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# Social Network Dynamics and Recovery Capital in Substance use Disorder Trajectories: A Process-Based Conceptual Review

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**ABSTRACT:** Substance use disorders (SUDs) are usually analyzed by describing factors that are thought to increase risk. However, the real and changing social relationships of individuals are networks of social norms, social identity and social capital. The purpose of this review is to analyze social network dynamics and social capital within the framework of mobilizing resources to and for recovery. This review looks at social capital and the structural and functional aspects of social networks that determine a person's position, "social relationships and connections in networks. These aspects and networks may also influence the decision to use substances and engage in recovery. This review synthesizes existing knowledge and identifies gaps. It uses social networks to articulate, analyze and integrate social capital, psychosocial change during and after treatment and social recovery. Social networks provide a sense of social identity and social capital, as well as recovery resources, but may also serve to provide social norms and social controls to use substances. Social recovery capital encompasses a range of potential resources and constraints in social networks, but methods to accurately measure recovery capital are in their nascent stages. This review merges social network analysis and social recovery capital. The aim is to develop a framework that encourages integration of various theories and provides direction for change in substance use trajectories. The central hypothesis is that substance use recovery trajectories may change if those affected by the trauma of substance use are able to establish and engage in social relationships to reinforce treatment and recovery and expand opportunities to live by valued social identities.

## 1. INTRODUCTION

Social context is one of the phenomena that helps explain substance use disorders. Social context, however, can be rather ambiguous. I consider social context as the ever-changing social relationships that influence and shape social norms and behavior. A social relationship can be positive or negative, and it can provide opportunities for social support. A social relationship, for example, a friend, coworker, family member, or treatment partner, may set social norms and expectations. Some social relationships can be rigid or give people a social status. Some social relationships can be supportive, while others may require a person to alter or change their behavior or social norms in order to adhere to social expectations. Social relationships can help a person change their behavior and adapt to new social norms.

This paper looks at social relationship networks and social capital for recovery. This paper will not provide a broad-based review of adversity experienced in childhood and other social and economic conditions. The focus of this paper will be social relationships. It will explain how social relationships shape social norms and behavior throughout the process of changing social norms and behavior. This paper will also summarize the available social science research and provide integration of other social sciences and humanities research.

The goals are to clarify the composition and structure of networks, and to identify the functions of networks. These goals also include summarizing the body of evidence regarding networks, interventions, and aftercare. Additionally, this summary seeks to consider recovery capital as a finite resource. Finally, this summary will develop a research tool for tracking and measuring this capital over time. Not all SUDs are attributable to network-related reasons. Not all network interventions for SUDs result in recovery.

Certain psychosocial explanations for SUDs segment relationships into risk/protective factors. Ambivalence is often absent in these explanations. A friend may be a bad influence and an enabler. A family member may be a good influence and may support the decision to go into treatment, but the family member may do so by expressing shame. A positive "influence may be found in a support/recovery group, but group meetings may be inaccessible due to lack of transportation, child care, or other competing commitments. Social support may be offered in many different ways, and may carry a negative or a positive influence.

Networks are fluid; individuals move between and create new social groups. Relationships change and reinvent throughout a person's life. Kumar et al. (2021) studied randomized trials of family and social network interventions for the treatment of opioid use disorder. The authors found eight trials, and of those, five documented improvement in treatment outcomes. Family and social network interventions showed the most favorable outcomes. The authors concluded that, despite the lack of a sufficient body of evidence, family and social network interventions may be a viable resource.

Recovery capital focuses on the resources available to a person in recovery, and the barriers to recovery. The measurement of recovery capital, however, is not standardized. Bunaciu et al. (2024) identified 69 measurement tools assessing a range of recovery capital constructs. To be useful, a resource must be congruent with the individual's values and align with the individual's recovery goals. This research considers how network structure and flexibility affect the scope of resources available to an individual.

## 2. REVIEW APPROACH AND CONCEPTUAL SYNTHESIS

This paper utilizes a process-oriented, conceptual review approach and incorporates pertinent concepts, theories and evidence on social networks, social recovery and psychosocial change, as well as treatment and recovery capital. Relevant literature was identified and appraised based on the functions and changes in social relationships, along the pathways and ways in which individuals mobilise and activate their recovery capital, and changes in their substance use. The studies and reviews were identified and appraised based on their contributions to the understanding of social networks and measurement of recovery capital. The focus of this synthesis is to bring out the types of questions addressed by the evidence considered and to interpret and explain the findings of the studies based on their treatments, designs and settings. A qualitative synthesis was performed to comprehend and analyze the views, perceptions and meanings expressed in the studies. The review integrates and synthesizes the definition and description of treatment and recovery-related constructs. The review incorporates and utilizes evidence from a range of treatment-related and recovery-related fields. The review does not present any participant-level or effect size data.

The synthesis is presented primarily as a process model rather than as a listing of risks and/or protective factors. This model differentiates the composition, structure and function of social networks, and examines the influence of network features such as norms, modeling, and/or physical or verbal aggression; and considers the role of network changes. While the framework focuses on the composition, structure and functions of social networks, it permits evaluation of evidence generated from different research traditions. The author of the framework does not contend that particular social network features are the determining factors of variance in individual behavior.

A social network describes the relationships among individuals and groups. An ego-centered social network describes relationships of an individual (ego) and the social actors or alters that ego integrates in his/her social world. Composition concerns the social actors or alters that are part of an ego's social world. Structure is determined by the nature of the connections between social actors (e.g. density, isolation). Function is determined by the nature of the ties that connect social actors (e.g. care, control, conflict, access). These aspects of social networks need to be studied and analyzed separately (Stone et al., 2016).

Recovery capital is the total resources available to an individual, group, family or community that is utilized to initiate and sustain recovery (best and Hennessy, 2022). Recovery capital is classified as social, community and personal (Hennessy, 2017). Social recovery capital encompasses the individual's social connections and support. Community recovery capital consists of the community's willingness to participate and contribute in ways to promote the recovery of its members. Some of the community's resources may be insufficient, unsafe or unavailable, thus limiting the community's capacity to participate in recovery activities. It is, therefore, important that community resources and participation be evaluated for potential and viability.

Recovery may entail positive and/or negative changes in an individual's self identity, belonging, social roles, social activities and social relations. Substance-related changes may include transformation in an individual's social identity, social role and social relations. Vigdal et al (2022) evaluated the role of communities in recovery. The ideas described in the article are grounded in the belief that the individual is a member of the community and is recovering, but is not defined by the substance-related issue, and may include the individual's recovery identity. Reciprocal and sustained relationship may foster the individual's sense of self and identity.

The substance use rate among members of one's network may impact the availability of substances, social norms regarding substance use, as well as rewards and reinforcement. Being friends with people who use substances does not mean one's friends' peers positively reinforce substance use. Often times, friends share peers, and these peers may also positively and negatively influence an individual. Distinguishing positive influence (i.e. desistance) from negative influence (i.e. persistence) usually takes time, and highly complex networks are common and do not have to be linear.

