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# Taking the biscuit: defining excessive quantities of free refreshments in a healthcare library

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## **Taking the biscuit: Defining "excessive quantities" of free hot drinks and biscuits in a healthcare library setting; a cross-profession cross-sectional international survey**

### **Authors**

**Andrew Tabner** (*corresponding author*)

Emergency Medicine Consultant

University Hospitals of Derby and Burton NHS Foundation Trust

[andrew.tabner@nhs.net](mailto:andrew.tabner@nhs.net)

Emergency Department, Royal Derby Hospital, Uttoxeter Road, Derby, DE22 3NE

**Stuart Spicer**

Research Fellow in Applied Healthcare

University of Plymouth

[stuart.spicer@plymouth.ac.uk](mailto:stuart.spicer@plymouth.ac.uk)

**Kerryn Husk**

Associate Professor of Health Services Research

University of Plymouth

[Kerryn.husk@plymouth.ac.uk](mailto:Kerryn.husk@plymouth.ac.uk)

**Holly Blake**

Professor of Behavioural Medicine

University of Nottingham.

[holly.blake@nottingham.ac.uk](mailto:holly.blake@nottingham.ac.uk)

**Caroline White**

Library & Knowledge Services Manager

University Hospitals of Derby and Burton NHS Foundation Trust

[caroline.white15@nhs.net](mailto:caroline.white15@nhs.net)

**Suzanne Toft**

Clinical Librarian

University Hospitals of Derby and Burton NHS Foundation Trust

[suzanne.toft@nhs.net](mailto:suzanne.toft@nhs.net)

**Graham Johnson**

Consultant Emergency/Paediatric Emergency Medicine

University Hospitals of Derby and Burton NHS Foundation Trust

[graham.johnson4@nhs.net](mailto:graham.johnson4@nhs.net)

## **Abstract**

**Objectives** - To interrogate interpretations of academic library signage asking patrons to avoid 'excessive' free hot drink and biscuit consumption.

**Design** - Cross-sectional, online survey.

**Setting** - Survey conducted from the comfort of a hospital library with a ready supply of (free) hot beverages and biscuits.

**Participants** - convenience sample of 1874 participants 'working in healthcare' recruited through social media, personal and professional networks. Multi-professional, international cohort, including primary and secondary care and academics.

**Instrument and outcomes** – Google form comprising 3 sections and 15 questions, assessing interpretations of 'excessive' for hot drink and biscuit consumption. Administered Feb-March 2022. Data captured included: profession; role; specialty; time in role; country; usual hot drink consumption. Initial economic analyses conducted on the back of a biscuit wrapper.

**Results** - The mean number of free hot drinks and packets of biscuits healthcare staff would consume before considering it excessive was 3 and 2 respectively. The introduction of a nominal charge reduces this to 2 hot drinks and 1 packet of biscuits. Coffee drinkers take more hot drinks than other individuals. Doctors have a greater appetite for free biscuits than non-doctors. Time in role correlates inversely with the number of free packets of biscuits considered excessive, but those in role longer are willing to pay for a higher number of hot drinks.

Providing all members of NHS staff with 3 hot drinks per day would cost approximately £32,692,935, or approximately 0.017% of the entire NHS budget.

**Conclusions** - Academic library signage creators should exercise caution; healthcare staff have widely variable perceptions of what "excessive" means in the context of free hot drinks and biscuits. However, the benefits of complementary refreshments on staff morale and wellbeing means that their provision are recommended for all healthcare staff. The cost of national implementation represents a tiny proportion of the NHS budget, and the anticipated positive impacts far outweigh the financial implications.

**What is already known on this topic**

- Complementary hot drinks are known to have a beneficial effect on staff well-being.
- Interpretations of the term “excessive” are subjective, and the lack of a standardised definition has various negative consequences.
- Healthcare professions are some of the most caffeine dependent.

**What this study adds**

- The number of hot drinks deemed excessive is 3 (rounded to the nearest hot drink for obvious reasons).
- A nominal charge reduces free hot drink and biscuit consumption.
- Multiple factors, including time in role, specialty, profession and preferred hot drink, are associated with the quantity of hot drinks and biscuits consumed.

