

Community of Communities: Co-Created Education to Increase COVID-19 Vaccine Uptake

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ABSTRACT

Introduction: This paper describes and evaluates the COVAX educational program for VALUE (Vaccine Acceptance and Access Lives in Unity, Engagement, and Education), Baltimore's Peer Ambassador (VPA) initiative, which served to engage the community (including those resistant to vaccination) and increase community knowledge of COVID-19 and COVID-19 vaccination.

Methods: A mixed methods approach was used to describe the effectiveness of the education program for VPA and coordinators. We surveyed VPAs to determine the impact of training and perceived influence in the community. In April and May 2022, we conducted four focus groups of VPAs and coordinators to gain further insights into survey responses.

Results: The engaged approach used in training allowed for a forum where VPA's and coordinators could share their experiences in the field and participate in the learning process. 82% of VPAs and coordinators indicated that they found the training extremely or very useful and 72% perceived their impact in the community to be high. 53% of VPAs and coordinators felt they were heard and understood by the administrators of the project.

Conclusion: The educational component of the VPA initiative used a variety of pedagogical approaches and allowed for the engagement of VPA's and coordinators. This engaged approach assisted in not only increasing scientific knowledge about COVID-19 and COVID-19 vaccination, but also built trust within a diverse group of VPA's, coordinators and trainers.

KEYWORDS: Community engagement, Bottom-up approach, Co-creation, Education, COVID-19 vaccines

Introduction

The first COVID-19 vaccines were granted emergency use authorization in December 2020 by the Centers for Disease Control and Prevention (CDC), and the State of Maryland implemented a phased allocation plan to provide vaccination to certain groups. The Baltimore City Health Department (BCHD) ambitiously sought to vaccinate 80% of its population. As part of the larger strategy, BCHD identified a need to focus on underserved communities where vaccination rates were low, and distrust of the health system high.¹ Previous flu vaccination rates in the city achieved only 13% coverage, indicating a challenging objective.² The first group to get vaccinated were health workers and other essential personnel followed by older adults. Despite this allocation plan, it became clear that there were significant disparities among groups, with Black and Latinx residents vaccinated at significantly lower rates than white residents.

Place has a significant influence on the health of individuals and communities, and BCHD's COVAX strategy and response emphasized that engaged partners should recognize the history of racism in Baltimore City and the ongoing injustices in the healthcare system and other areas (e.g. food insecurity, financial difficulties, safety concerns, health conditions) that contribute to a person's decision to get vaccinated. As a city and regional institution, communities perceive Johns Hopkins University (JHU) suspiciously because of its extractive history. In general, the relationship between underserved communities and medical institutions is riddled with mistrust; contextually, this skepticism can be linked to practices that have not always been equitable, inclusive, and/or just. In Baltimore, memories persist of JHU's treatment of Henrietta Lacks and the HeLa cell line cultivation.³ These and other historical episodes

continue to influence the level of trust between the community and institutions, which became amplified during the coronavirus pandemic.

As a highly segregated city in the United States, certain community statistical areas (CSA's) in Baltimore have lower socio-economic statuses and are predominantly African American. The historical practice of redlining influences contemporary racial and socio-economic residential patterns and has resulted in the development of the Black Butterfly, with low-income majority African American neighborhoods making up East and West Baltimore. In contrast to the Black Butterfly, the white L is an area around the Inner Harbor stretching straight North to the wealthy neighborhoods of Homewood and Guilford.⁴ A recent study found an association between historical redlining and present-day health in Baltimore.⁵ Areas of Baltimore that were originally redlined were associated with a 5.23-year reduction in CSA life expectancy.⁵ In addition to the Black Butterfly, the southernmost CSAs of Curtis Bay, Brooklyn, and Cherry Hill were experiencing the lowest percentage of people vaccinated. Curtis Bay/Brooklyn is one of the most polluted CSAs in Baltimore. Cherry Hill is the site of the first and largest planned suburban-style community and was the most striking example of deliberate residential racial segregation in any U.S. city.⁶⁻⁷ VPAs (Vaccine Peer Ambassadors) would be on the front lines in these low vaccination areas engaging with the community and working to build trust that would enable the number of individuals getting vaccinated.

To achieve high levels of vaccination in underserved communities, BCHD engaged the International Vaccine Access Center (IVAC) at JHU, The School of Community Health and Policy at Morgan State University (MSU), and Maryland Institute College of Art (MICA) to help address disparities through an educational initiative based in community engagement and co-creation. The VALUE (Vaccine Acceptance and Access Lives in Unity, Engagement, and

Education) Baltimore COVAX education initiative identified, engaged, and hired community members as Vaccine Peer Ambassadors (VPAs), and coordinators (managers) to address low vaccination rates, counteract misinformation, increase health literacy, and build trust.¹

Four Value Community (VC) groups were established using the life course approach and included Older Adults, Young Men, Pregnant and Lactating Women, and Youth. Other VCs were more specific and represented populations in Baltimore, including Orthodox Jewish, People Experiencing Homelessness, Latinx, People living with Disabilities and Underlying Conditions (DUC), and Immigrants. As members of the Baltimore City community, VPAs and coordinators were a conduit that helped to understand what was happening in the community and were committed to helping improve the health and wellness of others.⁸⁻¹⁰ The program was initiated with a series of listening sessions which assisted in designing and implementing the strategy and training.

