Outreach to Low-Wage and Precarious Workers

Concept Mapping for Public Health Officers

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Objective: To explore concept mapping (CM) as a participatory methodology that can be used by public health officials to strategize approaches to reducing health inequities among low wage workers and workers with unstable employment. **Methods:** In a workshop of 68 occupational health officers, mainly from government agencies, CM was demonstrated through gathering and prioritizing ideas for reaching underserved, at-risk working populations. **Results:** Prior to the workshop, occupational health officers generated 99 brainstormed ideas on how to reach underserved workers. These were reduced to 39 unique items, which workshop participants then sorted into themes and prioritized based on perceived effectiveness and feasibility. Twelve specific approaches covering enhanced surveillance methods, occupational safety and health (OSH) training, and partnering with employers, other agencies, and community groups were considered most actionable by occupational/public health officers to address the health of low-wage, and precarious workers. In a follow-up session 1 year later, a subset of participants discussed the findings. **Conclusion:** Concept mapping can be used to elucidate actionable approaches by government agencies to better address occupational health inequities experienced by low wage and precarious workers.

Keywords: community engaged, concept mapping, health inequities, occupational health, public health officers

BACKGROUND

Community based participatory research (CBPR) methodologies are increasingly being used to assess needs and assets, implement community-driven interventions, and evaluate intervention effectiveness to improve health and reduce health inequities among communities.[1] Concept mapping (CM) is a mixed-methods, consensus-driven, participatory approach that is uniquely capable of bringing public health professionals and communities together in a short-term, but intensive way when funding and human resources are limited.[2–5] CM allows participants to generate and crystallize concepts and ideas, elucidate relationships between those ideas, rank the ideas in terms of importance, and rate the ideas according to pre-set criteria.[2–4] CM can help with the development of a conceptual model and focus public health interventions,[5] and its participatory nature makes it particularly useful when addressing issues of health inequities.

There is increasing scientific and public health surveillance literature that focuses on the health and health care needs of the working poor.[6,7] Awareness of disparities in severe injury,[8–11] unsafe employment conditions,[12,13] and limited access to workers' compensation[14–23] and appropriate health services[24,25] has led public health agencies and community groups to develop programs and reach out to low-wage, minority, immigrant, and precariously employed workers.[26] Because the working poor are often employed in very small businesses or in unstable employment conditions like ''temp'' and short-term contracted work,[27,28] directly evaluating and addressing prevention needs presents a significant challenge.

NIOSH funds 27 state agencies—health and labor departments, and their bona fide agents—to conduct state-based surveillance of occupational health indicators,[29] as well as other programs that address occupational health needs of various segments of the US workforce.[30] Precarious, minority, and immigrant workers have been targeted in many of these programs because of their high risk of work-related illnesses and injuries.[31]

In June of 2017, an Occupational Health Workshop was conducted to introduce staff of public health and labor departments and other interested attendees to CM as a methodology that they might use in their jurisdictions to reduce work-related illnesses and injuries among high-risk workforces. Attendees participated in facilitated engagement with CM methods prior to, during, and 1 year later, after the conference. This paper describes the CM methods presented in the workshop to illustrate how CM can be used in occupational health as an approach to generating participant/community-driven strategies to address complex health concerns.

METHODS

A workshop on CM was developed for occupational and general public health professionals attending the Occupational Health Section of the Council of State and Territorial Epidemiologists (CSTE) meeting in Boise, Idaho in June of 2017. To best illustrate its use, workshop leaders (WLs) developed a CM exercise that focused on addressing health issues among underserved working populations in their jurisdictions. An instructional slideshow on CM was tailored to the audience and to the content of the workshop.

CM methodology consists of three phases—brainstorming, sorting and rating, and debriefing the findings. A focal question for brainstorming was constructed based on the interest of this group in occupational health disparities and this group's interest in public health work designed to address the needs of precariously employed workers:

One action, program, or service that state and territorial health departments and affiliates can take to protect the health of workers in low wage, precarious jobs would be ____.

In the weeks prior to the workshop, a link was sent to the Occupational Health listserv of the Council of State and Territorial Epidemiologists, and participants were asked to log on to Concept Systems Global MAX © (Concept Systems, Inc., Ithaca, NY) and respond anonymously to the focal question with as many single answers as they wanted. Four individuals responded, generating an initial list of 99 ideas. In preparation for the meeting, the WLs reduced the number of responses by deleting duplicates, removing non-sense items, and combining items that were very similar, yet preserving unique ideas. Each item was entered into the Concept Systems© software and printed on sets of cards to enable participants to complete the remaining activities either online or on paper during the workshop.