## Introduction

Whilst there may be no such thing as a free lunch [1,2], study authors were pleasantly surprised to find free coffee, tea, hot chocolate and biscuits available in their hospital library. However, they noted a sign cautioning against taking “excessive” refreshments (Figure 1). In a subsequent interlude from academic productivity a discussion ensued as to whether, in this context, “excessive” is a term with a universally accepted definition or whether there may be variation in interpretation. The Oxford English Dictionary [3] definition (“exceeding what is right, proportionate, or desirable”) supports the supposition that individuals may apply their own values, and indeed the authors displayed clear variation in their respective interpretations. This dilemma is not confined to academic libraries; we were reminded that there is also troublesome contention over the definition of “excessive usage” in other industries [4]. Subsequent discussion identified several factors that might affect interpretation, including biological determinants (e.g., hunger, appetite, taste), economic determinants (e.g., income), physical determinants (e.g., proximity, time), attitudes (e.g., beliefs and knowledge about food) and psychological determinants (e.g., mood, stress, guilt). Individuals are, of course, influenced by their perception of social norms [5] on the one hand, and their usual hot beverage/biscuit consumption on the other; past behaviour may predict future behaviour [6]. One author also described a desire not to be perceived by any observers to be taking excessive quantities, and therefore modifying their behaviour as a result (Bentham’s Panopticon Effect [7]). Proximity of snacks to beverages is known to increase food consumption in the workplace [8].

Healthcare workers are amongst the most likely to describe a need for caffeine in order to function optimally [9]. There is also evidence that the provision of complimentary beverages in the workplace has positive impacts; free coffee has been found to improve safety behaviours amongst workers [10], and to reduce unethical behaviours when sleep-deprived [11,12]. Most notably, workers have identified free hot drinks as a more important benefit than free mental health support, and free coffee is associated with improved morale and productivity [13]. Given understandable concerns over NHS staff morale, recruitment and retention [14], and the well-documented challenges facing health and social care provision [14–47], we feel this is likely to be a cost-effective intervention to improve staff wellbeing.

Gaining consensus of definition for the term ‘excessive’ would therefore bring multiple benefits, including: 1) increased likelihood of compliance; 2) provision of a ‘fair usage’ threshold for providers; 3) ensuring users can maximise their utilisation of the provided service without guilt or concern about external judgement or sanction. Furthermore, quantifying maximum likely usage of a “free hot drinks and biscuits” scheme allows an evaluation of the potential costs of wider implementation, both within the NHS and elsewhere.

This study aimed to assess interpretations of the term “excessive” in the context of free hot drinks and biscuits across a large population encompassing any individual with a professional role in healthcare. It also evaluated factors thought likely by the study team to impact individual perceptions of the term, and the impact of the introduction of a nominal charge on individuals’ hot drink and biscuit consumption.

## **Methods**

### **Study design**

An international cross-sectional online survey.

### **Data collection**

The survey tool, purpose-built for this study as a Google form, comprised 15 questions over 3 sections. It was created by two of the study authors and pre-tested by the remaining study team (all of whom would meet the study inclusion criteria). Data from pre-testing were not included in the final analysis. The final survey tool (Supplementary Material 1) was refined during broader team discussion; the authors acknowledge that their shared positionality on the issue of decaffeinated hot drinks may have affected the phrasing of these questions, but every effort was made to create a neutrally presented, unbiased survey tool.

The study surveyed an international cohort of individuals working in both clinical and non-clinical roles within the healthcare field, including those in academic roles. Given the broad inclusion criteria the study could not sample solely from a known population; the value of the increased number of responses that could be obtained from a web survey distributed across multiple platforms were felt to outweigh the resulting increase in error and sampling bias [48,49].

The survey went live on 23<sup>rd</sup> February 2022 with promotion by the authors on social media (Facebook, Twitter) and through personal networks. Three further coordinated efforts of promoting the survey followed at approximately weekly intervals. The survey was closed on 31<sup>st</sup> March 2022; this was the first point at which a 24-hour period had elapsed with no further responses.

### **Statistical analysis**

Data were processed and analysed in R [50]. The four key outcome variables (number of free drinks taken before considered excessive, number of free packets of biscuits taken before considered excessive, number of drinks taken if a nominal charge were introduced, number of packets of biscuits taken if a nominal charge were introduced) were converted to numeric format. Those who selected "10 or more" as their response were coded as 10. Participants who selected "other" on the four outcome variables could not be recoded numerically, so these responses were not included in any quantitative analysis.