Following the listening sessions, IVAC developed a curriculum of training to ensure VPAs were both knowledgeable about COVID-19 and vaccination and had the skills to address the concerns of the community. IVAC also trained VPAs on communication techniques informed by research on vaccine suspicion and acceptance and the role they can play in ensuring access and a public voice.¹¹⁻¹⁵ Training was conducted weekly (Tech Talks and Questions and Coffee), and a key component of the program was feedback from VPAs which assisted in driving the curriculum so it could be adjusted to reflect current community concerns.

The VALUE COVAX educational initiative aimed to provide a virtual space for a culturally and ethnically diverse group of VPAs, coordinators, and trainers who were linked by their dedication to engaging in joint action in geographical locations or settings to inform the community about COVID-19 vaccination. Building community among the VPAs and

coordinators was a priority and would have to be sensitive to past and ongoing extractive and discriminatory practices. VPAs were trained to be culturally competent, humble, transparent, accountable, and collaborative so that partnerships and relationships could be nurtured.

IVAC worked with MICA to co-create materials with VPAs through facilitated design sessions. IVAC developed a continuously updated compendium of information to be used by VPAs as a resource for addressing questions on an ongoing basis. MSU facilitated training around resources for social determinants of health to supplement knowledge needed to refer individuals to services that could address broader issues.

This paper discusses and evaluates the VALUE COVAX educational initiative that prepared and supported Vaccine Peer Ambassadors (VPAs) and coordinators to work in Baltimore City communities and provide information about COVID-19 and COVID-19 vaccination.

Methods

A mixed methods approach was used to evaluate the educational component for VPAs and coordinators working with the VALUE Baltimore initiative. Feedback was gathered throughout the project to test VPA knowledge and determine the types of questions they were receiving from the field to adapt training content regularly and address the community's needs.

In April 2022, we evaluated VPA perceptions on the impact of both the VALUE program and training provided by IVAC to ensure VPAs were equipped to educate the community, answer questions and were adept in evidence-informed techniques to respond to people who raised concerns about vaccines. We conducted an anonymous survey using Qualtrics software. We included questions on changes in knowledge and collected feedback on a Likert scale on

both questions from the field and VPAs' perceived adaptability of the training to community needs throughout the project's duration (table 1). We used spearman rank correlation coefficient test to explore the relationship between training and experiences as a VPA.

In April and May 2022, we conducted four focus groups, two with eleven VPA coordinators and two with 20 VPA's (10 in each group). VPA coordinators selected VPAs who were the most active in the field and regularly attended the training to participate in the focus groups. Broad questions were used to guide the focus group discussion (see tables 3, 4, 5). This data was used to contextualize quantitative data. The IVAC team conducted a thematic data analysis which included reading interview transcripts twice and then analyzing using the "Cut and Sort" processing technique.¹⁶⁻¹⁷ The IVAC team identified sections in the texts relevant to the problem statement and objectives. The IVAC team coded data with the predetermined themes: VC effectiveness, IVAC training evaluation, administration/management, and perceived community impact. There was no data collected from the People Experiencing Homeless Group as this team's work did not continue as part of the IVAC/MSU/MICA component of the VALUE COVAX initiative after December 2021.

This work was reviewed by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board Office which made the determination of public health surveillance and not research requiring IRB oversight.

Results

VPA and Coordinator Survey & Focus Groups

85% of VPAs participated in the survey. All 11 of the VPA coordinators and 20 VPAs participated in focus groups.

Training Evaluation

The survey revealed that 82% of VPAs (including coordinators) found the IVAC training (Tech Talks and Questions and Coffee) very useful (47%) or extremely useful (35%) when interacting with Baltimore City community members. 92% of the VPAs and coordinators saw themselves as a lot more knowledgeable (42%) and a great deal more knowledgeable (50%) since beginning the program. 69% of the VPAs found the IVAC training personally very useful (43%) or extremely useful (26%). 22% found the training moderately useful (table 2).

The focus groups supported and provided context for the survey results. VPAs and coordinators discussed how the training increased their knowledge and that it was useful when encountering community members. A unique part of the educational component of the VALUE COVAX initiative was that training was virtual, held weekly and continuous for a total of about 72 sessions over the course of the project. Often referred to as cross training, Many VPAs and coordinators also mentioned how they enjoyed training with other VALUE communities (Table 3).

Perceived Impact and Influence

The perceived impact of VPA efforts in their respective VALUE communities was deemed high, with 72% of the VPAs reporting they had a lot or a great deal of impact while 22% thought their impact was moderate. The average mean for groups having an impact on other VALUE communities was 3.69 out of 5 (table 2).

Qualitative comments corroborated the importance of training to conduct outreach across life stages and communities. VPAs and coordinators self-evaluated themselves as being successful in the field. “trust” and “relationship building” emerged as common themes during the focus groups. VPA’s noted they were not always able to get everyone vaccinated, but that the conversations with people were meaningful (Table 4).

A Spearman rank correlation coefficient test found that those who found the training useful were positively correlated to having had an impact on the city (0.44; $p < 0.001$), understanding the community (0.43; $p < 0.001$), and the project being influential (0.31; $p < 0.05$).

