

# Community-based system dynamics modelling of stigmatized public health issues: Increasing diverse representation of individuals with personal experiences

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## Abstract

Utility of community-based system dynamics (CBSD) models on stigmatized public health issues and health disparities depends upon how representative the model is to real-world experience within the community. ‘Personal experience’ participants (PEP), especially from marginalized groups, are essential model contributors but are often underrepresented in modelling groups due to multiple barriers. This study details a method to increase PEP representation for models on stigmatized issues. We use a case study from a CBSD project on health disparities within the association between alcohol misuse (AM) and intimate partner violence (IPV) for Northern Plains Indigenous women. Short group model building sessions were held at three community organizations providing relevant resources. Each model contributed unique system components, and there were few similarities between models. A consolidated model provided a rich picture of the complex system. Adding brief PEP-based group modelling sessions can enhance PEP representation in model development for stigmatized public health issues.

## KEYWORDS

alcohol misuse, community-based system dynamics, health disparities, intimate partner violence

## 1 | INTRODUCTION

System dynamics is an increasingly popular method within public and community health research (Carey et al., 2015; Cilenti et al., 2019) that accounts for system-level complexity. Through simulation and testing causal hypotheses, system dynamics models can inform policy change and action related to improving health (Lich et al., 2013). Stigmatized public health issues (e.g., mental health and substance use disorders, violence perpetration and victimization, and sexually transmitted infections; Stangl et al., 2019) disproportionately impact vulnerable and marginalized populations (groups oppressed or stigmatized due to race/ethnicity, gender, sexual

orientation, socio-economic status and disability; Bayer, 2008; Braveman et al., 2011). Discerning high-efficacy action to improve health and health disparities requires models that account for systemic contributors to inequity. The integration of system dynamics and community-based participatory research methods (e.g., community-based system dynamics [CSBD]; Hovmand, 2014) allows for a holistic conceptualization of health disparities (Apostolopoulos et al., 2018) and evaluation of health equity solutions (Frerichs, Lich, Dave, & Corbie-Smith, 2016; Zimmerman et al., 2016).

In CSBD projects, community stakeholders (individuals with personal or professional investment in the target issue) develop models through activities such as

group model building (GMB; Hovmand, 2014; Hirsch et al., 2007; Vennix, 1999), engaging in a series of model-building exercises (e.g., behaviour-over-time graphs and causal loop diagrams; Hovmand, Nelson, & Carson, 2012). Effective CBSD practice requires including a diverse group of stakeholders representing distinct aspects of the target problem within the community. These groups typically include institutional leaders, subject matter experts, front-line providers of relevant services and ‘community members’—individuals who live in the community and whose interest or experience with the issue is non-professional (a layman’s perspective). When focusing on stigmatized public health issues disproportionately faced by marginalized groups, it is necessary to include community members who have personally experienced these issues (personal experience participants [PEP]; Hovmand, Andersen, et al., 2012). We define ‘personal experience’ broadly as non-professional experience with a public or community health issue, in which the experience has had some effect on an individual and their life. The types of ways PEP experience issues (e.g., as happening to them and happening to family or friends) can be highly diverse, representing the inherent complexity that underlies stigmatized issues. Many stigmatized health issues are also co-morbid and form syndemic relationships (Singer et al., 2017; Tsai et al., 2017), and this co-morbidity can be important to represent. Similarly, not all PEP engage with every institution contributing to the underlying system framing a complex issue (e.g., legal, medical, social services), and engagement/non-engagement with different institutions needs to be included in diverse PEP representation. For example, models of homelessness may require PEP representation for those who have experiences as individuals versus part of a family, those whose experiences with homelessness include unmet chronic physical or mental health needs and those who may or may not have involvement with different institutions associated with the system underlying homelessness (e.g., law/justice and social services/housing).

Many articles on applied community or participatory system dynamics projects for public or community health issues do not clearly discuss PEP diversity (e.g., only defining PEP as active or potential ‘consumers’ of a programme of interest, those with a specific diagnosis). PEP representation is usually discussed in terms of number of participants and varies among studies from no-PEP to PEP-only modelling groups (e.g., Batchelder et al., 2015; Mahamoud et al., 2013; Reno, 2018; Skouteris et al., 2015; Williams et al., 2018). PEP are typically represented proportional to either (a) all other ‘non-PEP’, using individual GMB sessions (one PEP model and one practitioner/community leader model; Fowler

et al., 2019), or (b) all other stakeholders representing different system components in a diverse GMB session (e.g., non-PEP professionals from health care, housing, social services, non-profit leaders etc.; Frerichs, Lich, Funchess, et al., 2016; Weeks et al., 2017). Proportional approaches imply that PEP are a single ‘component’ of the system to be represented, similar to stakeholders who represent different institutions. The typically small number of CSBD participants in a study can therefore force a smaller number of PEP to represent the variety of personal experiences within an overall system. Researchers commonly recruit a diverse array of professionals or academics for modelling groups (Atkinson et al., 2017; Mahamoud et al., 2013). Such recruitment, or at least discussions of this recruitment within articles, rarely extends to PEP (e.g., PEP with experiences in different system areas). The ‘proportional’ approach also assumes that equal representation is equitable representation. However, lower power (political, social, cultural) for marginalized PEP may require over-representation to achieve balance (Pratt, 2019). Finally, recruiting PEP to represent a single ‘system component’ within a group mostly populated by non-PEP ignores any unequal power distribution between PEP and non-PEP, which can inhibit PEP participation (Gaventa & Cornwall, 2015; van Nistelrooij et al., 2012).

