The labels and models used to describe problematic substance use impact discrete elements of stigma: A Registered Report

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Abstract

Objectives: Problematic substance use is one of the most stigmatised health conditions leading research to examine how the labels and models used to describe it influence public stigma. Two recent studies examine whether beliefs in a disease model of addiction influence public stigma but result in equivocal findings – in line with the mixed-blessings model, Kelly et al. (2021) found that whilst the label 'chronically relapsing brain disease' reduced blame attribution, it decreased prognostic optimism and increased perceived danger and need for continued care; however, Rundle et al. (2021) conclude absence of evidence. This study isolates the different factors used in these two studies to assess whether health condition (drug use vs. health concern), aetiological label (brain disease vs. problem), and attributional judgement (low vs. high treatment stability) influence public stigma towards problematic substance use. **Methods:** 1613 participants were assigned randomly to one of eight vignette conditions that manipulated these factors. They completed self-report measures of discrete and general public stigma and an indirect measure of discrimination. **Results:** Greater social distance, danger, and public stigma but lower blame were ascribed to drug use relative to a health concern. Greater (genetic) blame was reported when drug use was labelled as a 'chronically relapsing brain disease' relative to a 'problem'. Findings for attributional judgement were either inconclusive or statistically equivalent. **Discussion:** The labels used to describe problematic substance use appear to impact discrete elements of stigma. We suggest that addiction is a functional attribution, which may explain the mixed literature on the impact of aetiological labels on stigma to date.

Key words: problematic substance use; addiction; stigma; discrimination; vignettes; models of addiction; brain disease.

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Problematic substance use is one of the most heavily stigmatised health conditions (Kilian et al., 2021; Room et al., 2001; Schomerus et al., 2011). Public stigma is defined as the endorsement of negative attitudes held by members of the public against a specific group, which manifests in discrimination towards its members (Corrigan & Watson, 2002; Corrigan & Rao, 2012). Individuals diagnosed with a substance use disorder (SUD) are routinely viewed as dangerous, unpredictable, helpless, and non-human (Dyregrov & Bruland-Selseng, 2020; Nieweglowski et al., 2017). Such public stigma can contribute to self-stigma for individuals with SUD, causing feelings of marginalisation and social exclusion (Maurage et al., 2012; Pescosolido et al., 2010), hindering attempts to reduce consumption (Hammarlund et al., 2018), and acting as a barrier to help-seeking and treatment (Keyes et al., 2010; Yang et al., 2017). Research also suggests that healthcare practitioners can display stigmatising attitudes towards those seeking treatment support for substance misuse (Janulis et al., 2013; Luoma et al., 2007), which may result in suboptimal care (van Boekel et al., 2013), diagnostic overshadowing (Palmer et al., 2009), and less efficacious treatment (Andréasson et al., 2013).

In an effort to inform public health strategies (i.e. public framing around 'addiction') and interventions (i.e. stigma reduction), research has examined the factors that may exacerbate or lessen perceptions of problematic substance use. Some of these efforts center on how the different aetiological labels and models used to describe substance misuse (e.g., labelling addiction as a *brain disease* vs. *problem*) influence public stigma (e.g., Kruis et al., 2020; Lebowitz & Appelbaum, 2017; Wiens & Walker, 2015; see Hall et al., 2015; Kvaale et al., 2013 for reviews). Two recent studies by Kelly et al. (2021) and Rundle et al. (2021), however, have resulted in somewhat equivocal findings, making it difficult to provide any clear recommendations and to end the use of stigmatising terminology in the field (Atayde et al.,

2021). A closer look at these studies reveals that whilst both aimed to assess how the brain disease model of addiction influences public stigma, they included different and additional methodological factors that could explain their discrepant findings. The current study aims to isolate these factors to examine how they may exacerbate or lessen stigmatising perceptions of problematic substance use.

In the study conducted by Kelly et al. (2021), participants (n = 3635) were presented with one of twelve vignettes describing a man or woman being treated for opioid-dependence which was defined as either a 'chronically relapsing brain disease', 'brain disease', 'disease', 'illness', 'disorder' or 'problem' (see File S1; https://osf.io/dk694/). In line with the 'mixed-blessings' model (Haslam & Kvaale, 2015), findings indicated that while the label 'chronically relapsing brain disease' was associated with lower stigmatising blame attributions compared to all other labels, it was associated simultaneously with decreased prognostic optimism (personal agency) and increased perceptions of danger and need for continuing care. Findings from this study suggest that there may not be one single term that can reduce all dimensions of stigma. Kelly et al. state "to reduce stigmatizing blame, biomedical 'chronically relapsing brain disease' terminology may be optimal; to increase prognostic optimism and decrease perceived danger […] use of non-medical terminology (e.g., 'opioid problem') may be optimal" (pp. 1757).

Rundle et al. (2021) assessed whether public stigma differs for substance use disorders relative to other health conditions and if this was moderated by people's pre-existing beliefs about different aetiological models of addiction. Participants (n = 872) were given a vignette which described an individual experiencing difficulty in their daily routine and who was diagnosed with one of four health conditions: an alcohol use disorder (AUD), major depressive disorder (MDD), co-occurring AUD and MDD, or diabetes. Findings indicated that public stigma was highest for the diagnosis of AUD followed by AUD/MDD compared to both the

MDD and diabetes conditions. Furthermore, endorsement of the psychological and nature models of addiction were associated with lower public stigma, and endorsement of the moral model was related to higher stigma. However, against both the author's predictions and the findings from Kelly et al., endorsement of the disease model was not associated with public stigma. Rundle et al. suggest that "a straightforward interpretation of this finding is that disease beliefs do not relate to public stigma toward AUD" but "considering that this effect is null, we are unable to suggest that the disease [model] does in fact not relate to public stigma ratings" (pp. 845).