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TABLE 1. Characteristics of 68 Participants at Occupational Health Concept Mapping Workshop, CSTE 2017, Boise

Characteristic	No.	% of Total ($N = 68$)	Characteristic	No.	% of Total ($N = 68$)
Primary focus			Participant's employer		
Occupational health	47	69.1%	Health Dept—State or Territorial	33	48.5%
General public health	15	22.1%	Health Dept—County or City	4	5.9%
No response	6	8.8%	Federal Agency	11	16.3%
			State Agency (other than health dept)	7	10.3%
Years of experience			University	5	7.4%
<1 yr	3	4.4%	Non-profit or Community-based Org	1	1.5%
1–5 yrs	15	22.1%	Other	1	1.5%
6–10 yrs	13	19.1%	No response	6	8.8%
11–15 yrs	10	14.7%			
16–20 yrs	7	10.3%	US region		
>20 yrs	14	20.6%	I: CT, ME, MA, NH, RI, VT	4	5.9%
No response	6	8.8%	II: NJ, NY, PR, USVI	6	8.8%
			III: DL, DC, MD, PA, VA, WV	2	2.9%
Gender			IV: AL, FL, GA, KY, MS, NC, SC, TN	7	10.3%
Female	41	60.3%	V: IL, IN, MI, MN, OH, WI	14	20.6%
Male	16	23.5%	VI: AR, LA, NM, OK, TX	3	4.4%
Transgender	0	0.0%	VII: IA, KS, MO, NE	5	7.4%
Queer/non-conforming	1	1.5%	VIII: CO, MT, ND, SD, UT, WY	4	5.9%
Prefer not to answer	3	4.4%	IX: AZ, CA, HI, NV, AS, GU, MP, TTPI	5	7.4%
No response	7	10.3%	X: AK, ID, OR, WA	9	13.2%
			No response	9	13.2%

At the workshop, experts in occupational health practice were formally introduced to CM by WLs. Sixty-eight individuals participated in the workshop; their characteristics are shown in Table 1. As part of the learning activities, they were asked either to go online or use the cards to sort brainstorm items into piles where all the items seemed related to one another, and then to name each pile with a label that described the content (online, they were able to drag and drop items into lists and label each list).

Participants were then given a list of the items and asked to go through and rate each item using a Likert scale. Participants did this twice, for two separate rating scales. The rating questions were:

1. Below is a list of actions or programs that state/territorial health departments can take to improve the health of precariously employed workers in their jurisdiction. This was generated from our online brainstorm, completed prior to the CSTE Sunday Workshop in Occupational Health. Please rate each item based on how feasible you think this action or program would be to conduct in your individual jurisdiction.

Very Feasible				Relatively Infeasible
1	2	3	4	5

2. Below is a list of actions or programs that state/territorial health departments can take to improve the health of precariously employed workers in their jurisdiction. This was generated from our online brainstorm, completed prior to the CSTE Sunday Workshop in Occupational Health. Please rate each item based on how effective you think this action or program would be in addressing the health needs of the low wage workforce in your jurisdiction. By effective, we mean that this action, service, or program would have the greatest positive impact on the largest number of people.

Very Effective				Relatively Ineffective
1	2	3	4	5

After the workshop concluded, the results from paper-based sorting and rating were entered into the Concept Systems© software in combination with the online sorting and rating input. Data were analyzed using multidimensional scaling and hierarchical cluster analysis. The sorting data were first used to formulate dot maps that showed the relationship between items. Hierarchical cluster analysis was used to illustrate how the items grouped into clusters. Workshop leaders went through the cluster hierarchy, reviewing the list of items starting with 15 clusters, and subsequently reduced the number of clusters, one at a time, to 14 then 13 then 12, etc., with the recombination of items in the newly configured clusters. At each reduction, the WLs determined as individuals, and then by consensus, whether the newly constituted cluster-list ''made sense''—that is, whether each new combination of items conceptually fit together. Distinct clusters were reduced one at a time from 15 to 7, after which further recombination of the items no longer made sense to the WLs.

WLs also looked at the themes or constructs (labels) that emerged during examination of the cluster patterns. Rating data were used to create pattern match and go zone illustrations that show whether certain constructs appear to have greater priority or importance to the participants, and along which continuums. WLs explored the data as a whole, and also stratified it by whether respondents worked at health departments or elsewhere, and whether participants had worked for a short (5 or fewer years) or long time in occupational health. Concept maps and other visual aides were developed to depict how the items and themes relate to one another.

