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Cover Page Footnote

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Mind mapping as a pragmatic solution for evaluation: A critical reflection through two case studies

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Funders of social interventions that address complex child and family welfare concerns for highly vulnerable populations are increasingly seeking cost-effective and rapid mixed method evaluations of their services. This paper describes a mind mapping approach that was used to collect valid and reliable qualitative data from large numbers of informants across two separate evaluation projects. The mind mapping approach provided a rapid, credible solution to the need to extract and summarize views from a diverse range of informants, and to gain consensus agreement on themes arising from the data. Through the use of two case studies to illustrate the application of the technique, we explore the advantages and disadvantages of the method and reflect upon the utility of mind mapping for quality improvement evaluation within the human services.

Introduction

In the context of service delivery for families at risk of child abuse and neglect, family violence and other 'wicked' problems (Horn & Weber, 2007; Stanley, Glauert, McKenzie, & O'Donnell, 2011), government and non-government organisations are increasingly seeking cost-effective and rapid evaluation solutions to verify the value of their services. The pressure on human service agencies to adopt evidence-based interventions places evaluation front of mind for these agencies, acknowledging that the existing evidence base is limited, and that solutions for the full scope of target populations and targeted problems do not exist. In this climate of outcomes-driven service responses, government departments and other service providers recognise the need and the value of evaluation, yet their expenditure on evaluation is often constricted. Further, the demands on agencies to demonstrate effectiveness swiftly means that evaluators are often under great pressure to deliver much for little. Subsequently, cost- and time-efficient evaluation solutions are in demand.

This paper explores whether mind mapping for qualitative data collection and analysis can be used to

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enhance the cost-efficiency and timeliness of evaluations. We illustrate and critically reflect on how a mind mapping approach was used to augment a range of traditional data collection and analysis approaches within two multifaceted evaluation projects that demanded the summarisation of perspectives from large numbers of evaluation informants within tight timelines.

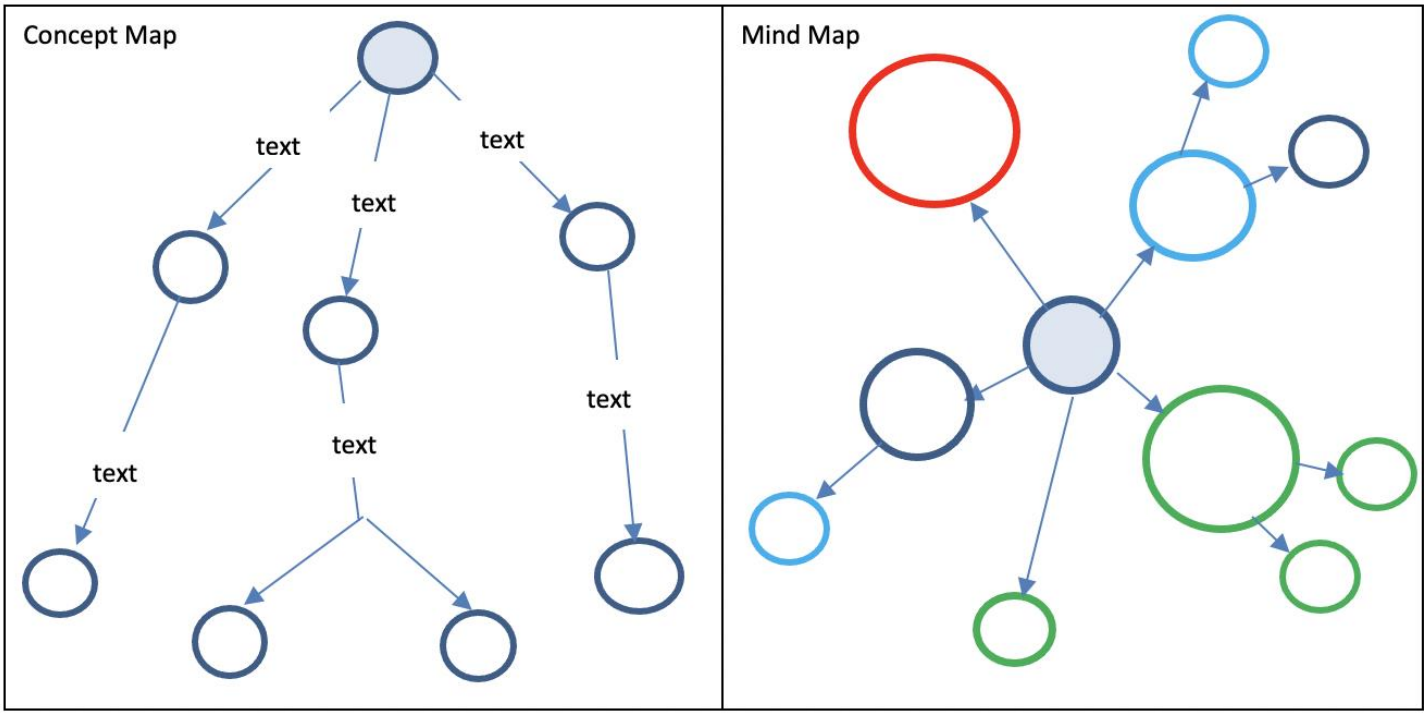
Visual presentation of evaluation concepts

Mind maps are one of a range of techniques (e.g., spider diagrams, entity-relationship models, flow charts, Toulmin maps, semantic networks, swim lane diagrams, evocative knowledge maps, process event chains) that can be used to visually present sets of concepts and the relationships between them (Ahlberg, 2008; Eppler, 2006). There is some confusion in terminology associated with the different techniques, because proponents of each form tend to use their preferred terms both loosely (to refer to all diagrams), and narrowly (to refer to their own preferred type).

Nonetheless, the two most common forms of visual presentation appear to be:

- *Concept maps* (Cañas & Novak 2008). These are hierarchical, and canonically depicted in top-down fashion with more general or important concepts at the top. Links may be made between concepts at any level, and are depicted with labelled arrows, thus forming webs of "propositions" (see Figure 1 for an example concept map).
- *Mind maps* (Buzan 1994), which are canonically depicted in radial form, with subordinate ideas appearing further from the central concept. Mind maps usually lack labels on connections between concepts, may use colour to emphasise similarities or highlight differences, often feature only first-order hierarchical connections and often include pictorial representations of concepts (see Figure 1 for an example mind map).