These two studies therefore had a common goal - they aimed to examine whether beliefs in a disease model of addiction (whether manipulated or measured) influence public stigma, yet they come to different conclusions. Whilst Kelly et al. (2021) demonstrate that the aetiological label of 'chronically relapsing disease' differentially affects stigmatising attitudes towards problematic substance use, Rundle et al. (2021) conclude absence of evidence (but importantly not evidence of absence). A closer look at the vignettes used in both of these studies reveal that the 'brain disease' model factor is not the only variable manipulated; in other words, additional methodological factors may have influenced stigmatising perceptions[1]. We now describe each of these to provide a rationale for their inclusion in the current study.

The first difference is that the vignettes employed in each study differed based on the **health condition** described. Specifically, Rundle et al. (2021) compare the public stigma ascribed to problematic substance use (AUD) with other health conditions (e.g., diabetes) whereas this control comparison is absent within the study by Kelly et al (2021). Indeed, research indicates that the general public ascribe greater stigma to problematic substance use

[1]Another difference is that the two studies include different *substances* within the vignette: whilst Kelly et al. focus on problematic opioid use, Rundle et al. focus on alcohol use. Research has consistently shown that both alcohol use and substance use disorder are heavily stigmatised (Kilian et al., 2021; see also Room, 2009) so we do not expect this to explain the different findings. In the current study, we therefore do not manipulate the substance itself.

compared to other mental and physical health conditions (Kilian et al., 2021; Room et al., 2001, 2009; Schomerus et al., 2011) and this comparison may therefore explain why Rundle et al. found larger effect sizes for stigmatising perceptions compared to Kelly et al. (2021). We first aim to isolate this factor to examine whether the health condition of 'drug use' compared to 'health concern' influences public stigma.

A second difference is that Kelly et al. manipulate different aetiological labels to describe substance misuse within the vignette itself (e.g., 'chronically relapsing brain disease' vs. 'disease' vs. 'problem') whereas Rundle et al. measure these beliefs indirectly through a general self-report questionnaire of addiction beliefs (e.g., "Addicts cannot control their addictive behaviour"). Providing an explicit explanation for the aetiology of problematic substance misuse may therefore directly influence stigmatising perceptions, and this may particularly be the case when participants believe that this messaging is relayed by a trusted professional (e.g., healthcare practitioner or scientist; Wiens & Walker, 2015; see also Bogren, 2019). Despite the brain disease model of addiction being contested and vehemently debated (see Hall et al., 2015; Hart, 2017; Heather et al., 2019; Heim et al., 2014; Heilig et al., 2021; Leshner, 1997; Kuorikoski & Uusitalo, 2018; Volkow et al., 2016), it has gained prominence in public understanding (Vederhus et al., 2016), likely because it is commonly defined in such a way by national organisations (NIAAA, 2021; NIDA, 2021) and endorsed by healthcare professionals (Lawrence et al., 2013; see also Hickman, 2014; Russell et al., 2011). We therefore assess whether the explicit aetiological label of 'chronically relapsing brain disease' elicits public stigma relative to the 'problem' label.

Third, although not considered in either of the studies, the vignettes include different information about treatment seeking and outcome and therefore provide variable scope for **attributional judgement.** In the vignette employed by Kelly et al. the individual with problematic substance use is described as receiving treatment with a high likelihood of success

("Alex is committed to doing all that they can to ensure success following treatment"). Conversely, in Rundle et al. they are described as seeking treatment with a variable outcome ("The doctor tells John/Jane that this is potentially a long-term condition that could get worse over time, but that John's/Jane's condition could also improve if he/her starts treatment now"). While the former statement may initially seem innocuous, it ascribes some level of volitional control and temporal stability to problematic substance use ("high treatment stability"; for other examples see Monk & Heim, 2011). In contrast, the statement in Rundle et al. is more circumspect, as it presents two possible outcomes - the behaviour either abates or persists long term ("low stability"). It may therefore be suggested that the two studies elicit different attributional judgements about problematic substance use (see Davies, 1997; Kingree et al., 1999) with this treatment information impacting public stigma towards addiction (see Ashford et al., 2018; Cunningham & Godinho, 2021; McGinty et al., 2015; Romer & Bock, 2008).

Finally, both studies use different dependent measures to assess public stigma towards problematic substance use. Kelly et al. (2021) examined discrete elements of stigma, specifically social distance, perceived danger, prognostic optimism, blame attribution and continued care. Conversely, Rundle et al. measured perceived public, treatment, personal and discriminatory stigma but aggregated these into an index of general public stigma. The disease model of addiction, however, has been shown to differentially affect discrete elements of public stigma consistent with the mixed-blessings model (Haslam & Kvaale, 2015; Kvaale et al., 2013). For example, whilst it may lessen blame towards substance (mis)use, it appears to reduce ascriptions of agency and self-control. Furthermore, both studies are potentially limited by their reliance on self-report questionnaires, which are susceptible to social desirability biases when assessing sensitive attitudes (Nisbett & Wilson, 1977; Tourangeau & Yan, 2007). In order to overcome this limitation, the current study also employs a indirect measure of discrimination (Jones et al., 2022), which assesses the magnitude of financial rewards and

punishments directed towards the person depicted in the vignette. Informing the inclusion of this measure, previous research has shown that the labels used to describe problematic substance use may induce cognitive biases that result in a perceived need for punishment rather than support (Ashford et al., 2019; Kelly et al., 2010; Kelly & Westerhoff, 2010).

Study Overview & Hypotheses

The current study aims to isolate factors which may exacerbate or lessen public stigma towards problematic substance use and explain further the different findings between Kelly et al. (2021) and Rundle et al. (2021). Specifically, it will examine whether **health condition** (drug use vs. health concern), **aetiological label** (brain disease vs. problem), and **attributional judgement** (low vs. high treatment stability) influence public stigma and discrimination towards problematic substance use. Given the mixed literature regarding whether the 'brain disease' label lessens or exacerbates public stigma, and the novel inclusion of the attributional judgement factor, we do not make any directional predictions. Instead, we have the following research questions:

RQ1: Does the health condition of 'drug use' or 'health concern' influence public stigma and discrimination?