At the annual meeting of the Council of State and Territorial Epidemiologists, 1 year following the workshop where these data were collected, one of the workshop leaders led a formal session to present the methodology and results, and to facilitate a discussion of the audience's perceptions and interpretations of the findings. Around half of the 20 attendees had participated in the original workshop, and all worked in the realm of occupational health. At this debrief, the group discussed their interpretation of the findings, as well as their impressions of the CM method and its value to them as occupational health professionals.

Table 2 presents details about each step: what it entails, who was involved, how it was executed, and what the expected output is.

TABLE 2. Specific Components of Concept Mapping Workshop: Who Was Involved, How It Was Executed, and What the Final Product Was

What	Who	How	Product
Develop a focal question to be answered by target audience	Investigators (in this case, ''workshop leaders'' (WLs)	Iterative process with CSTE staff and conference planning committee. Can be done using cognitive interviews or pilot testing	Focal question, ready to use in the project
Brainstorm—give responses to the focal question	Participants (workshop attendees); investigators added a limited number of items from their own knowledge of the subject and from the literature	Participants invited to respond to question online using concept systems software. Can also be done in person	Exhaustive list of items responding to brainstorm ($N = 98$)
Reduce brainstorm items to eliminate redundancy and non-sense items	Investigators (WLs)	Two WLs sat together and talked through the reduction to get items to smallest number possible, yet preserve all unique ideas	Non-redundant, minimal list of items ready for sorting
List each brainstorm item either online or on paper	Investigators (WLs)	Each item copied onto a card or put in online platform	Set of cards to distribute; or access to online list
Sorting items into piles that have meaningful associations; every item has at least one buddy and there must be more than one pile	Participants	Each participant either had cards to sort or could ''click and drag'' within the concept systems software on their laptops	Piles with ''associated items'' per sensibilities of the participants
Cluster analysis hierarchical modeling	Investigators	Using concept systems software	Relational maps: scattered dots for each item; set of polygons
Cluster reduction	Investigators (could be done in collaboration with community)	Using CM software and hand analysis of each cluster reduction	Minimal number of meaningful clusters (scattered dots; scattered polygons) on a plane
Rating questions (2): Most feasible strategy Most effective strategy	Investigators developed questions; participants did the rating	Two questions with Likert scale responses	Ratings of each item by each individual
Creating maps and graphics	Investigators	Using CM software	Graphics: Concept maps, Go-zones Pattern matches
Group interpretation of results (items, clusters, relationships) (not completed in this project)	Investigators and participants	Face to face	Analysis with attributed meaning

RESULTS

Ninety-nine brainstorm items were entered by four of the widely solicited occupational health practitioners into Concept Systems© software prior to the workshop; these items were reduced to 39 items by the WLs through elimination of duplicates and non-sense items and by combining items that described essentially the same idea. Table 3 shows the various items (responses to brainstorm question) in this project. After participants sorted the 39 items into piles with associated themes and labeled each pile with their perceived theme, WLs used the software to create a dot map, showing each item (ignoring the theme label) on a plane and its relationship to all other items (not shown here). Using the Concept Systems software, it is possible to hover over each dot and see the item written out.

WLs initially examined the data using a 15-cluster solution, and began the process of cluster reduction as described in the Methods. WLs felt that the 7-cluster solution provided the best fit (stopping when further combination of items led to grouping of items not applicable to the theme). The final cluster solution is illustrated in Fig. 1. WLs renamed the clusters (piles) by combining and renaming (shortening) the pile labels given by participants: enhance surveillance systems; occupational safety and health (OSH) education and communication; foster collaboration among stakeholders; engage stakeholders in planning activities; support community based efforts; fund healthcare and prevention activities; policy and advocacy. The items (interventions) grouped under the seven cluster labels are shown in Table 3.

Figure 2 shows the pattern match comparing participants' perceptions of feasibility versus effectiveness of interventions, represented by each of the clusters. As the overall correlation coefficient $r = 0.18$ shows, there was a weak correlation between the clusters that participants ranked as feasible and what they ranked as important. Four clusters—policy and advocacy; support community efforts; funding for health care services; enhancing surveillance systems—were perceived to be highly effective, though feasibility of implementation was considered to be relatively low. In contrast, providing OSH education and supporting stakeholder planning were considered to be more feasible than effective. One item, ''fostering collaboration among stakeholders'' was almost equally feasible and effective. We compared the pattern matches by years of experience and whether individuals worked in occupational versus general public health, but we did not find meaningful differences when we stratified for these variables (data not shown).

