



Original article

## Mapping the Views of Adolescent Health Stakeholders



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### ABSTRACT

**Purpose:** Health research that includes youth and family stakeholders increases the contextual relevance of findings, which can benefit both the researchers and stakeholders involved. The goal of this study was to identify youth and family adolescent health priorities and to explore strategies to address these concerns.

**Methods:** Stakeholders identified important adolescent health concerns, perceptions of which were then explored using concept mapping. Concept mapping is a mixed-method participatory research approach that invites input from various stakeholders. In response to prompts, stakeholders suggested ways to address the identified health conditions. Adolescent participants then sorted the statements into groups based on content similarity and rated the statements for importance and feasibility. Multidimensional scaling and cluster analysis were then applied to create the concept maps.

**Results:** Stakeholders identified sexually transmitted infections (STIs) and obesity as the health conditions they considered most important. The concept map for STIs identified 7 clusters: General sex education, support and empowerment, testing and treatment, community involvement and awareness, prevention and protection, parental involvement in sex education, and media. The obesity concept map portrayed 8 clusters: Healthy food choices, obesity education, support systems, clinical and community involvement, community support for exercise, physical activity, nutrition support, and nutrition education. Ratings were generally higher for importance than for feasibility.

**Conclusions:** The concept maps demonstrate stakeholder-driven ideas about approaches to target STIs and obesity in this context. Strategies at multiple social ecological levels were emphasized. The concept maps can be used to generate discussion regarding these topics and to identify interventions.

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### IMPLICATIONS AND CONTRIBUTION

Research that includes youth and family stakeholders increases the contextual relevance of findings, yet participatory research with adolescents is an underutilized strategy. This study reports that the most common health concerns of stakeholders in adolescent health include STIs and obesity. The results further describe stakeholder-recommended approaches to target these concerns.

Youth health research that includes adolescents and families increases the contextual relevance of findings [1]. Participatory approaches can engage local youth and families in research to

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address problems of interest to the stakeholders involved. Benefits of participatory research include increased relevance of the research to both the various stakeholders and the academic partners, and development of interventions that are informed by the lived experience of the stakeholders involved [2].

Participatory approaches to research have become increasingly commonplace, particularly regarding adult health [3].

Children and adolescents are uniquely situated to benefit from participatory research approaches that emphasize multifactorial elements affecting health and illness [3]. Although children and adolescents are especially impacted by health conditions with social and environmental etiologies [3], youth engagement in health research using participatory approaches remains less frequent than among adults [3]. Participatory research is also particularly important among marginalized populations [1], including minorities and populations of low socioeconomic status [3].

Youth are less often actively engaged in health research than are adults [3], although several studies do report youth involvement. Ginsburg et al. [4] report on services desired by youth and their preferences regarding health care provision. Mathews et al. [5] describe a project designed to reduce health disparities in which adolescent girls assessed community needs and designed an intervention. Reis et al. [6] describe youth impressions of factors affecting physical activity. Recently, an issue of the *American Journal of Community Psychology* was dedicated to the topic of participatory research with children [7]. The participatory work described within ranges from examination of school recess [8] to work on youth mental health issues [9]. Similarly, an issue of *Family & Community Health* dealt with youth-involved community-based participatory research work ranging from substance abuse prevention [10] to issues affecting immigrant youth [11]. However, relatively little information exists about adolescents' health priorities. As Reich et al. [12] state, "Youth are rarely involved in the process of identifying or addressing their own needs". Yet, this information is significant because interventions have the potential to be more successful if they target concerns of the affected population of youth [13].

Concept mapping (CM) is a stakeholder-driven, mixed-method research approach that is particularly well suited to the evaluation of health issues within the local community context [14]. CM has been used with adults and, to a more limited extent, with youth in conducting health research [3,15]. CM has been used to examine coping strategies among high-risk youth [16] as well as youth perceptions of physical activity [6] and bullying [14]. A singular strength of CM is that it moves beyond the mere identification of priority health conditions by offering youth the opportunity to become directly involved in discussing strategies to address those health conditions. Typically, interventions are expert driven and/or selected from existing evidence-based practices without seeking any youth input [14]. Strategies created with input from youth are desirable because they are more contextually relevant, which can improve the "translational capacity" of this research [17]. Prior research suggests that outcomes are improved when the target group is involved in identifying the problems to be targeted [12]. This study sought to identify youth, family, clinical health care worker (HCW), and public health worker adolescent health concerns and subsequently use CM to explore strategies to address those health concerns.