Collaborative Experience

As a co-created project, collaboration between VPA (as representatives of the community) and the administration was important. 53% percent of VPAs and coordinators felt they were heard and understood by the administrators of the project with thirty two percent believing they were heard a lot and 21% believing they were heard a great deal. 30% felt they were moderately heard. Collaborative experience by the VALUE group is provided in table 2.

Despite the vast majority of VPAs feeling that they contributed to project design, a quarter of VPAs felt they were limited in their impact. For example, VPAs explained that the focus on COVID-19 vaccination limited their ability to address the many needs of city residents (Table 5).

Discussion

In “Baltimore City: County-Level Comparisons of COVID-19 Cases and Deaths” Kyu Han Lee and Melissa Marx report that Baltimore City was one of the top-performing cities in

their peer group when it came to COVID-19 vaccination coverage rates, also faring well in terms of COVID-19 cases and mortality. They suggest that Baltimore City did particularly well after its initial COVID-19 surge.¹⁶ As of February 2024, the total number of persons vaccinated in Baltimore City was 423,693 (72% of the total population 585,708). At the end of the ambassador project (12/31/22) there were a total of 385,200 (65.8%) persons vaccinated. Vaccines for children 5-11 and from six months of age were approved in October 2021 and June 2022, respectively. There are about 99,280 (17%) children under the age of eleven in Baltimore City. The push for childhood vaccination began toward the end of the COVAX ambassador initiative. Table 6 shows that over the course of the COVAX project, while never achieving its ambitious 80% goal, the number and percent of vaccine uptake increased incrementally.¹⁷⁻¹⁸

It can be assumed that ambassadors contributed to the increasing number of individuals getting vaccinated. Community-based interventions represent one public health approach to managing and preventing disease, and community-level strategies are important as many residents may not actively seek and/or be able to access healthcare through traditional settings.¹⁹ These strategies are effective because they can uniquely reach and empower those with the information and resources needed to prevent diseases and provide support for individuals to successfully manage their conditions. Health ambassadors work to empower community residents through education and advocacy. Community health ambassadors can be a comprehensive way to promote multilevel involvement of community leaders and diverse organizations to concentrate on alleviating health disparities.²⁰ VPAs and coordinators made the Baltimore COVAX initiative hyper-local allowing for the tailoring of messaging and strategies to address access barriers. This hyper-local approach included nonverbal language skills, social/environmental familiarity, and a unique understanding of the community's health beliefs,

health behaviors, and barriers to health services.²¹ It was a priority of the VALUE Baltimore COVAX education initiative to bring these perspectives into the learning space.

The modus operandi of many programs is often to produce a proposal and then invite the community to make any adjustments. The Baltimore VALUE COVAX educational initiative was foundationally designed to elicit input from and position communities as equal partners throughout the project lifespan. Through the educational initiative, out of a diverse group of eight VALUE communities, one equitable and inclusive community emerged where individuals felt safe to share their experiences, challenges, strategies, and successes. VPAs and coordinators worked together on the front lines of Baltimore City to assist in making the COVID-19 vaccine not only available and accessible but utilized by residents. The educational initiative approach focused on diversity, equity, inclusion, and accessibility through community engagement and helped community members take the lead.

The education component of a health ambassador program is important when implementing a lay-health education initiative.¹⁹ A series of VALUE community specific listening sessions/co-creation exercises was the foundation of the initiative. While these sessions were VALUE community specific, all communities were linked by their dedication to engaging in joint action in geographical locations or settings to inform the community about COVID-19 vaccination.²² All participants had to be culturally competent, humble, transparent, accountable, and collaborative so that partnerships and relationships could be nurtured. Building community among the VPAs, coordinators, trainers, and administrators was a priority, and all participants were sensitive to past and ongoing discriminatory practices. An assumption underlying the educational approach was that by building an equitable, inclusive, and trusting educational space,

a community of communities would emerge and then extend into the communities the VPAs and coordinators served.