RQ2: Does the aetiological label of 'chronically relapsing brain disease' or 'problem' influence public stigma and discrimination towards problematic substance use?

RQ3: Does attributional judgement - low versus high treatment stability - influence public stigma and discrimination towards problematic substance use?

Allowing for comparisons between Kelly et al. (2021) and Rundle et al. (2021), we examine whether these findings are dependent on stigma being measured using discrete (Stigma & Attribution Assessment; Kelly et al., 2021) or aggregate measures (Personal & Perceived

Public Stigma Measure; Rundle et al., 2021), as well as employing an indirect measure of discrimination (Financial Discrimination Task; Jones et al., 2021).

Method

Transparency & Openness

The Stage 1 protocol was given In-Principle Acceptance on 25/01/2022 via the Peer Community In Registered Report (PCI RR) platform and can be found at: https://osf.io/4vscg. All materials, code and raw data are publicly available on the Open Science Framework: https://osf.io/dk694/. In the sections below, we report all manipulations, measures, and exclusions. This study meets the Level 6 of the PCI RR bias control (https://rr.peercommunityin.org/help/guide_for_authors).

Design & Participants

This study comprised a 2 (health condition: drug use vs. health concern) x 2 (aetiological label: chronically relapsing brain disease vs. problem) x 2 (attributional judgement: low vs. high treatment stability) between-participants design. To be eligible to take part, participants confirmed that they were aged 18 or above and that they did not have or know any close relatives with a previous or current substance use or psychiatric diagnosis. They were recruited via research participation schemes (SONA Systems Ltd), Prolific Academic (https://prolific.co/; see Peer et al., 2017), and social media platforms (e.g., Twitter, LinkedIn). Participants were recompensed with either university course credits or £5.00 per hour.

Our planned sample size was informed by the effect sizes obtained from Kelly et al. (2021) and Rundle et al. (2021). For our main effects of interest (see "Vignette development" below), Kelly et al. observed a significant effect of Cohen's $d_s \sim .15$ for perceived danger, $d_s \sim .20$ for prognostic optimism, $d_s \sim .30$ for continuing care and $d_s \sim .43$ for blame, whilst Rundle

et al. observed an effect of d_s ~ .1.03 for Stigma Ratings[2]. We conducted a series of sensitivity power analyses based on the two one-sided tests procedure for equivalence testing (see Dienes, 2021; Lakens, 2017). In the first, we input the smallest significant effect of −ΔL = -.15 and ΔU = .15 from Kelly et al., which required 2,804 participants to achieve 90% statistical power with alpha set at .01. However, this was outside of our funding resources (see Lakens, 2022a). For this reason, we then input the second smallest effect of −ΔL = -.20 and ΔU = .20, again from Kelly et al., which required 1,578 participants (n = 789 per factor): given that this was within our resources, this determined our planned sample size. Note that effect sizes of d_s =/> .20 have also been found in meta-analyses assessing the influence of the brain disease model on public stigma (Kvaale et al., 2013) meaning that this sample size would yield informative results with respect to the presence or absence of effect size estimates provided by this meta-analysis.

A total of 1622 participants were recruited to ensure approximately balanced cell sizes in each experimental condition. Nine participants were excluded due to failed attention checks (n = 6), withdrawn data (n = 2), and implausible response time (n = 1). The final sample size comprised 1613 participants, with the majority aged between 18-25 years (36.5%), female (55.9%), and White (77.1%). Detailed demographic characteristics can be found in File S2 (https://osf.io/4vscg). Sensitivity power analyses indicated that, based on the lowest cell size, we were able to detect an equivalence range of −ΔL = -.21 and ΔU = .21 for RQ1 (n = 741), -.28 and .28 for RQ2 (n = 392), and -.30 to .30 for RQ3 (n = 362). The study was ethically approved by each institution and all participants provided informed consent.

[2] d_s from Kelly et al. are perceived danger, 0.13 / 0.87 = 0.15; prognostic optimism, 0.18 / 0.87 = 0.21; continuing care, 0.26 / 0.87 = 0.30; and blame, 0.37 / 0.87 = 0.43 (Pooled *SD* was calculated as SQRT of N = 300 * SE = .05). d_s from Rundle et al., stigma ratings = 11.49 / 11.12 (Pooled *SD* = (10.98 + 11.26)/2).

Measures

Vignette development

To decide on the independent factors to manipulate in the current study, we evaluated the largest mean difference between the vignette conditions used in two previous study's respective dependent measures (i.e. vignettes eliciting the highest relative to lowest public stigma). In Rundle et al. the largest difference was between the health condition "alcohol use disorder" relative to "diabetes". In Kelly et al. this was between the aetiological label "chronically relapsing brain disease" relative to "problem". Each vignette also differed on attributional judgement, providing either low or high stability for treatment seeking and outcome, so we also included this factor. We therefore selected the vignette from Kelly et al. and incorporated additional manipulations by Rundle et al.[3]. Participants were randomised to one of eight conditions with the manipulated factors of health condition (underlined/green), aetiological label (highlighted bold/red), and attributional judgement (italics/purple):

> 'Alex was having serious trouble at home and work because of their increasing drug use / health concern. They *are now in a treatment program / have now visited a doctor* where they are learning from staff that their drug use / health concern is best understood as a **chronically relapsing brain disease / problem** that often impacts multiple areas of one's life. *Alex is committed to doing all that they can to ensure success following treatment / The doctor tells Alex that this is potentially long-term and could get worse over time, but could also improve if they start treatment now*. In the meantime, they have been asked to think about what they have learned with

[3]We use the gender-neutral pronouns of they/them compared to he/she from Kelly et al. (as Kelly et al. also manipulated the gender of the person depicted in the vignette).

regard to understanding their drug use / health concern as a **chronically relapsing brain disease/problem.**

Stigma and Attribution Assessment

The Stigma and Attribution Assessment (Kelly et al., 2021) assessed multiple dimensions of stigma towards problematic substance use. This 22-item questionnaire comprises five subscales including social distance (e.g., I would be happy to have Alex as a neighbour"), perceived danger ("I believe Alex is dangerous"), prognostic optimism ("Alex will be able to maintain recovery over the next three months"), blame attribution ("Alex's opioid addiction is definitely genetic in origin") and need for continued care ("Alex will need lifelong support to sustain their recovery"). Kelly et al. found that all subscales resulted in acceptable internal reliability (a > 0.70), as did the current study (a = .88, .79, .70, and .69, respectively). Responses are recorded on a scale of 1 (Strongly disagree) to 6 (Strongly agree) and summed to create a total score for each subscale. Four questions were adapted for the 'health concerns' vignette condition (i.e. removal of the term opioid addiction). Higher scores correspond to greater danger and continued care, whereas lower scores correspond to greater social distance, lower blame, and lower prognostic optimism.

