MONASH University

Addiction treatment providers' views about disease models of addiction and neuroscience: Implications for practice, policy and research translation

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B. Psych Studies (Hons)

A thesis submitted for the degree of Doctor of Philosophy at Monash University in 2019

Brain, Mind and Society Research Hub and
Turner Institute for Brain and Mental Health

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Abstract

Debates about disease models of addiction amongst researchers, treatment providers and policy makers have a long history and continue to the present day. In contemporary society, the brain disease model of addiction (BDMA) receives strong support from policy makers, particularly in the US, and there continues to be a significant investment in addiction neuroscience research globally. However, it remains uncertain to what extent addiction treatment providers support the BDMA and how they engage with, and view the relevance of, neuroscience in practice.

This mixed-methods, interdisciplinary thesis explores addiction treatment providers' views in Australia, the UK and US about disease models of addiction and neuroscience. Chapter 3 presents a systematic review of previous research that explores treatment providers' views about disease models of addiction and their impact for practice and client behaviour. The review elucidates how treatment providers' endorsement of disease models is highly variable and that they may deploy disease concepts strategically in different therapeutic situations.

Chapters 4 and 5 present findings from the qualitative phase of the project that is based on interviews with twenty Australian addiction treatment providers. Chapter 4 draws on poststructuralist ideas to trace how neuroscientific discourses produce addiction as a certain type of serviceable 'problem' and explores the effects of these particular problematisations. Neuroscientific discourses are shown to constitute pathological subjects requiring treatment, and the guilt and shame associated with drug use is often alleviated via the concept of the 'diseased brain'.

Chapter 5 explores when, how and why treatment providers deploy neuroscientific representations and discuss the brain in practice. Neurological ontologies of addiction, whilst shown to be selectively and strategically invoked in certain circumstances, for example when discussing neuroplasticity to foster optimism about recovery, are also sometimes viewed as lacking relevance within treatment providers' clinical work.

Chapter 6 presents findings from the quantitative phase of the project that includes an international survey of treatment providers' attitudes in Australia, the UK and US

(n=1,438). The survey explores levels of support for the psychosocial, disease and BDMA, and which treatment provider individual characteristics (e.g., age, having previously had an addiction) predict support for these models. The findings indicate: (a) higher support for the BDMA in the US sample in comparison the Australian and UK samples; and (b) that older age and having previously attended 12-step programs predict higher disease model support.

Given the different ways treatment providers view disease models and the relevance of neuroscience for practice, the project's findings unsettle claims that addiction neuroscience will revolutionise treatment and be uncritically accepted in clinical settings. Policy makers in charge of national drug policy and treatment provider peak bodies have not appropriately considered the variable views of treatment providers about disease models and their implications for practice. Consequently, continued support for the BDMA in drug policy may have unintended consequences for treatment and treatment seekers may be faced with variable, contradictory messages about addiction when accessing different treatment services. The oversimplified, linear 'bench to bedside' notion of translation elides the pivotal roles treatment providers play when translating, or at times resisting, neuroscientific concepts in practice. In the future, interdisciplinary, mixed-methods research has the potential to open new spaces and discourses where critical work on the biomedicalisation of addiction can contribute to reducing the harms associated with alcohol and other drugs.

Acknowledgements

First, I would like to express my gratitude to my team of supervisors who guided me on my PhD journey. I have been very fortunate to work under the supervision of A/Prof Adrian Carter. Adrian has always provided wise words at critical times and has challenged me to overcome hurdles, extend myself, and reflect on my assumptions and research practice. Working with Adrian has instilled principles of collegiality, generosity and humility that will guide me in my future research endeavours, and also in life. Furthermore, I am very grateful for the opportunities I have had to work with an experienced team of associate supervisors including Prof Wayne Hall, A/Prof Craig Fry and Dr Ella Dilkes-Frayne. In particular, Wayne's advice, drawing from a stellar career over many decades, has been invaluable and he has involved me in writing opportunities I would not have otherwise received for which I am thankful. Thank you also to Craig, for his ongoing support and who got me interested in this topic in the first instance in 2014, and to Ella, who has encouraged me to extend and develop my critical social science work. I must also thank three collaborators, Dr Michael Savic, Dr Martyn Pickersgill and Prof Kerry O'Brien, for their expertise, time and support on work presented in this thesis.

Second, thank you to everyone at the Brain, Mind and Society Research Hub, at Monash University, for their ongoing support throughout my candidature. In particular, Prof Murat Yücel (and his assistant and Operations Manager Ms Amy Allen!) have provided support to me, and all my PhD colleagues, and have always had an 'open door' policy and commitment to making sure every students' experience at Monash is the best it can be. To all my student and Monash colleagues, keep on chipping away and I wish the whole team every success and thank them for their encouragement. Thank you also to Dr Narelle Warren and A/Prof Marie Yap for their time and critique at my PhD milestone events: their joint feedback has been most helpful in guiding the direction of my work. Thank you to Monash University for administering funding to support me throughout my PhD and for the funding provided by an Australian Government Research Training Program (RTP) scholarship.

Third, I wish to acknowledgment the support of many members of the wider drug and alcohol research community in Melbourne. We are very fortunate to have such a vibrant community of critical social science scholars here in Victoria. Thank you to Dr Adrian Farrugia, and other organisers of the *Victorian Substance Use Research Forum* (VSURF), for inviting me to contribute to the forum. I wish to acknowledge Prof Suzanne Fraser and Prof David Moore who have been very encouraging of students outside of Curtin and La Trobe University to also attend critical addiction social science events they have organised. Also, thanks to Prof Dan Lubman and the entire Turning Point team for their guidance, friendship and for opportunities they have provided me.

Finally, to all my friends for putting up with me and supporting me during my thesis writing: your joint help and doses of reality have been treasured! Thanks very much to my Mum for her unconditional support over all my time at university. In finishing, it would be wrong of me to also not acknowledge the backing of a key non-human actor and canine collaborator: Estelle, the Labrador – thanks for the walks!

Thesis including published works declaration

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes two original papers published in peer reviewed journals and two submitted publications. The core theme of the thesis is addiction treatment providers' engagements with disease models of addiction and neuroscience. The ideas, development and writing up of all the papers in the thesis were the principal responsibility of myself, the student, working within the School of Psychological Sciences under the supervision of Associate Professor Adrian Carter (primary supervisor), Professor Wayne Hall, Associate Professor Craig Fry and Dr Ella Dilkes-Frayne.

The inclusion of co-authors reflects the fact that the work came from active collaboration between researchers and acknowledges input into team-based research. In the case of Chapters 3, 4, 5 and 6, my contribution to the work involved the following:

Thesis Chapter	Publication Title	Status	Nature and % of student contribution	Co-author name(s) Nature and % of Co-author's contribution*	Co-author, Monash student Y/N*
3	Drug and alcohol treatment providers' views about the disease model of addiction and its impact on clinical practice: A systematic review	Published	I conducted the literature search, analysis, synthesis, prepared the initial draft and edited the final manuscript (70%)	All co-authors provided critical feedback on drafts to varying extents. AC also screened articles for inclusion. Wayne Hall (7.5%) Craig Fry (5%) Ella Dilkes-Frayne (2.5%) Adrian Carter (15%)	No

4	When the brain leaves the scanner and enters the clinic: The role of neuroscientific discourses in producing the problem of "addiction"	Published	I recruited all participants, collected all the data, conducted the data analysis, prepared the draft manuscript and edited the final paper (70%)	All co-authors provided critical feedback on drafts to varying extents. Ella Dilkes-Frayne (10%) Michael Savic (10%) Adrian Carter (10%)	No
5	Neural imaginaries at work: Exploring Australian addiction treatment providers' selective representations of the brain in clinical practice	Published	I recruited all participants, collected all the data, conducted the data analysis, prepared the draft manuscript and edited the final paper (70%)	All co-authors provided critical feedback on drafts to varying extents. Martyn Pickersgill (12.5%) Ella Dilkes-Frayne (5%) Adrian Carter (12.5%)	No
6	Support for the psychosocial, disease and brain disease models of addiction: A survey of treatment providers' attitudes in Australia, the UK and US	Under Review	I recruited all participants, collected all the data, conducted the data analysis, prepared the draft manuscript and edited the final paper (70%)	All co-authors provided critical feedback on drafts to varying extents. KO also assisted with the data analysis. Kerry O'Brien (15%) Wayne Hall (5%) Adrian Carter (10%)	No

I have renumbered sections of submitted or published papers in order to generate a consistent presentation within the thesis.

Student name: Anthony Barnett

Student signature: **Date:** 10/4/20

I hereby certify that the above declaration correctly reflects the nature and extent of the student's and co-authors' contributions to this work. In instances where I am not the responsible author I have consulted with the responsible author to agree on the respective contributions of the authors.

Main Supervisor name: A/Prof Adrian Carter

Main Supervisor signature: **Date:** 10/4/20

Publications during enrolment

Publications presented in the thesis

1. **Barnett, A.**, Hall, W., Fry, C. L., Dilkes-Frayne, E., & Carter, A. (2018). Drug and alcohol treatment providers' views about the disease model of addiction and its impact on clinical practice: A systematic review. *Drug and Alcohol Review, 37*(6), 697-720.

2. **Barnett, A.**, Dilkes-Frayne, E., Savic, M., & Carter, A. (2018). When the brain leaves the scanner and enters the clinic: The role of neuroscientific discourses in producing the problem of "addiction". *Contemporary Drug Problems*, *45*(3), 227-243.

3. **Barnett, A.**, Pickersgill, M., Dilkes-Frayne, E., & Carter, A. (in press). Neural imaginaries at work: Exploring Australian addiction treatment providers' selective representations of the brain in clinical practice. *Social Science & Medicine.*

4. **Barnett, A.**, O'Brien, K., Hall, W., & Carter, A. (2019). *Support for the psychosocial, disease and brain disease models of addiction: A survey of treatment providers' attitudes in Australia, the UK and US*. Manuscript is under review.

Other published works during candidature

Peer reviewed journal articles

5. **Barnett, A. I.**, Hall, W., Fry, C. L., Dilkes-Frayne, E., Carter, A. (2018). Implications of treatment providers' varying conceptions of the disease model of addiction: A response. *Drug and Alcohol Review*, 37(6), 729.
6. Cullen, A. J., **Barnett, A.**, Komesaroff, P. A., Brown, W., O'Brien, K. S., Hall, W., & Carter, A. (2017). A qualitative study of overweight and obese Australians' views of food addiction. *Appetite, 115,* 62-70.

7. Hall, W., Carter, A., & **Barnett, A**. (2017). Disease or developmental disorder: competing perspectives on the neuroscience of addiction. *Neuroethics*, 1-8.

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Commentaries and letters

9. **Barnett, A.** (2018). Ethics in Mental Health [invited book review]-Substance Use, David Cooper (Ed) New York: Routledge *Drug and Alcohol Review*, 37(3), 429-429.

10. **Barnett, A.**, Hall, W., & Carter, A. (2017). Substance Use Terminology [letter to the editors]. *JAMA, 317*(7), 769.

11. **Barnett, A.**, Hall, W., & Carter, A. (2017). Disease model of addiction. In A. Wenzel (Ed.), *The SAGE Encyclopedia of Abnormal and Clinical Psychology* SAGE Publications Ltd. DOI: 10.4135/9781483365817.n442

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Part I

Introduction and methods

Chapter 1
Introduction

In 1990, Howard Shaffer (1990), in response to the rising 'disease model controversy', made a number of predictions concerning the future debate about the aetiology of addiction. He optimistically forecast that the historical controversy about whether addiction was a disease would diminish and be replaced by a return to a multidimensional view of addiction that paid attention to social determinants of health. This would, Shaffer argued, herald "a 1960s-like return to the study of social psychology" (Shaffer, 1990, p. 62).

In 2019, and with the benefit of hindsight, it is fair to say that Shaffer and few other researchers or policy makers were able to predict how the 'disease model controversy' would harden into the 'brain disease model controversy'. Contemporary debate about the brain disease model of addiction (BDMA) has entered and remains vibrant within everyday discourse. For example, in the public sphere we have seen TED Talks by prominent addiction clinicians, for example psychiatrist Dr Sally Satel (2019), and best-selling books by Gabor Maté (2011) and Marc Lewis (2015) arguing that addiction is not a brain disease. Within research, arguments led by leading advocates of the BDMA, including Alan Leshner (1997) and Nora Volkow, George Koob, and Tom McLellan (2016), have been opposed by others advocating for a public health approach to addiction treatment (e.g., Hall, Carter, & Forlini, 2015; Heyman, 2009; Kalant, 2010). A two-volume special issue of *Neuroethics* (see Snoek & Matthews, 2017) was dedicated to the debate and newly formed research groups have galvanised to oppose the BDMA, such as the *Addiction Theory Network* (Heather et al., 2018).

The debate about the aetiology of addiction and the 'remaking' of addiction as a disease of the brain (Fraser, Moore, & Keane, 2014) has consequences that extend far beyond academic discourse. How addiction is framed influences the development of drug policy (Lancaster & Ritter, 2014; Vrecko, 2010), access to healthcare and health insurance (Barry, Huskamp, & Goldman, 2010), the medicalisation of behavioural problems (e.g., gaming) (Hellman, Schoenmakers, Nordstrom, & van Holst, 2013), and how people with addictions are treated by the law (Seear & Fraser, 2014b). This thesis focusses on the influence of addiction models on clinical practice, specifically on how addiction treatment providers view the aetiology of addiction, the clinical impact of the BDMA and how they engage with neuroscience in their

clinical work. Understanding their views is critical to inform future clinical practice and policy development, and the translation of addiction neuroscience into practice.

The BDMA: History and definition

Debates about the aetiology of addiction have a long history.[1] The medicalisation of addiction can be traced back centuries (Campbell, 2007; Courtwright, 2012). In the early 19th century, after witnessing the damaging effects of alcohol, physicians such as Benjamin Rush in America and Thomas Trotter in England developed what is now understood as the foundation of the modern disease model of alcoholism (Berridge, 2013; Edwards, 2012; Levine, 1985). Later, in the first half of the twentieth century, America witnessed a radical demedicalisation of addiction as medical approaches to 'inebriety' and opiate abuse were replaced by prohibition and the criminalisation of drug use (Campbell, 2007; Gerstein & Harwood, 1990; Levine, 1985; Musto, 1999).

In the mid-twentieth century, the repeal of national alcohol prohibition and the 'rediscovery' of the disease concept were attributed to a confluence of social and political factors: (1) the growth of the Alcoholics Anonymous (AA) movement founded in 1935; (2) the establishment of the Yale Center of Alcohol Studies in the 1930s; and (3) the publication of Jellinek's (1960) widely cited text *The Disease Concept of Alcoholism* that was heavily influenced by AA (Conrad & Schneider, 2010; Levine, 1985). The development of effective pharmacotherapies in the 1960s to treat heroin addiction (Dole & Nyswander, 1967) provided further support for a disease model of addiction (DMA).

In the mid-1960s and mid-1970s, an emerging "neurobiological style of thought" (Vrecko, 2010, p. 56) increasingly pervaded addiction medicine, and addiction research and treatment became increasingly focussed on the brain and its dysfunction (Vrecko, 2010). Towards the mid-1990s, based on insights from neuroscience and in particular neuroimaging, a number of prominent US research agencies began to frame alcohol and other drug (AOD) addiction as a chronic, relapsing brain disease (Leshner, 1997; McLellan, Lewis, O'Brien, & Kleber, 2000; Volkow, 2005). The *National Institute on Drug Abuse* (NIDA) in the US, which funds more

[1] At the start of Chapter 3 and in Appendix A we discuss the history of the disease model of addiction in more detail, shedding light on the medicalisation of addiction both in and outside the US.

than 85% of global research on AOD addiction (US Government Printing Office, 1998), has been a vocal advocate of the BDMA since then.

A number of prominent medical associations around the world have redefined addiction as a brain disease. In 2011, the *American Society of Addiction Medicine* (ASAM), representing addiction physicians and professionals in the US, stated that "addiction is a primary, chronic disease of brain reward, motivation, memory and related circuitry" (American Society of Addiction Medicine, 2011). In 2017, the *Australian Medical Association* also provided a policy position statement supporting the BDMA (Australian Medical Association, 2017).

The BDMA is not a single, well defined neuroscientific model, but rather a loose congeries of neuroscientific ideas about AOD addiction and the effects of drugs on the brain. Volkow and colleagues (2005; 2000; 2016; 2012) have provided a number of reviews of recent advances in the neurobiology of addiction. Despite debates within the neuroscientific community, Volkow and colleagues (2016) synthesise a complex and multifarious neuroscientific literature to present a unified understanding of addiction. This includes: the role of dopamine and disruption to brain reward circuitry; the development of conditioned responses to drug use that produce drug craving and negative emotions when cravings are not sated; and the "weakening" (p. 363) of brain regions involved in executive function (such as inhibitory control and self-regulation) leading to repeated relapse. Referring to Volkow and colleagues' work (2012), Nutt and McLellan (2013, p. 4) summarise the BDMA:

> In simple terms addiction can be considered a gradually acquired (through repeated use) loss of the sophisticated neurochemical and reciprocal balance among these *(brain)* regions such that drives become less well regulated by "top down" cognitive control from the dorso-lateral pre-frontal cortex; concurrent with likely increased salience and greater impulsivity (through learned drive salience) and thence more drug use.

These neurobiological changes described within the BDMA, which are also influenced by genetic, learned and environmental factors, cause drug 'use' to become 'abuse' before ultimately becoming 'addiction' (Nutt & McLellan, 2013).

Proposed advantages and disadvantages of the BDMA

It has been argued that research informed by the brain disease paradigm has led to more effective methods of preventing addiction and more informed public health policy. For example, Volkow et al. (2016) argue that research guided by the BDMA aided the inclusion of addiction in the Mental Health Parity and Addiction Equity Act of 2008, which required medical insurance plans in the US to provide the same coverage for substance use disorders compared to other mental health illnesses. Furthermore, proponents of the BDMA argue that it will reduce moral judgments of addicted persons, provide more effective behavioural and medical interventions (e.g., anti-craving drugs, cognitive brain training games, and brain stimulation devices) and foster more effective public health policies (e.g., less incarceration) to address addiction by framing it as a medical issue, rather than moral failing (Leshner, 1997; Volkow et al., 2016).

Critics have contested the neurobiological evidence underpinning the BDMA and argued that, for example, addiction neuroscience evidence supports the view that addiction is a neurodevelopmental disorder rather than 'brain disease'[2] (Lewis, 2015). Others have argued that viewing addiction as a brain disease may increase stigma for people with an addiction and lead policy-makers to focus on individual medical solutions to social problems (Hall et al., 2015; Hammer et al., 2013).

There are continuing tensions between neurobiological accounts and social accounts underlying drug use and addiction. Framing addiction as a brain disease has been criticised as a form of neurobiological essentialism (Carter & Hall, 2012; Courtwright, 2010); the reduction of complex addictive behaviour to neuronal circuitry ignoring the important role of social and environmental context in driving drug use and maintaining addiction. A key criticism of the BDMA is that neurochemical explanations of addiction are limited and partial (Fraser et al., 2014), and that the relationships between molecular processes and complex social interactions remain frustratingly elusive.

A few studies have explored the views of addicted individuals, addiction neuroscientists and community-based clinicians about the BDMA (Barnett & Fry, 2015; Bell et al., 2014; Meurk et al., 2016). These studies report that treatment informed by a BDMA may have both positive

[2] In Appendix B, we present a critique of Lewis's *neurodevelopmental model* and the social impacts of neurocentric models of addiction.

(e.g., increased insight and treatment seeking behaviour) and negative clinical impacts (e.g., reduced self-efficacy, increased stigma). However, further research elucidating the views of AOD treatment providers' views on the implications of the BDMA and how they integrate neuroscience within practice remains underexplored.

Why are AOD treatment providers' perspectives important?

AOD treatment providers are an important, but often absent, stakeholder voice in debates about the BDMA and the effects of neuroscientific understandings on clinical work. By exploring treatment providers' perspectives in Australia, the UK and US, this project has potential implications for: (1) clinical practice to address AOD harms; (2) the development of AOD policy; and (3) critical scholarship examining the translation of addiction neuroscience to practice.

Clinical practice and addressing AOD harms

Alcohol and other drug addiction remains a significant health, social and economic burden in Australia (Australian Institute of Health and Welfare, 2019b), the UK (NHS Digital, 2017) and US (US Department of Health and Human Services, 2016). In the US, opioid use, overdoses and mortality continue to represent a substantial threat to public health (US Department of Health and Human Services, 2018). The harms from opioid use in Australia including mortality and poisoning hospitalisations have also risen in the past decade (Australian Institute of Health and Welfare, 2018).

Treatment services play a vital role in addressing the harms caused by AOD use and addiction. In Australia, around 130,000 clients received treatment from publicly funded addiction treatment agencies in Australia during 2017-18 (a rise of 9% since 2013-14) (Australian Institute of Health and Welfare, 2019a). Within the UK, there were 268,390 adults in contact with drug and alcohol services in England in 2017-18 (Public Health England, 2018). In the US, the number of drug and alcohol treatment admissions for clients aged 12 years and older was 2,005,395 in 2017 (a decrease from 2,162,877 in 2007) (Substance Abuse and Mental Health Services Administration, 2019).

Future care and measures to reduce harms associated with AOD use can be improved by a better understanding of the ways that treatment providers view the clinical impact of the BDMA and how they adopt neuroscience in practice. Importantly, treatment providers' views about the aetiology of addiction, their support for addiction as a disease or brain disease, and how they discuss neuroscience in practice may all contribute to clients' experience of treatment (Barnett & Fry, 2015; Bell et al., 2014). The findings from this project may have important implications for a large cohort of clients accessing treatment. Furthermore, the findings may inform the development of learning and training resources designed to improve future care within diverse AOD workforces in Australia and internationally.

Future AOD policy development

In the US, the BDMA has received strong support from the national drug strategy (Office of National Drug Control Policy, 2016b), research agencies such as NIDA (Leshner, 1997; Volkow et al., 2016) and also professional associations, including ASAM (American Society of Addiction Medicine, 2011). Policy position statements from these agencies in the US have unequivocally supported the BDMA. In Australia and the UK, similar statements in support of the BDMA at the national drug strategy level have not been made.

It is therefore apparent that policy, research and treatment provider agency support for the BDMA differ in Australia, the UK and US. This project is the first to conduct a cross-cultural comparison of treatment providers' level of support for the DMA and BDMA in these three English-speaking countries. In doing so, the project may provide insights into how support for addiction models found in policy influences treatment providers' perspectives. By exploring their views, future AOD policy makers, researchers and treatment organisations in different jurisdictions may be better informed, and better able to design policy that is more representative of the treatment providers on whose behalf they advocate. Failure to consider treatment providers' views about the BDMA when designing policy runs the risk of unintended adverse effects of policy for practice (e.g., focussing on biomedical solutions at the expense of other solutions to addiction problems) and may fail to capitalise on potential policy improvements. This thesis will attempt to address this epistemic gap.

Future translation of addiction neuroscience

Regardless of debates about the aetiology of addiction, there continues to be substantial investment in addiction neuroscience globally. For example, the *National Institutes of Health* (2016) collaborative research agenda in the US and the *Medical Research Council* (2019) in the UK continue to invest heavily in addiction neuroscience research. Furthermore, tertiary institutes affiliated with Harvard (Harvard Medical School, 2019) in the US, Cambridge (Cambridge Neuroscience, 2019) in the UK, and The University of Melbourne (The Florey Institute of Neuroscience and Mental Health, 2019) in Australia also invest substantial resources in neuroscience research with an aim to improve the diagnosis, treatment and prevention of AOD addiction.

The therapeutic promises of addiction neuroscientific technologies have been wide ranging. They include more effective pharmacological treatments with fewer side effects (e.g., medication assisted treatments for opioid dependence) (Veilleux, Colvin, Anderson, York, & Heinz, 2010; Volkow et al., 2016), direct brain interventions such as deep brain stimulation (Luigjes et al., 2012), and neuroimaging technologies and neurocognitive tests to diagnose clients with AOD addictions (Franken & van de Wetering, 2015; Lubman, 2007; Volkow & Li, 2005).

The translation of addiction neuroscience research to practice, however, has largely been unsuccessful resulting in a "bench to bedside gap" (National Institute on Drug Abuse, 2016, p. 5). Despite almost three decades of neuroscience research on addiction, very few of its clinical promises have been realised (Hall et al., 2015; Kalant, 2010). To overcome this failure, there has been a renewed focus on 'rapid translation' (Ostergren, Hammer, Dingel, Koenig, & McCormick, 2014). Moreover, the *Institute of Medicine* recognises that we need greater engagement with end-users if we are to bridge the 'quality chasm' (Committee on Quality of Health Care in America, 2001). The field of *implementation science* (Brownson, Colditz, & Proctor, 2018) and other forms of participatory research promise to bridge the translation gap between science research and healthcare.

The role that treatment providers play in translating and representing neuroscience in clinical practice has been largely overlooked. How treatment providers view the relevance and application of addiction neuroscience for practice has implications for future attempts at translating addiction neuroscience into treatment. It is vital that addiction treatment providers views' about the BDMA and its relevance for clinical practice are considered: (a) as part of a

wider commitment to *responsible research and innovation* (Owen, Macnaghten, & Stilgoe, 2012) that many research programmes aspire to; and (b) to inform scholarship (e.g., Martin, Brown, & Kraft, 2008; Rhodes & Lancaster, 2019) that applies a critical lens to translation and implementation science by unsettling simplistic 'bench to bedside' models.

Taking an interdisciplinary approach

This thesis utilises an interdisciplinary, mixed-methods approach that draws upon analytic methods from a range of fields. Each of the published or submitted papers that form the empirical results section of this thesis (see Chapters 3 to 6) are self-contained, but related, bodies of work. Each paper includes a review of the literature relevant to that study and a summary of the analytic approach employed (see Chapter 2 for a more comprehensive discussion of the methods). I will therefore refrain from rearticulating or summarising that material here. It is worthwhile, though, to briefly introduce the disciplines that the thesis engages with, and to highlight specific tensions between these disciplines and describe how these tensions are addressed in the thesis.

Psychological perspectives are engaged with throughout the thesis. They offer varying ways to conceptualise drug use and addiction both within and outside a disease model. For example, drug use may serve as a means to alleviate distress and manage painful emotions, often referred to as the *self-medication hypothesis* (Khantzian, 1985). Problematic drug use may also be viewed as a maladaptive coping strategy by a *stress coping model* (Wills & Filer, 1996). Liberal accounts characterise addiction as a form of 'pleasure-seeking' in which the problem of addiction lies in managing pleasure, rather than treating a disease (Foddy & Savulescu, 2007).

Psychological theoretical frameworks also allow for an analysis of how treatment providers perceive the potential impact of the BDMA for clients' sense of self-efficacy and autonomy. For example, some treatment providers have argued that viewing addiction as a brain disease may provide certain individuals with an increased insight into their condition, empowering them to make positive behavioural changes (Bell et al., 2014). Other treatment providers have suggested that if clients view their condition as a brain disease it may reduce their sense of agency (Barnett & Fry, 2015; Bell et al., 2014), and lead to a state of *learned helplessness* (Seligman, Maier, & Geer, 1968) in which low expectations about the future lead to passive inaction rather than active engagement with recovery.

This thesis also draws from approaches familiar to sociology and science and technology studies (STS). A sociological approach provides an analytic toolkit to examine treatment providers' views about the medicalisation (or *over medicalisation*) of social issues, such as drug use, by characterising them in terms of disease (Conrad, 1992; Illich, 1977). Indeed, medicalisation has coalesced into a process of *biomedicalisation*, an extension and reconstitution of medicalisation in light of developments in biomedical research and technology (Clarke, Shim, Mamo, Fosket, & Fishman, 2003). AOD addiction has been biomedicalised through emergent neuroscientific technologies with the BDMA having been "embodied in the brain and materialised in biomedical processes" (Netherland, 2011, p. 154). There has been less attention to how and why treatment providers engage with addiction biomedicine in their clinical practice, and with what effect. This thesis aims to fill this gap.

Sociological and STS approaches also provide the tools necessary to engage with an emergent body of critical work tracing the links between neuroscience and personhood. This work examines how individuals draw upon neuroscientific concepts to understand themselves and others. The constitution of individuals as 'cerebral subjects' (Vidal, 2009) has been the focus of recent work that explores an increasing "neurologisation of the person" (Singh, 2013, p. 813). How different actors (e.g., patients, clinicians, scientists) deploy neuroscientific terms and frameworks to construct and position themselves and others has received attention in other areas (cf. Buchbinder, 2015; Pickersgill, Cunningham-Burley, & Martin, 2011; Singh, 2013), but not within addiction clinical practice.

The thesis also adds to the literature that examines the ways concepts of addiction are enacted across different sites, for example within AOD screening and diagnostic tools (Dwyer & Fraser, 2015, 2016; Savic, Barker, Hunter, & Lubman, 2016; Savic & Fomiatti, 2016), policy and funding models (Lancaster, Duke, & Ritter, 2015; Moore & Fraser, 2013; Moore, Fraser, Törrönen, & Tinghög, 2015), and legal processes (Seear, 2019; Seear & Fraser, 2014a, 2016). By applying similar methods to explore how neuroscientific discourses enact addiction in treatment settings, the project's findings reveal how addiction is constructed as a serviceable problem with real-world 'lived effects' (Bacchi, 2009) that influence clients' experiences of care.

Taking an interdisciplinary approach facilitates an exploration of treatment providers' engagements with addiction neuroscience from multiple theoretical paradigms. However, at the same time, there are epistemological and ontological tensions that exist in a project that adopts psychological and sociological perspectives. Such tensions between different disciplines are not new. Discussing the disease concept of alcoholism, Room (1983) discussed the strain between positivist medical or psychological perspectives and sociological viewpoints where alcoholism is often seen as a social creation of particular times or circumstances. In the context of this project, issues concerning methodological and ideological tensions and how the interdisciplinary findings come together, are discussed further in the method and discussion chapters.

Aims and chapter outline

This thesis takes the format of a 'thesis by published works'. *Part I: Introduction and methods* continues in Chapter 2 where I provide an overview of the methods that guide the empirical component of the thesis. I detail the overarching mixed-methods strategy and how each chapter in Part II fits within it. In *Part II: Empirical publications* I present four empirical papers: a systematic literature review (Chapter 3), two qualitative papers (Chapters 4 and 5) and a quantitative paper (Chapter 6).

The initial aim of the thesis is to establish whether treatment providers endorse and how they view the clinical impact of the DMA and BDMA. To achieve this aim, a systematic review of research exploring treatment providers' views about the clinical impact of the disease model and BDMA is conducted to provide the most comprehensive international review of treatment providers' attitudes to date (Chapter 3).

The second aim of the thesis is to explore treatment providers' engagements with neuroscience and how neuroscientific models of addiction impact on their clinical practice. The qualitative data emerging from interviews with Australian treatment providers are analysed to provide a critical exploration of the way neuroscientific discourses problematise addiction (Chapter 4). This is followed by an examination of how, when and for what purpose treatment providers discuss the brain in practice with clients (Chapter 5).

The third aim of the thesis is to provide an international comparison of treatment providers' views about the psychosocial, DMA and BDMA. This aim is addressed through the largest international survey to date exploring treatment providers' views about the psychosocial, DMA and BDMA in Australia, the UK and US (Chapter 6).

Finally, in *Part III: Implications of the findings and future directions* (Chapter 7), I discuss and present a synthesis of my findings and reflect on their implications for: clinical practice, policy development and research translation.

Chapter 2
The mixed-methods approach

This chapter provides an overview of the mixed-methods methodological framework that guides the empirical component of the thesis (see Chapters 3 to 6). Within each of the forthcoming empirical chapters, methodological considerations relevant to each particular study are described in detail within the paper presented. The purpose of this chapter is not repeat those detailed methodological descriptions, but rather to summarise the structure of the overarching mixed-methods design, recruitment, data collection and analysis.

Introducing mixed-methods research

Simply described, mixed-methods research (MMR) is an eclectic methodological approach where researchers select and integrate multiple techniques drawn from a variety of qualitative and quantitative 'toolboxes' (Creswell, 2011; Creswell & Clark, 2007; Teddlie & Tashakkori, 2011). In order to thoroughly investigate a phenomenon, mixed-methods practitioners are committed to a pluralistic approach where multiple paradigms associated with various methods are employed within the same body of work.

However, any claim that the field of MMR, and those working within it, are in agreement about what MMR is, or how it should be best conducted, is misguided. Discussing the 'controversies' emanating from the field of MMR, Creswell (2011) provides a detailed summary of methodological, philosophical and pragmatic critiques that have been raised about mixed-methods approaches. Creswell narrows the debate down to eleven key controversies, including: the changing and expanding definitions of MMR; whether MMR is indeed novel and what drives interest in it; and, whether MMR provides value beyond that of individual qualitative and quantitative research alone.

This debate has a long history, with MMR evolving from the '1980s paradigm wars' (between qualitative and quantitative practitioners) to become a 'third methodological movement' (Denzin, 2010). MMR has been criticised as a form of methodological bilingualism, where the combination of qualitative (often associated with constructionism) and quantitative (often associated with positivism) methods, is often viewed as conflicting, or at worst unworkable

(Denzin, 2008). Therefore, researchers, when taking an MMR approach, have to remain aware of the potential epistemological, ontological and axiological conflicts that need to be addressed at each stage of research.

An exploratory sequential mixed-methods design

This thesis adopts an *exploratory sequential mixed-methods* design (Creswell & Clark, 2007). The design is composed of an initial phase of qualitative data collection and analysis (interviews), followed by a quantitative data collection and analysis phase (survey) (refer to Figure 1). Chapters 4 and 5 report findings from the qualitative phase and Chapter 6 reports findings from the quantitative phase. Furthermore, the findings from the systematic review (Chapter 3) also informed the design of both the qualitative and quantitative phases.

The qualitative phase

Participants

Recruitment of AOD treatment providers to participate in an in-depth qualitative interview began in 2015. The study was conducted in Victoria, Australia, and aimed to recruit a range of treatment providers with different professional backgrounds. Potential recruitment sites were purposively selected to recruit treatment providers from settings with varying treatment philosophies (e.g., harm reduction, abstinence), funding models (including both public and private), and geographic locations that spanned urban and rural areas in the state of Victoria.

In total, 20 interviews were conducted between 2015 and 2016 with treatment providers working at five public drug and alcohol treatment services in Victoria (participant details are summarised in Table 1). Recruitment sites included: clinics in inner and outer Melbourne offering a range of services, including counselling and pharmacotherapy; a private psychology practice; and a rural therapeutic community offering a short-term, abstinence-based programme. Following a "gatekeeper referral" method (Jessiman, 2013), a primary contact at each site advertised the study to other treatment providers. One private service that had agreed to take part in the study cancelled their involvement citing resource difficulties and a lack of available staff to participate.

Figure 1: Exploratory sequential mixed-methods architecture of the thesis

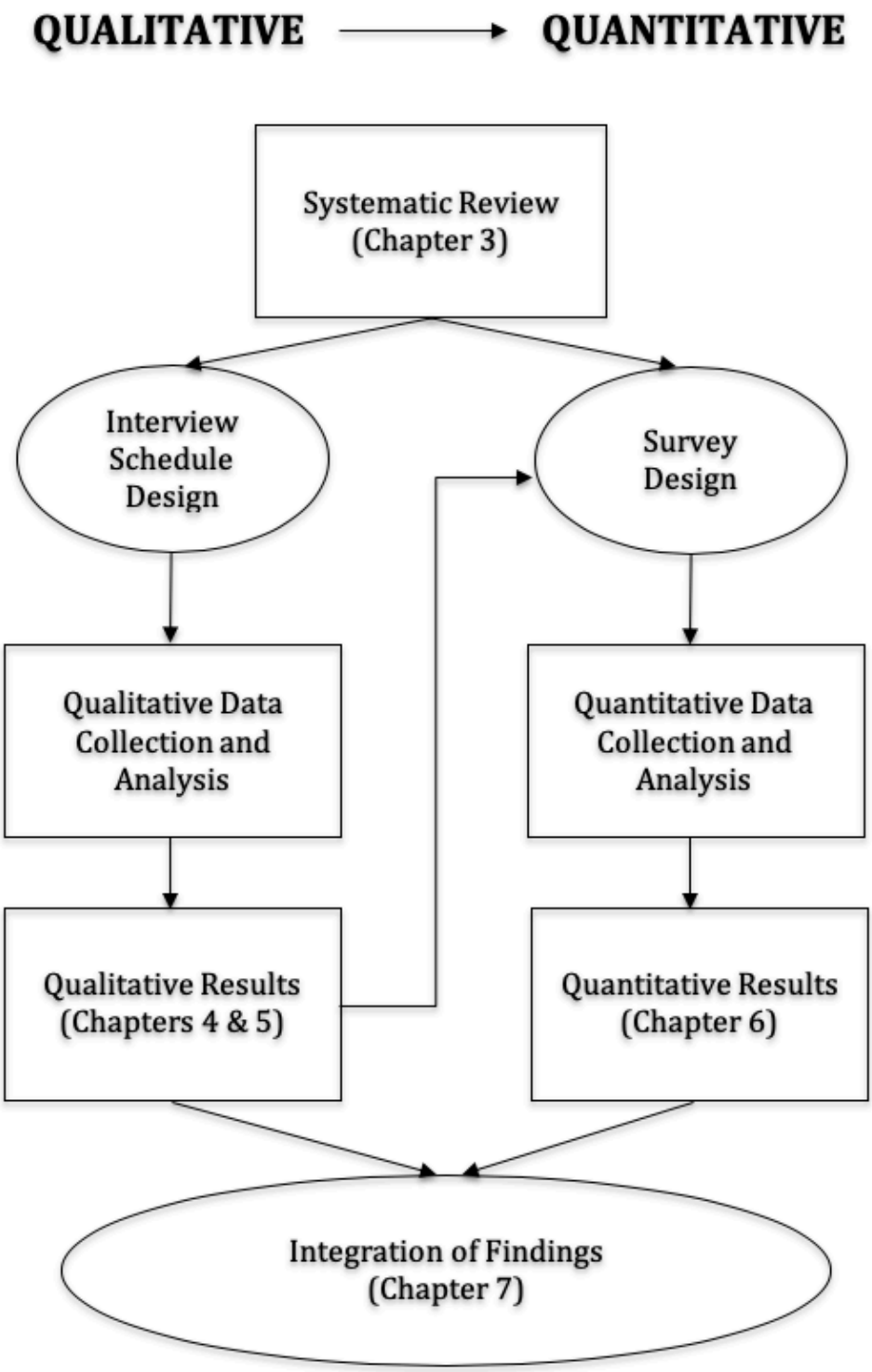

Table 1: Qualitative phase participants

Recruitment site	ID	Role
Outer Melbourne inter-disciplinary clinic	A1	Addiction Medicine Specialist
	A2	Registered Nurse
	A3	Counsellor Psychologist
	A4	Primary Health Care and Needle and Syringe Programme Worker
	A5	Counsellor
	A6	Enrolled Nurse
	A7	Enrolled Nurse
	A8	Enrolled Nurse
	A9	Dual Diagnosis Clinician
	A10	Nurse - assessment
Therapeutic community	B1	Manager and Counsellor
	B2	Cognitive Behavioural Therapy (CBT) Trainer
	B3	Case Worker
	B4	Case Manager
Inner Melbourne inter-disciplinary clinic	C1	Addiction Psychiatrist
	C2	Addiction Psychiatrist
	C3	Addiction Psychiatry Registrar
	C4	Addiction Medicine Specialist
Private psychology practice	D1	Psychologist
Inner Melbourne clinic linked to hospital	E1	Addiction Medicine Specialist

The 20 participants included Addiction Medicine Specialists, Psychiatrists, Nurses, Social Workers, Psychologists, Counsellors and Case Workers, along with others working in addiction treatment services. They comprised 10 men and 10 women, ranging in age from 32 to 66 years. Their length of employment at their current workplace ranged from less than one year to 14 years. Participants had worked within alcohol and other drug treatment for between one year and 31 years. Demographic data was unavailable for one participant.

Data Collection

The interviews were designed to explore a broad range of themes. Themes included how addiction treatment providers viewed addiction problems, how they viewed different models and their clinical impact (specifically the DMA and BDMA), their views about AOD treatment, and how they conceptualised the role of the brain in addiction. The full interview schedule is presented to Appendix C. The mean interview duration was 44 minutes (ranging from 18 to 69 minutes) and all interviews were conducted face-to-face on site at treatment providers' places of employment. Interviews were recorded and transcribed verbatim by an external transcription service.

Data Analysis

Interview transcripts were anonymised and analysed using NVivo, Version 11. Data were coded guided by the constant comparison method (Seale, 1999). Data were read and preliminary codes were applied to emergent themes that related to treatment providers' views about drug and alcohol problems (e.g., aetiology, treatment), their references to neuroscience or the brain, and their views on how neuroscientific models such as the BDMA impacted practice. A detailed coding structure was formed from this coding stage. Following this initial coding, the qualitative papers presented in Chapters 4 and 5 took slightly different analytic approaches (as part of a second stage) in order to answer the specific research questions they addressed. Chapter 4 traces neuroscientific discourses at work within clinical settings based on the interviews and Chapter 5 explores how, why and when treatment providers discuss the brain in practice. These divergent approaches are elaborated on within the specific chapters.