Networks can impact the intensity and scope of social control and social conformity. Positive influences can model and socialize people to perform activities and reinforce positive social norms. Likewise, negative influences can model and socialize people to perform and reinforce activities that are likely maladaptive. Ego-centered networks can positively influence mental health, and identify opportunities to cope with stress and socialize people to engage in adaptive and fulfilling social activities. Also, health-related and substance-free activities can be positively influenced and reinforced by adaptive social networks.

Activities can be negatively influenced and reinforced by social networks to use substances. Activities can be positively reinforced and influenced to be health-related and substance-free by social networks. The goals of health-related social activities can be positively influenced to bring about changes in mental health and create opportunities to cope and adapt to stressful situations. Positive social influences can also be reinforcing and model fulfilling social and health related activities.

Digital technologies allow different ways of providing mutual support across geographical borders. These technologies include websites, apps, forums, social networking sites, and others. Bergman et al. (2020) noted that the body of evidence related to this area of study was scant, and consisted primarily of qualitative and/or observational studies. Face-to-face support and digital support should be viewed as complementary. Digital support, for example, may help individuals who have limited access to support and who live in geographically remote areas.

Positive social influences in a network may contribute to substance use. Use, however, may also be rejected in the presence of alternative activities/rewards. As with other forms of social behavior, the presence of substance use in a social connection does not guarantee that the individual will also use the substance. It will depend on a number of factors including the nature of the substance, presence of social supports, and the values and beliefs of the individual.

Substance use creates networks focused on the use, and changes the individual's social environment. Social networks may limit use by, for example, shifting the individual's social supports to different social connections who do not use the substance. The reciprocal nature of social relationships means that use also affects social networks. This relationship, however, may vary in strength depending on the social environment. It is possible that, in some cases, a change in the individual's social environment may occur prior to and independently of a change in an individual's substance use.

Those like family members, partners, friends, employees, and volunteers can help identify and connect people to services. The fear of losing social supports and being stigmatized may prevent people from accessing treatment. Network support integrated with medication for opioid use disorder has shown promising results and may warrant further investigation.

Supporting a service user to make changes in their social network may lead to improvements in their social routine. This may include having social contacts and social opportunities to fulfill social roles that are important to them (Vigdal et al., 2022). The support of a social contact may help a service user access opportunities to fulfill social roles and social activities. Recurrence of

use may not indicate a lack of motivation on the part of the service user and may represent the loss of other support, increased stress, exposure to use cues, and other environmental changes.

Recovery capital includes the social, economic, and community resources of a service user. Recovery capital may be comprised of a limited number of high quality social contacts. The quality of contacts is more important than the number of contacts. From the available evidence, a small, quality social contact network is important for support and may aid recovery. Recovery capital has been the focus of recent review and research.

A person may not have time or money to provide support. Recovery groups may not be accessible due to financial constraints, disability, language barriers, or social stigma. Structural barriers should be considered when assessing the reasons for a low score. It should be examined whether a given resource is safe and acceptable, as well as whether it is sustainable. When working with limited resources, outcomes should be defined and ownership should be maintained. Working with limited resources should not mean that the expectation is (solely) defined by the achievement of abstinence or a given score.

The review literature supports the need and use of social resources in recovery. More structured literature addresses social capital and recovery, but do not present evidence for causality. Other review literature describes measures of recovery capital and puts forward definitions.

There are a number of limitations in the reviewed literature. First, reversed causality is possible. Second, confounding is also possible. Finally, measures of recovery capital and social support are also heterogeneous. Findings in the field of opioid recovery and treatment may not be applicable to recovery in other substances and may be context-dependent.

## 3. CONCEPTUAL FRAMEWORK AND PROPOSITIONS

The framework in Figure 1, is different from the large, 'multilevel' determinant frameworks. It focuses on the relational processes and transitions within the focal person's network. This framework consists of six elements: network ecology; relational mechanisms; network transitions; recovery capital; a trajectory of the focal person's substance use; and feedback. This framework is a proposal for organization, and not a causal framework that has been validated.

The elements of network ecology consist of the family, peer, employment, treatment, community and digital networks. Relational mechanisms include e.g. normative modeled behaviors, social and emotional support, and conflict. Network transitions consist of e.g. the formation and dissolution of social ties, and the individual's movement across social networks. Recovery capital encompasses e.g. individual's personal traits and recovery, social and community resources. Other potential outcomes of the model, feedback and time, may include e.g. relapse, loss of recovery. Trajectory outcomes may include e.g. the focal person's initial engagement with treatment, continued use, and renewed efforts to remain abstinent. Because the network and social processes change as a result of the individual's interactions with his/her recovery and support network over time, this model calls for ongoing assessment.

The propositions below are hypotheses and are not the result of this review.

P1: Informant reports of tie strength and the nature of relationships will provide more actionable intelligence than simply stating the percentage of contacts that use substances.

P2: Under the condition that support is directed and/or malignant to the goal of engagement, perceived and actual support may differ in their associations with treatment engagement.

P3: The best prediction of an impending change in condition will come from repeated assessments of the social network, and not from the baseline assessment, accounting for the effects of prior treatment, if any, and other confounders.

P4: Improving the social network will enhance recovery capital and improve psychological, social and other outcomes of recovery.

P5: Associations between social network support and the outcomes of mental health treatment will depend upon the type of substance use, the type of treatment, cultural values and preferences regarding the extent of family network involvement.

P6: Diversity of social network will improve recovery outcomes if new social contacts provide safe, usable and approachable resources.

P7: Acceptability of social network interventions will increase if new social contacts are chosen and the user retains the option to maintain ties.

P8: Some new social contacts may improve the potential for recovery. Also, recovery may help generate new social contacts.

A person-centered network map asks about different types of support, including emotional and practical support, substance and treatment support, and company. It tracks tie functions. There is often not sufficient contact. The gap may be about transportation, fear of disclosure, or lack of sufficient substance-free activities. The plan aims to address the gap and strengthen the chosen tie by providing peer and community support. It may address the barrier by planning safer contact.

Family members should be part of the network to the extent that they wish to participate. Benefits may be outweighed by violence and coercion. The level of control and the nature of the evidence supporting care should determine the role of recovery-based digital services. The services should be safe, accessible, and used with care and judgment. There is varying evidence about the effectiveness of digital services (Bergman et al., 2020). Networks of care and support should include individuals and families. It is ethical to support autonomy of the individual to make choice that allow for safety and maintain social connections. Peer networks may provide safety, income and sense of belonging including a secure place to live.

Before, during, and after treating a service user, studies should assess the networks relevant to them. The frequency of assessments should align with the hypothesized process of engagement. Studies should describe the components of the networks including relationship types, and how members of the network are connected. Furthermore, studies should describe whether the support is self-reported or perceived, and the nature of the support. Studies should evaluate the user's 'recovery capital' and include the name of the assessment instrument used, and what the constructs of the instrument are. Assessments may reveal that the user has many supportive relationships but has no means of housing.

