

On the need and contents of a specific addiction recovery research agenda

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Abstract

Background: For decades knowledge about the etiology, epidemiology, neurobiology, typology, and treatment of addiction in various populations has been well documented and widely disseminated. In more recent years, there has been a growing interest in investigating the prevalence, multiple pathways, and mechanisms that facilitate sustained remission and long-term stable *recovery*. Such an endeavor is predicated on the belief that discovery of not just more effective short-term stabilization and addiction treatment protocols, but also how people achieve long-term recovery will help ameliorate current addiction crises. Such experiential knowledge could inspire and inform the testing of new service strategies to meet the dynamic recovery needs of diverse populations—services that could be coordinated with, or supplant, existing ones toward the goals of engaging affected individuals and families earlier and better supporting them across the long-term stages of recovery.

Argument/Analysis: The “why”, “what” and “how”, involved in creating and pursuing a recovery research agenda is described, with detailed attention given to twelve significant research dimensions that promise to enhance understanding of the multiple recovery pathways and mechanisms and thereby improve the precision, nature, timing, and scope of services. The article also describes how best to engage with recovery communities cross-culturally to obtain the most accurate, informative, and beneficial results.

Conclusions: A new science of addiction recovery promises to reinvigorate and vitally inform clinical and public health efforts in ameliorating endemic harms related to addiction.

KEYWORDS

addiction, agenda, problem resolution, recovery, remission, substance use disorder

INTRODUCTION

For decades, knowledge about the etiology, epidemiology, neurobiology, typology and treatment pertaining to and addressing alcohol and other drug (AOD) disorders in various populations around the world has been well documented and disseminated [1–6]. In more recent years, there has been a growing interest and trend to investigate the prevalence and the multiple pathways and mechanisms that facilitate and help explain sustained remission and long-term stable AOD disorder recovery [7–10, 11]. Such endeavor is grounded in the belief that understanding not only effective short-term stabilization and

treatment protocols for AOD disorders, but also how people achieve long-term stable recovery, will inspire and inform new services that can meet the dynamic recovery needs of diverse populations—services that could be aligned and coordinated with, or supplant, existing ones working toward the goals of engaging affected individuals and families earlier and supporting them across the stages of long-term recovery [12–14]. In this article, we describe the ‘why’ (the rationale for recovery research), the ‘what’ (the specific aspects that need to be researched) and the ‘how’ (the ethical procedures for conducting such research), in arguing for an expanded recovery research agenda. It is hoped that this agenda may help national governments

and international agencies formulate research targets and priorities across broad biopsychosocial public health and health service domains.

WHY

First is the question of why an explicitly defined recovery research agenda is needed. Four primary arenas of knowledge, or ways of knowing, exist within the AOD arena: (i) experiential knowledge; (ii) public and cultural perceptions; (iii) professional/clinical knowledge; and (iv) scientific knowledge. Extensive studies have been published on addiction and its related pathologies and brief clinical interventions [6, 15, 16], but until recently, only a paucity of material existed from the standpoint of science about the prevalence, pathways, processes, styles and stages of long-term personal and family recovery across the continuum of care, beyond initial stabilization and brief treatment.

At the turn of the 21st century, people in recovery and their allies launched a new recovery advocacy movement [14, 17, 18]. They proposed shifting the center of the AOD arena from pathology and brief intervention paradigms to a resilience and recovery paradigm. Recovery advocates championed the reality of recovery and challenged the professional/scientific community to measure its population prevalence. They affirmed the existence of multiple pathways of recovery and challenged scientists to map such pathways [19]. They argued that recovery is as dependent on previously dormant internal and external assets as it is on personal vulnerabilities and pleaded with the professional and scientific communities to extend their focus from pathology assessment to the assessment of personal, family and community recovery capital [20]. They lamented that some of the most critical questions related to long-term recovery had yet to be addressed by the research community and advocated in support of an expanded recovery research agenda.

We believe there is legitimacy and import to such requests. The shift to a recovery paradigm, and within that shift the pursuit of a recovery research agenda, is filled with hazards and opportunities. Such a shift requires deep exploration of some of the most contentious issues within the field, with outcomes profoundly affecting individuals, families, organizations and communities [6, 7, 21, 22, 23].