Low PEP representation within CBSD projects may be due in part to recruitment and engagement difficulties, a difficulty commonly required to overcome in any community-based participatory research study. Connecting with marginalized and vulnerable populations and engaging with them in collaborative research can take considerable time and effort, due to a variety of barriers researchers must account for. Connections require building researcher–community relationships based on trust and an equitable infrastructure for decision-making and collaboration (Christopher et al., 2011; Collins et al., 2018). Projects that ignore unequal power dynamics (either between researcher and participants or between participants with different levels of social capital) will decrease engagement of marginalized community members (Ellard-Gray et al., 2015). In addition to difficulties commonly faced for community-based researchers, CSBD projects include additional barriers for PEP engagement, as CSBD often requires a sizable time commitment for participation. Individual GMB sessions can span from 60 min to multiple days (Hovmand, Andersen, et al., 2012), and community member engagement in projects can last multiple months (Kiraly & Miskolczi, 2019). Many PEP may not have the necessary resources (time, financial, psychological, transportation) to take part in projects requiring intensive commitment (Bonevski et al., 2014). As researchers

balance time and cost expenditures for deadlines and milestones, recruiting a larger, diverse group of PEP may not be feasible.

## 1.1 | Current study

The current article discusses actions taken to increase diversity of PEP representation (e.g., individuals who have experienced different areas of the system are represented) during a CBSD model development process, while (a) reducing the burden for PEP who otherwise may not have the resources to participate and (b) providing a space in which PEP were on similar levels of power to encourage engagement in groups. We highlight that individual models were more different than they were similar—indicating that representing diverse experiences within the system will result in a richer collective model. We will use a case study of an ongoing CSBD study on two stigmatized topics: intimate partner violence (IPV) and alcohol misuse (AM), with a focus on inequities experienced by Northern Plains Indigenous women. We focus only on the specific models developed under this individual strategy, rather than the CBSD project in its entirety (which would include describing how the research team developed relationships with the community and community members over multiple years through continual informal and formal [community advisory board] meetings, the iterative process of co-developing and refining the research question and modelling activities with Indigenous community members to not only ensure cultural competency but ensure that the modelling process was able to promote discussion of cultural strengths and resiliency, and all other modelling activities and sessions that are still ongoing for this project). It should also be noted that models discussed here are not the ‘full’ and final models of the project, nor are these the only models in this project representing PEP. Specifically, we discuss how three of the individual models developed within this project by specific groups of PEP were unique and collectively contributed to a rich and complex overall model. Additionally, we show that short modelling sessions with multiple groups reduce individual participant burden and increase community member input.

## 1.2 | Case study: Disparities in the association between AM and IPV within Indigenous women

The study described is part of an ongoing CBSD project for reducing alcohol-exposed pregnancy and health

outcome disparities among Indigenous women, by targeting the syndemic association between IPV and AM. The project is based in a Northern Plains small metro non-reservation area with a substantial Indigenous population, and marked disparity between Indigenous and non-Indigenous residents, and involves a community-based partnership between researchers and stakeholders who represent a wide variety of relevant system areas (Indigenous health and activism, justice, behavioural/mental health, child welfare, prenatal and maternal health). Stakeholder partners include both those with personal and professional experience, and public, non-profit and grassroots organizations are represented. Below, we will focus on model development pertaining to the association between AM and IPV, a component of the syndemic association between AM, IPV and risky sexual behaviour that underlies alcohol-exposed pregnancies (Deutsch, 2019; Eaton et al., 2012; Gilbert et al., 2015).

## 1.3 | Background

The bidirectional association between IPV and AM is well established (Cafferky et al., 2018; Capaldi et al., 2012). IPV events are more likely to occur on alcohol-using days (Shorey et al., 2011; Stuart et al., 2013) and within alcohol-using couples (Cunradi et al., 2015; Lipsky et al., 2005). In turn, AM is a coping mechanism often associated with trauma and stress-related events. Repeated increases of AM and IPV can lead to a habitual pattern of partner interaction in which these behaviours become part of a continual cycle of interpersonal conflict (Katerndahl et al., 2014), and patterns can be maintained across relationships (Testa et al., 2003). Proximal and distal influences contributing to the AM–IPV system include intrapersonal (e.g., adverse childhood experiences and coping skills; Flanagan et al., 2014; Strine et al., 2012), interpersonal (e.g., partner AM and conflict; Eckhardt et al., 2015; Golinelli et al., 2009) and community/institutional factors (e.g., involvement with justice system, community disorganization and violence; Cunradi, 2007; Goodman et al., 2009; Macy & Goodbourn, 2012). Both IPV and AM are highly stigmatized (Murray et al., 2015; Schomerus et al., 2011), impacting multiple layers of the system underlying AM–IPV and making it more resistant to change.