The quantitative phase

Participants

The quantitative phase involved an online survey of addiction treatment providers in Australia, the UK and US. An online survey was advertised to addiction treatment providers in the US, UK and Australia via a range of methods. First, an email that contained a link to the survey was sent to subscribers of different mailing lists including: (a) US lists: Addiction Medicine; Addict-L; (b) UK lists: Alcohol Misuse; Drugs Misuse Research; DrugWise; Addiction Course Convenors; Scottish Addiction Studies; TC-Open Forum; (c) Australian lists: Drugtalk;

Victorian Alcohol and Drug Association (VAADA); and, (d) international lists: Therapeutic Communities; Kettil Bruun Society; EWODOR; Addiction Theory Network.

Second, advertisements for the study were placed in a range of professional association newsletters or on their message boards/websites including: (a) US associations: The Association for Addiction Professionals (NAADAC); (b) UK associations: Federation of Drug and Alcohol Practitioners (SMMGP/FDAP); Society for the Study of Addiction (SSA); and (c) Australian associations: Australasian Professional Society on Alcohol & other Drugs (APSAD); The Royal Australian and New Zealand College of Psychiatrists (RANZCP). The survey was open between to 13 February 2018 and 23 August 2018.

Participants were included if they: were employed as a treatment provider working with alcohol and/or drug addiction clients (e.g., doctors, nurses, social workers, psychologists, dual diagnosis clinicians, case workers, harm reduction workers, peer workers); worked in Australia, the UK or US; and were over 18 years of age. Those who were retired or did not work with alcohol and/or drug addiction clients were excluded.

We received 1,963 survey responses: 490 incomplete responses were excluded, 28 as participants were outside of Australia, the UK or US, and 7 who were under 18 years of age. This left a final sample of 1,438. Participant demographic characteristics are provided in Table 2.

Table 2: Quantitative phase participants by country

Variable		**Australia**	**UK**	**USA**	**Total**
N		337	165	936	1438
Age, *M (SD)*		46.0 (12.3)	49.6 (10.2)	51.7 (12.5)	50.1 (12.5)
Gender, *N*	Male	116	73	270	459
	Female	220	90	654	964

Data Collection

The survey instrument was created in Qualtrics. The survey explored participants' views about addiction and the disease model, views about the harm reduction, drugs and the brain, and the BDMA and its clinical impact.

Support for the DMA was measured using the *Short Understanding of Substance Abuse Scale* (SUSS) (Humphreys, Greenbaum, Noke, & Finney, 1996) which is a modified version of the Understanding of Alcoholism Scale (Moyers & Miller, 1993). The SUSS is a 19-item scale measuring beliefs about substance abuse and it has three subscales including the: disease model (7-items); psychosocial model (5-item); and, eclectic orientation (7-items) subscales.

To measure BDMA support, treatment providers' views about the clinical impact of the BDMA and the relevance of neuroscience to their role, we created a range of ad doc questions (in Chapter 6 we provide further detail on how support for the BDMA was operationalised). Insights from the qualitative analysis informed the design of this part of the survey. No validated measures exist to explore treatment providers' views about the BDMA and how they use neuroscience in practice. Thus, the MMR strategy not only enabled a deep qualitative exploration of treatment providers' views about neuroscience but also allowed for the design of a bespoke survey instrument to measure BDMA support.

We also collected demographic information (e.g., age, gender, education level) and asked about participants' personal addiction history and whether they had attended 12-step programmes to address their own AOD problems.

Data Analysis

Statistical analyses (e.g., ANOVAs) were performed to examine differences in level of support for the psychosocial, DMA and BDMA in each country group. Hierarchical multiple regression analyses were used to analyse associations between treatment providers' individual characteristics (e.g., previous 12-step attendance, age, gender) and their support for the psychosocial, DMA and BDMA (see Chapter 6).

Integrating the findings

In order to integrate the qualitative and quantitative findings, the thesis utilises two stages from Onwuegbuzie and Teddlie's (2003) mixed data analysis approach. These include *data comparison* (where the qualitative and quantitative data is contrasted and compared) and *data integration* (drawing meta-inferences stemming from both qualitative and quantitative findings). This process enables the triangulation of findings from different methodological traditions that MMR aspires to. I present the integration of findings in the Discussion (Chapter 7).

It is worth noting, that even within an MMR approach, it is rare for a programme of work such as this to include studies informed by such different methodological, epistemic, and ontological commitments. For example, in Chapter 4, the qualitative analysis is informed by poststructuralist perspectives on addiction using Bacchi's (2009) WPR approach. Using Bacchi's approach, addiction is not conceptualised as a stable pre-existing object, but rather it is made to be a certain way (i.e., 'problematised') via the operation of neuroscientific discourses. In contrast, the quantitative study (Chapter 6), by its very nature, measures views about addiction. In so doing, views about addiction are conceptualised as quantifiable, and 'addiction' is assumed to be stable and measurable. In view of these tensions and being attentive to the way Denzin (2010) described potential conflicts within MMR, I further address these epistemological and ontological tensions in Chapter 7.

Part II
Empirical publications

Chapter 3

Drug and alcohol treatment providers' views about the disease model of addiction and its impact on clinical practice: A systematic review

Barnett, A., Hall, W., Fry, C. L., Dilkes-Frayne, E., & Carter, A. (2018). Drug and alcohol treatment providers' views about the disease model of addiction and its impact on clinical practice: A systematic review. *Drug and Alcohol Review, 37*(6), 697-720.

This opening empirical chapter presents a systematic review of addiction treatment providers': (a) level of support for disease models of addiction; (b) individual characteristics (e.g., age, being in recovery) that are associated with disease model support; and (c) views about the potential impact of disease models for practice. The implications of the findings for practice and policy are considered.

The supplementary materials referred to in the paper can be found in Appendix D.

Drug and Alcohol REVIEW

Drug and Alcohol Review (September 2018), 37, 697–720
DOI: 10.1111/dar.12632

COMPREHENSIVE REVIEW

Drug and alcohol treatment providers' views about the disease model of addiction and its impact on clinical practice: A systematic review

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Abstract

Issues. *Addiction treatment providers' views about the disease model of addiction (DMA), and their contemporary views about the brain disease model of addiction (BDMA), remain an understudied area. We systematically revieved treatment providers' attitudes about the DMA/BDMA, examined factors associated with positive or negative attitudes and assessed their views on the potential clinical impact of both models.* ***Approach.*** *Pubmed, EMBASE, PsycINFO, CINAHL Plus and Sociological Abstracts were systematically searched. Original papers on treatment providers' views about the DMA/BDMA and its clinical impact were included. Studies focussing on tobacco, behavioural addictions or non-Western populations were excluded.* ***Key Findings.*** *The 34 included studies were predominantly quantitative and conducted in the USA. Among mixed findings of treatment providers' support for the DMA, strong validity studies indicated treatment providers supported the disease concept and moral, free-will or social models simultaneously. Support for the DMA was positively associated with treatment providers' age, year of qualification, certification status, religious beliefs, being in recovery and Alcoholics Anonymous attendance. Greater education was negatively associated with DMA support. Treatment providers identified potential positive (e.g. reduced stigma) and negative (e.g. increased sense of helplessness) impacts of the DMA on client behaviour.* ***Implications/Conclusion.*** *The review suggests treatment providers may endorse disease and other models while strategically deploying the DMA for presumed therapeutic benefits. Varying DMA support across workforces indicated service users may experience multiple and potentially contradictory explanations of addiction. Future policy development will benefit by considering how treatment providers adopt disease concepts in practice.* [Barnett AI, Hall W, Fry CL, Dilkes-Frayne E, Carter A. Drug and alcohol treatment providers' views about the disease model of addiction and its impact on clinical practice: A systematic review. *Drug Alcohol Rev* 2018;37:697–720]

Key words: addiction, attitudes of health personnel, brain disease, medicalisation, treatment.

Introduction

The brain disease model of addiction (BDMA), characterising addiction as a primary, chronic disease of neural circuitry, receives strong support from influential US agencies including the National Institute of Drug Abuse [1–3] and American Society of Addiction Medicine [4]. Proponents of the BDMA argue that it will benefit addicted individuals by reducing moral judgment and providing enhanced biomedical interventions (e.g. opioid replacement therapies) [1,3]. However, critics have contested the neurobiological evidence underpinning the BDMA, claiming it may increase stigma for people with addictions and lead policy makers to focus on medical solutions to social problems [5–9].

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Received 8 June 2017; accepted for publication 21 October 2017.

Although contemporary discourse is often dominated by the BDMA, the modern disease model of addiction (DMA) can be traced back to the early 17th century when Stuart clergymen in England advanced the notion that habitual drunkenness constituted a disease [10]. In the late 18th century, physicians such as Benjamin Rush in America and Thomas Trotter in England consolidated a disease model of alcoholism [11,12]. Although the precise mechanism was not fully theorised, this early disease model defined addiction as a compulsive loss of control over drinking, or a 'disease of the will'. Later, following the repeal of prohibition, during the mid-20th century the 'rediscovery' of the disease concept was attributed to a confluence of social and political factors: (i) the growth of the Alcoholics Anonymous (AA) movement founded in 1935; (ii) the establishment of the Yale Center of Alcohol Studies in the 1930s; and (iii) Jellinek's [13] widely cited text *The Disease Concept of Alcoholism* [11,14]. In the 1960s, the DMA gained further support with advances in biomedical treatments, such as methadone maintenance therapy for heroin addiction [15].

Outside the USA, the framing of addiction and support for the DMA has been more equivocal. Up until the 1960s, 'alcoholism' was often assumed to be universal across cultures [16]. However, as Room notes, Jellinek's classification of 'the alcoholisms' into a series of 'species' challenged this assumption and framed alcoholism within a series of culture-bound syndromes. In 1970, Kettil Bruun presented a non-medical approach to alcoholism from Finland, where alcoholism was viewed as a social problem that needed to be dealt with accordingly [17]. Similarly, Sweden has had a long tradition of viewing drug and alcohol problems as social problems [18]. Recently, differences between the USA and Europe have been elucidated by historiographical research suggesting that Anglo-American disease concepts were applied in different ways in Europe from the 1860s to the 1960s [19].

In contrast to the DMA, other conceptualisations of addiction include: (i) the *moral model* where addiction is seen as a character flaw or moral failing [20]; (ii) the *choice model* where drug use is a voluntary but harmful behaviour [e.g. Refs. [21,22]]; and (iii) the *psychosocial model* where addiction is an expression of social factors involving class, cultural and socioeconomic processes [e.g. Refs. [23,24]].

Furthermore, different models of addiction make varying assumptions about individuals' responsibility for having and resolving addiction problems. Brickman *et al.*, [25] proposed four models in a 2 × 2 matrix (See Table 1). Individuals in the *medical model* are neither responsible for problems nor solutions and require treatment by a medical professional. The *moral model* holds the individual responsible for acquiring and recovering from the problem. In the *enlightenment model* the individual is responsible for the problem but not the solution and in the *compensatory model* the individual is not responsible for the problem but is responsible for its solution. These different framings of addiction have important implications for treatment, prognosis and future recovery goals, as well as the rights and duties of people with addictions and their families [26].

One critical voice that is often absent from the disease model debate is that of alcohol and other drug (AOD) treatment providers. These actors play a key role in communicating the nature of addiction and its solution. In multi-disciplinary contemporary settings, treatment providers include professional and paraprofessional workers such as psychiatrists, physicians, nurses, psychologists, social workers, counsellors and general workers [27,28]. It is not clear how this diverse workforce understands addiction, or what their views are about the implications and clinical impact of framing addiction as a disease.

To date, no systematic review has explored the attitudes of treatment providers towards the DMA (note the term DMA is used hereafter as a general term to include all AOD addictions and the BDMA unless indicated otherwise). The review addressed three research questions: (i) Do treatment providers endorse the DMA?; (ii) What factors (e.g. treatment providers' age, being in recovery) are associated with positive or negative attitudes about the DMA?; and (iii) What are treatment providers' views about the potential clinical impact of the DMA on clinical practice? This analysis of treatment providers' attitudes will yield important insights into international trends of support for the DMA, how diverse workforces view the DMA or other models differently and how they view the potential clinical impact of the DMA for practice. These findings have important implications for how service users experience treatment in their contact with different treatment providers and how policy makers approach future workforce training and health promotion.

Materials and Methods

A detailed description of the systematic review protocol, reported in line with Preferred Reporting Items for Systematic Reviews and Meta-Analyses standards [29], is provided in Appendix 1 (Supporting information).

Search strategy

AB conducted systematic searches of Pubmed, EMBASE via Ovid, PsycINFO via Ovid, CINAHL

Table 1. *Brickman* et al. *four models characterising an individual's responsibility for his/her problem and for the solution of the problem*

		Responsibility for solution	
		High	Low
Responsibility for problem	High	Moral model	Enlightenment model
	Low	Compensatory model	Medical model

Plus via EBSCO and Sociological Abstracts on 8 November 2015. A second search was conducted on 12 January 2017 after appending the search criteria with two terms to expand the search (note this search was set with a date limit for papers published before 8 November 2015—the initial search cut-off—see Appendix 1 for rationale).

Search terms including medical subject headings (MeSH-terms) and text words were formulated using the 'PICOS' (population, interventions, comparator, outcomes and study design) approach: (i) population: AOD treatment providers; (ii) intervention/exposure: substance use disorders/addiction (including alcohol and illicit drugs; excluding tobacco); and (iv) outcomes: attitude of treatment providers, disease, medicalisation. (iii) Comparator and (v) study design were not applicable to this review. Search terms were created for PubMed (see Table 2), and similar versions devised for the other databases based on their specific MeSH-term indexes (see Appendix 2). No date limits were set in order to survey treatment providers' attitudes towards the DMA over time. The inclusion/exclusion criteria are presented in Table 3.

Study selection

After removing duplicates, the retrieved articles were screened in 3 phases: (i) screening of titles; (ii) abstract review; and (iii) full-text review (AB). See Figure 1. Study selection was accompanied by 'berry picking' [30], which included reference list checking and inclusion of papers known through the authors' networks. A random sample of 10% of all papers was screened by a second reviewer (AC) with an inter-rater agreement of 98%. Following the discussion of their evaluations, both reviewers reached consensus resulting in one paper being added and one excluded from the final sample.

Data extraction and analysis

Data were extracted for the following themes: country where the study was conducted; addiction type; study population and recruitment; sample size; tools and analysis (see Table 4). Also, results were extracted and divided into three components: (i) treatment providers' attitudes about the DMA; (ii) factors associated with positive or negative attitudes; and (iii) treatment providers' views about the clinical impact of the DMA (see Table 5). Data extraction and analysis were conducted by AB. A random sample of over 20% of papers included in the review was subjected to

Table 2. *Pubmed search strategy*[a]

1. Population
#1. health personnel
#2. general practitioners
#3. physicians
#4. nurses
#5. *psychologist**
#6. *social worker**
#7. *counsellor** *OR counselor**
#8. *AOD worker**
#9. *clinician**
#10. *provider**
#11. *staff*
#12. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11

2. Intervention/exposure
#13. substance related disorders
#14. alcoholism
#15. *drug abuse*
#16. *addiction**
#17. dependency
#18. smoking (NOT)
#19. tobacco use disorder (NOT)
#20. 13 OR 14 OR 15 OR 16 OR 17 NOT 18 NOT 19

3. Outcomes
#21. attitude of health personnel
#22. attitude to health
#23. *perspective** *OR perception** *OR view** *OR belief**
#24. 21 OR 22 OR 23

#25. disease
#26. medicalization OR *medicalisation*
#27. 25 OR 26

Combine all searches
#28. 12 AND 20 AND 24 AND 27

[a]Italic terms above are not Mesh-terms.

Table 3. *Search inclusion and exclusion criteria*

Inclusion criteria
- Studies focusing on attitudes of AOD treatment providers about a DMA, factors associated with positive/negative attitudes or treatment providers' views about the clinical impact of a DMA
- Respondents of the study are AOD treatment providers
- Studies focus on AOD abuse, substance related disorders or addiction

Exclusion criteria
- Studies focusing on the views of specialists/workers not involved in the primary treatment of AOD addiction (e.g. ophthalmologists, surgeons, scientists, dentists, pharmacologists and pharmacists)
- Studies focusing on the views of students
- Studies focusing on tobacco smoking
- Studies focusing on behavioural addictions (e.g. internet addiction)
- Studies focusing on comorbid diseases associated with AOD use (e.g. human immunodeficiency virus, Hepatitis C and chronic obstructive pulmonary disease)
- Studies focusing on treatment provider views that do not include views concerning addiction as a disease (e.g. attitude towards a specialised treatment)
- Studies focusing primarily on treatments for addictive disorders (e.g. opioid replacement therapy)
- Studies conducted in Asia, Africa and South America

AOD, alcohol and other drugs; DMA, disease model of addiction.

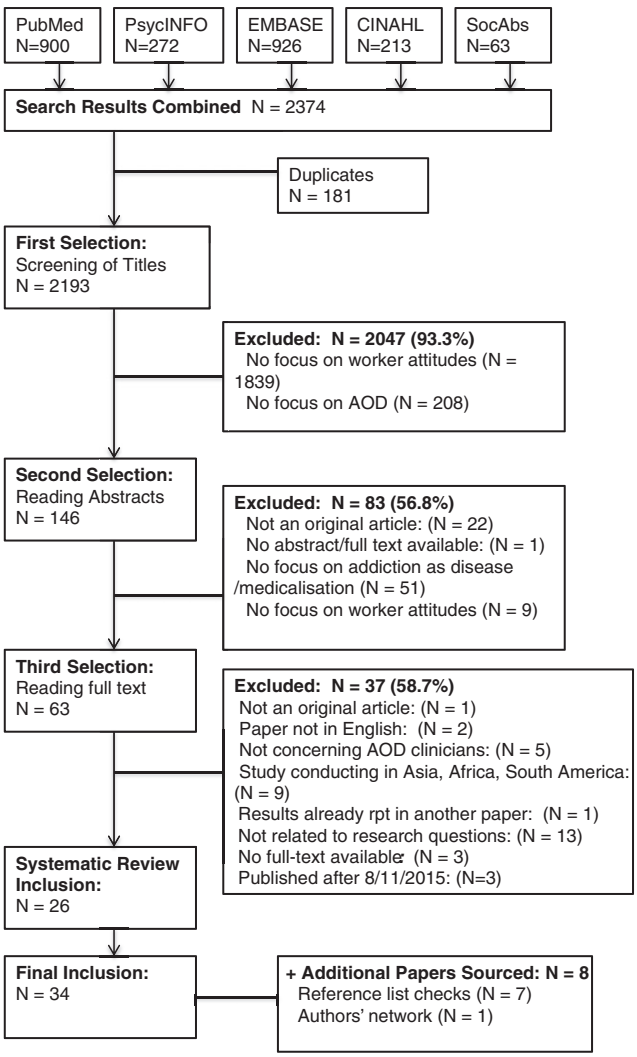

Figure 1. *Literature selection process. AOD, alcohol and other drugs.*

independent data extraction and analysis by AC. The inter-rater agreement was 84%. Consensus was reached following discussion and reviewing original studies. Given the heterogeneity of the studies in sampling, design and measures, a qualitative approach to analysis was adopted and results were summarised thematically rather than by a meta-analysis.

Quality appraisal

We used the Mixed Methods Appraisal Tool [41] to assess the quality of the reviewed literature (AB). Quality appraisal scores are presented in Table 4 and we provide a summary of included papers' methodological strengths and weaknesses in the results. A random sample of 20% of papers was subjected to independent quality appraisals (AC) that resulted in an inter-rater agreement of 75%. Consensus was reached following discussion of the studies in light of Mixed Methods Appraisal Tool criteria.

Results

Sample for analysis

The initial search yielded 2193 papers. After the first selection phase, 146 papers remained and after the second selection phase, 63 papers were subjected to a full-text review. Twenty-six of these papers met the final inclusion criteria. Eight additional papers were sourced from references in these papers and the authors' networks producing a final sample of 34 papers that were included in the analysis.

Table 4. *Characteristics and design of the studies (split by quantitative/qualitative method)*

Quantitative studies						
Study	Country	Addiction type	Study population and recruitment	Sample size	Tools and analysis	MMAT score
Al-Damigh and Cwoger (1994)	USA	Alcoholism	Licensed clinical social workers in Illinois randomly selected from a state regulated mailing list	*n* = 129 (64.5% response rate; 23.1% were male, 76.9% female)	Survey developed measuring views about aetiology of alcoholism, support for a disease model, controlled drinking model, moral model. Demographics used to predict support for different models	2
Burke and Clapp (1997)	USA	AOD addiction	Managers of OSAT units participated; stratified random sample of OSAT units included	*n* = 575 (86% response rate; 56.2% male)	Data from the 1988 Drug Abuse Treatment System Survey was analysed. Differences between attitudes of social work and non-social work background managers reported	4
Casswell and McPherson (1983)	New Zealand	Alcoholism	GPs; 50% of the GPs in New Zealand (988 GPs) were contacted via mail; sample was self-selected	*n* = 431 (43.6% response rate; demographic details not provided)	Survey developed measuring GPs' views about alcoholism (e.g. 'Alcoholism is a disease', 'People who become dependent on alcohol are weak-willed'). Analysis performed to predict GP attitudes based on self-reported behaviour in response to patient concerns	3
Chu and Sung (2014)	USA	AOD addiction	Faith-based counsellors and counsellors in secular programs; independent random sampling strategy	*n* = 110 (59 faith-based treatment program counsellors, 36% male; 51 secular-treatment program counsellors, 49% male; overall 51% response rate)	Survey developed measuring support for a religious or disease model of causation of drug abuse (e.g. 'Drug abuse is a brain disease', 'Drug abuse is a consequence of separation from God'). Regression model run exploring factors predicting support for different models	3
Fisher *et al.* (1975)	USA	Alcoholism	Resident physicians; purposefully recruited from a family-practice residency training program at a southeastern medical school	*n* = 35 (13, 11 and 11 in the first, second and third year levels, respectively of a family-practice residency training program)	Subjects were reported as labelling alcoholism a disease or behavioural disorder, then attitudes were measured including: (i) locus of control beliefs using the Internal-External Scale [31]; and (ii) attitudes using a survey about the 'average', 'alcoholic' and 'diabetic' person (e.g. 'weak–strong', 'sick–healthy').	2
Hshieh and Srebalus (1997)	USA	Alcoholism	Psychologists and alcoholism counsellors; random selection strategy from professional membership organisations	*n* = 229 (119 psychologists, 85% male; 110 alcoholism counsellors, 32% male; overall questionnaire return rate 50%)	Survey developed exploring participants' treatment philosophies and approaches to alcoholism (e.g. 'Do you agree with the disease analogy of alcoholism?'). Factors associated with beliefs also examined	2

(Continues)

Table 4. (Continued)

Quantitative studies						
Study	Country	Addiction type	Study population and recruitment	Sample size	Tools and analysis	MMAT score
Humphreys *et al.* (1996)	USA	AOD addiction	VA treatment program staff (counsellors, physicians, psychiatrists, nurses etc.); recruitment occurred at 15 VA programs in California	n = 329 (55% were female; mean age 46.9, SD = 3.5 years; 86% response rate)	The Short Understanding of Substance Abuse Scale [49] was used to measure support for a disease model of addiction. Two scales based on the Drug and Alcohol Program Treatment Invention [33] measured participants' perception of various treatments. Multiple regression models used to explore factors associated with support for a disease model	4
Jurd and Lee (1989)	Australia	Alcoholism	Doctors (visiting and resident medical staff; NB: final year medical students—results not included in this review) were recruited randomly from a teaching hospital (50% of staff cohort were contacted)	n = 139 (52% response rate)	Casswell and McPherson's [51] questionnaire; between group (e.g. visiting vs. resident staff) attitudinal differences were measured	3
Kahle and White (1991)	USA	Alcoholism	Psychologists and MFCCs in California; random sampling strategy	n = 589 (250 psychologists, 54% male; 339 MFCCs, 32% male)	Survey developed measuring attitudes and conceptions towards alcoholism, abstinence and insight, prognosis, moralism and treatment criteria	3
Kloss and Lisman (2003)	USA	Alcoholism	Mental health clinicians and addiction clinicians; recruited from two sites—an alcohol user treatment centre and a community mental health centre	n = 61 (32 from an alcohol user treatment centre, 29 from a community mental health centre; 70% women; 40% response rate)	Survey developed exploring views concerning attribution of blame and control towards patients with alcohol dependence, schizophrenia and a combination of both. Additionally, clinician support for a disease model of alcoholism was assessed using the UAS [48].	2
Knox (1971)	USA	Alcoholism	Psychologists and psychiatrists employed by veterans affairs across the USA; recruited from professional directories	n = 825 (480 psychologists, 345 psychiatrists; approximately 66.7% response rate)	Survey developed asking respondents to check items they agreed with (e.g. Cause of alcoholism: behaviour problem, symptom complex, escape mechanism, habit, disease) and then to rank answers checked in order of preference	3
Knox (1973)	USA	Alcoholism	Social workers were recruited directly from veterans affairs across the USA	n = 588 (52% male; response rate 86.2%)	Survey developed asking respondents to check items they agreed with (e.g. Cause of alcoholism: Behaviour problem, symptom complex, escape mechanism, habit, disease) and then to rank answers checked in order of preference	3

(Continues)

Table 4. (Continued)

Quantitative studies						
Study	Country	Addiction type	Study population and recruitment	Sample size	Tools and analysis	MMAT score
Lawrence *et al.* (2013)	USA	AOD addiction	PCPs and psychiatrists; stratified random sampling strategy of professional database.	n = 1208 (896 PCPs, 64% male; 312 psychiatrists, 57% male; 63% response rate)	Survey developed exploring views of participants concerning whether they viewed alcoholism or drug addiction a disease, a response to psychological woundedness or a moral failing. Regression models were used to explore predictors of support for a disease model	3
Meza *et al.* (2001)	Canada	Alcoholism	Alcohol treatment providers from diverse disciplines; recruited from Canadian physician and non-physician professional registries	n = 296 (95 drug and alcohol counsellors, 46 social workers, 81 non-psychiatrist addiction physicians, 74 addiction physicians; overall response rate 56%; 57% were men)	Survey developed exploring support for a disease and other addiction models of alcoholism, and views concerning pharmacotherapy	2
Miller and Frances (1986)	USA	AOD addiction	Psychiatrists; recruited from the professional membership database	n = 1705 (36.6% response rate; demographic details not provided)	Survey developed by American Psychiatric Association Committee on Alcoholism and Drug Abuse exploring respondents' practice setting, therapies employed, attitudes about disease, training and experience resulting in interest in chemical dependencies	1
Mogar *et al.* (1969)	USA	Alcoholism	Various professional (e.g. physicians, psychologists, social workers) and non-professional staff (working directly with or not with alcoholic patients) were recruited from two agencies. Patients also sampled (not included in this review)	n = 128 (note 88 treatment providers in sample consisting of five staff groups—55 professional and 33 non-professional staff; response rate unknown)	Staff Attitudes Toward Alcoholism Questionnaire [50] used to measure optimism and pessimism in regards to treatment and recovery, and moralism and disease model support	2
Moyers and Miller (1993)	USA	Alcoholism	Therapists treating patients with alcoholism. Multiple recruitment methods from treatment agencies and providers in New Mexico	n = 170 (60% women; mean age 43, SD = 12 years; 20% response rate)	The UAS was developed by the authors to differentiate therapist support for conceptual models underlying alcoholism. A factor analysis was conducted elucidating different subscales (including a disease model subscale). The relationship between support for a model and demographic variables was explored	2

(Continues)

Table 4. (Continued)

Quantitative studies						
Study	Country	Addiction type	Study population and recruitment	Sample size	Tools and analysis	MMAT score
Musil (1982)	Czechoslovakia	Alcoholism	Psychologists and psychiatrists; recruited from professional societies in Czechoslovakia.	*n* = 217 (107 psychologists, 56% men; 110 psychiatrists 59% men; response rate approximately 41%)	The authors translated the survey instrument designed by Knox [53] into Czech to explore the attitudes of psychologists and psychiatrists in Czechoslovakia in comparison to American results	1
Osborn (1997)	USA	Alcoholism	Alcoholism/drug counsellors with NAADAC membership (including social workers, nurses, licensed counsellors); randomly recruited from NAADAC database	*n* = 284 (83% certified as alcoholism/drug counsellors; 60% female; 63% response rate)	(i) Understanding of Alcoholism Scale—Short Form based on UAS [48]; (ii) Theoretical Orientation Scale for Counsellors (constructed by authors); and (iii) demographic variables and recovery status	4
Palm (2004)	Sweden	AOD addiction	All staff working in a health-based treatment system and a sample of staff working in social services were asked to participate	*n* = 918 (344 health system and 574 social services staff; 73% female; 57% response rate)	The authors constructed a questionnaire to categorise participants' attitudes about responsibility for addiction consistent with Brickman's model, and to measure support for a moral, medical/disease or social view of addiction	2
Rosenbaum (1977)	Canada	Alcoholism	Nurses were recruited from one health unit	*n* = 34 (response rate unknown)	The authors constructed a questionnaire to measure participants' support for a disease model of alcoholism, causes and treatment of alcoholism. Following the questionnaire, participants provided five case-reports on first five drug abuse cases encountered to examine relationship between attitudes and case-management	2
Rosta (2004)	Denmark and Germany	Alcoholism	General practitioners and hospital doctors; recruited from two cities in Denmark and Germany	*n* = 374 (75% of Aarhus respondents male, mean age 44 years; 76% of Mainz respondents male, mean age 40 years; overall 66% response rate)	Survey developed exploring support for a disease model of alcoholism with two statements: 'alcoholism is a disease' and 'alcoholism is a self-induced disease'. Regression model explored predictive factors associated with each statement	2
Russell *et al.* (2011)	USA and UK	AOD addiction	Addiction treatment providers; recruited from UK and the USA, using an opportunistic sampling method	*n* = 591 (219 USA, 372 UK treatment providers; mean age 45.35, SD = 10.78 years)	Disease model beliefs were measured using the ABS [46]. Additionally, the Spiritual Belief Scale [39] was utilised and demographic/addiction history questions were asked. Variables predicting support for models of addiction were analysed	4

(Continues)

Table 4. (Continued)

Quantitative studies						
Study	Country	Addiction type	Study population and recruitment	Sample size	Tools and analysis	MMAT score
Schaler (1995)	USA, Canada and Australia	AOD addiction	Addiction treatment providers in USA, Canada and Australia; recruited via mail from various professional membership lists	n = 295 (63% male; mean age 44.04, SD = 9.68 years; 64% survey return rate)	The author designed and tested the ABS to explore strength in the disease versus free-will model of addiction among providers.	3
Schaler (1997)	USA, Canada and Australia	AOD addiction	Addiction treatment providers in USA, Canada and Australia; recruited via mail from various professional membership lists	n = 295 (63% male; mean age 44.04, SD = 9.68 years)	(i) ABS; (ii) The Spiritual Belief Scale; (iii) The Multidimensional Health Locus of Control—MHLC Scales [40]; (iv) Demographic questions; and (v) Questions about beliefs on addiction recovery without treatment. The SBS, MHLC and demographic questions were used to predict support for ABS scores	3
Schwartz and Taylor (1989)	USA	Alcoholism	Mental health professionals; recruited from a veterans affairs medical centre and midwestern medical centre	n = 100 (47 psychiatric physicians, 36 psychiatric nurses, eight social workers, five pathologists, four allied health professionals; 40% male)	Survey developed exploring the attitudes of health professionals towards alcoholism diagnosis and treatment	1
Qualitative studies						
Study	Country	Addiction type	Study population and recruitment	Sample size	Tools and analysis	MMAT score
Barnett and Fry (2015)	Australia	AOD addiction	Community-based AOD clinicians; recruited purposefully from one site in Melbourne	n = 6 (physician, social workers, psychologist, generic workers; five men, one woman)	Interviews explored support for a BDMA and the impact a BDMA may have on clinical practice and client behaviour. Interviews analysed using thematic analysis	3
Bell *et al.* (2014)	Australia	AOD addiction	Addiction neuroscientists and clinicians (all engaged in neuroscience research) recruited using expert and quota sampling methods	n = 31 (21 men, 10 women; 16 with clinical experience, 15 with no clinical experience; mean age 45 years)	Interviews explored: (i) extent to which participants accept a brain disease view of addiction; and (ii) their views on the impact such a view may have on individuals' beliefs and behaviour. Interviews analysed using thematic analysis.	4
Benoit *et al.* (2014)	Canada	AOD addiction	Health and social care providers; recruited from Vancouver women's, infants and families service providers	n = 56 (demographic details not provided)	Interviews focussed on providers' responses to and views concerning problematic substance use among pregnant and early parenting women	3

(Continues)

Table 4. (Continued)

Qualitative studies						
Study	Country	Addiction type	Study population and recruitment	Sample size	Tools and analysis	MMAT score
Fraser (2015)	Australia and Canada	AOD addiction	AOD policy makers and service providers (including psychologists, pharmacotherapy prescribers and counsellors) recruited from range of organisations (e.g. treatment clinics, primary health-care providers)	n = 60 (40 in Australia, 20 in Canada; demographic details not provided)	Open-ended interview schedule designed by the author exploring attitudes towards addiction; combination of methods used to analyse data	4
Karasaki *et al.* (2013)	Australia	AOD addiction	Clinical and policy professionals working recruited through various networks	n = 20 (14 service providers; six policy development specialists)	Semi-structured interviews; inductive constant comparison method	4
Ketterer *et al.* (2014)	Belgium	AOD addiction	GPs in Belgium; recruited via local networks	n = 20 (10 from Liege, 10 from Antwerp; 10 males, 10 females)	Semi-structured interview schedule exploring GPs experiences, attitudes, perspectives and decision-making skills in relation to abuse of alcohol, illegal drugs, hypnotics and tranquilisers. Coding was guided by a constant comparison technique.	4
Mignon (1996)	USA	Alcoholism	Physicians; recruited from a community hospital in the Northeast	n = 26 (11 internists; four cardiologists; four general surgeons; three orthopaedic surgeons; a one family practitioner, oncologists, gastroenterologist, and neurologist)	Semi-structured interview schedule used to explore physicians' perceptions of alcoholics and their views of the disease concept. Content analysis was used to analyse semi-structured interview data	4
Pauly *et al.* (2015)	Canada	AOD addiction	Nurses and patients were recruited from a health facility; purposive sampling strategy	n = 34 (19 nurses, age range 27 to 57 years; 15 patients)	Ethnographic study using data from in-depth interviews, participant observation and reviewing hospital documents. Interpretive description was used to analyse data	4

ABS, Addiction Belief Scale; AOD, alcohol and other drugs; BDMA, brain disease model of addiction; GP, general practitioner; MHC, mental health clinician; MHLC, multidimensional health locus of control; MMAT, Mixed Methods Appraisal Tool; MFCC, marriage, family and child counsellors; OSAT, outpatient substance abuse treatment; PCP, primary care physician; SBS, spiritual belief scale; UAS, Understanding of Alcoholism Scale; VA, Veterans Affairs.