WHAT

The second foundational issue involves the most critical questions that we believe need to be addressed within national recovery research agendas. We briefly note 12 critical dimensions of recovery that warrant focused attention to varying degrees.

Definition and measurement of recovery

Creating an encompassing definition of recovery has garnered much attention and discussion in the past 20 years. Some of the most popular definitions are listed below along with their different key elements

(Table 1). No science of addiction recovery is possible without a working definition that meets the criteria of precision, inclusiveness, exclusiveness, measurability, acceptability and simplicity [14]. Comparing research findings across studies is only possible and productive with a shared definition of recovery and common elements of measurement. The implications of such a definition extend far beyond the scientific community to who is married or divorced, who retains or loses custody of their children, who goes to jail or is freed, who is hired or fired, who is approved or disapproved for a loan, who is accepted or rejected for college admission, who is deemed worthy or unworthy as a friend, and so forth. Recovery definitions and measures that serve our research agenda must move beyond vague, aspirational language to achieve the clarity, precision and operationalization that its import demands.

As noted by Kelly and Stauffer [31], there are subjective and more standardized, objective, ways of measuring 'recovery', with several studies now documenting subjective self-defined recovery status and prevalence rates, but only one that we know of that has examined specific recovery prevalence and utility using an objective operational definition [26, 31]. We realize that creating a measurable operationalized recovery definition is not easy in a multi-dimensional construct like recovery, where measurement thresholds (e.g. what level of any specific recovery subdimension must a person achieve before it is considered to have prognostic significance) and durations (e.g. for how long must that element endure at that threshold for it to be considered to have prognostic utility) must occur to be able to inform answers to the kinds of serious questions noted above (e.g. whether someone should be denied child custody or not) [31]. Several very well-conceived and constructed measures of recovery-related change exist, but while useful in their own right, these are mostly dimensional process measures of improvements in psychosocial status and functioning [32–34], and cannot yield standardized, objective, recovery prevalence rate data or provide thresholds for deciding important socio-legal decisions (e.g. child custody), such as can be done with objective criteria for diagnostic remission. Operationalized definitions are emerging [26], and are shown to have potential clinical and public health utility [31], but there remains a tension between measurable operationalized definitions, which typically require narrower and more concrete elements involving thresholds and durations, as noted above [26], and the often broader descriptive conceptualizations of 'recovery' as including multiple indices of functioning, emotional growth and psychological wellbeing. We argue that we need more tests of the former (operational and testable definitions) and not of the latter (descriptive definitions) [25].

Neurobiology of long-term recovery

Tremendous progress has been made in recent decades in unraveling the neurobiology of addiction [6, 35], while far less attention has been devoted to unraveling and disseminating information on the neurobiology of short- and long-term addiction recovery [7]. People seeking and in recovery, and their caregivers, need normative data on the degree and stages of neurobiological repair following recovery

TABLE 1 Some common addiction recovery definitions.

Source/organization	Recovery definition	Key elements/themes
American Society of Addiction Medicine (ASAM) [24]	The ASAM defines recovery as an active and ongoing process of sustained action that addresses the biological, psychological, social and spiritual disturbances associated with addiction. It is a path to improved quality of life through a consistent pursuit of abstinence, improved behavioral control, relief from symptoms and enriched relationships	Focuses on the broad multifaceted and dynamic nature of recovery
Betty Ford Institute Consensus Panel [25]	A voluntarily maintained lifestyle characterized by sobriety, personal health and citizenship	Focus on sobriety, personal health and citizenship as defining features
National Institute on Alcohol Abuse and Alcoholism (NIAAA) [26]	Remission plus cessation from heavy drinking	Focus on diagnostic remission and no more than low-level alcohol exposure that does not exceed NIAAA-defined guidelines for low-risk use
National Institute on Drug Abuse (NIDA)	Recovery from drug addiction means a person stops using drugs and starts to lead a healthy, productive life	Abstinence, health, functioning
Recovery Science Research Collaborative [27]	Recovery is a dynamic process involving sustained improvements in biopsychosocial functioning and wellbeing, which may or may not include abstinence, and which involves growth, connection and purpose	Dynamic process, wellbeing, connection, growth, abstinence-optional
Substance Abuse and Mental Health Services Administration (SAMHSA) [28]	A process of change through which individuals improve their health and wellness, live a self-directed life and strive to reach their full potential	Emphasizes process, health, self-direction, purpose and community participation
UK Drug Policy Commission (UKDPC) [29]	The process of recovery from problem drug use is characterized by voluntarily sustained control over substance use, maximization of health and wellbeing, and participation in the rights, roles and responsibilities of society	Emphasizes personal control over substance use, health and wellbeing, and social reintegration
White & Kurtz [30]	The experience (i) through which formerly dependent persons resolve alcohol and other drug problems, (ii) heal the wounds inflicted by active addiction and (iii) actively manage their continued vulnerability to relapse, while rebuilding meaningful and productive lives	Healing, ongoing management, meaning and productivity