Figure 1. Example concept map and mind map



Regardless of the preferred terminology, these diagrams had their origins in educational contexts. Novak and Cañas (2007, 2008) report developing concept maps in the early 1970s, as part of a study of changes in children's understanding of complex concepts. They also report on further work examining their use as tools for students to facilitate "meaningful" learning, alone or in groups (see also Cañas & Novak 2008). They subsequently considered the use of concept maps as tools for teachers, particularly for assessing students' understanding of complex sets of concepts (Cañas & Novak 2006:3). This draws, in particular, on the opportunities for structural analysis and comparison which are made possible by the use of map creation software in the classroom, including identification of "types" of map and analysis of how these change over time as students revise in light of subsequent learning (Cañas & Novak 2006:5). Mind maps, by contrast, appear to have been developed independently in a case of convergent evolution, by Buzan (1994), as a tool for summarising to facilitate recall (Farrand, Hussain, & Usher, 2002).

Outside education and prior to the 2010s, maps for the visual presentation of data were also the subject of occasional attention as a professional tool. Appropriate uses identified in the literature include as tools for professional reflection and client engagement, particularly in nursing in the UK (Jenkins 2005; Kern, Bush & McCleish, 2006; Tattersall, Watts & Vernon, 2007), and as ways for researchers to efficiently present complex data from their work (Hegazy, Ali & Abdel-Monem, 2011). However, there is not universal consensus on their effectiveness as a communication tool due to the low upper limit of complexity that can be easily presented (Eppler 2006).

Mapping remains a niche tool for qualitative researchers, although there has been a growing body of literature since the mid-2000s. Most of the early work focused on the usefulness for researchers of creating such maps themselves. These included summarising material (Daley, 2004) or coding schemes (Whiting & Sines, 2012), and presenting these back to research subjects for confirmation. They were also identified as a possible alternative to note taking in interviews but were reportedly not widely used in this way (Tattersall *et al.* 2007).

The use of maps for gathering research data from others appears to have been extremely limited before the mid-2010s. This is somewhat surprising given their long-standing use in cognate ways in education. More recently, however, there have been several studies published examining the use of maps for visual representation of data in conjunction with interviews (Mojtahed, Nunes, Martins & Peng, 2014; van den Bogaart, Schaap, Hummel & Kirschner, 2017; Heron, Kinchin & Medland, 2018) and at least one analytic review of their potential in research (Conceição, Samuel & Yelich Biniecki, 2017). There is also a small but growing number of studies which explicitly rely on visual maps as a tool for gathering data (e.g., Burrows & Mooring 2015; Gill & Persson 2008).

As a qualitative data collection method completed during focus groups or interviews, maps offer a visual, non-linear representation of ideas, and allow free-form spontaneous thinking with the aim of discovering common themes amongst informants (Davies, 2011). The mind mapping technique supports an inductive approach to data analysis and interpretation as it allows the data to inform theme generation, rather than working deductively toward confirming existing themes or theory. As a visual data collection method completed in real time, the process of drawing the map in-situ also allows participants to provide immediate feedback on themes recorded in maps.

Drawing on this emerging evidence of the value of mapping in evaluation, this paper describes a mind mapping approach that was intended by the evaluators to provide a partial solution for common challenges associated with the cost and time limitations often imposed on evaluation projects by funders. We used mind maps to gather qualitative information from multiple categories of informants in two mixed method evaluation projects (see Figures 2 and 3 for background information about these projects).

We adopted a mind mapping approach to the evaluations for five main reasons:

- First, mind maps were deemed appropriate to the evaluation context. Theoretically, we expected our fieldwork to be constructivist rather than positivist in tone. We used focus groups to consult with professionals on complex changes involving introduction of new practice models which had recently been adopted within existing services, and to

Figure 2. Background information for Case Study 1

Case Study 1: Evaluation of Uniting's 'Working with Families Experiencing Domestic Violence Practice Framework'

Background: 'Uniting' is the main social services and advocacy arm of the Uniting Church in New South Wales and the Australian Capital Territory. As one of the largest not-for-profit community service providers in those jurisdictions, Uniting provides services for vulnerable children, young people and families, early learning, aged care and programs for people with disability. Uniting's *Working with Families Experiencing Domestic Violence Practice Framework (DVF)* is an outcomes-driven, evidence-informed intervention targeting the needs of children by strengthening parents' coping skills and parenting abilities.

Services: At the time of this evaluation the DVF was delivered by Uniting within two service types across four locations in New South Wales. These two service types were: (1) Brighter Futures, which is a targeted, voluntary, early intervention child protection program for families experiencing challenges that impact on their ability to care for young children; and (2) Intensive Family Based Services (IFBS), which work with children at imminent risk of removal from their families, but where an assessment is made that there is a reasonable prospect of improvement within the family with the right support.

Evaluation: The evaluators were commissioned by Uniting in 2016 to conduct an evaluation of Uniting's DVF to provide a point in time evaluation of implementation fidelity associated with the DVF. Informants for the evaluation were Uniting staff who were involved in the delivery of the DVF to families.

Figure 3. Background information for Case Study 2

Case Study 2: Evaluation of 'Intensive Family Support (IFS) Services'

Context: The Queensland Government funds non-government agencies to deliver *Intensive Family Support (IFS) services* across Queensland, providing intensive case management and support for families with multiple or complex needs who require assistance to safely care for their children. IFS services aim to improve child safety and wellbeing and reduce entry or re-entry of highly vulnerable families to the statutory child protection system.

Services: The agencies delivering IFS services are independent of the statutory child protection system. At the time of evaluation, the IFS service model was being implemented in 22 sites across Queensland.

Evaluation: The evaluators were commissioned by the Queensland Government in 2017-2018 to conduct an evaluation of the implementation and early outcomes from the IFS service model, including whether IFS was associated with a reduction in the risk of entry or re-entry into the statutory child protection system. Specific aspects of the IFS model were also evaluated, including the value of specialist domestic and family violence services and the functioning of the coordinated case planning aspect of the model. Informants for the evaluation were caseworkers and specialist staff directly involved in the delivery of services to families, as well as their managers and team leaders.

elicit both their subjective experience and their analysis of these new ways of working. We expected that the informants would have considerable relevant experience of the recently introduced practice models but not necessarily have mature or settled opinions prior to the consultation. We used focus groups primarily on practical grounds, but also knowing they are well-suited to creating shared meaning between participants through conversation (Liamputtong 2011). Concept and mind maps have an explicit foundation in constructivist educational theory, and have been demonstrated as useful for group work in school classrooms (Novak and Cañas 2007, 2008).