Personal & Perceived Public Stigma Measure

The Personal & Perceived Public Stigma Measure (Rundle et al., 2021) measured public stigma. This 23-item questionnaire comprises four subscales including perceived public stigma ("People like them should feel embarrassed about their situation"), perceived treatment stigma ("Opportunities would be limited if people knew they received treatment"), personal stereotypical/prejudicial stigma ("How likely is it they would do something violent to themselves?"), and personal discriminatory stigma ("I would be willing to befriend them" [reverse scored]). Rundle et al. found that these subscales resulted in acceptable internal reliability (a > .70), as did the current study (a = .70, .73, .80, and .91, respectively). Responses

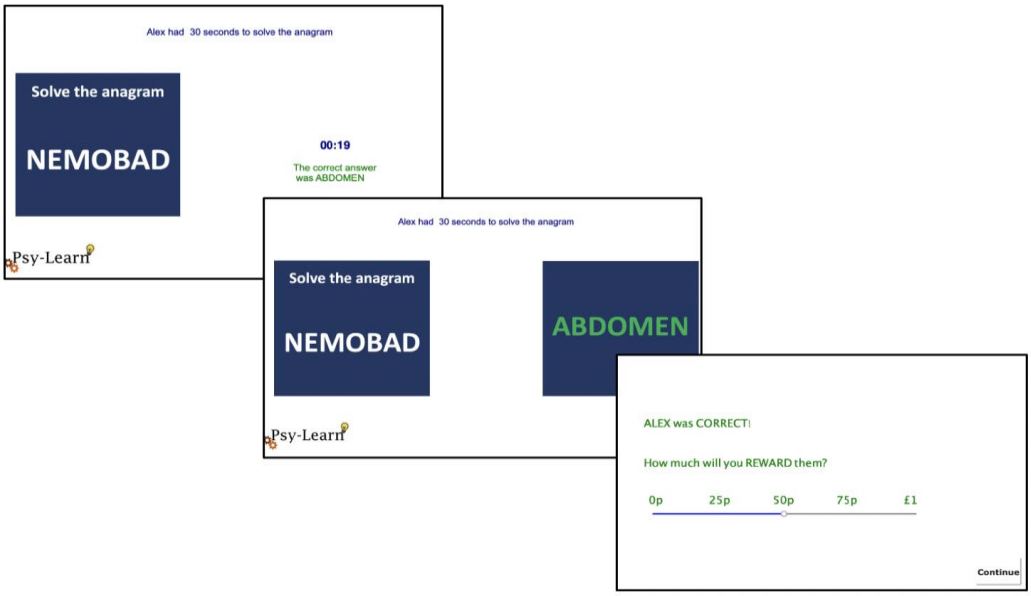
are recorded on a scale of 1 (lower endorsement) to 4 (higher endorsement) and summed to create a total score. Responses are scored in line with the original questionnaire by Holman (2015) so that higher scores correspond to greater stigmatising perceptions.

Financial Discrimination Task

The Financial Discrimination Task (Jones et al., 2022) assessed whether participants discriminated against "Alex" based on their assigned vignette condition. This task mimics a learning platform named "Psy-Learn", which informs participants that they will observe the cognitive performance of a 'learner' and provide small financial rewards or punishments depending on their performance. Participants can also decide whether learners should be permitted to continue to the next stage of the course (akin to denial or progression of a service, often used in hypothetical stigma paradigms: see Swami & Monk, 2013). This sham platform shows the performance of the individual in the vignette on six cognitive trials, which include an assessment of speeded-reaction time, a word anagram, and a memory test. After each question, the participant is then shown the correct answer, the learner's response, and a statement highlighting whether the learner was 'correct' or 'incorrect'. Participants are instructed to distribute a monetary reward for correct performance and a punishment for incorrect performance ranging from 0- to 100-pence on a sliding scale (see Figure 1). The task is programmed so that the learner always gets 50% of the answers correct. Two dependent variables are computed from the task: monetary reward summed across the three correct answers (+0 pence- 300 pence) and punishment summed across the three incorrect answers (-0 pence, 300 pence). Lower rewards and greater punishment correspond to greater discriminatory behaviour, respectively. Our team's previous research indicates that participants are more likely to discriminate learners from stigmatised groups (weight-related bias, addiction-related bias; Jones et al., 2022; Pennington et al., *in prep*).

Figure 1.

An example of the trial procedure from the Financial Discrimination Task.



Manipulation & Attention Checks

Following the Financial Discrimination Task, participants were asked three manipulation check questions relating to their assigned vignette condition. Specifically, they were asked, "At the start of this study, you were given a description of a person named Alex. Was Alex described as having: (1) 'drug use' or 'health concerns'? (2) a 'chronically relapsing brain disease' or 'problem'? and were they (3) 'now in a treatment program' or 'visiting a doctor?', selecting their answers via a drop-down box. To disguise this manipulation check, participants were also asked "what gender was the person described?" (male/female). To control for careless responding (see Jones et al., 2021), two attention checks were employed. First, participants answered the multiple-choice question "What planet do you live on?" (Earth, Mars, Mercury, Saturn: see Robinson et al., 2021) which is endorsed by Prolific Academic as an ethically viable question (see also Curran & Hauser, 2019). This occurred as part of the demographic assessment of participants. Second, implausible completion times were monitored by assessing any responses that were </> 3*SD* of the average completion time. Any

participant who failed either of the two attention checks was excluded from the dataset, and any participant who failed a manipulation check relevant to the research question being tested (e.g., manipulation check 1 for RQ1) was excluded for that particular analysis.