Table 5. *Results of studies (split by quantitative/qualitative method)*

Quantitative studies			
Study	Attitudes about a DMA	Factors associated with positive/negative attitudes	Attitudes about clinical impact of the DMA
Al-Damigh and Cwoger (1994)	Over 86% of participants identified with the disease model and endorsed an abstinence approach (note over half of these were strong disease model supporters). Less than 7% identified with the controlled drinking model. However, the authors also noted that respondents acknowledged the importance of environmental factors affecting alcoholism, hence the authors claim that it seems the disease model is not sufficient to explain the nature of alcoholism.	There was no significant relationship between personal experience (including being a recovering alcoholic) or demographic data and support for a disease model of alcoholism.	NA
Burke and Clapp (1997)	About one-quarter of managers overall, and managers with a social work background or not, supported a disease approach to AOD problems; a psychological approach received more support overall.	There was no significant difference for disease model support between managers with a social work background and those without.	NA
Casswell and McPherson (1983)	Four factors emerged describing GPs conceptions of alcohol dependence: (i) traditional disease/abstinence concept; (ii) moralism; (iii) modified disease concept to include psychological dependence; (iv) continuum of problem alcohol use including agreement that anyone can become alcohol-dependent. The authors report that the majority of GP respondents held a traditional or modified disease concept of alcohol problems.	Both tradition and modified disease attitudes were significantly associated with GP year of qualification; those who qualified more recently were slightly more likely to hold a modified disease concept and less likely to hold a traditional disease concept.	Respondents who were in agreement with the traditional disease/ abstinence model of alcoholism were more likely to mention referral was an appropriate course of action (to services including AA) and hold beliefs that advice given to patients is likely to be ineffective.
Chu and Sung (2014)	Counsellors in faith-based programs were significantly more likely to support a religious model of drug abuse causation; whereas, those in secular-based programs were supportive of a disease model and were prone to conceive that drug abuse is a brain disease or caused by genetic propensity.	Secular program affiliation and secular counsellors with heavier caseloads were more likely to support a disease model of causation of drug abuse.	NA
Fisher *et al.* (1975)	Twelve residents thought alcoholism was a disease and 23 considered alcoholism a behavioural disorder. No significant difference in attitudes towards alcoholics (e.g. being 'weak', 'sick', 'dangerous') was found when comparing the attitudes of residents supporting a disease model to those who supported a behavioural model of alcoholism. However, alcoholics were seen as being weaker and more hopeless and aimless than average persons.	NA	NA

(Continues)

Table 5. (Continued)

Quantitative studies			
Study	Attitudes about a DMA	Factors associated with positive/negative attitudes	Attitudes about clinical impact of the DMA
Hshieh and Srebalus (1997)	Both groups reported support for a disease model of alcoholism; however, the addiction counsellors were more likely to ascribe to a disease model of alcoholism compared to the psychologists.	Subjects who identified themselves as religious, spiritual, recovering problem drinkers, or who reported significant others/ family members as problem drinkers, were more likely to support a disease model of alcoholism.	Subjects who ascribed to the disease concept of alcoholism were more likely to view abstinence as a treatment goal.
Humphreys *et al.* (1996)	NA	Age was associated with greater endorsement of the disease model of substance abuse, and education was associated with less endorsement. The relationship between being in recovery and endorsing the disease model, though positive, was not significant. Program 12-step goals and activities were positively associated with disease model beliefs.	NA
Jurd and Lee (1989)	The disease model of alcoholism was supported by approximately 80% of participants.	NA	NA
Kahle and White (1991)	The majority of participants (75%), subscribed to a disease concept of alcoholism, whereas 9% more psychologists than MFCCs did not feel it was a disease.	NA	Although three-quarters of participants agreed with the disease concept of alcoholism, nearly half expressed discomfort with being around alcoholics a lot, and over half of each group viewed the alcoholic as responsible for their disease. Therefore, the authors note it appears that belief in a disease model of alcoholism does not preclude the accompaniment of attitudes of a moralistic nature.
Kloss and Lisman (2003)	Participant reported moderate to high endorsement of a disease mode of alcoholism. Of the 59 respondents to the scale, 78% of these respondents scored in the upper-half of the scale.	Factors including recovery status, referral pattern to AA, blame and control ratings (Brickman's model) did not differentiate relative endorsement of a disease model.	NA
Knox (1971)	The majority of respondents from each group (psychologists and psychiatrists) rejected the disease concept of alcoholism. Both groups rarely selected "Disease" as a definition of alcoholism and ranked Behaviour problem, Symptom complex, Escape mechanism and Habit above Disease when asked to define alcoholism.	NA	NA

(Continues)

Table 5. (Continued)

Quantitative studies			
Study	Attitudes about a DMA	Factors associated with positive/negative attitudes	Attitudes about clinical impact of the DMA
Knox (1973)	Social workers favoured the disease concept of alcoholism, however did not subscribe to the disease concept at the exclusion of other theoretical conceptualisations. Alcoholism was defined as an escape mechanism by 68%, as a symptom complex by 67%, a disease by 65%, and as a behavioural problem by 60%.	Disease model support was greater among participants working in general medical and surgical hospitals compared to neuropsychiatric hospitals.	NA
Lawrence *et al.* (2013)	Psychiatrists were more likely than PCPs to believe addiction is a disease (64% of psychiatrists indicated "a lot" in support of a disease model versus 56% of PCPs). Authors conclude the disease model is prominent among physicians, however exists alongside other beliefs that addiction is a response to psychological woundedness, or a result of moral failings.	Females were more likely to consider addiction a disease. Asians were less likely than whites to consider addiction a disease. Northeast physicians were more likely to prioritize the disease model than Southern physicians, and older doctors were more likely to prioritize the disease model over other models. Compared to frequent attenders at religious services, doctors who infrequently attended services were more likely to consider addiction a disease. Type of addiction had a marginally significant independent effect, with support for a disease model of alcoholism higher among participants in comparison to drug addiction.	The authors argue physicians in the study are especially attuned to a biological/disease model of addiction and this has clinical implications. This support can promote a non-judgmental environment; however patients might be left feeling misunderstood if they or their family view addiction in psychological or moral terms.
Meza *et al.* (2001)	As a group, physicians endorsed a disease concept of alcoholism significantly higher than counsellors and social workers. Counsellors provided higher support for a disease model of alcoholism compared to social workers who viewed self-medication as a significant issue in alcoholism.	NA	NA
Miller and Frances (1986)	Acceptance of alcoholism and substance abuse as a primary disease was strongly supported by 58% of respondents. The authors assert that psychiatrists have incorporated an abstinence-oriented disease concept and think of addictions as treatable disorders.	NA	NA
Mogar *et al.* (1969)	Strong support for disease model over moral model (except in non-professional staff).	Professional staff and those with experience working with alcoholics held greater support for disease models.	NA

(Continues)

Table 5. (Continued)

Quantitative studies			
Study	Attitudes about a DMA	Factors associated with positive/negative attitudes	Attitudes about clinical impact of the DMA
Moyers and Miller (1993)	A strong first factor emerged (labelled Disease Model Beliefs) suggesting that traditional beliefs guided by the American disease model of alcoholism are endorsed as a conceptual cluster by treatment providers. Importantly, all statements reflecting moralistic characterological attributions also loaded onto this factor, hence the authors argue that endorsement of the disease model does not preclude simultaneously holding a moral model of alcoholism—termed an amalgamated disease model.	Therapists with a personal history of AOD abuse showed significantly greater adherence to a disease model belief.	Therapists who were high in their endorsement of the disease model had a tendency to impose their own treatment goals, rather than incorporate those generated by the client. Furthermore, they were less willing to offer controlled drinking options or to consider a moderation goal.
Musil (1982)	Czechoslovakian experts preferred to define alcoholism as a disease (psychiatrists) or habit (psychologists), whereas American providers preferred to define it as a behavioural problem, a complex of symptoms or an escape mechanism.	NA	NA
Osborn (1997)	45% of respondents agreed or strongly agreed with the tenets of a disease concept of alcoholism; 54% endorsed a psycho-social concept of alcoholism.	Older respondents and those whom identified as recovering alcoholics were more likely to endorse the disease concept of alcoholism in comparison to younger respondents and those who were not in recovery. Higher levels of education were associated with psycho-social model rather than disease model support.	NA
Palm (2004)	Regarding Brickman's model, about one-quarter to one-third of staff fell into the medical (disease) quadrant, while most were placed between the moral and compensatory models. Other questions found popular support for the disease concept, although a majority also agreed that addiction is a social problem rather than medical.	Disease model support higher for alcoholism than drugs. Regarding Brickman's model, the less respondents viewed the individual as responsible (blame rating), the stronger their disease model support. Participants fitting the compensatory model agreed more strongly with disease concept in comparison to those fitting the medical and moral models.	NA
Rosenbaum (1977)	About 74% of participants reported a disease-oriented view of alcoholism. A multiple attribution of aetiology was present among nurses' attitudes.	Non-moralism and optimism were associated with support for a medical (disease-oriented) model of alcoholism. Discovering and reporting causes of alcoholism in cases-reports was not significantly associated with commitment to a disease model of alcoholism.	NA
Rosta (2004)	The majority of doctors in both cities agreed with the statement 'alcoholism is a disease' (92.4% of doctors from Mainz compared to 73.7% of doctors from Aarhus). On average, every second doctor from both	In both cities, gender, age group and health-care setting did not predict support for either disease statement.	NA

(Continues)

Table 5. (Continued)

Quantitative studies			
Study	Attitudes about a DMA	Factors associated with positive/negative attitudes	Attitudes about clinical impact of the DMA
	cities also supported the statement 'alcoholism is a self-induced disease'.		
Russell *et al.* (2011)	NA	Support for a disease model was stronger among USA treatment providers in comparison to those in the United Kingdom; and those who provide for-profit treatment, have stronger spiritual beliefs, have a personal history of addiction, are older, are members of a group of addiction professionals, and have been treating addiction for longer.	NA
Schaler (1995)	Factor analysis revealed that treatment providers held contradictory views in their conceptualisation of addiction. They appeared to hold both disease model, and free-will model beliefs simultaneously, which led to the finding that the disease concept may be supported and contradicted by treatment providers at the same time.	NA	NA
Schaler (1997)	NA	Addiction treatment providers who believed in a disease model of addiction tended to also utilise spiritual thinking, be female, attend AA, be certified as addiction treatment providers, and drink less alcohol or ingest fewer mood-altering drugs per week in comparison to those believed in a free-will model of addiction. Health locus of control orientation appeared to be unrelated to disease model beliefs.	NA
Schwartz and Taylor (1989)	The majority of the respondents, with physicians more than other groups, viewed alcohol dependence as a disease in its own right.	NA	NA

Qualitative studies			
Study	Attitudes about a DMA	Factors associated with positive/ negative attitudes	Attitudes about clinical impact of the DMA
Barnett and Fry (2015)	Participants did not support the claim that addiction is a chronic relapsing brain disease.	NA	Participants thought a BDMA may ignore psychological, social and environmental factors during treatment and may also lack relevance for certain clients. However, a BDMA may integrate with specific therapies (e.g. CBT, pharmacotherapy). Further, a BDMA may have negative (e.g. increased helplessness) and positive (e.g. increased insight) impacts for client behaviour.
Bell *et al.* (2014)	One-third (n = 10) of participants strongly endorsed the BDMA, remaining two-thirds expressed negative or a combination of positive and negative views about the impact of a BDMA (note the clinicians were generally more sceptical that the neuroscientists about the BDMA and its likely impact).	NA	For treatment of addiction a BDMA was thought to increase treatment seeking behaviour, however focussed on medical interventions and ignored social drivers of addiction. For client self-understanding, a BDMA was viewed as having potential positive (e.g. increased insight, reduced guilt) and negative (e.g. undermines responsibility) clinical impacts.
Benoit *et al.* (2014)	Participants had little to say about a medicalised notion of addiction as disease, expressing confusion about the biomedical definition of problematic substance abuse among pregnant women. Findings suggest that substance use among pregnant women is so deviant, that the disease concept is not readily utilised in the case of maternal substance abuse among practitioners.	NA	NA
Fraser (2015)	While essentialist disease accounts of addiction appeared to be rejected by participants in acknowledgment of a more complex understanding (e.g. a bio-psycho-social or bio-psycho-social-spiritual view), they nonetheless relied upon and invoked disease concepts for therapeutic benefits, to strategically counter stigma and command resources.	NA	Participants at times invoked the disease (and brain disease) model of addiction for positive therapeutic effects and to counter stigma.
Karasaki *et al.* (2013)	Participants' characterisations of addiction were heterogeneous and at times inconsistent; they held social, medical and to some degree moral views consistent with Palm's [68] findings underpinned by Brickman's model.	NA	Participants who drew upon a disease model viewed addicts as requiring external controls (e.g. pharmacotherapy).
Ketterer *et al.* (2014)	The views of GPs concerning substance abuse were not homogenous. Their perceptions of substance abuse were on a continuum from a chronic disease to a moral failing (for which the patient was completely responsible). Accordingly, GPs either considered substance abuse as a chronic disease, or expressed moral judgment about patients, considering them untrustworthy and responsible for clinical and social damages.	NA	NA

(Continues)

Table 5. (Continued)

Qualitative studies			
Study	Attitudes about a DMA	Factors associated with positive/ negative attitudes	Attitudes about clinical impact of the DMA
Mignon (1996)	Seven physicians (27%) stated alcoholism was a disease; three physicians (were sure that alcoholism is not a disease; 16 physicians' (61.5%) responses reflected an ambivalent attitude about the disease concept. The way internists got involved in social and family problems of clients indicated a strong desire to perceive alcoholism a social rather than medical problem.	One physician acknowledged that his support for the disease concept was influenced by his clinical experience and the level of frustration induced by treating different patients. He adhered to the disease concept if not inconvenienced by a medically 'compliant' patient, however did not adhere to the disease concept when inconvenienced by a patient.	Several physicians who were ambivalent about the disease concept argued the disease concept of alcoholism may be useful in removing stigma and an effective way of relieving guilt.
Pauly *et al.* (2015)	On the one hand, some nurses supported the view that addiction is a disease or illness, where patients' lives are characterised as a consequence of their disease rather than an individual failing. Alternatively, the authors report findings where nurses resisted the disease concept in order to promote personal agency in recovery and avoid labelling patients as helpless victims.	NA	NA

AA, Alcoholics Anonymous; AOD, alcohol and other drugs; BDMA, brain disease model of addiction; DMA, disease model of addiction; GP, general practitioner; MFCC, marriage, family and child counsellors; NA, not applicable for study; PCP, primary care physician.

General findings

The majority of studies were conducted solely in the USA (n = 17), followed by Canada (n = 4) and Australia (n = 4). A number of studies were conducted in Europe (Belgium, Czechoslovakia, Sweden and a comparative study in Denmark and Germany). There was a surprising lack of research in the UK, although one study was conducted in both the USA and the UK. Publication dates ranged from 1969 to 2015 (see Figure 2). Studies from 1969 to the turn of the century focused predominately on alcoholism. Since 2010, the focus shifted towards AOD addiction more generally.

Studies primarily focused on treatment providers' views towards a disease model (n = 29), and to a lesser extent a brain disease model of addiction (n = 4) or both (n = 1). Only five of the 14 papers published since Leshner's [1] paper advocating adoption of the brain disease paradigm have explored treatment providers' views on the BDMA: one in the USA [42], three in Australia [38,43,44] and one in Australia and Canada [45].

The majority of studies utilised quantitative methods (n = 26). Eight of these studies employed measures that had been subjected to robust validity testing. Three studies [35,46,47] utilised the Addiction Belief Scale [ABS; 46]; three [32,36,48] used the Understanding of Alcoholism Scale [UAS; 48]; one [34] used the Short Understanding of Substance Abuse Scale [SUSS; 49] and another [37] the Staff Attitudes Toward Alcoholism Questionnaire [50].

The other quantitative papers (n = 18) employed measures developed by their authors that were rarely validated. Examples of these 'ad hoc' measures included: attitudinal statements scored on a Likert scale [51]; dichotomous yes/no questions [52]; and requiring respondents to check and rank items that they agreed with [53].

Three of the eight qualitative papers directly explored treatment providers' views about addiction as a disease [38,43,54]. In the remaining studies (n = 5), the disease model was secondary to the main research questions. All the qualitative studies used interviews and some form of thematic or content analysis, except for one that employed ethnographic techniques [55].

Treatment providers' views about the DMA

Quantitative studies. A range of US studies indicated support for the DMA. In the 1980s, a study of US psychiatrists suggested they had incorporated the disease concept and viewed addiction as a treatable disorder [56]. In another study of mental health professionals, the majority viewed alcoholism as a disease [57]. In later research, the disease concept of alcoholism received majority support in two samples of marriage, family and child counsellors [58] and psychologists and counsellors [52]. However, the samples of these studies may not have represented the wider treatment provider population.

There was also evidence of low support for or rejection of the disease concept in the USA. In the 1970s, the majority of respondents in limited samples of resident physicians [59] and psychologists and psychiatrists [53] rejected the disease model of alcoholism. They viewed alcoholism as a behavioural disorder or

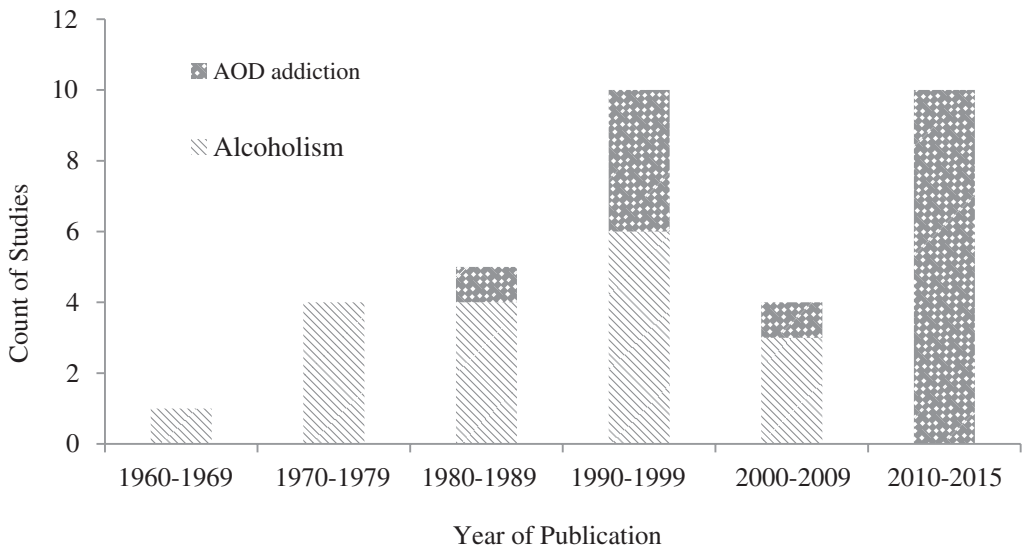

Figure 2. *Number of studies focusing on treatment providers' views about the disease model of alcoholism and disease model of alcohol and other drugs (AOD) addiction from 1960s to 2015.*

escape mechanism. In research of higher validity and reliability, only one quarter of managers of outpatient programmes (mostly from a social work background) supported the DMA, with the majority taking a psychological approach [60]. In another study less than half of alcoholism/drug counsellors supported a disease model of alcoholism in favour of a psycho-social approach [36].

A number of US studies suggested that support for the DMA coexists with support for other models. Social workers recruited from Veteran Affairs were favourable to the disease model of alcoholism but also understood it as an escape mechanism or behavioural problem [61]. DMA support was prominent among US psychiatrists, who also believed addiction to be a response to psychological woundedness or a moral failing [62]. Moyers and Miller [48] reported that among US therapists treating alcoholism, endorsement of the DMA did not preclude simultaneously holding a moral model of alcoholism—termed an amalgamated disease model. Similarly, Schaler [46] reported that US treatment providers appeared to support the DMA and free-will model at the same time. These studies provide evidence that support for the DMA does not preclude support for other seemingly contradictory models.

Russell *et al.*, [35] used the ABS to compare treatment providers' attitudes between the USA and UK. They found that treatment providers in the USA more strongly supported the DMA than in the UK. Comparing their results to Schaler's [46] original study using the ABS, Russell *et al.* tentatively concluded that the DMA had been the dominant model within US treatment services for the 20 years preceding their 2011 study.

In Canada, the majority of nurses recruited from a single health unit supported a disease view of alcoholism amongst other aetiological factors [63]. In another study, Meza *et al.*, [64] found that physicians endorsed a disease model of alcoholism more than counsellors and social workers. The generalisability of both studies was potentially undermined by unrepresentative samples.

The disease model of alcoholism was supported in a sample of Australian doctors at a Sydney hospital [65] and one of New Zealand general practitioners [51]. While both studies used valid instruments, response rates were low, potentially undermining the generalizability of the findings.

In Europe, three quantitative studies were identified in Czechoslovakia [66], Denmark and Germany [67] and Sweden [68]. Musil [66] conducted a cross-cultural study based on Knox's [53] research to compare attitudes of Czechoslovakian and American psychologists and psychiatrists. Musil reported that Czechoslovakian practitioners had incorporated Jellinek's disease concept of alcoholism in comparison to the US respondents in Knox's study who saw alcoholism primarily as a behavioural problem.

In a limited sample of doctors in Denmark and Germany, Rosta [67] found that the majority in both countries viewed addiction as a disease but almost half of them also believed it was a 'self-induced disease'. Thus the medical treatment of alcoholism was seen in the context of an individual being responsible, or at fault, for their addiction.

In Sweden, Palm [68] found that while most treatment staff disagreed with a moral model of addiction in favour of the disease concept, a majority also agreed that AOD problems were social rather than medical problems. Palm provides a possible explanation for this contradiction stating that treatment staff, consistent with AA-ideology, may view AOD problems as diseases not requiring medical attention. Both the design of the questionnaire and sampling concerns potentially undermined the study's validity.

Qualitative studies. Interviews with 26 US physicians found that only seven stated that alcoholism was a disease while the majority were more ambivalent [54]. Physicians' concern for social and family problems of clients indicated a much stronger desire to perceive alcoholism as a social or psychological problem rather than as a medical problem. In a Canadian study of family and infant health providers, substance use among pregnant women was seen as so deviant that practitioners did not use the disease concept to explain maternal substance abuse [69].

Three qualitative studies in Australia found limited support for the DMA. Bell *et al.*, [43] reported that only one-third of 31 addiction scientists and clinicians strongly endorsed the BDMA. Barnett and Fry [38] found that community-based AOD clinicians at a single treatment site did not fully support the BDMA but thought that addiction neuroscience was a key part of understanding and treating addiction. Furthermore, Karasaki *et al.*, [44] in their study of Australian treatment providers and policy makers found participants drew upon multiple and inconsistent explanations about the nature of addiction. These included social and medical or disease views, but also moral perspectives—a finding consistent with Palm's study [68].

In a study conducted in Australia and Canada, Fraser [45] found that while essentialist disease accounts of addiction appeared to be rejected by Australian and Canadian service providers in acknowledgment of a more complex biopsychosocial understanding, they nonetheless invoked disease concepts for their presumed therapeutic benefits to strategically counter stigma.

Factors associated with positive and negative support for the DMA

Addiction type. Two studies shed light on the relationship between addiction type and DMA support. Physicians and psychiatrists in the USA were more likely to support a disease model of alcoholism than drug addiction [62]. Similarly, among treatment staff in Sweden the disease concept was more established for alcohol than drug problems that were seen more as social problems [68].

Demographic variables. Three US studies [34,36,62], and one in the USA and UK [35] found that treatment providers' age predicted DMA support among a range of treatment provider types. Viewed collectively, these papers suggest that older treatment providers in the USA (still practicing in the mid-1990s to 2000s) were more likely to view the DMA positively than their younger colleagues. There was more limited evidence that the same was true in the UK.

In the USA, female physicians were more likely to consider addiction a disease rather than due to moral failings [62], however the validity of the study's questionnaire remains questionable. Schaler [47] similarly reported that females were more likely to support a DMA than males who supported a free-will model. Gender did not predict support for a disease model of alcoholism in a US clinical social worker sample [70], nor in a limited sample of doctors in Denmark and Germany [67].

A higher level of education was negatively associated with DMA endorsement among a wide range of US treatment providers [34,36]. However providers who were members of professional associations (e.g. The Association for Addiction Professionals) were more likely to support a DMA [35,47] or disease model of alcoholism [37]. This literature indicates that for US treatment providers, while tertiary education might lead to less support for a DMA, being certified as a member of a professional membership association was associated with more support.

Religiosity and spiritual thinking. Treatment providers who identified as religious or spiritual were more likely than non-religious providers to support the DMA in both the USA and UK [35,47,52]. Other studies indicated that in the US secular program affiliation was associated with support for the DMA [42] and doctors who infrequently attended religious services were more likely to consider addiction a disease than frequent attenders [62].

Recovery and AA attendance. Various studies across the USA and UK reported that respondents with a personal history of AOD abuse, including those 'in recovery', were more likely to subscribe to the DMA [35,36,48,52]. Others have found no significant association however [32,34,70]. Schaler [47] reported that treatment providers who supported the DMA were more likely to attend AA than those who believed in a choice model of addiction.

Treatment considerations. Support for the disease model was stronger amongst those who provided for-profit treatment in the USA and UK [35]. In the USA, although referral pattern to AA did not predict endorsement of the DMA [32], providers in programs guided by 12-step approaches were more likely to support the DMA [34]. In Denmark and Germany, treatment setting (general practices or hospitals) did not predict support for a disease model of alcoholism [67], however in an earlier study in the USA, social workers working in hospitals held greater disease model support than those working in neuropsychiatric hospitals [61].

Blame and control—Brickman's model. Kloss and Lisman [32] did not find support for their hypotheses that DMA support would be associated with decreased blame ratings (responsibility for the problem) and increased control ratings (responsibility for the solution). These unproven hypotheses indicated that Kloss and Lisman were expecting disease model support to be associated with support for a compensatory model within Brickman's typology.

In contrast, Palm [68] hypothesised that participants demonstrating high support for a DMA would fall within Brickman's medical model quadrant: holding individuals low in blame ratings and low in control ratings. As expected, Palm reported that treatment providers holding low blame ratings showed greater disease model support, but due to sample sizes a similar statistical analysis was not possible for control ratings.

Treatment providers' views about the clinical impact of the DMA

Treatment providers' views about the impact on clinical practice. Treatment providers who supported the disease model of alcoholism were: (i) more likely to have abstinence as a treatment goal [52]; (ii) less likely to consider controlled drinking as an appropriate goal [48]; (iii) more likely to mention referral to AA as an appropriate course of action [51]; and, (iv) more likely to impose their own treatment goals, rather than incorporate those of the client [48].

Strong support for the DMA was viewed as potentially obstructing client change processes. For example, treatment providers that supported the DMA might be less willing to revise their treatment philosophy when faced with evidence which suggests a revision should be considered [35]. Additionally, qualitative studies of Australian treatment providers suggested that treatment informed by the BDMA may ignore social and environmental drivers of addiction by focusing on medical interventions [38,43] and characterise people with addictions as requiring external control (e.g. pharmacotherapies) [44].

Treatment providers' views about the impact on client behaviour. Two Australian [38,43], one American [54] and one study in Australia and Canada [45] reported treatment providers' views about the potential impact of the DMA for client behaviour. Potential positive impacts, according to treatment providers, included: reduced stigma and guilt for those with an addiction [38,43,45,54]; increased insight by clients into their condition [38,43]; and increased treatment seeking [43]. However, treatment providers also identified potential negative impacts of the DMA on client behaviour. Being labelled with a brain disease was thought to potentially increase stigma [38], undermine personal responsibility/volition and increase a sense of helplessness by depicting addiction as incurable [38,43].

Discussion

Treatment providers' views about the DMA

Although the studies conducted in the USA exploring treatment providers' attitudes provided mixed support for the disease concept, the DMA appears to receive stronger support in the USA compared to the UK [35]. The strength of support for the DMA in the USA may be at least partially explained by social and historical factors in the USA that promoted the disease concept. These included: the historical strength of the temperance movement in the USA [11]; the establishment of the Yale Center of Alcohol Studies; and Jellinek's promotion of the disease model [14]. Outside the USA, studies of treatment providers found some support for the DMA among physicians in Canada, Australia, New Zealand, Germany, Denmark and Czechoslovakia and among nurses in Canada and treatment staff in Sweden. Although these studies were often limited in their reliability, they provide evidence of the global reach of the DMA and support among treatment providers.

The higher validity studies that utilised validated instruments (e.g. UAS, ABS) revealed a more complex picture in which support for the DMA did not necessarily exclude support for other models. Treatment providers' support for disease, moral, free-will or social models could be held simultaneously. This finding is similar to those found in studies of the general public in the USA where conceptions about alcoholism were not entirely consistent: moral models were not discounted as an explanation for alcoholism while a disease model was endorsed [71,72].

Importantly, endorsing a DMA along with other models of addiction, such as a free-will model, for example, is not necessarily inconsistent. For instance, Schaler [46] found that treatment providers often supported the notion of addicts overcoming addiction by: (i) relying on their own willpower (free-will model); and (ii) seeking treatment for a disease. Thus support for a disease model may be held alongside an emphasis on the importance of individuals being responsible for recovery.

Viewing this in the context of Brickman's model, Palm [68] argued that in one 'treatment situation' there may be a need for treatment providers to demoralise and show understanding for an individual (e.g. the medical quadrant), whereas in another treatment situation it may be important to ensure an individual feels capable of making change and that they take responsibility (e.g. the moral quadrant). Karasaki *et al.*, [44] argue that this 'hybrid approach' adopted by treatment providers may be an attempt to assign agency to clients, without holding them exclusively to a moral model. Hence these studies suggest treatment providers are agile in their deployment of disease, moral and social models depending on how they wish to frame a client's sense of responsibility for the problem and solution. As Fraser [45] observed, treatment providers appear to deploy disease concepts strategically to counter stigma and for their presumed therapeutic benefits.

Treatment providers' support for multiple models may have also developed through their personal or clinical experience and exposure to alternative models in their education [46]. Although the moral model of addiction was dominant prior to the popularisation of the DMA [11], Room [73] has argued that 'old discourses rarely die' and that long after the demise of the American temperance movement moral models were 'alive and well' in, for example, the criminal law and cognitive behavioural psychology. Consequently, treatment providers may adopt a complex tangle of medical and moral models that may explain at times contradictory conceptualisations of addiction.

The review found a number of patterns across factors predicting DMA support. The tendency for older treatment providers to view the DMA favourably in the USA may be due to them having been trained

during a time when the disease concept was promoted by Jellinek. If true, this suggests that once this cohort retires there may be less support in the workforce for the DMA. Treatment providers in recovery and those who attended AA were more likely to support the DMA which may be explained by their greater personal exposure to 12-step philosophies during their own treatment.

A number of predominantly qualitative studies suggested that treatment providers believed the BDMA may have potential positive (e.g. reduced stigma, increased insight) and negative (e.g. undermined responsibility, increased sense of helplessness) impacts for client behaviour. Whether these potential impacts are realised is an important question for future empirical research. Given the current debate about whether neuroscientific evidence constitutes addiction as a brain disease, and how a BDMA might impact practice, the examination of treatment providers' endorsement of the BDMA and how they view its clinical impact, implications for client autonomy and recovery remain an urgent and surprisingly neglected area of research.

Implications for policy

Within a diverse treatment provider workforce, the review's findings indicate that treatment providers have varying conceptions of what addiction is: a disease, moral or social problem—or a combination of these models. Assuming that treatment providers' attitudes are translated into practice, people accessing treatment services may be faced with multiple, sometimes contradictory, explanatory models for their AOD addictions. This raises the question of whether the role of policy makers in charge of service design and workforce development should be to 'standardise' treatments and service delivery through implementing an overarching, universal addiction model. Alternatively, in a complex service provision landscape where treatment providers characterise the problem of addiction in various ways, policy makers may wish to focus on engaging potential clients with the appropriate service type; one which aligns with their own beliefs and treatment goals.

There is also an important role for professional associations to engage with workforce stakeholders to promote better service delivery. Using the USA as an example, associations such as the American Society of Addiction Medicine have been vocal advocates redefining addiction as a chronic, relapsing brain disease [4]. However, our findings suggest that treatment providers may hold multiple models of addiction and have concerns regarding the potential clinical impact if practice was informed by the BDMA. The role of policy statements supporting the BDMA remains unclear. Have such statements been intended to guide treatment providers' practice? If so, there may be a disjuncture between BDMA support propagated by influential USA institutions and treatment providers' beliefs about addiction. Consequently, we would call for a conversation to take place between policy makers and treatment providers in different international jurisdictions to clarify the role of the DMA/BDMA in policy and practice.

Limitations

First, although a systematic search of the literature was conducted, it is possible that relevant papers were not found or included. Second, a mixed studies systematic review such as this is faced with difficulties in comparing findings. Notwithstanding these analytic challenges, our analysis suggests a number of findings on how treatment providers view the DMA. However, the review did not include research from Asia, Africa or South America, or those published in a language other than English. As a result, the analysis is of primarily Western countries and its findings may not be relevant in low-middle income and non-English speaking countries.

Conclusions

There is mixed evidence of support for the DMA among drug and alcohol treatment providers. Strong validity quantitative studies exploring treatment providers' support for the DMA indicated that they may endorse the DMA while simultaneously supporting moral or free-will models. Given the predominance of support for the BDMA, particularly in the USA, there is an urgent need for empirical examination of treatment providers' acceptance of the BDMA and its perceived positive and negative clinical impacts. Future analyses need to use validated and reliable quantitative measures across various cultural settings that are complemented by qualitative analyses to obtain more detailed insights into treatment providers' attitudes. In future, AOD policy development, policy designers and professional associations must consider a diverse range of treatment providers' attitudes towards addiction, the DMA and its potential clinical impact.

Role of Funding Source

AB receives an Australian Government Research Training Program Scholarship. AC is funded by an

Australian Research Council Discovery Early Career Researcher Award (No.: DE140101097).

Conflict of Interest

The authors have no conflicts of interest.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Appendix S1. Detailed methods protocol.

Appendix S2. Database research criteria.

Chapter 4

When the brain leaves the scanner and enters the clinic: The role of neuroscientific discourses in producing the problem of "addiction"

Barnett, A., Dilkes-Frayne, E., Savic, M., & Carter, A. (2018). When the brain leaves the scanner and enters the clinic: The role of neuroscientific discourses in producing the problem of "addiction". *Contemporary Drug Problems*, *45*(3), 227-243.

This chapter presents the first of two qualitative papers that are both based on interviews with addiction treatment providers in Australia. This empirical work explores the way neuroscientific discourses enact addiction as a certain type of problem and the types of subjects that are produced through these enactments. The findings aim to illuminate how addiction is constituted in different ways, which in turn has implications for how service users experience treatment and care in different settings.

Contemporary Drug Problems
1-17

DOI: 10.1177/0091450918774918
journals.sagepub.com/home/cdx
SAGE

When the Brain Leaves the Scanner and Enters the Clinic: The Role of Neuroscientific Discourses in Producing the Problem of "Addiction"

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Abstract

Addiction neuroscience promises to uncover the neural basis of addiction by mapping changes in the "diseased brains" of people with "drug addictions." It hopes to offer revolutionary treatments for addiction and reduce the stigma experienced by those seeking treatment for a medical, rather than moral, condition. While the promises of addiction neuroscience have received considerable attention, relatively few studies have examined how neuroscientific discourses and promises play out in drug treatment settings. Instead of asking how neuroscience might measure or treat a pre-existing addiction "problem," we draw on poststructuralist ideas to trace how neuroscientific discourses produce addiction as a certain type of "problem" and the effects of these particular problematizations. Based on interviews with a range of different types of treatment providers working in Victoria, Australia, we discuss three themes that reveal neuroscientific discourses at work: (1) constituting pathological subjects, (2) neuroplasticity and "recovery," and (3) the alleviation of guilt and shame via references to the "diseased brain." On the basis of our analysis, we argue that dominant neuroscientific discourses produce patients as pathologized subjects, requiring medical treatment. We also contend that the intersection of neuroscientific and recovery discourses enacts "recovery" in terms of brain "recovery" through references to neuroplasticity. Further, when

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Received December 11, 2017. Accepted for publication April 10, 2018.

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neuroscientific and moral discourses intersect, addicted subjects are absolved from the guilt associated with immoral behavior emerging from a "hijacked brain." We conclude by emphasizing the need for future critical work to explore the complex ways in which neuroscientific discourses operate in localized care ecologies.

Keywords
treatment, problematization, critical neuroscience, Foucault, Bacchi

In contemporary treatment for alcohol and other drug addiction, the therapeutic promises of addiction neuroscience and the brain disease model of addiction (BDMA) have been wide ranging. They include effective pharmacological treatments with fewer side effects, such as buprenorphine, to treat opioid addiction (Veilleux, Colvin, Anderson, York, & Heinz, 2010), direct brain interventions such as deep brain stimulation (Luigjes et al., 2012) and the application of neuroimaging technologies and neurocognitive research to diagnose and treat clients with alcohol and other drug addictions (Franken & van de Wetering, 2015; Lubman, 2007). Despite almost three decades of neuroscience research on addiction, very few of these clinical promises have been realized (Hall, Carter, & Forlini, 2015; Kalant, 2010). To quote the U.S. National Institute on Drug Abuse (NIDA, 2016), the failure to translate "evidence based" neuroscientific interventions into practice has resulted in a "bench-to-bedside gap" (p. 5).

Neuroscientific interventions for addiction are often based on a one-way premise that neuroscientific knowledge discovered in the scanner or laboratory has the potential to be translated to the "bedside" for therapeutic gain. There is, however, a growing critical neuroscience literature that sets out to challenge the "perspective-bound and interest-specific constraints that belie, in some contexts at least, objectivist aspirations of neuroscience and of those enthusiastic about its applicability in everyday life" (Slaby & Choudhury, 2018, p. 35). A key function of critical neuroscience is to move beyond a simplistic translational model by interrogating the social and cultural effects of neuroscience within society and how neuroscientific interventions might be used in local treatment settings. Instead of asking how neuroscience might measure or treat addiction, a critical perspective enables us to ask how neuroscientific discourses help produce addiction as a certain type of problem. This is important because problem enactments not only constitute concerns and influence what might be validly conceptualized as a concern but also affect how people's concerns are responded to, which concerns are responded to, and how people are enacted as "normal," "abnormal," or "immoral" subjects.

There is a growing corpus of literature in critical addiction studies exploring the ways in which different enactments of addiction emerge across different sites. Alcohol and other drug screening and diagnostic tools (Dwyer & Fraser, 2015, 2016b; Savic, Barker, Hunter, & Lubman, 2016; Savic & Fomiatti, 2016), policy and funding models (Lancaster, Duke, & Ritter, 2015; Moore & Fraser, 2013; Moore, Fraser, Törrönen, & Tinghög, 2015), legal processes (Seear & Fraser, 2014, 2016), online resources (Pienaar et al., 2015), and online platforms like Twitter (Dwyer & Fraser, 2016a), have all been the subject of recent critical enquiry concerning how the "problem" of addiction is constituted and what effects such constitutions entail for individuals. Further adding to this body of literature, the current study examines a key site in the production of addiction, which has rarely been the subject of critique: the alcohol and other drug treatment setting. This article adapts concepts from Bacchi's (2009) *What's the Problem Represented to Be?* (WPR) approach to policy analysis to examine (a) the role of neuroscientific discourses in the enactment of addiction as a serviceable problem in addiction treatment; and (b) the types of subjects produced through these enactments.

Background

While the focus of this article is neuroscientific discourses, in our analysis and in practice, these often intersect with other discourses such as recovery and moral discourses that treatment providers are exposed to, negotiate, and work with (Karasaki, Fraser, Moore, & Dietze, 2013). As such, before discussing our theoretical approach, it is necessary to introduce and map out neuroscientific, recovery, and moral discourses of addiction. For the purposes of our article, "discourse" does not merely refer to language or a linguistic analysis; rather, discourses are seen as socially produced forms of knowledge that set limits upon the way a topic can meaningfully be thought, written, or spoken about (Bacchi, 2009).

Neuroscientific Discourses

The significance of the role and effects of neuroscientific discourses within lay, professional, and policy settings continues to be the subject of historical and sociological enquiry (Dumit, 2004; Pickersgill, Cunningham-Burley, & Martin, 2011; Rose & Abi-Rached, 2013; Vidal, 2009). In regard to how neuroscience influences the way individuals understand their own subjectivity, Rose (2003) has argued that we have become "neurochemical selves" where "individuals themselves are beginning to recode their moods and their ills in terms of the functioning of their brain chemicals, and to act upon themselves in the light of this belief" (p. 59). Explaining this as not an entirely modern phenomenon, Vidal (2009) traced the history of the development of the "cerebral subject" from mid-20th century highly medicalized, industrial societies back to the 17th century, when a new form of subjectivity was influenced by neurological understandings of the self.

In contemporary alcohol and other drug addiction research and treatment, a number of prominent agencies, including NIDA (Leshner, 1997; Volkow, 2005; Volkow & Fowler, 2000; Volkow, Koob, & McLellan, 2016) and the American Society of Addiction Medicine (2011), have been strong proponents of the BDMA that characterizes addiction as a chronic, relapsing brain disease.

Historians have traced the rise of and resistance to the BDMA, situating it within a wider political context of medicalization where the positioning of the brain at the center of addiction allowed addiction researchers to access technical resources and draw upon the social authority afforded by neuroscience (Campbell, 2007; Courtwright, 2010). While supporters of the NIDA brain disease paradigm have argued that it may benefit people with addiction by reducing moral judgment and providing novel biomedical interventions (e.g., pharmacotherapies; Leshner, 1997; Volkow, Koob, & McLellan, 2016), critics have not only contested the neurobiological evidence underpinning the BDMA but also argued it may increase stigma for those with addictions and lead to a bias toward medical solutions to social problems (Fraser et al., 2017; Hall, Carter, & Forlini, 2015; Hammer et al., 2013; Midanik, 2004; Trujols, 2015).

Fraser, Moore, and Keane (2014) critically examined the effects of the BDMA and how neuroscientific discourses produce addiction as a biological process. Within this enactment of addiction as a brain disease, vivid visual representations emerging from brain imaging technologies (e.g., positron emission tomography [PET], functional magnetic resonance imaging) have been central to locating addiction within the brains of individuals (Dumit, 2004; Keane, 1999). Dumit (2004) explored how brain images come to be taken as facts about the world and how people might be placed among the different categories (e.g., normal vs. pathological) offered by the images. In regard to addiction, neuroscientific representations have been used to distinguish between the brains of "healthy controls" and those of "drug abusers," such as in the graphics represented in NIDA's health campaign entitled "Drugs, Brains, and Behavior: The Science of Addiction" (NIDA, 2014). While other analyses have elucidated the role of brain scans, such as in the constitution of the "teen brain" and addiction in neuroscience-informed Australian drug education (Farrugia & Fraser, 2017), our analysis provides a further empirical layer analyzing the effect of visual representations of the brain in the alcohol and other drug treatment setting.

Fraser and colleagues (2014) also drew attention to an apparent contradiction in neuroscientific accounts of addiction: while the concepts of neuroadaptation and neuroplasticity render the brain as changeable in both structure and function in response to external stimuli, the BDMA produces a "certain rigidity as characteristic of the addicted brain" (p. 52). While notions of neuroplasticity have been prominent in the public imagination via the work of, for example, Canadian psychiatrist Norman Doidge (2007) and have been the subject of various critical analyses (e.g., Choudhury & McKinney, 2013; Pickersgill, Martin, & Cunningham-Burley, 2015), the concept of neuroplasticity has been largely absent from dominant neuroscientific discourses of addiction such as those represented by NIDA (Hall, Carter, & Barnett, 2017).

Furthermore, Fraser and colleagues (2014) highlighted how the central player within neurobiological enactments of addiction has been the "hijacking" of the "brain reward system" that is cast as damaged as a result of long-term drug consumption. However, referencing Berridge's (2007) work, Fraser and colleagues noted that rather than reward being simply characterized by pleasure or euphoria, contemporary neuroscientific discourse differentiates "liking" from "wanting" and asserts that dopamine release maintains a state of "wanting" a drug independent of "liking" its effects. As such, those with drug addictions are enacted as disordered, continuing to pursue a practice they no longer enjoy.

Recovery Discourses

While there has been considerable debate and multiple attempts to define "recovery," often recovery is characterized by abstinence from alcohol and other drug use, improved health and well-being, and the development of a "nonaddict" identity via participation in "normal" social relationships and increased participation in work and community activities (Dahl, 2015; Fomiatti, Moore, & Fraser, 2017; Neale, Nettleton, & Pickering, 2011). The notion of recovery features prominently in contemporary alcohol and other drug policy and treatment in the United Kingdom (UK) and Australia (Fomiatti et al., 2017; Lancaster et al., 2015). However, the idea of recovery has had a fraught relationship with neuroscience (Heather et al., 2017). For example, Best and Kawalek have argued that the "emergence of the recovery paradigm has challenged the conceptualisation of addiction as a biologically-driven phenomenon rooted in human pathology" (Heather et al., 2017, p. 2), instead asserting recovery occurs in social contexts.

A wide body of research has critically examined the assumptions of the recovery paradigm and identified a number of potential effects (Fomiatti et al., 2017; Fraser & valentine, 2008; Harris & McElrath, 2012; Lancaster, 2017; Lancaster et al., 2015; Neale et al., 2011; Sedgwick, 1993). This body of scholarship has highlighted the way in which recovery discourses foreground abstinence, individual transformation, and citizenship while obscuring the role of sociostructural forces in people's lives and the different goals and desires of those who might be concerned about their alcohol and other drug use. For instance, in their analysis of UK and Australian alcohol and other drug policy documents, Lancaster and colleagues (2015) critically examined different conceptions of recovery, its place within policy, and how recovery discourses enacted the problem of drug use. Lancaster and colleagues traced how assumptions underpinning different representations of recovery construct individual drug using subjects as "responsible agents" and "patients" in need of curative attention through respective neoliberal and medical discourses. In contrast to the biomedical discourse of contemporary neurobiological accounts of addiction, where addicted subjects are seen as "brain diseased," Lancaster and colleagues argued that recovery discourses emphasize that people who use drugs are rational, autonomous neoliberal subjects who have agency to take control of their own health, presumably by engaging with drug treatment.