It is often difficult to distinguish the positive influences from the supporting relationships in a user's network. This can be overcome with repeated assessments, and given enough time and support, description of the relationships may align with the user's perceived support. Qualitative assessments may reveal the nature of the relationships and the support provided. The threat of loss of support is particularly high in mentally ill and homeless populations. Therefore, assessments should allow the participant to remain anonymous, as far as possible.

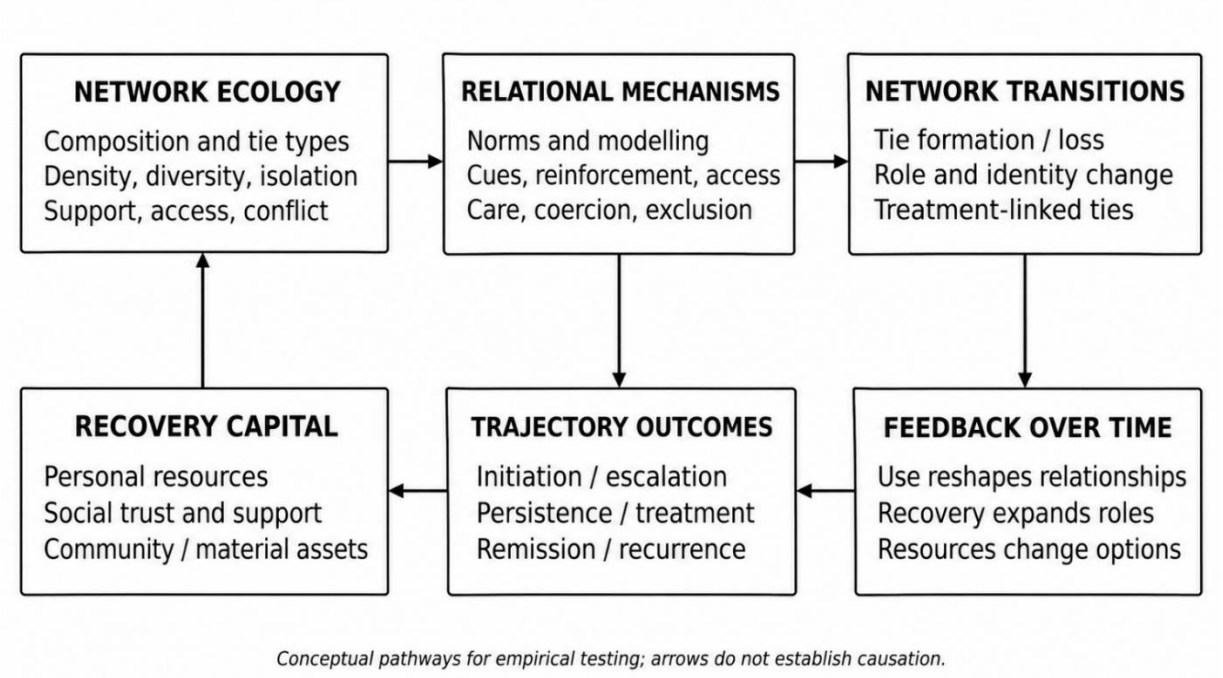



**Figure 1.** Network ecology, relational mechanisms, network transitions, recovery capital, trajectory outcomes, and feedback over time.

**Table 1.** Selected evidence informing the network and recovery-capital focus

| Source | Evidence focus | Contribution | Interpretive boundary |
|---|---|---|---|
| Kumar et al. (2021) | Systematic review of network support in medication treatment for opioid use disorder | Eight eligible studies; five reported significant improvement; family support showed strongest support in this review. | Limited trial count and specific treatment population. |
| Stone et al. (2016) | Review of ego-network methods in SUD recovery research | Shows how network composition and relationships can be measured beyond global support ratings. | Does not establish a universal predictive metric. |
| Vigdal et al. (2022) | Qualitative metasynthesis of social recovery | Highlights community connection, belonging, and social change. | Qualitative synthesis does not estimate causal effect size. |
| Hennessy (2017) | Systematic review of recovery-capital literature | Frames recovery resources as assets and barriers. | Definitions and operationalisations vary. |
| Bunaciu et al. (2024) | Systematic review of recovery-capital measures | Identifies 69 studies and diversity in instruments and constructs. | Measurement diversity limits direct comparison. |
| Bergman et al. (2020) | Systematic review of digital recovery support services | Maps digital platforms and evidence for digital support. | Many studies were observational or qualitative. |

## 4. TECHNOLOGY, RESEARCH DESIGN, AND IMPLEMENTATION

Technology impacts the formation and maintenance of relationships. It can impact the relationships people have in and out of their care teams. In this paper, technology will not be viewed as a replacement for human interaction or clinical care. Technology will be considered as a mechanism to help people contact and be supported by others, even if they are not in the same location, and to identify changes in how and when people work. Technology will be viewed as a means to help connect service providers to people at risk of service disruptions. Many of the questions in this paper will be relational. The main questions will address whether specific technology helps people connect to safe, trusted, and useful relationships and resources.

There are many examples of mobile apps that contain components of psychological or counseling interventions. Some apps provide self-help coping strategies or other types of support. Other apps provide self-monitoring or assist in the development of plans to support people's recovery from addictions. Often, mobile apps are combined with behavioral strategies and other recovery-supportive services, or with positive or negative incentive strategies. The Effectiveness of mobile apps in supporting people's recovery from addiction will depend on the components of the apps, rather than the presence of an app.

The present version of the app does not incorporate all possible features, and not everyrelational or recovery-capital mechanism has been associated with a functional element of the app. As such, not all elements of the app have been validated for changes in network structure. Some features of the app, however, may help users develop a network to support their recovery. The app may help users create a recovery plan, and in doing so, help them identify trusted persons and indicate what roles, if any, those persons will play in helping them achieve their goals. Not all mechanisms of an intervention need to be validated, and it is sufficient for interventions to target the mechanisms most closely related to intended outcomes. Outcomes of an intervention may include whether users of the app engage with the features of the app designed to help them accomplish their goal of recovering from SUD. Interventions may, for example, work to change the relationships of app users.

Telehealth has the potential to help users with SUD by eliminating the barriers of travel and scheduling and by providing follow-up and related counseling and medical services, as well as continuing care after discharge. The authors of a 2025 scoping review of telehealth and telemedicine state that for effective SUD care, interventions need to address relational context, such as the capacity and capability of support structures. Providing support via telehealth has the potential to reach and engage users of care services who are hard to reach. However, care services may be inaccessible to some users due to lack of appropriate technology.