Indigenous communities experience disproportionate rates of many public health issues. Critical among these issues is IPV; 84% of Indigenous women and 82% of Indigenous men report lifetime IPV victimization (1.2 and 1.3 times higher than White women and men, respectively; Rosay, 2019), and contexts of such violence

(e.g., severity and relationship/race of perpetrator) are unique compared with other racial/ethnic groups (Bachman et al., 2010). Rates of AM are also higher for Indigenous compared with non-Indigenous communities, although this varies by region (Cobb et al., 2014). Understanding disproportionate rates of IPV and AM requires understanding their origins in historical trauma, that is, cumulative psychological distress from mass community trauma across generations. The subjugation of tribes through violence, forced relocation to reservations or cities, familial disruption via mandatory child enrolment in boarding schools and suppression of cultural practices, language and identity (Evans-Campbell, 2008; Wilmon-Hague & BigFoot, 2008) have affected Indigenous communities since their colonization (Yellow Horse Brave Heart, 2011). Continued oppression and marginalization experienced by Indigenous individuals and communities helps maintain rates of AM and IPV across generations (Burnette & Figley, 2017; Walters et al., 2002). Higher poverty rates, neighbourhood disorganization and less access to health and wellness services (Sarche & Spicer, 2008) also contribute to this system and provide barriers to implement system change through effective programmes. Reservations are further burdened by a complex web of federal and tribal policies that substantially hinder tribal capacity for policing and prosecution of violent crimes (Deer, 2018; Redlingshafer, 2017), especially against non-Tribal (mostly non-Indigenous) perpetrators, who perpetrate the majority of sexual and physical violence against Indigenous male and female victims (Rosay, 2019). Interventions and services to reduce substance use or violence that promote the protective strengths of local Indigenous culture and foster positive Indigenous identities are demonstrably effective, and more so than traditional evidence-based practices developed with initial non-Indigenous communities (Gone & Looking, 2011; Lowe et al., 2012). However, there is still limited access to and sustainability for such culturally based services, even in areas with high Indigenous populations.

## 2 | METHODS

### 2.1 | Participants

Participants discussed below were receiving services from three community organizations, which all have representation on the project's advisory board—Group 1: a faith-based re-entry programme for women who were previously incarcerated; Group 2: a substance use treatment programme for pregnant women and mothers; and Group 3: a domestic violence shelter. The modellers/

group facilitators (the principal investigator and lab staff) received permission from organization leaders prior to participant recruitment to conduct the GMB sessions. Sessions were open to all clients within each organization who were available to participate. There was one modelling session held within each organization. Group 1 consisted of five women, Group 2 consisted of 20 women and Group 3 consisted of four women. We did not collect any identifying information from participants for anonymity. However, we learned during the sessions that the majority of participants in each group self-identified as Indigenous (although this was never asked explicitly by the session facilitators). All activities were approved by the research institution's institutional review board.

### 2.2 | Procedure

#### 2.2.1 | Engaging with potential participants

Before each session, the organization leaders informed clients of an opportunity to participate in a research focus group for which they would be compensated \$50. Organization leaders made sure to emphasize that participation was optional. The research team then scheduled a 'meet and greet' with clients who were interested in participating before the session to discuss the project. During the introduction meeting, we provided a meal and talked with clients about our project and the end goals of the project (developing stronger strategies to address alcohol-exposed pregnancy, IPV, and AM and Indigenous-related inequity within the community). We disclosed our personal interests in and personal experiences with these subjects to facilitate an environment of openness and trust and answered any questions individuals may have had about the project (funding, purpose, other people/organizations involved). Finally, we discussed GMB procedures and the value of participants' stories, highlighting the opportunity to be a co-owner of the model through participation.

#### 2.2.2 | Modelling script/activities

We developed a new script (e.g., a facilitation guide outlining how to conduct the GMB activities) for the three sessions that provided (1) sufficient time to develop a causal loop diagram model while accommodating busy schedules and external demands of participants and (2) accounting for potential emotional or psychological distress brought upon when discussing highly personal issues. After consulting with our community partners

and community advisory board, including our contacts at the participating organizations, we developed scripts to fit a 1.5-h timeframe, focusing on variable elicitation, variable voting (the 'dots' script) and causal loop diagrams. We used an informal 'talking circle' (e.g., Hodge et al., 1996) structure for causal loop development, which included choosing the most popular variable voted on during the dots script, and then having participants discuss how this variable fit in the overall system. This strategy allowed for the conversation between participants to progress naturally and respectfully, with organic introductions of new insights, ideas and themes. The facilitator served as the model illustrator and drew out the system model as the conversation progressed and only contributed to the discussion by asking clarifying questions to ensure the model was being drawn correctly. Given the 1.5-h timeframe, most of the time was devoted to the participants discussing how the variables related to each other to flesh out the causal loop model.