Moral Discourses

In his analysis of governing images in public discourse concerning problematic drinking, Room (2001) referred to the dynamics of competition between medical and moral discourses. He described a range of "new moral-accountability" discourses, arguing that "[l]ong after the demise of the North American temperance movement," moral models of drinking were indeed "alive and well" (p. 41). Drawing upon Gusfield's (1967) analysis, Room referred to the development of the moral conceptualizations of problematic drinking over time: from those of the "repentant drinker" in the initial temperance movement to the "enemy drinker" in the latter part of the 19th century, and finally to the "sick drinker" in the 1940s after the Repeal of Prohibition, essentially transitioning from one moral status to another.

Central to moral discourse lies a narrative of ethics delimiting what is right from what is wrong (Bright, Marsh, Smith, & Bishop, 2008). The kinds of subject positions made available within moral discourses relevant to addiction seemingly represent a binary opposition: a deviant, irresponsible, and immoral "addict" contrasted against a morally upstanding, nondrug using individual. Moreover, Bright and colleagues (2008) emphasized a dichotomy between abstinence/purity and use/sin, characterizing addictive behavior within moral ideology as "all or nothing."

Importantly, Room (2001) contended that medical and moral models were not necessarily mutually exclusive. Extending this proposition, Bright and colleagues (2008), in their analysis of substance use discourses in Australian media, argued that immorality was seen as a manifestation of exposure to the pathogen represented by drug use characterized within disease representations of addiction.

In summary, we have illustrated how neuroscientific discourses enact addiction as a disease of the brain and distinguish between "healthy" and "drug abusing" subjects on the basis of differences in brain function. In contrast to dominant neurobiological accounts of addiction, many have argued how recovery discourses emphasize that drug users are rational, autonomous neoliberal subjects who have increased agency to command responsibility for their recovery. Furthermore, we have highlighted how moral discourses establish a binary between the deviant "addict" and the "moral" nondrug using subject. Through our analysis of treatment providers' accounts, the primary aim of our study concerns the way neuroscientific discourses enact addiction as a certain type of problem and the types of subjects that are produced through these enactments. Our findings also illuminate how neuroscientific discourses intersect with recovery and moral discourses to constitute addiction in different ways, which has important implications for how service users experience treatment.

Theoretical Approach

Our analysis is framed by Bacchi's (2009; see also Bacchi, 2018) work on poststructural policy analysis, which has been productively extended beyond policy settings to explore the ways in which addiction has been problematized in the law (Seear & Fraser, 2014), online education resources (Pienaar et al., 2015), and online counseling (Savic, Ferguson, Manning, Bathish, & Lubman, 2017). Bacchi's (2009) WPR approach is inspired by Foucault and draws on his concept of "problematization": that is, "how and why certain things (behaviour, phenomena, processes) become a problem" (Foucault as cited in Bacchi, 2012, p. 1).

Further elucidating the epistemological and ontological implications of this approach, Bacchi again draws upon Foucault (as cited in Bacchi, 2009, p. 35):

> Problematisation doesn't mean the representation of a pre-existing object, nor the creation through discourse of an object that doesn't exist. It is a set of discursive and non-discursive practices that makes something enter into the play of the true and the false and constitutes it as an object for thought (whether under the form of moral reflection, scientific knowledge, political analysis, etc.).

Contrary to conventional views that frame policy interventions as responding to preexisting social problems, Bacchi (2009) has argued that "problems are endogenous—created within—rather than exogenous—existing outside—the policy-making process" (p. x). In undertaking this analysis, our aim is not to downplay people's concerns about their alcohol and other drug use. Rather, we seek to trace how people's concerns come to be known as "addiction problems" through the enactment of neuroscientific discourses in treatment settings.

An interrogation of the effects of different types of problematization is critical to understand how specific problem representations may benefit some while harming others, and influence how people are governed (Bacchi, 2009). Bacchi identifies three types of interconnected and overlapping effects that different problem representations might give rise to: discursive effects, subjectification effects, and lived effects. Discursive effects relate to how discourses that contain problem representations impose limits on what can be thought and said about particular problems and in turn "make it difficult to think differently" (Bacchi, 2009, p. 16). Subjectification effects refer to how we become subjects of a particular kind and how social relationships take place within discourses. Lived effects turn attention to the material impact of problem representations and their direct effects on people's lives such as reducing access to resources.

Moving from policy to interview transcripts as the site of analysis, the WPR approach guides our interrogation of the production of "problems" and "subjects" in addiction treatment providers' practice. While Bacchi (2009) typically refers to the effects of problem representations within policy, Savic and colleagues (2017) argued that a similar application of Bacchi's work is also useful in the context of alcohol and other drug treatment. They argued that treatment, like policy, is a site where purportedly therapeutic solutions are readily proposed, implemented, and presented as inevitable and commonsense responses to particular problems. Given the taken-for-granted assumption that solutions inevitably follow from problems, critical approaches that scrutinize how treatment constitutes problems, and the people with problems, are needed. In the context of our study, we argue that treatment interventions involving discussions of the brain or neuroscience produce addiction in important ways. Rather than responding to preexisting addiction "problems," neuroscientific discourses are productive; they enact addiction as a certain type of treatable problem. We analyze the effects these types of problem formulations give rise to, such as constructing certain people as "ill" or "diseased" and defining what is "normal," and how they shape the types of treatment resources made available to different individuals.

Method

In this article, we analyze data generated in interviews with treatment providers working in public and private alcohol and other drug treatment settings in Victoria, Australia. In 2015/2016, in-depth, semistructured interviews were conducted (by the first author, A.B.) with 20 treatment providers working in a variety of different settings. Potential recruitment sites were identified from the authors' networks as well as the alcohol and other drug treatment services online listing (https://www2.health.vic.gov.au/alcohol-and-drugs/aod-treatment-services). Potential sites were purposively selected in order to recruit different types of treatment providers from settings with varying treatment philosophies (e.g., harm reduction, abstinence) spanning inner Melbourne and rural Victoria. A primary contact at each site, who had granted local ethics approval for the research to proceed, also advertised the study and referred treatment providers following a "gatekeeper referral" method (Jessiman, 2013). The project was granted ethics approval by the Monash University Human Research Ethics Committee (CF15/2656—2015001096).

The 20 participants (10 men and 10 women) were recruited from five sites. Participants included addiction medicine specialists, psychiatrists, nurses, social workers, psychologists and counselors, harm reduction workers, and other general workers in the addiction treatment field. Recruitment sites

included inner and outer Melbourne interdisciplinary clinics offering a range of services including counseling and pharmacotherapies, a private psychology practice, and a rural therapeutic community offering a short-term, abstinence-based program. The mean age of participants was 48 years (range: 32–66 years). Participants had been employed in their current service for a mean of 5 years (range: less than 1 year to 14 years) and had worked within alcohol and other drug treatment for a mean of 12 years (range: 1 year to 31 years). Demographic data were unavailable for one participant. A number of participants had previously trained and/or worked in other jurisdictions including the US, UK, or Asia.

The interviews were conducted as part of a wider project exploring how addiction treatment providers viewed addiction problems, treatment, and policy initiatives. The mean interview duration was 44 minutes (range = 18–69 minutes), and all interviews were conducted face-to-face on site at treatment providers' places of employment. Interviews were recorded and transcribed verbatim by an external transcription service. Transcripts were anonymized, and analysis of the data was conducted using NVivo, Version 11. The transcripts were first analyzed for themes relating to treatment providers' references to neuroscience or the brain, how they discussed the brain, and how they viewed the impact or relevance of discussing neuroscientific concepts with service users. This process was guided by the constant comparison method (Seale, 1999). Coding was conducted by A.B., and regular meetings between A.B. and the other authors were held in order to discuss categories that were emerging from the coding process. A detailed coding structure emerged following the analysis of a subset of transcripts, and this structure then provided a coding framework for the remaining analysis. The second step of the analysis involved A.B. selecting a number of treatment providers' accounts that exemplified a range of different problem enactments and their effects from across the full data set. These accounts were then subjected to Bacchi's (2009) WPR approach.

Beyond policy analysis, there are a number of recent examples demonstrating the utility of Bacchi's (2009) WPR approach in analyzing interview transcripts (Lancaster, Treloar, & Ritter, 2017) and transcripts of online counseling sessions (Savic et al., 2017). The WPR approach comprises six key questions (Bacchi, 2009, p. 2):

1. What is the "problem" represented to be in a specific policy?
2. What presuppositions or assumptions underlie this representation of this "problem"?
3. How has this representation of the "problem" come about?
4. What is left unproblematic in this problem representation? Where are the silences? Can the "problem" be thought about differently?
5. What effects are produced by this representation of the problem?
6. How/where has this representation of the "problem" been produced, disseminated and defended?

In a similar way to other applications of the WPR approach (e.g., Savic et al., 2017), we sought to address particular questions, namely, Questions 1–5. For the accounts selected for analysis using the WPR approach, initial coding focused on identifying problems (Question 1), analyzing presuppositions and assumptions that underlied these problem representations (Question 2), followed by a genealogical approach to trace the discursive and nondiscursive practices along with developments that contributed to the formation of the identified problem representations (Question 3). We then analyzed how issues were relegated to the background or silenced by particular problem representations and how they might have been thought about differently (Question 4). Finally, we identified the effects produced by particular problem enactments (Question 5).

Where possible, we also draw upon field notes that were recorded in a diary (by the first author, A.B.) to describe characteristics of the different settings in which the research was conducted. These field notes provide insights into the clinical spaces where the interviews were conducted and further contextualize treatment providers' accounts.

Analysis

We now present and discuss three themes to explore a range of problem enactments of addiction and their effects: (1) constituting pathological subjects, (2) neuroplasticity and "recovery," and (3) the alleviation of guilt and shame via references to the "diseased brain." We have used pseudonyms to preserve treatment providers' anonymity.

Constituting Pathological Subjects

In exploring treatment providers' accounts of clinical encounters in which they discuss the brain with service users, we trace how addiction emerges as a certain type of "treatable problem." In this example, Steven, an addiction medicine specialist, recounts his experience of using a picture of the brain in the provision of a new therapeutic intervention that was being tested for its clinical utility in working with service users. When asked whether he discussed the brain with patients, Steven said:

> Yeah, look, it's interesting that when you say that question, I was thinking about, is this about whether or not we use it—in you know, consultation settings? Or in psycho-education, as they call it? [. . .] One of the things that came out was [. . . in testing the new therapeutic intervention with patients] a picture of the brain, showing the different parts of the brain and how they act in addiction and how they get deranged in addiction. The [staff] feedback, interestingly, was "well, we find that patients or the participants really like it. They like to see this stuff."

Through Steven's description of the picture of the brain, the problem of addiction is represented as one characterized by brain dysfunction. A key assumption underlying this problem representation is that the process of addiction leads to certain parts of the brain becoming "deranged." This conceptual logic of the addiction problem residing within the brain is made possible by neuroscientific discourses of addiction. Consistent with dominant neuroscientific discourses of addiction, addiction is characterized as a brain disease where brain "disruption" and "damage" play central roles (Leshner, 1997; Volkow, 2005; Volkow et al., 2016).

Importantly, the picture of the "deranged" brain as an object is not only rendered legitimate and objective by neuroscientific discourses (Choudhury & Slaby, 2016; Dumit, 2004) but is also important in the problematization of addiction as a brain disease, which has consequent effects. In this problem representation, a key discursive effect limiting what might be thought about addiction occurs when neuroscientific explanations of the causes of addiction are foregrounded, and other potential social or environmental factors that might be at play in addictive behavior are obscured. Similar to Dumit's (2004) work, in this instance, the picture of the brain makes available a certain type of category where patients become (via subjectification effects within Bacchi's framework) pathologized subjects in need of medical treatment, that is, they now are produced as having "deranged" or diseased brains that were presumably not deranged prior to becoming addicted.

Further, within this problem representation, another important subjectification effect emerges: the "patients or the participants" are constituted as subjects who "really like" viewing the brain picture. That is, the patient is constituted as an avid, appreciative consumer of neuroscience who takes interest in being educated about the inner workings of the brain. Here, we see evidence of the way the "neurochemical self" (Rose, 2003) might be constructed in the clinic where patients form an understanding of their own addictive behavior in terms of their own neurology. In addition to the work of neuroscientific discourses, there are a range of sociomaterial factors that might be at work that aid in the constitution of these subjects. These included the clinical space of the medical clinic, which incorporates clinical aids accessible to the addiction medicine specialist (e.g., the brain picture), or even the patient waiting room, which constitutes various aspects of patienthood or what it means to be a "patient."

Steven continues by elaborating on his own references to neuroscience in clinical practice:

> I think [. . .] in most cases, where there's the opportunity, I would refer to brain neurology, because part of it, I think is—because I'm often engaged in trying to get people on medication treatments. That's a lot of what I do as a doctor. It's a good way to engage people.

Additionally, Steven explains how he uses neuroscience to explain possible treatments such as the use of pharmacotherapies:

> [. . .] sometimes they [patients] say: "Why should I take more drugs?" Or "Why should I substitute this drug?" Or "I want to do it without medication." Often it's good discussion to say: "Well, studies have shown that addiction isn't just because you're weak-willed. It actually changes this part of the brain that is responsible for pleasure"—and a lot of people these days know all this stuff. [. . .] people appreciate being educated. But also, they might be more inclined to think: "Well, if that's the case, it's not my fault. I might benefit from treatments that address those neurological issues." So yeah, I think I do discuss it.

Through Steven's identification of the problem at hand as one of trying "to get people on medication treatments," there is an underlying assumption that patients, or pathologized subjects, require medical treatment. A potential lived effect of this problematization is that patients are encouraged to take prescribed medications (e.g., pharmacotherapies) targeting the brain where the pathology lies. In this account, questions and concerns raised by patients about treatment are discounted and silenced by scientific "facts" ("studies have shown") about the brain. This gives rise to discursive effects such as the delegitimizing of lay, nonbiomedical discourses through the greater scientific value afforded to neuroscientific discourses. As Bacchi (2009) details when discussing Foucault's work, the delegitimizing of lay discourse in this example is a form of subjugated knowledge insofar as the lay account appears to be disqualified. The epistemic authority given to dominant neuroscientific discourses over individuals' experience is described by Hall, Carter and Morley (2003, p. 867), who remark that "a 'disease' that can be 'seen' in the many-hued splendour of a PET scan carries more conviction than one justified by the possibly exculpatory self-reports of individuals who claim to be unable to control their drug use."

This enactment of addiction as a disorder of brain function reframes patients' addictive behavior from one of moral failure to a neurobiological problem caused by changes in the part of the brain responsible for pleasure. This type of reframing is consistent with a broader shift in understandings of alcohol and other drug problems from moral to neurobiological models of addiction (Carter & Hall, 2011). In contrast to common assumptions that the BDMA might reduce the stigmatization of people with addictions (Volkow et al., 2016), neurobiological enactments run the risk of stigmatizing patients as "addicts," "disordered," and "sick" in the process of seeking to treat them (Savic et al., 2017).

Neuroplasticity and "Recovery"

A number of treatment providers described discussing the concept of neuroplasticity with service users in order to create a sense of hope about the future and to create optimism about recovery. In this first example, Sarah, a staff member who provided training and education to residents at a recovery-focused therapeutic community, spoke about how she used the concept of neuroplasticity:

> [When running sessions with residents] I talk a little bit about neuroplasticity, about forming new pathways [. . .] I do bring that in in a very simplified form, just to reinforce that with people that you can make changes, that it's not locked in, but that it's very easy to slide back into the set pathways. I do have those discussions with people . . . that new patterns of behaviour become, or start to become, more entrenched as your brain changes. No more scientific than that, but to know that it can.

Like Sarah, Jarrad, an addiction medicine specialist at an outer suburban interdisciplinary pharmacotherapy clinic, also used the concept of neuroplasticity to create a sense of hope about the future.

> A.B.: Do you touch on concepts like neuroplasticity and how the brain might change over time?
> Jarrad: Yes definitely. Definitely because I think that that's one thing that people are frightened of. One of the reasons that people use drugs is because it makes them feel better but also feel stuck, that it's always going to be like this. I think one of the things you need to maintain in drug treatment is a sense of optimism that people change all the time. People's thinking changes all the time and just because they're on this dose of methadone now and they're on this other drug and they're on this depression medication, that isn't the way it's always going to be. Because the brain changes, the brain evolves, your ability to self-manage stress, anxiety, depression, changes and it isn't entirely dependent on drugs to do that; with appropriate behavioral change, their brain will get better. That's the neuroplasticity that you were talking about, it's absolutely critical for all the maintenance of optimism and I think maintenance of optimism is a key part of our therapy.

We might begin by comparing and contrasting the different environments in which the two interviews were conducted. Firstly, in relation to treatment philosophy, the therapeutic community provided the environment for a short-term (less than two months) period of residential rehabilitation based on an abstinence model of recovery. In contrast, at the interdisciplinary pharmacotherapy clinic, while abstinence goals might be discussed as a part of treatment, a range of harm reduction interventions were also available (e.g., a needle and syringe program; opioid replacement therapy). Second, in regard to clinical spaces, service users in the rural-based therapeutic community had access to varying nonmedical forms of therapy such as gardening, cooking, and exercise. In contrast, the pharmacotherapy clinic was generally designed with a waiting room and access to varying treatment rooms more consistent with a medical practice. Interestingly, our findings provide empirical evidence that neuroscientific discourses are at work in these two vastly different treatment settings.

In both of these examples, the problem of addiction for service users is represented as one of being "locked in" an entrenched cycle of addiction. A discursive effect of this "stuck-in-addiction" problem representation is the production of addiction as an inherently rigid problem that must be fixed. This entrenchment is associated with negative affects including being "frightened" about the inability to recover from addiction in the future. In both treatment providers' accounts, the concept of neuroplasticity constituted a sense of "optimism" about recovery and the future. This kind of hope is considered a vital ingredient in recovery and one which treatment providers are encouraged to foster (Best & Lubman, 2012).

In these examples, one of the key assumptions about the representation of the problem is that being "stuck" in an entrenched addiction cycle is due to abnormal neural circuitry. Similarly, just as the central feature of the addiction problem lies within the brain, so does the way out to recovery. That is, "recovery" is defined by brain "recovery" through "forming new pathways" where the brains of service users will "get better."

There is a complex intersection of multiple discourses at play that enable this problem representation to emerge. First, the notion of being entrenched in a cycle of addiction and not being able to change is consistent with the brain disease model's enactment of addiction as "incontrovertible" (Fraser et al., 2014, p. 55) and with a certain characteristic "rigidity" (Fraser et al., 2014, p. 52). This neuroscientific discourse also intersects with a "recovery" discourse. In our examples, "recovery," whether it be in an abstinence-based or harm reduction setting, is made possible as a result of the operation of neuroplasticity where the brain is enacted as being changeable in structure and function.

Lancaster and colleagues (2015) argued in their policy analysis that, in contrast to biomedical discourses where subjects are seen as "brain diseased," recovery discourse emphasizes rational and autonomous subjects taking control of their own recovery. Our analysis leads to an alternative view in

that through the operation of a discourse of neuroplasticity, recovery discourse is afforded greater weight and truth status. This does, however, open up a contradiction insofar as, in one enactment, subjects are produced as "brain diseased" while, in another enactment, subjects are produced as having highly plastic brains that can recover from addiction, seemingly through "appropriate behavior change"—a requirement that is left opaque in our example.

The Alleviation of Guilt and Shame

Treatment providers also discussed ways in which they worked with neuroscientific discourses in an attempt to reduce the shame and guilt associated with addiction. The following account exemplifies this theme. Bryce, a psychologist specializing in the treatment of addiction, described how he viewed the brain in relation to addiction:

> I subscribe to Robinson and Berridge's concept, that it's about the frontal cortical control. So that differentiates an urge from a craving. So to me you can have weak urges or strong urges, but there's still frontal cortical control behind it. But in addiction the frontal cortex gets disconnected. They talk about a disruption to the striato-thalamo-orbitofrontal circuit—which you've probably come across in your literature review. So that differentiates addiction from problematic substance use.

In Bryce's account, addiction is problematized as a disruption of highly specified circuitry within the brain, which gives rise to discursive effects that limit how we might think about addiction. The establishment of addiction as being caused by disrupted neural circuitry occurs via the operation of a neuroscientific discourse of addiction, where findings of neuroimaging studies have indicated disruptions to the striatal, thalamic, and orbitofrontal brain regions in people diagnosed with alcohol and other drug addictions (Volkow, Ding, Fowler, & Wang, 1996; Volkow & Fowler, 2000). This problematization is consistent with Robinson and Berridge's (1993) work where changes in specific neural systems distinguish "liking" drugs from "wanting" drugs. In Bryce's formulation, the differentiating factor between two types of drug problems—addiction and problematic substance use—is whether or not there is a "disconnection" between these brain regions affecting cortical control. This problematization sets up addiction as distinct from problematic substance use on the basis of neurobiology, which has implications for how Bryce explains addiction to clients.

When Bryce was asked whether he discusses the brain and neurobiology with his clients, he further explains that:

> Totally, yeah—well, with the ones who have got addictions. Yeah, absolutely. They have so much shame and so much confusion, and so many—even drug and alcohol workers—have set them up for such failure by saying, "okay well, next time you get the urge just do this." It's like, well, if it's a craving not an urge, you can't—the switch has gone off and you're on autopilot. So it really helps them understand that they're not a bad person, that they kind of—maybe I use the sort of term, you kind of become a "temporary psychopathic zombie." Sometimes it's just a one track mind, and psychopathic loss of conscience. Then unfortunately because it's temporary, everyone reconnects and then you get this huge wave of guilt—remorse, fear, angst, confusion, "what the hell happened?"—and no-one can explain that, "what just happened?"

Here, Bryce suggests that he discusses the brain primarily with those he considers to have an addiction (i.e., those whose brains have been changed to "want" drugs despite no longer "liking" them), in order to alleviate the shame and guilt he sees as associated with their failure to control a craving, a failure that results from a "switch" temporarily going off in their brain. Continuing to clarify the clinical utility of discussing the brain with service users, Bryce states:

> I often quote the neurology to give it legitimacy—not to teach them—but to make it sound—so that they kind of get, this actually is real. But I talk about two brains—so you've got your—whatever they'd like to call it: "my disease, or my addict brain"—or whatever it is. Whatever the person wants to call it, really it's up to them—and the "you brain" and this is what your values are, what you want, blah blah blah. This little bugger just wakes up now and again and just hijacks you. We've got to keep him boxed up . . .

Through Bryce's metaphorical reference to the "temporary psychopathic zombie," the behavior he associates with addiction is represented as temporary, irresponsible, episodic behavior outside a person's control, followed by waves of guilt, remorse, fear, and confusion. This formulation of addiction lies at the intersection between neuroscientific and moral discourses, where addiction is enacted as an issue of brain circuitry leading to irresponsible, immoral behavior. Consistent with moral discourses, Bryce's account of the addicted person shares aspects of the notion of the "repentant drinker" (Gusfield, 1967), which casts the drinking subject as either a repentant abstaining individual or a morally condemned, out of control drinker.

In Bryce's account, the repentant, abstinent drug using identity, and the sinful, out of control drug using identity, are both explained as being anchored in brain function with the respective comparisons of the "you brain" and the "diseased brain," both at work in a single individual. Within this problem representation, the immoral self is cordoned off and released via a process of brain "hijacking"—a metaphor central to BDMA discourse (Fraser et al., 2014). The addicted subject is absolved from the guilt associated with their immoral behavior because it is not due to a personal moral failing or lack of appropriate values but instead to a "hijacked" brain. This enactment gives rise to subjectification effects such as the production of addicted subjects who are both essentially moral but temporarily immoral, with behaviors assigned to two dichotomous selves, disconnected in the brain. Moral behavior is attributed to the real or authentic self, and drug using behaviors attributed to an immoral "hijacked" self. The subject may well behave badly, but only during a period when their "temporary psychopathic zombie" takes over.

Importantly, within Bryce's account, neuroscientific discourses around brain "hijacking" add legitimacy to the proposition that the drug use is outside of the drug user's control. Similar to the way in which a recovery discourse was afforded a greater truth status through the operation of a neuroscientific discourse earlier, we observe a similar intersection of discourses in this example. The moral discourse, which splits the addicted subject between a moral and immoral self, is afforded a greater truth status as a result of the operation of a neuroscientific discourse.

The neuroscientific discourses at work in this account have the effect of constituting Bryce as an expert. Independent of the trust status of what might inform Bryce's views or be talked about in terms of neural circuitry and the diseased brain, neuroscientific discourses may constitute those providing treatment for addiction as having certain expertise and as utilizing treatments with increased legitimacy underpinned by references to addiction neuroscience or the brain.

Conclusion

Informed by Bacchi's (2009) WPR approach, which is underpinned by poststructuralist theory on problematization, our analysis demonstrates that rather than being preexisting objects awaiting detection or treatment by neuroscience, addiction problems emerge and are constituted through the complex intersection of neuroscientific and other discourses in addiction treatment settings.

Neuroscientific discourses appeared to be at work in different ways. In our first theme, the delegitimation of lay accounts of addiction was made possible by the greater epistemic value afforded to neuroscientific discourse. In the second and third themes, it was through the operation of the epistemic authority of neuroscientific discourses that recovery discourses and moral discourses were afforded greater truth status. In light of these findings, we argue that there is a need for critical reflexivity in

alcohol and other drug treatment and research, which would encourage treatment providers, researchers, and funders to consider how "problems" are enacted, and the ways in which they might be enacted differently (Bacchi, 2009). Furthermore, we suggest that there is an urgent need for mechanisms to enable subjugated lay knowledges to come to the fore. For instance, consumer participation in treatment, qualitative research, and public communication voicing personal stories of alcohol and other drug use (e.g., on the website www.livesofsubstance.org; Fraser et al., 2016) may unsettle the dominant discourses of addiction we have discussed in this article and afford possibilities for other discourses and enactments of alcohol and other drug use to emerge (Pienaar et al., 2015; Pienaar et al., 2017; Pienaar & Dilkes-Frayne, 2017; Treloar, Pieenaar, Dilkes-Frayne, & Fraser, 2017).

In relation to recovery, our findings complicate Best and Kawalek's (Heather et al., 2017) assertion that the recovery paradigm has challenged biological conceptualizations of addiction. Instead, our findings provide evidence that neuroscientific discourses may intersect with recovery discourses with the effect of promoting hope and optimism about recovery for addicted subjects. In regard to moral discourses, our findings are consistent with Room's (2001) argument that medical and moral discourses are not mutually exclusive. Indeed, our results indicated that their intersection may give rise to subjects being alleviated of the guilt and shame associated with immoral behavior stemming from a "hijacked" brain.

Although our qualitative interview approach cannot provide an analysis of neuroscientific discourses at work across every type of profession present in differing clinical environments (e.g., psychiatry, addiction medicine, psychology, nursing, and social work in different types of treatment sites), our results do illuminate the work of neuroscientific discourses in multiple settings from the medical clinic and psychology practice to the therapeutic community. We have provided some indications about the varying nature of clinical spaces and their role in shaping encounters. Future qualitative research utilizing ethnographic methods in particular could build on the insights of this study to more explicitly examine how sociomaterial practices aid in the constitution of addiction as a certain type of problem and service users as different types of subjects.

As a consequence of neuroscientific enactments of addiction in our examples, other concerns regarding the social or cultural factors contributing to drug-related harm were left unaddressed and often remained silent. This silencing may give rise to what Bacchi (2009) calls "lived effects" insofar as they potentially mean that financial, housing, mental health, and/or legal issues experienced by people diagnosed with alcohol and other drug addictions may remain unaddressed. However, as Bacchi reminds us, it is vital that we remain reflexive about the limitations and effects of our own methodology and critical lens. Our analysis of treatment providers' accounts examined how neuroscientific enactments made addiction a certain type of problem. To facilitate this analysis, we extracted treatment providers' references to neuroscience within the interview transcripts analyzed. Other diverse themes within our data set relating to treatment providers' views about the relevance of psychological, social, and cultural aspects of addiction for clients in treatment were not considered in this article. As others have noted, people tend to interact with an array of diverse knowledges relating to the neurobiological, psychological, and social in constituting their own and others' subjectivities (Meurk et al., 2016; Pickersgill, Cunningham-Burley, & Martin, 2011). It is vital that readers avoid the conclusion that treatment providers in our study were neuro-essentialist in their treatment practices, that is, overly focused on neuroscience to the detriment of other factors. Instead, our poststructuralist analysis sought to analyze particular neuroscientific enactments of addiction, and we acknowledge that problems may emerge in many ways given they are situated within a complex web of entanglements or what Bacchi and Bonham (2014, p. 178) describe as "a whole package of relationships."

Set against the context of NIDA's claimed "bench to bedside" translational failure of addiction neuroscience, we would argue that future research should continue to move beyond simplistic translational models by examining the social effects of neuroscientific discourses. As a result of a narrow

focus guided by a neuroscientific evidence-based intervention approach, we argue that many of the unintended effects of addiction neuroscience within clinical practice have remained and continue to remain uncovered. Indeed, our findings offer a preliminary window into the ways in which neuroscientific discourses operate in treatment in varying ways and with many different effects. Such effects have the potential to lead to unintended harms and unknown benefits for people in treatment for addiction. Furthermore, policy makers involved in future knowledge translation would do better to consider how addiction neuroscience currently impacts clinical practice and how it is used in localized care settings, instead of focusing solely on what is often described as a translational failure. Such a focus tends to downplay the complexity underpinning the ways in which neuroscientific concepts are currently being adopted in localized care ecologies.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: A.B. receives an Australian Government Research Training Program Scholarship. A.C. receives an NHMRC Career Development Fellowship (No. APP1123311).

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Chapter 5

Neural imaginaries at work: Exploring Australian addiction treatment providers' selective representations of the brain in clinical practice

Barnett, A., Pickersgill, M., Dilkes-Frayne, E., Carter, A. (in press). Neural imaginaries at work: Exploring Australian addiction treatment providers' selective representations of the brain in clinical practice. *Social Science & Medicine.*

This chapter presents the second qualitative paper featured in the thesis. This empirical piece takes a different methodological approach in comparison to Chapter 4. It explores when, how and why treatment providers discuss the brain in clinical practice. The findings are discussed in the context of the translation and relevance of neuroscience in contemporary addiction treatment.

Neural imaginaries at work: Exploring Australian addiction treatment providers' selective representations of the brain in clinical practice

Abstract

Although addiction neuroscience hopes to uncover the neural basis of addiction and deliver a wide range of novel neuro-interventions to improve the treatment of addiction, the translation of addiction neuroscience to practice has been widely viewed as a 'bench to bedside' failure. Importantly, though, this linear 'bench to bedside' conceptualisation of knowledge translation has not been attentive to the role addiction treatment providers play in reproducing, translating, or resisting neuroscientific knowledge. This study explores how, to what extent, and for what purpose addiction treatment providers deploy neuroscientific representations and discuss the brain in practice. It draws upon interviews with 20 Australian treatment providers, ranging from addiction psychiatrists in clinics to case-workers in therapeutic communities. Our findings elucidate how different treatment providers: (1) invoke the authority and make use of neuroscience in practice; (2) make reference to neuroscientific concepts (e.g., neuroplasticity) and sometimes represent the brain using vivid neurobiological language, metaphors, and stories; and, (3) question the therapeutic benefits of discussing neuroscience and the use of neuroimages with clients. We argue that neurological ontologies of addiction, whilst shown to be selectively and strategically invoked in certain circumstances, may also at times be positioned as lacking centrality and salience within clinical work. In doing so, we render problematic any straightforward assumption about the universal import of neuroscience to practice that underpins narratives of 'bench to bedside' translation.

Keywords

Australia; Addiction; Clinical practice; Drug treatment; Neuroscience; Neuroimaging; Translation; Qualitative

Introduction

Despite substantial global investment in neuroscience research, including the *Human Brain Project* (Human Brain Project, 2017) in Europe and *The US BRAIN Initiative* (US National Institutes of Health, 2019), the translation into clinical practice of addiction neuroscience research continues to face challenges. There is a widely acknowledged "bench to bedside gap" (National Institute on Drug Abuse, 2016, p. 5) that characterises the difficulties research programs internationally have faced when attempting to translate research on the brain into clinical treatments. Efforts to bridge this gap have recently been revitalised. For example, the newly formed *Neuroscience Interest Group* within the *International Society of Addiction Medicine,* including among others, Australian, UK and US neuroscience researchers, published a consensus statement and 'roadmap' to better integrate neuroscience-informed interventions into addiction treatment (Verdejo-Garcia et al., 2019). Moreover, efforts to overcome these difficulties have increasingly focussed on 'rapid translation' (Ostergren, Hammer, Dingel, Koenig, & McCormick, 2014) to 'unlock' the clinical potential of neuroscience by accelerating the development of novel therapeutics (e.g., pharmacotherapies, gene therapies, gamified cognitive training) to treat drug addiction.

However, the framing of translation as a 'bench to bedside' process is oversimplified in its linear conceptualisation of knowledge transfer (Martin, Brown, & Kraft, 2008) and does not consider how treatment providers interact with, resist or reproduce addiction neuroscientific knowledge in clinical encounters and practices. In attending to the complexity of the translation of addiction neuroscience and its effects, our study is situated within a wider body of science and technology studies (STS) scholarship that explores how the emergence of addiction phenomena is unstable and context specific. By examining how treatment providers' practices

contribute to the enactment of addiction in different ways, our work adds to previous STS efforts that have explored how addiction problems are enacted in, for example, policy (Fraser, 2016), law (Seear, 2019), youth drug education (Farrugia & Fraser, 2017) and online counselling (Savic, Dilkes-Frayne, Carter, & Kokanovic, 2018).

The 'bench to bedside gap' metaphor tends to focus on the failure to deliver novel biotechnologies, including treatments (e.g., pharmacotherapies) and tools (e.g., advanced neuroimaging), to clinical practice. Often, however, little attention is paid to contemporary social effects of translating neuroscience into clinical interventions and policies, and the implications of framing addiction in neuroscientific terms. Given the critical role that treatment providers play in clinical translation and the potential impact of treatment providers' representations of the brain, their role in communicating and translating neuroscience on the front line of addiction treatment remains under-researched.

This study addresses this limitation by examining whether – and, if so, how – addiction treatment providers discuss neuroscience with clients and employ neuroscientific models in clinical practice. Through interviews with treatment providers working in a range of different professions in Victoria, Australia, we shed light on why neuroscience is at times discussed, but on other occasions avoided, and also how different methods are employed when discussing the brain (including through narrative accounts or analogy). Our findings elucidate the pivotal role that treatment providers play, and the varying techniques they adopt, when translating neuroscience to practice. In doing so, we complicate a simple 'bench to bedside' translational pathway by attending to treatment providers' roles in influencing translation, and also contribute to an ongoing debate (e.g., Fraser, Moore, & Keane, 2014; Hall, Carter, & Forlini,

2015) about the relevance of the neurobiological within contemporary addiction treatment settings.

Neuroscience, personhood and discussing the brain in practice

There is a growing body of scholarship tracing the links between neuroscience and personhood, in particular examining how individuals draw upon neuroscientific concepts to understand themselves and others. The constitution of individuals as 'cerebral subjects' (Vidal, 2009) has been the focus of recent work that explores an increasing "neurologisation of the person" (Singh, 2013, p. 813). Although running the risk of becoming an overdetermined sociological term (Pickersgill, Cunningham-Burley, & Martin, 2011), the employment of the verb 'to neurologise' and the process of 'neurologisation' has facilitated a conceptual critique exploring how different actors (e.g., patients, clinicians, scientists) deploy neuroscientific terms and frameworks to apportion responsibility and construct and position themselves and others in varying ways (Buchbinder, 2015; Pickersgill et al., 2011; Singh, 2013).

In constructing 'cerebral subjects', the compelling nature and rhetorical function of brain images has received considerable attention (Choudhury & Slaby, 2016; Dumit, 2004; Rose & Abi-Rached, 2013). Through primary and secondary sources, Rose and Abi-Rached (2013) traced the development of different brain visualisation techniques from the early nineteenth century through to the present day. They cast light upon how neuroimaging techniques, via the visualisation of often unforeseen neural structures or phenomena, have served to bridge the gap between the theoretical and observable in clinical medicine, and allowed for the proliferation of a wide range of neurobiological explanations. Such visualisations are epitomised by the *Glass Brain* (Neuroscape, 2016): a 'state-of-the-art' 3D brain visualisation technology that

combines magnetic resonance imaging (MRI) and electroencephalogram (EEG) to display real-time brain activity and connectivity between regions. Earlier critiques have been made about the highly aestheticized construction of contemporary neuroimages (e.g., fMRI images) that are often incorrectly presented as direct pictures of brain activity which constitute, for example, 'madness' as residing within the brain or mental illness caused by a damaged region of the brain (Dumit, 1999).

Within critical addiction scholarship, it has been argued that neuroimages, as part of a wider dominant neurobiological discourse, perform the function of characterising addiction as a disease of the brain (Fraser, Moore, & Keane, 2014). The *brain disease model of addiction* (BDMA) that represents addiction as a chronic, relapsing brain disease (Leshner, 1997; Volkow, Koob, & McLellan, 2016) has received strong support among policy-makers and neuroscientists, particularly in the US. Researchers from the US *National Institute on Drug Abuse* (NIDA) argue that chronic drug use 'hijacks' the brain's reward systems, making it difficult for people to stop using drugs and resulting in high rates of relapse (Dackis & O'Brien, 2005). There is an ongoing debate, however, about whether the BDMA is supported by neuroscientific evidence (Hall, Carter, & Barnett, 2017), and whether it has delivered on its promises to benefit treatment and reduce stigma for people with addiction (Fraser et al., 2017; Hall, Carter, & Forlini, 2015; Heather et al., 2018; Lewis, 2015). Although there has been research on treatment providers' views about disease models of addiction and their clinical impact (for a review, see: Barnett, Hall, Fry, Dilkes-Frayne, & Carter, 2017), little research has been conducted on how treatment providers discuss the brain more generally in practice, including whether they employ terminology familiar to the brain disease paradigm. Our paper addresses this gap in the literature.

Of particular relevance to our own study is Buchbinder's (2015) examination of the social implications of neuroscientific thinking and the creative uptake of neurobiological discourses by clinicians working in a US paediatric pain clinic. Buchbinder's ethnographic inquiry illustrated how, through discussing and rhetorically mapping the brain with patients as a therapeutic tool, physicians engaged in a distinctive form of neuroscientific representation: *neural imagining*. Buchbinder posited that neural imagining within the pain clinic relied on a distinctive clinical epistemology that privileged creative imaginaries over visualisation techniques (e.g., fMRI), which notably were often absent or technically impossible, to reveal truths about the body. Aided by the use of an 'imaginary toolkit' consisting of vivid neurobiological language, images, and metaphors, neural imagining was employed by clinicians to: reduce stigma and legitimise pain symptoms; reaffirm adolescent identities affected by chronic illness; and, to offer a glimpse of a world in which intractable pain could not only be visualised, but also cured. Neural imagining allowed for a metaphorical means to spatially locate pain when visualisation and diagnostic technologies could not. For example, hypnotherapy as an alternative therapy for pain was 'imagined' in the context of 'rewiring circuitry' and 'reprogramming the pain map'. Thus, by foregrounding a picture of a highly plastic brain, neural imagining offered a more hopeful alternative to dominant popular and scientific representations that viewed the teenage brain through a lens of pathology.

One question that is receiving increased attention within sociology, STS, anthropology and beyond is the relevance, or indeed *irrelevance*, of neuroscientific understandings of health and disease amongst a web of other biological, psychological and social concerns encountered in everyday life. Empirical findings increasingly demonstrate that neuroscientific concepts rarely "cleanly eclipse" (Buchbinder, 2015, p. 13) the person. Rather, neuroscientific concepts compete and integrate with other forms of subjectivity (e.g., psychological, social), with

subjectivity being constituted via more than just the brain (Meurk et al., 2016; Pickersgill et al., 2011). These empirical findings have highlighted the limitations of concepts such as the 'neurochemical self' (Rose, 2003), by disrupting over-theorised accounts that privilege neuroscience and characterise the brain as constituting the "epicentre of personhood" (Pickersgill et al., 2011, p. 362).

In this study we apply a critical lens to addiction clinical practice by exploring the ways in which treatment providers discuss and represent the brain. Specifically, our analysis aims to explore how, to what extent, and for what purpose addiction treatment providers invoke neuroscientific representations or discuss the brain in practice. In exploring these dimensions, we shed light on broader questions relevant to the uptake of biomedicine that examine whether neuroscientific ways of understanding addiction have universal import in different settings. Our analysis provides fresh insights into how treatment providers engage with neuroscience in healthcare practice, and in doing so has implications for: (1) the translation of addiction neuroscience via a nuanced understanding of current ways treatment providers adopt and deploy neuroscience; and, (2) organisations responsible for developing engaging and relevant clinical resources (e.g., health promotion materials) that incorporate addiction neuroscience.

Methods

In this paper, we present data generated from 20 interviews conducted in 2015-16 with treatment providers working in five drug and alcohol treatment settings in Victoria, Australia (participant details are summarised in Table 1). The interviews were conducted as part of a wider mixed-methods project that explored addiction treatment providers' views about a wide range of topics. These included how they viewed alcohol and other drug problems and the

aetiology of addiction, what types of treatment models they used in practice, and how, if at all, they drew upon (and ascribed relevance to) neuroscience in their clinical practice. The project was granted ethics approval by the Monash University Human Research Ethics Committee (CF15/2656 – 2015001096).