The following predictor variables were simplified to enable analysis: job role was converted to a binary variable (doctor/non-doctor); country was converted to a binary variable (UK/non-UK); department/specialty was converted into a three-level variable (General Practice/Emergency Medicine/other). Data with three or more variable levels were analysed using ANOVAs, whilst data with two variables were analysed with t-tests. If ANOVAs indicated a significant effect, pairwise t-tests were conducted using FDR corrections for multiple comparisons. Effect sizes were calculated for all significant effects; general eta-squared for ANOVA's and Cohen's d for t-tests. An alpha of  $p < .05$  was used for all tests of significance.

### **Economic analysis**

Given resource constraints, we were unable to carry out a formal health economic evaluation. Our provisional calculations have been carried out manually. Initially the back of a digestive packet was used, but no ink would stick; the authors therefore resorted to a club bar wrapper, which provided a suitable medium. And was delicious. Cost data were taken from a university catering provider, and workforce data from The King's Fund [51].

### **Patient and Public Involvement**

A group comprising individuals with lived experience of hot drinks, biscuits and/or libraries, but who did not work within healthcare, was convened through authors' personal networks. The group contributed feedback, suggestions and refinements to the project and underlying principles. The group meeting was held remotely, both because of practical barriers and concern for social distancing in the context of the COVID-19 pandemic. PPI group members were remunerated for any reasonable number of caffeinated beverages or biscuits consumed during the meeting. Given the identified difficulty in defining excessive consumption, authors were reassured that none of the group members were healthcare workers [9]. Furthermore, in much the same way as "an alcoholic has been lightly defined as a man who drinks more than his own doctor" [52,53], excessive hot drink consumption during the group meeting was considered to be drinking more coffee than the facilitator.

## Results

### Sample

A total of 1874 employees responded to our survey. Our sample contained a high proportion of doctors, and particularly General Practitioners and Emergency Medicine physicians (see below). Processed data and a script for conducting the analyses will be made available via OSF upon publication of this manuscript.

*Table 1. Means and standard deviations for each of the four outcome variables across the whole sample.*

<b>Variable</b>	<b>Mean</b>	<b>SD</b>
<b>Number of free drinks taken before considered excessive</b>	<b>3.32</b>	<b>2.23</b>
<b>Number of free packs of biscuits taken before considered excessive</b>	<b>2.24</b>	<b>1.71</b>
<b>Number of drinks taken if a nominal charge introduced</b>	<b>2.44</b>	<b>1.92</b>
<b>Number of packs of biscuits taken if a nominal charge introduced</b>	<b>1.49</b>	<b>1.40</b>

Means for the four ‘core’ outcome variables across the whole sample are reported in Table 1. The introduction of a nominal charge significantly reduces both the number of hot drinks ( $F(1780) = 15.1, p < .001, d = .43$ ) and the number of packs of biscuits ( $F(1757) = 17.1, p < .001, d = .49$ ) that participants would take when compared to free hot drinks and biscuits.

Participants in our sample reported drinking a mean of 3.04 (sd = 1.82) hot drinks per typical day (when supplying/paying for their own hot drinks), and the distribution of hot drink consumption is shown in Figure 2.

Dangerously, of the 962 coffee drinkers in our sample over 16% (n=157) of them consumed above the level where hot caffeinated drinks provide health benefits (3-4 cups per day [54]). When asked, “Would you eat a free doughnut (“donut”)?”, 1481 participants answered “Yes” (79%).

### Multivariate results

Table 2 reports means for each of our ‘core’ outcome variables by our seven predictor variables. In the following subsections we describe in detail the analyses of these relationships.



Table 2. Means for the four outcome variables across each of the seven predictor variables, along with participant numbers. “Free drinks mean” is the number of free drinks participants would take before considering it excessive; “Free bisc mean” is the number of free packs of biscuits participants would take before considering it excessive; “Nom chg drinks mean” is number of drinks taken if a nominal charge is introduced; “Nom chg biscs mean” is the number of packs of biscuits taken if a nominal charge is introduced. Green colour coding shows where a predictor variable had a significant effect on an outcome, while red indicates no evidence of a significant effect.