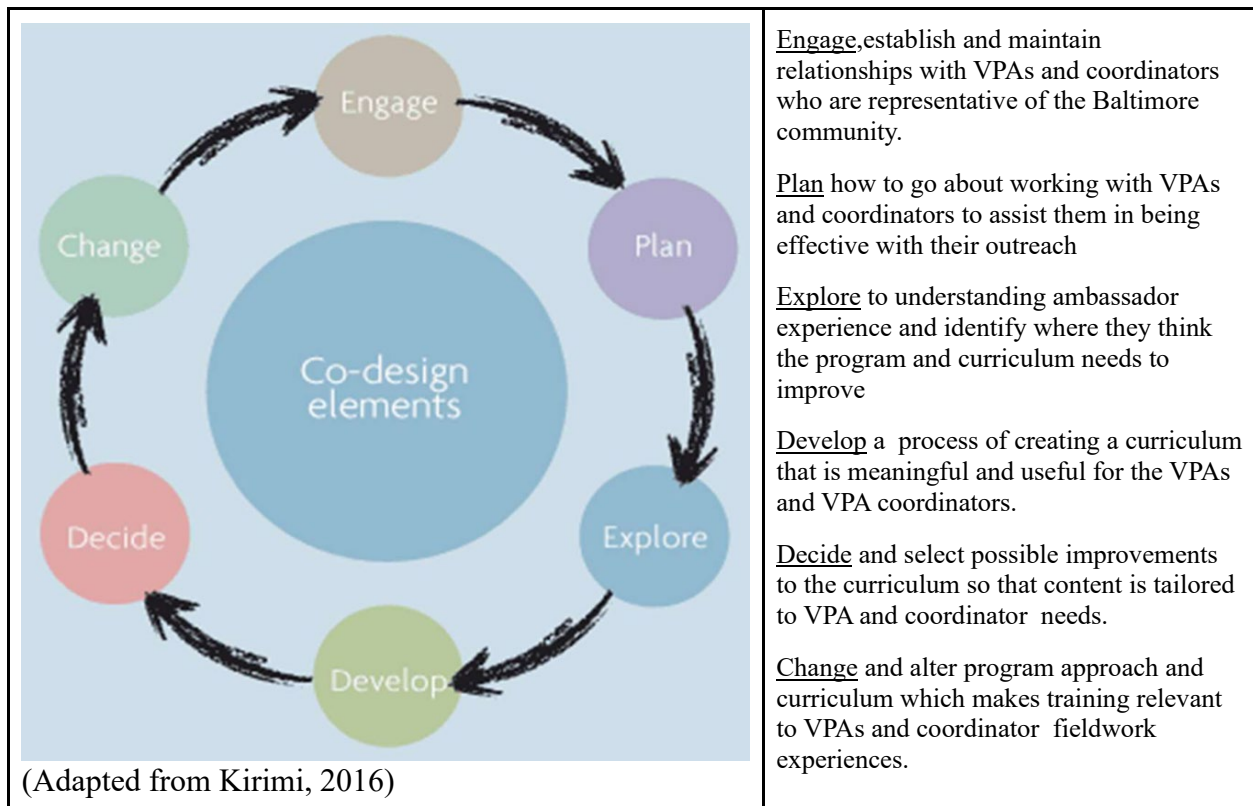
While the initial listening sessions (December 2020-June 2021) were VALUE community-specific, in July 2021, the virtual training space became an integrated virtual venue where all VALUE communities intersected. Sessions were weekly and did not adhere to what Pablo Friere referred to as the ‘banking’ concept of education where there is an authoritative hierarchy of those doing the training.²³ Rather, training served to tap into the community’s strengths and was a participatory space for sharing knowledge and experiences.²³⁻²⁴ Engaged pedagogies were implemented to create an exciting place of learning. Participatory strategies aligned the course content with the life and field experiences of VPA’s and coordinators.²⁵ This made the implementation of the Baltimore COVAX education initiative bottom-up and focused on building individual and community capacity. The bottom-up approach uplifted the field and life experiences of communities and trust.²⁶⁻²⁷

The Baltimore COVAX educational initiative worked to keep individuals involved over the long haul.²⁰ It incorporated a human-centered design framework focused on understanding people in their context and from their perspectives.²⁶⁻³¹ Through the co-creation process, VPAs, coordinators, and trainers shared experiences and stories while actively participating, shaping, and developing the curriculum. Throughout the process of working with VPAs and coordinators, trainers had to consciously seek to avoid reverting to the familiar top-down power structures or exploiting the experiences of people who are vulnerable or have survived trauma.³²

Thus, the co-design/creation educational process led to a feedback loop that began with listening sessions and continued with ongoing training to collect VPA and coordinator (community) input (Figure 1). During these sessions, VPAs, coordinators, and trainers shared

past and present experiences and stories from the field, as this is crucial to a human-centered design. The co-creation process formed the basis of training design. Feedback was initially sought during listening sessions and as the program progressed, feedback was acquired during training and then applied and integrated into the on-going education. Thus, the educational program was not simply didactic but also used different pedagogical styles for engagement purposes.

Figure 1. Feedback Loop Model



The two training spaces where these practices occurred were Tech Talks and Questions and Coffee which alternated weekly. Tech Talks was more didactic in approach in that it was teacher centered and focused on curriculum content and knowledge transfer. VPAs and

coordinators were provided with the latest scientific information and policy updates on a bi-weekly basis so that they could relay this information in their engagement. Misinformation about COVID-19 impeded efforts to get the pandemic under control and to rally the public around recommended health and safety measures. Thus, VPAs and coordinators had to have the most up to date information to do their jobs effectively and efficiently. In Tech Talks, assessments were often given to see, not only how well VPAs and coordinators were retaining information, but how the actual training had to be adjusted to accommodate the attendees' needs. The trainers used these assessments to identify areas of confusion. One area of confusion that surfaced in the assessments was the information surrounding booster doses. As a point of confusion, the trainers had to be reflective and think over how information on booster doses was taught and how the pedagogical approach might be improved or altered for improved learning outcomes. In this process, lessons were created that introduced scenarios where ambassadors would have to recall information. This exercise allowed VPA's and coordinators to apply information that they had learned and, in the process, learn from their mistakes. In addition to these scenarios, other fun methods were utilized for reviewing content such as playing COVID-19 jeopardy in small breakout rooms.