Go-zones (Fig. 3) are another form of comparison of participants' perceptions of high feasibility + high effectiveness, high feasibility + low effectiveness, low feasibility + high effectiveness, and low feasibility + low effectiveness. Unlike pattern matches, which rate the feasibility or effectiveness by general cluster,

TABLE 3. Sorting and Labeling

Cluster Descriptor	Item No.	Statement	*Go-Zone Quadrants (see Fig. 3)
Enhance surveillance systems	5	Improve surveillance methods for monitoring sentinel events of low-wage and precariously employed workers	I
	8	Respond to worker and employer requests for help in mitigating health hazards in workplaces of precarious workers	I
	22	Investigate sentinel occupational health events in companies	I
	34	Include state workers' compensation data in surveillance of occupational injuries and illnesses	I
	20	Conduct a health needs assessment of precarious workers in the jurisdiction of the HD using quantitative and qualitative approaches and write a data driven report	III
	23	Establish hotline at HD for reporting hazardous working conditions	IV
OSH education and communication	32	Develop workplace health and safety training tailored to specific highly vulnerable populations (eg, adults for whom English is a second language or adults who are undocumented)	I
	36	Develop safety-training materials specifically tailored for a workforce that rapidly moves from one job or job-site to another	I
	10	Partner with Community Health Centers to disseminate health information to precarious workers	I/II border
	35	Provide continuing education and training events (including webinars) for clinicians and clinic staff around occupational health issues	II
	1	Create and disseminate information for precarious workers about common occupational injuries and how to protect themselves	II
	9	Educate employers about promoting and protecting the health of their workforces	II
	38	Train local HD personnel to recognize occupational health and safety issues that affect precariously employed workers in their jurisdictions	II
	13	Create and disseminate information about general health issues that affect precarious workers	II
	30	Use cutting edge technology for prevention messaging	IV
Foster collaboration and knowledge exchange among stakeholders	3	Partner with local/regional trauma centers and emergency medical services to identify occupational health-related injuries and illnesses among precarious workers	I
	4	Share health data with OSHA and other state agencies to improve the health of precarious workers	I
	15	Collaborate with academic researchers on building evidence that supports the health of precarious workers	II
	37	Calculate and publicize the return on investment for employers who provide benefits such as paid sick leave and health insurance.	IV
Engage external stakeholders in OSH planning	17	Include workers' centers, union reps, and other worker advocates in HD strategic planning efforts for statewide prevention	I
	19	Ensure that occupational health and safety issues are integrated into the strategic planning of HDs, including injury prevention plans.	I/III border
	6	Convene/participate in regional professional meetings and stakeholder groups regarding the health and safety of working populations within the jurisdiction	II
	7	Include employers in HD strategic planning efforts for statewide prevention	II
	11	Convene different units/depts in the state HD to plan activities focused on OSH and precarious workers	II
	12	Engage faith based organizations in efforts to protect worker health	II
Support community-based efforts	29	Prioritize occupational categories that tend to be precarious or low-wage positions in HD surveillance and program planning efforts.	I
	24	Assist community based organizations to get grants to do high quality messaging about workplace hazards through news outlets	IV
	25	Provide grants to day labor organizations for health and safety outreach efforts	IV
Funding health and prevention activities	2	Provide or assist in obtaining direct medical services for precariously employed and migrant workers (eg, TB screening, immunizations)	III
	16	Find funding to provide preventive health care services to precarious workers	III
	26	Seek funding to address prevention of injuries among precarious workers	III
Policy and advocacy	33	Support policy to inform temp workers on workplace hazards and preventing injuries	I/II border
	31	Promote the enforcement of laws that allow state and local HDs to enter hazardous workplaces to protect workers	III
	21	Advocate for state and federal policies that increase the social safety net for low-wage workers (eg, guaranteed basic income, increased minimum wage, paid family leave, affordable child care, Medicaid, ability to transport benefits from one job to another).	III
	27	Advocate for state policies that ensure clean and safe working conditions for low-wage and precariously employed workers (eg, access to safe and sanitary bathrooms, smoke free workplaces)	III
	28	Advocate for policy to prevent temp workers from doing particularly hazardous jobs	IV
	18	Support the implementation of single-payer or universal health care in the jurisdiction	IV
	39	Advocate for the establishment of a federally qualified health center (sliding scale clinic) within each county in the state.	IV

HD, Health Department; OSHA, Occupational Safety and Health Administration.
*Go zone quadrants: I = hi feasibility, hi effectiveness; II = hi feasibility, lo effectiveness; III = lo feasibility, hi effectiveness; IV = lo feasibility, lo effectiveness
List of items (possible interventions) by cluster and go-zone quadrants.