A 2025 systematic review and meta-analysis of remote interventions for adults seeking treatment for alcohol and drug use reported on 34 randomized trials and 6,461 participants. Evidence showed that integrating remote components along with face-to-face support may have positive impacts on relapse and reduce the number of days of use compared to face-to-face support alone. The review noted that the conclusion for the impact of remote interventions that replace face-to-face support was inconclusive for number of days of use, and more than 70% of the outcomes were deemed to have a high risk of bias. Given the results of the review, it may be beneficial to integrate both face-to-face and remote components of a support service. There are certain populations, substances, and support service needs where the digital version of a support service may have positive impacts on continuity and reach.

Digital phenotyping is the analysis of data from personal electronic devices, from which estimates can be made about a person's location, movement, interactions and activities. The indicators can also be used to estimate a person's state of intoxication and support needs and may also be predictive of relapses. The 2024 research concepts paper discussed digital phenotyping and its potential for estimating and modeling substance use and its associated syndemics. The paper underscored the importace of integrating strategies for managing the ethical and legal concerns associated with the research.

The main reason for the enthusiasm for this technology is that traditional behavioral assessment is usually reported by the patient in an episodic and sometimes subjective manner. Changes that occur between the reported incidents or assessments are often difficult to determine. For example, reduced interactive communication may represent social isolation. However, it may also reflect a new work schedule, a deliberate choice to adjust the extent of online social interaction, loss of the communication device, or a preference to communicate in a different way. Passive location sensing has been employed to capture a user's proximity to various locations. The technique provides little or no information on the why or the what of a location, and thus, understanding of behavioral intent often requires input from the user. Increasingly, passive sensing and behavioral modeling are combined with declarative AI to create closed-loop systems whereby undefined behaviors are automatically classified as, for example, relapse, non-compliance, or adverse event.

Machine learning is useful for organization of repeated observations and identification of patterns. It can also be used to adjust the timing and content of digital interventions. Natural language processing can be used to analyze reflections for research. Generative AI can be used to provide psychoeducation and help users formulate questions to ask a clinician. However, it should not be used to diagnosis or replace in-person clincal services. Generative AI can serve as a personal safety net in the area of bounded assistance. It should be designed in a way that helps users identify and access clincal resources. The user should be able to manage and adjust the functions at any time.

Digital support is fragmented due to a lack of integration among different applications and support services. True interoperability can facilitate continuity of care when the exchange of information is appropriate and in the best interests of the individual. A clinical record should not contain extraneous information pertaining to third parties. If information describing the needs of a client and the support required is agreed to by the client, clinical integration will ensure that planning and support coordination is undertaken to meet the client's needs and coordinate support in a timely manner. Information regarding support, including arrangements, may also be recorded.

Ego-network surveys capture the relationships and the support provided to the individual. Reporting of relationships may not accurately capture the support provided to the individual by a particular relationship. Combined with ecological momentary assessment (EMA), relationships may be reported, but the support and experiences associated with that relationship may be captured on an ongoing basis, and may vary. Ecological momentary assessment may capture support encounters, experiences, and mood of an individual. EMA may also be combined with other methods to assess support and relationships.

Managing the extent of repeated assessment is important. Unnecessary prompts has the potential to drive-up attrition, obstruct normal everyday activity, and disproportionately stress and burden participants. It is important that researchers and relevant

stakeholders design the frequency and timing of assessments. Additionally, participants should be able to take breaks from the study if they wish. Researchers have an obligation to pay participants for their time, provide participants with study related materials, and provide participants with study completion rates. Missing data is not random, and is often the result of a participant self-administering a substance or losing study related communication. Researchers should report the level and type of missing data and consider alternative reasons for the data rather than ignoring the missing data.

Wearable technology has allowed researchers to collect real-world data pertaining to participant movement and participant sleep. Researchers have the potential to use a variety of techniques to collect the data they require. Before making any conclusion based on data collected from participants, researchers should account for the differences that exist in the technology used to collect the data, where the technology is worn on the body, the user, the participant's general health, what type of data is required, and the what effects the technology is intended to measure.

There is a difference between a digital marker and a clinical outcome. An individual altering their sleep schedule from, for example, a night owl to a morning person, is a behavioral indicator and should not be interpreted as a clinical relapse. A model may predict changes in a person's routine, but it should not be interpreted that the model captures the reason for the change. A model should be assessed based on the traditional indicators of a diagnostic test, including sensitivity, specificity, positive and negative predictive values, calibration, and reproducibility. A model may achieve a perfect correlation in a validation dataset, but this does not eliminate the possibility that the model creates a false positive alert in the vast majority of cases.

Network data allows researchers to examine the formation and breakdown of interpersonal relationships as they occur in concert with the treatment process and person's recovery. These relationships may be examined at the individual, interpersonal, and group levels. At the individual level, researchers may want to study whether people in the treatment process retain their support network. Researchers may want to study the relationship disintegration at the tie level.

Researchers should be careful in interpreting group level findings and determining individual level processes. The integration of longitudinal network data creates new research opportunities and makes it possible to examine group level processes and the evolution of a community.

Longitudinal network research also has limitations. The names of contacts may not be provided; alters may not agree to participate; the membership of the network may change; and changes in reported connections may be due to recall or the perception of the research participant, not the actual formation or disappearance of ties. Risks to research participants may be reduced through several methods including use of participant-generated names, removing identifiers, and informing research participants that names and other information generated by the research participant about others will not be disclosed. Tests of numerous outcomes should be pre-specified.

The basic difference between prediction and causal inference is that the former requires evidence to show that a particular case is likely to happen, while the latter entails making a judgment on the basis of rationale as to what may occur in a case under specific assumptions. It may be predicted in a digital model that a participant may become disengaged based on a change in the participant's communication and appointment patterns as well as change in the participant's sleep patterns. A failure to engage in communication may not always lead to disengagement. In this case, disengagement may occur due to other external factors, for example, the participant may be engaged in other activities, like work, and may be sick. Digital models may also play an important role in predicting other phenomena.

Distinctions should be made with respect to certain types of systems. A system may depend on a high-performing model to achieve its goals. That model may discover and implement an approach to the problem that may be inequitable and/or unrelated to the mechanism that can be modified. Reliable evidence regarding the impact of an approach to an inequitable problem would need to come from other methodologies such as randomized control trials. The model should be trained to predict the desired outcome; datasets should not be allowed to leak across distinctions made for the training and testing of the model. If the model is to be implemented in a clinical setting, it should be evaluated to determine whether or not it provides better care to patients, and if it helps guide the clinicians using it.

Persons who consent to have their data recovered electronically should have an understanding of the process that will be employed to collect the data, including whether it will be collected actively or passively. It should be made clear to whom the data will be given, how long it will be kept, if it will be given to service providers, will the data collection affect the individual's access to other services, and will the data collection impact the individual's overall care.

It is reasonable to assume that if a participant refuses to allow data to be collected in a certain way that it will still be permissible to allow data to be collected in a less invasive manner, i.e. it should still be possible to allow data to be collected using less "social" means, and to be collected in less social ways.