### 2.2.3 | GMB procedure

GMB sessions were scheduled based on recommendation by the organization leaders (when clients had free time). We provided either snacks and water or a meal (if we were conducting a session during a scheduled meal time). Consent forms were discussed by all (potential) participants prior to the start of the GMB sessions, allowing anyone who did not want to participate to opt-out. To provide a confidential and supportive environment, we emphasized the need for confidentiality ('what is said in this room stays in this room'), made sure that organization staff could not attend sessions, made participation as anonymous as possible by not collecting signed consent forms and addressed everyone by made-up names (a favourite colour or flower, or something else they found personally meaningful). We also emphasized that participants should not feel pressured to disclose any personal information, but rather general thoughts and feelings about these issues. To address potential participant distress due to the nature of the conversation, the consent form included counselling resources/numbers that the participants could contact. We also emphasized that participants were free to leave at any time (and could keep their incentive) if they desired. As all three sessions took place within the organization facility, there was staff either on hand or staff we could contact if needed.

After verbal consent, the session started by explaining the operational definitions of AM and IPV (presented in Table 1) and discussing if participants

agreed with these definitions. After agreement (or discussions of what else should be included/changed for the definitions), participants wrote down three causes and three effects for IPV and AM. These variables were placed on a wall and grouped thematically by the facilitators (e.g., variables related to mental health such as depression, anger and low self-esteem). Participants then voted for the most important causes and effects by placing stickers on their top three choices.

Using a large whiteboard visible to the group, the modelling facilitator drew a small causal loop diagram between IPV and AM to provide an example of positive and negative associations between variables. Participants discussed if AM caused IPV and vice versa. They were then asked if these relationships were positive (if one variable changes, the other also changes in the same direction) or negative (both variables change in opposite directions). The group then selected the variable with the most votes and asked about causal connections to IPV and AM, if relationships were positive or negative, and why. The conversation then proceeded organically, as participants discussed and added additional variables and connections (they were encouraged to also add new ones that were not listed during variable elicitation). The modelling facilitator asked for group consensus for each variable and connection added. During times in which the group seemed stuck regarding how to proceed, the facilitator would encourage the group to think about the next popular idea generated during the variable elicitation. This process continued until the allotted hour and a half concluded, after which the participants received their compensation. After the session, we thanked participants, emphasized the importance of their contribution to these models. We also discussed ways in which they could stay informed about and continue to be engaged with the activities of the overall project, such as connecting with us on our project social media pages, as we would be providing opportunities to contribute to models and strategies for programme development in the future.

## 3 | RESULTS

Table 1 presents all variables used in the models presented in this study (Figures 1 and S1–S3). Except for IPV and AM, which were pre-defined, all variables were defined in one of three ways. First, variables were defined through the modelling process when discussing how to translate thematic ideas from the variable elicitation activity to the modelling activity. For example, mental health was characterized by

TABLE 1 Operational definitions for all variables presented in Figures 1 and S1–S4

Variable name	Definition	Groups
Accountability	An obligation or willingness to accept responsibility	1, 2
Alcohol misuse	A pattern of drinking that impacts one's life negatively, potentially harming health and relationships; an individual that continues to drink even after experiencing consequences, needing alcohol to cope with life or deal with daily functions or sacrificing other aspects of life (activities, relationships) to drink	1–3
American Indian cultural identity	Identifying as AIAN; incorporating tribal and cultural knowledge, history and/or practices as a part of one's identity	2
Child removed from home	Legal/institutional intervention (e.g., Child Welfare and Department of Social Services) removing a child from the home and care of his parent or guardian.	1, 3
Children witness IPV in house	Children witnessing IPV within their family (typically parents/adults/caregivers)	3
Childhood home functioning	The quality of the overall relations within a family as determined between social, emotional and behavioural interactions with family members. Also incorporates quality of care/support received by a child (e.g., meeting their physical, emotional and mental needs)	2
Community acceptance of alcohol misuse	Acceptance of AM within a community; perceived norms related to the level of acceptance	3
Community acceptance of intimate partner violence	Acceptance of IPV within a community; perceived norms related to the level of acceptance	3
Community alcohol misuse rate	The rate of AM within a community	3
Community intimate partner violence rate	The rate of IPV within a community	3
Coping	Skills and abilities related to managing feelings and thoughts in a productive, healthy manner	1, 2
Court order to mental health resources	Legal mandate for receiving and engaging in mental health resources	3
Desire to stop the family cycle	Understanding an intergenerational history of violence and/or AM in one's family, wanting to stop transmission to children within a family unit	3
Dire situations	Experiences in which one's life is in danger through either an added	1

TABLE 1 (Continued)