Predictor variable	Level	n	Free drinks mean	Free bisc mean	Nom chg drinks mean	Nom chg biscs mean
<b>Hot drink choice</b>	Coffee	962	3.44	2.36	2.46	1.47
	Decaf coffee (you monster)	63	3.31	1.95	2.83	1.33
	Decaf tea (yes, it’s a thing)	59	3.04	1.91	2.49	1.46
	Hot Chocolate	107	3.12	2.62	1.52	1.82
	Other	73	2.47	2.10	1.17	1.03
	Tea	603	3.29	2.09	2.68	1.54
	<b>Biscuit choice</b>	Bourbon	496	3.18	2.36	2.37
Custard Cream		372	3.36	2.19	2.46	1.47
Digestive		187	3.42	2.21	2.66	1.43
Fruit Shortcakes		149	3.51	2.40	2.53	1.44
Ginger Nut		195	3.51	2.19	2.36	1.35
Other		259	3.31	2.11	2.33	1.42
Shortbread		209	3.21	2.23	2.49	1.44
<b>Role</b>	Doctor	954	3.40	2.35	2.42	1.51
	Not Doctor	913	3.24	2.14	2.45	1.47
<b>Time in role</b>	Fewer than 2 years	107	3.74	2.89	1.77	1.23
	Between 2 and 5 years	268	3.43	2.36	2.15	1.38
	Between 5 and 8 years	259	3.22	2.30	2.35	1.55
	More than 8 years	1233	3.28	2.16	2.58	1.52
<b>Dept/ Spec</b>	ED	276	3.22	2.28	2.30	1.56
	GP	258	3.67	2.27	2.87	1.55
	Other	1333	3.28	2.24	2.38	1.46
<b>Where heard</b>	Facebook	1025	3.40	2.23	2.53	1.52
	Other	24	2.92	1.91	2.14	1.19
	Personal email	9	3.00	2.67	3.33	2.11
	Twitter	391	3.56	2.51	2.33	1.54
	WhatsApp	213	3.12	2.35	2.24	1.39
	Word of mouth	60	3.71	2.18	2.36	1.21
	Work email	145	2.36	1.60	2.37	1.36
<b>Country</b>	Non-UK	122	3.32	2.97	1.70	1.37
	UK	1745	3.32	2.20	2.49	1.50

### **Number of free hot drinks taken before considering it excessive**

Figure 3 shows the overall distribution for the number of free drinks respondents would take before considering such consumption 'excessive' (mean = 3.32).

Participants' interpretation of 'excessive' differed by choice of hot drink ( $F(5, 1801) = 2.65, p = .021, \eta^2 = .01$ ); with participants who selected "other" having a lower mean than those who selected coffee ( $p = .016, d = .43$ ) and tea ( $p = .049, d = .38$ ). 'Other' included "w\*nky teas" of all varieties [Participant 12], hot whisky [Participant redacted] and those who don't consume hot drinks (an unanticipated subcategory, given the study cohort).

Interpretations of 'excessive' also differed by department/specialty ( $F(2, 1804) = 3.52, p = .030, \eta^2 = .004$ ). GPs would take more hot drinks before considering it excessive than Emergency Dept employees ( $p = .035, d = .19$ ) and all other departments/specialties ( $p = .034, d = .16$ ). The number of hot drinks also differed by where participants heard about the survey ( $F(6, 1800) = 6.02, p < .001, \eta^2 = .02$ ); with participants who saw the advert in a work email reporting a lower number of hot drinks being excessive than those who heard through WhatsApp ( $p = .009, d = .39$ ), Facebook ( $p < .001, d = .52$ ), Twitter ( $p < .001, d = .58$ ), or word of mouth ( $p = .001, d = 0.63$ ).

Perhaps surprisingly, there was no evidence of the number of free drinks taken differing by: choice of biscuit ( $F(6, 1800) = .85, p = .528$ ); job role ( $t(1767) = 1.53, p = .127$ ); time in role ( $F(3, 1803) = 1.69, p = .167$ ); or country ( $t(129) = .00, p = 1.000$ ).

### **Number of free packs of biscuits taken before considering it excessive**

Figure 4 shows the distribution of responses for how many free packs of biscuits participants would take before considering it excessive (mean = 2.24).

