# Final progress report

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# List of Terms and Abbreviations

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|---|---|
| CDC | Center for Disease Control and Prevention |
| COVID-19 | Coronavirus Disease 2019 |
| HBF | Hepatitis B Foundation |
| HBV | Hepatitis B virus |
| MSD | Musculoskeletal disease |
| NIH | National Institute of Health |
| NIEHS | National Institute of Environmental Health Sciences |
| NIOSH | National Institute of Occupational Safety and Health |

# Abstract

In the United States, Vietnamese immigrants and refugees occupy a major portion of the nail industry workforce. Nail salon workers have long been documented to experience multiple acute adverse health effects related to their chronic exposures to low level of chemicals and other hazards in the workplace. Barriers such as language access, lack of resources, and cultural differences have resulted in workers and owners receiving limited occupational health training. While outreach efforts have been active in some parts of the country, there exists limited evidenced-based intervention programs that were rigorously evaluated and documented.

The specific aims of the project were: 1) to identify knowledge gaps of workplace hazards and prevention measures, current practices, influential stakeholders, and perceived barriers to adopting safer practices among Vietnamese nail salon owners and employees; 2) to develop linguistically and culturally relevant training program; and 3) to pilot the training program. For the first aim, we recruited 17 Vietnamese nail salon owners and employees in the Greater Philadelphia area to participate in the focus groups and interviews. In a separate study with 19 Vietnamese nail salon owners and employees, we qualitatively assessed knowledge and misconceptions associated with the hepatitis B virus (HBV), and access to care. For the second aim, we developed a series of training covering infection control, musculoskeletal disease prevention, chemical protection, and worker' rights. In the last aim, we pre-tested the online training format with seven Vietnamese salon owners and employees to obtain feedback on the training content and online format.

There is a complex interplay between the individual and environmental factors that influence safe practices among Vietnamese nail salon owners and employees. On the individual level, incomplete knowledge of the workplace hazards and control measures resulted in low perceived susceptibility and severity of the potential adverse health outcomes associated with work-related exposures. Employees typically had limited influence over the salon's safety culture and policy, and they attributed most of the responsibilities to the owners. Influential external stakeholders such as customers and policy enforcers should be leveraged in future intervention design. There were substantial knowledge gaps and misconceptions about how the hepatitis B virus is transmitted and prevented, which led to stigmatization of infected individuals in the salon. Barriers to health care access within the Vietnamese nail community included the cost of health care, long work hours, lack of insurance and lack of understanding of current community resources. Lastly, advantages associated with the online training format were identified, which included the ability to reach a larger audience, potential savings on staff time, and flexibility to accommodate participants' schedules. Challenges encountered included the inability to reach those with limited/no access to technology, technology assistance to participants prior to the training, and limited opportunity to model safe procedures to enhance effectiveness of the training. Technical assistance following the training will be critical to the success of the program. Lessons learned from the pre-test phase will be used to improve the quality of the program in the pilot study.

# Section 1 of the Final Progress Report

**Significant or Key Findings**

For the first aim, our qualitative needs assessment with 17 Vietnamese nail salon owners and employees revealed a complex interplay between the individual and environmental factors that influence safe practices among Vietnamese nail salon owners and employees. On the individual level, incomplete knowledge of hazards resulted in low perceived susceptibility and severity of the potential adverse health outcomes associated with work-related exposures. Employees typically had limited influence over the salon's safety culture and policy, and they attributed most of the responsibilities to the owners. External stakeholders such as customers and policy enforcers could play significant roles in influencing safe practices in the salons and should be leveraged in future intervention design and outreach campaigns. The results were published in Huynh et al., (2019).

Nail salon technicians and owners are at risk of contracting blood-borne pathogens such as hepatitis B virus (HBV) working in the salons. In a separate qualitative study with 19 Vietnamese nail salon employees and owners, we found substantial knowledge gaps and misconceptions about how HBV is transmitted and prevented, which led to stigmatization of infected individuals in the workplace. Many participants did not recall receiving training specifically related to hepatitis B in cosmetology schools. Barriers to health care access within the Vietnamese nail community were identified, which included the cost of health care, long work hours, lack of insurance and lack of understanding of current community resources. The results were published in Freeland et al., (2020) and were used to develop the hepatitis B module of the training program.

For the second aim, we developed Vietnamese training modules covering chemical protection, general infection control, hepatitis B testing and vaccination, musculoskeletal disease prevention, and labor laws and workers' rights. The link to our training modules can be found here.

For the third aim, we pre-tested the training modules with seven Vietnamese nail salon employees and owners to obtain feedback on the content and online format. The online training format offered many advantages that included the ability to reach a larger audience in wider geographic areas, potential savings on staff time, and flexibility to accommodate participants' busy schedules. We also encountered challenges, which included not being able reach those with limited/no access to technology, demand on staff time to provide technical assistance prior to the training, and limited opportunity to model safety procedures to enhance effectiveness of the training. Technical assistance to follow the training will be critical to the success of the program. Lessons learned from this pre-test phase will be used to improve the quality of the training for the next cohort.

**Translation of Findings**.

Findings from the needs assessment were directly used to in the development of the training program and strategies to deliver the program more effectively. Training will likely increase knowledge, perceived susceptibility, and severity of the adverse health outcomes, all are important individual factors that influence safe practices in the salon. However, our study also identified multiple environmental factors that researchers, policy makers, and public health practitioners

need to consider when translating the findings into policies. For instance, in addition to offering training to the workers, intervention program should also offer targeted training and on-going technical assistance to the owners to increase the likelihood of the owners making the changes to the salon's environment. Understanding that nail salon owners respond to customers and enforcers, consideration of strategies to engage the customers and law enforcers could motivate greater compliance. For instance, the development of campaigns to inform consumers about healthy salons in the area could bring more profits to compliant salons. Labor law enforcers could also participate in more community outreach so that their visibility may help to deter salons from violating the laws. Policy enforcers could also issue more warnings (not fines) to get owners take these regulations more seriously.