Variable name	Definition	Groups
	threat or the removal of basic survival needs	
Experienced caseworker mistreatment	Experiencing mistreatment (e.g., stigma, shaming, hostility, bias and marginalization) from assigned child welfare caseworkers	3
Family functioning	The quality of the overall relations within a family as determined between social, emotional and behavioural interactions	1–3
Fear of partner	To be afraid of a partner's negative or violent behaviour—especially as directed towards others	2
Healing	Emotional/mental recovery from prior trauma or disorder	1
Higher power	Belief of and faith in a higher power (e.g., power greater than ourselves)—can be reference to a specific religion or spirituality	1
Historical trauma	Collective trauma (e.g., genocide, targeted oppression and violence) experienced by a community or group related to long-term social, mental and physical harm	2
Intimate partner violence (IPV)	The deliberate mental, physical, social, emotional, financial or spiritual harm of a romantic or sexual partner in order to exert power/control	1–3
IPV reporting	Contacting the police to report a case of IPV	2
Justice system intervention	Contact with policing or legal institutions leading to the enforcement of corrective orders	1, 3
Mental health	Absence of negative cognitions, feelings or mental disorders (e.g., depression, fear and anxiety) that impede daily life	1–3
Mental health resource	Resources related to the improvement of mental health	1, 3
Learning about [your] American Indian culture	Understanding of traditional tribal beliefs, norms, customs and practices associated with one's affiliated tribe and familial history	2
Leaving abusive partner	Dissolving the romantic relationship (e.g., breaking up and leaving the house)	3
Pursuing couples therapy	Utilizing couple's therapy to improve the relationship between romantically involved individuals	3
Partner dependence	Relying on your partner for social, financial and mental needs—in IPV	2

(Continues)

TABLE 1 (Continued)

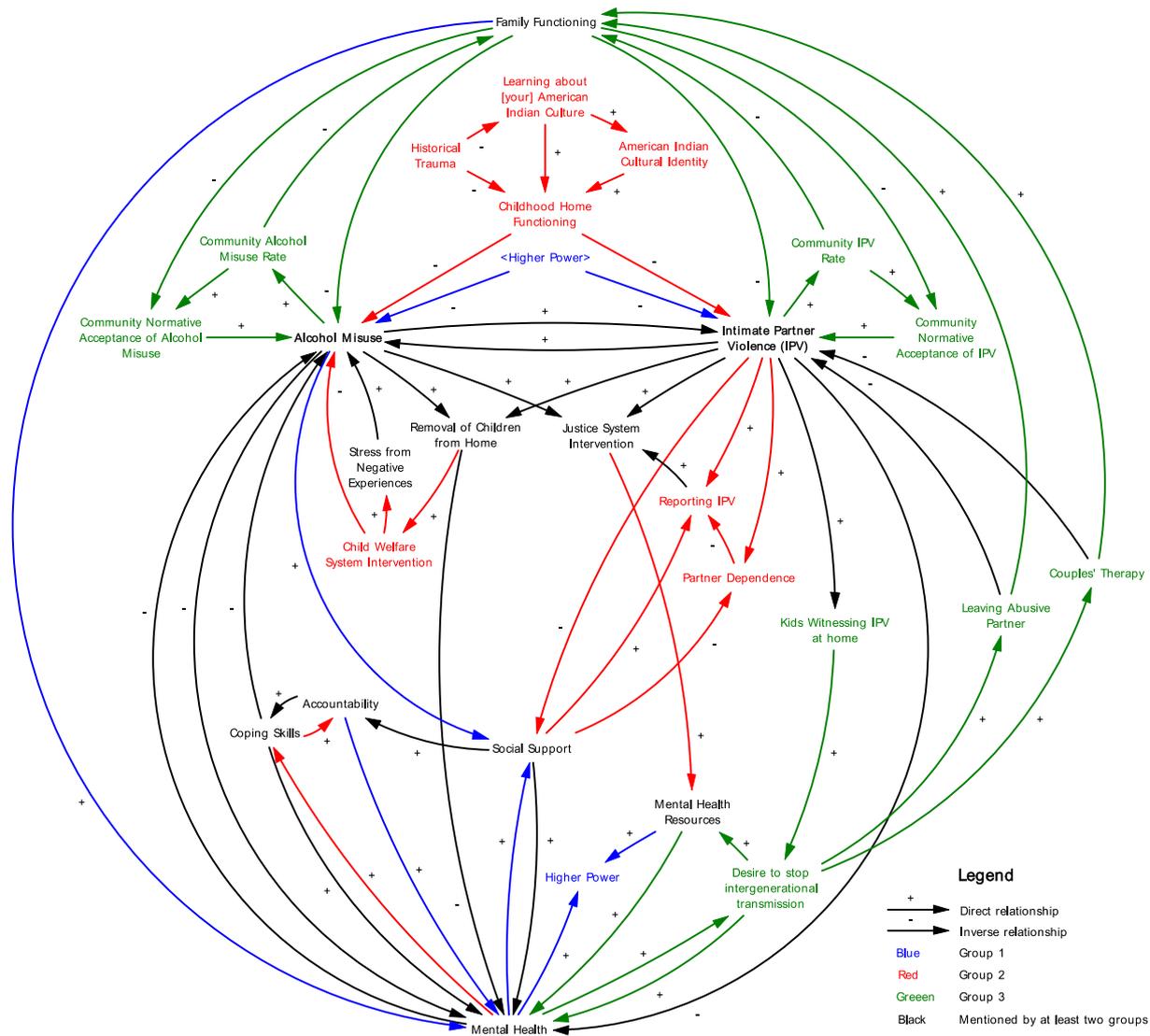
Variable name	Definition	Groups
	relationships, a partner forcing or coercing dependence upon them is a form of control	
Partner willingness to change	Partner's receptiveness to modifying their behaviour (e.g., violent/abusive behaviour), to improve the romantic relationship	3
Relationship functioning	The quality of a romantic relationship determined by social, emotional and behavioural interactions between partners	1, 2
Social support	Healthy, supportive relationships that provide external support and care for individuals	1, 2
Stress from child welfare intervention	Stressors that arise trying to fulfil and comply with the regulations and obligations necessary for reunification with one's child through child welfare and legal institutions	3
Structured and caring environment	An environment in which there is structure regarding activities, duties, interactions and meeting needs framed by a culture of support and encouragement of others	1

