (Marteau *et al.*,
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20 1995; Pancioli *et al.*, 1998; Potvin, Richard and Edwards, 2000; Trejo *et al.*, 2018), stress
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22 (Ritchie, Herscovitch and Norfor, 1994; Hunt *et al.*, 2000; Carroll *et al.*, 2003) and family
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24 history (Marteau *et al.*, 1995; Hunt *et al.*, 2000; Carroll *et al.*, 2003), as contributing to CVD
25
26 risk. These studies show that people often do not identify metabolic risk factors such as
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28 hypertension, high cholesterol and high blood sugar, all of which are prevalent in prison
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30 populations (Arries and Maposa, 2013; Wang *et al.*, 2017; Packham *et al.*, 2020). This was
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32 evident in our study where two prisoners did not consider their type 2 diabetes when
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34 discussing their perceived CVD risk. Other research has found that people with type 2
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36 diabetes are often unaware it is a CVD risk factor (Wartak *et al.*, 2011; Kilkenny *et al.*, 2017),
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38 and therefore underestimate their personal CVD risk (Van Der Weijden *et al.*, 2007; Diaz *et*
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40 *al.*, 2012). As type 2 diabetes increases the risk of developing CVD by two to four times
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42 compared to people without the condition (World Health Federation, 2017), there is a need
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44 to increase the awareness of this and other metabolic risk factors among prisoners and staff.
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55 This study shows there is a need for CVD education in prison, which addresses knowledge of
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57 CVD, its risk and risk perceptions, especially given prisoners' limited knowledge of CVD and
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59 its risks, and the high prevalence of CVD risk factors in prison populations. It is important
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5 that strategies for effectively communicating this information to prisoners are explored, as
6 many detainees have low educational attainment (Natale, 2010; Prisoners' Education Trust,
7 2015), and communicating information about CVD can generally be challenging and complex
8 (Waldron *et al.*, 2011). Based on findings from our study and previous research (Webster
9 and Heeley, 2010; Waldron *et al.*, 2011), simple language and visual aids presented over
10 short timeframes may be useful for communicating with prisoners. Staff who have a
11 healthcare role with prisoners will also benefit from CVD education, as this may enable them
12 to better support prisoners to engage in preventative behaviours.
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26 A novel finding is that our participants linked unhealthy behaviours that increase CVD risk to
27 individual-level factors i.e., mental health problems, boredom and powerlessness, that
28 lowered prisoners' motivation to engage in preventative health behaviours. However, these
29 factors were majorly influenced by social and environmental factors such as the
30 monotonous daily regime, large availability of unhealthy food and a culture of unhealthy
31 eating. Though other qualitative studies did not specifically focus on perceived CVD risk, they
32 similarly found that socio-environmental factors such as restrictive regimes, the availability
33 of unhealthy food, etc. did reduce prisoners' motivation to engage in healthy behaviours
34 such as physical activity and healthy eating (de Viggiani, 2006; De Viggiani, 2007; Woodall,
35 2010). Our findings highlight the importance of targeting socio-environmental factors, not
36 just individual factors, to reduce prisoners' CVD risk. Unfortunately, most interventions to
37 lower prisoners' CVD risk or improve their cardiovascular health focus on individual factors
38 (Mohan *et al.*, 2018). There are promising socio-environmental interventions that have
39 shown promise in improving factors and behaviours that can decrease CVD risk. For
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6 example, gardening interventions where prisoners grow their own fruits and vegetables
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8 have been shown to improve mental health and healthy eating habits, which in turn have led
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10 to improved perceptions of overall health and wellbeing among prisoners (Brown *et al.*,
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12 2016; Timler, Brown and Varcoe, 2019). Greenspaces in prison have also been found to
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14 improve prisoners' mental health and wellbeing (Moran *et al.*, 2020). Therefore, future
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16 research should explore if and how these interventions can lower CVD risk and improve
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18 physical and mental health outcomes on a short and long-term basis in prison. Developing
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20 socio-environmental interventions also requires input from multiple prisoner health
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22 stakeholders. Therefore, there also needs to be a focus on building partnership working
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24 among prison staff, NHS staff, outside agencies and researchers.
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35 ***Strengths and limitations***