## Methods

### Study setting and participants

Participants included a convenience sample of adolescents aged 12–22 years seeking primary care in an urban, hospital-based adolescent medicine clinic; parents/guardians of clinic patients; HCWs; and public health workers. Youth aged 12–22

years were included in an attempt to obtain the fullest range possible of the adolescent voice; youth aged 12–22 years are seen in the clinic from which participants were recruited, thus youth of these ages were included in the study. Clinic patients live primarily in urban areas of a mid-sized midwestern city; 74% of patients identify themselves as African American and most patients are covered by public insurance. Community physicians from the hospital's mailing list, physicians employed by the hospital, and public health professionals from local institutions were identified and invited to participate via email. Academic and community clinicians and public health workers from various institutions participated. Patients and caregivers were approached during clinic visits, and any or all eligible parties could participate.

This study was approved by the Institutional Review Board of Cincinnati Children's Hospital Medical Center in Ohio. Participants provided informed consent verbally; the need for written documentation of informed consent and the need for parental consent were both waived.

### Study methods

In step 1, stakeholders identified health topics that they perceived to be important to adolescent health. In steps 2 through 4 and data analysis, CM methodology as described previously by Trochim and Kane [18,19] was used. CM is a multistep, mixed-method participatory research approach. It uses multiple steps including idea generation or brainstorming and statement sorting followed by statistical analysis using multidimensional scaling and hierarchical cluster analysis. Participants were recruited separately for each step in an iterative fashion; data analysis from each step was necessary before proceeding to the following step.

*Step 1: Health topic identification.* We planned to recruit 150 total participants, ideally evenly distributed among adolescents; HCWs; and other participants. Youth participants were asked "Thinking about adolescents (people ages 12–22 years), what do you think are the three most important health problems affecting adolescents in your neighborhood, your school, and/or your group of friends?" Parents, public health workers, and HCWs were asked appropriately modified versions of the same question. Responses were coded by researchers (L.E.).

*Step 2: Idea generation.* We aimed to recruit sufficient participants to generate 50–100 distinct ideas after editing. Participants were provided with a focus prompt regarding health conditions identified in step 1, for example, "In order to address obesity among teenagers and young adults, I believe we need to..." and asked to provide 3 to 5 ideas in response to each prompt.

*Step 3: Statement editing.* In CM, responses obtained from the idea generation phase constitute the basis for the statement sorting and rating step. Statements should be easily understandable to participants and relevant to the focus prompt; therefore, researchers (L.E., L.V.) edited the statements for clarity. Additionally, prior work in CM has shown that the ideal number of statements for use in the sorting phase is <100 [19] but generally >50 so as to represent sufficiently the diversity of ideas. Researchers edited the statements for clarity and eliminated redundant statements and those that did not seem to

address the focus prompt. Statements were then printed on cards for the subsequent step.

**Step 4: Statement sorting and rating.** Prior work has shown that there is minimal variation in the final concept map after 20–30 sorts [18,20]. Thus, we recruited 30 participants for the statement sorting step. To increase contextual relevance, participants during this phase were limited to adolescents, who received instructions both verbally and in writing. Each participant was given a stack of cards representing the complete set of edited ideas for one health topic. Each participant sorted the cards into groups based on the perceived similarity of ideas, thereby creating the number of groups they felt was appropriate. Participants then named each group. Subsequently, participants were asked to rate each idea based on its importance and feasibility, relative to that of the other ideas, using a five-point Likert scale. Feasibility was explained as “how easy the idea would be to actually do.” Participants were compensated with gift cards for participation in step 4 because this step was more time consuming than the other steps.

## Data Analysis

CM data analysis has been described in detail elsewhere [14,18]. Consistent with prior CM analyses, data from the sorting step were analyzed using multidimensional scaling, which computed an x,y coordinate for each item. The result was a two-dimensional visual representation for the items of each topic. Items that were often sorted together were located relatively close together, and items that were seldom or never sorted together were located relatively far apart.

These multidimensional scaling output data—the x,y coordinates—were analyzed by the research team using hierarchical cluster analysis, which provided a framework for segregating the data points into clusters of similar ideas. Because the number of clusters can range from 1 to the total number of items sorted, an interpretive step is necessary to choose the most appropriate solution. The research team (L.E., L.V., D.M.) chose the cluster solutions that represented the major concepts and provided sufficient detail without being redundant.

Finally, the group names provided by participants in step 4 were analyzed. Using the coordinates for each item, the locations of items in each group were averaged and the resulting coordinates were assigned the name given to the specific group. The names located closest to the center of a cluster were used as a guide to develop a final name; researchers chose cluster names by evaluating closely linked group names provided by the participants.