determining a reasonable neutral variable (not inherently positive or negatively valenced) that would capture variables listed during the elicitation process that shared a similar (e.g., self-esteem, depression and insecurities). Second, variables were defined through the discussion and development of the model. For example, when discussing the connection between 'IPV' and 'jail' (an effect variable listed during the elicitation session), participants noted that 'reporting IPV to the police' needed to be a mediating variable, as the connection between IPV and jail was not automatic. Third, other variables were standardizations of terms that had similar definitions but different names. This was done to increase our ability to compare models. 'Legal troubles' (Group 2) and 'jail' (Groups 1 and 3) became 'justice system intervention'. 'Negative partners (broken person)' (Group 1) and 'relationship functioning' (Group 3) changed to 'relationship functioning' (this shows links between negative partners and other variables from Group 1). 'Family and emotional health' (Group 1) and 'family functioning' (Group 3) became 'family functioning', and '<Name of Mental Health Resource>' (Group 1) and 'mental health resources' (Group 2) became 'mental health resources'.

### 3.1 | Conceptual thematic model

There were 35 variables generated between all groups, with 23 variables mentioned in only one group. This indicated the broad array of perspectives, viewpoints and experiences expressed by individuals considered part of the population of interest. Figure 1, referred to as our 'conceptual' model, provides the main thematic constructs that combine all three individual organizational models. Colours for the model indicate the individual contributions of each group: Group 1 (the faith-based re-entry facility; blue), Group 2 (the substance use rehabilitation for pregnant women or mothers; red), Group 3 (the domestic violence shelter; green) and the consensus contributions (black). For efficiency, not every variable or link is presented in the conceptual model depicted in Figure 1. We present the individual organization models (Figures S1–S3) as well as our consolidated model, which includes all three individual organizational models in Figure S4. Below, we focus on discussing the differences in thematic contributions, rather than detailed descriptions of the content of each model.

As seen in Figure 1, there was little overlap in what was discussed between all three groups. All three groups



**FIGURE 1** Conceptual thematic causal loop diagram model representing the consolidation of all three individual organization group models. Positive/negative links imply that changes in the first variable result in changes in the second variable in the same/opposite direction [Colour figure can be viewed at wileyonlinelibrary.com]

discussed the bidirectional reinforcing loops between heightened rates of AM and IPV, as well as decreased rates of mental health. Some variables that were mentioned in two of the three groups were legal removal of children from the home, (current) family functioning, coping skills, accountability, justice system intervention, (intimate partner) relationship functioning, mental health resources and social support. Taking these factors into consideration, the conceptual model is a rich depiction of the way that individual, intrapersonal and community level constructs contribute to the maintenance of both IPV and AM within a complex system. Critical subthemes, such as the mental health process, engagement in child welfare and justice institutions, community norms and the importance of Indigenous culture and identity to childhood family well-being, were

unique contributions from the individual groups. There were key factors that were important for multiple sub-themes. For example, social support connects to both mental well-being (mental health subtheme) and the justice subtheme through partner dependence. New system areas were also created when combining models. Family functioning, although having relatively minor systemic influence in individual models, was an important connector between ‘community norms’ and ‘individual mental health’ in the conceptual model.

The contributions from the individual groups reflected differences in the contexts and experiences of the participants. Group 1’s (re-entry facility) contributions focused on therapeutic and mental care, as well as the importance of belief in a higher power. As seen in Figure S1, this group associated many of the mental

health maintenance and care components, such as accountability and coping skills, as relating to a higher power.<sup>1</sup> Belief in a higher power was seen as a catalyst for change (e.g., going to [faith-based organization] mental health resources) to reduce IPV and AM. Group 2 (substance use rehabilitation centre) contributed two unique themes—the role of the justice system for IPV prevention and the importance of Indigenous identity and culture. Seen in Figure 1, and in more detail in Figure S2, Group 2 spent time discussing potential barriers and key intermediaries between IPV and jail, particularly in IPV reporting. The role of a controlling partner in an IPV relationship (e.g., partner dependence) was seen as a barrier to reporting. Indigenous identity/culture and its impact on childhood home functioning was also discussed, as well as the role that continual historical trauma has had in decreasing Indigenous cultural exposure on childhood home functioning itself. Unique to the Group 3 (domestic violence shelter) model was the aspect of child welfare services, which was discussed exclusively as a source of additional stress rather than a potential connector for resources. The child welfare system itself was seen as a potential trigger for relapse, which in turn would increase AM. In Figure S3, participants also discussed feelings of mistreatment by individuals within the child welfare system, which subsequently decreased mental health. A second area unique for the Group 3 model was community norms and behaviour. This theme focuses on the way that individual, familial and community behaviour and norms have transactional relationships that strengthen AM and IPV on all three levels.