Questions and Coffee training utilized different pedagogical approaches and was not didactic. Sessions were learner-centered and used different tools and strategies focusing on the art and process of both teaching and learning. VPAs were front line workers during the COVID-19 pandemic and they were engaging with people in communities and working to increase the vaccination rate in Baltimore City. As front-line workers, they listened to people's stories about why they choose to, or choose not to, get vaccinated. Often this is not about information or the vaccine, but about how to be empathetic, listen and respond to people's concerns. Because of the

experience they brought to the learning space, a constructivist approach was used and VPAs, coordinators, and trainers were actively involved in a process of meaning and knowledge construction as opposed to passively receiving information from the trainers. In this manner, VPAs and coordinators were at the forefront and brought their knowledge to the learning space by sharing information about communication, relationship building, and trust.

Questions and Coffee training was also collaborative and cooperative whereby VPAs, coordinators, and the trainers learned with each other, together. It was the VPAs and coordinators, not the trainers, who were actively in the field engaging with the community. Thus, the experience and knowledge of the VPAs and coordinators were central, and the approach was learner centered. Often, trainers had to listen to the experiences of VPAs and coordinators, provide advice based on experience, but also listen to other VPAs and coordinators who may share similar experiences. Thus, there was engagement in the collaborative learning process which capitalized on one another's resources and skills. In this collaborative space, they asked each other for information, evaluated one another's ideas and monetized each other's knowledge and experience. Sessions were also often dedicated to peer teaching, where VPAs and coordinators led sessions on topics such as accessibility, incentives, and working with community-based organizations.

This human-centered approach utilized in the COVAX VALUE educational initiative allowed for place-based innovation by leveraging Baltimore's existing research institutions/universities and industries (IVAC-JHU, MSU, MICA, and the BCHD) and placing these institutions in an equal partnership with the community (via VPAs and coordinators). This allowed for joint learning and innovation that increased bottom-up grassroots initiatives to

enforce the collaborative spirit precipitating the expansion of new alliances and new institutional arrangements.^{28,33}

As the data illustrates, there were times when VPAs and coordinators felt they were not heard. While the VPAs and coordinators were at the center of the VALUE COVAX educational initiative, they were part of a much larger effort by BCHD. The COVAX initiative began with a small group of people who were quickly overwhelmed with the volume of work. Over time, more people were hired, and the project grew larger. During this process, the community, initially seen as an equal partner (especially when building trust), became decentralized with the approach becoming heavily top-down.

Thus, while the COVAX VALUE educational initiative remained human-centered and bottom up, VPAs and coordinators perceived that their voice was infrequently heard or appreciated in the overall program. During training, VPAs and coordinators expressed how many social determinants of health impacted the Baltimore City population. The educational space permitted project administrators to directly hear community suggestions and concerns, ranging from inequitable medical care access to mistrust of medical and government authorities. As community advocates, VPAs and coordinators understood the contextual challenges and possessed the knowledge about resources to refer people to needed services. However, their emphasis on the community and their needs was sometimes in conflict with the broader vaccination goals set by BCHD, which emphasized the need for vaccination and focused on the clinical aspects of the response and a COVID-only focused message. This often led to both frustration and fatigue. While VPAs and coordinators were able to find a balance in many situations, using their understanding of communities to meet people where they are, many activities remained solely focused on COVID messaging. COVID focused messaging included

information about the importance of vaccination, the types of vaccines available, and how to access vaccines. VPAs and coordinators expressed that a greater effort was needed to honor the community as equal partners as opposed to numbers who needed to get vaccinated. VPAs and coordinators saw the Baltimore population as people embedded in communities who are often in need of basic resources (food, housing, etc.). Acknowledging and addressing these issues would result in building trust and a greater willingness of people to listen to the COVID-19 vaccine messaging.

VPA's and coordinators were the bridges of communication and served to not only provide information about COVID-19 vaccinations, but also worked to build trust between the Baltimore City Government, the health care sector, and Baltimore City's marginalized communities.³⁴ Of great concern to VPAs and coordinators was their inability to assist people with non-COVID-19 vaccine concerns. This is a valuable lesson learned and, in the future, VPAs and coordinators should be empowered to act as individuals who can connect people to the available services and resources. During training and in the focus groups, VPAs and coordinators often emphasized that having the ability to aid and support those most in need would only serve to build stronger community relationships and establish a higher level of trust.

Limitations

While the overall educational program can be measured as a success, there were some limitations. Some VPAs and coordinators failed to complete all three pages of the survey, and thus the sample number drops by n=8 for sections (IVAC Training Evaluation and Additional Data). However, this did not impact the independent interpretation of each question. Attendance at training fluctuated throughout the program, although audio recordings and Tech Talks

PowerPoint slides were made available to VPA's and coordinators for later access. A compendium was also created and constantly updated so VPAs could have all the information on COVID-19 and COVID-19 vaccines at a user-friendly level.

This paper evaluated the educational component of the VALUE communities. The effectiveness of the program was measured by the participants, VPAs, and VPA coordinators. The evaluation of the educational component did not include a measure of how the greater Baltimore City community perceived the work of VALUE communities. Community surveys would have aided in impact attribution.

Conclusion

The VALUE COVAX educational initiative was ongoing and focused not only on knowledge transfer, but on engagement in a shared learning space. The evaluation of the program revealed that this engaged approach allowed for a forum where all participants could share their experiences in the field and participate in the learning process. This engaged approach assisted in not only increasing scientific knowledge about COVID-19 and COVID-19 vaccination but also built trust within a diverse group of VPA's, coordinators and trainers.