## Results

### Identification of important health conditions (step 1)

Table 1 shows the demographic makeup of participants. Some totals do not add up to 100% which reflects some missing data. For the first step, identifying health topics, participant responses varied and included “STDs,” “weight gain,” “depression,” “mental health (anxiety, depression, and suicidality),” “obesity/weight management,” “obesity,” and “sexual health.” Sexually transmitted infection (STI) was the most commonly cited health care condition, listed by 56% of all participants. Among adolescent participants, the most common responses were STIs, substance

**Table 1**  
Participant demographics

	Step 1 (topic identification)	Step 2 (idea generation)	Sorting/rating
<b>Participant type</b>			
Youth	103	70	61
Parent/guardian	22	8	n/a
HCW	93	62	n/a
Public health worker	17	8	n/a
Other	6	0	n/a
<b>Race/ethnicity</b>			
African American	105	65	54
Caucasian	108	62	3
Latino	7	5	0
Asian	2	0	0
Mixed	15	6	3
Other	3	0	0
<b>Gender</b>			
Female	185	108	54
Male	55	25	6

HCW = health care worker; n/a = not applicable.

abuse, and obesity. STIs were listed by 51% of adolescents, 35% listed substance use, and 28% listed obesity. Among clinical HCWs, the most common responses were mental health (71%), STIs (67%), and obesity (59%). Among parents and public health practitioners, the most common responses were STIs (76%), substance use (38%), and obesity (36%). Overall, the most common responses were STIs (56%), obesity (40%), and mental health (39%).

### Idea generation (step 2)

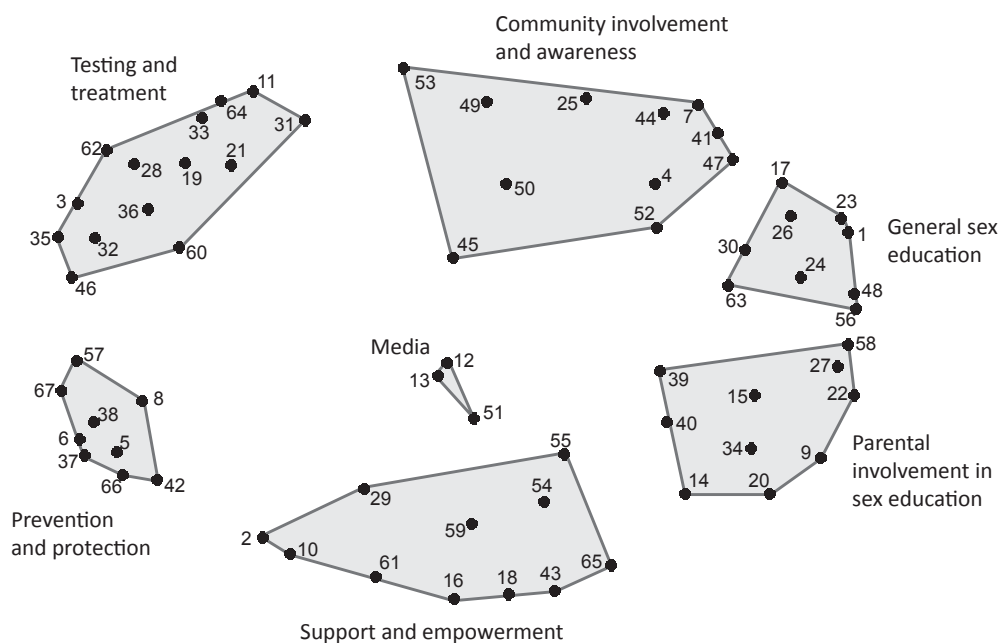
Table 1 shows the demographic makeup of participants. Stakeholders proposed a total of 331 ideas for addressing STIs and 525 ideas for addressing obesity. After editing these statements for redundancy (step 3), 67 STI statements and 70 obesity statements were used in the sorting task.

### Concept maps and rating data (step 4)

**STI concept map and rating data.** Figure 1 shows the STI concept map. Table 2 shows the statements. Items located close to one another were considered conceptually similar. For example, item 1 (educate teens on safe sex and STDs) and item 23 (educate about transmission) were situated close to each other, indicating that sorters found these ideas to be similar; thus, most stakeholders sorted these items together. In contrast, items 9 (educating parents) and 35 (offer free/reduced-cost STD screening) were situated quite far apart, indicating that sorters found these items to have limited conceptual similarity; thus, most stakeholders sorted these items separately.