## 4 | DISCUSSION

This study focuses on increasing representation for PEP of stigmatized public health issues in CBSD models, particularly those from marginalized groups. There are barriers to equitably represent both PEP and non-PEP (e.g., professional, political or academic experts) in modelling groups. The current study demonstrates that it is feasible to build a collectively inclusive model with diverse PEP representation through partnerships

<sup>1</sup>It is important to note that this is not only reflective of the participants within this specific faith-based organization, but also the overall community. Similar to other low-resource areas, faith-based organizations play large roles in disseminating critical programmes that may otherwise be inaccessible or unavailable to many community members (Allard, 2008) in our target community. However, the small representation of cultural/spiritual resources in comparison (e.g., a lack of culturally relevant resources for Indigenous community members) can often facilitate experiences of alienation and marginalization, furthering health disparities within Indigenous communities.

with multiple organizations. Differences between group models, and complexity of the full model, demonstrate the diversity ways in which the modelling issues of interest are experienced by individuals. Individuals in all three organizations had personal experience with the issues of interest, but how they experienced different aspects of an underlying system framing IPV and AM, especially from the perspective of systemic racism and health disparities, was reflected in the differences between the three individual models.

### 4.1 | Lessons learned from the GMB process

System dynamics is accessible to a wide variety of laymen and professionals (Frerichs, Lich, Dave, & Corbie-Smith, 2016). The visual language of systems models translates complicated experiences and situations into an understandable story. The organization leaders who we partnered with, all of whom provide services to vulnerable populations, were acutely aware of the need for a systems perspective to address our target issues. Participants quickly understood how AM and IPV are part of a broader system. The modelling process elicited a sense of empowerment among the groups, as the chaos and complexity of IPV and AM could be mapped out in a tangible way. Talking-circle style facilitation was also an appropriate strategy to generate participant input with little intervention from the facilitators. This is especially important, given researchers' unspoken cultural and social power can inhibit active participation in community research (Ellard-Gray et al., 2015).

Partnering with organizations that serve vulnerable and marginalized individuals was a powerful way to reach out to a variety of potential participants. The protocol for initiating sessions included a time and space to share a meal and information with women as a group, reducing the burden of participation for the clients (who did not need to reach out personally to the researchers or rearrange schedules to accommodate for participating in the session). Striving to remove practical barriers for participating and having face-to-face discussions with potential participants prior to research activities helped session success.

An open dialogue with participants prior to the modelling session encouraged participation in the GMB sessions. This included (1) a discussion of the intended project goals related to direct community benefit; (2) talking about our personal backgrounds, including personal experience with the subjects of interest or related subjects; and (3) acknowledging [the research team's] outsider status and emphasizing the need for participants' expertise to ensure project

success. We answered any questions about our personal motives in this project. Marginalized communities have experienced substantial ‘helicopter research’ (e.g., research that only benefits the research team; Mosavel & Simon, 2010), and therefore, open discussion about research motives is often necessary due to wariness towards research and those conducting research.

## 4.2 | Lessons learned from the group models

Given that the models collectively represent three short GMB sessions with a small group of individuals, we do not intend for this to be a comprehensive depiction of the system underlying the association between AM and IPV, especially within marginalized communities. However, models developed within these sessions illustrated many aspects of this complex system, which together incorporated themes from multiple bodies of established IPV and AM research (e.g., mental health: Capaldi et al., 2012; Flanagan et al., 2014; social support: Wenzel et al., 2004; relationship health: Eckhardt et al., 2015; and community influences: Goodman et al., 2009). As reflected in the model, participants had a clear understanding of reciprocal influence between individual, familial and community contexts (e.g., socioecological models; Bronfenbrenner, 1986). A practical understanding of barriers for seeking help within IPV relationships marked by power inequity (e.g., partner dependence via power and control; Ali et al., 2016) further added to the model. The comprehensive depiction of how these variables relate to each other was made possible by including a variety of PEP with different perspectives. Although other stakeholders—practitioners, policymakers, administrators or academics—may have similar contributions to a model, the breadth of the perspectives provided in the three groups was important for developing a modelling framework that accounted for diversity of PEP experiences and more equitable representation.

The current model demonstrates several systems components that are particularly relevant for Indigenous communities. One component is negative experiences with the child welfare system on personal and familial well-being. Indigenous families are disproportionately represented in child welfare systems (Lawler et al., 2012) and out-of-home placements (Donald et al., 2003). Childrearing and caregiving have a strong significance in many Indigenous cultures. Separation from children, particularly given the legacy of familial disruption through forced placement in boarding school and out-of-family adoptions (Crofoot & Harris, 2012; Halverson et al., 2002), paired with current experienced prejudice

and marginalization that Indigenous mothers experience during child welfare system engagement (Miller et al., 2012) may substantially increase stress and subsequent relapse of AM.