Findings from the hepatitis B needs assessment has motivated us to add the hepatitis B module focusing on the importance of testing and vaccination against hepatitis B. Of the seven participants in the cohort, three reached out to get tested. Future intervention program could consider similar partnership to help reducing HBV transmission risk in nail salons and enhancing the health and well-being of nail salon workers and their families.

Lessons from our pre-test phase were critical in improving our training program for next cohort. Future interventions that consider the use of online training could benefit from our experiences.

**Research Outcomes/Impact.**

Potential outcomes: When we delivered our training to a small group of participants during the pre-test phase, most participants indicated that the trainings were helpful, they learned new things, and could start implementing some of easier recommendations relating to MSD prevention. Participants mentioned that because of the training, they will be more mindful about their work habits. Positive feedback from participants are initial evidence of the usefulness of the training program in reducing work-related health risks in this population.

Intermediate outcomes: We have trained our community partner (Vietlead) to deliver the training and our partner organization already expressed in implementing the program in the future. Informed by our needs assessment, we have convened external stakeholders such as cosmetology state board inspector, regional OSHA enforcer, labor department representative to brainstorm local solutions to sustain the training program. We discussed the potential of adopting a voluntary healthy salons recognition at the local level utilizing our training program and our stakeholders have expressed willingness to investigate the idea.

End outcomes: This project has the potential to contribute to the reduction in work-related morbidity, mortality and/or exposure once scale-up. For instance, one immediate impact that we documented was the relatively high percentage (close to half) of participants reaching out for hepatitis B testing when we provided the patient navigation, language assistance, and testing service free of charge. If we continue to provide these supporting services (e.g., language access and on-going technical assistance), we project that rate of adoption and implementation of safer practices in the salon would be higher and therefore, it would help to reduce work-related illnesses in the Vietnamese nail community. Similar approaches can be adopted to reach other minority groups working in the nail industry.

# Section 2 of the Final Progress Report

## Aim 1: Identify gaps in knowledge regarding the workplace hazards and perceived barriers to safer practices.

Under this aim, we conducted two separate needs assessment: one study touches on all types of work-related hazards in the salons including chemicals, ergonomics, and infectious diseases; the other study, which focused on HBV transmission risk in the salon, were added later (not part of the original plan) when we formed partnership with the Hepatitis B Foundation and community partner, Vietlead. This aim was successfully accomplished and resulted in two publications.

### Manuscript 1: Factors influencing health and safety practices among Vietnamese nail salon technicians and owners: A qualitative study

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**Background**

The nail salon industry has experienced rapid growth within the last 20 years, seeing an increase of over 300% in the number of both nail salons and technicians.[1] Nationally, the population of licensed technicians has grown to over 430 000, and remains predominately comprised of females of reproductive age.[2] The average annual wage for a salon worker is estimated at $24 330[3] and many tend to work long hours and are responsible for over half of their household's income.[2] Many nail technicians also do not have basic health care coverage.[4] Over half of nail salon workers identify as Vietnamese in the United States (US),[2] a significant increase from only 10% in 1987.[5,6] Vietnamese immigrants have been able to occupy a major portion of the industry workforce because of limited training requirements, the ability to work without English fluency, and gaps in legislation and regulation.[4,5,7] Many nail salon employees, facing economic pressures to continue working, end up compromising their overall health.[8]

Nail salon workers encounter multiple hazards at the salons including chemicals, ergonomic hazards, and potential infectious diseases transmission from clients. Workers are exposed to hazardous chemicals, such as toluene, formaldehyde, and dibutyl phthalate[1,7,9-14] that are abundantly found in nail products. The long-term effects of these chemicals have been associated with risk of reproductive and cognitive development harm, cancer, allergies, and irritation to the respiratory, dermatological, and central nervous systems in other settings.[7,11,14-20] While chronic adverse health effects such as pregnancy complications, poor birth outcomes or cancers among nail salon workers remain uncertain,[21,22] acute health symptoms such as dermal and respiratory irritations and musculoskeletal pains, have been consistently reported in several studies.[7,11,14] In the literature, most studies of salons focus on exposure assessment of chemicals such as toluene, ethyl acetate, isopropyl acetate, methyl methacrylate,[12,23] indoor air quality,[12,24,25] and health outcomes.[11,14,21,22] Qualitative studies that explore facilitators and barriers to adoption of occupational health best practices in immigrant-owned nail salons are lacking. To our knowledge, there is only one qualitative study conducted in California with Vietnamese nail salon workers and owners that identified the role of key stakeholders, such as workers, owners, consumers, and governmental regulators, in promoting worker health.[26]

Philadelphia, Pennsylvania is home to approximately 16 682 Vietnamese-Americans, which is the 9th largest Vietnamese population among US cities.[27] There are about 396 salons in Philadelphia county, of which close to half are owned by Vietnamese owners.[28] The Pennsylvania State Board of Cosmetology regulates the practice and licensure of nail technicians, nail salons, teachers of nail technicians, and training schools and apprentice programs.[28] Requirements to become a licensed nail technician is minimal, which include a minimum educational level equivalent to 10th grade, 200 h of training at a licensed cosmetology school and an exam. The Board also prescribes management of nail salons including physical space and health and safety practices such as sanitation and sterilization of equipment,[29] largely designed to protect the customers not workers. Nail salons in Philadelphia must meet building codes in accordance with the International Building Code,[30] which in this case would require a source capture system (also known as local exhaust ventilation [LEV]) at each table.[31] However, many salons in Philadelphia do not have these systems. The Philadelphia Department of Public Health Environmental Health Services Division may also inspect and fine salons for sanitation violations. The Air Management Services regulates local and federal air quality standards for the city but it does not regulate air quality in nail salons.[32] Fragmented local regulations and the lack of safe nail products regulations at the federal level[4] lead to potentially unsafe exposures to chemicals and other hazards to nail salon workers. To our knowledge, there are no health promotion programs to assist nail salons workers in the Philadelphia metropolitan area.