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Works Cited

1. BCHD Strategy Baltimore City COVID-19 Vaccination Strategy 2021
2. BCHD, 2020-21 Flu Vaccine Initiative: Summary of Outcomes and Lessons Learned 2021.
3. Skloot, Rebecca. The Immortal Life of Henrietta Lacks. Picador, 2018.
4. Brown, LT The Black Butterfly: The Harmful Politics of Race and Space in America. Johns Hopkins University Press: Baltimore. 2021
5. Huang, SJ and Sehgal NJ Association of historic redlining and present-day health in Baltimore. PLOS One January 19, 2022 <https://doi.org/10.1371/journal.pone.0261028>
6. Environmental Integrity Project_Air Quality Profile Of Curtis Bay, Brooklyn and Hawkins Point, Maryland Washington DC 2012
https://www.environmentalintegrity.org/wp-content/uploads/2016/11/2012-06_Final_Curtis_Bay.pdf
7. Samuels, B (2007) Segregation and Public Housing Development in Cherry Hill and Westport: Historical Background Maryland State Commission on Environmental Justice and Sustainable Communities 2007 <https://www.aclu-md.org/sites/default/files/legacy/files/chpresentation.pdf>
8. Lv J , Liu QM , Ren YJ , He PP , Wang SF , Gao F , et al. A community-based multi-level intervention for smoking, physical activity, and diet: short-term findings from the Health VPAs and coordinators: A Model for Engaging Community Leaders to Promote Better

- Health 41 Community Interventions for Health Program² in Hangzhou, China. *J Epidemiol Community Health*. 2014;68(4):333–9.
9. Torres, S Health Ambassadors: A Model for Engaging Community Leaders to Promote Better Health (2020).
 10. MacDonald NE; SAGE Working Group on Vaccine Hesitancy. Vaccine hesitancy: Definition, scope and determinants. *Vaccine*. 2015 Aug 14;33(34):4161-4. doi: 10.1016/j.vaccine.2015.04.036. Epub 2015 Apr 17. PMID: 25896383.
 11. Troiano, G, A. Nardi, Vaccine hesitancy in the era of COVID-19, *Public Health*, 2021; 194:245-251 <https://doi.org/10.1016/j.puhe.2021.02.025>.
 12. Omer SB, Benjamin RM, Brewer NT, Bottenheim AM, Callaghan T, Caplan A, Carpiano RM, Clinton C, DiResta R, Elharake JA, Flowers LC, Galvani AP, Lakshmanan R, Maldonado YA, McFadden SM, Mello MM, Opel DJ, Reiss DR, Salmon DA, Schwartz JL, Sharfstein JM, Hotez PJ. Promoting COVID-19 vaccine acceptance: recommendations from the Lancet Commission on Vaccine Refusal, Acceptance, and Demand in the USA. *Lancet*. 2021 Dec 11;398(10317):2186-2192. doi: 10.1016/S0140-6736(21)02507-1. Epub 2021 Nov 15. PMID: 34793741; PMCID: PMC8592561.
 13. Schoch-Spana, M, Emily K. Brunson, Rex Long, Alexandra Ruth, Sanjana J. Ravi, Marc Trotochaud, Luciana Borio, Janesse Brewer, Joseph Buccina, Nancy Connell, Laura Lee Hall, Nancy Kass, Anna Kirkland, Lisa Koonin, Heidi Larson, Brooke Fisher Lu, Saad B. Omer, Walter A. Orenstein, Gregory A. Poland, Lois Privor-Dumm, Sandra Crouse Quinn, Daniel Salmon, Alexandre White, The public’s role in COVID-19 vaccination: Human-centered recommendations to enhance pandemic vaccine awareness, access, and

- acceptance in the United States, *Vaccine*, Volume 39, Issue 40, 2021, Pages 6004-6012, <https://doi.org/10.1016/j.vaccine.2020.10.059>.
14. Stewart, D.W., Rook, D.W., Shamdasani, P.N., *Focus groups: Theory and practice*. Sage Publications, Incorporated. (2006).
 15. Ryan, G.W., Bernard, H.R., . Techniques to identify themes. *Field Methods* 15, 85–109. (2003)
 16. Lee, KH and Marx M Baltimore City: County-level comparisons of COVID-19 cases and deaths Bhaumik, S., et al., *Community health workers for pandemic response: a rapid evidence synthesis*. *BMJ Global Health*, 2020. 5(6): p. e002769.
 17. BCHD COVID-19 Vaccination Dashboard Accessed 2/8/2024
<https://www.arcgis.com/apps/dashboards/eb70624fe27c4a86a45dbcb4cf89ccb2>
 18. United States Census Bureau. Accessed 2/8/2024 https://data.census.gov/profile/Baltimore_city,_Maryland?g=160XX00US2404000#race-and-ethnicity
 19. Bhaumik, S., et al., *Community health workers for pandemic response: a rapid evidence synthesis*. *BMJ Global Health*, 2020. 5(6): p. e002769.
 20. Pullen-Smith, Barbara MPH; Carter-Edwards, Lori PhD; Leathers, Kimberly H. JD. *Community Health Ambassadors: A Model for Engaging Community Leaders to Promote Better Health in North Carolina*. *Journal of Public Health Management and Practice*: November 2008 - Volume 14 - Issue 6 - p S73-S81 doi: 10.1097/01.PHH.0000338391.90059.16