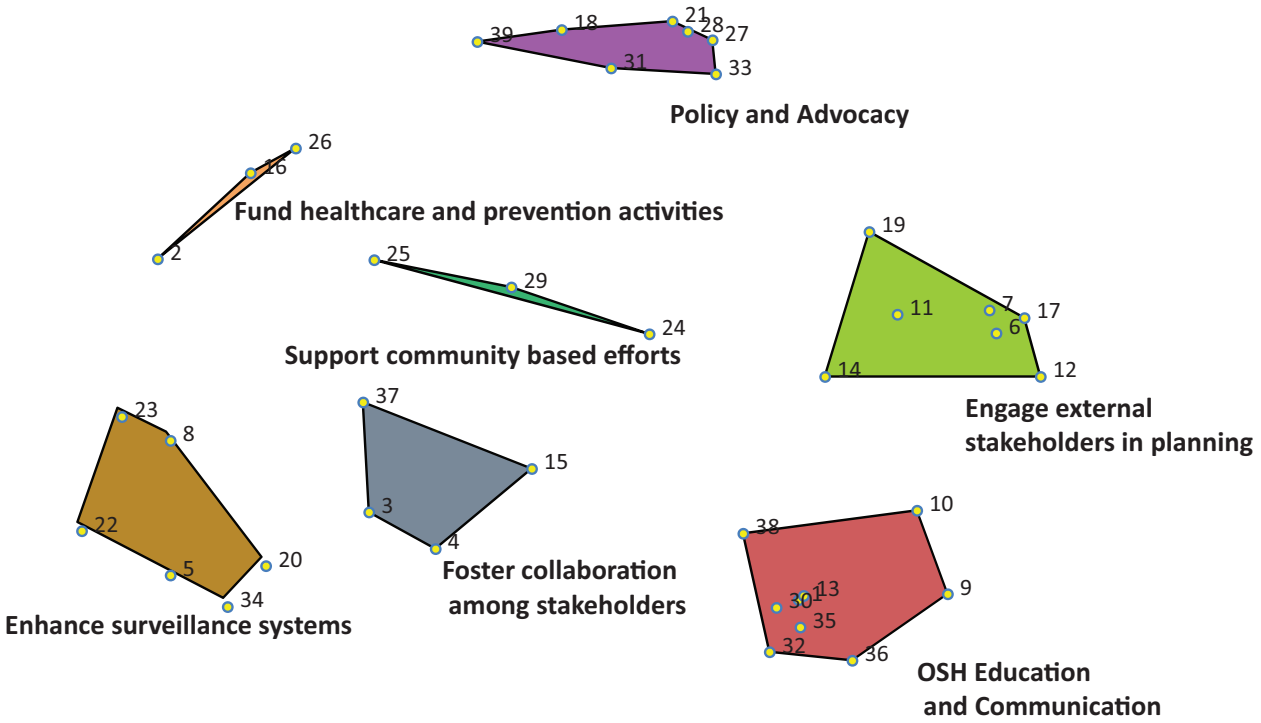

FIGURE 1. Cluster map showing relationships between themes (labels assigned to sorted piles).