The number of packets of free biscuits respondents would take before considering it 'excessive' varied by role, with Doctors having a higher mean than non-Doctors ( $t(1806) = 2.72, p = .007, d = .13$ ). This number of packets also varied by time in role, generally decreasing with a greater time in service ( $F(3, 1806) = 6.37, p < .001, \eta^2 = .01$ ). Respondents who had been in the role less than 2 years would take more packets than those who had been in the role 2-5 years ( $p = .015, d = .27$ ), 5-8 years ( $p = .003, d = .28$ ) and more than 8 years ( $p < .001, d = .36$ ).

The number of packets of free biscuits before being considered 'excessive' also varied by where people heard about our survey ( $F(6, 1803) = 5.43, p < .001, \eta^2 = .02$ ); with participants who saw the advert via work email having a lower mean number of packets than Facebook ( $p < .001, d = .44$ ), WhatsApp ( $p < .001, d = .47$ ), and Twitter ( $p < .001, d = .57$ ), and participants who saw the advert on Twitter having a higher mean number of packets than those who saw it on Facebook, ( $p = .027, d = .16$ ).

Non-UK respondents reported a higher mean number of packets before considering it excessive than UK respondents ( $t(125) = 3.56, p = .001, d = .39$ ). Additionally, the number of packets differed by preferred choice of hot drink ( $F(5, 1804) = 3.75, p = .002, \eta^2 = .01$ ); with tea drinkers taking fewer packets than coffee drinkers ( $p = .024, d = .16$ ), and hot chocolate drinkers ( $p = .024, d = .33$ ).

Interestingly, there was no evidence of the number of packets of biscuits differing by either choice of biscuit ( $F(6, 1803) = .90, p = .495$ ); or department/specialty ( $F(2, 1807) = .10, p = .903$ ).

### **Number of hot drinks taken if a nominal charge is introduced**

Figure 5 shows the distribution of responses for how many drinks participants would consider if a nominal charge were introduced for those drinks. Unsurprisingly, the mean is lower than before, at 2.44 drinks.

The number of hot drinks participants would take if a nominal charge was introduced differed by hot drink choice ( $F(5, 1821) = 14.08, p < .001, \eta^2 = .04$ ); with hot chocolate drinkers having a lower mean number of drinks than coffee ( $p < .001, d = .50$ ), tea ( $p < .001, d = .61$ ), decaf coffee ( $p < .001, d = .69$ ), and decaf tea ( $p = .003, d = .58$ ).

The number of hot drinks taken despite a nominal charge differed by time in role (with a reversal of the pattern seen with free packets of biscuits), generally increasing over time ( $F(3, 1823) = 8.62, p < .001, \eta^2 = .01$ ). Those with 5-8 years of service reported taking a higher number of nominally charged drinks than those with under 2 years ( $p = .018, d = .32$ ), and over 8 years of service had a higher mean than 2-5 years ( $p = .003, d = .23$ ) and under 2 years ( $p < .001, d = .42$ ).

The number of nominally charged hot drinks taken differed by department/specialty ( $F(2, 1824) = 7.67, p < .001, \eta^2 = .01$ ); with GPs yet again having a higher mean than ED ( $p = .001, d = .28$ ), and other ( $p = .001, d = .24$ ). The number also differed by country, with UK having a higher mean on this occasion than non-UK respondents ( $t(137) = 4.59, p < .001, d = .43$ ).

There was no evidence of the number of hot drinks differing by: biscuit choice ( $F(6, 1820) = .81, p = .566$ ); by role ( $t(1825) = .37, p = .714$ ); or by where participants heard about the survey ( $F(6, 1820) = 1.42, p = .20$ ).

### **Number of packs of biscuits taken if a nominal charge is introduced**

Figure 6 shows the distribution of responses for how many packs of biscuits participants would consider taking if there was a nominal charge introduced for those packets. Again, somewhat unsurprisingly the mean is lower than the non-charged mean at 1.49 packets.

The number of packets of biscuits participants would take if a nominal charge was introduced differed by hot drink choice ( $F(5, 1784) = 3.04, p = .010, \eta^2 = .01$ ); with “other” (see above for what constituted ‘other’) having a lower mean number of packets than tea drinkers ( $p = .031, d = .41$ ) and hot chocolate drinkers ( $p = .004, d = .49$ ).

However, there was no evidence of the number of packets of biscuits differing by: biscuit choice ( $F(6, 1783) = 1.56, p = .155$ ); role ( $t(1786) = .57, p = .568$ ); time in role ( $F(3, 1786) = 2.00, p = .113$ ); department/specialty ( $F(2, 1787) = .77, p = .464$ ); where participants heard about the survey ( $F(6, 1783) = 1.34, p = .238$ ); or country ( $t(134) = .98, p = .328$ ).