Other key variables were personal recognition of intergenerational transmission of violence (Evans-Campbell, 2008) and AM (Myhra & Wieling, 2014), and how a desire to stop this transmission can be a catalyst for change (Myhra, 2011), and most importantly, how cultural strengths such as identity and education are essential for the promotion of individual and familial wellness within Indigenous communities (Walters et al., 2020). As more prevention and intervention programmes for Indigenous youth focus on teaching culture and developing identity as a strategy to improve psychological well-being (Gone & Looking, 2011), a desire to stop the cycle can also relate to the Indigenous identity-child home functioning subsystem discussed by participants. Continued discussion and exploration of these areas in further model sessions will help elucidate system structures that maintain health disparities and ways in which community and cultural strengths can be utilized within leverage points to eliminate disparities and improve overall well-being.

## 4.3 | Limitations

The method discussed in the current study does not allow for inclusive groups of stakeholders from a wider variety of backgrounds (including people who are not clients of individual organizations). Inclusive groups can provide opportunities for the community and the participants themselves to discuss, discover and negotiate modelling a system. Such groups are ideal for CBSD (Kiraly & Miskolczi, 2019), and healthy conflicts that arise within these groups often lead to a richer model (Metcalf, 2008) and a more informed community. Unfortunately, there are multiple barriers to including a proportional number of marginalized, stigmatized or vulnerable individuals in such groups. These barriers include the long-term time commitments, power imbalances within groups, and fear of stigmatization or the potential for increased psychological distress. For individuals currently experiencing the issue at hand (those in a violent relationship, those in substance use recovery), participation in a GMB session may only be possible in more insular groups with others who share their experiences.

However, these insular groups could prompt participants to isolate themselves to an individual ‘personal experience’ role and focus only on this role when contributing to model sessions. Although the research team emphasized that discussions would be about ‘thoughts and feelings’ rather than ‘experiences’, participants

quickly adopted ‘personal experience’ roles, indicating that more groundwork should be laid to have participants can entertain multiple roles. Future CBSD research should explore potential methods to facilitate participant multi-role integration within modelling sessions.

In addition, partnering with organizations is only one of multiple ways in which ‘hard-to-reach’ participants are recruited (Shaghagi et al., 2011), and including PEP as modellers in CBSD projects should rely on multiple methods of recruitment. PEP non-engagement with organizations (due to mistrust, personal and systemic inaccessibility, past experiences of mistreatment by health and service organizations; e.g., Dovidio et al., 2008; Onukwugha et al., 2020) is also an essential ‘experience’ to capture in itself. Exclusion of such participants can further lead to a biased model. The current strategy is intended to provide additional models collected during this study to enhance the overall developed collective model (i.e., the consolidation/aggregation of all models developed by participants/groups within this study), rather than be a substitute for all PEP representation.

We designed sessions to be short and accommodate schedules, and we could not elaborate upon some model areas that merited further discussion. An example of this was the reciprocal loop between mental health and social support networks. Expanding this loop by adding multiple variables related to the way mental health associates with social support network formation, maintenance and dissolution (as well as the characteristics of the individuals who make up the support network) would likely provide more meaningful insight into potential areas for interventions compared with a broad ‘social support’ variable. If feasible, researchers should visit with participants or organizations multiple times to refine under-developed loops.

Although we could have follow-up sessions with the organization, follow-up with individuals was only participant-initiated (providing social media information for contact), as we did not record any identifying data to maintain anonymity. We consider this to be a limitation given the iterative nature of CBSD model development. One possible solution is to ask participants if they would like to be included on distribution lists (e.g., listservs) for community-level dissemination, in which the researchers would be able to ask ‘anybody who may have participated in a past session’ for potential follow-ups. Although similar to providing social media links, it shifts the burden of first-contact effort from participant to the research team.

#### 4.4 | Implications and future directions

CBSD continues to gain traction as a strong method for examining ‘wicked’ public health concerns, especially

those that are framed by inequity, injustice and inequality. This increase in utility should be accompanied by increased attention on the way in which researchers can and do include individuals experiencing these issues as co-owners of the research process and products. As many ‘traditional’ methods for developing systems models through GMB methods may provide undue burdens on marginalized community members (e.g., lower ability to commit to long periods of time, experienced power imbalances in groups with higher social-capital individuals), alternative strategies to help increase representation for diverse perspectives of experience with these issues are required. We suggest this method can be added to the more traditional GMB sessions within a CBSD study (i.e., longer sessions with small breakout groups of PEP and non-PEP). However, more formal research evaluating the quality of current CBSD research in representing marginalized individuals, and continual development of additional strategies in which researchers can provide diverse perspectives of individuals who experience these issues, will greatly enhance the potential of CBSD as a method for elucidating high-impact solutions for stigmatized public health issues.

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## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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