Once data collection has been authorized, it should be assumed that consent will need to be continuously reauthorized, especially if the collection is for a long time period or if its scope has been expanded.

Because the data are about third parties, they require special treatment. Data might be pseudonymized; however, reidentification might occur when they are coupled with other data (e.g., time and relationship data). Network data might include sensitive and stigmatized information, e.g., participation in substance use treatment, use of substance, family conflict, etc. There are many methods to safeguard the data, such as data minimization, access management, and data retention, as well as clearly defining how incidents are managed. Researchers must have a justifiable reason for collecting the contact information of alters. There must be justified consent for the collection of that information.

There are many demographic differences among individuals which might be reflected in the differences in the use of digital systems, e.g., age, language, disability, income, rural/urban residence, culture, etc. Depending on the target user group, the differences and variation might reflect the greatest challenges and barriers in the use and access to digital systems. There is a fairness trade-off when continuous authentication is used. Some cultural and individual differences might lead to variation in the amount of communication, e.g., when individuals prefer to communicate using different modes. It is better to assess fairness of a system using a variety of different metrics, e.g., performance, coverage, and trade-off. If a subgroup is not sufficiently covered, the system should communicate it, rather than making assumptions.

Monitoring or restricting a user based on the information they voluntarily provide undermines trust and may result in the user avoiding care. For example, a participant may decide not to disclose information to, or use a recovery app to access, services if the app shares information with a third party (e.g. an employer, insurer, law enforcement agency, family member, or other gatekeeper) without the participant's informed consent and legal justification. Digital technologies should employ a risk-management approach whereby alerts and notifications are used to enable service control and the determination of next steps by the participant. The technologies and governance structures should ensure that information is provided in a meaningful manner and in an understandable format. The structures should prohibit the use of information in a manner that is contrary to the participant's interests and provide an opportunity for the participant to correct the information.

The same trust and transparency should be applied to the routine and emergency services a digital system offers. Automated systems that purport to offer continuous monitoring should not create a false sense of security in users that help will be provided immediately. Crisis instruction and mitigation should be provided based on the service context. If a potential crisis or other emergency is predicted by the system, it should provide information to a clinician or other service worker to support the interpretation of the alert. Clinical safety and service should be the primary concern in integrating technology to provide support and services. The discipline should include systems, processes, and supports to avoid harm to the user and to support the functionality of the technology and system.

Designs for technology-based support need to take unequal access into account. A mobile phone–based service will exclude some individuals because of high costs for and/or limited access to the internet, shared electronic devices, insufficient digital literacy, and disability and language barriers. Stigma may prevent some individuals from using mobile phone–based recovery support. Support systems should provide at least some low-bandwidth and/or telephone-based options. Interventions should be as multimodal as possible, including offline, telephone, and in-person support. The goal is to offer as many options as practicable to ensure that technology-based recovery support is available and that individuals do not have to rely solely on in-person support to be able to access recovery services.

When designing technology-based support, the first step should be to analyze the service and define the problem to be solved. This may be high levels of service refusal, disconnection from other clients, inadequate aftercare, and/or disruptive service. Once the problem to be solved has been determined, the next step should be to define the solution at the tech-based service level. For example, to solve peer connection, the service may use a secure, online appointment-scheduling service to remove the requirement for the client to seek out and/or coordinate the appointment.

Local adaptation doesn't mean local translation. It goes much deeper. It encompasses things like local family structures, different types of stigma, language around recovery and accessing services, community members' trust and relationships with service

providers, community members' access to and use of treatment, the role and the relationship of community members and peer groups with service providers and peers, and community members' involvement in each phase of service. Some communities may prefer the use of local peer groups and service providers to support and reinforce positive behavior change. Others may prefer to work with service providers in an effort to retain the element of service anonymity. The level and the type of involvement of service users should be determined by each local community.

All of the above should be reflected in service models in use. A true evaluation of a model should consider the acceptability, adoption, costs, fidelity, usability, and sustainability, in addition to the intended clinical impacts and outcomes.

The main idea in Figure 1 can be developed in a way that allows its direct use in practice. First, a participant needs to represent their network in the way that is most natural to them. Next, those participating need to indicate for each of their ties which functions are provided by those ties. It is also necessary to indicate whether a function is provided in a safe and trusting manner. Next, participants need to state the goal they wish to attain. This goal can be reduction in exposure to a cue, access to treatment, and/or establishment of a community role, and/or development of trust and support (establishing a safe and trusting relationship) via the use of a contact. Finally, participants need to indicate if the goal is a lack of a social, public, or material resource. Based on this, the support action to be taken is defined and agreed upon. The effect of the action is to be reviewed by the participant.

A second principle is that of proportionality. The more intrusive the data collection, the more the need for justification. A clinical question may be answered with a self-reported support map and may not require the use of data collection methods that involve more privacy risks. Sensored data may be permissible where a researcher has concerns about privacy and the field being studied is such that a researcher cannot wait for participants to check in. Each data collection method should be assessed against its risks, benefits and the overall burden it will create for participants. The use of multiple data collection methods should be limited to situations where the overall collection allows a researcher or clinician to address a concern or question that cannot be answered using a single method.

A third principle is that of contestability. Participants must be able to change the classification and definition of locations, as well as communication within a classifiction system. A classification system should be designed so that participants may change it in a way that supports their recovery goals. Each participant must be treated in a way that ensures the classification system helps to answer questions in the way that best supports the participant.

The fourth principle is to evaluate both, clinical and relational outcomes. This includes positive changes in a participant's social system, safety and integration in society, improvement in quality of life, and attainment of personal goals and objectives. Measures should not be limited to the impact of a given intervention on the clinical outcomes of a participant.

The following propositions develop the eight propositions previously stated. They are speculative and not based on established data.

P9. In the context of digital forensics, a comprehensive network assessment, which includes the ability to capture and integrate context reported by participants, is likely to generate more actionable intelligence than passive digital data, which may not differentiate supportive from neutral from harmful.

P10. Digital-based recovery and support interventions are likely to increase beneficial engagement when the digital functionalities are aligned to the need for practical and/or social/peer connection and/or follow-up support, as opposed to when the interventions are generically delivered in an app.

P11. The scope of the impact of telehealth interventions should be evaluated against home situation conditions (including the availability of alternative care in the community, and the individual's digital health literacy and ICT skills) as opposed to simply describing the conditions in the background.

P12. Passive sensing models are likely to be less transportable when validated against new populations or changed context, as opposed to more seamlessly integrating new environments and populations.

P13. Explainable-AI alerts based on behavioral changes will be more tolerable if users have the opportunity to examine the evidence and challenge the analysis, and to determine the response each alert will demand.

P14. The association of recovery capital and other resource domains with treatment outcomes will be best explained by resource profile types than by total scores when social and personal resources are inadequate, and access to treatment is restricted.