## Free text comments

Survey participants were given the opportunity to make further comments regarding the provision of free hot drinks and biscuits; Table 3 contains a selection of the most informative responses for your perusal.

*Table 3. A selection of free text comments made by survey participants.*

Free text comments
Employers should provide hot drinks for their staff (I'm an employer and I do this)
Coffee is life. Coffee makes the magic happen. No coffee coffee, no fixy fixy.
I think it's excessive if lots of biscuits are taken in one hit. It's not excessive in my opinion if it's spread over the course of 8 hours.
Shocking paucity of Jaffa Cakes available in most healthcare settings. Urgent issue which MUST be addressed for the sake of worker morale and thus patient safety.
My answers heavily depend on the quality of the provisions on offer. I consider NHS-branded instant coffee hazardous for human consumption. Anything that takes longer than 1 minutes walk from the Ward and isn't barista-quality, is too far for me to justify.
There aren't enough free drinks and biscuits in the NHS
What about being offered fruit?
I'm interested in understanding how contextual features influence the consumption of complimentary drinks and biscuits: will you be doing any kind of realist analysis?
free means at least double your normal
Let people have as many hot drinks as they like!
I feel free biscuits in the library or workplace should be encouraged as part of a balanced diet.
Custard Creams are the best NHS biscuit
Some GPs seem to just drink hot water. I mean, where's the fun in that?
I have absolutely no self control when things are free.
I think the 'excessive quantity' comment would actually make me want to have an extra tea or biscuit. You don't get many perks from the NHS and when needed, limiting staff tea or biscuits is unethical.
Hobnobs without chocolate are blasphemous
The NHS appears to be the sole purchaser of Maxwelll House Coffee.
Depends how visible the stash of snacks is... I'd choose many more biscuits from a hidden cupboard as opposed to a table out in the open department...
Access to high quality, fully caffeinated coffee should be considered essential to the maintenance of full cognitive function for clinicians in all clinical settings.
Biscuit consumption is directly proportional to how badly the day is going
Tea and biscuits are the backbone of our businesses, NHS and country. Without these the people of the UK would crumble. Let's not squabble over free tea and coffee. Let's embrace this tradition with relish!
Tea enemas are good for night shifts, really give you a kick!
Decaf coffee should be banned in the work place
free refreshments are provided in nearly every workforce, especially the private sector. This really shouldn't be a contested issue
It's always sh*t coffee anyway.
If you're having to have a p*ss whilst drinking you've probably had too much.
This survey is the most important survey I've ever answered

### **Economic Analysis**

The NHS workforce is estimated at 1.2 million whole time equivalent (WTE) [51]. Assuming a 5-day working week, and allowing for approximated annual leave allowances [55] and bank holidays, there are approximately 224 working days per WTE per year. With an average level of staff sickness (4.5%) [56] there are 256,376,571.4 staff days per year in the NHS. 51.5% of our sample consume coffee as their drink of choice (cost 5.6p per drink [57]) and 32.3% tea (2.26p). For “other” we have taken the mean of coffee and tea (3.93p). Most workplaces already have provision for boiling water. Full details of economic impact calculations can be seen in Figure 7.

If an initiative were to be funded centrally to provide all members of NHS staff with 3 hot drinks per day, the cost would be approximately £32,692,935 plus administration costs. The addition of 2 packets of biscuits, at a cost of 25p each, would cost £128,188,286. Assuming an NHS budget of 192 billion pounds a year [51], the provision of drinks represents 0.017% of the entire NHS budget and 0.058% of the workforce budget.

## Discussion

The mean number of free hot drinks and packets of biscuits that healthcare staff would consume before considering it excessive (rounded to the nearest whole number for obvious reasons) was 3 and 2 respectively. The introduction of a nominal charge would reduce this consumption to 2 hot drinks and 1 packet of biscuits.