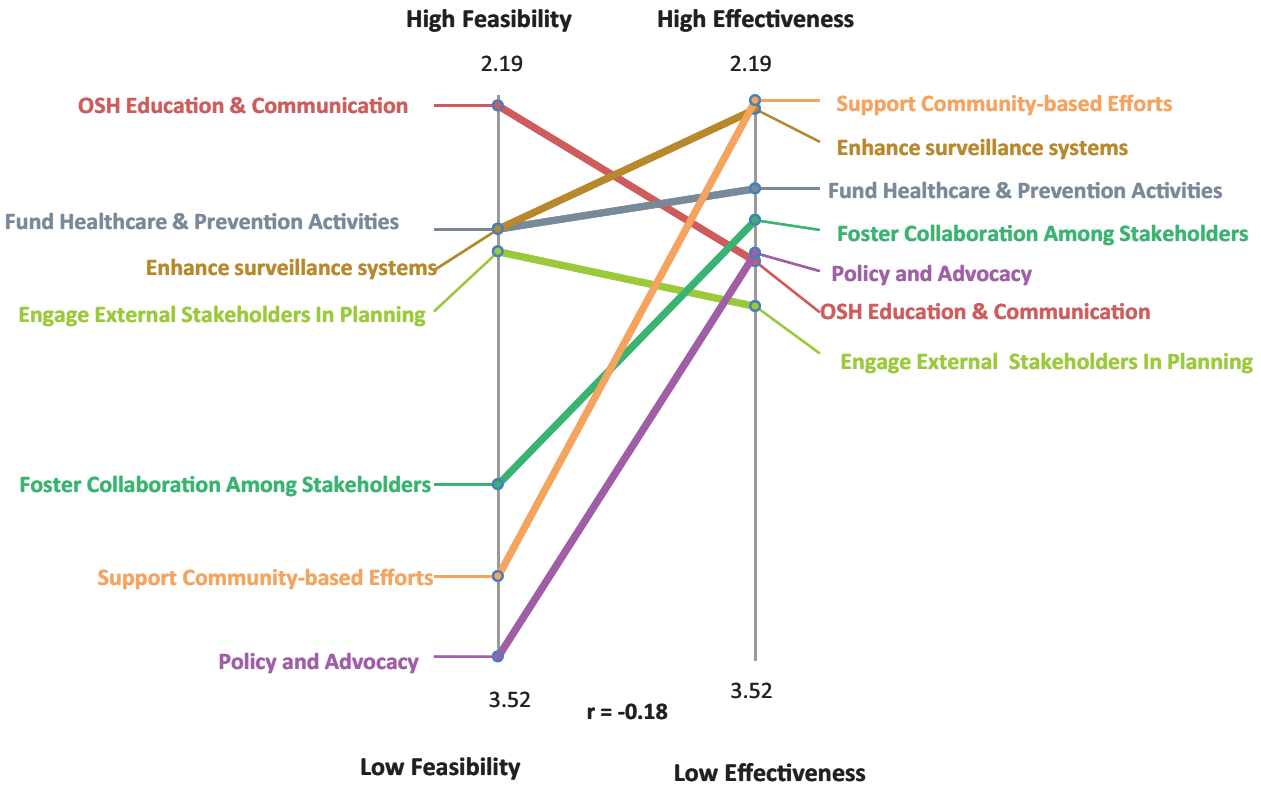

FIGURE 2. Pattern match of feasibility versus effectiveness of interventions for the working poor as perceived by public health personnel.