The seven-cluster solution was chosen for the STI CM because it comprised seven distinct clusters. Solutions with six or fewer clusters did not provide sufficient detail about the major concepts, and solutions with eight or more clusters contained overlapping concepts. The seven clusters were general sex education, support and empowerment, testing and treatment, community involvement and awareness, prevention and protection, parental involvement in sex education, and media.

Individual statements were rated from one (low) to five (high) for both importance and feasibility, and ratings were then averaged by cluster (Table 3). Cluster rating averages for importance



**Figure 1.** Sexually transmitted infection (STI) concept map after application of cluster analysis. Individual points represent individual ideas generated. The map displays the seven clusters of ideas to address STIs.

ranged from 3.6 for prevention and protection to 4.4 for general sex education, while cluster rating averages for feasibility ranged from 2.9 for media to 4.0 for general sex education. A cluster's rating for importance was generally higher than its rating for feasibility with the exception of prevention and protection, for which the average feasibility rating was higher than the average importance rating. General sex education received the highest ratings for both importance and feasibility.

**Obesity concept map and rating data.** The eight-cluster solution was chosen for the obesity concept map because it represented the major concepts without redundancy (Figure 2). The clusters included healthy food choices, obesity education, support systems, clinical and community involvement, community support for exercise, physical activity, nutrition support, and nutrition education. Cluster rating averages for importance ranged from 3.8 for both nutrition support and clinical and community involvement to 4.2 for both nutrition education and support systems (Table 3). Feasibility rating averages ranged from 2.8 for healthy food choices to 3.5 for obesity education. Each cluster's average rating for importance was higher than its rating for feasibility.

## Discussion

Participatory research invites input from various stakeholders that ideally is solicited from the earliest phases of the research. Benefits include an increased relevance of the research to the stakeholders and the potential to lead to improved health outcomes [13]. For interventions to succeed, these stakeholders must first find the topic relevant, yet they often do not have the opportunity to provide input on the topics chosen for research and intervention. In particular, youth are rarely involved in priority setting regarding health research [12].

In the present study, stakeholders, including youth, provided input on conditions they considered important to adolescent

health. Topics identified by youth stakeholders overlapped significantly with topics chosen by parents, clinical HCWs, and public health workers. Although teens might be expected to espouse very different health care concerns than adults, our current data suggest that teens actually endorse similar concerns, with both youth and adult stakeholders identifying STIs and obesity among the most important adolescent health conditions. The health conditions identified by stakeholders are prevalent among US adolescents. Regarding sexual health, adolescents ages 15–24 years have higher rates of chlamydia and gonorrhea than any other age groups, and 25% of sexually active adolescent women are infected with an STI [21]. Regarding obesity, the CDC reports that 20.5% of adolescents are obese [22].

The concept maps created for STIs and obesity outline several ways to address these health issues. Although STIs and obesity are distinct diagnoses clinically, the concept maps demonstrate that there is significant overlap in the ways in which stakeholders perceive that the two issues can be addressed. Each map contained clusters specific to the disease processes of STIs and obesity, such as condom use to prevent STIs and physical activity for obesity. However, despite being distinct clinical entities, the concept maps also show a significant degree of similarity, such as educational elements, support systems, and community involvement. Both conditions are influenced by complex factors that impact many aspects of youths' lives. This reinforces the idea that practitioners should view STIs and obesity as more than conditions to be treated at the level of the individual but rather as conditions that are affected and can be affected by factors at multiple levels.

Preventive measures and interventions are often considered within the social ecological model of health [23]. This model provides a framework for considering the different domains that affect a person's health and incorporates interventions within the context of these different domains. Complex medical problems are often affected by factors at the individual, interpersonal,