- Second, mind maps were deemed appropriate to the kind of analyses we hoped to conduct. We intended to use focus groups to elicit more complex information from informants than had been obtained in previous evaluations of each of the new practice models, and in particular to focus on relationships between the components of the practice models and the context in which they were being implemented. Mind maps are well-suited to depicting this kind of complex, structured information. Furthermore, we expected mind maps might lead to more consistent information between focus groups, by helping facilitators draw attention more easily to concepts or relations which the group had not discussed and which we expected to be relevant. Finally, we intended to make use of the formal structure of the maps to attempt more rigorous comparative analysis of the results of each focus group discussion.

- Third, mind maps were viewed as aligning well with the requirements of knowledge generation and translation. In the child and family services sector, there is a very clear hierarchy of evidence relating to the effectiveness of practices and services. This is supported by institutions such as the California Evidence-Based Clearinghouse (see https://www.cebc4cw.org/ratings/scientific-rating-scale/) that use hierarchical rating systems to rate the level of evidence for different practice approaches. Such rating systems place greatest value on quantitative evidence derived from randomised controlled trials (RCTs) or quasi-experimental studies, and which use analysis based on regression techniques to give estimates of average effect. While this produces knowledge which is useful for decisions about what to fund, it is not always directly applicable to the context of direct work with individual children and families. In the context of front-line service delivery, causes and consequences are often categorical rather than matters of degree, and causation may be conjunctural rather than additive. These issues are often explored through classic qualitative research, but we hoped to explore the appropriateness and usefulness of emerging methods such as qualitative comparative analysis for understanding the process of practice change in a way that is both consistent with the phenomenon under investigation and suitable for producing insights that can be more readily translated outside the context in which they were generated.

- Fourth, mind maps were viewed as aligning with the ethical stance of the service providers. For instance, Case Study 1, drawing on the specific faith background of the service provider, the agency places particularly strong normative importance on seeking out the voices of those with lived experience. In practice within research, this has manifested itself in a variety of ways, including a long-standing program of research for this agency around children's citizenship in some of its services, a strong emphasis on consultation with clients and staff, and attentiveness to the way authority can influence research. Mind maps appealed as a way of addressing this last point, by allowing informants to describe, precisely and efficiently, their views on the relationships between important concepts such as the value of staff training in the DVF and management expectations regarding staff workloads, rather than relying on the researchers to reconstitute these relationships during subsequent analysis of empirical material. In this, they aligned once again with

the appeal of focus groups (Liamputtong 2011).

- Fifth, mind maps were selected over concept maps as – aligned with the purpose of our research - we believed the service delivery frameworks under examination would always be the central topic from which other themes or concepts radiated, rather than the map being structured on hierarchical relationships and connections among concepts.

Thus, this paper presents a description of a mind mapping approach as used within multi-layered mixed-method evaluation projects that demanded efficiency yet comprehensiveness. The two case studies used to illustrate application of the mind mapping approach relate to (1) an implementation (process) and early impacts evaluation of a large, state-wide, multi-agency, government-funded initiative for families of at-risk children, and (2) a continuous quality improvement evaluation of a single-agency practice improvement framework for parents exposed to or at risk of domestic or family violence. The discussion highlights successes of the mind mapping approach, as well as the challenges experienced by evaluators and evaluation participants during the mind mapping process, including during evaluation design, data collection and data analysis.

Method

The mind mapping approach

Owing to the short duration of the evaluation projects, the mind mapping approach employed closely matched the approach described by Burgess-Allen and Owen-Smith (2010) which allows for rapid thematic analysis of data collected during focus groups and semi-structured individual interviews with informants. According to the Burgess-Allen and Owen-Smith approach, brief (e.g., single word) descriptions of ideas, values, concepts or tasks captured from informants radiate from a central key word or concept within a diagram. Primary branches from the core concept represent major themes or ideas, and subsequent branches provide increasing clarity or illustrative examples.

One adaptation away from the Burgess-Allen and Owen-Smith approach involved the use of multiple facilitators rather than a single common facilitator across different focus groups and interviews. This modification was influenced largely by the scope requirements and time restraints imposed by funders. By using multiple facilitators we could conduct a large number of focus groups in a short time period. Consistency in facilitator processes and mapping style was promoted through shared training of facilitators prior to data collection, testing the method in a pilot study, and regular (e.g., weekly) discussions among facilitators to ensure consistency in mapping approach, and to discuss emergent themes.

Piloting the approach

Prior to using the mind mapping approach a pilot study was conducted to test the methodology and confirm the validity of a mind map created in situ in a small focus group setting. One of the researchers responsible for conducting focus groups in both case studies facilitated a group discussion among six colleagues (consisting of staff from a range of roles and professional backgrounds) on the theme "flexible working arrangements". Most participants attended the group in person, with one participant joining via videoconferencing. Discussions in this pilot focus group centered around questions specific to the benefits, challenges and opportunities associated with flexible working arrangements, with a range of themes emerging in the discussion which were captured in a mind map created in situ during the session. Participants were encouraged to clarify, confirm and correct themes and categories in the visual representation of the discussion as the session progressed, ensuring the map provided an accurate representation of the group's views. There was time at the end of the session to also reflect and correct the map as a whole and discuss the process.

Feedback from pilot participants suggested visually seeing discussion themes enhanced participant engagement in the focus group and aided reflection on topics and pathways of thought. Participants in the pilot questioned whether some participants may be hesitant to provide their point of view in this type of data collection method. Further pilot feedback queried how to represent differing importance between themes on the map, which was addressed in future sessions through the use of bolding or underlining words on the map as emphasis. The draft mind map was then emailed to participants to provide a further feedback