Potential recruitment sites were identified from the first author's networks and the alcohol and other drug treatment services online listing (https://www2.health.vic.gov.au/alcohol-and-drugs/aod-treatment-services). Potential sites were purposively selected to recruit a variety of different types of providers from settings with varying treatment philosophies (e.g., harm reduction, abstinence), funding models (including both public and private), and geographic locations that spanned urban and rural areas in the state of Victoria. At the outset, six sites provisionally agreed to participate in the research. However, one site (a private service that charged clients fees) disengaged from the project citing lack of available staff resources.

The five recruitment sites that participated in the study included services based in inner and outer Melbourne that offered a range of different interventions. Sites A, C and E (refer to Table 1) were metropolitan Melbourne interdisciplinary clinics that offered services including: assessment and referral, counselling, psychiatry and addiction medicine, along with harm reduction interventions (e.g., pharmacotherapy, needle and syringe programs). In contrast, site B was a therapeutic community based in a rural setting where residents lived on site and participated in an abstinence-based recovery program. Site D was a private psychology practice. All sites, except for site D, were: linked to publicly-funded health services or non-government organisations; part of the wider Victorian public alcohol and other drug treatment sector; and, were generally free in terms of cost. Site D was outside the Victorian public alcohol

and other drug treatment sector and clients were charged fees for service (of which many clients could apply for a government rebate under mental health care public funding).

Once a site had provided local ethics approval for the research to proceed, a primary contact at each site advertised the study to other treatment providers following a "gatekeeper referral" method (Jessiman, 2013). The study advertisement informed prospective participants that their participation would involve an interview about their views on alcohol and other drug addiction treatment, practice, neuroscience and the BDMA.

The 20 participants across the five sites included Addiction Medicine Specialists, Psychiatrists, Nurses, Social Workers, Psychologists, Counsellors and Case Workers, along with others working in addiction treatment services. They comprised 10 men and 10 women, ranging in age from 32 to 66 years. Their length of employment at their current workplace ranged from less than one year to 14 years. Participants had worked within alcohol and other drug treatment for between one year and 31 years. Demographic data was unavailable for one participant.

Table 1: Participants

Recruitment site	ID	Role
Site A: Outer Melbourne inter-disciplinary clinic	A1	Addiction Medicine Specialist
	A2	Registered Nurse
	A3	Counsellor Psychologist
	A4	Primary Health Care and Needle and Syringe Programme Worker
	A5	Counsellor
	A6	Enrolled Nurse
	A7	Enrolled Nurse
	A8	Enrolled Nurse
	A9	Dual Diagnosis Clinician
	A10	Nurse - assessment
Site B: Therapeutic community	B1	Manager and Counsellor
	B2	Cognitive Behavioural Therapy (CBT) Trainer
	B3	Case Worker

	B4	Case Manager
Site C: Inner Melbourne inter-disciplinary clinic	C1	Addiction Psychiatrist
	C2	Addiction Psychiatrist
	C3	Addiction Psychiatry Registrar
	C4	Addiction Medicine Specialist
Site D: Private psychology practice	D1	Psychologist
Site E: Inner Melbourne clinic linked to hospital	E1	Addiction Medicine Specialist

The interview schedule was designed to explore participants' views about a wide range of topics including the aetiology of alcohol and other drug addiction, treatment models and the relevance of neuroscience to clinical practice. All interviews were conducted face-to-face and on site at treatment providers' places of employment. The mean duration of interviews was 44 minutes, ranging from 18 to 69 minutes.

Interview transcripts were anonymised and analysed using NVivo, Version 11. Data were coded by the first author (AB) following a two-staged approach in line with the constant comparison method (Seale, 1999). During the first stage, as part of the wider project, transcripts were read and preliminary codes were applied to emergent themes. These themes related to participants' views about: drug and alcohol problems (e.g., aetiology, treatment); social and psychological models and their relevance to treatment; and, (the focus of this current paper) the relevance and clinical utility of the brain and neuroscientific models for addiction clinical practice. A detailed coding structure was formed from this initial coding stage. From this first stage, data (not used in the current article) were presented in another paper that explored how neuroscientific discourses problematised addiction (Barnett, Dilkes-Frayne, Savic, & Carter, 2018).

Following on from the initial study, we also wanted to explore how addiction treatment providers invoked neuroscientific representations and whether they viewed discussing the brain

as relevant to practice. However, it was apparent that the first coding procedure had generated a broad coding structure that was insufficiently granular to answer the specific research questions asked in this article. Therefore, a second, more detailed coding of participants' references to the brain and views about neuroscientific models was performed in order to reinterrogate the initial coding framework to obtain a more detailed picture of why and how treatment providers discussed the brain with clients. For our discussion below, we draw out key themes that arose following this two-staged analysis and provide illustrative quotes for each.

Findings

In what follows, we explore how different treatment providers: (1) invoked the authority and made use of neuroscience in practice; (2) represented the brain and engaged in neural imagining (Buchbinder, 2015); and, (3) questioned the therapeutic benefits of discussing neurobiology and the use of neuroimages with clients.

Making use of neuroscience

The extent to which treatment providers discussed neuroscience with clients varied. Some described how they often spoke about the brain with clients, for example: "*It's all very neurobiological the discussion*" (A1). Several participants explained how they invoked the authority of neuroscience to explain what was happening for clients in *"scientific"* terms. For instance, an Enrolled Nurse (A7) talked about how she felt that talking with clients about addiction in neuroscientific terms was beneficial to her practice because clients were "*pleased that they can explain what's happened to them, and it's science*". Similarly, an Addiction

Medicine Specialist (E1) explained how discussing the brain, and deploying a neurobiological model as an explanatory tool, gave clients insight into what was "*actually*" happening:

> Absolutely I use that [neuroscience] all the time. I use, if you like, a neurobiological model of addiction and behaviour to try and explain things to people because I think it's really important that individuals understand what's actually happening for them.

Many participants viewed discussing the brain as providing clients with increased insight into their condition. For instance, in the context of abstinence and possible anhedonia associated with cessation of methamphetamine use, a Counsellor Psychologist (A3) believed that deploying neuroscientific concepts could offer her clients an explanation for their symptoms:

> […] with stimulants, amphetamines - you know, another hot topic now, 'ice' - people find that if they've been using stimulants for a long time that when they stop, what they - I guess their brain gets used to such a high level of stimulation, but when one goes back to normal it feels like depression. I'll say something like that. I'll discuss that on that level with them. That's as far as I'll go with things of neuroscience but that makes sense to me and makes sense to them.

A Dual Diagnosis Clinician (A9) with a social work background believed that delivery of neuroscientific information by, or in the presence of, someone with neuroscientific training strengthened the veracity of the information. Participant A9 gave an example of this in the context of discussing synthetic cannabis and its effects on the brain:

> [I talk about the brain] when talking about synthetic cannabis – the perfect binding to the CB1 and CB2 receptors – not only binds way more powerfully than marijuana but doesn't disintegrate. […] So we do a lot of that stuff without trying to be brain experts […] I will say: "listen you are listening to it from a social worker" – so it's a bit sort of downplaying it […] sometimes we'll take along a psychiatrist to be the scientist.

In these instances, neuroscientific knowledge and biomedical expertise were afforded epistemic authority over other ways that clients' drug and alcohol problems might be understood, such as in terms of social, cultural, or environmental factors.

Some participants strategically invoked research on the effects of drugs on the brain as a deterrent to future use. For example, a Manager and Counsellor (B1) working in a therapeutic community selectively discussed the brain to associate alcohol use with damage to the brain: "*so we'll talk about your brain, brain function, those sort of things. We might do it in conjunction with talking about alcohol in particular and the damage that can come [from drinking]*". This example reflected how certain treatment providers in our study recalled discussing the brain as an entity, without necessarily offering clients more detailed neuroscientific explanations (for example, by discussing 'neuroplasticity' as is mentioned in the next example).

In contrast to the use of neuroscience to describe the toxic and damaging impact of drugs on the brain, other participants employed neuroscience to reduce self-blame and generate optimism. For example, when describing the utility of deploying neuroscientific models one Psychologist (D1) said: "*So I think the neurology is really helpful for people to sort of start to begin to shed some of the shame around it [addiction]*". Several treatment providers mentioned

that they may explicitly discuss the concept of 'neuroplasticity' and the brain's ability to change over time with clients, in order to "*use neuroscience in order to create that hope*" (B2; CBT Trainer) about recovery.

In sum, the epistemic authority of neuroscience was strategically invoked in certain circumstances, in order to enjoin clients to embrace particular models of addiction or to discourage further drug use. It was also used to encourage both an empathetic relation with the self, and optimism about recovery and capacity for change.

Representing the brain

The majority of respondents described how they deployed various concepts (e.g., neuroplasticity, brain damage) with clients at different times. Some providers, though, gave more detailed accounts of how they discussed neuroscience with clients using vivid neurobiological language, metaphors, and stories. Informed by Buchbinder's (2015) notion of 'neural imagining', we discuss how metaphors were deployed to communicate complex neuroscientific concepts and translate these into accessible stories for clients. As we will show, neural imagining took place within wider treatment contexts and was designed to construct the problem of addiction, and the solution to it, in a specific way for particular types of clients.

The first example comes from an interview with a Dual Diagnosis Clinician (A9), who had experience of working in treatment delivery in the USA and Australia. Explaining how he spoke about addiction when teaching young people during a workshop, he stated:

> [The metaphor] I'd use with kids was 'Russian Roulette' […] I had a classroom full of kids and I'd say: "a certain percentage of you may have a natural tolerance. Another proportion of you are going to teach yourself to become attached to alcohol in an addictive way." […] I probably mightn't have said "your brain is going to be hijacked", but, I'd use a very similar word which was - I'd use the word 'hostage'. "So you're a hostage. Your brain will become a hostage. You're not already but - you can do something about it - but you may become a hostage." […] It's a similar metaphor to hijacking - but it's all metaphoric I think. But I like the word hijacking.

Though not employing the BDMA language of 'hijacking', this participant described his use of a similar metaphor about the brain becoming a 'hostage' to addiction. This description emphasises the belief in the difficulty of escape or recovery once addicted, while the Russian Roulette metaphor framed drug use as an inherently risky process. Buchbinder (2015) observed that neural imagining was employed in the pain clinic to reduce stigma, legitimise symptoms, and to offer hope that intractable pain could be cured. In contrast, by explaining addiction in terms of 'Russian Roulette' and the potential for the brain to become 'hostage' to drug use, neural imagining is used with a non-clinical audience with the aim to discourage youth from using alcohol and other drugs. Neural imagining in this instance provides a less flexible and less hopeful image of the brain than that constructed through the talk of Buchbinder's respondents.

In another example, an Addiction Medicine Specialist (E1) described how they viewed addiction not as a disease, but rather as a "conditioned response" or "a learned state". This participant said that their view of the aetiology of addiction was better matched to Marc Lewis' (2015) neurodevelopment model, that characterises addiction as a process of deep learning

underpinned by reversible forms of neuroplasticity, rather than a disease of the brain. Consistent with this view, participant E1 deployed metaphors that represented addiction as a process of learning. Neural imagining in this example references a neurodevelopmental model of addiction, comparing addiction to learning an instrument:

> That's just the way the brain works, I don't see it being separate from learning a behaviour. I use the illustration [with patients] if you were learning a musical instrument, your brain is developing new pathways and the better you get at it the more automatic that behaviour becomes. That's actually what's happening when people use drugs, it's just the drugs are much more highly rewarding and so those pathways are being developed much more rapidly.

In our final example, another Addiction Medicine Specialist (C4) talked about using metaphors in the context of educating patients about the effect of opioids on the brain and opioid replacement therapy. He deployed a lock and key metaphor with certain patients, depending on their health literacy, to explain the neuropharmacological effects of drugs on the brain and pharmacotherapies such as opioid replacement therapies:

> I use a metaphor a lot with talking about opioid substitution: the 'key in the lock'. [I explain to patients] – "when you take an opioid, such as if you're going to use heroin, heroin is like an external key that opens the lock. The body produces a whole lot of locks […] and when you stop taking heroin, you've got all these locks sitting here, and your body just stops making keys in the body factory. So, what happens is the doors don't open and the locks are locked and you get sick. [Replacement therapy] keeps you well and sober" […] certainly opioids are very suited to those sorts of metaphors.

However, the respondent further described how he avoided the 'lock and key' metaphor and references to the brain or science when treating patients who also worked in healthcare:

> With an impaired physician […] you don't want to pitch at that level, necessarily, because they'll start rolling their eyes. But then again, you don't want it to descend into an academic, intellectual discussion about addiction which a lot of doctors do […] you've got to be really careful that they're a patient, and this isn't a discussion about another patient. You wanted to bring it back to them. Their knowledge, or the level of detail about the science of addiction isn't really relevant. It's how they're feeling.

This example illustrates that for some patients, neural imagining (here, a 'lock and key' metaphor) was accounted for as having explanatory value insofar as translating complex pharmacological processes into something more comprehensible for people without specific expertise. For patients without a medical background, the use of the 'lock and key' metaphor framed (the solution to) addiction as residing within the brain. However, for doctors and nurses in treatment, the deployment of this metaphor was avoided for two reasons. First, it may be perceived as an over-simplistic representation of addiction and the brain. Second, it characterised addiction as being a biomedical problem with a technical solution (e.g., pharmacotherapies). In doing so, it depersonalised the problem of addiction for a patient population that may require their subjectivity and emotions to be specifically attended to in order to derive therapeutic gains. Thus, neural imagining was used strategically, as part of a broader process of 'selective neurologisation' that we discuss next.

Selective neurologisation

Despite the invocation of neuroscientific notions by several respondents, many treatment providers – as we have seen – recalled how they refrained from deploying neuroscientific accounts with every client. Although the central theme of the interviews was about how the brain was discussed, some participants in the initial interviews referenced how images may, or may not, aid discussions with their clients. Therefore, we asked specific questions about treatment providers' engagements with visual representations of the brain in subsequent interviews. In this section, we include reflections on the accounts of the use, or non-use, of images within therapy.

An Addiction Psychiatry Registrar (C3) was one example of a participant who did not fully embrace a neurobiological model in interactions with clients: she said that she discussed the brain only "*Sometimes […] in fairly vague terms*". Likewise, a Manager and Counsellor (B1) at another service stated that "*we might have those conversations […] it [the brain] might come up, but it might not*".

Decision-making about whether to introduce neurobiological concepts and language within therapeutic discourse was, for most participants, guided by whether a neuroscientific account was perceived to have clinical utility for a particular client. The following excerpt exemplifies such selective neurologisation. When asked whether they discussed the brain with clients, an Addiction Psychiatrist (C2) responded:

> Yes, not always. So not 100 per cent. I usually pick the client, who, first of all, might express an interest in it, then I always would […] So I guess what I'm saying is I tend

> to discuss it [neuroscience] only when I think it's helpful for whatever reason. It isn't always kind of an essential part of how I discuss diagnoses.

However, in the majority of cases, respondents spoke about how they "*usually [don't] go into that sort of depth [i.e. talking about neuroplasticity]*" (A2; Registered nurse), since "*you just have to keep it simple for the patients*" (C1; Addiction Psychiatrist). Participant C1 also questioned the clinical utility of showing a client an image or model of their own or another person's brain:

> I don't have a model of the brain on my desk. I know some GPs do. But even then, I'm not sure how helpful it would be. Well, some people, it might scare them. If they've had a brain scan, a CT or MRI of their brain, and it shows shrinkage, for some people that may register impact. [For others] it may be a bit late [to be helpful], if you see that, actually.

Another Addiction Psychiatrist (C2) reflected on how she might use a diagram with clients that presented the relationship between different emotions and behaviours; however, the diagram did not present a visualisation of the brain per se.

Of course, participants' clients may have been exposed to visual representations of the brain during their treatment via other avenues; for example, through leaflets given to clients, on websites of the services, or where clients themselves may have researched addiction neuroscience on the internet. It is worth noting, though, that when referring to their clinical interactions with clients, participants in our study generally described visual representations of

the brain as having only limited (or no) capacity for enjoining their clients to consider their addiction in neurobiological terms, with a view to advancing therapy.

The main factor influencing perceptions of clinical utility - and, hence, if and how the brain was introduced by treatment providers - was whether neuroscientific concepts were judged to align with clients' own perspectives on (their) addiction. For example, one respondent (A8; Enrolled Nurse) noted that neuroscience was discussed only when perceived to be desired by the client:

> You really have to choose the level that you deliver the information - yeah. Some people want it and some people don't, so it's - yeah, definitely, you're not going to discuss that [neuroscience] with every client.

Another provider (A3; Counsellor Psychologist) stated that they would not discuss addiction in neurobiological terms with clients "*unless they were 'into it' […] usually it's not brain stuff they come up with. Yeah, so I match whatever language they use*". In a similar vein, this participant also described how visual representations of the brain were mainly relevant for the education of treatment providers, but not necessarily clients:

> We might not show them pictures of MRIs and things that we might have seen and looked at in our PDs [personal development sessions] and discussed, but we will convey that information to clients if that makes sense in some way.

She went onto describe how MRI images with localised areas representing changes in specific brain regions were not helpful for clients in practice:

> We're not going to tell the clients: […] "this one thing in your brain here lights up [pointing to an imaginary picture], that's why you have this addiction." That's not helpful to anybody.

For some participants, discussions of the brain were avoided, as neuroscientific concepts were not seen to align with, or be relevant to, clients' own views concerning their addiction. Providing an illustrative example, a Case Manager (B4) expressed the view that discussing the brain with clients often failed to align with clients' own conceptions of their addiction and could be disengaging (stymieing the therapeutic process). She stated:

> I don't think they [clients] would gravitate to that type of speak to be perfectly honest. […] I've seen sometimes someone start speaking about all your neuron transmitters [*sic*] and this and that happening in your brain and they're all just like: "what the fuck?" […] they're not really interested that there was a neuron transmitter that's gone wrong in their brain. They're really pressured about "what is going to become of me?"

Despite the enthusiasm of some participants for neurobiological framings of addiction, others believed that discussions (and images) of the brain were to be avoided in certain therapeutic settings. Thus, notions and concepts from the neurosciences were used strategically and selectively. This related to perceptions of clinical utility, which were accounted for as resting upon provider opinion on whether neuroscientific concepts would align with, or be relevant to, clients' own views concerning their addiction. Hence, in some instances it would be therapeutically unproductive or even disadvantageous to introduce them.

Discussion

Our findings underscore how neuroscientific representations of addiction were selectively deployed by treatment providers for presumed therapeutic purposes. This process of (what we term) 'selective neurologisation' of clients' actions and experiences was driven by two key, and partially connected, factors: (1) whether a neurobiological account was perceived by providers to resonate with clients' own imaginaries of the ontology of addiction; and, (2) the extent to which providers thought invoking neuroscience had clinical utility. Elaborating on the second point, providers described a range of potential therapeutic benefits of discussing addiction in terms of the brain. These included: (a) making sense of clients' feelings (e.g. depressed mood) and experiences; (b) enjoining clients to concur with providers about the import of certain actions in the future (e.g., refraining from drug consumption); and, (c) fostering optimism about the future and reducing clients' self-blame and guilt for past actions.

There were many instances where neuroscience was invoked for its scientific authority in order to explain drug problems in terms of what was "actually" happening for clients. The 'epistemic authority' (Boswell, 2008) that neuroscience commands in legitimating the existence of various phenomena and substantiating access to resources has been the subject of critical analysis within other spheres, for instance, the effects of neuroscience within social policy (Broer & Pickersgill, 2015) and early childhood development policy (Edwards, Gillies, & Horsley, 2015). Challenging claims about the progressive effects of neuroscience, Edwards and colleagues (2015) found that 'brain science claims' essentialised mother-child relations and biologised ideas concerning childhood deprivation when invoked within childhood development policy and practice. Our findings (perhaps more optimistically) indicate that the decision about whether to deploy neuroscience for its epistemic authority within addiction

practice was conditional, based on a strategic choice guided by whether treatment providers perceived neuroscientific representations to be clinically advantageous. Thus, rather than observing universal effects of neuroscientific discourses within addiction practice, our findings provide insight into the role addiction treatment providers play as *agents* in deciding whether to deploy neuroscience (including for its epistemic authority) for therapeutic benefit.

Further exploring the ways neuroscience was deployed, it is worth reflecting on the flexibility and effects that neural imagining (Buchbinder, 2015) affords in clinical practice. At one level, our findings indicate that when addiction treatment providers assess it to be clinically advantageous, they translate concepts emerging from neuroscience research such as brain damage linked to drug use, or 'neuroplasticity', highlighting the brain's ability to change. At another level, this translation of individual concepts progresses into a completely different style of communication: neural imagining (Buchbinder, 2015) in the form of detailed neurobiological accounts using vivid metaphors and stories. As Buchbinder (2015) notes, neural imagining serves to represent the brain through language by enrolling materiality as a rhetorical resource, whilst offering a 'pliable' form of expression that operates to resist the "verisimilitude of diagnostic imaging techniques in favour of creative forms of expression" (Buchbinder, 2015, p. 2). Thus, for Buchbinder in the pain clinic, neural imagining afforded the teenage brain to become a space of possibility, "not to map things as they are, but rather, things as we hope they might be" (Buchbinder, 2015, p. 2). Buchbinder's theory about neural imagining may explain why addiction treatment providers tended to avoid the use of images, and instead to engage in verbal, highly metaphorical representations, that afforded a more flexible and tailored approach when communicating about the brain and addiction with clients.

Treatment providers' avoidance of presenting neuroimages to clients stands in contrast to what we might have expected from the range of social scientific work emphasising the salience, function and effects of brain images (e.g., Dumit, 1999; Dumit, 2004; Rose & Abi-Rached, 2013). Although critics have drawn attention to the often-incorrect presentation of neuroimages as direct pictures of brain activity that aid in the constitution of mental pathology (e.g., Dumit, 1999), our own empirical work indicates that treatment providers did not perceive the presentation of neuroimages as necessary or helpful. Given participants generally did not report considering visual representations whilst working with clients as of clinical benefit, the question is raised about the possible effects and benefits of images or artistic impressions of the brain presented in public health campaigns and client resources (e.g., websites about addiction). We see examples of neuroimages in many contexts, for example, within a resource for Indigenous people in Australia named the *Grog Brain Story* (Cairney, Fitz, Thompson, & Currie, 2009), through to the US where NIDA presents resources such as *Drugs, Brains, and Behavior: The Science of Addiction* (National Institute of Drug Addiction, 2014). In the future, moving beyond our own sample, cross-cultural research of treatment providers' views about the effects of neuroimages and how they present neuroscience in practice, along with the views of clients themselves, presents an interesting opportunity for research, particularly in light of the proliferation of addiction neuroscience and neuroimages in the media and elsewhere.

At times, neuroscience was specifically framed as irrelevant by the treatment providers we interviewed. This resonates with other work (e.g., Fraser, valentine, & Ekendahl, 2018; Meurk et al., 2016; Pickersgill et al., 2011; Pickersgill, Martin, & Cunningham-Burley, 2015) which has shown how those often posited as likely beneficiaries of neuroscientific concepts and findings can reflexively elide or problematise this knowledge. Somewhat less considered within the addiction literature have been analyses of treatment providers themselves (though

see, for examples: Barnett & Fry, 2015; Bell et al., 2014; Fraser et al., 2018). Our contribution provides further evidence that amongst treatment providers who are both biomedically trained (e.g., addiction medicine, psychiatry) and those with other educational backgrounds (e.g., social work), neurological ontologies can be at times positioned as lacking centrality and salience within clinical work. It is worth noting, however, that these research examples of treatment providers' views (e.g., Barnett & Fry, 2015; Bell et al., 2014; Fraser et al., 2018) and our own work represent what appears to have become an increasingly Australian branch of research exploring addiction treatment providers' perspectives about neuroscience and the clinical impact of the BDMA. Care should be taken in making assumptions that similar findings hold true in other international contexts. Moreover, given that the BDMA receives particularly strong support from policy-makers (e.g., NIDA) and treatment provider representative bodies such as the *American Society of Addiction Medicine* (American Society of Addiction Medicine, 2011) in the US, a similar analysis of US treatment providers' views about neuroscience requires further attention.

Finally, what do our results mean for critical work on translation? Given that providers did not view as mandatory, nor always attempt, to enrol clients in a neuroscientific understanding of their addictive behaviour (i.e., for clients to consider their own drug use in terms of neuroscience), a neuroscientific idiom was not an "obligatory rhetorical passage point" (Broer and Pickersgill, 2015, p56; cf. Callon, 1984, p. 205) for provider-client interactions. Rather, treatment providers strategically and contingently decided upon whether to deploy neuroscientific representations within practice. These treatment practices led to addiction being enacted in varying ways and with different effect. Our work adds to existing STS scholarship (e.g., Farrugia & Fraser, 2017; Fraser, 2016; Savic, Dilkes-Frayne, Carter, & Kokanovic, 2018;

Seear, 2019) by demonstrating the different ways addiction is problematised through clinical practice and how its construction is highly context dependent.

Our work further renders problematic any straightforward assumption about the universal and/or linear import of neuroscience to practice, of the kind that is commonly implicit and sometimes explicit within narratives of 'bench-to-bedside' translation. Importantly, given that there are other examples of the translation of neuroscience to practice (e.g., how treatment providers conceptualise the brain when prescribing pharmacotherapies; or how they perceive client autonomy in light of the damaged brain), the future holds many opportunities for the application of social science studies of biomedicine to further interrogate what it means to 'translate' neuroscience into clinical practice.

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Chapter 6

Support for the psychosocial, disease and brain disease models of addiction: A survey of treatment providers' attitudes in Australia, the UK and US

Barnett, A., O'Brien, K., Hall, W., Carter, A. (2019). *Support for the psychosocial, disease and brain disease models of addiction: A survey of treatment providers' attitudes in Australia, the UK and US*. Manuscript is under review.

This final empirical chapter presents the quantitative work in the mixed-methods thesis. This paper aims to extend the extant literature by providing the largest survey to date that explores addiction treatment providers' views about the psychosocial, DMA and BDMA in Australia, the UK and US. Implications for clinical practice and policy are discussed.

ABSTRACT

Background

How addiction treatment providers view different models of addiction has implications for workforce development and addiction treatment, however research exploring their views is limited. This study examined Australian, UK and US treatment providers': (1) levels of support for the psychosocial, disease model of addiction (DMA) and brain disease model of addiction (BDMA); and, (2) individual demographic characteristics that were associated with support for these models.

Methods

A total of 1,438 treatment providers in Australia (n=337), the UK (n=165) and US (n=936) completed an online survey. Support for the psychosocial and DMA were measured using the *Short Understanding of Substance Abuse Scale* (SUSS) (Humphreys et al., 1996) and BDMA support using a measure created by the authors. Hierarchical multiple linear regression analyses were used to analyse associations between treatment providers' demographic characteristics (i.e., previous addiction status, attended 12-step programmes, age, gender, education level) and level of support for each model.

Results

There were no significant differences in treatment providers' support for the psychosocial model between the three country groups. US participants had significantly higher levels of support for the DMA than the UK group, and the UK group was higher than the Australian group. US participants had significantly higher levels of support for the BDMA than Australian and UK participants. Regression analyses found that being younger in all three country groups and a higher level of education in the UK group was associated with greater psychosocial model support. A personal experience of addiction and 12-step programmes was associated with stronger support for the DMA, as was older age in the Australian and US treatment provider groups. In the US group, a personal experience of addiction and 12-step programmes was associated with support for the BDMA.

Conclusion

Treatment providers from different backgrounds and in different countries vary in how they view the aetiology of addiction. How differences in views about addiction impact service delivery and clients' experience of care remains an important topic for future research. Furthermore, policy makers should consider treatment providers' heterogenous views about addiction and the implications for service delivery and workforce policy development.

KEYWORDS

Addiction; attitudes of health personnel; psychosocial; brain disease; treatment.

Support for the psychosocial, disease and brain disease models of addiction: A survey of treatment providers' attitudes in Australia, the UK and US

1. Introduction

Debates about the definition and aetiology of addiction have a long history (Campbell, 2007; Courtwright, 2012). Treatment providers' views about the aetiology of addiction can critically influence the way people with alcohol and other drug (AOD) problems are characterised, diagnosed and treated (Blomqvist, Koski-Jännes, & Cunningham, 2014; Room, 2001). A better understanding of treatment providers' support for different models of addiction has the potential to improve workforce development, the delivery of treatment services and to enable the development of policies designed to better engage clients with treatment.

There are a range of different models that conceptualise the nature and aetiology of AOD addiction. The *psychosocial model* explains the causes of addiction by reference to psychological, social and socioeconomic factors (e.g., Donovan, 2004; Kandel, 1982). Different disease models of addiction characterise addiction as a medical problem. The modern *disease model of addiction* (DMA) can be traced back to the early 19th century when Benjamin Rush asserted that alcoholism was a 'disease of the will' that resided within the individual and impaired their ability to control drinking alcohol (Berridge, 2013; Levine, 1985). The 20th Century 'rediscovery' of the DMA in the US is often attributed to a confluence of social and political factors, notably the birth of the Alcoholics Anonymous movement in the mid-1930s and research led by the Yale Center of Alcohol Studies (Levine, 1985) and influential work by Jellinek (Jellinek, 1960).

More recently, addiction has been characterised as a "chronic, relapsing disease of the brain" (Leshner, 1997, p. 46). The *brain disease model of addiction* (BDMA) specifically locates the mechanistic cause of addiction within the brain (Volkow, Koob, & McLellan, 2016), whereas previously the DMA located the problem of addiction within the individual without providing a specific or unitary mechanistic explanation. The BDMA has received strong support amongst US policy makers (Office of National Drug Control Policy, 2016), research organisations such as the *National Institute on Drug Abuse* (NIDA) (Volkow, Koob, & McLellan, 2016), and agencies representing treatment providers in the US (American Society of Addiction Medicine, 2011) and Australia (Australian Medical Association, 2017). Advocates of the BDMA have

argued that it will deliver more effective treatments (e.g., novel pharmacotherapies), reduce self-blame and increase treatment-seeking, and reduce moral judgment and stigmatisation of people with addiction (Dackis & O'Brien, 2005; Leshner, 1997; Volkow et al., 2016). Critics have argued that framing addiction as a brain disease may instead increase stigma for those with addictions, reduce self-efficacy and treatment seeking, and bias policies towards medical solutions to social problems (Hall, Carter, & Barnett, 2017; Hall, Carter, & Forlini, 2015; Hammer et al., 2013; Heather et al., 2018; Trujols, 2015).

The level of support for these models of addiction among treatment providers has received limited attention. A recent systematic review found variability in treatment providers' views about the DMA, very few studies exploring views on the BDMA, and that the quality of these studies was generally low (Barnett, Hall, Fry, Dilkes-Frayne, & Carter, 2018a). The limited number of higher quality studies found in the review that used validated instruments indicated that treatment providers may support different models of addiction simultaneously (i.e., disease model support did not necessarily preclude support for other models). One study suggested that DMA support was higher in the US than the UK (Russell, Davies, & Hunter, 2011). There was some evidence suggesting that DMA support was positively associated with treatment providers' age and year of qualification. It may be the case that older treatment providers view the DMA favourably as they trained during a time when the disease concept was promoted by Jellinek (Barnett et al., 2018a). Treatment providers who themselves attended 12-step programs were also found to support the DMA which may be due to their personal exposure to 12-step philosophy which is aligned with the disease concept. Higher levels of education were associated with less support for the DMA among treatment providers as they may have been exposed to, and come to support other models in higher education courses (Barnett et al., 2018a). The majority of previous research was conducted only in the US and there was very little international comparative research to examine whether these patterns of results hold true in other jurisdictions.

The present study addressed these limitations by comparing treatment providers' views on the nature of addiction in large samples of treatment providers in three English speaking countries. It aimed to explore addiction treatment providers' level of support for the psychosocial, DMA and BDMA in Australia, the UK and US. The specific research questions were: (1) What are the respective levels of support for the psychosocial, DMA and

BDMA in each of the three countries?; (2) What treatment provider characteristics (i.e., previous addiction status, attended 12-step programme, age, gender, education level) predict support for the three models in each country; and (3) how do patterns of support vary by country? The findings regarding treatment providers' support for different addiction models have important implications for: (a) how service users accessing treatment may experience care; (b) how different views within workforces may impact service provision; and (c) policy development, in particular regarding whether treatment providers support the BDMA in view of the rapid growth in neuroscience research and the strong promotion of the BDMA by research and treatment provider associations.

2. Method

2.1 Participants

An online survey was advertised to addiction treatment providers in Australia, the UK and US via a range of methods. First, an email that contained a link to the survey was sent to subscribers of different mailing lists (e.g., Australia: Victorian Alcohol and Drug Association; UK: DrugWise; US: Addict-L). Second, advertisements for the study were placed in a range of professional association newsletters or on their websites (e.g., Australia: Australasian Professional Society on Alcohol & other Drugs - APSAD; UK associations: Federation of Drug and Alcohol Practitioners - SMMGP/FDAP; US: The Association for Addiction Professionals – NAADAC). The advertisement advised that treatment providers who completed the survey could enter a prize draw to win an Apple iPad or voucher of equivalent value. Treatment providers who responded to the study's advertisement were directed to an online survey where their informed consent was obtained. The survey was open between 13 February 2018 and 23 August 2018. Ethics approval to run the study had been provided by the Monash University Human Research Ethics Committee (Ref: CF15/2656 - 2015001096).

Participants were included if they: were employed as a treatment provider working with alcohol and/or drug addiction clients (e.g., doctors, nurses, social workers, psychologists, dual diagnosis clinicians, case workers, harm reduction workers, peer workers); worked in Australia, the UK or US; and were over 18 years of age. Those who were retired or did not work with alcohol and/or drug addiction clients were excluded.

We received 1,963 responses: 490 incomplete responses were excluded, 28 as participants were outside of Australia, the UK or US, and 7 who were under 18 years of age. This left a final sample of 1,438. Participant characteristics are summarised in Table 1. A survey response rate could not be calculated because participants self-selected and comprised a non-probability sample.

< INSERT TABLE 1 >

2.2 Measures

A survey was created in Qualtrics. For pragmatic reasons (difficult to reach sample) a single survey was designed to measure variables of interest for two different studies and sets of research questions. The studies explored (a) treatment providers' levels of support for the psychosocial, disease and BDMA (presented in the current paper); and (b) treatment providers' views about harm reduction practices, and the effects of drugs on the brain (forthcoming). The present study's focus was on treatment providers' support for the psychosocial, disease model and BDMA. Accordingly, we describe the questions used to measure that support and a priori posited correlates.

Support for the psychosocial and DMA was measured using the *Short Understanding of Substance Abuse Scale* (SUSS; Humphreys, Greenbaum, Noke, & Finney, 1996) which is a modified version of the *Understanding of Alcoholism Scale* (Moyers & Miller, 1993). The SUSS is a 19-item scale measuring beliefs about substance abuse and it has three subscales including the: disease model (7-items); psychosocial model (5-item); and, eclectic orientation (7-items) subscales. Each item is rated on a five-point Likert scale indicating the extent to which participants agree with each statement (0=*strongly disagree* to 4=*strongly agree*). Consistent with previous work (e.g., Moggi, Giovanoli, Sutter, & Humphreys, 2005; Vederhus, Clausen, & Humphreys, 2016) and personal communications with the scale developer, we excluded the eclectic orientation scale from analysis because of its lack of reliability. Factor analysis revealed a two-factor solution from the present data, with an eigen value of 4.37 for the disease model subscale, and 1.86 for the psychosocial model subscale. The eigen value for the eclectic orientation subscale was below 1 (0.76), supporting the decision to exclude it from the analysis. Cronbach's alphas for the disease and psychosocial subscales were good, 0.86 and 0.72, respectively.

There is currently no standardised measure of support for the BDMA. Accordingly, we consulted with subject matter experts and drew on statements from peak bodies that described the BDMA as a 'chronic relapsing brain disease' (e.g., NIDA) to develop a single item with strong face validity. Specifically, we asked participants "To what extent do you agree that addiction is a chronic relapsing brain disease?" Participants indicated their agreement using a 5-point scale (1=strongly disagree, to 5=strongly agree). Higher scores equal greater support for the BDMA.

We also collected key demographic information that could, based on previous research (Barnett et al., 2018a), add explanatory power to the models assessing level of support for the psychosocial, DMA and BDMA. This included age, gender, education level, participants' personal addiction history, and whether they had attended 12-step programmes to address their own AOD problems.

2.3 Data analysis

A one-way ANOVA and two-sided tests of equality of column proportions for categorical variables examined differences between participants' demographic characteristics in each country. Descriptive statistics are reported to indicate the level of support for each model in each country (research question 1). One-way ANOVAs were conducted to examine differences in level of support for the psychosocial, DMA, and BDMA across the three country samples (research question 3).

Pearson's correlation coefficients assessed relationships between the variables of interest, and are reported separately for each country. Hierarchical multiple linear regression analyses (one for each model in each of the three countries) were used to analyse associations between treatment providers' characteristics and their support for the psychosocial, DMA and BDMA (research questions 2 and 3). In the first step we entered age, gender (0=Male; 1=Female) and level of education (high-school certificate = 1 to postgraduate degree (Masters/PhD) = 4). We created dummy variables for whether a participant had a personal history of an addiction problem and had attended a 12-step programme in the past. Specifically, the variable *had an addiction problem without 12-step programme attendance* herein referred to as "addiction history (no 12-step)" was coded as 0=No and 1=Yes, and this variable was entered in the second

step. In step three, the variable *had an addiction problem in the past with 12-step attendance* herein referred to as "addiction history (attended 12-step)" was entered (0=No and 1=Yes). Standardised co-efficients are reported for all models.

3. Results

3.1 Support for the psychosocial, disease model and brain disease model of addiction

Mean scores for the psychosocial, DMA and BDMA are presented in Table 2.

< INSERT TABLE 2 >

In terms of differences in support for the addiction models across countries, there were no statistically significant differences in the level of support for the psychosocial model between the three countries, $F(2, 1435) = 0.919$, p = .399. However, support for the disease model significantly differed between countries, $F(2, 413.957) = 217.621$, $p < .001$. As seen in table 2, and supported by post-hoc analyses, there was lower support for the DMA in Australia than the UK, and lower support in the UK than the US. There was also a significant country difference in support for the BDMA, $F(2, 374.651) = 186.093$, $p < .001$. US participants had higher levels of support for the BDMA than Australian and UK participants which did not differ significantly from each other.

3.2 Bivariate analysis

There were a number of significant correlations between treatment provider characteristics and support for the psychosocial, disease and BDMA scores (see Table 3).

< INSERT TABLE 3 >

Psychosocial model support was: (a) negatively related to age in all three country groups; (b) weakly negatively related to addiction history (attended 12-step) in the UK and US group; and (c) moderately correlated with higher levels of education in the UK group.

Disease model support was: (a) correlated with age in the Australian and US group; (b) associated with lower education level in the US group; (c) moderately related to addiction history (attended 12-step) in all three country groups; and (d) strongly correlated with support for the brain disease model in all three country groups.

Finally, brain disease model support was: (a) weakly correlated with age in the Australian group; (b) negatively related to addiction history (no 12-step) in the Australian and US group; (c) weakly correlated with addiction history (attended 12-step) in the US group; and (d) correlated with psychosocial model support in the UK group.

3.3 Regression models

For each of the three models, we examined how the relationship between treatment providers' individual characteristics and support for each model varied across country.

3.3.1 The psychosocial model

For each country group, a hierarchical multiple regression was run to determine if the addition of addiction history (no 12-step) and then of addiction history (attended 12-step) improved the prediction of psychosocial model support over and above education, age and gender alone (see Table 4).

< INSERT TABLE 4 >

The models were significant for each of the three country groups (ps < 0.001). However, none of the models exhibited significant changes in R^2 across the three steps (all ps > 0.05), except in the US group where the addition of addiction history (with 12-step) (Step 3) led to a statistically significant increase in R^2 of .01, $F(1, 779) = 4.811$, $p < .05$. The final model of treatment provider education, age, gender, addiction history (no 12-step) and addiction history (attended 12-step) accounted for 8%, 15% and 5% of the variance in psychosocial model support in the Australian, UK and US treatment provider groups respectively. In the final models, significant predictors of psychosocial model support included: lower age in all three countries; being male in the Australian and US groups; and greater education in the UK group.

Addiction history (attended 12-step) predicted lower psychosocial model support in the US group.

3.3.2 The disease model of addiction

Similarly, a hierarchical multiple regression was run to determine if the addition of addiction history (no 12-step) and then of addiction history (attended 12-step) improved the prediction of disease model support over and above education, age and gender alone (refer to Table 5).

< INSERT TABLE 5 >

In all three country groups, all models were statistically significant (all *p*s < 0.001), however step 1 of the model for the UK was not significant ($p > 0.05$). All models exhibited significant changes in R^2 across steps (all *p*s < 0.05).