**Table 2**  
Statements from sexually transmitted infection and obesity concept maps

STI statements	
1	Educate teens on safe sex and STDs
2	Do not have sex
3	Make sure contraception is paid for by health insurance
4	Have programs in the community to talk about STDs
5	Give more condoms out
6	Make condoms free
7	Check for and educate about sexual activity at every regular doctor's visit
8	Have free access to condoms in school nurse stations at public schools in Cincinnati
9	Educating parents
10	No sex until marriage
11	Have appropriate follow-up after treatment
12	Decrease exposure to sexual behavior in the media—TV, YouTube, videos, movies, and so forth
13	Social media
14	Promote more safe sex
15	People should talk to us more about it
16	Do not judge
17	Show them what some STDs look like
18	Improve self-esteem
19	Make sure teenagers have adequate access to health care/treatment
20	Tell parents to talk about STDs with their kids
21	Have testing available in nontraditional settings (other than doctors' offices)
22	Talk to teens about safe sex
23	Educate about transmission
24	Be sure teens know the risk of STDs
25	Talk about STD prevention at regular doctor's visits
26	Have comprehensive sex education in all schools
27	Teach about healthy relationships
28	Have confidential clinic services available
29	Know your partner's status
30	Show and talk to them about consequences
31	Make school-based health clinics more available
32	Make sure contraception is easily available for teenagers
33	Offer testing at every visit
34	Teach proper condom use
35	Offer free/reduced-cost STD screening
36	Reduce barriers to screening and treatment
37	Condoms should be more noticeable in stores
38	Make protection available to those who want it
39	Have a meeting with fellow teenagers and young adults about the topic
40	Awareness
41	Educate patients at each visit risk of STD
42	Have more events they can pass out condoms
43	Be supportive
44	Educate our community physicians about checking for STDs and treating STDs
45	Address barriers to using protection
46	Free access for everyone to birth control implants and IUDs
47	Educate our community about the very high STD rates here
48	Educate on condom use
49	Encourage teens to get tested, know your status
50	Make sure that there are meaningful, fulfilling activities for children and adolescents
51	Public health messages
52	Show videos of STD consequences
53	Encourage HPV vaccine
54	Ask teens if they are worried that they have an STD
55	Have churches/preacher talk about it
56	Teach safe sex (use condoms, birth control, and so forth)
57	Give out condoms when they come for doctor visit
58	Educate early (before initiating sexual activity)
59	Empower teens to advocate for their sexual safety
60	Reduce stigma of testing/treating
61	Encourage abstinence as a healthy option
62	Easy access to treatment
63	Talk consequences about STDs
64	Provide treatment
65	Make it easier for teens and young adults to talk to someone about STDs when they have questions
66	Make condoms more accessible
67	Reduce barriers to accessing condoms
Obesity statements	
1	Make healthy food more accessible (easier to get)
2	Try to get more people to talk about obesity

(continued on next page)

**Table 2**  
Continued

3	Make it “cool” to eat healthy
4	Empower teens to make a change
5	Give more education about why it is important to exercise and eat healthy
6	Have a support system
7	Physicians do a better job of recognizing the problem
8	Encourage teens to exercise
9	Stop eating junk food
10	Educate teens and young adults on nutrition
11	Group sessions talking about eating healthier
12	Better food choices
13	Have a dietitian available for counseling
14	Community exercise programs
15	More exercise in schools (gym)
16	Find out what teens know about obesity
17	Sports
18	Offer more programs for teens for exercise and fitness
19	Get kids aware of the harmful effects of obesity
20	Give information on obesity
21	Parents can be more involved with children
22	More physical activity on a regular basis
23	Educate parents
24	Talk about it in health class in schools
25	Have more safe and free recreation centers for teens
26	Motivate kids to want to lose weight
27	Address the entire family
28	Provide role models who eat healthy foods
29	More involvement of teens in developing their own plans
30	Create a treatment plan, including visit, nutrition, goals
31	Be more specific on how to have a good diet
32	Find a way to get their attention
33	Work with schools to provide basic nutrition information
34	Teach families how to cook in healthier ways
35	Give them specific goals of weight
36	Provide printed information displayed in clinic with nutrition basics
37	Less TV, computers, video games
38	See physician frequently for follow-up
39	Take away candy and pop machines at school
40	Encourage a healthy diet
41	Make healthy food cheaper and easier to get
42	Offer diet guidelines
43	Better lunches in school (healthier)
44	Provide a healthy eating chart to fill out and return
45	Have parental involvement
46	Stop all the eating out
47	Offer free classes for losing weight
48	Get communities involved in addressing obesity
49	Educate about physical education
50	Educate about portion size and calorie counts
51	Try to encourage them not to eat as much
52	Provide more healthy and cheap snacks
53	Do not drink soda pop
54	Educate everyone about a healthy diet
55	Find ways to motivate teens to exercise
56	Educate them on the long-term effects of obesity
57	Have programs for teens/young adults who want help with their weight
58	Have more commercials and ads about obesity
59	Address obesity before it becomes a problem (early childhood)
60	Put healthier foods in more households
61	Discuss weight at each clinic visit
62	Take away the stigma about obesity
63	Explain the healthy foods the teen should eat
64	Give specific recommendations to teens about healthy lifestyle
65	Bring attention to the problem of obesity
66	Make healthy food more accessible (easier to get)
67	Try to get more people to talk about obesity
68	Make it “cool” to eat healthy
69	Empower teens to make a change
70	Give more education about why it is important to exercise and eat healthy

HPV = human papillomavirus; IUD = intrauterine device; STDs = sexually transmitted diseases; STI = sexually transmitted infection.