This qualitative study is part of a larger needs assessment project. The purpose of the qualitative component of the assessment is to identify personal and environmental factors that influence health protective work practices among Vietnamese nail salon technicians and owners in the Philadelphia metropolitan area. Results from this study, along with findings from a literature review and insights from a community advisory board, will be used to develop a multilevel occupational health intervention program for nail salon workers and owners.

## Methods

### *Participant recruitment and study procedures*

We recruited Vietnamese nail salon technicians and owners in the Philadelphia metropolitan area using a snowball sampling approach, due to the fact that this is a hard-to-reach and vulnerable population.[33] We initially tried cold calling without success and quickly learned from other nail technicians that referrals from former/current co-workers, friends, and relatives was needed to reach this population. Part-time and full-time nail technicians and owners (including former nail technicians) between the ages of 18 and 65 years were recruited to join the study between September 2016 and April 2017.

We sent a detailed informed consent document in either English or Vietnamese (whichever language was indicated as preferred) in advance to participants who were willing to provide their contact information to us. Not all participants provided their contact information to the research team in advance. Some preferred to meet the team at a specified location. Prior to the start of each interview/focus group, we orally went through the consent form, provided participants with information regarding the purpose of the study, procedure of the interview/focus group, permission to audio record, plan to protect anonymity and confidentiality, and voluntary participation. Each interview and focus group lasted approximately 30-45 min. Participants were offered a $20 gift card as compensation for their time. We provided participants a copy of the consent form to keep

at the end of the session. The research protocol was reviewed and approved by the Institutional Review Board at Drexel University. Verbal informed consent was sought for each participant; signed written informed consent was waived because it would be the only record that linked participants to the study.

*Data collection*

In this formative study, we employed both focus group discussion and one-on-one interview methods in order to accommodate participants' schedules and preference. We organized two focus group discussions with nail technicians. We met one group of young female technicians ($N$ = 7, ages between 18 and 24 years old) at an Asian tea shop they selected. The other focus group ($N$ = 4, ages between 25 and 53 years old) occurred at the private home of a technician who helped us recruit other technicians. Based on participant preference, we also conducted one-on-one interviews with four nail technicians and two female owners. Owners/managers typically preferred to be interviewed at their salons, whereas technicians preferred to meet outside of their salons so they would feel more comfortable expressing their opinions. Regardless of the salons they worked at, we separated the owner/manager group from the technicians to avoid owner's influence on the technician's responses. The interviews and focus groups were conducted in the participants' preferred language. Six were conducted in Vietnamese, two were in English. We created two semi-structured interview guides (one for salon owners/managers and one for technicians) which were used for both the focus groups and one-on-one interviews.[34] Though some questions were worded slightly differently for owners and workers, the open-ended questions from both interview guides covered the same topics. We started out asking "warm-up" questions about: (i) how they entered the nail profession; (ii) health symptoms they experience, and then moved on to substantive questions probing around; (iii) knowledge of workplace hazards; (iv) current preventive practices relating to chemical protection and ergonomics; and (v) attitudes and barriers about certain occupational health best practices (eg, use of personal protective equipment or ventilation system). After each session, participants were also asked to complete a short anonymous demographic survey.

The Principal Investigator (PI) conducted all of the interviews and focus group discussions. The research assistants (ND and NT) took notes throughout each session to note interview or focus group dynamics and engaged in informal unrecorded talks with participants (such as how and why they came to the US, their family, their career aspirations) before and after each meeting so they would feel comfortable talking with us. After the first focus group, questions were modified and additional ones were included to further explore themes that emerged from the first discussion. The interviews were audiorecorded, transcribed in Vietnamese, and translated to English by bilingual and bicultural research assistants and reviewed by the PI for completeness of the translation.

*Analytic Methods*

Data consisted of eight transcripts that were uploaded into and coded using Atlas.ti version 8 (Cleverbridge AG, Cologne, Germany). The coding team included the PI, part-time nail technicians who were also undergraduate student research assistants (ND, NT), and graduate research assistants who were not knowledgeable about the industry (SS, NV). The coding process began with multiple coders performing open coding on two transcripts using a grounded theory approach.[35] The team met to discuss and resolve differences between coders and the initial list of

codes. Next, focused codes were created and discussed that were relevant to the research questions. Once a coding scheme was finalized through an iterative process of coding, team discussion and consensus-building, all the transcripts were coded using the final scheme by multiple coders. Additional codes were added to the coding scheme as they arose and were later reviewed for group consensus. After the coding was completed, emerging themes were identified. Illustrative quotes were extracted to substantiate the findings derived from the themes and codes. Pseudonyms were used to protect the privacy of participants. The inclusion of multiple coders with diverse perspectives throughout the process helped the team maintain objectivity and avoid biased interpretation of the data.