In the Australian treatment provider group, the initial model that included age, gender and education accounted for 7% of the variance, with age a significant predictor of DMA support. In the second model, age predicted DMA support, and higher education and addiction history (no 12-step) predicted significantly lower DMA support, with the second model accounting for another 4% of the variance in DMA support. In the final model, the entry of addiction history (attended 12-step) accounted for an additional 5% variance, and age and addiction history (attended 12-step) significantly predicted DMA support, whilst addiction history (no 12-step) again predicted significantly lower DMA support.

In the UK treatment provider group, the initial model only accounted for 0.3% of the variance in DMA support. Adding addiction history (no 12-step) in the second model accounted for an additional 9% of the variance in DMA support, with addiction history (no 12-step) a significant predictor of lower DMA support. The final model accounted for an additional 9% in variance, and addiction history (no 12-step) significantly predicted lower and addiction history (attended 12-step) significantly predicted higher DMA support.

In the US treatment provider group, the initial model accounted for 4% of the variance in DMA support, and age and lower education were significant predictors. Adding addiction history (no 12-step) in the second model only accounted for an additional 0.8% of the variance in DMA

support. Age and lower education remained significant predictors and addiction history (no 12-step) significantly predicted lower DMA support. For the US group, the final model accounted for an additional 3% of the variance in DMA support. In the final model, age, lower education and having a previous addiction history (attended 12-step) were significant predictors of DMA support.

3.3.3 The brain disease model of addiction

Finally, a hierarchical multiple regression was run to determine if the addition of addiction history (no 12-step) and then of addiction history (attended 12-step) improved the prediction of brain disease model support over and above education, age and gender alone (refer to Table 6).

< INSERT TABLE 6 >

The models were statistically significant in the Australian and US treatment provider samples (both $p < 0.05$), except for the initial model (step 1) in the US group. All three steps in the UK group models were not statistically significant (all ps > 0.05). In the Australian treatment provider group, there was a significant change in R^2 in step 2 ($p < 0.05$) but not step 3 ($p > 0.05$), and in the US treatment provider group, significant changes were shown in the R^2 across steps 2 and 3 (both $p < 0.05$).

In the Australian treatment provider group, the initial model including age, gender and education accounted for 3% of the variance, with age a significant predictor of BDMA support. In the second model, age significantly predicted higher and addiction history (no 12-step) lower BDMA support, with the second model accounting for another 2% of the variance. In the final model, age was no longer a significant predictor of BDMA support however addiction history (no 12-step) significantly predicted lower BDMA support.

In the US treatment provider group, in the second model, addiction history (no 12-step) significantly predicted lower BDMA support and the second model only accounted for another 1% of the variance in BDMA support. In the final model, addiction history (no 12-step) significantly predicted lower and addiction history (attended 12-step) higher BDMA support, however the final model only accounted for another 0.6% of the variance in BDMA support.

4. Discussion

The present study provided the first international comparison of Australian, UK and US treatment providers' level of support for the psychosocial, DMA and BDMA. Our results shed light on the diverse range of views within treatment workforces about the aetiology of addiction and how different treatment provider characteristics are associated with support for the psychosocial, DMA and BDMA.

In terms of individual treatment provider characteristics, in all three country groups, psychosocial model support was associated with being younger, and in the Australian and US groups those who supported the DMA were older. Also using the SUSS instrument, a US study (Humphreys, Noke, & Moos, 1996) did not find an association between psychosocial model support and younger age, but did find older treatment providers were more likely to support the DMA. Older treatment provider age and greater support for the DMA has been found in other US research (Lawrence, Rasinski, Yoon, & Curlin, 2013; Osborn, 1997) and a comparative UK/US study (Russell et al., 2011). Our results support previous research that points to an 'age divide' in views about the aetiology of addiction in which older treatment providers are more likely to support a disease view. Our research also suggests that younger treatment providers are more likely to support a psychosocial model.

Higher levels of education were related to higher psychosocial model support in the UK treatment provider group and lower DMA support in the US group. Other US studies have also found a negative association between higher levels of education and DMA endorsement (Humphreys, Noke, et al., 1996; Osborn, 1997). In our survey, education level did not predict support for any addiction model in the Australian sample. Although we asked about participants' general education level ranging from high-school certificate through to postgraduate degree (Masters/PhD), we did not ascertain whether or to what extent these qualifications specifically related to addiction training, an important factor to examine in future research. Future research is also required to understand the relationship between treatment providers' views about addiction and international differences in the way higher levels of education and addiction teaching programs are structured.

Consistent with previous research (Hshieh & Srebalus, 1997; Moyers & Miller, 1993; Osborn, 1997; Russell et al., 2011), support for the DMA was strongly associated with a history of an AOD addiction and having attended a 12-step program in all three country groups. The disease model items on the SUSS measure are aligned in part with 12-step values so this is not surprising. In separating a personal history of an addiction and having attended a 12-step programme (or not) as predictors, our results showed that 12-step attendance predicted DMA support more than just having had an addiction. Addiction history (attended 12-step) was also associated with less psychosocial model support and more support for the BDMA in the US group but these patterns were not present in the Australian and UK groups. One factor that may explain this is that 12-step programmes in the US may be different to those in Australia and the UK, such that treatment providers exposed to 12-step models in the US may form different beliefs about the aetiology of addiction. However, this possible explanation requires further research in the future.

The influence of 12-step programs and whether they lead to positive outcomes for clients is contentious (e.g., Humphreys, 2002; Kelly, Dow, Yeterian, & Kahler, 2010). Some arguments have been made that attending 12-step programmes is associated with reduced alcohol consumption; therefore, negative beliefs held by certain treatment providers about 12-step should be addressed through training with an aim to increase their referral rates of clients to 12-step or other mutual aid programs (e.g., SMART recovery) (Best et al., 2016). Our study sheds light on how a treatment provider's personal 12-step program attendance influences their views about the aetiology of addiction. Whether and to what extent these views translate into different treatment practices (e.g., encouraging client abstinence; favouring 12-step terms like "alcoholic" in practice), and whether treatment providers' conceptualisations of addiction influence client outcomes, remain important questions for future research.

Adding addiction history (attended 12-step) into analyses was most successful in predicting DMA support in the three models. Whilst the predictors of interest overall explained a modest amount of variance in psychosocial model support (R^2 values from 5 to 15%) and DMA support (R^2 values from 8 to 16%), these predictors were less informative in explaining BDMA support (R^2 values from 2 to 5%). In this study, we explored the association between individual treatment provider characteristics linked to support for different models found in previous research (see Barnett et al., 2018a). However, future research will benefit by exploring other previously unexplored factors that may also influence treatment providers' support for different

models of addiction. These include: other types of individual treatment provider characteristics (e.g., profession type; their perception of a client's needs or addiction severity; involvement in addiction research including addiction neuroscience), workplace factors (e.g., harm reduction or abstinence based local policies; setting type such as criminal justice versus community facility), and national policy settings (e.g., model support in national drug policy).

Support for the psychosocial model support did not differ between treatment provider samples in the three countries but DMA support was higher in the UK than the Australian group, and higher in the US group than the UK group. Other research has also found higher DMA support amongst treatment providers in the US in comparison to the UK (Russell et al., 2011). BDMA support was higher in the US group than the Australian and UK groups. The stronger support for the BDMA in our US sample may be in part explained by strong institutional support for the BDMA in US treatment policy (e.g., American Society of Addiction Medicine) and the two major US funding bodies for research on addiction (NIDA and *National Institute on Alcohol Abuse and Alcoholism*).

4.1 Implications for practice and policy

The lack of correlation between the psychosocial and disease model subscales on the SUSS indicates that endorsement of the psychosocial model does not preclude endorsement of the DMA model. Thus, treatment providers may support the DMA and other models simultaneously, a finding that is consistent with previous research (Barnett et al., 2018a). Palm (2004) and Karasaki, Fraser, Moore, and Dietze (2013) suggested that one explanation for this is may be that treatment providers deploy different models depending on how they frame a clients' sense of responsibility for the problem of, and solution to, their addiction (cf. Brickman et al., 1982). Therefore, it is not a case of exclusively supporting one model or another; rather, that the disease and other models of addiction may both be supported and strategically deployed when necessary.

Policy makers responsible for addiction workforce development and service delivery need to be aware of treatment providers' heterogenous views about addiction. If these views translate to assessing clients in different ways or favouring certain treatments (e.g., abstinence-based treatments), clients might be given different, even conflicting, explanations of their AOD problems and the most appropriate treatment options. There have been discussions about

whether better client/provider matching based on factors such as aligned treatment goals may benefit practice (Babor & Del Boca, 2003; Miller & Cooney, 1994; Shaffer, 1990). Further, the question has been raised about whether the implementation of standardised treatment models (Barnett, Hall, Fry, Dilkes-Frayne, & Carter, 2018b) and harmonising providers' views about addiction based on 'evidence-based practice' within care settings may be of benefit. However, critics of universal treatment models have argued that they would be difficult to implement and that a 'one-size fits all' approach would not account for the differing, complex needs of clients (Savic & Lubman, 2018; Storbjörk, 2018). It remains a critical area for future empirical research to explore how different treatment providers' views about addiction affect clients' engagement with and experience of care.

Finally, agencies representing treatment providers should exercise caution when integrating addiction models into their own policy frameworks that may be popular amongst policy makers in other jurisdictions. Specifically, support for the DMA and BDMA differed between the three country groups in this study. Agencies in Australia, the UK and US may benefit by considering workforce differences when designing policies that aim to represent a diverse set of treatment providers' views about the nature of AOD addiction.

4.2 Limitations

The study has a number of limitations. The opportunistic sampling method means that the findings may not be representative of Australian, UK or US addiction treatment workforces. Future work in other clinical settings (e.g., general practice) and also in different countries in Asia, Africa and South America that have not received attention would be useful to examine whether this study's findings are replicated elsewhere. Furthermore, the item created to measure BDMA support, whilst having strong face validity, was not a validated measure. There are a range of problems with single-item measures including that they may not fully represent a complex theoretical concept and may have less validity and reliability than their multi-item equivalents (McIver & Carmines, 1981). Future research would benefit by designing and testing psychometrically robust instruments to explore support for the BDMA among clinicians and other populations.

4.3 Conclusion

Consistent with previous literature our findings indicated that treatment provider workforces are diverse in their beliefs about the aetiology of addiction. Being younger in all three country groups and a higher level of education in the UK group was associated with psychosocial model support. Being older along with personal experience of addiction and 12-step programmes was associated with stronger support for the DMA among addiction treatment providers. Furthermore, the effects of policy support for the BDMA in the US may underpin stronger support for the BDMA among treatment providers in the US in comparison to their Australian and UK counterparts, however this requires further research using representative treatment provider samples. The extent to which treatment providers' views about addiction translate into different treatment practices and how potential client/provider differences in views about addiction impact care are important areas of future research.

Table 1

Participant demographics by country: count (percentage within country)

Variable		Australia	UK	USA	Total
N		337	165	936	1438
Age, *M (SD)*		46.0 (12.3)[a]	49.6 (10.2)[b]	51.7 (12.5)[b]	50.1 (12.5)
Gender	Male	116 (34.4)[a]	73 (44.2)[b]	270 (28.8)[a]	459 (31.9)
	Female	220 (65.3)[a]	90 (54.5)[b]	654 (69.9)[a]	964 (67.0)
Highest education level completed	High school certificate	2 (0.6)[a]	7 (4.2)[b]	11 (1.2)[a]	20 (1.4)
	Diploma	57 (16.9)[a]	27 (16.4)[a]	15 (1.6)[b]	99 (6.9)
	Undergraduate degree	100 (29.7)[a]	47 (28.5)[a]	167 (17.8)[b]	314 (21.8)
	Postgraduate degree	158 (46.9)[a]	70 (42.4)[a]	655 (70.0)[b]	883 (61.4)
	Other	20 (5.9)[a]	14 (8.5)[a]	88 (9.4)[a]	122 (8.5)
Had an AOD problem in the past?	Yes	100 (29.7)[a]	57 (34.5)[b]	390 (41.7)[c]	547 (38.0)
	No	216 (64.1)[a]	106 (64.2)[a]	483 (51.6)[b]	805 (56.0)
	Rather not say	21 (6.2)[a]	2 (1.2)[b]	63 (6.7)[a]	86 (6.0)
Attended a 12-step programme in the past?	Yes	44 (44.0[#])[a]	32 (56.1[#])[a]	329 (84.4[#])[b]	405 (74.0[#])
	No	56 (56.0[#])[a]	25 (43.9[#])[a]	61 (15.6[#])[b]	142 (26.0[#])

Notes

An ANOVA was used to test differences in age. Country x Variable differences were tested using a two-sided test of equality of column proportions for categorical variables. Values in the same row not sharing the same superscript are significantly different at $p<.05$.

Percentage within 'Had an AOD problem in the past group?' = Yes

Table 2

Means scores for the psychosocial, disease and brain disease model of addiction by country

	Australia (*N*=337)		UK (*N* =165)		USA (*N* =936)	
Model[1]	Mean	SD	Mean	SD	Mean	SD
Psychosocial Model	13.27[a]	3.18	12.94[a]	3.50	13.00[a]	3.37
Disease Model	6.35[a]	5.44	8.47[b]	6.12	13.66[c]	6.41
Brain Disease Model	3.11[a]	1.05	3.07[a]	1.21	4.22[b]	.96

Notes
[1] Scoring of Psychosocial Model subscale is from 0 to 20; Disease Model subscale is from 0 to 28; Brain Disease Model item is from 1 to 5. Higher scores equate to higher levels of support. Different superscript letters indicate significant group differences at the $p < .001$ level.

Table 3

Pearson's product moment correlations between all variables by country

	1	2	3	4	5	6	7	8
Australia								
1. Age	1	-.15**	0.01	-0.06	.16**	-.19**	.26**	.11*
2. Gender (ref: female)	-.15**	1	0.07	-.14*	-0.06	-0.11	-0.09	-0.02
3. Education level	0.01	0.07	1	-.24**	-.23**	0.08	-0.09	0.10
4. Addiction (No 12-Step)	-0.06	-.14*	-.24**	1	-.19**	-0.03	-.16**	-.19**
5. Addiction (Attended 12-Step)	.16**	-0.06	-.23**	-.19**	1	-0.02	.33**	0.07
6. Psychosocial Model	-.19**	-0.11	0.08	-0.03	-0.02	1	-0.03	-0.01
7. Disease Model	.26**	-0.09	-0.09	-.16**	.33**	-0.03	1	.31**
8. Brain Disease	.11*	-0.02	0.10	-.19**	0.07	-0.01	.31**	1
UK								
1. Age	1	-.24**	-0.04	-0.00	0.03	-.22**	0.01	0.01
2. Gender (ref: female)	-.24**	1	-0.03	-.20*	-.21**	0.09	-0.03	-0.06
3. Education level	-0.04	-0.03	1	0.06	-0.07	.33**	-0.03	0.12
4. Addiction (No 12-Step)	-0.00	-.20*	0.06	1	-.21**	-0.01	-.28**	-0.14
5. Addiction (Attended 12-Step)	0.03	-.21**	-0.07	-.21**	1	-.16*	.39**	0.07
6. Psychosocial Model	-.22**	0.09	.33**	-0.01	-.16*	1	0.05	.16*
7. Disease Model	0.01	-0.03	-0.03	-.28**	.39**	0.05	1	.47**
8. Brain Disease	0.01	-0.06	0.12	-0.14	0.07	.16*	.47**	1
USA								
1. Age	1	-.20**	.07*	0	.13**	-.16**	.13**	0.02
2. Gender (ref: female)	-.20**	1	.10**	-0.01	-.24**	-0.04	-0.05	0.01
3. Education level	.07*	.10**	1	-0.01	-.21**	-0.02	-.15**	-0.05
4. Addiction (No 12-Step)	.00	-0.01	-0.01	1	-.21**	0.06	-.08*	-.11**

5. Addiction (Attended 12-Step)	.13**	-.24**	-.21**	-.21**	1	-.09*	.25**	.09**
6. Psychosocial Model	-.16**	-0.04	-0.02	0.06	-.09*	1	-0.05	-0.00
7. Disease Model	.13**	-0.05	-.15**	-.08*	.25**	-0.05	1	.32**
8. Brain Disease	0.02	0.01	-0.05	-.11**	.09**	-0.00	.32**	1

Notes
*$p < .05$. **$p < .01$.

Table 4

Separate hierarchical regression analyses for predictors of psychosocial model support in each country. Adjusted (Adj) betas are reported for all models.

		Australia			UK			USA		
Step	Predictor	Adj β	Adj β	Adj β	Adj β	Adj β	Adj β	Adj β	Adj β	Adj β
1	Age	-.213***	-.216***	-.218***	-.166*	-.167*	-.175*	-.189***	-.189***	-.181***
	Gender	-.195**	-.199**	-.198**	.066	.062	.038	-.095**	-.095**	-.113**
	Education	.078	.068	.073	.327***	.328***	.324***	.002	.003	-.014
2	Addiction (No 12-Step)		-.044	-.040		-.015	-.038		.059	.042
3	Addiction (Attended 12-Step)			.017			-.080			-.083*

*$p < .05$. **$p < .01$. ***$p < .001$. **Note:** All VIF's were less than 2.0.

Table 5

Separate hierarchical regression analyses for predictors of disease model support in each country. Adjusted (Adj) betas are reported for all models.

		Australia			UK			USA		
Step	Predictor	Adj β	Adj β	Adj β	Adj β	Adj β	Adj β	Adj β	Adj β	Adj β
1	Age	.246***	.230***	.197***	-.001	-.021	.011	.109**	.109**	.089*
	Gender	-.037	-.057	-.043	-.046	-.119	-.024	-.042	-.042	-.001
	Education	-.099	-.146*	-.077	-.023	-.005	.013	-.153***	-.153***	-.113**
2	Addiction (No 12-Step)		-.198**	-.135*		-.315***	-.225**		-.089*	-.047
3	Addiction (Attended 12-Step)			.242***			.317***			.201***

*$p < .05$. **$p < .01$. ***$p < .001$. **Note:** All VIF's were less than 2.0.

Table 6

Separate hierarchical regression analyses for predictors of brain disease model support in each country. Adjusted (Adj) betas are reported for all models.

		Australia			UK			USA		
Step	Predictor	Adj β	Adj β	Adj β	Adj β	Adj β	Adj β	Adj β	Adj β	Adj β
1	Age	.128*	.116*	.114	.010	.000	.004	.032	.031	.023
	Gender	-.012	-.028	-.027	-.023	-.060	-.048	-.002	-.001	.017
	Education	.105	.068	.073	.116	.125	.128	-.036	-.037	-.020
2	Addiction (No 12-Step)		-.154*	-.150*		-.162	-.150		-.104**	-.086*
3	Addiction (Attended 12-Step)			.015			.042			.085*

*$p < .05$. **$p < .01$. ***$p < .001$. **Note:** All VIF's were less than 2.0.

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Part III

Implications of the findings and future directions

Chapter 7
Discussion and conclusion

This mixed-methods research project had three aims. First, the thesis aimed to establish whether treatment providers endorsed and how they viewed the clinical impact of the DMA and BDMA. Our systematic literature review (Chapter 3) found highly heterogenous levels of support for the DMA across international workforces, mixed support for the DMA within the US, higher support for the DMA in the US compared to the UK, and variability in the ways treatment providers viewed the clinical impact of viewing addiction as a brain disease (Barnett, Hall, Fry, Dilkes-Frayne, & Carter, 2018).

The second aim was to explore treatment providers' engagements with neuroscience and how neuroscientific models of addiction impacted their clinical practice. To address this aim I conducted interviews with 20 addiction treatment providers working in Victoria, Australia. The first qualitative paper reporting the findings (Chapter 4) analysed the effects of neuroscientific discourses in clinical settings (Barnett, Dilkes-Frayne, Savic, & Carter, 2018). Rather than being a pre-existing object awaiting detection or treatment by neuroscience, we traced how addiction 'problems' emerged through the intersection of neuroscientific, recovery and moral discourses in treatment settings. Treatment providers' engagements with neuroscientific discourses impacted how people become pathologized and treated, and how they experienced care.

The second qualitative paper (Chapter 5), explored how treatment providers' deployment of neuroscience in practice (rarely in overt terms of "brain disease") was found to be strategic and the brain was only discussed when perceived to be clinically relevant for certain clients. Australian treatment providers were found to selectively deploy neuroscientific models and discuss the brain in order to achieve positive therapeutic outcomes such as optimism about recovery (Barnett, Pickersgill, Dilkes-Frayne, & Carter, 2019).

The third aim of the thesis was to provide an international comparison of treatment providers' views about the psychosocial model, DMA and BDMA. This aim was addressed by providing the largest survey on the topic to date (Chapter 6). The international survey found higher DMA support in the UK treatment provider group compared to the Australian group, and higher in

the US compared to the UK group (Barnett, O'Brien, Hall, & Carter, 2019). The BDMA received higher support in the US treatment provider group in comparison to the Australian and UK groups, which did not differ. The results also pointed to a diverse set of views within workforces about the aetiology of addiction and that individual treatment provider characteristics (e.g., age, highest education level, 12-step attendance) differed in how they predicted support for different addiction models.

In this chapter, I continue my analysis by synthesising the project's findings and discussing their implications for clinical practice, policy development, research translation, and wider society. I present examples of how this programme of work has been translated to practice and policy, and also highlight priorities for future research. I bring the project to a close by addressing the project's methodological considerations and limitations.

Implications for clinical practice

The selective use and clinical impact of disease models of addiction

The debate about the underlying aetiology of addiction (see Berridge, 2013; Campbell, 2007; Courtwright, 2012) continues to the present day. Even during the period of this research project, highly charged debates between researchers and policy makers about whether addiction is a disease of the brain have continued. For example, in Amsterdam on January 9th, 2018, two of the most prominent advocates for and against the BDMA, Nora Volkow and Marc Lewis, held a lively debate about its merits (SA Drug Policy Week, 2019). Debates like these tend to reach an impasse where the debate turns on the definition of 'disease' or 'brain disease'. Furthermore, there has been a tendency among researchers to frame the debate about the BDMA in binary either/or terms. Such a framing tends to be inattentive to how and why treatment providers adopt different models in practice. The findings from this thesis demonstrate how the 'Is addiction a brain disease or not?' debate is unnecessarily simplistic, how it often lacks relevance to real world clinical settings, and how it fails to pay attention to treatment providers' engagements with disease models and neuroscience in practice.

As discussed in Chapter 3 (Barnett et al., 2018a), different models, including disease, moral or psychosocial models, may be supported simultaneously by treatment providers as part of a 'hybrid approach' (Karasaki, Fraser, Moore, & Dietze, 2013) to understanding drug use and

addiction. In Chapter 6 we found that within our Australian, UK and US treatment provider samples, endorsement of the psychosocial model did not preclude support for disease accounts of addiction (Barnett, O'Brien et al., 2019). In different clinical contexts (e.g., working with clients with different AOD problem severity; or at different stages of recovery), treatment providers may be agile and strategic in their deployment of different addiction models. The DMA may be deployed to remove people's sense of responsibility for their AOD problems and for perceived therapeutic benefits, such as to counter the stigma they experience (Barnett et al., 2018a).

The views of treatment providers about the potential impact of framing addiction as a brain disease for client behaviour varies (Barnett et al., 2018a). On the one hand, some treatment providers expressed the view that if clients understand their addiction as a brain disease, it might reduce stigma they experience by framing clients' conditions as a medical rather than a moral problem, reduce guilt, increase insight into their drug use, and increase treatment seeking behaviour. On the other hand, viewing addiction as a brain disease was also thought to potentially increase stigma (by, for example, characterising people as dangerous), undermining clients' sense of personal responsibility or increasing their sense of helplessness which in turn could undermine attempts at recovery.

Whether or not treatment providers' perceptions about the BDMA's potential impact for clients are realised remains uncertain. There is a growing body of empirical research examining the impact of neuroscientific framings of addiction on how people view their own and others' sense of self-efficacy and free-will. For example, Australian smokers who agreed smoking was a brain disease were more likely to report an intention to use cessation medicines and had higher self-efficacy than those who disagreed (Morphett et al., 2017). Another study found that being exposed to addiction neuroscience information may have only modest effects for how people view other addicted individuals' levels of free-will and responsibility for their behaviour (Racine, Sattler, & Escande, 2017).

There has also been empirical research examining the association between biogenetic explanations and stigma towards people with mental illness and addiction (Kvaale, Gottdiener, & Haslam, 2013; Lebowitz & Ahn, 2012). For instance, although more of the public sampled in the US between 1996 and 2006 embraced a neurobiological understanding of mental illness (including alcohol dependence), a neurobiological conception was not related to a reduction in

stigma towards people with mental illnesses (Pescosolido et al., 2010). Future research is required to further explore how the BDMA might impact people's sense of self efficacy, free-will, and levels of stigma they experience.

In addition to how the BDMA might influence client behaviour, the literature review in Chapter 3 also explored treatment providers' views about how the BDMA might influence practice. Some treatment providers thought that practice informed by a brain disease model might be inattentive to psychological and social factors that also require attention during treatment. However, the question about the likely impact of the BDMA on practice appears to be a hypothetical one. Research, including this thesis, has shown that practice is rarely (if at all) informed by such a narrow view as to only view treatment through the lens of neurobiology or a brain disease (see also Meurk et al., 2016; Pickersgill et al., 2011).

Rather than being informed by a 'brain disease view', this thesis shows that, in Australia at least, treatment providers engage in a process of 'selective neurologisation' (Barnett, Pickersgill et al., 2019). That is, treatment providers are highly selective and agile in their neuroscientific representations with clients to, for example, foster optimism and reduce self-blame and guilt related to past behaviour. Furthermore, rather than overtly discussing addiction in terms of a 'brain disease', neuroscientific terms are often communicated using highly metaphorical storytelling. This process of 'neural imagining' (Buchbinder, 2015) affords flexibility in the way the brain is represented to clients and allows treatment providers to tailor science communication for therapeutic gain in different circumstances and for varying audiences.

Views about the relevance of neuroimages for practice

Examining the use, relevance and effects of neuroimages in clinical practice (e.g., presenting clients with education resources showing the damaging effects of AOD use on the brain), the different analytic approaches in the qualitative papers (Chapters 4 and 5) produced contrasting perspectives. The poststructuralist informed analysis in Chapter 4 highlighted the way a picture of the 'deranged' brain presented to clients aided in the production of pathologized subjects requiring medical treatment (e.g., pharmacotherapies), and was also appreciated by clients as a form of psychoeducation. In contrast, though, in our examination in Chapter 5 of how and why treatment providers presented neuroscience in practice, we found that 'neural imagining'

(Buchbinder, 2015), in the form of highly creative, metaphorical storytelling, was often favoured over showing clients static neuroimages of pathology. Again, the use of stories over neuroimages provided a more flexible approach when introducing neuroscience into clinical conversations with clients about the effects of drugs on the brain. Agencies responsible for the design of public health and clinical resources should take this into account because the project's results indicated that Australian treatment providers did not uncritically accept the purported benefits of using neuroimages to educate people about drug use.

Neuroscientific discourses at work in clinical settings

Our findings add to a growing body of critical literature (e.g., Farrugia & Fraser, 2017; Fraser et al., 2014; Lancaster & Ritter, 2014) that has explored how addiction emerges as different types of problems in different settings. Consistent with other work, our findings indicate that treatment providers would benefit from reflecting on how neuroscientific discourses (including the 'diseased brain' narrative) construct addiction as a certain type of problem and how these constructions impact treatment and clients' experience of care (Barnett, Dilkes-Frayne et al., 2018; Savic, Ferguson, Manning, Bathish, & Lubman, 2017). Importantly, lay accounts (e.g., patients' experiences of addiction) at risk of subjugation to dominant neuroscientific discourses should be considered in practice in order to provide care that considers clients' own perspectives on their AOD problems. Neuroscientific discourses informing treatment may silence other mental health, social or financial concerns which also require attention in treatment (Barnett, Dilkes-Frayne et al., 2018). These arguments fall into a 'neuroessentialist' critique in sociology that is often made against models of care that focus on the brain to the exclusion of social, environmental and phenomenological factors related to drug use.

However, one criticism of this emerging branch of critical scholarship, including my own work in Chapter 4, is that it ignores the agency and care that treatment providers exercise when discussing the brain with clients. My analysis in Chapter 5 found that treatment providers also questioned the relevance and effects of neuroscientific conceptions of addiction with certain clients. Treatment providers reflexively decided to invoke (or avoid) neuroscientific framings of addiction in different clinical situations (Barnett, Pickersgill et al., 2019). This suggests that the role treatment providers play in invoking neuroscientific explanations for clinical benefit requires more attention. By applying a critical lens to how and why treatment providers selectively invoke neuroscience in practice, future research may be able to advance clichéd

sociological critiques that frame treatment providers and patients as passive and uncritical subjects of (bio)medicalization. Instead the findings point to the strategic way treatment providers exercise their judgment when deciding whether to use neuroscience for therapeutic gain.

Translating the findings to clinical audiences

A primary objective of this thesis was to translate the project's findings into accessible resources for treatment providers with the aim of promoting reflexive practice about the potential clinical impact of the BDMA. I was invited to present results from the thesis via a live webinar (See Figure 2 for the webinar link and engagement metrics). The webinar was part of the *Turning Point Connect & Learn* programme which includes a series of webinars providing education to the AOD public sector workforce in Victoria, Australia. In the webinar, I discuss the project's findings and the implications for treatment providers' own clinical practice.

Figure 2: Webinar: The brain disease model of addiction and implications for practice

Webinar link
https://www.youtube.com/watch?time_continue=1&v=LLftoHdfmn8

Engagement Metrics
Live attendees on July 31, 2019: 72 (out of 200 registrants)
YouTube views: 133 (between July 31 and October 14, 2019)

There are few online resources that encourage treatment providers to engage in reflexive practice by considering the clinical impact of disease models of addiction and neuroscientific models for practice. When discussing neuroscience and the brain, the majority of online resources support a brain disease view of addiction and uncritically represent its benefits for addiction practice. Examples include NIDA's website for clinicians entitled "Principles of Drug Addiction Treatment: A Research-Based Guide" (National Institute on Drug Abuse, 2018) and the *Australian Medical Association's* policy position statement (Australian Medical Association, 2017). These online resources both present the BDMA in only positive ways, blind to any potential negative clinical impacts in practice. Consequently, there is an urgent need for more online, evidence based clinical resources that present, in a more balanced fashion, the potential clinical impact of the BDMA and how neuroscientific models of addiction impact care.

Implications for policy

The diversity of views that treatment providers hold about the aetiology of addiction has implications for service delivery and treatment, for peak bodies representing treatment providers and for the development of drug policy.

Service delivery and treatment

An important consideration for policymakers is how differences in treatment providers' views about the DMA and BDMA influence service delivery and clients' experience of care. If we assume treatment providers' divergent views are translated into different practices that favour certain treatment approaches (e.g., harm reduction versus abstinence-based treatments), then clients accessing treatment may be presented with multiple, at times contradictory, views about the factors underlying their AOD problems and the most appropriate treatment solutions. As suggested in Chapter 3 (Barnett et al., 2018a), one way to address the effects of differences in how treatment providers' view addiction may be for policy makers in charge of service design to consider advancing an 'overarching, universal addiction model' in order to standardise service delivery.

In published commentaries responding to our paper in Chapter 3, Savic and Lubman (2018) and Storbjörk (2018) made compelling cases against the concept of treatment 'standardisation'.

Savic and Lubman's argument was threefold. First, attempts to translate a standardised treatment model into practice would be challenging. Second, a 'one-size fits all' approach would not account for people's complex needs in treatment. Third, implementing an overarching model would paternalistically rely on 'expert' knowledge at the expense of consumer participation and client-centred care. Storbjörk also advocated for the maintenance of multiple treatment models in practice by arguing that different conceptions in the treatment landscape may facilitate better matches between service users, and treatment models and goals available.

One concern about failing to standardise addiction treatment is that treatment providers may have varying and contradictory views about the aetiology of addiction that may adversely impact clients experience of, and engagement with, addiction treatment (Barnett et al., 2018b). In our view, Savic and Lubman (2018) understated the extent to which treatment providers' varying conceptualisations of addiction shape and direct treatment practices. Savic and Lubman argued that clients' needs and beliefs should be the starting point in understanding their concerns and that treatment providers play the role of presenting clients with a range of possible ways of understanding and addressing their problems. While we don't disagree with this principle, our findings in Chapter 3 suggest that treatment providers play a more active, assertive role in directing care in line with their beliefs systems about addiction and treatment rather than listening to their clients' views (Barnett et al., 2018a).

For example, there is evidence that treatment providers who support the disease model of alcoholism are more likely to insist on abstinence as the only treatment goal (Hshieh & Srebalus, 1997), less likely to consider controlled drinking (Moyers & Miller, 1993), more likely to refer to AA (Casswell & McPherson, 1983), and more likely to impose their own treatment goals rather than incorporate the goals of the client (Moyers & Miller, 1993). The extent to which treatment providers' views about addiction translate into different care practices requires future research. We also need more research on how asymmetric client and treatment provider views of addiction are negotiated in care settings where power and authority are vested in the treatment provider.

In her commentary, Storbjörk (2018) discussed the contested medicalization of addiction in the 'non-medical stronghold' of the Nordic countries. As she stated, in Sweden, key stakeholders within AOD policy have resisted and continue to resist a wholly biomedical understanding of

drug problems. Storbjörk's commentary prompts us to consider tensions between treatment providers' variable views about biomedical and social models of addiction. To use an Australian example, when examining AOD treatment in the state of Victoria, we see a highly heterogeneous treatment landscape made up of services that differ in treatment philosophies (e.g., pharmacotherapy clinics based on harm reduction approaches; therapeutic communities based on abstinence models). Within these settings, there has been tension (see Best & Lubman, 2012) between a biomedicalised framing of addiction as a 'chronic, relapsing brain disease' (Leshner, 1997; Volkow, Koob, & McLellan, 2016), and social models such as the *Social Identity Model of Recovery* (Best et al., 2016) that see the solutions to AOD problems as residing within individuals' social networks.

Schmidt (2018) also drew attention to conflicts between different models of addiction in response to our paper in Chapter 3. Schmidt argued that moralised formulations of the disease concept were present in Benjamin Rush's original formulation of alcoholism as a 'disease of the will' (Levine, 1985; Schmidt, 1995), and continue to pose problems for clients because they have never fully dropped away (e.g., stigma deterring people from accessing treatment). Schmidt argued this was problematic because addiction treatment stakes its legitimacy on evidence-based medical science rather than ideological systems of belief.

We see no reason why different treatments based on social and biomedical models cannot co-exist, particularly given that medical and social factors are so intertwined for people experiencing AOD problems. Clients in treatment may benefit from both social interventions (e.g., built on a Social Identity of Model of Recovery approach) and biomedical interventions (e.g., pharmacotherapies). However, and importantly, matching people to individualised treatments remains a policy challenge. Addressing this challenge, centralised intake and assessment processes (such as we see in Victoria, Australia) provide one practical way to assess clients' needs and direct them to appropriate care. Given that addiction treatment dropout rates are high (Brorson, Arnevik, Rand-Hendriksen, & Duckert, 2013), policy interventions that match clients with the providers most suitable for them are vital in promoting treatment seeker engagement. Future research will benefit by assessing how treatment providers' personal views about the aetiology of addiction translate into different practices, and in turn, how these practices influence clients' experiences of treatment, the therapeutic alliance, treatment completion rates and recovery outcomes.

Treatment provider representative bodies

Support for the BDMA has been prevalent in US National Drug Policy (Office of National Drug Control Policy, 2016b), among research agencies in the US that have significant global influence on investment in addiction neuroscience research (e.g., NIDA), and in agencies that represent US treatment providers (American Society of Addiction Medicine, 2011). Furthermore, there have been other examples of policy statements in support of the BDMA outside the US since the current project commenced. For example, the BDMA was explicitly endorsed by the Australian Medical Association in 2017 (Australian Medical Association, 2017).

The international survey found that support for the BDMA was higher among US treatment providers than Australian and UK treatment providers (Barnett et al., 2018a; Barnett, O'Brien et al., 2019). We might speculate that there are several reasons underpinning this difference. On the one hand, higher support for the BDMA amongst US treatment providers may be explained in part by the strong support for the BDMA in US drug and treatment policy. By being exposed to policy messages in support of the BDMA, US treatment providers may be more likely to view the brain disease model as offering the best prospects for treatment and client outcomes. Future quantitative research that measures policy over time and its effect on treatment providers' views about addiction across different countries would be useful to examine this speculation. On the other hand, these results may also in part be explained by the survey participants responding in a way they thought was expected of them. Indeed, US treatment providers in the survey may have answered in support of the BDMA to align themselves with positions supported in US drug policy (irrespective of their own personal views or practices).

When considering the quantitative findings (Chapter 6) of the thesis in light of the qualitative findings (Chapters 4 and 5), a question is raised about how we might interpret the survey responses. The Likert style statements put to participants in the survey included a statement measuring agreement with the BDMA (from strongly disagree to strongly agree). Such a statement measures general agreement with the BDMA. It is rather a blunt instrument that generates a 'fixed-response' from participants that does not consider whether, for example, treatment providers might support a brain disease view of addiction for certain clients with different types of clinical issues over others. Indeed, my qualitative work, described in Chapter

5, found that treatment providers in the Australian sample strategically deployed concepts from addiction neuroscience (including concepts familiar to the brain disease paradigm) only when they found it to be therapeutically advantageous.

This raises the question about how policy position statements supporting the BDMA (e.g., led by the Australian Medical Association) are implemented in and shape treatment. Again, as outlined in Chapter 5, treatment providers selectively decide how and when to discuss addiction in terms of the brain with clients: that is, they tend to be agile in framing and employing messages that are supported in policy in their own practice. Consequently, representative bodies should be aware that whilst their messaging in support of the BDMA (or other models) may be well represented and actively communicated, treatment providers draw on these messages only when they feel it clinically relevant to do so. My qualitative work examined Australian treatment providers' views. Whether UK and US treatment providers selectively invoke neuroscience in a similar way remains a topic for future enquiry.

These matters aside, the questions remain: (1) what are the roles of peak bodies representing addiction treatment providers in regards to issues like the BDMA?; and (2) in the formation of policy positions, should peak bodies reflect the views of their members (a 'bottom up' approach), or aim to lead what they believe to be best practice in order to influence their members' practice (a 'top down' approach)? If peak bodies aim to take a bottom up approach by representing their members' views, agencies in Australia and the UK should exercise caution when issuing statements in support of the BDMA, as their members may have less positive views about the BDMA than their US colleagues. Conversely, if peak bodies aim to take a top down approach by advocating for what they believe as effective, evidence-based policy to influence members' practice, they should be aware that treatment models are selectively adopted (or avoided) in practice. Furthermore, the potential risks and benefits that treatment providers raise (Barnett et al., 2018a) about the BDMA for practice must be considered.

Translating the findings to policy audiences

Throughout this project, I have taken the opportunity where possible to engage in policy discussions about treatment providers' engagement with the BDMA. For example, in a letter to the editor of *The Journal of the American Medical Association*

(Barnett, Hall, & Carter, 2017), we commented on a viewpoint by Mr Michael Botticelli, former director of the *White House Office of National Drug Control Policy*, and Dr Howard Koh, physician and former Assistant Secretary for Health for the US Department of Health and Human Services (Botticelli & Koh, 2016).

In their viewpoint, Botticelli and Koh (2016) drew attention to the potential stigmatizing effects of language used by health professionals to describe individuals with substance use disorders. They argued that scientific evidence demonstrates that drug addiction is a "chronic brain disorder with potential for recurrence" (Botticelli & Koh, 2016, p. 1361). They discussed a *White House Office of National Drug Control* policy document entitled *Changing the Language of Addiction* (Office of National Drug Control Policy, 2016a), which encouraged clinicians to replace commonly stigmatizing terms (e.g., "substance abuser") with "alternative language more aligned with science." Botticelli and Koh asserted that this change would help to reduce stigma, lead to less isolation, and encourage treatment seeking for people affected by addiction.

We agree that it is important to consider the effects of language on stigma and discrimination of addicted individuals but we remain sceptical that framing addiction as a "chronic brain disorder" will achieve this aim (Barnett et al., 2017). Botticelli and Koh (2016) cited evidence in which clinicians were more likely to assign blame to and support punitive actions towards people who use drugs when an individual was described as a "substance abuser" rather than a "person with a substance use disorder". In our rebuttal, we referred to other evidence that suggests that biogenetic explanations of addiction (within which a "brain disorder" falls) have mixed effects on stigma. For example, Kvaale and colleagues found in two systematic reviews that acceptance of biogenetic explanations of mental disorders were weakly related to stigma (Kvaale, Gottdiener, et al., 2013; Kvaale, Haslam, & Gottdiener, 2013). Experimental manipulation of beliefs in biogenetic explanations for psychological difficulties (including substance abuse) reduced blame but also induced pessimism, increased perceptions of dangerousness, and did not reduce social distance (Kvaale, Haslam, et al., 2013).