Procedure

Participants were instructed to complete the study in a quiet space without distractions and the entire experiment was hosted by Inquisit Web (v.5 Millisecond, Seattle). After providing informed consent, participants were assigned randomly (via Inquisit) to one of the eight vignette conditions, which remained on screen for a minimum of 60 seconds. They then completed the Stigma & Attribution Assessment (Kelly et al., 2021) and the Personal & Perceived Stigma Measure (Rundle et al., 2021), which were administered in a randomised order between participants, and finally the Financial Discrimination Task (Jones et al., 2022).

Analytic Strategy

Table S1 provides our Stage 1 design summary. Data were analysed using R, version 4.0.2 (R Core Team, 2020). Independent samples equivalence tests (see Dienes, 2021; Lakens, 2017; Lakens et al., 2018) were conducted using the TOSTER R-package (Lakens, 2017) on each of the RQs. Allowing for direct comparisons between the current study and that of Kelly et al. (2021) and Rundle et al. (2021), these were conducted on the five discrete subscales of the Stigma & Attribution Assessment and the total score from the Personal & Perceived Public Stigma Measure. The same analyses were then conducted on the reward and punishment indices of the Financial Discrimination Task. Equivalence tests use the two one-sided tests procedure to statistically reject the presence of effects large enough to be considered worthwhile. We used the upper and lower equivalence range of $-\Delta_L$ = -.20 and Δ_U = .20 based on our sample size justification and set a conservative alpha (p < .01) given the number of

analyses[4]. We interpret an effect as *meaningful* if, given α = .01, the mean difference is significantly different from zero and the 99% CI falls outside of the equivalence range; *equivalent* if the mean difference is not significantly different from zero and the 99% CI falls within this equivalence range; and *inconclusive* if the 99% CI overlaps both the equivalence range and the range of values deemed meaningful. Effect sizes are reported as Cohen's *d*, with a positive sign corresponding to a greater value for the reference condition and a negative sign corresponding to a lower value. The below results are fully detailed in File S3, along with additional exploratory analyses documenting that the interpretation of results for RQ2 and RQ3 does not change when using the equivalence range that the final sample size had 90% power to detect.

Results

RQ1: Does the health condition ('drug use' vs. 'health concern') influence public stigma and discrimination?

Fifty-three participants (3.29%) failed the manipulation check for RQ1, with the remaining total of 819 assigned to the 'drug use' and 741 to the 'health concern' condition. On the Stigma & Attribution Assessment, participants in the drug use condition reported significantly greater social distance (*d* = .87, 99% CI = .74, .99), perceived danger (*d* = .78, CI = .66, .90) but lower blame (*d* = -.35, CI = -.47, -.23) compared to those in the health concern condition, with the observed effect sizes significantly outside of the equivalence range of -.20 to .20. The difference for prognostic optimism (*d* = -.06, CI = -.18, .06) was not significantly different to zero and equivalent, and the difference for continued care (*d* = .09, CI = -.03, .21) was inconclusive. On the Personal & Perceived Public Stigma Measure, participants in the drug use

[4] Note therefore that other researchers may specify a different smallest effect size of interest that they perceive is meaningful.

condition reported significantly greater public stigma compared to the health concern condition (*d* = .95, CI = .82, 1.07), which was significantly outside of the equivalence range. For the Financial Discrimination Task, the difference in reward (*d* = -.03, CI = -.14, .09) was not significantly different and equivalent, and for punishment (*d* = .14, CI = .02, .26) was inconclusive. Table 1 provides both the descriptive statistics and inferential results.

RQ2: Does aetiological label ('chronically relapsing brain disease' vs. 'problem') influence public stigma and discrimination towards problematic substance use?

This analysis focuses on the 'drug use' health condition only. Thirty-two participants (3.78%) failed the manipulation check for RQ2, with a total of 392 assigned to the 'chronically relapsing brain disease' and 423 to the 'problem' condition. Participants in the brain disease condition reported significantly greater blame (*d* = .54, CI = .38, .71) compared to those in the problem condition, with the observed effect size significantly outside of the equivalence range. The difference for continued care (*d* = .01, CI = -.15, .17) was not statistically different to zero and equivalent. The difference for social distance (*d* = -.20, CI = -.36, - .03), prognostic optimism (*d* = -.07, CI = -.24, .09), danger (*d* = -.11, CI = -.28, .05), and public stigma (*d* = -.18, CI = -.34, -.02) were inconclusive. The difference for rewards (*d* = .15, CI = -.02, .31) was inconclusive and for punishment (*d* = .007, 99% CI = -.16, .17) was equivalent.

RQ3: Does attributional judgement (low vs. high treatment stability) influence public stigma and discrimination towards problematic substance use?

This analysis focuses on the 'drug use' health condition only. One-hundred and two (11.96%) participants failed the manipulation check for RQ3, with a total of 362 assigned to the 'low' and 383 to the 'high' treatment stability condition. The differences for social distance (*d* = -.23, CI = -.40, -.06), danger (*d* = .19, CI = .03, .37), blame, (*d* = -.11, CI = -.27, .07), prognostic optimism (*d* = -.17, CI = -.35, -.004) and continued care (*d* = .11, CI = -.06, .28) were all

inconclusive. Similarly, the difference for public stigma (*d* = .31, CI = .14, .48) was inconclusive, as although the effect size estimate was outside of the equivalence range, the CIs included values that were within it. The difference for reward (*d* = -.13, CI = -.30, .04) was also inconclusive and for punishment (*d* = -.02, CI = -.19, .16) was equivalent.