*Participants characteristics*

Seventeen adults participated in the study, including 15 females (88%) and two male technicians (12%) (Table 1). They represented eight salons from different neighborhoods in both central Philadelphia and surrounding suburbs. We were able to visit only three of these salons (one located inside a large mall and two on relatively busy streets) where we interviewed two female owners and a female technician who appeared to have some managerial role in the salon. The majority of participants were technicians (88%), born in Vietnam (88%), and primarily speak Vietnamese at home (59%). On average, study participants were 33 years old (range = 18-53 years). The mean number of years living in the US was 15 years, ranging from being born in the US to having been in the US for 33 years. The reported time being in the nail profession ranged from 1 to 17 years and the majority of participants reported working more than 40 h per week. Study participants had a variety of educational backgrounds obtained in either Vietnam or the US. Three (17%) were college graduates. One manager was a US college graduate who took over the ownership of her mother's salon so that her mom could work less and the other used to work part-time while attending school. We had no background information on the third college graduate. Seven participants had some college education (41%) which included a couple of college dropouts who ended up working full-time at the salons and the rest were full-time students at a community college or university working part-time during the school year and full-time in the summer. Other full-time nail technicians were older or recently came to the US with limited English skills. Almost all got into the profession through connections with family or friends. We did not ask about their nail licenses as such sensitive question might affect their engagement during the discussion.

## Results

Analysis of the transcripts revealed three major themes relating to our core research question: (i) health symptoms experienced; (ii) protective practices; and (iii) factors that influence the adoption of health and safety best practices in the nail salons. We identified sub-themes related to the third theme and explored how they could serve as motivators or barriers to performing protective actions by the nail technicians and owners/managers (Table 2). Similarities and differences between the groups in their perspectives were also reported.

*Health symptoms experienced*

Most participants reported having experienced adverse health symptoms that they thought could be related to chemicals in nail products such as acetone, glue, liquid used in acrylic nails (methyl methacrylate or MMA), and gel nails. These symptoms included sneezing, eczema, eye irritations, dry/cracked and itchy skin on the hands, and headaches. For instance, one female technician mentioned her issue with gel nails:

*"When I do gels, my eyes feel sticky and itchy… When I don't do gel, I don't have those symptoms. I do not have those issues with acrylic nails, only with gel nails. My eyes feel like there is a pus in my eyes. It's slightly sticky. I'm just not comfortable working with gel." (Female nail technician).*

One older male technician, however, thought some of these symptoms could be related to pollens or allergens outside of work. It should be noted that this male technician consistently dominated the group discussion and refuted health concerns brought up by other participants. Our informant later told us that he was a manager but he had indicated to us that he was a technician.

In addition to chemical concerns, musculoskeletal symptoms such as shoulder and back pain were also mentioned, "I have shoulder and back pain," said one female technician from the group discussion. Another female nail technician mentioned hearing about nail workers needing surgery on their fingers, "There are people who have to have surgery on their fingers because they hold customers' hands for too long… Some people lost sensation on their finger."

We found that the owners/managers reported either less or no negative health symptoms or concerns compared to the nail technicians:

*"I have done nails for a long time but have not seen any effect. No regular illness… I'm not sure about new workers but I myself have worked for a long time and I feel fine. Just normal. (Female owner)"*

*Protective practices*

*Chemical protection*

All participants indicated that they adopted some forms of protective practices when working at the salons. These practices included the use of ventilation (eg, fans, general mechanical ventilation or keeping the door open), wearing personal protective equipment, proper storage and handling of chemicals (e.g., transferring bulk chemicals into smaller containers with labels, storing chemicals soaked cotton balls in a small container and discarding them at the end of the day), having indoor plants, and keeping the salon clean.

The use of gloves and surgical masks were mentioned more often than other practices. These practices appeared to vary between study participants, the type of nail services being performed, and salons. All participants reported using surgical masks for dust and chemical protection. All but one young male technician were unaware of the N-95 respirator for dust protection. The male technician talked about his preference for the N-95 respirator but it was unclear whether it was accessible to him. All participants reported using gloves and they used gloves for pedicures more often than manicures. One female participant described her typical gloves use:

*"It's normal when doing pedicure, just uncomfortable when doing manicure." (Female nail technician)*

*Musculoskeletal prevention*

Regarding musculoskeletal prevention, more experienced workers appeared to know how to better protect themselves than less experienced ones. Some participants reported not doing anything about the muscular pain they experienced. Others recounted examples of measures that they took, which included being aware of the posture, sitting up straight, not putting too much force on the hands, working out or doing yoga after work, standing up to walk between clients, taking pain

relievers, or having family members help at the shop so that they can work less. One female owner thought that handling hands constantly could cause shoulder pain and shared how she took care of herself, "You have to be aware of your posture when you are sitting instead of hunching over. You have to sit up straight. Most people want to get close to customer's nails so that you can see the details. A lot of people have bad posture." In addition, she and her sister also worked at the salon so their mom can work less, "My sister and I are here helping her so she can work less."

Another seasoned female owner shared that she used a raised platform to rest her hands so that she did not have to use too much force holding the client's hands:

*"I always have this cushion to support my hands when I work. There are many people who do not know. Just pull their hand up and lift. I put my hand on this cushion. No need to lift or hold people's hands up. Then I have the right angle to work." (Female owner)*

When asked about doing body stretches during free time at work, one young female participant in a focus group said that she would not do it because she did not think her owner would support it and even if they did, she might consider doing very light exercises, " I would just do something light that does not require too much force. We're in a salon. Doing stretches like you're dancing would make you look like a crazy person."

Overall, the owners/managers tended to report better adherence to safety practices in their salons compared to the nail technicians.

*Factors influencing adoption of health and safety practices*

*Perceived health benefits/concerns*

Most participants mentioned self-protection as one of the reasons they performed safe work practices. This attitude is shared by both the nail technician and the owner/manager groups.