initiation, and caregivers need science-informed guidelines on how to best provide specific recovery support that can aid or even accelerate healing. Pathology-focused scientific findings that elicit despair and professional/public passivity are distorting and counterproductive if they do not include recent research findings on brain resilience and recovery that inspire hope and recovery aspirations. Similarly, there is a need to better align pre-clinical animal research with emerging neuroscience on resilience so that such models can inform and confer greater benefit to understanding recovery. Broader biobehavioral assessment that includes neurobiological findings coupled with measures of psychosocial functioning will also help to

uncover the robustness of brain-behavior links; whether and how, for example, potential recovery-related gains in functioning may be possible even when observable neurobiological deficits persist, and vice versa.

Incidence and prevalence of recovery

Governments often meticulously measure year-to-year trends in the incidence and prevalence of AOD use and the toll of addiction via death, disease, and multiple social and economic cost categories [16,

36] but, until recently [10, 16], have not assessed parallel trends on the incidence and prevalence of recovery. Recent recovery prevalence [8, 37] and life in recovery surveys [10, 38–42, 43] are challenging many prevailing myths about addiction recovery—at least subjective, self-defined, recovery, as noted above. Though this has begun in countries such as the USA [16] and the UK [40], further international efforts are needed to integrate recovery-specific and related questions into existing population-based substance use and broader public health surveys. Targeted interventions may not be possible unless we are able to regularly measure with whom and where recovery is and is not flourishing. Recovery prevalence in and of itself may well constitute a valuable form of community recovery capital, as a greater number of observable successfully recovering role models across societal strata may be able to help reduce stigma and attract and engage others into the recovery process; we need to know if such community recovery capital is increasing or decreasing and which subpopulations are and are not achieving sustainable recovery. As noted above, however, if we are to move beyond estimating rates of subjectively defined ‘recovery’, consensus will need to be reached on standardized objective criteria specific to addiction recovery [31].

Resolution and recovery across the severity spectrum

Alcohol and other drug (AOD) problems exist on a spectrum of severity, complexity and chronicity, and their course and outcome are highly influenced by levels of internal and external recovery capital. Studies of such problems in clinical populations generally portray such problems as severe, self-accelerating and resolved primarily through involvement in specialized addiction treatment, post-treatment recovery mutual aid participation and lifelong AOD abstinence. Studies of AOD problems in community populations conclude that most such problems are mild to moderate, transitory and are resolved without specialized professional care or formal peer recovery support. Such transitory problems are most often resolved via maturation, change in life circumstances, improved coping skills and the deceleration rather than complete cessation of drug use [8, 40, 44, 45]. The challenge we face as a field is avoiding indiscriminately transferring knowledge acquired from one population to the other as we disentangle, reconcile and disseminate these findings. Research is needed to understand which specific phenotypes of substance involvement and impairment might be more likely to follow which type of trajectory and achieve and maintain which outcomes.

Pathways and styles of recovery across diverse geographical/cultural/religious contexts and clinical subpopulations

There is much to be learned about the many potential recovery-related changes and outcomes that can occur across the multitude of subgroups that meet the lifetime criteria for an AOD disorder. These

can take the form of sudden transformative change, versus incremental change, or partial, full and amplified recovery, where individuals not only survive but thrive way beyond pre-morbid functioning levels [30]. Recovery pathways can be secular, spiritual or religious [46], with and without embracing a recovery identity [47, 48]. Recovery can occur with and without participation in recovery mutual aid fellowships, and with and without specialized addiction treatment, including the use of medications. Recovery can involve single or multiple pathways (‘dual citizenship’ in recovery) and there can be pathway transitions over time. There is the potential of pathways to unwittingly inflict harm in the name of help. Such work mapping recovery pathways and styles is at an early stage and must be expanded and completed as a science-grounded guide for individuals, families and caregivers [30].