Table 1. *Descriptive (M, SD) and inferential statistics for the three research questions. The first reported result is the Welch's t-test and the second is the equivalence test based on the range of - .20 to .20. Based on this equivalence range, green cells = meaningful, yellow = equivalent and red = inconclusive.*

	RQ1 Health condition		**RQ2 Aetiological label**		**RQ3 Treatment stability**	
	Drug use (n = 819)	Concern (n = 741)	Disease (n = 392)	Problem (n = 423)	Low (n = 362)	High (n = 383)
Social distance	18.84 (5.46)[5]	23.76 (5.87)	19.46 (5.50)	18.38 (5.41)	18.14 (5.25)	19.38 (5.50)
	t(1512.82) = -17.07, p < .001 t(1512.82) = -13.13, p = 1.00.		t(806.22) = 2.82, p = .004. t(806.22) = -.03, p = .49.		t(742.93) = 3.15, p = .002. t(742.82) = 0.35, p = .36.	
Perceived danger	17.37 (5.61)	13.32 (4.80)	16.94 (5.62)	17.58 (5.53)	18.00 (5.72)	16.89 (5.47)
	t(1553.09) = 15.38, p < .001 t(1553.09) = 11.42, p = 1.00.		t(806.15) = -1.64, p = .10. t(806.15) = 1.21, p = .11		t(753.49) = 2.71, p = .006. t(735.49) = -.02, p = .49.	
Prognostic optimism	18.84 (3.63)	19.06 (4.16)	18.71 (3.60)	18.98 (3.70)	18.47 (3.44)	19.09 (3.69)
	t(1477.04) = -1.12, p = .26 t(1477.04) = 2.81, p = .002.		t(811.23) = -1.03, p = .30. t(811.23) = 1.83, p = .03.		t(742.82) = -2.38, p = .02. t(742.82) = 0.35, p = .36.	
Blame attribution	7.88 (2.66)	8.81 (2.67)	8.61 (2.63)	7.22 (2.51)	7.73 (2.61)	7.99 (2.59)
	t(1541.51) = -6.83, p < .001 t(1541.51) = -2.89, p = 1.00.		t(801.02) = 7.71, p < .01. t(801.02) = 4.86, p = 1.00.		t(739.90) = -1.39, p = .16. t(739.90) = -1.34, p = .09.	
Continued care	4.24 (1.18)	4.13 (1.08)	4.25 (1.17)	4.24 (1.20)	4.33 (1.14)	4.20 (1.23)
	t(1557.77) = 1.78, p = .08. t(1557.77) = -2.18, p = .01.		t(811.09) = 0.13, p = .89. t(811.09) = -2.72, p = .003.		t(742.66) = 1.53, p = .13. t(742.66) = -1.20, p = .12.	
Public stigma	50.59 (8.86)	42.15 (8.99)	49.62 (8.89)	51.20 (8.78)	52.15 (8.40)	49.48 (8.80)
	t(1537.61) = 18.65, p < .001. t(1537.61) = 14.71, p = 1.00.		t(806.59) = -2.55, p < .01. t(806.59) = 0.30, p = .38.		t(742.93) = 4.24, p < .001. t(742.93) = 1.51, p = .93.	
Reward	248.11 (62.63)	249.72 (62.61)	253.39 (59.98)	244.20 (64.13)	245.76 (62.69)	253.74 (59.38)
	t(1542.61) = -0.51, p = .61 t(1542.61) = 3.44, p < .001.		t(812.93) = 2.11, p = .03. t(812.93) = -0.74, p = .23.		t(734.04) = -1.78, p = .08. t(734.04) = .95, p = .17.	
Punishment	62.05 (59.59)	53.96 (54.18)	62.18 (58.01)	61.74 (63.02)	62.21 (63.12)	63.16 (59.02)
	t(1557.96) = 2.81, p = .005. t(1557.96) = -1.14, p = .13.		t(812.96) = 0.10, p = .92. t(812.96) = -2.75, p = .003.		t(731.87) = 0.21, p = .83 t(731.87) = 2.51, p = .006	

[5]Recall that for the Stigma Attribution Assessment, lower and higher values have different meanings: higher scores correspond to greater danger and continued care, whereas lower scores correspond to greater social distance, lower blame, and lower prognostic optimism.

Discussion

The choice of aetiological labels and models used to describe problematic substance use are important because they can exacerbate the perpetuation of stigmatising attitudes and influence both help-seeking behaviours and selection of public health policy (Kelly, 2004; Kelly et al., 2021). Two recent studies by Kelly et al. (2021) and Rundle et al. (2021) are laudable for bringing these discussions to the fore, but their equivocal findings may lead to contrasting recommendations as to which terms to use or avoid. The current study isolated the different factors manipulated in these studies to assess whether health condition (drug use vs. health concern), aetiological label ('chronically relapsing brain disease' vs. 'problem'), and attributional judgement (low vs. high treatment stability) influence public stigma and discrimination towards problematic substance use.

In line with Rundle et al. (2021), participants assigned to the drug use relative to the health concern condition reported significantly greater public stigma on the Personal and Perceived Public Stigma Measure, with a similarly large effect size (Rundle d = 1.03; current d = .95). This is in line with research suggesting that problematic substance use is one of the most heavily stigmatised health conditions (Kilian et al., 2021; Room et al., 2001; Schomerus et al., 2011). A more nuanced pattern of findings was found, however, when assessing the subscales of the Stigma and Attribution Assessment used by Kelly et al. (2021): on this measure, participants in the drug use condition reported significantly greater social distance and perceived danger but lower blame relative to the health concern condition. Findings relating to prognostic optimism were statistically equivalent and those relating to continued care were inconclusive. These findings highlight how using different dependent measures can lead to divergent findings and interpretations. Using the aggregated measure from Rundle et al. (2021) leads to the suggestion that greater public stigma is ascribed to drug use, whilst the multidimensional measure used by Kelly et al. (2021) suggests distinct elements of stigma may

be differentially drawn upon in lay perceptions of substance use. Such differences in measurement approach are an important consideration for future research, particularly given their resulting implications for stigma-reduction interventions and their selection should be informed by theory.