P15. Behavioral interventions based on digital networks will have better acceptance if users are empowered to decide who to communicate with. Interventions based on universal network data will have less acceptance, especially in the presence of stigma and relationship issues.

P16. Data collected by wearable or other smart devices will have greater value in behavioral analysis if if creates a meaningful clinical or support change rather than collecting and amassing more data.

**Table 2.** Technology and methods: evidence status and appropriate interpretation

| Approach | Potential contribution | Evidence boundary | Minimum responsible practice |
|---|---|---|---|
| Mobile recovery apps | Self-management, coping, reminders, peer support, recovery planning. | Umbrella-review evidence remains mixed; components differ in support. | Evaluate the active component, engagement, clinical outcomes, and unintended effects. |
| Telehealth / hybrid care | Continuity, reduced travel, remote counselling and follow-up. | 2025 meta-analysis suggests benefits for some remote adjuncts; high risk of bias in many outcomes. | Offer choice, protect privacy, preserve escalation and in-person pathways. |
| Digital phenotyping | Repeated behavioural signals between appointments. | Promising adjacent evidence; not a validated universal SUD relapse detector. | Use consent, ground truth, external validation, calibration, and human interpretation. |
| AI-supported personalisation | Tailored reminders, resource navigation, summarisation, decision support. | Performance and safety depend on task, data, model, and setting. | Bounded use, transparent limitations, no autonomous diagnosis or punitive decisions. |
| Repeated ego-network mapping | Tracks tie formation, loss, function, and changing support. | Sensitive to recall, attrition, selection, and privacy constraints. | Minimise identifiers and use repeated, participant-centred measures. |
| Wearables and multimodal data | Adds sleep, movement, and physiological signals. | Signals are non-specific and vary by device and population. | Report device, processing, missingness, subgroup performance, and clinical utility. |
| Peer and digital communities | Belonging, mutual aid, access to lived-experience knowledge. | Quality, moderation, accessibility, and evidence vary across platforms. | Moderate risk, protect privacy, avoid replacing evidence-based treatment. |

The table distinguishes between what is technically feasible and what has been clinically demonstrated to be effective. We evaluate the utility of newly developed methods by considering the role it is intended to perform and the evidence that supports this role. For example, sensors and algorithms can both be used to capture signals. However, a sensor or an algorithm, in itself, cannot define a social mechanism. Similarly, algorithms and models can identify and represent relationships. However, they do not, by themselves, define what the appropriate or ethical response should be.

One potential short-term objective is the conduction of a longitudinal study that implements a mixed methods design. The study should evaluate individuals with an SUD at the time of their intake to the treatment program, as well as at predetermined

follow-up periods. To the extent possible, the design should integrate the ego-network and recovery-capital assessment tools, along with conventional clinical outcome measures, and behavioral assessments. The study should striveto collect and analyze data according to the selected digital/sensing strategy. Furthermore, to the extent possible, the study should integrate the collection of data to answer the sensing research question. Study participants should be free to choose whether they wish to participate in the digital sensing component of the study and should be provided with information on the sensing research question.

At baseline, participants identified few contacts using participant-generated codes, described contact relationships, and assigned ratings for support and conflict on a 1-5 point Likert scale. Ratings were also made for substance-use exposure, trust, and practical assistance. Recovery capital was assessed for domains rather than as a single construct. Potential outcomes of interest included participant attendance and retention in treatment; participant reports of substance use and symptoms; observation of safety and harmful events to the participant; participant-defined goals for recovery; and participant's quality of life. Justification for the outcome of interest and the time between follow-up assessments was required.

Analyses of longitudinal data should address the order and timing of repeated assessments for the same participant. Ties may also change or be lost over time. Longitudinal analyses should address the reasons for tie change and loss. Mediation and other explanatory models should include reasoned rationale for assumption of temporal order. Prediction models should use independent (hoped for) and dependent (observed) variables from different, preferably large, sample populations to help validate the models.

Qualitative analysis may include participants' perceptions of positive relationships, reasons for maintaining relationships that may appear risky to others, and the role of online contact in building trust. This analysis may also include participants' understanding of their recovery capital. Integration should be shown through joint displays and/or narrative description of quantitative and qualitative data. Divergence should be demonstrated; for example, when participants state that their support has increased along with an increase in control and/or surveillance, this should be shown rather than average support score based on participants' statements. The study should create and implement a fair and consistent protocol for collecting, defining, and analyzing data. The study should publish its analysis plan to provide the protocol, definitions, and procedures for missing data. The study should protect the identities of participants.

When an intervention is being assessed, it should be shown that any differences in the implementation of the intervention is not related to its effects. The safety and acceptability of an intervention may be assessed through a pilot study, but the study should not state that the pilot assessed the clinical effectiveness of the intervention. A pragmatic clinical trial may assess the effectiveness of providing a network-informed support package compared to the status quo; however, all participants should be allowed to receive evidence-based support and interventions. The effectiveness of the intervention may be assessed through a process evaluation to determine if the intervention facilitated changes in the mechanism of interest (e.g. providing support to obtain concrete assistance, connecting to a supportive peer, etc). The design of the assessed intervention should be described.

## 5. DISCUSSION

The framework has three main benefits. First, it focuses on changing relationships as opposed to constant risk or protective relationships. This allows researchers to analyze the different aspects of a relationship (e.g. the function of the relationship, the structure of the relationship, etc.). Second, this framework integrates the concept of relational processes with the concept of recovery capital. The framework also addresses the importance of resources. Third, this framework allows the integration of digital resources. Furthermore, the use of digital resources is to assist in the monitoring of progress, and not to explain processes that are beyond control of the user. Overall, the framework integrates social and relational processes with the control and direction of resources. This framework is useful to carry out both qualitative and quantitative analyses.

The framework also notes that interventions of this nature may have unintended consequences. For example, encouraging a service user to stop hanging out with peer drug users may help to stop being exposed to drug using situation. However, it may also lead to loss of housing. Digital monitoring may also assist in the early intervention. However, it may also compromise trust of the service user. Intervention strategies should be individualized and based on the function of the strategy. The key is to evaluate the function of a relationship and the level of control that a service user has on the relationship.

Technology should be conceptualized as an enabler to core mechanisms. Digital platforms may facilitate meeting individuals. Sensors may serve as reminders or help detect changes in daily activities. Artificial intelligence may help translate and organize

users' information. However, they cannot establish trusting relationships. Similar to other enablers, they cannot ensure the availability and accessibility of services and interventions. The 2025 evidence and the 2024 umbrella review provide insights on type and quality of available evidence. A user-centered and technology-integrated research approach offers the greatest potential to address unmet needs.

Finally, we encourage a user-centered and conceptually integrated approach to the measurement of recovery capital. Similarly to recovery capital measurement instruments, variations in recovery capital network measures may result from differences in the approaches used to define and conceptualize constructs of interest. For cumulative science to be achieved, researchers should adopt or harmonize concepts, methods, and approaches where feasible. Measures and tools should be described to provide transparency and clarify why researchers made particular choices. Researchers should report why and how a specific change to a network measure impacted an outcome of interest.