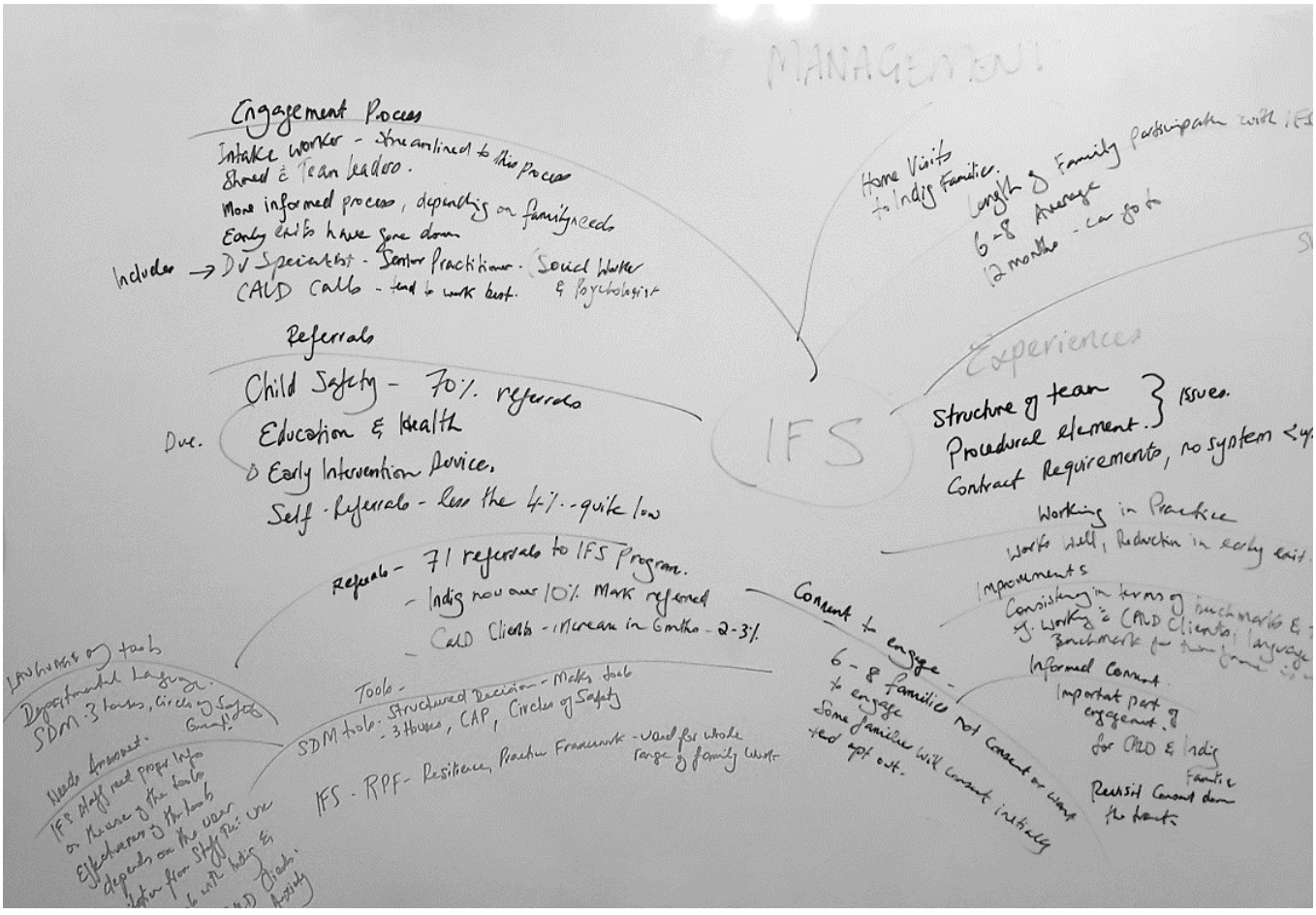
opportunity. With this final opportunity for feedback, the researchers hoped to reduce the effects of one concern raised by pilot participants (making responses to feedback anonymous for research participants) and obtain a final validity check. Feedback suggested a high level of accuracy of the mind map, with minimal further changes or additions suggested.

Procedure

To recruit participants into interviews or focus groups for each study, the evaluation funders provided the evaluators with contact details for managers of each service, who were then asked to distribute information about the evaluation (e.g., key evaluation questions, a description of requests of staff time) to relevant staff, with a request to contact the evaluators if they were interested in participating in an interview or focus group. The evaluators endeavoured to recruit sufficient numbers of participants from each service to reflect the proportionate size of the service. This was achieved by stressing the value of the evaluations, and explaining how informants' individual identities would be concealed in any reporting of findings. Interested participants selected a suitable date, time, and location of their preference for interview or focus group, and were sent: a) a Plain Language Information Statement outlining the purpose of this research, what they will be asked to do during and after interviews or focus groups, and information about confidentiality; b) a consent form to be signed prior to interview or focus group commencement; and c) a demographic survey to be completed prior to the interview or focus group.

Then, in each focus group or interview, a facilitator led discussions by following an interview or focus group schedule with questions and follow-up prompts to use if needed in order to generate discussion among participants. During each interview or focus group, the facilitator created a mind map while discussions were taking place (see Figure 4 for an

Figure 4. Example mind map being created during a focus group



example) and used the map to reflect back to participants the content and direction of discussions and to seek immediate validation of concepts under discussion (e.g., by regularly asking informants if the map reflected what they were saying). Where the facilitator deemed it appropriate, pictorial representations of concepts (e.g., a frowning face to symbolise aspects of a program that focus group participants did not approve of) were used mind maps. The maps were always on display in front of participants. All interviews and focus group discussions were audio recorded. This ensured the researchers had detail from discussions which they could use to supplement the thematic analysis of ideas discussed in interviews and focus groups if needed, and could include participant quotes reflecting identified themes.

To help ensure accuracy of ideas and themes taken away from consultations, further validity checks of individual group mind maps were conducted, which involved emailing (within one week) the mind maps to participants in each interview or focus group and checking their agreement with what was recorded. Informants gave their feedback by completing an online questionnaire about the accuracy of the map (see Appendix 1 for an example of this questionnaire). Maps were then updated by the facilitator based on feedback received.

Results

Case Study 1 – Evaluation of Uniting's Working with Families Experiencing Domestic Violence Practice Framework (DVF)

Fifty-three caseworkers, coordinators and managers participated in one of 12 focus groups or semi-structured interviews across three Uniting sites. Coordinators and managers were interviewed individually or in small groups and separately to caseworkers. A semi-structured interview schedule centred around key research questions was used to guide discussions during focus groups and interviews and included investigation of how the DVF is implemented in practice, and exploration of the factors that support or inhibit consistent implementation. Participants reported having a range of experience in their role (range = 1 month to 22 years, M = 3 years and 3 months). Over half (57%) reported they had implemented the DVF with fewer than four families, with 37% indicating they had experience implementing the DVF with between 5 and 15 families. Participants reported a range of qualifications relevant to their role, with the three most commonly reported professional backgrounds being child protection, community services and social work.

One researcher collected the data. Following a research description and participant consent, the researcher began the mind mapping exercise with an open-ended question about the DVF. The researcher used the semi-structured interview schedule to continue questioning participants while also creating a mind map on a white-board or butcher's paper. Key themes, categories and sub-categories within themes that emerged through discussions were represented visually, with participants encouraged to correct, modify or add to the map as it was created to ensure it adequately captured their views. The discussion was also audio-taped to capture any information that may have been missed and to allow extraction of direct quotations to illustrate key points. At the end of the focus group, participants were asked to consider the map as a whole and suggest any further additions or amendments.