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39 We used a qualitative approach to understand prisoners' knowledge of CVD. Previous
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41 studies in non-prison settings have used questionnaires to assess CVD knowledge, which
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43 include a list of potential CVD risk factors (Homko *et al.*, 2008; Wartak *et al.*, 2011). Including
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45 potential risk factors can prompt recall and limit researchers' understanding of the extent to
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47 which participants understand CVD and CVD risk (Wartak *et al.*, 2011). Our qualitative
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49 approach allowed for any misunderstandings or misconceptions about CVD and CVD risk to
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51 be identified. It also allowed us to observe the type of language prisoners use when
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53 describing CVD, and how prisoners received and processed information about CVD and
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55 related issues. Further, it allowed us to observe first-hand the usefulness of visualisation (via
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5 a visual aid to explain atherosclerosis), as a technique to communicate information about
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8 CVD. There were some limitations. First, most prisoners interviewed were serving a long-
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10 term sentence; it is possible that their perspectives may differ from short-term prisoners'.
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12 Second, our study was conducted in a private prison, thus our findings cannot be generalised
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14 to state-run prisons. Third, we did not objectively measure the prisoners' actual CVD risk; it
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16 may have been useful to see how the prisoners' actual CVD risk compared to their perceived
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18 personal risk, given that many people either underestimate or overestimate person risk
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23 (Webster and Heeley, 2010).
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26 **Conclusion**

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31 This study provides new insights into prisoners' knowledge of CVD and prisoners and staff's
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33 perceptions of prisoners' CVD risk. Our findings indicate that detainees had limited
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35 knowledge of CVD and its risks and highlight the need for CVD education among prisoners.
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38 Socio-environmental factors that impact on individual-level factors that reduce prisoners'
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40 motivation to engage in preventative health behaviours must be targeted to reduce
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42 prisoners' CVD risk. Future research should focus on developing socio-environmental
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44 interventions to reduce prisoners' CVD risk.
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50 **Funding**

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54 This study was undertaken as part of a Doctoral studentship, which was partly funded by
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57 NHS Ayrshire & Arran.
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Conflicts of interest

None to declare.

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Table I – Characteristics of prisoners

Participant No.	Age group	Sentence duration	Exercise frequency (days/week)	Health issues	Family history of CVD	Health in prison versus the community
K01IR	≥40	Long-term	Medium	None		Improved
K02IR	<40	Long-term	High	Type 2 diabetes, overweight, smoker, high cholesterol		Declined
K03IR	≥40	Long-term	Medium	None; previous drug user		Declined then improved
K04IR	<40	Long-term	High	Smoker		Improved
K05IR	≥40	Long-term	Medium	Asthmatic	Yes	Improved
K06IR	<40	Long-term	High	None		Improved
K07IR	<40	Short-term	High	None		Declined then improved
K08IR	<40	Long-term	High	None	Yes	Improved
K09IR*	<40	Long-term	Low	None		Declined
K10IR*	≥40	Long-term	Low	Smoker		Stayed the same
K11IR*	≥40	Long-term	Medium	Overweight		Declined
K12IR†	<40	Long-term	Low	Smoker	Yes	Declined
K13IR†	≥40	Long-term	Medium	Type 2 diabetes		Improved
K14IR	≥40	Long-term	Medium	Smoker, mental health problems; previous drug user	Yes	Declined
K15IR	≥40	Long-term	Low	Overweight, smoker		Declined
K16IR	≥40	Long-term	Low	Smoker, mental health problems		Declined

* Joint interview with three participants; † Pair interview with two participant

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Table II – Role of staff within the study prison

Participant No.	Role
K01NS	NHS staff
K02NS [†]	NHS staff
K03NS [†]	NHS staff
K04PS	Prison staff
K05NS	NHS staff
K06NS	NHS staff
K07PS	Prison staff
K08PS	Prison staff
K09PS	Prison staff
K10NS	NHS staff
K11NS	NHS staff

[†] Pair interview with two participants