Coffee drinkers take more hot drinks before considering it excessive than other individuals, whilst decaffeinated coffee drinkers consume the most hot drinks after the introduction of a nominal charge. It is possible that coffee drinkers, used to paying for espresso-based drinks with a higher caffeine content than the instant coffee referenced in the questionnaire, are anticipating a larger intake in order to maintain their functional serum caffeine level. Alternatively, the known association between bitter taste preference and antisocial personality traits may lead to coffee drinkers consuming free refreshments with blatant disregard for social norms [58]. Whilst mindful that correlation is not causation, and of the fallibility of psychopathy testing [59], it is interesting to note that other studies identified surgeons as both high volume coffee consumers [60] and possessing of psychopathic tendencies [61].

Doctors have a greater appetite for free biscuits than non-doctors [62]; this reflects the known association between shift work and higher consumption of foods with higher levels of saturated fats, more snacking, and eating at unconventional times. The availability of sugary snacks in a healthcare environment has generated significant online discussion [63]; nevertheless, 79% of survey respondents would be happy to eat a free doughnut. Free fruit may be a healthier option [64,65], but free biscuits likely represent an acceptable halfway house for many.

Time in role correlates inversely with the number of free packets of biscuits considered excessive (and a similar non-significant trend is noted in free hot drinks), but those in role longer are willing to pay for a higher number of hot drinks. This may well reflect the greater financial stability that tends to come with professional advancement, together with reduced shift working and better sleep hygiene resulting in a lower likelihood of work-related caffeine dependency.

Individuals who came to the survey through social media have a higher threshold for considering the number of free hot drinks taken to be excessive; given the likely association between age and time in role, and the higher number of young people who are social media users [66], it is likely that this association is confounded.

The potential health impacts of high-volume hot drink consumption must be considered. The mean quantity of free coffee deemed to be excessive falls within identified safe limits for consumption, and may in fact confer some health benefits [54]. An umbrella analysis of 201 meta-analyses found that this level of coffee consumption is associated with a reduced risk of cancer and neurological, metabolic and liver conditions. The only negative associations are low birth weight (in the drinker's child, rather than the drinker), and fracture risk in women. Similarly, tea is associated with antioxidative, anti-inflammatory, antimicrobial, anticarcinogenic, antihypertensive, and neuroprotective effects; it is surprising that tea drinkers don't live forever. There are some clear outliers for high

consumption; whether these individuals and their potential caffeine-associated tremor are responsible for poor handwriting amongst physicians is not known.

The introduction of a nominal charge requires careful consideration. The study findings suggest that it would reduce refreshment consumption, making any initiative more financially sustainable for the host institution whilst still being significantly more economical for users than commercial outlets. However, zero cost goods are perceived by consumers to be more beneficial than their monetary value would suggest [67], and many of the morale and wellbeing benefits associated with free refreshments may be lost if a charge is introduced. The introduction of a nominal charge would appear likely to disproportionately impact staff with less time in role. Notably, the library whose refreshment policy stimulated this research project were forced to limit the program due to excessive consumption by a few users; this reflects the study findings that some individuals would take “10 or more” free hot drinks or packets of biscuits. The library has retained a policy of free refreshments, but now with librarian oversight (Figure 8).

### **Impact of findings and further work**

Given the relatively small cost associated with providing free hot drinks and biscuits to staff, together with the multiple potential benefits for staff wellbeing, retention, health, and productivity, the authors feel a large-scale trial is merited across both primary and secondary care. Given its importance, and to further impact at a broader geographic scale, we provide a spreadsheet to support local implementation of this initiative (Supplementary Material 2); staffing data and local consumable costs can be entered, and predicted costs calculated.

The University Hospitals of Derby and Burton Charities team have launched a one-month trial providing free hot and cold drinks, available for all members of staff in all departments. A sum of £2.30 per month per staff member is allocated, equivalent to approximately 41 cups of coffee. Over the calculated average of 18.6 working days per month this is approximately 2.2 cups of coffee per person per day which, whilst less than what would be considered excessive, is certainly a very welcome step in the right direction. Given current working intensity across the NHS and therefore the limited time in which to take advantage of refreshments, free or otherwise, this provision may well be adequate in most settings.

### **Limitations**

A disproportionately large number of emergency department and general practice staff responded to the survey, and the majority of respondents were UK-based; this was likely influenced by the reach of the authors’ professional networks. However, the wide range of respondents across specialty, professional role, workplace and country mitigates this somewhat, and allows the findings of the survey to be generalised to many healthcare settings.