To confirm the themes, categories and connections of the mind map created for each group or interview, and to conduct a further validity check of the data, participants were emailed the map that related to them and were asked to complete a brief online questionnaire seeking feedback on the accuracy of the map and eliciting any further information participants did not feel comfortable sharing in the interview or focus group. Participants were also asked to comment on the process of participating in the mind mapping exercise. Based on methodology described by Burgess-Allen and Owen-Smith (2010), mind maps created for individual groups or interviews were updated based on feedback from participants. Overall, responses indicated high level of agreement by participants with the draft mind maps, with only two of the twelve maps requiring modification as a result of feedback received.

Following the mind map validity check, 'meta' mind maps for each service type (IFBS and Brighter Futures) were created (see Figure 5 for example). The decision to create a mind map specific to each service type was made on the basis of the following factors: (1) during data collection, the researcher observed some

variation in the themes raised between IFBS and Brighter Futures focus groups and interviews - to ensure these differences were adequately captured for the purposes of understanding the perspectives of workers from each service type and in addressing specific issues raised by informants, the evaluators determined that data should be collated according to service type; and (2) to ensure the range of themes and categories raised during focus groups or interviews was adequately represented in a mind map that did not include too much information, the evaluators determined that the development of two meta-maps would enable greater ease of interpretation.

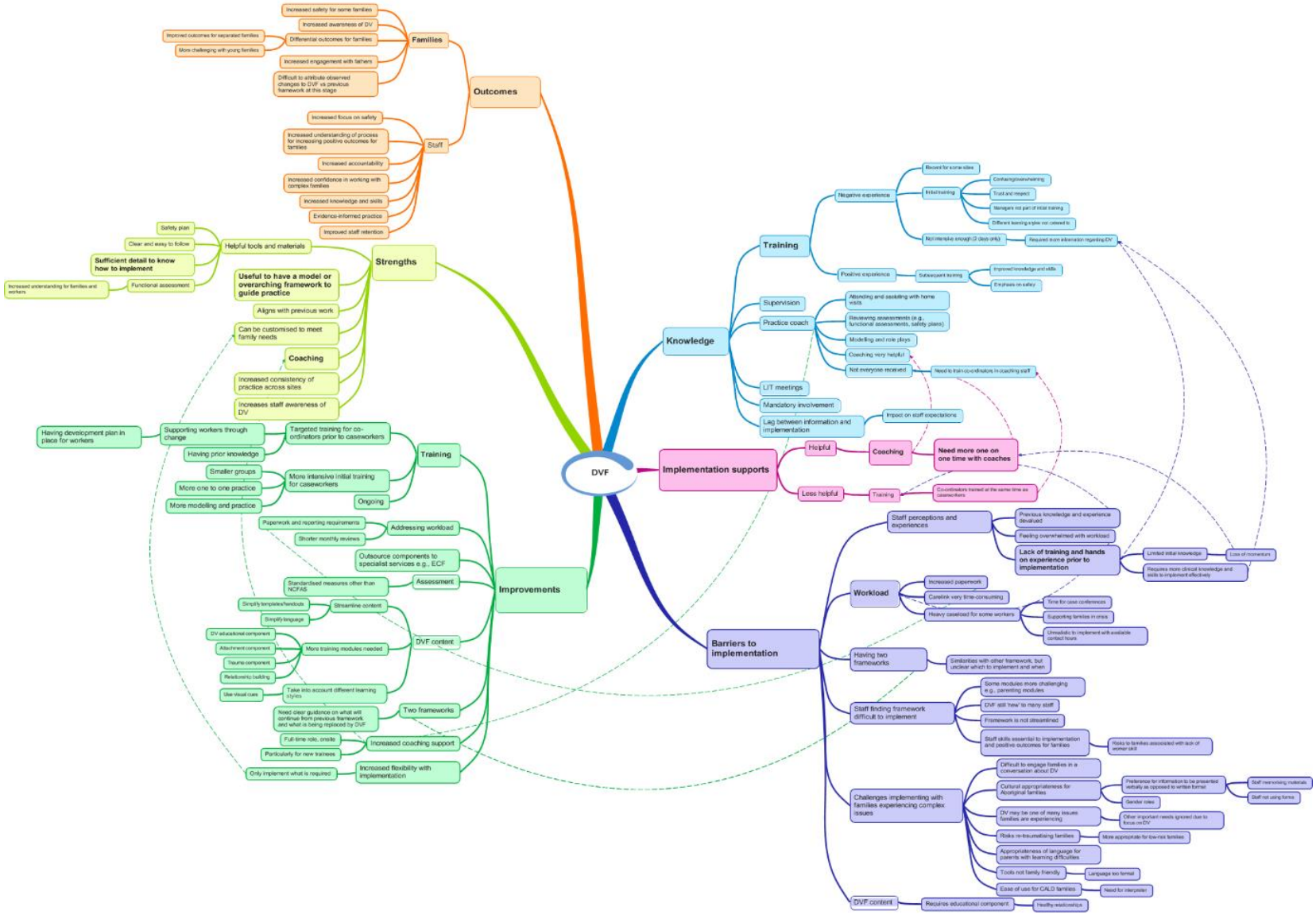
The frequency of themes and categories and sub-categories within themes was then calculated for the mind maps created for each service type. In the preparation of the meta maps for each service type, themes and categories that were mentioned during all interviews or groups were indicated by a large and highlighted circle to reflect their relative importance. Although it was not possible to capture the relative intensity of participant views in the final mind maps, specific comments from participants were identified and included in the presentation of findings to illustrate the range of perspectives for specific themes and categories within themes. In addition, themes that were mentioned in more than two groups' maps were bolded in the meta map to indicate greater consensus of views on the importance of those themes across the service. Where possible, connections between themes and categories were highlighted in the meta maps where these were identified throughout the discussions.