**Table 3**  
Average importance and feasibility ratings for sexually transmitted infection clusters and obesity clusters

Cluster	Average importance rating	Average feasibility rating
<b>STI concept map</b>		
General sex education	4.4	4.0
Support and empowerment	3.9	3.2
Testing and treatment	4.0	3.4
Community involvement and awareness	4.3	3.9
Prevention and protection	3.6	3.8
Parental involvement in sex education	4.3	3.8
Media	3.7	2.9
<b>Obesity concept map</b>		
Healthy food choices	4.0	2.8
Obesity education	4.0	3.5
Support systems	4.2	3.4
Clinical and community involvement	3.8	3.3
Community support for exercise	4.1	3.1
Physical activity	4.0	3.2
Nutrition support	3.8	3.4
Nutrition education	4.2	3.4

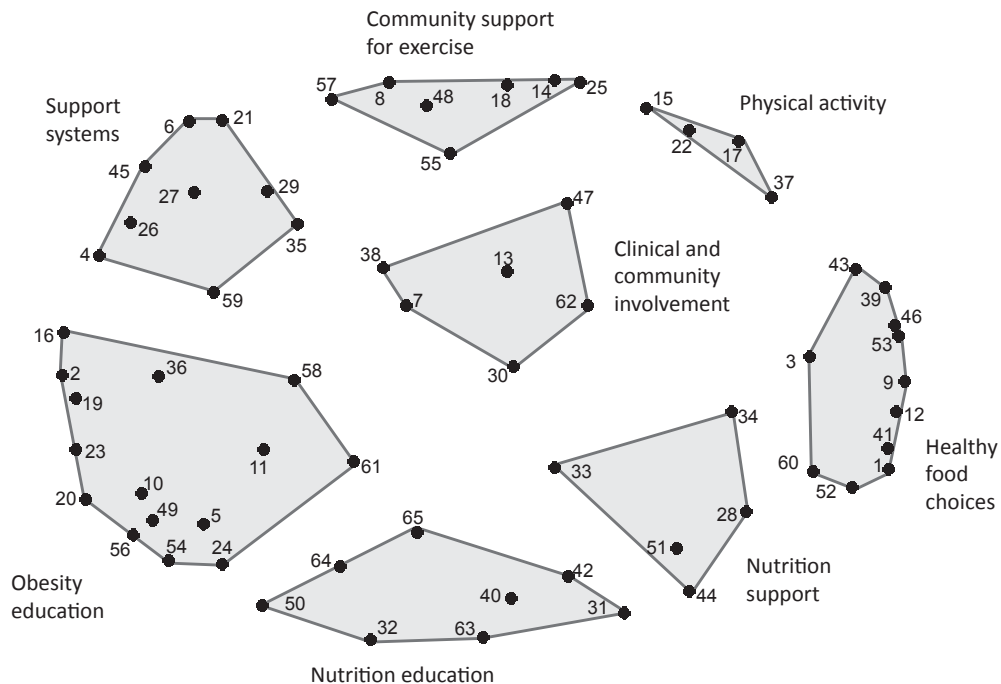
STI = sexually transmitted infection.

and community levels as well as the level of the larger society. Each concept map contains clusters that relate to various social ecological levels. Both maps contain clusters describing the importance of education and the ability to make healthy choices, reflecting the importance of health interventions at the individual level. At the interpersonal level, the STI concept map includes a cluster pertaining to family involvement, while the obesity concept map contains multiple individual items discussing the need for family involvement. At the broader social ecological levels, both concept maps contain clusters that represent the need for community support. These findings are

consistent with prior work in the areas of adolescent STIs and obesity [24,25]. DiClemente et al. [25] describe the myriad factors affecting STIs at different social ecological levels and conclude that interventions should be created based on a social ecological framework. Similar work has demonstrated the need for social ecological approaches to prevention and treatment of obesity. The Centers for Disease Control and Prevention describes the problem of obesity in terms of the social ecological model of health [26] and has created a “toolkit” for practitioners to use specifically to target health disparities in obesity [27]. Prevention programs based on social ecological approaches have been designed to treat adolescent obesity and have been shown to be successful [28].

In addition to viewing the concept maps in terms of their individual clusters, the clusters in each map can be seen on a continuum, where adjacent clusters contain items that are related, and can be seen as “bridging” items [29]. For example, within the STI map, the general sex education cluster is adjacent to the community involvement and awareness cluster. Item 47, “educate our community about the very high STD rates here,” falls within the community involvement cluster and is in close proximity to the general sex education cluster. Although this item involves the need for community involvement and awareness, it also involves education and is thus located near that cluster.