*"Because there are many nails disease that you may not know. When someone who has a disease gets cut, you can get infected. So the gloves are a must-have." (Female nail technician)*

*Knowledge about health and safety at work*

The level of health and safety knowledge appeared to vary among participants and topics. Many participants mentioned that they knew working with chemicals can affect their health:

*"[Acrylic] has liquid, then when we file, there are dusts from the powder. You will inhale those dusts, it is not good." (Female nail technician)*

Some had no knowledge of the potential risks of chemicals:

*"I do not know if it actually affects our health." (Female nail technician)*

*"I don't really know if there is anything we have to really be worried about health risk. Like anything in life that you are doing, there is always risk of cancer. I don't think I have seen it here or I have heard of it." (Female owner)*

Knowledge appeared to be gained and/or reinforced by the health effects that they or people they know experienced at work:

*"At that time I did not know, but after working for a while, I realized it." (Female nail technician)*

Similarly, personal experience seems to shape the participant's perceived susceptibility and severity of the potential health effects more than knowledge. A female owner recalls her pregnancies:

*"I was nervous at first. Because I heard that women who work in the nail industry during pregnancy, may have some effects on their children later on. I also asked the doctor. The doctor also advised me to wear protective masks and other things… We should also pay attention to any little thing at the time of pregnancy. When I have three children, all three children are healthy. There are many people in my family who do not do nails but their kids are not healthy. I think it may just depend on each of our body types." (Female owner)*

Participants have basic knowledge of ways to protect their health from chemical and infectious diseases transmission such as use of gloves and masks. Many participants did not know about local exhaust ventilation. When shown pictures of individual mobile local exhaust machine, none of the participants said their salons had such machines or similar units. People generally know about the general ventilation but not the local exhaust ventilation.

We found having the knowledge does not necessarily translate to consistent practices due to barriers discussed below.

*Salon's management and policies attributed to the owners*

Results showed support from owners was related to technicians' health and safety behaviors. Many Vietnamese salons are family-owned and owners typically hire Vietnamese technicians. The work environment is often perceived like family:

*"Everybody looks out for everybody in the salon, you know. It is very much we are in a close group." (Female owner)*

However, not all technicians felt that way. Management styles and organizational policy varied between owners and salons. Some owners treat employees better than others and also encourage using protective equipment.

While owners/managers could be a source of motivation, they can also be barriers. One former nail technician revealed that when she used to work at a family owned salon, she sensed that the owner was not happy with her using some of the personal protective equipment so she did not use them even though they were available at the salon.

Another technician told us that "Some owners just don't care." She knew of one owner who did not want her technicians to wear gloves because she feared that wearing gloves might leave a bad impression on the customers:

*"I actually know the lady that own the nail salon that did not want people to wear gloves, cause she [the owner] took different way, thinking when you wear gloves, you grossed out the clients, and she did not want the client to feel like what's wrong with my feet. There were times that she said you guys should stop wearing gloves." (Female nail technician)*

Instead of providing gloves to workers, some owners/managers may suggest that the technicians buy gloves themselves:

*"Only worker will support it [wearing gloves] because owner does not want to provide it. But sometimes the boss is also nice enough to suggest buying gloves ourselves." (Female nail technician)*

*Client influence*

Customers can play a big role in influencing nail salon's practices in a positive way which can reinforce the technician's and owner's protective practices:

*"In the beginning, when you first introduce to that concept, I think they [clients] were taken back… But after a while, they understand it. I mean you are working with the chemical, it's dirty stuff. They started to understand more. It is actually protecting the clients and also the workers." (Female nail technician)*

There is, however, variability in customers' perceptions and preferences toward certain salon health and safety practices that could make it difficult for the workers to adhere to good practices. For instance, if clients were allergic to latex, technicians were requested not to wear gloves:

*"There are also people who are allergic to latex gloves that they let you know. So I do not wear gloves at their request." (Female owner)*

Or when the salon's door is kept open to facilitate air circulation, clients might express their dislike of noise or insects:

*"But many times the customers do not like the door to be opened. Sometimes the flies can come in or the noise of traffic is annoying." (Female nail technician)*

Client preference affected both the owner/manager and nail technician groups.

*External regulations/policies*

Owners had the responsibility to be compliant with the laws and thus were more responsive to legal/contractual requirements and law enforcers compared to the nail technicians:

*"When opening the shop [in the mall], they required me to install a ventilation system… Here this [general] ventilation costs thousands of dollars." (Female owner)*

*Protective equipment-specific challenges*

While many nail technicians supported the use of protective equipment (masks and gloves), they also expressed challenges in using them. These included discomfort, blurriness in their glasses (masks use), slipperiness, and slowing them down (gloves use).

When asked about potential challenges of having or using a local exhaust ventilation unit, participants talked about the potential noise, entanglement, too busy to turn it on, or that the owner might not want to install it because of the cost:

*"I do not think the owner would like that because it costs [money] to install and fixes it if something big breaks. Or if you have too many customers coming in you do not have time to turn it on." (Female nail technician)*

**Discussion**

The purpose of the study was to identify factors that influence the adoption of safe practices among Vietnamese nail salon technicians and owners in the Philadelphia metropolitan area. Our findings revealed a complex interaction between personal and environmental factors that affect health and safety practices in nail salons.

Nail salon workers talked about several acute health symptoms related to chemical use, ergonomics, and infectious disease hazards that they or their co-workers experienced such as headaches, respiratory, eye, and skin irritation, and pain in the shoulders, back, and hands. However, they were less certain about more serious health risks such as pregnancy-related outcomes or cancers. Acute symptoms reported by our participants were consistent with the literature from several quantitative cross-sectional health surveys of nail salon technicians in different states, including California and Massachusetts.[7,11,14] The owners and managers were more likely to be dismissive of the health risks than the nail technicians in their responses.