The evaluators reflected on the perceived advantages of the mind mapping approach as relevant to the Uniting DVF project, compared with alternative possible options for data collection, transcription and coding of individual interviews or focus groups. From the evaluation team's perspective the value of mind mapping lay in its speed and cost-effectiveness in capturing large volumes of data from a large number of informants quite quickly; and the capacity of one researcher to simultaneously facilitate the group discussion, record a graphical summary of themes raised by participants in situ, and obtain immediate feedback from participants on the accuracy and validity of identified themes. A further perceived benefit was the capacity of the mind mapping approach to stimulate group discussion whilst also maintaining a focus on the key evaluation questions, thereby ensuring the most productive use of the limited time available during each focus group. That is, the summary of the discussion presented visually could trigger further reflection on, or consolidation or refinement of themes. Feedback from Uniting's participants suggested the approach was also effective in "*getting everyone together and opening up discussion" (Brighter Future*s *participant)*, as well as validating the perceptions and experiences of participants: *"it was nice to be asked and feel heard" (IFBS participant).*

Despite these perceived advantages and the overall positive experiences of participants, there were a number of limitations associated with using the mind mapping approach in this context, including the potential for the approach to over-simplify constructs, as indicated by one participant: *"The mind map is a helpful clarifying tool but overly simplifies the concepts making it open to interpretation rather than a factual representation of personal views"* (*IFBS coordinator).* Another key learning from this project included the importance of using the mind mapping approach to structure and facilitate conversations within a group context as opposed to a data collection tool for one on one interviews. Feedback from participants involved in one on one interviews was generally less positive, as suggested by the following comment: *"As Coordinators were asked to complete the process in isolation from one another it is difficult to moderate one's views through the lens of others. It would have been good to have that option so we could share experience, views and concepts that may have led to a deeper or broader personal view of the concepts" (IFBS coordinator).*

These learnings were used to further refine the researchers' approach to mind mapping as applied in future projects. For instance, increased emphasis was placed on checking the validity of the visual map as representing all participants' varied views, and increased care was taken to identify when (i.e., what indicative timestamp) potentially useful participant quotations were made. The evaluation of the Intensive Family Support service described in Case Study 2 reflects how some of these learnings were applied in subsequent evaluation projects.

Figure 5. Meta mind map for Brighter Futures informants



Case Study 2 – Evaluation of the Intensive Family Support (IFS) Service

The evaluation employed multiple methods to address evaluation questions, including use of mind mapping during individual and group consultations with IFS frontline and management staff from each agency delivering IFS. Frontline staff and managers across all 22 IFS service sites were invited by email to participate in an informal interview or focus group discussion about the implementation, impacts, and early outcomes of IFS. Interested staff and managers selected a suitable date, time, and location of their preference for the interview or focus group and were sent a Plain Language Information Statement, consent form, and demographic survey prior to sessions.

Interviews and focus groups were conducted over the phone or in person on site at an IFS agency's premises. In most instances, managers were interviewed separately to caseworkers either in small groups or individually. Discussions were guided by focus group and interview schedules made up of questions and prompts that centered around the key evaluation questions. In total, 39 interviews and focus groups were conducted, with 199 participants overall. Focus groups were conducted at all 22 sites, with most staff at a given site attending, giving excellent coverage of the range of perspectives of staff. Demographic information was available for 189 focus group and interview participants; ten did not complete the demographic survey. Just under half of participants were under 40 years of age (45%), most were female (84%), 12% were of Aboriginal or Torres Strait Islander origin, and almost all spoke English as their main language at home (95%). Most participants possessed degree level qualifications in social work (35%) or human services, such as psychology, social science, education, and nursing (42%). Most participants were caseworkers, support workers, specialists, or allied health practitioners (73%), and 19% reported being in a managerial position (e.g., coordinator, supervisor, team leader).

Four individual researchers facilitated the interviews or focus groups. During consultations, mind maps were used as a qualitative data collation procedure, whereby individual mind maps were created in situ documenting key themes, categories and subcategories identified during consultations. Mind maps were documented either on a whiteboard or butcher's paper, with participants invited to provide continuous feedback throughout the session on the accuracy of recorded themes, categories and subcategories. Each session was also audio recorded, with participants' quotes later used to illustrate findings. Additional validity checks via online survey following individual sessions were intended, and were conducted for two sites (i.e., emailing a mind map to participants and checking their agreement with what was recorded), however, owing to time restrictions it was decided that individual map validity checks were an inefficient use of researcher time. Rather, an online survey validity check of the final merged maps was deemed to have greater cost-benefit.

After all interviews and focus groups, rapid thematic analysis of mind maps was conducted to create two meta mind maps for two distinct evaluation components: (1) an Implementation meta map (including coverage of the collaborative case planning and domestic and family violence aspects of the service mode); and (2) an Outcomes meta map. The Implementation meta map was large, and was therefore best presented across three separate maps to ensure participants' views were adequately presented without crowding the map with too much information that would be difficult to view and interpret. To create these meta maps the frequency of themes and categories within themes was calculated. The final meta maps highlighted themes and categories that were raised across multiple sites and were identified by at least 10 groups. To confirm the validity and clarity of the final maps, a meeting between all IFS focus group/interview facilitators was held to explain the analysis performed by one of the researchers, and to confirm and clarify the themes represented in the meta maps. Once the meta maps were finalised with minor changes that were suggested during the meeting, feedback was sought from informants who had provided their email for feedback purposes. No feedback was received from participants to amend the maps, so these meta maps were deemed final.

Similar to the first case study, the evaluators viewed a positive aspect of using mind mapping in the evaluation of the IFS was its visual style of information presentation, which assisted in generating further group discussion while at the same time providing a structure and guide to collecting information relevant to the evaluation questions. Another positive was the

ability to generate instant feedback from participants on the accuracy of recorded data. As a visual data collection method completed in real time, this process allowed participants to provide immediate corrections of themes and categories recorded in mind maps and to further clarify their views so those were more accurately reported.

However, a few challenges associated with application of the mind mapping approach in this project were identified. Since the evaluation of the IFS service model included several components, with each component including a separate set of evaluation questions, it was challenging for researchers to maintain in-depth discussions across all components within the allocated consultation time. As such, the maps summarised variable levels of detail for the different evaluation components and evaluation questions relevant to these components.

Another challenge of using mind maps in this context was related to the amount of time spent producing the meta maps. Creating these maps was time consuming since it involved summarising themes and ideas from 22 sites, with each site typically producing two maps. This effort, coupled with the additional time required to listen to recordings from each session to capture quotations that could illustrate participants' views, reduced the overall efficiency of the mind mapping approach in this project.

A question was also raised by one researcher about the appropriateness of using a whiteboard to develop mind maps during focus groups involving Aboriginal or Torres Strait Islanders participants. One of the researchers expressed a concern about the facilitator turning their back to focus group participants while recording their ideas on the board – this could be perceived as a culturally inappropriate sign of disrespect for the person who was sharing information.