Exploring the varieties of addiction recovery experience across diverse contexts has begun but is far from complete. The extent to which existing knowledge about addiction recovery is applicable across different geographical, cultural or religious contexts remains unclear. There is evidence, for example, of distinct cultural pathways of recovery within communities of color [46, 49, 50, 51], but the prevalence and variability of such pathways within these communities remains unclear. Also unclear is the potential for injury in the misapplication of mainstream concepts and practices drawn from existing research to populations not included within those foundational research studies. Given the long history of harm in the name of help in addiction treatment [10, 52], such risk of iatrogenesis must be examined as future studies map the growing varieties of recovery experience and expose any potential risks for exploitation or harm found within those varieties.

Recovery across the life course

The bulk of what we know from the standpoint of science about addiction and recovery is based on studies of people entering specialized addiction treatment in mid-life at late stages of addiction [45, 53]. This resulting knowledge base has until recently excluded two critical groups at the ends of the age distribution of affected persons: (i) adolescents and transition-age youth; and (ii) older adults. How is recovery different when it is initiated at age 17 years rather than at age 35 or 45 years? What role do youth-specific recovery support services such as recovery schools and recovery supports in college settings play [54, 55]. What special obstacles and opportunities exist when recovery is initiated early or late in one’s life [56]. Research touching on such questions can have life and death consequences. For example, there is considerable evidence that a point of recovery stability and durability is reached after 4–5 years of continuous recovery [45, 57, 58, 59], but an exception to this rule exists among a subset of people who experience addiction recurrence after decades of recovery stability. What factors contribute to such recurrences? How can the rapid re-stabilization of recovery be best achieved in these circumstances? These are the kinds of critical questions that lie unanswered within the existing body of addiction-related science [60].

Stages of recovery

Let us for a moment posit five potential stages of addiction recovery: (i) pre-recovery, a period of recovery incubation/priming; (ii) recovery initiation and stabilization; (iii) transition to long-term recovery maintenance; (iv) enhanced quality of global health and social functioning in long-term recovery; and (v) efforts to break intergenerational cycles of addiction and related problems. Nearly everything we know about recovery from the standpoint of science is based on the study of people in the stage of recovery initiation. If we consider the possibility that distinct stages of recovery exist and that the needs of individuals and families evolve across these stages [43], then the mapping of these stages, identifying stage-dependent needs and evaluating stage-sensitive recovery support interventions becomes a critical recovery research agenda item. We have yet to create a comprehensive model of how problem severity/complexity, recovery capital and service needs evolve across the long-term stages of addiction and recovery. Furthermore, the different needs of individuals that may arise at different recovery stages may themselves intersect with a multitude of other variables, including the age at which recovery is initiated (e.g., during adolescence/emerging adulthood vs older adulthood) or sex and gender, which bring with them different life-stage and life-context challenges.

Social transmission of recovery

One of the central discoveries of the recovery advocacy movement is imbedded within the slogan that ‘recovery is contagious’, meaning that recovery may be socially ‘transmitted’ and may not depend solely on the ebb and flow of intrapersonal motivation. Where the latter is often conceived as a pain quotient (‘hitting bottom’), recovery advocates extoll instead the role of hope conveyed by exposure to ‘recovery carriers/champions’—people who make recovery infectious based on the power of their personal story and the quality of their life and character [61]. As noted above in relation to recovery prevalence being a potential form of community recovery capital, such processes of recovery transmission require disentanglement and testing as to whether recovery prevalence could be significantly increased by elevating the density and visibility of recovery role models within a social network or local community. This potential also calls for research into potential recovery cascades—sudden and dramatic surges in recovery initiation—and the factors that might incubate, lead to and sustain such cascades. The key question is whether it is possible to strategically shorten the course of substance use disorders and extend the durations of recovery, amplifying years of recovery achievements and reducing the cumulative toll of addiction-related harm to individuals, families and communities.