Despite the screening information at the start of the survey, seven respondents described themselves as not working in healthcare, but their responses were kept in the sample for completeness.

Google forms restrict a user to a single survey completion, but only if the participant uses the same device or account. It would therefore be theoretically possible for an individual to complete the survey more than once by using multiple devices or google accounts. Given the nature of the survey and the study population we feel that the likelihood of an individual being sufficiently motivated to skew the data is unlikely.

Given the lack of resources with which to undertake formal economic evaluation, various assumptions have been made within calculations. Staff overtime could not be accurately quantified and has therefore been disregarded. The cost of milk to add to hot drinks has been discounted due to the wide variety of types available (including non-dairy varieties), variability in costs, and personal variation in quantities used. We felt that exploring whether users added milk before or after pouring their hot drink of choice, whilst an important area of investigation, was beyond the scope of this study; experiences during the provision of free doughnuts for NHS staff also suggested that it may also lead to incivility in online discussions of study findings.

The authors acknowledge that whilst all statistical analyses were planned prior to data collection, some comparisons were more speculative than others.

Ongoing widespread provision of free refreshments may be challenging given current levels of inflation; the cost to provide free hot drinks and biscuits to all NHS staff in 2024/25 is unfortunately predicted to be roughly equivalent to the GDP of Luxembourg. Thankfully this issue is likely inconsequential as no-one will be able to afford the electricity to boil a kettle.

## **Conclusions**

Academic library signage creators should exercise caution. Healthcare staff have widely variable perceptions of what “excessive” means in the context of free hot drinks and biscuits, but the mean number felt to be excessive across all study groups fell within published safe ranges for coffee consumption.

Complementary refreshments should be introduced for all healthcare staff. The cost of national implementation of this initiative currently represents a tiny proportion of the NHS budget, and the anticipated positive impacts far outweigh the financial implications. This study provides evidence to support and tools to implement such changes.

## **Contributorship statement**

AT conceived the study in a caffeine-induced moment of clarity. AT and GJ constructed the first draft of the data collection tool, and KH, HB, CW and ST revised it prior to dissemination. SS undertook data analysis, and all authors contributed to data interpretation. AT, GJ, KH and SS contributed to the first draft of the manuscript, with the remaining authors and our PPI contributors revising it critically for content. All authors have reviewed and approved the final version of the manuscript. AT and GJ are overall guarantors for the work. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.



### **Data sharing**

Data will be made available upon reasonable request to the corresponding author and a limited data set will be available via OSF. Biscuits will not.

### **Ethics approval**

The study did not require Research Ethics Committee Review. The host library was contacted and approved use of the photographs; the sign was originally approved by CW, an author of this manuscript. The potential risks to researchers through inadvertent supra-therapeutic caffeine consumption during study activities were considered; given pre-existing caffeine consumption, these were deemed negligible. Survey responses were anonymous.

### **Transparency statement**

The manuscript guarantor affirms that the manuscript is an honest, accurate, and transparent account of the study being reported. No important aspects of the study have been omitted and there have been no significant changes in the original study plan during the conduct of the study. The study is reported in accordance with the CROSS reporting guideline [68].

### **Role of the funding source**

Despite the importance of the research question and the anticipated impact of the study findings, no funding was sought during the planning of this study. University Hospitals of Derby and Burton Library and Knowledge Service provided sufficient quantities of complementary hot beverages and biscuits to ensure that the study authors were able to complete the study within the required timescales; this is not felt to be a conflict of interest given researchers did not provide data for the survey.

We sought institutional support for any Open Access Publishing Fee incurred during the publication of this study. Given that the British Medical Journal are kind enough to waive Open Access Publishing Fees for their Christmas edition, we will instead request that these funds are used to provide access to free refreshments in the authors' host departments where these are not already available; individual limits on access to these refreshments will be instituted in line with this study's overall findings, unadjusted for professional role.

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The sign that prompted the development of this project was created by Karen Trifunovic.

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## Dissemination to participants and related patient and public communities

The anonymous nature of data collection makes sharing results directly with participants impossible. We will share study outputs via the same channels through which potential participants were contacted, including personal networks, social media, and departmental communications. Appropriate social media “hashtags” will be developed to encourage engagement once the study authors have drunk sufficient caffeinated beverages to drive creativity. Given the ongoing availability of free beverages in the authors’ workplaces discussed above, this probably won’t take long.

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