Discussion

This paper described how a mind mapping procedure was used within focus groups and interviews for data collection, summation and interpretation to generate valid conclusions about the implementation and impact of programs designed to benefit at-risk children and their families. The approach adopted for these family-support initiatives is a relatively novel application of mind maps, which in the past have primarily been used for education rather than research, and which have rarely been used in large scale evaluations of multiply layered interventions in the human services. Thus, this paper contributes to the growing body of papers describing use of mind mapping as a data collection and analytic tool (e.g., Burrows & Mooring 2015; Gill & Persson 2008; Conceição *et al.* 2017), further demonstrating their potential value in program evaluation.

Desirable attributes of the mind mapping method appealed to the current researchers, as it was thought that it would fit with the time and expense constraints imposed by commissioning bodies. According to Burgess-Allen and Owen-Smith (2010) favourable attributes of mind mapping can include a short data collection duration, rapid thematic analysis, low cost software and labour, and little time and cost for technique skilling, while producing similar themes to more traditional qualitative methods. Additional advantages proposed by previous authors (Burgess-Allen & Owen-Smith, 2010; Wheeldon, 2011) included engaging users with a visual tool, creating a group consensus of meaning while acknowledging individual experience, and in situ qualitative analysis with immediate validation by participants, reducing researcher interpretation. The acknowledged limitations of mind mapping, such as limited analytical depth, and difficulty capturing comments not clearly expressed or somewhat unrelated to the central topic, were considered by the current evaluators to be outweighed by the advantages for the purposes of the evaluations commonly requested of the researchers.

Using the approach articulated by Burgess-Allen and Owen-Smith (2010) to guide our own approach to mind mapping, we used mind mapping in two evaluations that differed in size, complexity and purpose. For both evaluations, mind mapping facilitated rapid visual summation of key themes and sub-themes, and allowed immediate validation from informants. Variations from the approach described by Burgess-Allen and Owen-Smith (2010) included use of multiple facilitators for one of the projects (IFS), and creation of meta maps collating findings across multiple groups to distinguish between different service types (Uniting) or different evaluation components (IFS).

As a visual data collection and data collation method completed in real time, the use of mind maps to summarise data in situ not only helps to facilitate recall (Farrand et al., 2002), but also allows participants to provide immediate feedback on themes recorded graphically in the mind maps. As suggested by Hegazy and colleagues (2011), mind maps appear to be an efficient way of presenting complex data into summarising themes, and as such presents a less cumbersome approach to identifying themes in contrast to standard thematic analysis. Coupled with the benefits associated with time efficiency and therefore cost-effectiveness for evaluators, the immediate validation of data make mind mapping an appealing solution for evaluators. A further advantage of mind mapping is the tendency for the visual presentation of findings in situ to generate further discussion (Davies, 2011), while also maintaining the focus of participants on the core questions driving the evaluation. Taken together, these advantages of the mind mapping technique mean it is a viable, valid and efficient method for use in qualitative research projects that have imposed time and budget limitations.

Our findings indicate that mind mapping seems to be acceptable to informants to evaluation projects. This was suggested though the high participation and engagement rates among attendees at interviews and focus groups, and positive feedback about the running of the sessions generally. Although one researcher queried the cultural appropriateness of having a facilitator turn their back on Indigenous participants to record themes, feedback from Indigenous participants about the mind mapping technique was also favourable. Another advantage of the use of mind maps to summarise detailed qualitative data lies in its flexible, non-prescriptive nature. Adaptions to the way mind mapping takes place are tolerable. For instance, we see potential for mind mapping to meld well with 'yarning circle' style approaches to qualitative data capture (see Geia, Hayes & Usher, 2013), whereby story sharing and knowledge development occurs via conversations as a prioritised form of communication that is '…culturally prescribed, cooperative, and respectful' (Walker, Fredericks, Mills & Anderson, 2014, p.1216).

Notwithstanding the overall positive experiences of participants in the interviews and focus groups described herein, a number of limitations of the mind mapping approach were articulated by participants, and by the researchers involved in data collection, analysis and reporting. Our learnings suggest some limitations to the use of mind mapping as a technique for capturing data from a large and diverse cross-section of informants in evaluations of complex social interventions. These limitations may apply more to some evaluations than others, as many relate to the size or complexity of the evaluation.

For example, we found it increasingly difficult to facilitate meaningful discussion and subsequently to accurately capture this discussion in summary form when the groups were large. Similarly, it was more difficult to summarise multiple maps into a single meta map when there were a large number of individual groups or interviews to include in the meta maps. This challenges our earlier assumption that mind mapping would facilitate more systematic comparative analysis than other thematic analysis methods. In addition, our assumptions about the anticipated time savings with mind mapping were challenged: time savings at data collection were not always realised at the data processing and analysis stage, particularly when complex and varied viewpoints needed to be mapped visually. Furthermore, the difficulties associated with group size, diversity of views and complexity of relationships between themes conforms with views about the limited value of mind mapping as a communication tool due to the low upper limit of complexity that can be easily presented (Eppler, 2006). While having a large number of informants presented a challenge to the mind mapping method, it may not be insurmountable. Evaluators should pay careful attention to desired sample sizes, and aim for representation of a diverse range of informants in preference to inclusion of more individual informants. This aligns with the 'depth in preference to breadth' nature of much phenomenological qualitative research (Rossman & Rallis, 2003), and therefore should be considered an acceptable constraint on evaluation methods employing mind mapping.

The diversity of informant types also presented a challenge. In any qualitative research it can be difficult to capture the total range of diversity of views (i.e., an aspect of breadth), but this is particularly so when using mind mapping to simplify a consensus view of phenomena. While discrepant views to the majority can indeed be captured in a mind map, the limits

imposed by the need for visual clarity and simplicity in map creation can inhibit the extent to which discrepant views are represented. Indeed, Eppler (2006) notes this upper limit of complexity as one of the four main disadvantages of mind mapping as a data visualisation strategy in his comparison between concept maps, mind maps, conceptual diagrams, and visual metaphors for knowledge construction and sharing. Therefore, if capturing the full breadth or diversity of perspectives is important in your research, alternatives to mind mapping as a qualitative evaluation and data summary method might offer a more acceptable solution to data collection and analysis.