Cognitive behavioral factors such as knowledge, perceived health risks and benefits were influencing factors among both the nail technicians and owners and managers. We learned that even though some workers and owners may report knowing about potential health hazards, their perceived susceptibility and severity of more serious adverse health conditions were generally low. This may be due to the perceived lack of evidence of the longer-term health risks associated with working at nail salons that they or people in their network encountered. The statistics of severe chronic health conditions associated with the nail profession is also limited in the literature, which might be due to the difficulty in conducting research in this hard-to-reach population and healthy worker effects where seriously-ill workers tend to leave their jobs.

While some basic knowledge about the hazards and control measures were generally known among the participants, misconceptions about certain health and safety practices also existed. These included, but were not limited to, the use of surgical masks for dust and chemical protection or the belief that muscular pains is mostly due to aging. Some of these misunderstandings were consistent with reports of nail salon practices from other states,[7] which might indicate that information/training gaps persist not only in Philadelphia but potentially among the larger nail salon industry's niche involving nail salon workers and owners. One potential reason for the continued use of these surgical masks was that they were much less expensive, more comfortable to wear, and friendlier looking than the recommended N-95 respirators. While outreach programs targeting existing technicians and owners will address short-term training gaps, more sustainable efforts might need to involve changing curriculum in cosmetology schools, apprentice programs, and nail salon regulations.

Our qualitative analysis also found several important workplace environmental factors that played significant roles in shaping nail salon safety practices. First, different owners have different management styles and organizational policy within their salons that can affect technicians' behaviors. Educating owners and managers of health and safety best practices may help owners establish better organizational policy and reinforce health promoting behaviors for workers. Second, clients can also either positively or negatively influence a salon's practices. Thus, it would be interesting to compare salon practices by neighborhoods (eg, customers from affluent neighborhood may be more willing to pay for higher prices for safer and more expensive products). Lastly, owners and technicians are generally responsive to external requirements and law enforcement. Many family-owned salons operate on low profit margins so strict regulations such as installing local exhaust ventilation might negatively impact small businesses due to potential

high cost of implementing and maintaining the system. Therefore, consideration of a balanced regulatory approach (eg, providing economic assistance to small businesses) might attract more owner's buy-ins and bring more sustainable change in this industry.

The results of our study may be impacted by several limitations. One limitation is the small sample of nail technicians and owners that may not be representative of the experiences of all Vietnamese nail salon workers in Philadelphia. Although our sample size is relatively small, we found repeated themes in most of the transcripts which indicated to us that some level of thematic saturation was reached. Another limitation is the limited inference to other ethnic groups that make up the rest of the nail industry's workforce including English-speaking Non-Hispanic Whites and African Americans, other Asian ethnic groups and Latino/Hispanic minorities. We recommend future research to explore the experiences and organizational culture of workers from those racial/ethnic groups in order to better understand industry-wide best practices and optimize outreach efforts. However, it is possible that some of what we found among Vietnamese workers, most of whom were immigrants, could be applicable to salon workers who emigrated to the US from other countries. It is also possible that our results may be unique geographically because other municipalities and states may have different requirements for nail salon operations and thus would impact their safety practices. For instance, New York has now implemented ventilation regulation for nail salons requiring a source capture system at each nail table[36] but some cities in California use a voluntary approach where salons are incentivized to be legally recognized as being a healthy nail salon.[37] There is also a possibility of social desirability bias and misclassification of the participants' roles in the salons, particularly among the owners and managers. There were two participants who self-reported to be nail technicians but we later learned through our informant that they were managers. Managers of small nail salons often also work as technicians and thus would sometimes prefer to classify themselves as technicians. While we took their actual status into account in our transcript analysis, this status misclassification may pose challenges in future study where we may not have informants to confirm their backgrounds and thus identify any potential bias in their response.

There were differences that arose from combining individual interviews and focus group discussions into one analysis. Responses from individual interviews tend to be more in-depth than focus groups, as the interviewer could probe and clarify responses. On the other hand, moderators of the focus group discussions had to navigate dynamics between dominant and shy participants. Yet these discussions took advantage of the dynamic nature of a focus group discussion, including the stimulation of richer responses and the ability to build consensus. We felt that having both methods allowed us to balance the breath and depths of the topics. It also allowed us to engage nail technicians who would not have agreed to participate without being able to do so with their trusted peers. Thus allowing participants to self-select into focus group discussion or interview helped to increase our response rate in this formative study. Lastly, much of the information was obtained via focus groups rather than individual-level surveys, thus precluding us from learning the frequency with which certain views are shared within this sample. That said, the knowledge gained from conducting these focus groups will inform the development of a survey instrument that could assess prevalence and frequency of experiences in future phases of the study.

Despite these limitations, a major strength of this study was the use of qualitative methods to gain a more in-depth understanding of the complex interplay between the personal and environmental factors that contributed to the current occupational health practices of Vietnamese nail salon technicians and owners. These formative findings provide a foundation upon which to expand the

research such as interviews with policy makers, cosmetology school educators, and customers. They will also inform the development of a healthy nail salon intervention program and help us identify opportunities for outreach and policy changes for more sustainable prevention efforts for this worker population.

## Conclusions

Our study highlighted a complex interplay between personal and environmental factors that influence health and safety practices among Vietnamese nail technicians and owners. Our results confirm the need to incorporate linguistic and cultural components in future intervention programs but also highlight barriers to healthier salons and worker behaviors that must be addressed at multiple levels as much as possible. This will require key stakeholders such as technicians, owners, cosmetology educators, researchers, public health professionals, community organizations, the public, and policy makers working in synergy to create more sustainable behavioral and system changes for the health and wellbeing of workers in the nail industry.