21. Nemcek MA, Sabatier R. State of evaluation: community health workers. *Public Health Nurs.* 2003 Jul-Aug;20(4):260-70. doi: 10.1046/j.1525-1446.2003.20403.x. PMID: 12823786.
22. MacQueen KM, McLellan E, Metzger DS, Kegeles S, Strauss RP, Scotti R, Blanchard L, Trotter RT 2nd. What is community? An evidence-based definition for participatory public health. *Am J Public Health.* 2001 Dec;91(12):1929-38. doi: 10.2105/ajph.91.12.1929. PMID: 11726368; PMCID: PMC1446907.
23. Freire, P *The “Banking” Concept of Education, Ways of Reading*, (Boston,1996), p. 212-223.
24. Rämgård, M., Ramji, R., Kottorp, A. *et al.* ‘No one size fits all’ – community trust-building as a strategy to reduce COVID-19-related health disparities. *BMC Public Health* **23**, 18 (2023). <https://doi.org/10.1186/s12889-022-14936-6>
25. Hooks, B . *Teaching to transgress: education as the practice of freedom* .London: Routledge.1994
26. Miwiti, KB *Bottom-up Design Approach A Community Led Interventions Fighting lifestyle Disease Within Urban Informal Settlements in Nairobi Kenya*, (2016)
27. Miwiti, KB A Ambole, L Soanjon *Appraisal of Human-Centered Design as a Public Health Tool: Curbing the Incidence of Lifestyle Diseases in Kenya* *Africa Habitat Review Journal* Volume 13 Issue 1 (December 2019)
28. Vechakul J, Shrimali BP, Sandhu JS. Human-Centered Design as an Approach for Place-Based Innovation in Public Health: A Case Study from Oakland, California. *Matern Child Health J.* 2015 Dec;19(12):2552-9. doi: 10.1007/s10995-015-1787-x. PMID: 26197732

29. Ostrach B. Human-Centered Design for a Women's Health Screening Tool: Participant Experiences. *South Med J*. 2020 Oct;113(10):469-474. doi: 10.14423/SMJ.0000000000001157. PMID: 33005959.
30. Blynn E, Harris E, Wendland M, Chang C, Kasungami D, Ashok M, Ayenekulu M. Integrating Human-Centered Design to Advance Global Health: Lessons From 3 Programs. *Glob Health Sci Pract*. 2021 Nov 29;9(Suppl 2):S261-S273. doi: 10.9745/GHSP-D-21-00279. PMID: 34845049; PMCID: PMC8628497.
31. Chen E, Neta G, Roberts MC. Complementary approaches to problem solving in healthcare and public health: implementation science and human-centered design. *Transl Behav Med*. 2021 May 25;11(5):1115-1121. doi: 10.1093/tbm/ibaa079. PMID: 32986098; PMCID: PMC8158168.
32. Ku B and E Lupton *Health Design Thinking Creating Products and Services for Better Health*. MIT Press: Cambridge. 2022
33. Horlings LG, Roep D, Wellbrock W. The role of leadership in place-based development and building institutional arrangements. *Local Econ*. 2018 May;33(3):245-268. doi: 10.1177/0269094218763050. Epub 2018 Mar 29. PMID: 30034073; PMCID: PMC6044014.
34. Herodotou, C, Sharples, M, Gaved M, Kukulaka Hulme, A, Rienters, B Scanlon, E Whitelock, D *Innovative Pedagogies of the Future: An Evidence-Based Selection Front. Educ.*, 11 October 2019 <https://doi.org/10.3389/feduc.2019.00113>

Tables

Table 1. Survey Response Rates

Group	Count	Response Rate
DUC (Disability and Underlying Conditions)	6	86% (6/7)
Immigrant	4	80% (4/5)
LatinX	12	80% (12/15)
Older Adults	15	115% (15/13)
Orthodox Jewish	2	40% (2/5)
P&L (Pregnant and Lactating)	18	95% (18/19)
Young Men	12	86% (12/14)
Youth	11	65% (11/17)
Other	1	-
Total	81	85% (81/95)

*count and response rate include all coordinators and 1 participant who declined to identify VA group. Analysis by groups in other sections do not include the 1 surveyor who declined to identify the VA group. There are 84 VA and 11 coordinators in the VALUE Baltimore Project as of 4/11/2022

There were 2 extra individuals included in the older adults groups. Individuals most likely selected the wrong group when filling out the survey

Table 2. VPA and VPA coordinator survey responses

						%	
Question	1	2	3	4	5		
TRAINING EVALUATION							
How useful were the training sessions when interacting with Baltimore City Communities?	1	3	14	47	35		
Did the training increase your knowledge since first becoming a VPA?	1	3	4	42	50		
Was the training personally useful?	3	6	22	43	26		
How confident are you in your knowledge about COVID-19 now?	1	0	10	38	51		
IMPACT & INFLUENCE							
What Impact did you have within your own VALUE Community?	1	5	22	31	41		
Did you influence other VALUE Communities?	4	10	23	36	27		
Were VPA's influential	0	1	11	38	49		
Did you have an Impact in Baltimore City	0	2	27	26	44		
COLLABORATIVE EXPERIENCE							
Were you heard and understood by the Administrators on the project?	1	16	30	32	21		
Were you Heard and Understood by the Baltimore City Community	1	1	36	40	22		