Family recovery

The many hundreds of millions of family members affected by addiction globally has been described as ‘a major but neglected contributor

to the global burden of adult ill-health’ [62]. Highlighting the gaps in recovery-specific, as well as other, research on family functioning patterns, help for family members and family addiction impacts globally, Bischoff and colleagues [12] summarize and document the substantial evidence base on the experiences, harms and patterns of support among affected family members, but note that the field overall remains under-researched, under-recognized in policy and under-supported in practice. Their extensive work highlights the fact that the hundreds of millions of affected family members worldwide suffer high levels of stress, poorer mental and physical health, stigma, financial burden and social isolation, yet receive vastly inadequate support from health and social systems. They argue for a multi-layered response encompassing policy changes, practice shifts and research priorities. On the policy side, affected family members need formal recognition within addiction strategy frameworks so they are not relegated to ‘secondary’ or invisible status. In practice, health and social care workers should receive training to sensitively identify and respond to family members, and services should integrate family-oriented support rather than focus solely on the person with the addiction. Clinically, this means expanding evidence-based interventions that address the trauma, coping needs and long-term wellbeing of family members in their own rights, rather than merely as adjuncts to the addicted person’s treatment. For research, more rigorous and long-term, culturally and contextually diverse studies are needed that include and incorporate the affected family members’ voices, examine outcomes from the perspective of families (not just ‘identified patients’) and test interventions tailored to different subgroups (e.g. male partners, low-resource settings). Increasing the visibility and voice of family is deemed essential to mobilize resources and develop meaningful, equitable support systems [12].

McCrary and Flanagan [63] also highlight the fact that while much has been learned about how the family is impacted by addiction and how it may need to, and does, re-adjust and adapt during the early stages of recovery, further studies are needed that can inform the family recovery process and that can guide caregivers in the design and construction of the most effective family support scaffolding that may be needed for different individuals at different stages of recovery and stages of life within and across cultures. For instance, adult parents may well have different tasks and face distinct challenges for adolescent/emerging adult offspring starting recovery than partners or spouses or parents [64].

The importance of family-specific recovery research was highlighted long ago in work conducted by Stephanie Brown and Virginia Lewis [65], in one of the first in-depth studies on the effects of addiction recovery on the family, which drew an unexpected conclusion. They found that recovery initiation could *destabilize* families whose relationships, roles, rules and rituals had for years of active addiction been frozen into self-protective but toxic patterns. Depicting this demand for radical recovery readjustment as the ‘trauma of recovery’, Brown and Lewis called for scaffolding of support through the family reconstruction process—points echoed and amplified by Bishchof and colleagues [12].

Finally, considerable attention has also been given to the intergenerational transmission of AOD problems [66], but far less attention

to mechanisms that may be used to break such cycles and promote intergenerational resistance, resilience and recovery.

Recovery management and recovery-oriented systems of care

In the closing years of the 20th century a growing number of recovery advocates and addiction professionals expressed concern that addiction treatment had become disconnected from the processes of long-term recovery—that far too many patients were being recycled through ever-briefer episodes of treatment without achieving sustainable recovery [14, 67]. This sparked calls to extend acute care models of addiction treatment to models of sustained recovery management nested within larger recovery-oriented systems of care (ROSCs) [68, 69], with ‘systems’ defined not as the treatment system but as the larger mobilization of recovery support resources within the community. At the federal level in the USA, ‘Access to Recovery’ (ATR) created structured ‘service menus’ consisting of curated lists of clinical and non-clinical services from which individuals could choose based on their recovery goals and preferences. These service menus were built collaboratively with community stakeholders and people with lived experience, and included supports such as recovery coaching, peer support services, housing assistance, employment counseling, relapse prevention, transportation, case management, education and support groups. The menus were intended to expand the continuum of care and formally legitimize recovery supports that had traditionally been under-funded and considered ancillary to clinical treatment [31, 70]. Such ROSC models also often involved assertive outreach and early intervention, strengths-based assessment protocol, partnership—rather than expert-based service relationships, evidence-based and integrated treatment methods, assertive linkage to indigenous recovery resources, prolonged post-treatment monitoring and support [71], and, if and when needed, early reintervention [71, 72]. The application of chronic disease principles and practices from primary medicine to the most severe, complex and chronic substance use disorders offers great promise but requires rigorous and long-term evaluation [31, 67].