Within the obesity map, the clusters pertaining to nutrition (i.e., healthy food choices, nutrition support, and nutrition education) are located in the lower right corner. These three clusters represent distinct but related concepts. The ability to make healthy food choices relates to having the support to do so. The clinical and community involvement cluster is located centrally. In CM, a cluster is generally positioned centrally when it relates to many additional aspects of the topic. Here, clinical and



**Figure 2.** Obesity concept map after application of cluster analysis. Individual points represent individual ideas generated. The map displays the eight clusters of ideas to address obesity.

community involvement is relevant to many other clusters. It impacts educational opportunities, opportunities for physical activity, and education on physical activity and nutrition.

Average cluster ratings for importance and feasibility demonstrate how youth participants perceive the different types of interventions. Ideally, interventions should be considered both important and feasible. For STIs, general sex education was given the highest average ratings for both importance and feasibility, suggesting that interventions implemented to address STIs should include a sex education component. For obesity, both nutrition education and support systems received high ratings for importance and relatively high ratings for feasibility. Obesity education received the highest ratings for feasibility. This represents the stakeholders' beliefs that programs that include both nutrition education and obesity education may be prime resources for addressing adolescent obesity and that adequate support systems should be present.

This study has several limitations. Fewer parents and public health workers were recruited than had been anticipated, which may have led to under-representation of the ideas held by this group. However, data from the topic selection phase (step 1) revealed that the topics chosen most often were fairly consistent across groups, so it is likely that the topics chosen would not have changed significantly with increased representation from these groups. Because participants were recruited from a convenience sample during times when research staff were available, this lack of random sampling may have introduced bias. Additionally, we do not have precise participant response rates. Youth and their parents were recruited from a clinical setting, which may have generated different data than if they had been recruited from a community setting. Because of somewhat limited participant diversity among the participants in step 4, we were unable to do pattern matching. Ideally in future work this would be possible as it adds depth to CM research. Selection of the most appropriate cluster solution was performed by the research team. In future work, it would be ideal to have participants involved in this process. Finally, these results are not generalizable to a broader population. One strength of participatory research is that results are uniquely relevant to the local setting where the research was conducted. The lived experience of the local community influences the data and results of the study, with one consequence being that the results may not be directly applicable to other settings. The study does, however, demonstrate an approach that could be used in other settings to gather data relevant to those contexts.

This study used CM to explore youth and community priorities for adolescent health and identify strategies to address the top concerns identified. The input of multiple stakeholders pinpointed STIs and obesity as top health concerns, and these topics were further evaluated with CM. Adolescents performed the sorting task, which led to creation of concept maps containing strategies to address STIs and obesity. Both concept maps highlight the need for education, support systems, and community involvement. Having youth engaged in this research process increased the contextual relevance of the intervention strategies identified by and for our community.

An essential tenet of participatory research is that data from the research belongs to all who have participated. As such, data dissemination plans need to include a method for informing the community stakeholders about the research results. Next steps will include displaying the concept maps in a public area of the clinic from which patients were recruited. Members of the

research team will be present to engage community members in discussion about the research findings.

Our research provides the basis for choosing existing programs or designing new interventions for addressing STIs and obesity within this community. Numerous evidence-based interventions are available to treat health conditions as broad as STIs and obesity. Thus, it is informative to understand what types of interventions are considered important by stakeholders in the community. The concept maps demonstrate elements of interventions that the stakeholders, including patients and families, find important. Importance and feasibility ratings may direct us toward those strategies found most acceptable by the target population. These recommendations are impacted by the lived experience of the adolescents. As shown in previous research, allowing the target population a voice in addressing its problems is beneficial for effecting change [12].