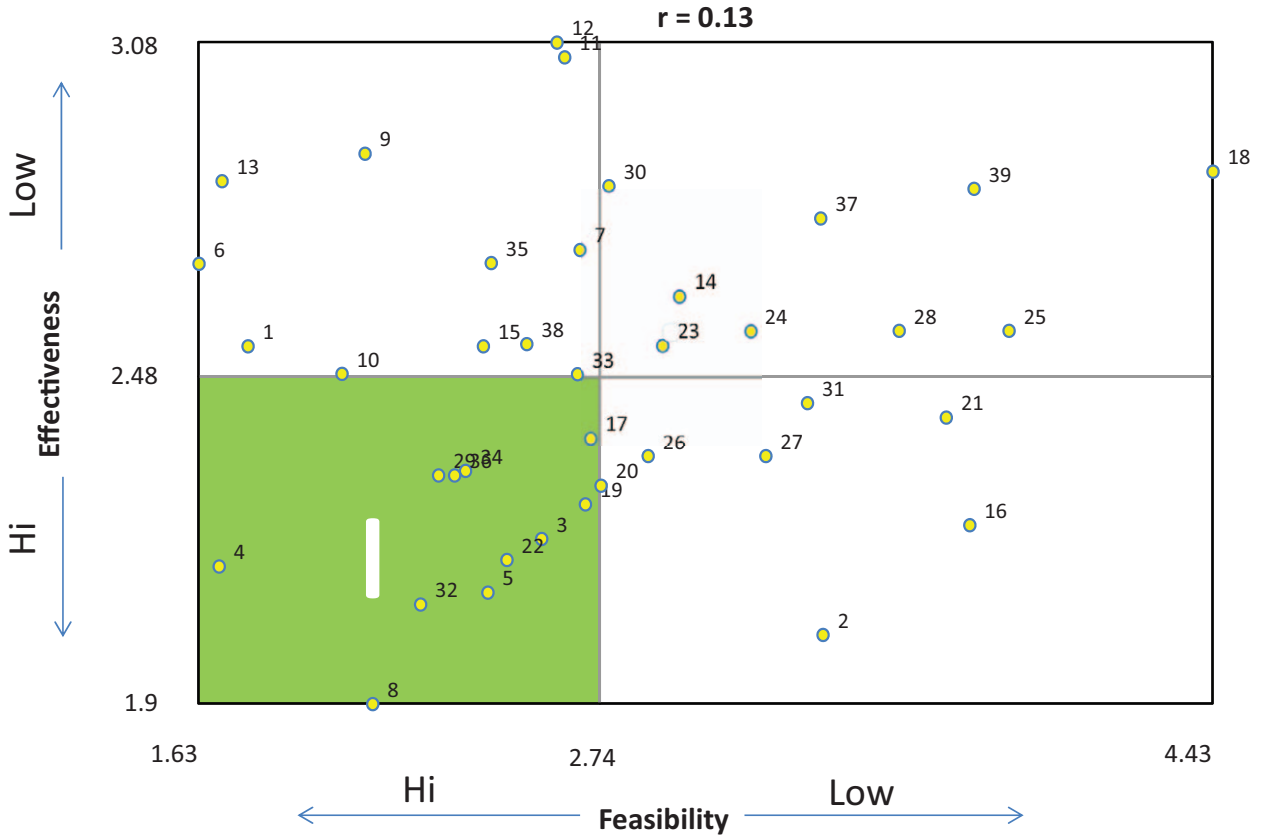

FIGURE 3. Go-zone shows items that are perceived to be of high feasibility and high effectiveness.

Go-zones are based on individual item ratings. The four quadrants are divided by a vertical line that lay on the mean score of feasibility (2.74) and a horizontal line that is drawn on the mean score of effectiveness (2.48). The lower left quadrant, shaded, contains interventions with perceived high feasibility and high effectiveness; these interventions (items) are likely to be the most promising (in other words, the interventions to ''go to'' first), in the eyes of the participants in this workshop. The items that clustered in the Go-zone areas are listed in the last column of Table 3. Quadrant I includes items with the highest feasibility and the highest effectiveness; these are listed separately in Table 4. According to the participants in the workshop, the interventions listed in the Go-zone (quadrant I) stand the chance of greatest success in being implemented and in having a positive effect. Quadrant II contains items perceived to have high feasibility and low effectiveness; quadrant III with items perceived to have low feasibility and high

TABLE 4. High Effectiveness and High Feasibility Interventions to Address Health Inequities Among Low Wage and Precarious Workers, as Determined by Occupational/Public Health Professionals (Go-Zone Quadrant I)

Proposed Interventions
Improve surveillance methods for monitoring sentinel events of low-wage and precariously employed workers
Prioritize occupational categories that tend to be precarious or low-wage positions in HD surveillance and program planning efforts
Include state workers' compensation data in surveillance of occupational injuries and illnesses
Share health data with OSHA and other state agencies to improve the health of precarious workers
Partner with local/regional trauma centers and emergency medical services to identify occupational health-related injuries and illnesses among precarious workers
Investigate sentinel occupational health events in companies
Respond to worker and employer requests for help in mitigating health hazards in workplaces of precarious workers
Develop workplace health and safety training tailored to specific highly vulnerable populations (eg, adults for whom English is a second language or adults who are undocumented)
Develop safety-training materials specifically tailored for a workforce that rapidly moves from one job or job-site to another
Partner with Community Health Centers to disseminate health information to precarious workers
Include workers' centers, union reps, and other worker advocates in HD strategic planning efforts for statewide prevention
Ensure that occupational health and safety issues are integrated into the strategic planning of HDs, including injury prevention plans
Support policy to inform temp workers on workplace hazards and preventing injuries

HD, Health Department; OSHA, Occupational Safety and Health Administration.

effectiveness, and quadrant IV with items that have both low feasibility and low perceived effectiveness.

At the debrief session, a group of occupational health officials—many of whom were in the original workshop—discussed the meaning of these findings and whether the results of the exercise or the process itself was informative. Three major points were made by participants:

Advocacy and policy engagement are absent from the Go-zone (zone I) because policymaking and direct policy support are generally not in the realm of government employees; furthermore, they are either not allowed or not encouraged to engage with policy as part of their work.

Participants, whether the array and diversity of items in Table 4, reflect the diversity of the participants, only, or whether they represent all OH professionals. It was pointed out that findings were expected and ''tidy'' because this group is homogeneous, and a small number of individuals provided brainstorm items. Therefore, this may not reflect the whole realm of occupational health practice.

It was suggested that participants simply described the work they do, not necessarily what would be most effective. One person questioned whether CM is truly useful for gaining insights or driving further action (as opposed to perpetuating or validating current practices).