- 1 lowest, 5 highest

Table 3. Training Evaluation

<p>Was the provided training effective?</p> <p>Was there inter-team collaboration?</p>	<p>Increased Knowledge</p> <p>Cross Training</p>	<p><i>“some things that I didn't know before now, I think I'm more capable to answer some kind of questions you know even to my family (VPA 6)”.</i></p> <p><i>“I feel like I'm more informed with information that can definitely be used in the field (VPA 10).”</i></p> <p><i>“really assisted me with talking points and to talk to people...I just really felt very knowledgeable about what I was explaining to people (VPA18).”</i></p> <p><i>“I grew more confident and knowledgeable about Covid and engaging with my community...thanks to my team's support (VPA 15) .”</i></p> <p><i>“I think that was really beneficial with all of us, because we have the opportunity to hear what other teams are doing and the similar challenges they are facing (VPA 11).”</i></p> <p><i>“the best training that we've had has been inter group training which allowed them to learn how to deal with the community and how to interact, form relationships, and build trust.” VPA 16</i></p> <p><i>Cross Training allowed us to serve whoever shows up. It allowed us to build relationships with different cohorts of people in the field (VPA 2).”</i></p> <p><i>We were able to share some strategies that I use in the field and dealing with the public and passing on that which was passed on to me to learn from different groups (VPA 4).</i></p>
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Table 4. Impact and Influence

Did you have an impact in the community?

Connecting with all people
Relationship Building and Trust

People had many questions about the vaccine, and I had all the right answers for them ... I saw them at a clinic a month later (VPA 2)"
"you get a chance to really listen to the needs of the people and just give a listening ear....I think that our training has enabled me to really be even more sensitive to people in the community. We have that training from our counterpart teams we're better able to serve whoever shows up. Just as we build relationships with different cohorts of people in the field (VPA 7),"
"the training allowed me to do outreach among everyone ...we weren't like specific on who we targeted outreach or like you know who we invited to the clinic we would do that for you know the area at large (VPA 20)."
. "It's about building relationships....everything starts with relationships,.. If you do not have that , you have nothing (VPAC 3).
"constantly showing up just caring about how people were doing how their families were doing was important to people in communities(VPA 1)"
" I just felt like I had kind of built trust with people ... who were totally (like) against getting vaccinated (VPA 9).
As an ambassador I had one of the most insightful conversations I had had with a stranger. We weren't able to convince him to get vaccinated, but I felt like we all walked away from that conversation as better people. (VPAC 2)."
It was not only about convincing someone to get the vaccine, but rewarding to see that he'd had a shift in how he would collect and evaluate information moving forward (VPAC 2)."
"we made an impact ... We created you know trust when people were coming to us (VPAC 2)."

Table 5. Collaborative Experience

<p>Did you feel heard by management/administration? What are the needs in the community? What were the missed opportunities/challenges?</p>	<p>Listening to VPA and VPA coordinator needs Inability to address other needs in community</p>	<p><i>"In Questions and Coffee was a little less pressure, a little more informal where I think people were really able to bring on concerns and questions to the table. Q & C was able to tap into, and take us to the next level to get some results. We began to feel more comfortable expressing our feelings expressing what we felt needed to be addressed expressing the fact that we are the boots on the ground, so we can give a full delivery of what the public is dealing with and their views on things and their concerns and I think the more we express that we were being heard (VPA 17). We were able to speak our mind, and just give you as much feedback as possible because it can only make the job better {and make us more} informed (VPA 3). "if we have any question, the staff is thinking of our needs (VPA 3)" of our needs. Questions were asked to see what we were thinking, how we feel (VPA 8). "I don't think there's ever been a time where I shared something I felt like I wouldn't be heard, or you know, not listened to (VPA 10)." Sometimes it was disappointing to because we did not have the ability to truly meet the needs of the people that are in front of you (VPAC 9). . "there is a need to address other things as well as the vaccine.. like general public health...(VPAC 3)", "they (people) need more than a vaccine they need actual resources as well (VPAC 1)," "it's not just about telling people where to get the vaccine why the vaccine is good when they're struggling with a lot of other more basic needs that they need to have addressed (VPA 19) "Some of the people they met in the field just did not have time to really think about a vaccine...if you're struggling to figure out where you're going to be sleeping that day, or what you're going to make ends meet for the week getting the vaccine is not on the top of your priority (VPAC 5)".</i></p>
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Table 6- Number and Percent of individuals Vaccinated in Baltimore City June2021-Dec 2022

DATE	All Total population 585,708	Black n/% Total pop 338,478	White n/% Total pop 157,276	Hispanic n/% Total Pop 45,927
June 2021	232k (40%)	132k (38%)	99k (63%)	15.5k (33%)
Dec. 2021	348k (59%)	196k (57%)	118k (75%)	27.8k (51%)
June 2022	373k (63%)	211k (62%)	121k (76%)	30.8k (67%)
Dec. 2022	385k (66%)	218k (64%)	125k (79%)	32.2k (70%)

17-18