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## References

1. Women's Voices for the Earth. Glossed Over: Health Hazards Associated with Toxic Exposure in Nail Salons. 2007. https://womensvoices.org/wp-content/uploads/2010/06/Glossed_Over.pdf. Accessed December 21, 2018.

2. NAILS Magazine. NAILS Magazine 2017-2018 The Big Book. Industry Statistics 2017; https://files.nailsmag.com/Handouts/NABB2017-18stats-LR.pdf. Accessed Dec 21, 2018.

3. US Department of Labor BoLS. May 2016 National Occupational Employment and Wage Estimates. 2016. https://www.bls.gov/oes/current/oes395092.htm. Accessed December 21, 2018.

4. Hu K, Soyoung H, Yeung M. Removing the topcoat: understanding federal oversight of nail salons. National Asian Pacific American Women's Forum on behalf of the National Healthy Nail Salon Alliance. May 2011. Web link no longer available.

5. Quach T, Liou J, Fu L, Mendiratta A, Tong M, Reynolds P. Developing a proactive research agenda to advance nail salon worker health, safety, and rights. Prog Community Health Partnersh. 2012;6:75–82. [PubMed] [Google Scholar]

6. Federman MN, Harrington DE, Krynski K. Vietnamese manicurists: are immigrants displacing natives or finding new nails to polish? Ind Labor Relat Rev. 2006;59:302–318. [Google Scholar]

7. Roelofs C, Azaroff LS, Holcroft C, Nguyen H, Doan T. Results from a community-based occupational health survey of Vietnamese-American nail salon workers. J Immigr Minor Health. 2008;10:353–361. [PubMed] [Google Scholar]

8. Sharma P, Waheed S, Nguyen V, et al. Nail File: A study of Nail Salon Workers and Industry in the United States. UCLA Labor Center and California Healthy Nail Salon Collaborative; 2018. https://www.labor.ucla.edu/wp-content/uploads/2018/11/NAILFILES_FINAL.pdf. Accessed December 21, 2018. [Google Scholar]

9. Environmental Protection Agency. Protecting the health of nail salon workers. 2018. https://www.epa.gov/saferchoice/protecting-health-nail-salon-workers-0. Accessed December 21, 2018.

10. Occupational Safety and Health Administration. Health Hazards in Nail Salons. 2018. https://www.osha.gov/SLTC/nailsalons. Accessed December 21, 2018.

11. Quach T, Nguyen K-D, Doan-Billings PA, et al. A preliminary survey of vietnamese nail salons workers in Alameda county, california. J Community Health. 2008;33:336–343. [PubMed] [Google Scholar]

12. Quach T, Gunier R, Tran A, et al. Characterizing workplace exposures in Vietnamese women working in California nail salons. Am J Public Health. 2011;101:S271–S276. [PMC free article] [PubMed] [Google Scholar]

13. Alaves VM, Sleeth DK, Thiese MS, Larson RR. Characterization of indoor air contaminants in a randomly selected set of commercial nail salons in Salt Lake County, Utah, USA. Int J Environ Health Res. 2013;23:419–433. [PubMed] [Google Scholar]

14. White H, Khan K, Lau C, Leung H, Montgomery D, Rohlman DS. Identifying health and safety concerns in Southeast Asian immigrant nail salon workers. Arch Environ Occup Health. 2015;70:196–203. [PubMed] [Google Scholar]

15. Agency for Toxic Saubstances & Disease Registry. Toxicological Profile for Toluene. https://www.atsdr.cdc.gov/toxprofiles/tp56.pdf. Accessed December 21, 2018.

16. Occupational Safety and Health Administration. OSHA Fact Sheet: Formaldehyde. https://www.osha.gov/OshDoc/data_General_Facts/formaldehyde-factsheet.pdf. Accessed December 21, 2018.

17. Pak VM, McCauley LA, Pinto-Martin J. Phthalate exposures and human health concerns. AAOHN J. 2011;59:228–233. [PubMed] [Google Scholar]

18. Kwapniewski R, Kozaczka S, Hauser R, Silva MJ, Calafat AM, Duty SM. Occupational exposures to dibutyl phthalate among manicurists. J Occup Environ Med. 2008;50:705–711. [PubMed] [Google Scholar]

19. LoSasso GL, Rapport LJ, Axelrod BN. Neuropsychological symptoms associated with low-Level exposure to solvents and (Meth)acrylates among nail technicians. Neuropsychiatry Neuropsychol Behav Neurol. 2001;14:183–189. [PubMed] [Google Scholar]

20. LoSasso GL, Rapport LJ, Axelrod BR, Whitman D. Neurocognitive sequelae of exposure to organic solvents and (Meth)Acrylates among nail-Studio technicians. Neuropsychiatry Neuropsychol Behav Neurol. 2001;15:44–55. [PubMed] [Google Scholar]

21. Quach T, Doan-Billing PA, Layefsky M, et al. Cancer incidence in female cosmetologists and manicurists in California, 1988- 2005. Am J Epidemiol. 2010;172:691–699. [PMC free article] [PubMed] [Google Scholar]

22. Quach T, Von Behren J, Goldberg D, Layefsky M, Reynolds P. Adverse birth outcomes and maternal complications in licensed cosmetologists and manicurists in California. Int Arch Occup Environ Health. 2015;88:823–833. [PubMed] [Google Scholar]

23. Garcia E, Sharma S, Pierce M, et al. Evaluating a county-based healthy nail salon recognition program. Am J Ind Med. 2015;58:193–202. [PubMed] [Google Scholar]

24. Pavilonis B, Roelofs C, Blair C. Assessing indoor air quality in New York City nail salons. J Occup Environ Hyg. 2018;15:422–429. [PubMed] [Google Scholar]

25. Quach T, Varshavsky J, Von Behren J, et al. Reducing chemical exposures in nail salons through owner and worker trainings: an exploratory intervention study. Am J Ind Med. 2013;56:806–817. [PubMed] [Google Scholar]

26. Quach T,Tsoh JY, Le G, et al. Identifying and understanding the role of key stakeholders in promoting worker health and safety in nail salons. J Health Care Poor Underserved. 2015;26:104–115. [PubMed] [Google Scholar]

27. U.S. Census Bureau. 2012-2016 American Community Survey 5-Year Estimates. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF. Accessed December 21, 2018.