Technical performance is the extent to which a system meets performance requirements and reliably captures data. Clinical value is determined by whether a given technology improves clinical outcomes such that, for example, clients have improved access to treatment and experienced a reduction in treatment interruptions. User experience is subjective and determined by an individual's perception and experience with a technology. Social consequences refer to how a technology impacts the balance between control and connection, and potential adverse consequences, including increased surveillance and stigmatization.

A basic assessment plan should identify the population targeted by the intervention and the context in which the intervention is to be used. It should identify a comparator and define an outcome of interest. It should describe the time period within which the outcome is to be measured and potential adverse consequences. The plan should define the type and amount of improvement that would be considered meaningful. It should describe the level of false alerts and/or burden that would be unacceptable. If the goal of an intervention is to improve connection and integration, the adverse consequences of increased social control should also be measured. If the goal of an intervention is to improve engagement and connection, and a technology is used to alert staff to engage clients, the assessment should determine if the alerts improve connection and if staff engage in a helpful and timely manner.

Costs and sustainability are important as well. A successful pilot may require research staff and grant money. Routine services require realistic estimates of staff, training, and maintenance. Other considerations include the cost of data storage and cyber security, the availability of adaptive technologies, and how the service integrates with existing work. The economic analysis of a service should take into account the costs of the service and the potential savings related to travel, work shifts to patients, and increased work demands for clinicians and peer workers.

Continuation of a service should depend on the expected value of that service. If constraints make the expected value of a service negative, the service should not be provided. An evaluation of a service should contain a stopping or redesign rule. If subgroup performance is negatively impacted, or data breaches occur, the service should stop and be reviewed. Responsible innovation requires that the service be provisionally offered for evaluation.

A service that is safe and effective for one user or group may not be for another. Just because a service is useful for one user group or purpose does not mean that it is safe and effective for another group. Constant and iterative evaluation of a service and how it integrates with other services should be performed to assess its risk.

The ideas of support and surveillance must be treated separately. Typically, support takes the form of assistance that is given in response to a request and in a manner that allows the person to make the decisions for themselves. Surveillance is typically the result of another person or entity observing or interpreting behavior. Whether a given activity is considered support or surveillance is often determined by the level of control the person being observed exercises. Activities that are deemed support may be viewed as surveillance in the presence of mistrust or if a person believes they are being observed by a superior.

Digital technologies increase the need to be able to distinguish support from surveillance because digital devices are capable of monitoring behavior and capturing information continuously, often invisibly. Because digital technologies are so adept at monitoring behavior, it is imperative that the behaviors and preferences that determine the support and accountability relationships of persons be clearly communicated.

Not all social control practices are harmful. There are practices of social control that allow individuals to support one another in order to achieve positive outcomes such as attendance at treatment and avoidance of high-risk situations. Social control practices become problematic when the means to achieve the control is through the use of physical or psychological coercion.

Thus, a network-informed approach, considers who sets the goals, who holds the information, whether the participant can say no, and how do they respond if they do not agree with the interpretation. The focus of these considerations should be shifts in the practices and policies related to implementation" and research, as opposed to the realm of ethics review.

This perspective clarifies the situation where a system is considered to be technically accurate but deemed to be ethically unsafe. For example, punitive systems that flag people for missing several appointments may be technically accurate, but may contribute to further disengagement. However, if a system alerts the clinician to a potential barrier, such as a patient being unable to attend due to transport issues, and the clinician and patient then engage in a conversation, the system has contributed to addressing an access barrier. From a methodological viewpoint, user-defined relational goals should be placed between measurement and intervention.

## 6. LIMITATIONS

There are a few points to consider before interpreting the findings. The literature encompasses a broad range of substances, populations and treatment situations. Findings in one situation may not be generalizable to another. Networks may be influenced by various factors including social desirability, recall, and semantic differences in the definitions of important relationships, and may impede the ability to distinguish social selection from social influence. The definition of recovery capital may differ from study to study. Due to the aforementioned limitations and the nature of the propositions, interpretation should be conservative and guided by the findings of network assessments which have defined the concepts and addressed confounding and other threats to validity.

## 7. CONCLUSION

The importance of social relationships may be best illustrated by considering how relationships shape a person's identity and sense of belonging. Social networks may evolve according to the person's use, treatment and recovery situation. In the recovery situation, a relationship may be positive in one respect and negative in another; the same may be true of a large, cohesive social network.

The next stage of research on social network and recovery capital should include relational theory, and focus on measurement, longitudinal designs and appropriate technology. The development of digital technology should enhance support and help workers to interpret change, including loss, and not substitute a professional judgment about support, relapse or other critical aspects of care. Network data are always to be read in conjunction with the context and the material situation of the individual in question.

The field should aim to develop best practice by using representative samples and replicating studies, and define and achieve a balance between the benefits of research, and any potential risks to the individual or the community. Research should aim to validate the technology and the core components of digital, and other, interventions. Passive sensing and Artificial Intelligence" should always be used with human oversight and integrity, and where a challenge is possible. It is important to recognize that the field of recovery aims to encourage and enhance the range of personal and social options, including the range of networks, that are available to an individual. Digital technology should aim to achieve the same.

## REFERENCE LIST

[1] Bergman, B. G., Kelly, J. F., Fava, M., & Evins, A. E. (2020). Digital recovery support services used to support people with substance use disorders: A systematic review. Human Behavior and Emerging Technologies, 2, 18–32. https://doi.org/10.1002/hbe2.148

[2] Best, D., & Hennessy, E. A. (2022). The science of recovery capital: Where do we go from here? Addiction, 117(4), 1139–1145. https://doi.org/10.1111/add.15732

[3] Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network analysis in the social sciences. Science, 323(5916), 892–895. https://doi.org/10.1126/science.1165821

[4] Bunaciu, A., Bliuc, A.-M., Best, D., Hennessy, E. A., Belanger, M., & Benwell, C. (2024). Measuring recovery capital for people recovering from alcohol and drug addiction: A systematic review. Addiction Research & Theory, 32(3), 225–236. https://doi.org/10.1080/16066359.2023.2245323

[5] Cloud, W., & Granfield, R. (2008). Conceptualizing recovery capital: Expansion of a theoretical construct. Substance Use & Misuse, 43(12–13), 1971–1986. https://doi.org/10.1080/10826080802289762

[6] Fang, S.-S., & Chen, S.-H. (2026). Digital phenotyping for predicting relapse in psychiatric disorders: A systematic review of passive sensing approaches. BMC Psychiatry, 26, Article 507. https://doi.org/10.1186/s12888-026-08157-z

[7] Hennessy, E. A. (2017). Recovery capital: A systematic review of the literature. Addiction Research & Theory, 25(5), 349–360. https://doi.org/10.1080/16066359.2017.1297990