When drug use was labelled as a 'chronically relapsing brain disease' relative to a 'problem', participants attributed greater blame but the findings for continued care were equivalent and those concerning social distance, perceived danger, prognostic optimism and public stigma were inconclusive. Despite being similar to Rundle et al. (2021), these results contrast with Kelly et al. (2021) who, in line with the mixed blessings model (Haslam & Kvaale, 2015), found that this label was associated with lower blame attributions and decreased prognostic optimism and increased danger and continued care. Whilst Kelly et al. were able to detect smaller effect sizes than the current study (e.g., perceived danger, $d = .15$), and some of our confidence intervals include effect sizes around this region that others may deem meaningful, the direction of these findings for all but one of the subscales (prognostic optimism) are contrary. The significant finding for blame attribution in the current study may be explained by looking closely at the phrasing of this subscale in the Stigma and Attribution Assessment. All three of the questions in this subscale attribute blame to the disease process (e.g., "Alex's opioid addiction is definitely genetic in origin"), thus denoting that the behaviour is outside of an individual's control. From this perspective, labelling drug use as a 'chronically relapsing brain disease' may absolve *personal* blame by shifting this to underlying brain pathology (Clark et al., 2021; Pickard, 2022; also see Davies, 1994). Recent research has proposed an alternative 'choice' model, which emphasises that individuals experiencing problematic substance use can make choices, some of which may cause harm. Using a 'responsibility without blame' framework is suggested to increase a sense of agency, empowerment, self-understanding, and personal growth (Clark et al., 2021; Pickard, 2022).

Although not considered explicitly within either, a key difference between the two previous studies relates to the scope for attributional judgments afforded by the vignettes (see Davies, 1997; Kingree et al., 1999): in Kelly et al. the individual with problematic substance use is described as receiving treatment with a high likelihood of success (high stability condition), whereas in Rundle et al. they are described as seeking treatment with a variable outcome (low stability condition). When manipulating these factors in the current study, we found that the differences for social distance (d = -.23), danger (d = .19), blame (d = -.11), prognostic optimism (d = -.17), continued care (d = .11), and public stigma (d = .31) were inconclusive. As such, whilst the effect size estimates for some of these effects were outside of our equivalence range, and align with that of previous research (Kelly et al., 2021; Rundle et al., 2021; see also Kvaale et al., 2013), their confidence intervals overlapped both the equivalence range and values deemed meaningful. Future work in this area should therefore explicitly define their smallest effect size of interest, justify which effects are practically meaningful (see Anvari et al., 2022), and ensure that they have sufficient statistical power to reliably detect these effects. Furthermore, researchers should scrutinise whether the vignettes they use inadvertently manipulate other potentially confounding factors that may impact results.

Finally, in a bid to overcome potential issues of social desirability when assessing sensitive attitudes towards substance use (Nisbett & Wilson; Tourangeau & Yan, 2007), we employed an indirect measure of discrimination (Jones et al., 2022) that assessed the magnitude of financial rewards and punishments allocated to the person depicted in the vignette. The influence of health condition was inconclusive for punishment and equivalent for reward indices on this task, and the influence of both aetiological label and attributional judgment was equivalent for punishment and inconclusive for reward. Offering perhaps a more optimistic perspective, the current results may suggest that whilst problematic substance use elicits self-

reported public stigma and the label ‘chronically relapsing brain disease’ elicits greater blame, these attitudes to not appear to manifest reliably in overt discriminatory behaviour. Other research has nevertheless found that problematic substance use is associated with a perceived need for punishment rather than support, which extends to punitive measures for treatment and recovery (Ashford et al., 2019; Kelly et al., 2010; Kelly & Westerhoff, 2010). Further research which assesses this, and expands on the use of similar tasks as employed in the current study, is therefore recommended.

Taken together, the outcomes from three recent, large-scale studies – those of Kelly et al. (2021), Rundle et al. (2021), and our own concur that problematic substance use is one of the most stigmatised health conditions. However, the findings from these three studies appear to be somewhat contradictory with regards to how they contribute to the important ongoing debate as to whether the brain disease model of addiction exacerbates or lessens public stigma (see Hall et al., 2015; Kvaale et al., 2013; Pickard, 2022 for reviews). How do we reconcile this? We put forth the notion that the construct of addiction (including the models and labels used to describe it) is a *functional attribution* in which its different explanatory components may be deployed, as required, by both the observer and the observed in a context-dependent fashion to attribute or displace responsibility, accountability, and blame (see also Davies, 1997; Heim et al., 2001; Heim & Monk, 2022; Shaver, 2012). The way in which this functional attribution is used varies both within and between individuals, populations (e.g., general public, clinicians, and individuals with AUD; see Pickard, 2022), the context in which problematic substance use occurs (Monk & Heim, 2011), and how a ‘disease’ is defined (Murphy, 2021). A recent review suggests that whilst many researchers consider the disease model to be the dominant view in addiction science, they also believe that it is an oversimplification of a complex bio-psycho-social phenomenon (Ochterbeck & Forberger, 2022). Future research should therefore seek to better understand in which contexts particular explanations of

substance use impact stigma and discrimination, and how this may vary dependent on the attributional functions that these models and labels serve.

Conclusions

This study isolated the methodological factors used in two recent studies examining substance-use related stigma (Kelly et al., 2021; Rundle et al., 2021) to assess how health condition, aetiological label, and attributional judgement influence public stigma and discrimination towards problematic substance use. Findings indicate that when an individual's health concern was described as drug specific, participants reported greater public stigma, perceived danger, and social distance, though less blame was attributed to their situation. When this drug use was labelled as a 'chronically relapsing brain disease', participants expressed greater blame (on genetic factors as the cause of the behaviour). The effects were less clear cut, however, for the impact of attributional judgment on stigmatising perceptions. These findings offer further evidence that problematic substance use is one of the most stigmatised health conditions, while adding further to the mixed evidence base regarding the impact of the brain disease model on public stigma. We highlight how different methodological approaches (i.e. manipulating aetiological models experimentally versus measuring pre-existing beliefs) and measures (i.e. aggregated or multidimensional measures of stigma) result in different findings and interpretations. We further suggest that the differential and paradoxical effects of aetiological labels observed in research to date may reflect the complex *functional* value of the addiction construct and call for research to make the explanatory contexts in which stigmatisation occurs a focus of future work. Such efforts could aid the development of more nuanced and context-appropriate approaches to tackling substance-use related (self) stigmatisation.