DISCUSSION

This workshop provides an example of how CM could be used in occupational health and other fields of public health to brainstorm and prioritize public health activities in a rapid, straightforward, community engaged, and consensus driven method. Occupational health is generally not given a high priority in state agencies and in public health, in general, as suggested by funding allocation and number of personnel undertaking OH activities (personal communication, Laura A. Linnan). Those present at the workshop represent the majority of state agencies' occupational health staff (44/69 = 63.8%; multiple staff members from each of the 27 NIOSH funded states in all regions were most likely to be the ones in attendance). Federal agency (NIOSH) officials who work on occupational surveillance were also in attendance. This suggests that the findings are representative of state-level public/occupational health professionals working in this field, though a higher number of brainstorming contributors and a higher number of final interpreters would make the findings stronger. Furthermore, the tool provided a mechanism for occupational health professionals, who may be isolated in local and state health departments that have limited staff and are marginalized, to exploit national meetings to help leverage their peer expertise to define and drive specific public health policies at the local level.

It may not be surprising that enhancing surveillance systems and conducting OSH education, training, and outreach were identified as three of the most feasible (and not ineffective) categories of actions OH staff can take, as these are often the specific activities undertaken by participants in their public health roles. The specific items identified in the ''go-zone''—things public health staff can do ''to protect low wage and precarious workers in their jobs''—are also reflective of the tasks generally done by participants in their work. Occupational health professionals have confidence in time-honored strategies.

Notably, however, approaches that center around policy, advocacy, and funding, were identified as some of the most effective types of strategies to improve the health and safety of workers, yet were considered the least feasible. Structural changes are likely to have the greatest impact on ''protecting the health of workers.''[32,33] However, the perceived lack of feasibility identified by these professionals describes the constraints placed on public health and occupational health and safety professionals in local, state, and federal health agencies, where engagement in political and legal efforts are often discouraged or banned, outright. Furthermore, most of the participants were staff and not decision-makers in their organizations.

However, mainly, this paper illustrates the applicability of CM to the field of OSH. While concept mapping has been applied in other public health contexts, including community needs assessments, intervention planning, and program evaluation,[5] we were unable to identify examples of how OSH professionals or researchers have used this method to conceptualize or address issues of critical import to worker safety and well-being. Yet, as demonstrated here, this process would allow OSH professionals to reach a wide variety of participants using both in-person and on-line approaches. It allows participants to provide substantial input into defining the constructs being examined through the brainstorming process, which provides the basis for the prioritization (unlike standard surveys, where the researchers control the content of the response options). When trying to identify barriers or facilitators to workplace safety and health, this approach could offer greater opportunities for workers themselves to frame the issues. Additionally, by aggregating and de-identifying the brainstorming data, power imbalances between participants can be addressed; for example, an idea brainstormed by a worker is given the same opportunity to be sorted and rated as one raised by a supervisor. In this example, we had ideas generated by long-time public health professionals as well as newcomers to public health, and while we were able to see how different groups perceived the effectiveness or feasibility of items differently, the items themselves were initially considered and included as equally important.

Limitations

There are several limitations to this work. First, because this concept mapping project was completed as part of a workshop intended to introduce occupational health professionals to concept mapping and not as a formal research project, these findings may not reflect the same level of thoughtful consideration that would have been given if participants had been recruited for research purposes. However, the goal was to introduce an applied research methodology, CM, to an audience that needs to engage with the communities it serves, and that was achieved.

Second, a small number of individuals contributed ''brainstorm'' ideas, and the two workshop leaders had a larger role in managing the data than might be expected in a research context. In a community based participatory research project, the target audience would, best, have a larger role in the research itself—that is, more people would generate brainstorm items, more individuals might do the item reduction and decide on the appropriate number of clusters, and there would likely be several final interpretation sessions to make meaning of the results. This is required to achieve representativeness and to develop strategies that are truly actionable. It also is a means of achieving true participation in community-based participatory research.

Third, OSH professionals include a wide variety of job titles including: clinicians practicing in free-standing, contracted, and in-company settings; personnel hired by companies in the realms of human resources, industrial hygiene, and safety management; employees of OSH enforcement agencies (Occupational Safety and Health Administration, departments of labor, departments of agriculture, and departments of environmental protection); and community based organizations like workers' centers. These results would be most generalizable to OSH professionals working in public health agencies and their bona fide agents.

Finally, this workshop was conducted for the purpose of training occupational health professionals on a methodology to engage communities. To our knowledge, none of the participants have used the CM methodology in their work and we do not know what the implementation barriers might be.

CONCLUSIONS

Concept mapping is a methodology that can engage public health stakeholders and can glean useful insights about needed and effective public health services. The outcomes from this workshop suggest that this approach has important application in the world of occupational health and safety. While our project examined how public health officials who work in occupational health perceive strategies to address the health needs of low wage, precariously employed workers, our experience and our results suggest that this approach can lead to the development of roadmaps for action across a number of occupational health issues. CM should be further explored as a tool for enhancing interventions to protect the health of workers and other populations that are the focus of governmental public health agencies.

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