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### References

- [1] Israel BA, Parker EA, Rowe Z, et al. Community-based participatory research: Lessons learned from the Centers for Children's Environmental Health and Disease Prevention Research. *Environ Health Perspect* 2005; 113:1463–71.
- [2] Israel BA, Schulz AJ, Parker EA, Becker AB. Review of community-based research: Assessing partnership approaches to improve public health. *Annu Rev Public Health* 1998;19:173–202.
- [3] Vaughn LM, Wagner E, Jacquez F. A review of community-based participatory research in child health. *MCN Am J Matern Child Nurs* 2013;38: 48–53.
- [4] Ginsburg KR, Forke CM, Cnaan A, Slap GB. Important health provider characteristics: The perspective of urban ninth graders. *J Dev Behav Pediatr* 2002;23:237–43.
- [5] Mathews JR, Mathews TL, Mwaja E. "Girls take charge": A community-based participatory research program for adolescent girls. *Prog Community Health Partnersh* 2010;4:17–24.
- [6] Ries AV, Voorhees CC, Gittelsohn J, et al. Adolescents' perceptions of environmental influences on physical activity. *Am J Health Behav* 2008;32: 26–39.
- [7] Langhout RD, Thomas E. Imagining participatory action research in collaboration with children: An introduction. *Am J Community Psychol* 2010;46:60–6.
- [8] Ren JY, Langhout RD. A recess evaluation with the players: Taking steps toward participatory action research. *Am J Community Psychol* 2010;46: 124–38.
- [9] Liggghio M, Nelson G, Evans SD. Partnering with children diagnosed with mental health issues: Contributions of a sociology of childhood perspective to participatory action research. *Am J Community Psychol* 2010;46:84–99.
- [10] Kulbok PA, Meszaros PS, Bond DC, et al. Youths as partners in a community participatory project for substance abuse prevention. *Fam Community Health* 2015;38:3–11.
- [11] Ferrera MJ, Sacks TK, Perez M, et al. Empowering immigrant youth in Chicago: Utilizing CBPR to document the impact of a youth health service corps program. *Fam Community Health* 2015;38:12–21.



- [12] Reich S, Kay J, Lin G. Nourishing a partnership to improve middle school lunch options: A community-based participatory research project. *Fam Community Health* 2015;38:77–86.
- [13] Vaughn LM, Jacquez F, Zhao J, Lang M. Partnering with students to explore the health needs of an ethnically diverse, low-resource school: An innovative large group assessment approach. *Fam Community Health* 2011;34:72–84.
- [14] Vaughn LM, Jacquez F, McLinden D. The use of concept mapping to identify community-driven intervention strategies for physical and mental health. *Health Promot Pract* 2013;14:675–85.
- [15] Burke JG, O'Campo P, Peak GL, et al. An introduction to concept mapping as a participatory public health research method. *Qual Health Res* 2005;15:1392–410.
- [16] Chun J, Springer DW. Stress and coping strategies in runaway youths: An application of concept mapping. *Brief Treat Crisis Interv* 2005;5:57–74.
- [17] Sangalang C, Ngouy S, Lau A. Using community-based participatory research to identify health issues for Cambodian American youth. *Fam Community Health* 2015;38:55–65.
- [18] Trochim W, Kane M. Concept mapping: An introduction to structured conceptualization in health care. *Int J Qual Health Care* 2005;17:187–91.
- [19] Kane M, Trochim WM. *Concept mapping for planning and evaluation*. Thousand Oaks, CA: Sage Publications; 2007.
- [20] Tullis T, Wood L. Card sorting: Current practices and beyond. *J Usability Stud* 2008;4:1–6.
- [21] Centers for Disease Control and Prevention. STDs in adolescents and young adults. Available at: <http://www.cdc.gov/std/stats12/adol.htm>. Accessed August 6, 2015.
- [22] Centers for Disease Control and Prevention. Adolescent health. Available at: <http://www.cdc.gov/nchs/fastats/adolescent-health.htm>. Accessed August 6, 2015.
- [23] Glanz K, Bishop DB. The role of behavioral science theory in development and implementation of public health interventions. *Annu Rev Public Health* 2010;31:399–418.
- [24] Cardoza VJ, Documet PI, Fryer CS, et al. Sexual health behavior interventions for U.S. Latino adolescents: A systematic review of the literature. *J Pediatr Adolesc Gynecol* 2012;25:136–49.
- [25] DiClemente RJ, Salazar LF, Crosby RA. A review of STD/HIV preventive interventions for adolescents: Sustaining effects using an ecological approach. *J Pediatr Psychol* 2007;32:888–906.
- [26] Centers for Disease Control and Prevention. Addressing obesity disparities: The social ecological model. Available at: [http://www.cdc.gov/obesity/health\\_equity/addressingtheissue.html](http://www.cdc.gov/obesity/health_equity/addressingtheissue.html). Accessed March 2, 2015.
- [27] Payne GH, James SD Jr, Hawley L, et al. CDC's Health Equity Resource Toolkit: Disseminating guidance for state practitioners to address obesity disparities. *Health Promot Pract* 2015;16:84–90.
- [28] Simon C, Kellou N, Dugas J, et al. A socio-ecological approach promoting physical activity and limiting sedentary behavior in adolescence showed weight benefits maintained 2.5 years after intervention cessation. *Int J Obes (Lond)* 2014;38:936–43.
- [29] Jackson KM, Trochim WMK. Concept mapping as an alternative approach for the analysis of open-ended survey responses. *Organ Res Methods* 2002; 5:307–36.