Table S1. Design summary.

Question	**Hypothesis**	**Sampling plan**	**Analysis Plan**	**Rationale for deciding the sensitivity of the test for confirming or disconfirming the hypothesis**	**Interpretation given different outcomes**	**Theory that could be shown wrong by the outcomes**
RQ1: Does the health condition of 'drug use' or 'health concern' influence public stigma and discrimination ?	The health condition of 'drug use' will elicit significantly greater stigma and discrimination compared to 'health concern'.	A sample size of 1,578 participants will be recruited, allowing for >90% statistical power to conduct equivalence tests on the upper and lower equivalence range of $-\Delta L$ = -.20 and ΔU = .20 with a = .01. Sensitivity power analyses will be conducted in the event we do not hit this target, indicating the effect size we	Independent samples equivalence tests will be conducted on the between-participants factor of health condition, with the upper and lower equivalence range of $-\Delta L$ = -.20 and ΔU = .20. To allow direct comparisons with Kelly et al. (2021) and Rundle et al. (2021), these will be conducted on the five discrete subscales of the Stigma & Attribution Assessment and the total score from the Personal & Perceived Public Stigma Measure. We will also conduct these on the reward and punishment indices of	If the 99% CI lies outside of the equivalence range ($-\Delta L$ = -.20 and ΔU = .20), we will assert a meaningful effect. If the 99% CIs lie within the equivalence range, we will assert equivalence (given the effect size that our sample is powered to detect).	If we find evidence of a meaningful effect, then this will provide support for previous findings suggesting that drug use is more stigmatised compared to other health conditions. If this effect is equivalent, then this will suggest that the effect was smaller than our effect size of interest and the CIs lie within the equivalence range.	Research indicates that problematic substance use is one of the most heavily stigmatised health conditions (Kilian et al., 2021; Room et al., 2001; Schomerus et al., 2011) with individuals diagnosed with a substance use disorder (SUD) routinely viewed as dangerous, unpredictable, helpless, and non-human (Dyregrov & Bruland-Selseng, 2020; Nieweglowski et al., 2017). If the findings of this analysis are equivalent, then this would suggest that future research is required to assess whether problematic

		were powered to detect.	the novel Financial Discrimination Task.			substance use is heavily stigmatised compared to general health concerns and the effect sizes that are deemed meaningful within this research field.
RQ2: Does the aetiological label of 'chronically relapsing brain disease' or 'problem' influence public stigma and discrimination towards problematic substance use?	Non-directional: There is mixed evidence regarding whether the 'disease' label exacerbates or lessens stigma, and the findings may differ based on discrete elements of stigma measured, which we aim to test.	As above.	Independent samples equivalence tests will be conducted on the between-participants factor of aetiological label. This analysis will be conducted on the 'drug use' health condition only (as we are interested in examining stigma and discrimination towards problematic substance use). These will be conducted on the five discrete subscales of the Stigma & Attribution Assessment and the total score from the Personal & Perceived Public Stigma Measure. We will also conduct these on the reward and punishment indices of the novel Financial Discrimination Task.	As above.	If we find evidence of a meaningful effect, then this will provide support either for (lower stigma) or against (higher stigma) the brain disease model of addiction (BDMA). If this effect is equivalent, then this will suggest that the effect was smaller than our effect size of interest and that the CIs lie within the equivalence range. If different effects are concluded from the two self-report questionnaires, then this will suggest that one of the measures may be better (more sensitive) for detecting public stigma compared to the other. Specifically, it is possible that the Stigma & Attribution Assessment (Kelly et al.,	The mixed-blessings model (Haslam & Kvaale, 2015) suggests that the disease model may lower stigmatising perceptions of blame but decrease prognostic optimism (personal agency) and increase perceptions of danger and need for continuing care (see Kelly et al., 2021). If the findings from this analysis are equivalent, then future research would be required to test support for both the BDMA and the mixed-blessings model. This analysis will also provide evidence of which measures are best suited to measuring stigmatising perceptions towards problematic substance use.

					2021) will result in different findings to the Personal & Perceived Public Stigma Measure (Rundle et al., 2021) because the former assesses discrete elements of stigma whereas the latter is more general. This will inform future research of what measures may be best suited to examining stigma. If this effect is only found for the discrimination measure, then this may suggest that indirect measures are better suited than self-reports, which are susceptible to socially desirable responses.	
RQ3: Does attributional judgement - high versus low treatment stability - influence public stigma and discrimination towards problematic substance use?	Non-directional: Neither Kelly et al. nor Rundle et al. (2021) manipulated attributional judgement in their studies, but this is an additional factor that we recognised	As above.	Independent samples equivalence tests will be conducted on the between-participants factor of attributional judgement. This analysis will be conducted on the 'drug use' health condition only. These will be conducted on the five discrete subscales of	As above.	Previous research has not explicitly examined whether attributional judgement influences public stigma and discrimination towards problematic substance use. If we find evidence of a meaningful effect, then this would suggest that attributional	Previous research has shown that attributional judgement affects how individuals who use substances perceive themselves (self-image bias; Monk & Heim, 2013). However, to our knowledge, this has not been tested on public

	as a difference between the two.		the Stigma & Attribution Assessment and the total score from the Personal & Perceived Public Stigma Measure. We will also conduct these on the reward and punishment indices of the novel Financial Discrimination Task.		judgement (low vs. high treatment stability) influences public stigma and/or discrimination. If this effect is equivalent, then it will suggest that the effect was smaller than our effect size of interest and that the CIs lie within the equivalence range.	stigma and discrimination.

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