In making policy recommendations to change practice, we believe that it is premature to claim that describing drug addiction in terms of a "substance use disorder" or a "chronic brain disorder" will reduce stigma. Indeed, the evidence suggests that such a framing of addiction may increase stigma in some people. As we previously argued, further empirical research is

needed on how neurobiological models of addiction affect stigma and discrimination. Without such inquiry, the effects of policy documents like *Changing the Language of Addiction* (Office of National Drug Control Policy, 2016a) aimed at changing treatment providers' practice remain uncertain.

Dr Howard Koh (Koh, 2017) responded to our letter to the editor, stating:

> Mr Barnett and colleagues are sceptical that reframing addiction as a chronic brain disease will reduce stigma. But as noted in the Viewpoint, stigma can only be reduced by starting with use of medically appropriate terms and then broadening to wider societal commitments to education, outreach, and policy change. Future research on such comprehensive approaches can place the work they cite into this broader context.

In remains to be seen exactly what "medically appropriate terms" include for AOD treatment sectors and providers and whether discussing addiction in terms of a brain disease falls within this poorly defined category. Koh's recognition that further research is required to examine the effects of language and different framings of addiction in treatment policy is something that we called for in our letter. Critically, though, in the meantime whilst we await this evidence, it seems unwise to steam ahead with policy support for the BDMA as we have seen made by leading treatment provider peak bodies.

Implications for the translation of addiction neuroscience

From the 1980s to the beginning of the 21st century, there was a rapid increase in the number of published neuroscience studies (Netherland, 2011). However, it has been argued that the translation of this scientific knowledge to practice has been underwhelming. In NIDA's 2016-2020 strategic plan, this translational failure was explicitly acknowledged as a "bench to bedside gap" (National Institute on Drug Abuse, 2016, p. 5). It should be recognised, though, that this metaphor focusses on translation from the science lab to the clinic. In other areas, arguments have been made that the brain disease paradigm has been successful, for example, in attracting research funding for addiction and including substance use disorders in US health insurance plans (Volkow et al., 2016). Thus, NIDA's discussion of the failure to translate addiction neuroscience to practice is clinically focused and, if we take a wider view of 'translation', the BDMA has not been entirely without success.

Implicit in the notion of *clinical* translation is the idea that scientific knowledge can form the basis of clinical knowledge (Martin et al., 2008), or that scientific evidence equates with social practice. However, Martin et al. (2008) contest this assumption by arguing that scientific knowledge is socially organised and embedded within local networks and epistemic communities. The findings from this thesis also challenge the oversimplified notion that addiction neuroscientific knowledge forms the basis of clinical knowledge. Treatment providers' representations of the brain to clients using techniques like 'neural imagining' (Buchbinder, 2015) are applied for strategic purposes (Barnett, Pickersgill et al., 2019). For example, we found the brain was sometimes discussed in order to create optimism about recovery while at other times the relevance of neuroscience for clients was questioned. Future aspirational narratives of 'bench to bedside' translation run the risk of ignoring the complex ways that treatment providers engage with neuroscience and represent the brain in the clinic.

In order to examine the complexities of translation and taking analytic cues from STS scholarship, Rhodes and Lancaster (2019) critiqued linear models of translation based on 'evidence-based interventions'. Instead, they offered a conceptual framework of 'evidence-making interventions'. They describe two key aims of an evidence-making intervention approach: (1) to understand how an intervention is constituted through frictions between different forms of knowledge that make it; and (2) to make visible the multiple lived effects of health interventions in how they form local bio-social subjectivities and how they shape localised 'ecologies of care', including those potentially unforeseen by an intervention's evidencing elsewhere.

Applying the principles of an evidence-making intervention approach (Rhodes & Lancaster, 2019), our results suggest two key findings. First, neuroscientific interventions arise from the intersection of different discourses (e.g., neuroscientific, recovery, moral) and knowledges in varying ways in different local settings (Barnett, Dilkes-Frayne et al., 2018). Second, neuroscientific enactments of addiction, and how they give rise to different bio-social subjectivities, differ in varying clinical contexts. We found that when the brain is discussed selectively and in different ways with clients (Barnett, Pickersgill et al., 2019), the types of client subjectivities that emerge may vary. For example, discussing the damaging effects of alcohol highlighted clients' future risk of pathology and acted as a deterrent to drinking. In other examples, deploying the concept of neuroplasticity had the effect of producing optimism

about recovery after stopping or reducing drug use. Rhodes and colleagues' (2016) observed that addiction science as a biomedical object does not have stable, universal effects in all settings. This thesis also shows how the effects of neuroscience in the clinic are multiple and embedded within dynamic care ecologies in local treatment settings.

In the context of NIDA's acknowledged 'bench to bedside' translational failure of addiction neuroscience to practice, future research may benefit from drawing upon theory laid out within an evidence-making intervention approach (Rhodes & Lancaster, 2019). An evidence-making intervention approach provides the toolkit for an analysis that is sensitive to how different actors (e.g., treatment providers, patients, education resources, policy instruments) are actively engaged in knowledge production. The status quo narrow focus on simplistic linear translational models means that the many potential unintended uses and effects of addiction neuroscience within clinical practice continue to remain uncovered.

The project in the context of wider society

So far, I have addressed the implications of the findings for practice, policy and translation. What, though, do the findings mean when we zoom out and view them in the context of wider society?

Detailed historiographical work has traced how the disease concept emerged in the 19th Century in the US (Campbell, 2007; Levine, 1985). Less historical analysis has been conducted in the UK, and very little in Australia. Recent work in Europe, such as the *Addiction and Lifestyles in Contemporary Europe – Reframing Addictions Project* (ALICE-RAP) has added to historical work. For example, part of the ALICE-RAP project mapped how the disease concept instantiated in different ways and at different times during the 20th Century in the UK, Italy, Poland and Austria (Berridge et al, 2014). This thesis provides, for the first time, an international comparison of treatment providers' support for disease models in the US, UK and Australia. In doing so, this work has provided a 21st Century window into how support for the DMA and BDMA differs between three Anglophone countries.

My findings lend further support to the idea that the concept of addiction emerges in different ways across different countries and clinical contexts. Moreover, the proposed causes of, and solutions to, addiction problems are embedded within, and contingent upon, local cultures and

institutions. For example, other international comparative work has shown how: (a) general practitioners' views on alcohol problems in Finland and France are embedded within different welfare state contexts (Egerer, 2012); and (b) how addiction narratives are constructed differently in the media in the US and Finland (Hellman & Room, 2015). Similarly, my thesis found that greater support for disease models of addiction amongst treatment providers in the US in comparison to the UK and Australia is inextricably linked to the deep history of the AA movement in 20th Century US history (see Room, 1983; Levine, 1978). Future international comparative work should further explore the effects of how addiction problems are constituting for individuals within different cultural contexts.

The qualitative arm of this thesis provides a local, Australian example (Chapters 4 and 5), of how neurobiological conceptions influence practice and how the medicalisation of addiction has transformed into a process of biomedicalization (Clarke et al., 2003). The project's findings resonate with other work that has explored how biological explanations for addiction problems differ across time and space in different contexts (see Hellman et al., 2015 for another example about how biological explanations appear in the media in different European countries). In shedding light on the differences in treatment providers' views about the underlying nature of addiction and how they discuss the brain in different ways, my findings destabilise the notion that how addiction emerges, and how it is governed, is in any way stable. In doing so, the empirical findings provide further evidence of how 'governing images' (Room, 1983) of addiction are linked to spatial, temporal and political forces in local treatment settings.

Finally, my work reveals that neuroscience is used in clinical practice as a tool, to perform work, in particular to encourage behavioural change. Neuroscience is shown to function as a cultural imaginary that treatment providers draw upon when they communicate about the phenomenon of addiction. In doing so, the cause and solution to addiction problems become reduced to brain function, to the exclusion of societal factors that may underpin addiction. However, the 'selective neurologisation' (Barnett, Pickersgill et al., 2019) of client problems is a strategic process where treatment providers make calls to bring the brain to the fore of discussion when they judge it to be clinically beneficial. Thus, my work further evidences that a new instrument of selectively referencing brain science, has entered the imagination of those working in treatment. Moreover, neuroscience is not merely a science of exploring, measuring and detecting brain function, but operates as a cultural tool to explain drug problems that require behavioural change in people within treatment settings and society.

Methodological implications

Future interdisciplinary research on the social and ethical implications of neuroscience

The study's findings raise much broader implications for the translation of neuroscience to medicine and practice. There continues to be an unprecedented investment in neuroscience research globally with a proliferation of 'brain initiatives', such as the *Human Brain Project* (Human Brain Project, 2017) in Europe and *The US BRAIN Initiative* (US National Institutes of Health, 2019). These research programmes state their commitment to ethical delivery of research by adopting principles drawn from *Responsible Research and Innovation* and exploring the ethical, legal and social implications (ELSI) of neuroscience (Amadio et al., 2018).

Empirically informed analytic philosophy has made a strong contribution in examining the implications of framing addiction in neuroscientific terms for individuals' agency and responsibility (e.g., Levy, 2013; Uusitalo, 2015). Furthermore, the emerging fields of *neuroethics* (Illes, 2006; Levy, 2007) and addiction neuroethics (Carter & Hall, 2011) have played a central role in guiding ethical research conduct and the ethical translation of neuroscience research. The benefits of a structured neuroethics research framework has been discussed in the context of the *Australian Brain Initiative* (Kennett et al., 2019). The framework calls for trans-disciplinary research and aims to bring together ethicists, legal scholars, social scientists, policy makers and clinicians to address the social and ethical implications of neuroscience research in Australia. To date, neuroethics as a discipline has often drawn upon moral philosophy to answer questions about the *ethical* implications of neuroscience. For example, neuroethics has provided detailed critiques on the ethics of novel neurological interventions (e.g., deep brain stimulation to treat addiction, see: Carter, Bell, Racine, & Hall, 2011), and also has been useful when analysing how funding should be allocated in an ethical way to address neurological disorders across the globe[3].

[3] In Appendix E, we provide an analysis of substance use disorders and global mental health, and critique the role of neuroethics in setting funding priorities for addiction research in the future.

The question remains: does neuroethics provide the methodological and analytic toolkit to interrogate the *social* implications of neuroscience? It would be easy to say that because of neuroethic's trans-disciplinary nature that it adequately explores the *social*. However, in my experience neuroethicists in practice often view STS, which draws upon sociological and anthropological methodologies, as somehow counter to the aspirations and epistemic commitments of neuroethical approaches based on moral philosophy. This thesis drew upon STS scholarship to explore social interactions with and effects of neuroscience for addiction practice. In taking this critical approach, treatment providers' engagements with addiction neuroscience were examined and the social implications of neuroscientific discourses in clinical settings were traced. More broadly, in my view, STS scholarship remains underutilised in this field of critical enquiry, and the methodological and analytic tools STS provides would be a welcome addition to international brain initiatives that seek to understand the social implications of neuroscience.

Mixed-methods at work: Where does the future lie?

The exploratory sequential mixed-methods design that was utilised within this project raises questions about how critical qualitative research fits with quantitative research. The empirical chapters employed different theoretical perspectives. In doing so, there were certain differences between chapters in the epistemological and ontological assumptions made about the phenomenon of 'addiction'. For example, the qualitative paper in Chapter 4 drew upon Bacchi's postructuralist approach (Bacchi, 2009), in which addiction was not seen as a pre-existing, stable phenomenon but rather emerged as a certain type of problem from the operation of neurobiological discourses. In contrast, though, the quantitative paper in Chapter 6 presented the results of the survey that explored treatment providers' views about addiction, and whether they supported the DMA and BDMA. This type of survey enquiry is based upon positivist epistemological assumptions that characterise addiction as a measurable, and stable, pre-existing phenomenon. In other words, within the qualitative work, addiction is viewed as unstable and conceptualised as emerging through socio-material practices; however, in the quantitative work, addiction is reified as a stable phenomenon about which treatment providers have attitudes.

Thus, there are tensions when comparing the thesis' results which rely upon different assumptions and conceptualisations about the nature of the 'addiction' concept under

examination. Moreover, the object of study shifts when examined through different lenses in the same doctoral project. This problem, however, is not new to mixed-methods scholarship. Within mixed-methods approaches, there is a long, historic and ongoing debate about how best to synthesise qualitative and quantitative research drawn from different paradigms (Creswell, 2011). Denzin (2010) reflected on the 'ambiguities' and conflicts that surround 'mixed-multiple emergent-methods'. Denzin challenged researchers to overcome historical tensions within mixed-methods research by moving beyond them with a flexible, collaborative spirit, open to new ways of connecting methodologies and research designs.

As Silverman (2013) asserted, it is naïve to assume that merely combining methods and aggregating data leads to a more complete analysis of a topic with increased validity. In my own experience within this mixed-methods project, the findings generated from the qualitative and quantitative empirical analyses have at times been contrasting, and I view such tensions that can arise from mixed-methods designs as being productive for two reasons. First, mixed-methods inquiry requires us to explicitly reflect on the epistemological and ontological assumptions that underpin our work, and in doing so, ask deep questions about the very nature of the topic being investigated (in this case 'addiction'). Second, potential conflicts aside, there is common ground that emerges from qualitative and quantitative approaches that allow an in-depth analysis which could not otherwise be achieved. For instance, both the qualitative and quantitative approaches reveal, in differing ways, how addiction treatment providers view and engage with addiction neuroscience in Australia, the UK and US. In sum, taking a collaborative and open-minded approach to mixed-methods research can produce a 'productive tension' to the benefit of critical social science enquiry.

Limitations

In addition to the limitations noted in each results chapter, it is worth noting some general limitations of the thesis. First, the nature of the samples recruited means that the results may not be relevant to other treatment provider groups. The qualitative phase explored the views of Australian treatment providers and the quantitative phase explored the views of Australian, UK and US treatment providers. The results from the qualitative phase may not be as relevant to treatment providers in the US, UK or other countries. They may also not be relevant to other types of groups of treatment providers in Australia, for example the private AOD sector, or treatment providers working with Indigenous people or other groups who experience harms

from AOD use. Further, the results of the empirical chapters may not be relevant to treatment providers from other countries. This may be especially true of: (a) countries in the Nordic regions where there has been a long tradition or viewing addiction as a social problem (Blomqvist, 1998; Takala & Lehto, 1992); and (b) Asian, African and South American countries, where the way treatment providers view addiction and engage with addiction neuroscience, or the way in which drug use has been understood and managed by these societies, may be different and embedded within local cultures.

Second, the quantitative survey in Chapter 6 had a number of limitations. Because we used a non-probability sampling strategy we need to be cautious about assuming the findings can be generalised to wider treatment provider workforces in Australia, the UK and US. This means we must be careful about making strong claims about differences between these countries. In addition, the ad-hoc question that was created to measure treatment providers' support for the BDMA, whilst having strong face validity, was not a psychometrically validated measure. Future research will benefit by designing and testing a psychometrically validated instrument to measure BDMA support amongst treatment providers and other types of groups. There have also been recent studies that have translated the SUSS scale and tested it in different groups, such as in treatment providers in Norway (Vederhus, Clausen, & Humphreys, 2016). This opens up the possibility of overcoming this project's focus on English speaking cultures, by facilitating future cross-cultural work on treatment providers views.

Conclusion

The contemporary debate about the BDMA and aetiology of addiction has a very long history and continues to engage philosophers, sociologists, ethicists and neuroscientists across the globe. This thesis contributes an empirical exploration of addiction treatment providers' attitudes about the mechanisms underlying addiction, the BDMA and how neuroscience impacts practice. My findings indicate that Australian treatment providers are highly selective and strategic in how they frame addiction and deploy different addiction models with clients. As part of a process of 'selective neurologisation' (Barnett, Pickersgill et al., 2019), Australian treatment providers decide when to invoke, or avoid, neuroscience and how and when to discuss the brain with clients. My work elucidates how treatment providers' levels of support for the DMA and BDMA in Australia, the UK and US differ. Strong policy support for the

BDMA in US drug policy may be one factor underpinning US treatment providers' tendency to hold more favourable views about the BDMA, however this requires further research.

Considering the substantial, continuing investment in addiction neuroscience research by global agencies and universities, it is surprising that the views of treatment providers about the relevance of neuroscience, and indeed how they engage with it, have not received more attention. This is in part due to the way the well-worn, 'bench to bedside' metaphor oversimplifies the translation of addiction neuroscience and elides treatment providers' pivotal role in adopting, or resisting, addiction biomedicine in practice. Given that neuroscience, genetics and interventions based on addiction biomedicine all promise to shape future practice, there is an urgent need for critical research to explore how treatment providers, clients, policymakers and scientists engage with, adopt, resist and translate addiction neuroscience in different settings. Mixed-methods research that is committed to collaboration and critical examination has the potential to open new spaces and discourses, and to produce productive conflicts to propel critical research on biomedicalisation forward. Ultimately, critical, interdisciplinary social science perspectives on translation that overcome the epistemic and normative assumptions of siloed disciplines have the potential to facilitate a more effective translation of addiction biomedicine to address and reduce the harms associated with AOD use.

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Appendices

Appendix A

Disease Model of Addiction

Barnett, A., Hall, W., & Carter, A. (2017). Disease model of addiction. In A. Wenzel (Ed.), *The SAGE Encyclopedia of Abnormal and Clinical Psychology* SAGE Publications Ltd. DOI: 10.4135/9781483365817.n442

Our understanding of addiction and those who are addicted has changed significantly since the early 19th Century. How we think about addiction influences the way in which we respond to drug use and drug users. Central to this debate is the question of whether individuals with an addiction can control their drug use. Addiction is often characterised by two competing models: *liberal models* in which individuals freely choose to engage in drug use, and are held morally responsible for harms arising from their drug use; and medical or *disease models* of addiction where an individual's control over their drug use is impaired. Disease models of addiction focus on medical or therapeutic interventions to address this impairment.

The modern disease model of addiction is often attributed to Benjamin Rush, physician and Founding Father of the United States. In the early 19th century, Rush posited that alcoholism was a medical disease that impaired a person's ability to control their drinking. This disease model approach to alcoholism laid the groundwork for the development of Alcoholics Anonymous in the 1930s and 1940s, and later Narcotics Anonymous. Addiction was believed to overwhelm an addicted individual's ability to control their drug use, although the precise mechanism by which this occurred was not fully articulated.

The failure of tough laws and punitive measures to address increased opioid addiction in the early 20th century in many developed countries led to the re-emergence of the disease model of addiction in the 1960s. This shift was supported by the development of methadone maintenance in the USA that was effective in treating heroin addiction.

Since the 1990s, neuroscience research has identified neurochemical mechanisms that may explain how addictive drugs impair an addicted individual's ability to control their drug use.

Chronic drug use produces long-lasting changes within brain reward pathways that drive decisions to continue to use drugs and increase the vulnerability of drug users to relapse after abstinence. These discoveries have led to the *brain disease model* of addiction (BDMA) in which addiction is described as a 'chronic, relapsing brain disease'. The BDMA is supported by the US National Institute of Drug Addiction (NIDA) and has become the dominant approach to understanding addiction in the USA.

The BDMA is claimed to provide a number of social and clinical benefits, namely, improved treatment through the development of medications targeted to affected neural mechanisms; greater funding and support for medical interventions to replace more punitive approaches to addiction, such as incarceration; increased support for a medical view of addiction rather than a moral view that stigmatises and discriminates against addicted individuals; increased funding of addiction treatment; greater insight for individuals into their condition; and reduced self-blame and moral judgment about addictive drug use.

Critics argue that the BDMA may also have significant negative consequences. Individuals may believe their addiction, characterised by long-lasting or potentially permanent changes in their brains, to be untreatable, reducing their belief in their ability to overcome their addiction or a willingness to try. A focus on a disease model might also overemphasise medical treatments at the expense of more broadly effective public health and population level approaches (e.g., increased taxes, regulations on the promotion and sale of addictive drugs).

The disease model of addiction also raises a number of ethical challenges in the treatment of people with drug and alcohol addictions. A BDMA in which changes in the brain 'hijack' a person's ability to control their drug use can be used to support coerced or involuntary treatment of addiction, and the use of invasive neurological treatments, such as deep brain stimulation. Given the complex and controversial nature of drug and alcohol addiction, it is critical that we examine the historical development of disease models of addiction, the scientific evidence used to support them, and their potential social, ethical and clinical consequences.

Cross-References

Addictive Disorders: Overview

Alcohol Use Disorder

Dopaminergic

Drug Use Disorder

Neuroimaging

Neurotransmitters

Substance-Related and Addictive Disorders

Further Readings

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Appendix B

Disease or developmental disorder: competing perspectives on the neuroscience of addiction

Hall, W., Carter, A., & Barnett, A. (2017). Disease or developmental disorder: competing perspectives on the neuroscience of addiction. *Neuroethics*, 1-8.

Neuroethics (2017) 10:103–110
DOI 10.1007/s12152-017-9303-1

ORIGINAL PAPER

Disease or Developmental Disorder: Competing Perspectives on the Neuroscience of Addiction

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Received: 29 August 2016 / Accepted: 16 January 2017 / Published online: 1 February 2017

Abstract Lewis' neurodevelopmental model provides a plausible alternative to the brain disease model of addiction (BDMA) that is a dominant perspective in the USA. We disagree with Lewis' claim that the BDMA is unchallenged within the addiction field but we agree that it provides unduly pessimistic prospects of recovery. We question the strength of evidence for the BDMA provided by animal models and human neuroimaging studies. We endorse Lewis' framing of addiction as a developmental process underpinned by reversible forms of neuroplasticity. His view is consistent with epidemiological evidence of addicted individuals 'maturing out' and recovering from addiction. We do however hold some reservations about Lewis' model. We do not think that his analysis of the neurobiological evidence is clearly different from that of the BDMA or that his neurodevelopmental model provides a more rigorous interpretation of the evidence than the BDMA. We believe that our understanding of the neurobiology of drug use is too immature to warrant the major role given to it in the BDMA. Our social research finds very mixed support for the BDMA among addicted people and health professionals in Australia. Lewis' account of addiction requires similar empirical evaluation of its real-world implications.

Keywords Addiction · Brain disease · Neuroplasticity · Neurodevelopment · Learning

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Introduction

There have been numerous critiques of the brain disease model of addiction (BDMA) in recent years (e.g. [1–7]). Marc Lewis' critique is unusual in being from the perspective of a neurobiological researcher rather than that of a social scientist or clinician [8]. In what follows we outline the key criticisms that Lewis makes of the BDMA, indicate where we agree and disagree with his criticisms, and critically analyse his alternative developmental interpretation of neurobiological research on addiction.

Is the BDMA Unchallenged within the Addictions Field?

We do not accept Lewis' claim that the BDMA is "nearly unchallenged" by medical, psychiatric and

research communities, research funding bodies and professional organisations. We agree that the BDMA does dominate official discourse in the USA, as promulgated by the National Institute on Drug Abuse (NIDA), National Institute on Alcohol Abuse and Alcoholism (NIAAA), American Society for Addiction Medicine (ASAM), and the American Medical Association (AMA). However, the BDMA has not gone unchallenged in the USA [3, 6, 9, 10] and it enjoys much less support from international addiction researchers, 94 of whom signed a letter to the editor of *Nature* dissenting from an editorial promoting the BDMA [11]. Our interviews with addiction scientists and clinicians in Australia have not found universal support for the BDMA.

We agree with Lewis that political factors have played a major role in the apparent dominance of the BDMA in the USA. The primary political factor has been the funding and institutional clout of the leading institutional advocates of the BDMA in the USA, Nora Volkow and George Koob, the Directors of NIDA and NIAAA, respectively. These NIH Institutes fund most of the research on alcohol and other drugs in the USA. Applications that support the BDMA are more likely to be funded given the NIH's bias towards funding neuroscience and biological research on addiction [6, 12]. As Lewis argues, NIAAA and NIDA funding decisions minimise the volume and impact of research findings that contradict the BDMA.

These Institutes have also conducted well-funded high public profile education and advocacy efforts in favour of the BDMA over the past 20 years. The Directors have published pieces advocating for the BDMA in the *Journal of the American Medical Association* [13] and *New England Journal of Medicine* [14]. They have also sponsored special issues in leading science journals like *Nature* [15] to promote their views as the consensus in the field. They have been very reluctant to engage in debate with their critics, preferring to simply reiterate their views when challenged [16, 17].

The chronicity of addiction entailed by the BDMA is also congenial to the private rehabilitation sector in the USA, which provides expensive, long-term residential treatment for addicted persons who can afford it [18]. A chronic model of addiction provides a strong rationale for intensive residential services, in the absence of evidence of long-term clinical efficacy. The pharmaceutical industry has been less supportive of the BDMA; indeed it has been criticised for its lack of interest in developing new drugs to assist addicted persons to remain abstinent [18, 19].

Lewis' Account of the BDMA

According to NIDA, addiction is: "a chronic relapsing brain disease" characterised by compulsive drug seeking and use, despite harmful consequences [20, 21]. The key evidence presented for this assertion is that chronic drug use produces changes in dopamine (DA) activity and transmission over time, affecting motivation, goal-directed behaviour, attention and memory. It is also claimed that DA rewires the brain in the striatum, amygdala, hippocampus and prefrontal cortex (PFC), "hijacking" the brain [21, 22].

Most of the evidence for the BDMA comes from animal studies, which receive some support from neuroimaging studies, that report differences in brain structure and function between addicted and non-addicted individuals that are assumed to be caused by chronic drug use. According to the BDMA, chronic drug use produces a progressive shift in voluntary control of behaviour away from the PFC and ventral striatum towards compulsive behaviour controlled by the dorsal striatum. The claim is that chronic drug use and addiction change the way the brain works much like diabetes changes the functioning of the pancreas. These changes in brain function are what make addiction a brain disease.

Lewis identifies a number of advantages of the BDMA. He says that it helps to understand why it can be difficult for addicted individuals to achieve abstinence by simple act of will; it invokes neurogenetic vulnerabilities to explain individual differences in addiction liability and response to environmental factors; it promises to provide a basis for developing new drugs to reduce withdrawal and craving; and it counters the common perception that addicted individuals are morally deficient and self-indulgent.

Lewis' Critique of the BDMA

Lewis' criticisms of the BDMA echo those of others [3, 6, 7, 23]. He stresses, for example, that the BDMA clashes with the experiences of many former 'addicts' who do not accept that they were sick and have been cured. The BDMA ignores the fact that most people who develop an addiction do recover, often without any formal treatment, and with very few using the pharmacological treatments rationalised by the BDMA.

We strongly agree with Lewis that the BDMA provides an unduly pessimistic view of the prospects of recovery from addiction. We have noted before [6] that

there are no analogues of recovery in the animal models of addiction described by Koob and Moal [24]. The BDMA gives rise to a pessimistic outlook because it mistakenly equates all forms of addiction with the severe cases of relapsing addiction seen in specialist addiction treatment centres (from which the research subjects in neuroimaging studies are usually recruited). Proponents of the BDMA misleadingly cite epidemiological data on the prevalence of the common forms of addiction in community surveys as if the addiction of individuals described in those surveys was the same as that in the minority of severely addicted individuals whom neuroimaging researchers study [6]. They fail to note that their pessimistic view of addiction chronicity is at odds with the same epidemiological evidence that they cite in showing very high rates of recovery from addiction in adulthood [25] in the absence of treatment, as a result of positive changes in life circumstances [3].

We are less impressed than Lewis by the research evidence offered in support of the BDMA. The identification of the neural pathways on which drugs of dependence act is heavily reliant on animal models of the effects of chronic drug exposure on brain function; these models are of doubtful relevance to addicted humans [9, 26, 27]. Human neuroimaging studies typically compare small samples of severely addicted persons with equally small samples of non-drug using controls. These studies have low statistical power and report too many positive findings for their estimated size of effect and typical sample size [28]. A recent study has also called into question the validity of the statistical methods used in some 40,000 fMRI research studies to identify areas of brain activation. It suggests that these methods result in false-positive rates of up to 70% in identifying "activated" brain regions [29]. The case-control design also means that neuroimaging studies are unable to determine to what extent the differences found between the brains of addicted individuals and controls are causes or consequences of chronic drug use (or more likely some combination of the two). For a more detailed discussion of our points, see [6].

Lewis' Alternative Interpretation – Entrenched Habit rather than Disease

Lewis proposes that patterns of addictive drug use should be thought of as deeply entrenched habits rather than as *diseases* [30]. He argues that there is no clear dividing line in personal experience or brain function between an addiction and the repeated pursuit of other rewarding activities. If dopamine release makes addiction a disease then, he suggests, all goal-directed behaviours pursued to excess can be classified as diseases. He argues, for example, that romantic love would qualify as a disease on this definition because it involves dopamine release and it can become compulsive and dysfunctional when the 'sufferer' becomes preoccupied with spending time with the object of their affection, with little regard for the long term consequences of their behaviour or its effects on their ability to perform other roles [8].

We are sympathetic to the alternative explanations that Lewis offers for the cortical changes in animal models of addiction and neuroimaging studies of persons with severe addictions. According to the BDMA, these structural cortical changes comprise the anatomical basis for the brain disease model, especially the reduced connections between the prefrontal cortex and striatum that are reflected in a loss of grey matter in persons with long term addiction. The BDMA implies that these changes are either irreversible or, at least, very hard to reverse.

Lewis interprets these changes as evidence of neuroplasticity, that is, the ability for neural connectivity to adapt in response to changes to behaviour or the environment. He is accordingly more optimistic about the possibility that sustained abstinence can reverse these changes. Indeed, he cites neuroimaging studies in which persons with many forms of severe addiction appear to show a full recovery of cortical connections between the frontal and striatal areas after prolonged abstinence. His interpretation of the neurobiological evidence fits better with the epidemiological evidence on the recovery of the majority of persons with the more common, less severe forms of addiction. It also suggests that we can successfully use treatment approaches (in addition to pharmacological ones) that enhance the prospect of recovery (e.g., lifestyle interventions such as exercise).

Lewis' Developmental Approach to Addiction

The major challenge for critics of the BDMA is in providing a more plausible model that does justice to our understanding of the effects that addictive drugs have on the brain while taking into account evidence that behavioural, social and economic factors also affect

drug use and addiction. As Harold Kalant has argued, this evidential synthesis has barely begun because neuroscientists see their work as ontologically more fundamental than that of other disciplines [9, 27]. The major challenges in producing a convincing synthesis makes it easier to settle for the simplified, NIDA version of the BDMA.

According to Lewis, addiction is a form of learning that is underpinned by dopamine signalling. Addictive drug use accelerates learning and makes the learned behaviour more deeply ingrained because drugs are potent activators of the brain's dopaminergic reward system. This form of learning, he suggests, becomes stronger and more invariant over time through a confluence of social, cultural, societal and economic factors that act in concert with these neurobiological adaptations.

Lewis hypothesizes that three mechanisms increase our attraction to the rewarding effects of addictive drugs and thereby entrench addictive patterns of drug use, none of which makes addiction a brain disease in his view. The first is the phenomenon of delay discounting in which humans (and other animals) give a higher priority to immediate over delayed rewards. This biases our attention towards the short term rewarding effects of drugs (and other activities such as the consumption of high calorie foods) that produce greater than normal dopamine release.

The second mechanism is the motivational amplification of the behaviour that precedes drug use. According to Lewis, the frequent repetition of a behaviour that is boosted by strong motivation is one of the most effective drivers of synaptic shaping.

The third mechanism is that the rewarding effects of many drugs are short lived and their rapid dissipation whets the appetite for more. The rewarding effects of drugs disappear quickly, leaving frustration, loss and depression in their wake, prompting more drug use. These dysphoric feelings may be amplified by a sense of shame when a person sees him or herself, and is seen by others, as selfishly using drugs. These painful feelings may be relieved by more drug use, producing a vicious cycle. The fact that using drugs also relieves the symptoms of drug withdrawal increases the difficulty that many drug users experience in trying to stop using drugs. Lewis also suggests that the drug-induced relief of anxiety and depression in persons who are prone to develop these disorders forms synaptic configurations within which addictive behaviour fits well [30].

On Lewis' analysis, then, addiction is "motivated repetition that gives rise to deep learning" [30]. Addictive patterns of drug use grow more quickly and become more deeply entrenched than other, less compelling habits, because the intensely positive drug effects, and avoidance of dysphoric states, motivate drug users to repeat the experience. The emotional turmoil of childhood and adolescence can initiate patterns of personality development that "anchor" the person in a search for addictive drugs as sources of relief and comfort [30].

Critique of Lewis' Neurodevelopmental Model of Addiction

We prefer Lewis' neurodevelopmental approach to that of the BDMA because it recognises that addiction emerges during the process of human development. For example, addiction is more likely to develop in adolescence in young men who had conduct disorders during primary and secondary school, in young women and men who have anxiety and depressive disorders, and in psychologically vulnerable individuals who have experienced emotional or physical trauma during childhood [3].

A developmental approach is also more consistent with the most common outcome of addiction, namely, that young adults "mature out" of addictive drug use as they enter the workforce and develop positive personal relationships. This approach encourages the search for social strategies to assist young people to disengage from drug use. For example, Lewis' view encourages the use of social groups to support skill development and foster socially positive outcomes rather than focusing on pharmacological treatments to modify neurotransmitter systems in the brains of the minority of persons who become severely addicted.

Most significantly, Lewis' emphasis on addiction as a reversible, neuroplastic developmental process provides a more optimistic view of the prospects of recovery than the BDMA. This is an important difference between Lewis' account and that of the BDMA because the latter emphasises the persistence of drug-induced changes in the brain and the need for medical interventions to overcome addiction. Consequently, the BDMA view, which is characterised by persistent brain changes, may have detrimental effects on drug addicted individuals' hope for the future and on their motivations for recovery. It may also increase stigmatisation of people with drug problems.

We nonetheless have a number of reservations about Lewis' neurodevelopmental model. First, it is not clear how distinct Lewis' model is from the BDMA as it shares many similarities with the interpretations of neurobiological studies provided by supporters of the BDMA. For example, Steve Hyman, former Director of the National Institute of Mental Health, and prominent addiction researcher [31, 32], also emphasises the role of overlearning in the development of addiction. He argues that learning in addiction is underpinned by adaptations at the molecular and neural levels that are driven by dopamine release produced by chronic drug use. The role of negative affect in maintaining addiction is also consistent with George Koob's allostatic model of addiction [33, 34]. According to Koob, adaptations to the stress system (produced by interactions between dopamine and the hypothalamopituitary axis) motivate addictive drug use and produce relapse when the addicted individual ceases drug use. Koob's account also emphasises that these changes are the result of plastic neural adaptations [34, 35].

Second, we think that Lewis' model shares a major weakness with the BDMA, namely, both rely on the use of metaphors to bridge the explanatory gaps between neurobiological evidence (from animal studies and human neuroimaging studies) and the addictive patterns of behaviour that the neuroscience models are supposed to explain. Thus in Lewis' model the "hijacking" of the brain is replaced by metaphors about drugs "leaving footprints in the brain" and "entrenching and anchoring" behaviour in the brain. These metaphors simply re-describe the addictive behaviour that the neurobiology is supposed to explain. In our view, both types of metaphors exhibit features of the *mereological fallacy* described by Bennett and Hacker (after Aristotle) [36], namely, they ascribe the behaviour of addicted persons to patterns of activity in brain regions and assume that this somehow explains the addictive behaviour. The persistent use of addictive drugs clearly produces important changes to the neural activity within key regions of the brain. However, a large explanatory gap remains between these neural changes and the behaviour and intent of people who use addictive drugs. It is beyond the scope of this article to determine whether such an explanatory gap will be bridged in the future, although the complex role of psychological and social factors in driving drug use leave us doubtful.

Third, we think that our understanding of the neurobiology of drug use and addiction is too immature to support the BDMA. Neuroscience has provided suggestive evidence that the chronic use of drugs changes brain functioning in ways that make it more difficult for severely addicted persons to desist from using drugs in the absence of substantial social and pharmacological support to remain abstinent. The role of these neurobiological changes in brain function seems most plausible in explaining the cognitive and motivational impairments often seen during drug intoxication and drug withdrawal. Our improved understanding of these processes has helped to alleviate the symptoms of drug withdrawal but we believe that a preoccupation with the neurobiology of drug effects focuses too much attention on the use of pharmacotherapies to reverse the neurobiological changes that advocates of the BDMA claim are central to addiction.

The Social Impacts of Neurocentric Models of Addiction

The focus on neurobiology in both the BDMA and Lewis' model distracts attention away from the important roles played by interpersonal, social and economic factors in addiction. These factors need to be addressed in treatment if we are to assist addicted persons to live more productive and happier lives; the best ways of preventing relapses to drug use [37]. Although Lewis makes brief mention of social factors implicated in addiction, such factors do not play a central part in his alternative model. Additionally, whilst social factors are given lip service by proponents of the BDMA [17, 38], their importance is not reflected in either the funding of NIDA and NIAAA or the policy solutions that they offer.

In 1997, Alan Leshner confidently predicted that the BDMA would deliver more effective and targeted pharmacological treatments that would substantially improve addiction treatment outcomes. We do not think that the BDMA has delivered on these promises [6]. The main drug treatments derived from neuroscience research are modestly effective and the most efficacious of these (methadone maintenance) preceded the proclamation of the BDMA [6, 7, 27]. These drugs represent a very small return on a large and sustained research investment in neurobiological research and drug development. The failures of a long list of "promising" new drugs and drug vaccines to move beyond clinical trials have been quickly forgotten as attention has shifted to the next great hope.

Leshner also claimed that a wider social acceptance of the BDMA would reduce the stigma of addiction, discrimination against people with an addiction, and the use of incarceration as a first line treatment of addiction. It would do so, he suggested, by convincing a sceptical public that addiction is a real (meaning neurobiologically-based) disorder. There is very little evidence that the BDMA has reduced stigma or discrimination. A growing body of social research on public attitudes and understanding suggests that portraying mental and substance use disorders as brain diseases may entrench rather than reduce negative public attitudes towards persons with these disorders [39]. Indeed, a disease model may reinforce public fears of addicted persons by suggesting that their behaviour is an uncontrollable consequence of permanent changes in their brains produced by their drug use [40].

Our social research in Australia has found very mixed support for the BDMA among addicted people and health professionals. In our interviews with 44 people in treatment for drug and alcohol addiction, essentialist biological explanations of addiction were rarely offered by participants [41]. They favoured multi-dimensional accounts that emphasised the role of social relationships and environmental factors in the origins of their addictions. Some narratives described the experience of addiction as a form of pleasure-seeking rather than as a 'sickness' or disease. Participants were ambivalent about the idea of addiction as a (brain) disease because many saw this as a synonym for 'brain damage' and understood the BDMA to imply that addiction was incurable. Unsurprisingly, many believed that the brain disease label was very stigmatising.

Additionally, our research also found that most Australian addiction treatment providers did not wholeheartedly support the BDMA [42, 43]. Whilst the BDMA was seen as potentially increasing treatment-seeking because pharmacotherapy may be viewed more favourably, treatment providers feared that a focus on medical interventions would discount the role of social and environmental factors in addiction and recovery. These clinicians identified both positive and negative clinical impacts for addicted individuals if they came to see addiction as a brain disease. On the positive side, the BDMA may increase addicted persons' insight about the reasons for their drug use and reduce their sense of guilt. In contrast, it may increase feelings of helplessness and fatalism, undermining people's ability to change.

Lewis' model is more optimistic about the prospects of recovery and avoids the loaded term 'brain disease' but it is not clear what impact his neurobiological developmental model may have on stigma, self-efficacy or addicted individuals' self-understanding. We conjecture that many of the positive and negative implications raised about neurobiological understandings of addiction would also apply to Lewis' neurodevelopmental model. Most notably, Lewis' model still privileges neurobiological explanations of addiction in ways that may not integrate with the phenomenological experience of different people affected by addiction. Further empirical research is needed on the real-world impact of Lewis' model.

Conclusions

Lewis' assertion that the BDMA has been widely unchallenged within the addictions field has been overstated. The BDMA is primarily a North American view that owes its promotion to the leaders of the major US research funding bodies. Furthermore, it is nowhere near as widely endorsed among researchers and clinicians outside the USA and dissident views are expressed by leading US clinicians and researchers.

Second, the neurobiological evidence base for the BDMA is weaker than its advocates acknowledge. The BDMA is heavily reliant on animal models and small sample case-control neuroimaging studies with highly selected samples of severely addicted persons. We argue it is premature for advocates of a BDMA to insist upon the pre-eminence of their neurobiological accounts of addiction.

Lewis' developmental approach is more consonant with the research evidence from epidemiology, social science and economics than the BDMA of the NIH. His model more reasonably frames addiction as a disorder that develops over time, and from which most affected individuals can recover, often without formal treatment.

Lewis' model nonetheless shares some of the weaknesses of the BDMA. He also relies on animal models and evidence based on weak neuroimaging research designs. Lewis' neurobiological explanations of addiction also attempt to smuggle descriptions of the behaviour of addicted individuals into his descriptions of neuroimaging studies. We also contend that Lewis' model underplays the role that social and interpersonal factors play in the origins of and recovery from addiction.