As research scientists, we isolate and evaluate the effects of narrowly defined interventions, but the greatest breakthroughs in enhancing future recovery outcomes may well lie not within a single new personal or environmental intervention, but in finding multiple interventions that when uniquely combined or sequenced generate dramatically amplified recovery effects. What might lie in our future is the bio/psycho/social/spiritual equivalent of the cocktail that radically altered the course and outcome of AIDS. We need solutions that mirror the complexity of the problems we face. Thus, in addition to the development and testing of new multifaceted programs, research is needed that examines the utility of self-selected ‘treatment and recovery support menus’, the clinical and non-clinical recovery support services of which can be personally combined and strategically sequenced across the stages of personal and family recovery.

New recovery support institutions, service roles and recovery cultural production

For more than 150 years, recovery mutual aid societies and professionally directed addiction treatment programs have coexisted as the two specialized groups offering support to people seeking recovery from addiction. In the past 25 years, new recovery support institutions and roles have emerged that reach people at earlier stages of addiction and offer support over the long-term course of recovery [73]. These new institutions include recovery advocacy organizations, recovery community centers [31], recovery residences [74], recovery high schools and collegiate recovery programs [54], recovery-focused employment programs, recovery ministries, recovery cafes, and recovery-focused sports and leisure activities [41]. Newly conceived peer recovery coaches and recovery support specialists are serving in a wide variety of contexts [75, 76]. And people in recovery are expressing and celebrating their recoveries through the vehicle of recovery cultural production in the arenas of history, language, literature, art, music, theatre, film and public recovery celebration events.

Collectively, these represent efforts to expand community spaces/landscapes in which recovery is welcomed, supported and celebrated [27, 77]. There is a robust body of scientific knowledge about addiction treatment and recovery mutual aid societies, but only a paucity of research on these new recovery support institutions/roles and the extension of intrapersonal research to studies of the physical and social ecology of addiction recovery [78]. Also, as in evidence-based addiction treatment services implementation research [79], the same types of implementation science frameworks and best practices must be researched and applied to the optimal uptake and effective delivery of these newer recovery support institutions and services.

Flourishing/thriving in recovery

Traditionally, addiction recovery has been viewed as a process of subtraction—deleting or decreasing drug use and its progeny of allied problems. But a singular message across most recovery pathways is that recovery is far more than just the removal of drug use and related problems. Recovery in the view of recovery advocates also involves processes of addition (enhancement in global health and functioning and positive reconstruction of the person–community relationship) and the potential for processes of multiplication (getting ‘better than well’ via enhanced acts of citizenship and community service) [80, 81]. The study of thriving, flourishing and mindful citizenship is one of the exciting frontiers of recovery research. We know a great deal about the cost that addiction inflicts on individuals, families and communities, but, until recently, little if anything has been revealed about the assets that recovery returns to individuals, families and communities [82].

HOW

The third foundational question involves the processes through which recovery research should be designed, conducted and disseminated. Put plainly, most of the design and implementation of published studies on addiction recovery have not been directly informed by people in recovery, and nor have the fruits of such research reached the people in greatest need of science-grounded information on recovery in different regions and countries. In this regard, all recovery research efforts could benefit from earlier work on cross-cultural research and the risk of cultural appropriation [83]. We must scrupulously avoid cultural theft: representing ideas and language drawn from recovering individuals and communities of recovery as our own creation, without proper respect, permission, acknowledgement or explanation of the source and historical and cultural context in which such ideas and language were developed. There are two related issues and strategies of import: (i) the need for recovery representation; and (ii) the potential for recovery research; with the latter reflecting more comprehensive and in-depth involvement by individuals with lived experience of addiction and recovery in the design, implementation, documentation, summarization, and publication of addiction recovery science [6, 84, 85].

Assuring recovery representation within recovery research addresses three concerns: (i) the adequacy of recovery representation (beyond token inclusion); (ii) the authenticity of recovery representation (avoiding the problem of ‘double agency’—masking of hidden personal/institutional interests behind the claim of recovery status); and (iii) diversity of recovery representation (demographic, cultural and recovery pathway diversity).