A further challenge to the use of mind mapping emerged in our studies in relation to the complexity of the interventions under evaluation. It was difficult to summarise all information in a single mind map, and even when we divided our data into separate meta maps representing either different service types (Uniting) or different intervention components (IFS) we still could see potential value in breaking down further. Yet, this potential need to create additional maps puts the time- and cost-efficiency benefits of mind mapping at risk. Oversimplification of constructs or concepts was the potential consequence of not breaking maps down into separate maps with more detail relevant to separate services or intervention components, which as one informant identified may leave things '…*open to interpretation rather than a factual representation of personal views'*. This could explain why mind mapping was viewed by the researchers as less successful for IFS than it was for Uniting. Were we trying to do too much in limited time and within the constraints of a visual diagram for the IFS evaluation? The loss of data complexity inhibited the extent to which we could discuss aspects of the implementation of two sub-components of the IFS service – the domestic and family violence specialist supports and the coordinated case planning aspects of the model.

Collectively, these limitations of mind mapping described in the paragraphs above suggest the need for researchers to carefully consider a priori whether mind mapping suits the particular evaluation project, by considering the size of service (and therefore the likely size of the research sample), the complexity of the evaluation questions, and the complexity of the service or program under study.

A further practical limitation of mind mapping encountered by the current researchers was the unanticipated amount of researcher time spent listening to audio-recordings of the focus groups and interviews. This task was performed either to clarify the meaning of terms or phrases depicted in the documented mind maps, or to locate quotations that could be used to illustrate a point. This task was time consuming, and ultimately for the IFS project, counteracted a solution to one of the barriers to efficient evaluation (i.e., time savings) that the mind maps were supposed to alleviate. For the Uniting project, however, the lead researcher (author FM) - who was the person doing the analysis of data - found the data analysis to have been much quicker using the mind mapping process compared to more traditional approaches to transcribing audio recordings and conducting thematic analysis post-hoc. However, this researcher did note that having to go back to the audio files to extract quotes was onerous and added time to the write up of findings. One recommendation that would alleviate this time challenge is for quotes which illustrate key themes to be noted during the interviews or groups, perhaps also considering the addition of another researcher during consultations, whose express role it is to note down relevant quotations in situ.

The extensive time spent by the researchers in actually creating the complex pictorial maps (in particular for the multi-site, multi-component IFS project) was also unanticipated. A partial solution to this practical challenge would be to use the same person who conducted the consultations to perform the analysis and write up the results, and for the latency of time between these two activities to be minimal. This would mean ideally one single person would run all consultations within a project, as well as analysing and writing up results. For the IFS evaluation this would have imposed a great burden on a single person, given the need to cover 22 locations across regional and metropolitan areas of the geographically large state of Queensland. This would certainly have impacted timelines for the evaluation – again another barrier that mind maps were intended to alleviate.

Finally, the value of mind mapping for individual interviews was questioned by informants and the researchers. The value of mind mapping appears to be in its ability to consolidate multiple perspectives into a

consensus view, or at least to map areas where consensus could not be reached. Further, the capacity to reflect on the views expressed by others in a group, was noted by one participant to be of value in shaping their own personal view of the topic under discussion. Therefore, use of mind maps in individual consultations is not recommended, unless the value of having a visual representation to seek immediate validation and to maintain the informant's engagement with the discussion deems mind mapping useful. Thus, decisions to use mind mapping in individual consultations should be made judiciously.

Conclusions

Mind mapping offers a pragmatic solution for the collection, collation and reporting of voluminous qualitative data from multiple informants in program evaluation. Mind mapping is an acceptable method for capturing and synthesising valid data from informants. It is a helpful qualitative research technique that brings advantages to the researcher in reducing the time burden associated with standard thematic analysis of audio recordings or recalling content in detail after a focus group. Use of mind mapping for focus group data collation allows validation to occur in situ. It seems from our analyses that mind mapping is best used for smaller sample research projects that involve less complex evaluation coverage. That is, mind mapping data collection and analysis proved less beneficial for the larger evaluation involving a multiple component intervention across multiple, diverse locations.

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Appendix 1. Questionnaire accompanying validation request (example used for the Uniting DVF case study)

Survey items sent with meta maps
• What is your role?
• Which service location/s do you work in?
• Did you attend a mind mapping session?
• Which mind mapping session/s did you attend?
• To what extent do you think you contributed to the creation of the mind map in your session?
The following pages relate to the accuracy of this map in regard to your opinion
• Please rate how well the mind map reflects the discussion of your session
• Do the items connected to 'Knowledge' relating to the DVF reflect your views and/or experiences?
• Do the items connected to 'Implementation' of the DVF reflect your views and/or experiences?
• Do the items connected to 'Improvements' for the DVF reflect your views and/or experiences?
• Do the items connected to 'Barriers' regarding the DVF reflect your views and/or experiences?
• Did the mind mapping exercise provide you enough opportunities to actively participate?
• Comparing the mind map provided with your personal views, which of the following statements are true? Select all that apply and provide details where possible ▪ The mind map is missing some important concepts ▪ One or more of the concepts on the mind map are not quite right ▪ The mind map includes one or more irrelevant or unimportant concepts ▪ The mind map does not depict one or more important relationships between concepts ▪ One or more relationships between concepts on the mind map are not quite right ▪ We were unable to depict at least one important issue using the mind map ▪ None of the above

Survey items sent with meta maps
• Thinking about the process of developing the mind map, which of the following statements are true? Select all that apply and provide details where possible ▪ I learned that my colleagues and I thought differently about which concepts matter ▪ I learned that my colleagues and I thought differently about what at least one concept means ▪ I learned that my colleagues and I thought differently about the relationships between at least two concepts ▪ I changed my mind about how important at least one concept is ▪ I have a clearer/deeper understanding of at least one concept ▪ I have changed my mind about the way at least one set of concepts relate to each other ▪ I have a clearer/deeper understanding of the relationship between at least one set of concepts ▪ None of the above
• Thinking about this experience of using mind maps as a tool for group discussion and consultation, which of the following statements are true? Select all that apply and provide details where possible ▪ This is a useful technique for helping groups to develop a shared understanding ▪ This is a useful technique for communicating complex ideas succinctly ▪ The shortcomings of the mind map, which I noted in Q12, are due at least in part to the mind map technique itself (i.e., they aren't solely the result of a disagreement among members of the group) ▪ I wish we'd been able to go into more detail about what at least one concept means ▪ I wish we'd been able to explain at least one relationship between concepts in more detail ▪ None of the above
• In an overall sense, how satisfied were you with the mind mapping exercise?
• Please note any other benefits of the mind mapping exercise (valuable things gained)
• Please note any other weaknesses of the mind mapping exercise (things you did not like)

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