Acknowledgements Adrian Carter received an Australian Research Council Discovery Early Career Researcher Award (No. DE140101097).

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Appendix C

Qualitative interview schedule

Interview Questions

Background Questions

1. Tell me about your current position? Tell me about your day-to-day role and the type of clients you see.

2. And what is your educational background and training (high school certificate, undergraduate, post-graduate, PhD)?

3. How long have you been working in the addiction field at ____? Prior to this – cover a brief history of experience.

Theme 1 – Definition and Aetiology of Addiction

Now I want to start by exploring your views on Alcohol and Other Drug (AOD) addiction:

1. So when we use the word 'addiction', how would you <u>define</u> that term? What does that term mean to you?

PROMPT
Is addiction: - A 'disease'? (what do you mean?) - 'Chronic' in nature? (elaborate) - 'Relapsing' in nature? (elaborate)

2. What are your views on the <u>causes</u> of addiction?

PROMPT

Do you believe there are:

- Biological
- Psychological
- Social
- System

factors that underly addiction? Probe for examples from clinician's practice.

3. Is the nature of addiction different for different people with an addiction? If so, how and why?

4. Is the nature of addiction different for different types of drugs? (e.g., cigarettes, alcohol, cannabis, opioids) If so, how and why?

Theme 2 – Addiction Models and Therapies Informing Practice

Let's now move onto your practice and the way you work with clients.

1. Is/are there a model/models of addiction that inform your practice?

PROMPT
Example answers may be "Yes – a biopsychosocial model" *Alternatively, the clinician may advise "No, there is no one model"* **Prompts to elucidate clinicians' view might be:** **"For example a medical model, social work model, harm reduction framework…"**

List of Models:

2. What sort of therapies do you use in your practice with clients?

PROMPT
The following therapeutic interventions may act as prompts: - Talking with clients - Psychoeducation - Cognitive Behaviour Therapy (CBT) - Mindfulness - Psychodynamic Intervention - Motivational Interviewing - Pharmacotherapy

List of Therapies:

Theme 3 – Clinician's conceptualisation of the role of the brain within their practice (addiction model and therapeutic interventions)

Ok, so you just mentioned that XYX model informs your practice and you use XYZ therapies. I want to now discuss further how the brain and its function might fit within those models.

<table>
<tr>
<td>Brain function and neuroscience within clinician's models of addiction</td>
<td>For each addiction model that the clinician listed in Theme 2, probe for the following information:

1. Within the ____ model of addiction you mentioned, what role does the brain play?

2. Is the brain and its function relevant to ____model?</td>
</tr>
<tr>
<td>Brain function and neuroscience within clinician's therapeutic interventions</td>
<td>For each therapeutic model that the clinician listed in Theme 2, probe for the following information:

1. Within the ____ therapy you use within your practice, is the brain and its function relevant? How?

2. Do you discuss the brain and its function within ____ therapy with clients? Why?

3. What is the clinical impact of discussing the brain with clients during _____ therapy?

PROMPT
Potential Positive impacts:
- Increased insight
- Empowering to make changes
- Destigmatising (reduced moral judgment)
- Increased treatment seeking/treatment adherence

Potential Negative impacts:
- Stigmatising (brain is damaged, client is damaged)
- Reduced sense of control (volition)</td>
</tr>
</table>

	4. Do you refer to concepts like **a.** neuroplasticity (brain changes over time due to environmental stimuli)? **b.** Genetics? **5.** Is talking about the brain only relevant for certain clients when you use this particular therapy?

2. In regards to what you just mentioned about the brain and neuroscience, from what sources have you built your knowledge base?

PROMPTS
- Academic literature - Colleagues - At work (e.g., journal clubs) - The media - Other sources

Theme 4 – Clinician's view on the 'Brain Disease' model of Addiction and its Clinical Impact

This part of the interviews explores your views about framing addiction as a 'brain disease'.

1. The claim has been made by a number of agencies, that AOD addiction is a chronic, relapsing brain disease…(that addiction is a primary, chronic disease of brain reward systems and related circuitry) - What are your thoughts on that?

2. Do you support the claim that addiction is a brain disease?

3. Is a brain disease model relevant to clinical practice?

4. If clinical practice was informed by a brain disease model of addiction, how would that impact practice?

PROMPTS

Positive Impacts:

- Provides rationale for treatments?
- Integrates with therapies (e.g., CBT)?

Negative Impacts:

- Ignores other factors requiring consideration (e.g., Social, Environmental)?
- Lacks relevance for certain clients?

Theme 5 – The clinical impact of the BDM on addicted individuals

Now I want to explore with you your ideas about the impact a brain disease view of addiction might have on client behaviour.

If AOD addicted people understand their addiction through the BDM, what are the potential clinical impacts for them? Are their positive/negative impacts? TRY TO GET CLIENT TYPICAL EXAMPLES…

What are the potential positive/negative impacts for clients viewing their addiction as a brain disease or problem with brain function?

Further prompts:

Can the model **provide insight** and allow people to make sense of their addiction?

AOD represents many types of addiction including poly-drug use…do you think the model might benefit any particular group within AOD in understanding their addiction?

Do you think helping people to understand their addiction through the BDM can be **empowering** to make change? How? Can it also be **disempowering**?

Can the brain disease label be **stigmatising? Destigmatising?** Why? Do you have any typical examples from your clinical practice?

If a person feels stigmatised through the BDM, can this adversely affect people to seek or stay in **treatment**?

Do you think the model might reduce a person's sense of **responsibility** or undermine their **self-control** in relation to their addiction?

Do you think the BDM may lead to people feeling **helpless** in addressing their addiction?

Any other clinical impacts or anything you'd like to add?

Appendix D

Systematic review: Supplementary materials

S1: Detailed methods

2. MATERIALS AND METHODS (DETAILED)

2.1 Search strategy

Consistent with best practice for systematic reviews recommending comprehensive searches of multiple sources [1], we searched Pubmed, EMBASE via Ovid, PsycINFO via Ovid, CINAHL Plus via EBSCO and Sociological Abstracts. In searching biomedical literature, we selected Pubmed and also included EMBASE via Ovid to expand the search to European journals given Pubmed focuses on American literature. In addition to searching psychological literature using PsycINFO via OVID, CINAHL Plus via EBSCO was also utilised to search allied health journals and Sociological Abstracts to search international literature in sociology and related disciplines. No date limits were set in order to capture literature published over preceding decades concerning treatment providers' attitudes about a disease model of addiction. Note we did not conduct a 'gray' literature search for this review or search for unpublished papers or findings. Also, the search protocol was not registered in an international prospective register of systematic reviews.

The formulation of search terms within the search strategy was guided using the 'PICOS' method [2]. In line with the PICOS method, *medical subject headings* (MeSH-terms) and text words were divided into groups: (1) population: AOD treatment providers; (2) intervention/exposure: substance use disorders/addiction; and (4) outcomes: attitude of treatment providers, disease, medicalization. Note (3) comparator and (5) study design were not applicable to this review.

The first group of search terms included professional and paraprofessional AOD treatment providers from a wide array of disciplines. Within the second group, substance use disorders involving alcohol and illicit drug use were included, however smoking and tobacco use disorders were excluded. We excluded smoking and tobacco

use disorders as the main interest of our study was alcohol and illicit or licit drug addictions that are the main focus of addiction treatment settings (both public and private). The fourth group of terms was sub-divided into two categories: the first category comprised outcomes covering attitudes of health personnel and the second included disease and medicalization. After reviewing the MeSH-term subject directories, a search strategy was created for PubMed (see Table 2), and then similar versions were devised for the other databases based on their specific MeSH-term indexes (see Appendix S2). The search strategy was tested and refined over a number of iterations to ensure broad search coverage was achieved, whilst also maintaining search specificity.

2.1.1 Rationale for conducting two searches

The first database search was conducted on November 8, 2015. After completing the study selection process outlined in Section 2.2, the authors became aware that a study [3] that was relevant had not been picked up by the search criteria. As a result, the authors decided to adjust the search criteria, by adding "staff" to *population* and "dependency" to *intervention/exposure* (see Appendix S2), and reran the database search on January 12, 2017 (note this search was set with a date limit for papers published before November 8, 2015 – the initial search cutoff – therefore this review only looks at papers published before November 8, 2015). Once all records were extracted by the second search, any duplicate records found by the first search (conducted on November 8, 2015) were removed, and all remaining records were then subjected to the study selection process. The quality assurance processes were extended to the records found by the second search.

2.2 Study selection

The literature selection process was conducted using Endnote v7.1 reference management software and is summarised in Figure 1. Search results from all five databases were collated and duplicates were removed before conducting the *First Selection* phase. During this phase, titles were screened in two iterations (see Table 3 for specific inclusion and exclusion criteria). The first screening excluded papers with no focus on treatment providers' attitudes, and the second screening excluded papers

with no focus on AOD abuse or addiction. Titles were not screened for references to disease or medicalization given that such findings were often reported in article abstracts. When the reviewer was uncertain whether a paper met an exclusion criterion, the paper proceeded to the next selection phase.

During the *Second Selection* phase abstracts were screened and in the *Third Selection* phase a full-text review was conducted. During the second selection phase articles were excluded if their abstract had no focus on addiction as disease or the medicalization of addiction and were therefore not relevant to this review.

Additionally, study selection was accompanied by 'berry picking' [4], which included reference checking of papers found through the systematic searches and inclusion of papers known through the authors' networks.

The literature selection process was conducted by AB. A random sample of 10% of all papers found after duplicate removal were screened by a second reviewer (AC). After conducting the three selection phases and comparing articles to be included the inter-rater agreement was 98%. Following the discussion of their evaluations, both reviewers reached consensus resulting in one paper being added and one excluded from the final sample.

During the literature selection process, a number of protocol adjustments were made. Firstly, studies that focussed on the views of undergraduate students were excluded given their lack of exposure to clinical practice; however, studies exploring views of medical residents in training were included. Additionally, during the final selection phase, studies conducted in Asia, Africa and South America were excluded given their potential low cross-cultural applicability to studies conducted in Western countries relevant to this review [5, 6]. Where a paper presented the results of drug and alcohol treatment providers and other groups not relevant to this review (e.g., patients), they were included, however where possible only relevant results were extracted.

2.3 Data extraction and analysis

Data were extracted for the following themes: country where the study was conducted; addiction type; study population and recruitment; sample size; tools and analysis (see Table 4). Also, in line with the research questions, results were extracted and divided into three components: (1) treatment providers' attitudes about a DMA; (2) factors associated with positive or negative attitudes; and (3) treatment providers' views about the clinical impact of a DMA (see Table 5).

Data extraction and analysis were conducted by AB. A random sample of over 20% of papers included in the review were subjected to independent data extraction and analysis by AC. The inter-rater agreement was 84%. Consensus was reached following discussion and reviewing original studies.

A range of different synthesis methods were considered for data analysis (e.g., meta-ethnography; see [7]). However, similar to the approach of Van Boekel et al. [8], given the heterogeneity of the studies reviewed in regards to sample, design and measures, a qualitative approach to analysis was adopted and results were summarised thematically rather than by a meta-analysis.

2.4 Quality Appraisal

We used the *Mixed Methods Appraisal Tool* (MMAT) [9] to assess the quality of the reviewed literature (AB). *Quality appraisal scores* are presented in Table 4 and we provide a summary of included papers' methodological strengths and weaknesses in the results. A random sample of 20% of papers were subjected to independent quality appraisals (AC) that resulted in an inter-rater agreement of 75%. Consensus was reached following discussion of the studies in light of MMAT criteria.

S2: Database Search Criteria

SEARCH TERMS (SEARCH CONDUCTED JANUARY 12, 2017)

PubMed

1. Population
#1. health personnel
#2. general practitioners
#3. physicians
#4. nurses
#5. *psychologist**
#6. *social worker**
#7. *counsellor* OR counselor**
#8. *AOD worker**
*#9. clinician**
*#10. provider**
#11. staff
#12. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11

2. Intervention/Exposure
#13. substance related disorders
#14. alcoholism
#15. *drug abuse*
#16. *addiction**
#17. dependency
#18. smoking (NOT)
#19. tobacco use disorder (NOT)
#20. 13 OR 14 OR 15 OR 16 OR 17 NOT 18 NOT 19

4. Outcomes
#21. attitude of health personnel
#22. attitude to health
#23. *perspective* OR perception* OR view* OR belief**
#24. 21 OR 22 OR 23

#25. disease
#26. medicalization OR *medicalisation*
#27. 25 OR 26

Combine all searches
#28. 12 AND 20 AND 24 AND 27

NB: Italic terms above are not Mesh-terms

EMBASE via Ovid

1. Population
#1. health care personnel/
#2. general practitioner/
#3. physician/
#4. nurse/
#5. psychologist/
#6. social worker/
#7. *(counsellor* or counselor*).mp.*
#8. *AOD worker*.mp.*
#9. *clinician*.mp.*
#10. provider.mp.*
#11. staff.mp.
#12. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11

2. Intervention/Exposure
#13. drug dependence/
#14. alcoholism/
#15. drug abuse/
#16. *addiction*.mp.*
#17. *dependency.mp.*
#18. smoking/ or tobacco dependence/ (*NOT)
#19. 13 OR 14 OR 15 OR 16 OR 17 NOT 18

4. Outcomes
#20. health personnel attitude/
#21. attitude to health/
#22. (*perspective* OR perception* OR view* OR belief*).mp.*
#23. 20 OR 21 OR 22

#24. disease.mp.
#25. medicalization OR *medicalisation.mp.*
#26. 24 OR 25

Combine all searches
#27. 12 AND 19 AND 23 AND 26

PsycINFO via Ovid

1. Population
#1. Health Personnel/
#2. General Practitioners/
#3. Physicians/
#4. Nurses/
#5. psychologists/
#6. Social Workers/
#7. counselor/
#8. *AOD worker*.mp.*
#9. *clinician*.mp.*
#10. provider.mp.*
#11. staff.mp.
#12. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11

2. Intervention/Exposure
#13. Drug Addiction/
#14. Alcoholism/
#15. Drug Abuse/
#16. *addiction*.mp.*
#17. *dependency.mp.*
#18. *smoking.mp.* or Tobacco Smoking/ *(*NOT)*
#19. 13 OR 14 OR 15 OR 16 OR 17 NOT 18

4. Outcomes
#20. Health Personnel Attitudes/
#21. (*perspective* or perception* or view* or belief*).*mp.
#22. 20 OR 21

#23. *disease**.mp.
#24. *medicalisation.mp.* OR *medicalization.mp.*
#25. 23 OR 24

#26. 12 AND 19 AND 22 AND 25

CINAHL Plus via EBSCO

1. Population
#1. (MH "Health Personnel+")
#2. general practitioners
#3. (MH "Physicians+")
#4. (MH "Nurses+")
#5. psychologist*
#6. (MH "Social Workers")
#7. (MH "Counselors")
#8. AOD worker*
#9. clinician*
#10. provider*
#11. staff
#12. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 11

2. Intervention/Exposure
#13. (MH "Substance Use Disorders+")
#14. Alcoholism
#15. (MH "Substance Abuse")
#16. addiction
#17. dependency
#18. (MH "Smoking") (NOT)
#19. 13 OR 14 OR 15 OR 16 OR 17 NOT 18

4. Outcomes
#20. (MH "Attitude of Health Personnel")
#21. (MH "Attitude to Health")
#22. *perspective* OR perception* OR view* OR belief**
#23. 20 OR 21 OR 22

#24. disease
#25. medicalisation OR *medicalization*
#26. 24 OR 25

Combine all searches
#27. 12 AND 19 AND 23 AND 26

Sociological Abstracts

1. Population

#1. (health personnel) OR (general practitioners) OR physicians OR nurses OR psychologist* OR (social worker*) OR counsellor OR (AO* worker*) OR clinician* OR provider* OR staff

2. Intervention/Exposure

#2. ("Alcohol Abuse" OR "Drug Abuse" OR "Drug Addiction" OR "Substance Abuse") OR (substance related disorder) OR alcoholism OR (drug abuse) OR addiction OR dependency NOT smoking

3. Outcomes

#3. (attitude health personnel) OR (perspective* OR perception* OR view* OR belief*)

#4. disease* OR (medicalisation OR medicalization)

Combine all searches

#5. 1 AND 2 AND 3 AND 4

Appendix E

Disease, wellness, and addiction: A global perspective

Barnett, A., Hall, W., & Carter, A. (in press). Disease, wellness, and addiction: A global perspective. In D. Stein & I. Singh (Eds.), *Global Mental Health and Neuroethics*.

Abstract

The emerging field of global mental health offers an important framework to address the burden of disease attributable to substance use disorders (SUDs) across the globe. There are, however, different approaches about how to prioritise investment in the treatment of SUDs globally. In this chapter, we review two prioritisation exercises for global mental health: the US National Institute for Mental Health's *Grand Challenges in Global Mental Health*; and The *Lancet Mental Health Group's* approach to funding priorities. We examine how the two approaches converge and differ, and reflect on the implications of the priorities of both approaches. Finally, we explore the role neuroethics has in setting funding priorities and allocating scarce financial resources for addiction research in the future.

Keywords

Addiction; global mental health; neuroscience; brain disease

Introduction

The global mental health movement (Becker and Kleinman, 2013, Patel, 2012, Stein and Giordano, 2015) has a critical role to play in addressing the burden of disease resulting from substance use disorders (SUDs). Global mental health is an emergent field that advocates for culturally appropriate forms of mental health care that can be scaled up to reduce the population impact of mental disorders across all nations and peoples, particularly lower income countries and socially marginalised populations. The global mental health movement assumes that access to healthcare is a human right and that there should be 'no health without mental health' (Prince et al., 2007). It recognises a global 90:10 research gap in which the vast majority of mental health research (90%) has been done in high-income countries (HICs) to the benefit of 10% of the world's population who live in those countries. The movement emphasises that

mental disorders remain underdiagnosed and undertreated across the world, with the widest treatment gap in low- and middle-income countries (LMICs) (Saxena et al., 2006). It advocates for evidence-based clinical practice while recognising that mental disorders need to be understood within their socio-cultural context (Stein and Giordano, 2015).

Within this consensus, however, there are varying philosophical approaches about how best to reduce the global burden of mental illness and drug addiction. In this chapter we review two prominent approaches that produce different priorities for global mental health. We contrast a more clinical, technology driven approach against one that emphasises a population level approach to global mental health, and examine the effectiveness of each of these prioritisation exercises in the area of drug addiction. In particular we look at the impact that drug addiction has globally, and critically analyse the effectiveness of the National Institute on Drug Abuse (NIDA) brain disease approach (Leshner, 1997, Volkow et al., 2016) in reducing the global burden of drug addiction. We make some provisional recommendations about the most appropriate and effective approaches to global mental health in drug addiction, and reflect on the role of addiction neuroethics in guiding decisions about research investment.

Competing approaches to prioritising global mental health

The US National Institute for Mental Health's (NIMH) *Grand Challenges in Global Mental Health* initiative identified priorities for research over the coming decade in order to improve the lives of people living with mental, neurological and substance-use (MNS) disorders (Collins et al., 2011). The key tenets of this initiative were that it: (1) had a global scope; (2) used the Delphi method; (3) covered the full range of MNS disorders; and (4) hoped to build a wide ranging community of research funders to help implement the research.

The prioritisation exercise brought together the largest Delphi panel to consider global mental health research. It was guided by a scientific advisory board consisting of over 400 researchers, clinicians and programme implementers working in more than 60 countries (Collins et al., 2011). Over a number of rounds, panellists were asked: "What are the grand challenges in global mental health?" that if successfully implemented, would aid in solving an important health problem.

The exercise identified 25 grand challenges for global mental health. These included research on the aetiology and treatment of MNS disorders and the implementation of interventions targeting individuals experiencing drug addiction that may be scaled up to have a population impact. Importantly, NIMH's approach emphasised the role of neuroscientific and pharmacological research in delivering more effective treatments for MNS disorders. It argued that "…breakthroughs are likely to depend on discoveries in genomics and neuroscience, in tandem with exploration of the role of sociocultural and environmental contexts" (Collins et al., 2011, p. 3).

Another influential research prioritisation exercise for global mental health emphasised a different vision of priorities. The *Lancet Mental Health Group* (Tomlinson et al., 2009) assessed priorities for a more efficient use of funds for global mental health research. Their assessment involved a systematic evaluation of research investment options for four broad classes of disorders, one of which was alcohol and other SUDs. Members of the group adopted a priority-setting approach that listed research questions and scored them using criteria such as answerability, effectiveness, deliverability, equity and potential impact on persisting burden of mental health disorders.

The *Lancet Mental Health Group* (Tomlinson et al., 2009) gave the highest priority to research on health policy and systems. These included research on how to deliver cost-effective interventions in low-resource settings, and epidemiological research on child and adolescent mental disorders including alcohol and other drugs of abuse. They gave the lowest priority to developing new interventions and new drugs or pharmacological interventions, vaccines or other technologies. The Lancet exercise concluded that critical knowledge gaps were best filled by research on health policy and systems, the epidemiology of disorders and better ways to deliver cost-effective interventions.

Priorities for the treatment of addiction

The NIMH prioritisation of genomic and neuroscience research for global mental health research is reflected in the priorities for drug research led by NIDA (Leshner, 1997, Volkow et al., 2016). In 1997, Alan Leshner, then director of NIDA, claimed that addiction was best understood as a chronic, relapsing brain disease and that advances in neuroscience research would substantially reduce the scale of the problem (Leshner, 1997). Researchers from NIDA

argued that chronic drug use hijacks the brain's reward systems, making it difficult for people to stop using drugs and resulting in high rates of relapse (Dackis and O'Brien, 2005).

NIDA has invested heavily in neuroscience research in the strong belief that it will produce novel breakthrough treatments for addiction (Hall et al., 2015a). Advocates of the BDMA claimed that it would deliver novel and more effective pharmacological treatments with fewer side effects to prevent drug addiction in vulnerable individuals (Veilleux et al., 2010, Kosten and Owens, 2005). Other promises include the use of direct brain interventions, such as deep brain stimulation (Luigjes et al., 2012), and neuroimaging technologies to better diagnose and treat people with addictions (Franken and van de Wetering, 2015, Lubman, 2007). Advocates of the NIDA approach have also claimed that it will benefit people with addictions by reducing moral judgment, stigma and discrimination, improving their access to quality health care and reducing the use of punitive approaches to addiction, such as imprisonment (Leshner, 1997, Volkow et al., 2016).

However, critics have argued that the BDMA may increase (rather than decrease) stigma for those with addictions and bias policies towards medical solutions to social problems (Hall et al., 2017, Hall et al., 2015a, Hammer et al., 2013, Trujols, 2015). Opinions differ on the impact of the BDMA on treatment: some treatment providers see the BDMA as having potentially positive impacts for clients (e.g., increased insight into their condition, reduced self-blame), whereas others view the BDMA as having potential negative impacts (e.g., making people feel helpless about their recovery, reducing self-efficacy and treatment-seeking) (Barnett et al., 2017).

NIDA's focus on addiction neuroscience research and medical treatments of the individual (Hall et al., 2015a) can be contrasted with support for more public health and health services research suggested by the *Lancet Mental Health Group's* prioritisation exercise. In the remainder of the chapter we attempt to evaluate these differing visions, whilst paying particular attention to how they might reduce the scale of global addiction problems.

Substance use across the globe

Both NIMH and The Lancet group's global mental health exercises focussed on alcohol and SUDs, without discussing tobacco use. Given the health burden that tobacco represents across

the globe and the co-morbidity of tobacco use with other drugs, we include it in our analysis of substance use. Tobacco policy and treatment also provides an instructive case for understanding the relative impacts of the NIMH and The Lancet group's approaches to research tackling addiction globally.

Tobacco

Cigarettes and other forms of tobacco smoking remain a significant and increasing burden on global public health (Jha et al., 2006, Jha et al., 2002, Ng et al., 2014). A systematic review of studies in 139 countries estimating worldwide smoking prevalence in 1995 (Jha et al., 2002), found that globally 29% of people aged 15 years or over were regular smokers. Of the world's 1.1 billion smokers in 1995, four-fifths lived in LMICs. Countries in East Asia accounted for a disproportionately high percentage (38%) of the world's smokers and four-fifths of all smokers were male. There were, however, large reductions in the prevalence of daily smoking from 1980 to 2012 (Institute for Health Metrics and Evaluation, 2018, Ng et al., 2014) at the global level, but due to population growth the number of daily smokers increased significantly over this period. From 1980 to 2012, it was estimated that the number of cigarettes consumed globally increased by approximately 26%.

In 2000, it was estimated that approximately 4.8 million (Ezzati and Lopez, 2003) premature deaths were attributable to smoking worldwide; a figure that has increased to 5.7 million in 2010 (Ng et al., 2014). In 2000, approximately half of these deaths occurred in LMICs (Ezzati and Lopez, 2003). The leading causes of death were cardiovascular diseases, chronic obstructive pulmonary disease, and lung cancer. Furthermore, a higher prevalence of smoking has been found in individuals experiencing mental illness (Lê Cook et al., 2014). In 2010, smoking remained among the top risk factors for global disease burden, with tobacco smoking, including second hand smoke, representing approximately 6% of global disability adjusted life years (DALYs) (Lim et al., 2012).

Alcohol

Generally, HICs have the highest levels of per capita alcohol consumption and prevalence of heavy episodic drinking. The highest alcohol consumption continues to be found in Europe and the Americas, with intermediate levels in the Western Pacific and African regions, and the

lowest in South-East Asia and the Eastern Mediterranean (Kisa, 2018; World Health Organization, 2014). Worldwide between 2006 and 2010, there was an increase in per capita alcohol consumption. This was mainly driven by increased per capita alcohol consumption in China and India. Globally women drink less alcohol than men and have a lower prevalence of alcohol use disorders (World Health Organization, 2014).

DALYs attributable to alcohol use disorder varied by more than ten times between regions such as North Africa or the Middle East and Eastern Europe. The largest burden of disease for alcohol use disorders was found in the 25-50 age group, followed by a gradual decline with age (Whiteford et al., 2013). Globally, the age-standardised DALY rate (per 100,000) decreased for alcohol use disorders in both men and women between 1990 and 2010 (Whiteford et al., 2015). In 2010, the global proportion of total DALYs for alcohol use disorder (including alcohol dependence and fetal alcohol syndrome) was 0.7% (Whiteford et al., 2015). Alcohol remains an important risk factor for premature mortality that disproportionally affects LMICs, with more than 85 per cent of global deaths attributable to alcohol in these nations (Medina-Mora et al., 2015).

Illicit Drugs

Cannabis products (e.g., marijuana, hashish) remain the most widely used illicit drugs, followed by amphetamine-type stimulants (e.g., cocaine, methamphetamine) and illicit opioids (e.g., heroin, diverted pharmaceutical opioids) (UNODC, 2013). In 2010, the rates of opioid and cannabis dependence were higher in HICs than in LMICs; cocaine use and dependence rates were highest in North America and Latin America (Degenhardt et al., 2011); and rates of amphetamine dependence were be highest in Southeast Asia and Australasia (Degenhardt et al., 2014).

The proportion of DALYs attributed to illicit drug dependence was 20 times higher in some regions than others. The countries with the highest burden included the USA, UK, Russia, and Australia (Degenhardt et al., 2013). Illicit drug dependence (with opioid dependence the largest contributor) accounted for 20 million DALYs in 2010 and represented approximately 0.8% of all global DALYs (Degenhardt et al., 2013). Across the globe, the age-standardised DALY rate (per 100,000) increased for opioid dependence in both men and women, and

remained stable for cocaine, amphetamine and cannabis dependence between 1990 and 2010 (Whiteford et al., 2015).

Comparing NIMH and The Lancet's approach to reducing the burden of SUDs

In this section we summarise evidence on the effectiveness of interventions and treatment for SUDs, paying particular attention to LMICs. We then assess how the NIMH and The Lancet group's research priorities fit with the existing evidence on interventions to reduce the harms of drug use and SUDs.

Tobacco

A growing body of studies in HICs has examined the efficacy of interventions in reducing demand for tobacco products (Jha and Chaloupka, 2000, Jha et al., 2006). Fewer studies have compared differences in the effectiveness of these interventions between HICs and LMICs. There is robust evidence from HICs and LMICs that increasing taxes on cigarettes and other tobacco products significantly reduces tobacco smoking (Chaloupka et al., 2012, Farrelly et al., 2008, Jha et al., 2006, US Department of Health Human Services, 2014, Wakefield et al., 2008). So does legislation restricting smoking in public and private places (e.g., smoking bans in workplaces) (Fichtenberg and Glantz, 2002), bans on cigarette advertising (World Health Organization, 2013), and counter-advertising campaigns (Friend and Levy, 2002) in HICs. However, most smokers in LMICs remain unaware of the risks of smoking because their governments have made little effort to inform them (Steptoe et al., 2002, Yang et al., 2010).

A number of pharmacological treatments are available to help smokers quit. These include nicotine replacement therapy (NRT), bupropion (Cahill et al., 2013) and varenicline. These treatments only modestly increase the success of quit attempts when given with psychological support and counselling. Policies that decrease the cost of pharmacological treatments and increase their availability may lead to significant increases in smoking cessation (Jha et al., 2006).

The substantial interest among smokers in new forms of nicotine delivery, such as e-cigarettes and nicotine vaporisers, has taken the tobacco control field by surprise and produced strongly polarised policy responses. Proponents see these as disruptive technologies that will accelerate

the end of tobacco smoking by increasing quitting and providing a safer long-term alternative to combustible cigarettes (McNeil et al., 2015, Gartner and Hall, 2016). Their opponents see them as a threat to tobacco control that will allow the cigarette industry to subvert tobacco control policies, renormalise smoking and recruit new smokers (Kalkhoran and Glantz, 2016, Grana et al., 2014).

It has been very difficult to assess the plausibility of these radically different scenarios in the absence of good evidence on who uses these devices and how they are used. Most evidence to date has been limited to cross-sectional studies. Prospective studies are needed to clarify how many smokers are using them to quit and with what success.

Nations have adopted very different approaches to regulating e-cigarettes. Some have treated non-combustibles as a medical device/medicine for cessation use only, others as a tobacco product, and some as a general consumer good. Restricting smokers' access to nicotine vaporisers only when they are approved for use as medicines (as has occurred in Australia) may have the unintended effect of conferring a monopoly on products owned by the tobacco industry. Over-regulation of vaping products can also have the perverse effect of denying smokers access to a less harmful option, while allowing much more dangerous cigarettes to remain freely available (Hall et al., 2015b).

Under-regulation may also prevent smokers who could benefit from switching if consumers lack confidence in the safety of the devices and liquids. Finding the optimal regulatory sweet spot between prohibition and regulatory anarchy is a difficult task given the lack of consensus in the tobacco control community about how much regulation is necessary and what aspects of these products should be regulated and how. A similar challenge exists in finding the optimal regulatory framework for cannabis products in countries that have decriminalised it (Caulkins et al., 2016).

Alcohol and illicit drugs

There are a range of interventions at the population, community and health care levels that have been identified as effective in reducing the harms of alcohol and illicit drug dependence. These are summarised in Table 1. Although this framework focuses on alcohol and illicit drug

dependence, similar approaches have been applied to interventions for behavioural addictions including gambling (cf. Gainsbury et al., 2014).

Table 1. Summary of interventions for alcohol and illicit drug dependence

	Alcohol use and dependence[1]	**Illicit drug use and dependence[2]**
Population platform interventions	Prohibition, rationing, and partial bans Taxation Minimum Prices Restrictions on sales and advertising	Regulation (e.g., law enforcement) Awareness campaigns Inter-sector collaboration (e.g., court mandated treatment)
Community platform interventions	Family-based interventions Mass media campaigns	Workplace drug testing Drug education (incl. children and adolescents Self-help groups (e.g., SMART Recovery)
Health care platform interventions	Screening and brief interventions Medical and social detoxification, counselling, follow up, and referral Self-help and support groups (e.g., AA)	Community based care (e.g., emergency naloxone provision) Specialist healthcare (e.g., detoxification and withdrawal) Brief psychological interventions Medications (e.g., MMT, sustained release naltrexone, medications for cannabis dependence)

Source: Table information adapted from Disease Control Priorities (3rd edition)
References: [1] Medina-Mora et al. (2015) [2] Degenhardt et al. (2015)

An evidence-based approach to global treatment of SUDs

A number of broad statements can be made about how the evidence on the effectiveness of polices to reduce tobacco and alcohol and illicit drug harm fits with the global mental health research priorities of NIMH's *Grand Challenges in Global Mental Health* initiative and the *Lancet Mental Health Group.* Firstly, there is strong evidence in HICs, and to a lesser degree in LMICs, supporting the efficacy of increased tobacco taxes, legislation restricting smoking in public places, bans of advertising, and public health campaigns on the risks of smoking in reducing tobacco smoking. In Asia, which has a disproportionately high proportion of the

world's smokers there will be major benefits from research on how to implement these policies. The *Lancet Mental Health Group's* prioritisation of health policy and systems research is supported by robust evidence about the effectiveness of population level demand reduction initiatives.

There is also evidence that pharmacological treatments (e.g., NRT, buproprion, varenicline) are only modestly effective in increasing the success of quit attempts when combined with psychosocial interventions. In this regard, NIMH's prioritisation in global mental health funding for research exploring the aetiology and treatment of SUDs and addiction may have benefits for tobacco use reduction in the future. This may occur after population level approaches have reduced the prevalence of smoking to a low level, as has happened in some HICs. However, these pharmacological treatments are rarely provided with the sorts of psychosocial interventions that trials show are required for their efficacy. Effectiveness and cost-effectiveness studies would need to take this into consideration when examining the role of pharmacological treatments, particularly in LMICs with limited resources and infrastructure to provide ongoing counselling and psychosocial support.

Our synthesis of strategies to address alcohol and illicit drug dependence drawn from the Disease Control Priorities report (Degenhardt et al., 2015; Medina-Mora et al., 2015) describes interventions on three levels (see Table 1): population platform; community platform; and health care platform interventions. The *Lancet Mental Health Group's* priorities for global mental health funding aligns with the two higher level platforms. For example, future research in LMICs exploring taxation and restriction of sales for alcohol, and the regulation of illicit drugs at the population platform level, fit better with The Lancet group's global mental health research prioritisation strategy than that of NIMH.

There is an important role for the assessment and treatment of individuals who are dependent on alcohol and illicit drugs. Health care interventions (see Table 1) include screening and brief interventions and medical detoxification that may reduce the burden of alcohol dependence. Naloxone provision, specialist detoxification and withdrawal services, and pharmacotherapies (e.g., opioid replacements therapies) have scope to reduce harm related to illicit drug use and dependence in HIC and LMICs. NIMH's research priorities to examine the aetiology and treatment of substance use and the effectiveness of policies to scale up access to interventions align with evidence supporting these health care interventions. So too does the *Lancet Mental*

Health Group's prioritisation of research on health systems and research on improved delivery of cost-effective interventions.

In LMICs epidemiological research and better surveillance systems are critical to understand the prevalence, patterns and harms of SUDs in these countries. Both the *Lancet Mental Health Group's* and NIMH's prioritisation exercises include epidemiological research as a focus area in order to better capture the prevalence of SUDs in LMICs.

However, in contrast to the *Lancet Mental Health Group's* approach, one of the defining features of NIMH's global health research priorities is the importance attached to curiosity driven research in genomics and neuroscience. NIMH's approach runs the risk of being overly optimistic about how soon neuroscience research might produce breakthrough treatments. Critically, lessons can be learnt from the translational failures that have characterised NIDA's focus on neuroscience research to deliver new treatments. Although there continues to be a debate about whether or not addiction is a brain disease, there is more agreement that the promises made by Leshner that addiction neuroscience would lead to improved treatment (such as novel pharmacotherapies) remain unfulfilled. Leshner predicted over 20 years ago that the BDMA would deliver more effective drug vaccines and long-acting, implantable drugs to reduce relapse; pharmacogenomic tests to match patients to the most effective treatment; drugs to modulate the stress response or the salience of drug-related cues; and most recently, drugs to reverse epigenetic changes produced by chronic drug use (Hall et al., 2015a).

Despite NIDA investing over US$1 billion a year on addiction research, the vast majority on neurobiological or clinical research (Hall et al., 2015a), the most widely used treatments for addiction remain those that were discovered over three decades ago before the exponential increase in addiction neuroscience research (e.g., methadone, NRT). Despite almost three decades of neuroscience research, very few of the clinical promises espoused by the BDMA have been realized (Hall et al., 2015a, Kalant, 2010). During this time, population-based policy approaches have reduced smoking rates from around 50% to under 15% in some countries. This failure would suggest that a population-based, public health approach as described by The Lancet group would yield more effective and cost-effective results in reducing disease burden sooner in LMICs.

Is there a role for neuroethics in setting funding priorities?

Two expert led prioritisation exercises have reached conclusions that emphasise differing priorities about where research funds should be allocated in global mental health research. Does *addiction neuroethics* (Carter and Hall, 2011) as a discipline have a useful role to play in deciding between these competing views?

There have already been a number of suggestions made about how neuroethics might assist the global mental health movement. Stein and Giordano (2015) noted that historically the two fields have had little interaction and outlined some important differences between the fields that may explain why. They argued that: (1) global mental health has focused on reducing problems in LMICs, while neuroethics has focussed more on ethical issues most relevant to Western HICs; (2) global mental health has focussed on implementation science while neuroethics has more often focussed on ethical issues raised by new neurotechnologies and novel interventions being developed in HICs; and (3) global mental health has emphasised the value of employing community health workers for mental health interventions, whereas neuroethics has explored technological procedures such as neuroimaging and deep brain stimulation that require significant costs and infrastructure and highly trained medical and other staff to implement them. These differences reflect the historical development of neuroethics as a field, rather than any inherent priorities in a neuroethical approach.

Nonetheless, Stein and Giordano (2015) argued that global mental health and neuroethics have a number of converging perspectives that may enable collaboration. They specifically suggested that neuroethics might explore issues that arise at the intersection between global mental health and clinical neuroscience, such as, what constitutes disease and wellness, human rights issues in neuropsychiatric care, and the value of inclusion and patient empowerment in service delivery.

We agree with Stein and Giordano's (2015) view. The field of neuroethics and its engagement with global mental health research needs to broaden its focus to engage with wider debates in bioethics about the rationing of scarce resources to addiction research to reduce the global burden caused by these disorders. Such approaches, commonly considered within healthcare research funding allocation, are informed by cost-benefit analyses and economic evaluations with the aim of maximising health outcomes by use of the most cost effective interventions with the largest public health impacts. In doing so, neuroethics may overcome the criticism

that it is overly focused on neurotechnologies in HICs. In the context of global mental health, neuroethics has an important contribution to make in influencing decisions on where funding for addiction neuroscience research might best be invested. Furthermore, it is vital for neuroethics research to explore the social impact of neuroscientific discourses by examining how clinicians, policy makers and service users view the role of the brain in addiction in LMICs.

One of the difficulties with deciding how to allocate resources to maximise health benefits is uncertainty about what future benefits may accrue from curiosity driven research (Sassi et al., 2001). This issue is particularly salient for genomics and neuroscience research on SUDs and addiction. As we and others have argued, despite a sustained financial investment in addiction neuroscience, the brain disease paradigm has not yet fulfilled the promises of delivering more effective therapies for addiction problems promised by Alan Leshner in 1997 (Hall et al., 2015a, Lewis, 2015, Heather et al., 2017, Kalant, 2010). In view of this, the current level of investment in genomics and neuroscience assumed by NIMH's *Grand Challenges in Global Mental Health* initiative may not be justified.

We support some funding of speculative curiosity driven research. Science and medicine as a profession has a duty to advance scientific knowledge and pursue novel therapies by investing in research with more speculative longer term benefits. Investment in scientific and medical research also provides economic benefits in terms of increased employment and industrial development. However, these are seldom the goals used to justify investment in medical research and innovation which stress the short term benefits of the research. It is a question of balance in which more weight should be given to funding health services research than blue sky research than has been the case at NIDA over the past three decades.

Conclusion

Two prioritisation exercises for global mental health research on SUDs have produced different recommendations on where research funding should be allocated to improve global mental health. On the one hand, NIMH has prioritised research on the aetiology and treatment of MNS disorders, with an emphasis on the role of genomic, neuroscientific and pharmacological research to deliver more effective treatments. On the other, The Lancet group's prioritisation

exercise recommended that critical knowledge gaps were best filled by research on health policy and systems, epidemiology and the improved delivery of cost-effective interventions.

NIMH's prioritisation of research on the aetiology of SUDs may have limited benefits for health care interventions in the future, for example, in medical detoxification and pharmacotherapies. However, The Lancet group's commitment to a population-based, public health approach to treating SUDs across the globe is likely to yield more cost-effective and timely results, especially in LMICs. NIMH's commitment to speculative neuroscience research is likely to face the same translational difficulties as NIDA has with its focus on addiction neuroscience research at the expense of public health interventions and health services research. In the future, a greater participation by addiction neuroethics may improve debates on how funding and other resources are allocated towards addiction research globally.

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