[8] Jason, L. A., & Ferrari, J. R. (2010). Oxford House recovery homes: Characteristics and effectiveness. Psychological Services, 7(2), 92–102. https://doi.org/10.1037/a0017932

[9] Johannessen, D. A., Nordfjærn, T., & Geirdal, A. Ø. (2019). Change in psychosocial factors connected to coping after inpatient treatment for substance use disorder: A systematic review. Substance Abuse Treatment, Prevention, and Policy, 14, Article 16. https://doi.org/10.1186/s13011-019-0210-9

[10] Kelly, J. F., & Hoeppner, B. B. (2015). A biaxial formulation of the recovery construct. Addiction Research & Theory, 23(1), 5–9. https://doi.org/10.3109/16066359.2014.930132

[11] Kelly, J. F., Stout, R. L., Magill, M., & Tonigan, J. S. (2011). The role of Alcoholics Anonymous in mobilizing adaptive social network changes: A prospective lagged mediational analysis. Drug and Alcohol Dependence, 114(2–3), 119–126. https://doi.org/10.1016/j.drugalcdep.2010.09.009

[12] Kumar, N., Oles, W., Howell, B. A., Janmohamed, K., Lee, S. T., Funaro, M. C., O'Connor, P. G., & Alexander, M. (2021). The role of social network support in treatment outcomes for medication for opioid use disorder: A systematic review. Journal of Substance Abuse Treatment, 127, 108367. https://doi.org/10.1016/j.jsat.2021.108367

[13] Kwan, I., Burchett, H. E. D., Macdowall, W., D'Souza, P., Stansfield, C., Kneale, D., & Sutcliffe, K. (2025). How effective are remote and/or digital interventions as part of alcohol and drug treatment and recovery support? A systematic review and meta-analysis. *Addiction, 120*(8), 1531–1550. https://doi.org/10.1111/add.70021

[14] Lee, J. S., Browning, E., Hokayem, J., Goldstein, R., Torous, J., & Doran, K. M. (2024). Smartphone and wearable device-based digital phenotyping to understand substance use and its syndemics. Journal of Medical Toxicology, 20(2), 205–214. https://doi.org/10.1007/s13181-024-01000-5

[15] Lenzi, L., Ibrahim, A., Brough, D., & Thompson, A. (2025). Digital interventions for supporting alcohol abstinence in aftercare: A systematic review. Internet Interventions, 40, Article 100832. https://doi.org/10.1016/j.invent.2025.100832

[16] Linardon, J., Chen, K., Gajjar, S., Eadara, A., Wang, S., Flathers, M., Burns, J., & Torous, J. (2025). Smartphone digital phenotyping in mental health disorders: A review of raw sensors utilized, machine learning processing pipelines, and derived behavioral features. Psychiatry Research, 348, 116483. https://doi.org/10.1016/j.psychres.2025.116483

[17] Longabaugh, R., Wirtz, P. W., Zweben, A., & Stout, R. L. (1998). Network support for drinking, Alcoholics Anonymous and long-term matching effects. Addiction, 93(9), 1313–1333. https://doi.org/10.1046/j.1360-0443.1998.93913133.x

[18] McLellan, A. T., Lewis, D. C., O'Brien, C. P., & Kleber, H. D. (2000). Drug dependence, a chronic medical illness: Implications for treatment, insurance, and outcomes evaluation. JAMA, 284(13), 1689–1695. https://doi.org/10.1001/jama.284.13.1689

[19] Moos, R. H. (2007). Theory-based active ingredients of effective treatments for substance use disorders. Drug and Alcohol Dependence, 88(2–3), 109–121. https://doi.org/10.1016/j.drugalcdep.2006.10.010

[20] Oesterle, T. S., Hall-Flavin, D. K., Bormann, N. L., Loukianova, L. L., Fipps, D. C., Breitinger, S. A., Gilliam, W. P., Wu, T., Correa da Costa, S., Arndt, S., & Karpyak, V. M. (2024). Therapeutic content of mobile phone applications for substance use disorders: An umbrella review. Mayo Clinic Proceedings: Digital Health, 2(2), 192–206. https://doi.org/10.1016/j.mcpdig.2024.03.004

[21] Pettersen, H., Landheim, A., Skeie, I., Biong, S., Brodahl, M., Oute, J., & Davidson, L. (2019). How social relationships influence substance use disorder recovery: A collaborative narrative study. Substance Abuse: Research and Treatment, 13, 1–9. https://doi.org/10.1177/1178221819833379

[22] Pham, H., Lin, C., Zhu, Y., Clingan, S. E., Lin, L. A., Mooney, L. J., Murphy, S. M., Campbell, C. I., Liu, Y., & Hser, Y.-I. (2025). Telemedicine-delivered treatment for substance use disorder: A scoping review. *Journal of Telemedicine and Telecare, 31*(3), 359–375. https://doi.org/10.1177/1357633X231190945

[23] Ramo, D. E., & Brown, S. A. (2008). Classes of substance abuse relapse situations: A comparison of adolescents and adults. Psychology of Addictive Behaviors, 22(3), 372–379. https://doi.org/10.1037/0893-164X.22.3.372
[24] Room, R. (2005). Stigma, social inequality and alcohol and drug use. Drug and Alcohol Review, 24(2), 143–155. https://doi.org/10.1080/09595230500102434
[25] Stone, A. L., Jason, L. A., Light, J. M., & Stevens, E. B. (2016). The role of ego networks in studies of substance use disorder recovery. Alcoholism Treatment Quarterly, 34(4), 437–447. https://doi.org/10.1080/07347324.2016.1182818
[26] Tracy, K., & Wallace, S. P. (2016). Benefits of peer support groups in the treatment of addiction. Substance Abuse and Rehabilitation, 7, 143–154. https://doi.org/10.2147/SAR.S81535
[27] Valente, T. W. (2012). Network interventions. Science, 337(6090), 49–53. https://doi.org/10.1126/science.1217330
[28] Vigdal, M. I., Moltu, C., Bjørnestad, J., & Selseng, L. B. (2022). Social recovery in substance use disorder: A metasynthesis of qualitative studies. Drug and Alcohol Review, 41(4), 974–987. https://doi.org/10.1111/dar.13434
[29] Villanueva-Blasco, V. J., Eslava, D., Olave, L., & Torrens, M. (2024). Electronic interventions in primary care to address substance use: A systematic review. Addictive Behaviors, 156, 108073. https://doi.org/10.1016/j.addbeh.2024.108073
[30] White, W. L., & Cloud, W. (2008). Recovery capital: A primer for addictions professionals. Counselor, 9(5), 22–27.
[31] World Health Organization, & United Nations Office on Drugs and Crime. (2020). International standards for the treatment of drug use disorders: Revised edition incorporating results of field-testing. World Health Organization. https://www.who.int/publications/i/item/international-standards-for-the-treatment-of-drug-use-disorders