As noted in the mental health field more broadly in describing the principles and practices of community-based participatory research [86, 87], recovery research co-production needs to involve more of a state of co-ownership in which people in recovery participate with other research team members on an equal co-production footing. This means that recovery representatives are involved in all aspects of a study, including topic refinement, instrument development, site selection, subject recruitment, crafting informed consent procedures, data analysis, interpretation of findings, selection of publication outlets, co-authorship or acknowledgement of contributions, selection of post-publication information dissemination outlets and co-ownership of study data. This also means recruiting and supporting researchers with lived experience of addiction into PhD programs, postdoctoral fellowships and recovery-oriented research training environments [84].

The goals of recovery representation and co-production also go beyond enhancing study quality to first adhering to the ultimate ethical guideline of ‘First do no harm’—in this case, to recovering individuals and families and their associated social institutions. Recovery representation and co-production will also help assure study utility. It is not enough to publish recovery research findings in access-restricted scientific journals via articles couched in the equally inaccessible arcane language of science. What is needed is not just the conduct of recovery research, but its translation to enable the liberation of recovery research knowledge to people for whom that knowledge involves life-and-death decisions. To that end, people in

recovery have a key role in shaping the why, what and how of recovery research, and in shaping study conclusions, dissemination venues and the language through which study implications are publicly communicated.

Co-production involves the reciprocity of benefit. If value (e.g. indigenous knowledge) is extracted from a community through a research enterprise, then analogous value should be returned to that community by those responsible for the conduct of the research. If value (e.g. profit, prestige) accrues to those leading a research enterprise, then analogous value should be shared with the subjects/community under investigation or their representative institutions. We have many topical and methodological aspects of recovery research to explore, but we must include in that process the ethics and etiquette of recovery research.

CONCLUSION

Whereas much has been learned during the past 50 years about the causes, consequences, clinical course and ingredients necessary to facilitate short-term stabilization in the care of addiction, comparatively little is known about the factors associated with producing initial and sustained remission and facilitating stable long-term recovery [13, 18]. There are estimated to be tens of millions living such recovery every day around the world [8, 10, 40], yet such populations have largely remained an untapped source of knowledge [8, 14, 88]. There have been recent government initiatives to grow the science base, particularly regarding the clinical and public health utility of a variety of mostly peer-based recovery support services for different populations in the USA (e.g. the National Institute of Drug Abuse Recovery Research Networks initiative), but much remains to be learned about the dynamic developmental recovery-specific needs of different people seeking and following the many different pathways of recovery. Here we have outlined a potential research agenda based upon our collective decades of focused attention and scientific review in these areas that may be useful in stimulating and amplifying research.

Perhaps, most pivotally, if we are to move beyond descriptive ‘recovery’ definitions and prevalence estimates, based on purely subjective self-defined definitions (although these are also useful), to estimating standardized, objective, recovery-specific prevalence rates that are distinct from diagnostic remission rates, and enhance the value of ‘recovery’ as something separate and useful in its own right [31], then we need to develop testable operational definitions [26, 31]. We also believe that there is much to be gained from a broader, dynamic and developmental, biopsychosocial model that explicates the complex interplay of intra- and extra-individual contextual factors across multiple recovery pathways over time—but a model that once again moves beyond purely diagnostic remission [31, 78]. In the spirit of ethics and fairness, we also advocate for a greater active incorporation of the voices of lived experience—and the personal expertise that comes with it—of those individuals and family members who have suffered first-hand from the effects of addiction in recovery research design, measurement and execution. Such experiences are likely to

enhance the efficiency and precision of research efforts and thus also the ultimate yield from research investment. In turn, these populations who contribute, and stand to benefit from the new information gained, should be the most immediate beneficiaries of any expanded knowledge, disseminated to them in ways that they can understand and use. Enhanced knowledge in these areas has the potential to further shift the clinical and public health addiction paradigm from one involving mostly brief, discrete, episodic, clinic-based, interventions, to one that involves building a broader, more cost-effective and more finely-tuned public health infrastructure involving interwoven clinical and community services informed by lived experience [13].

AUTHOR CONTRIBUTIONS

William White: Conceptualization (lead); writing—original draft (lead); formal analysis (lead); methodology (lead); writing—review and editing (equal); **John Kelly:** writing—review and editing (lead); conceptualization (supporting); writing—original draft (supporting).

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None.

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