28. Pensylvania Department of State. State Board of Cosmetology. https://www.dos.pa.gov/ProfessionalLicensing/BoardsCommissions/Cosmetology/Pages/default.aspx. Accessed Dec 21, 2018.

29. The Pensylvania Code. Chapter 7. State Board of Cosmetology. https://www.pacode.com/secure/data/049/chapter7/chap7toc.html. Accessed December 21, 2018.

30. City of Philadelphia Business Services. Nail Salon; https://business.phila.gov/business/beauty-and-personal-care/nail-salon/. Accessed December 21, 2018.

31. International Code Council. 2018 International Mechanical Code. Chapter 4 Ventilation. https://codes.iccsafe.org/content/yc7355qxk7/chapter-4-ventilation. December 21, 2018.

32. City of Philadelphia. Air Pollution Control Board. https://www.phila.gov/departments/air-pollution-control-board/. Accessed December 21, 2018.

33. Sadler GR, Lee HC, Lim RS, Fullerton J. Recruitment of hard-to-reach population subgroups via adaption of the snowball sampling strategy. Nurs Health Sci. 2010;12:369–374. [PMC free article] [PubMed] [Google Scholar]

34. Krueger RA, Casey MA. Focus Groups: A Practical Guide for Applied Research, 3rd ed. Thousand Oaks, CA: Sage Publications; 2000. [Google Scholar]

35. Creswell JW. Qualitative Inquiry and Research Design: Choosing Among Five Approaches, 3rd ed. Thousand Oaks, CA: Sage Publications; 2013. [Google Scholar]

36. New York State: Governor Cuomo announces new ventilation standards for nail salons are now in effect. https://www.governor.ny.gov/news/governor-cuomo-announces-new-ventilation-standards-nail-salons-are-now-effect. Accessed December 21, 2018. [Google Scholar]

37. San Francisco Department of the Environment. Healthy Nail salon Recognition Program. https://sfenvironment.org/nail-salons. Accessed December 21, 2018.

## Manuscript #2: Understanding Knowledge and Barriers Related to Hepatitis B for Vietnamese Nail Salon Workers in the City of Philadelphia and Some of Its Environs

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### Introduction

Worldwide, hepatitis B virus (HBV) is the most prevalent liver disease and leading cause of cirrhosis, liver failure, and liver cancer [1,2]. In the United States (U.S.), up to 2.2 million individuals are chronically infected with HBV [3] and only 25-30% are aware of their infection. Screening rates remain low among high-risk communities, even though there are guidelines advising risk-based screening [5,6]. Implementation of screening guidelines has been low, and HBV testing is not typically included in bloodwork during routine check-ups, even for high-risk individuals [7-12]. Additionally, the HBV vaccination coverage rate among adults in the U.S. remains low, at just 25% [13,14]. HBV infection disproportionately impacts Asian Americans and Pacific Islanders (AAPI), partly due to high prevalence rates of HBV in Asia and the Western Pacific and the asymptomatic nature of the infection [3]. Within Philadelphia, PA over 25,000 individuals and 8-12% of local Vietnamese residents are estimated to be living with HBV [15,16].

In the Vietnamese immigrant and refugee community, nail salons are the core economic support [17]. Many nail salon workers are at risk for HBV as they are coming from high-risk and traditionally underserved communities. Blood to blood transmission of HBV within the nail salon is also a hazard nail salon worker face in the workplace [18,19]. Previous research and community-based input has identified health disparities and gaps in access to care for nail salon workers who come from AAPI populations [9]. The estimated number of manicurists working in the U.S. is up to 439,000 individuals and 56% are Vietnamese [20,21]. Philadelphia has the 9$^{th}$ largest population of Vietnamese among U.S. cities and at least 46% of nail salons in Philadelphia are owned by Vietnamese, confirming that the number of Vietnamese nail salon workers in Philadelphia is hi gh[22].

In an effort to work towards reducing the barriers and health disparities associated with HBV in the Greater Philadelphia area, this study aimed to qualitatively assess the health needs for

the prevention of HBV among Vietnamese nail salon workers through focus groups and interviews. The Health Belief Model (HBM) was used to guide questions asked to understand individual knowledge associated with hepatitis B (*perceived susceptibility*), individual perception of severity and risk of HBV (*perceived severity*), individual understanding of benefits to screening (*perceived benefits*) and barriers to act on screening or vaccination among nail technicians within this at-risk community (*perceived barriers),* and recommendations for effective public health outreach to raise awareness *(cues to action*)[23-25].

**Methods:**

We recruited Vietnamese nail salon workers, including technicians and owners, who work for salons in the Philadelphia metro area and southern New Jersey aged 18 and older. Participants were part-time, full-time, current and former nail technicians. Our primary recruitment strategy was through a community-based organization serving the Vietnamese community using snowball sampling. We conducted five individual interviews with nail salon owners, five individual interviews with technicians and two focus groups with the technicians between Feb 2019 – June 2019 (N=19). Prior to participating in the interviews and focus groups, each participant consented and completed a brief demographic questionnaire. All interviews were recorded in Vietnamese, transcribed in Vietnamese and translated into English. A codebook was created systematically through literature review and reading a subsample of the initial interview transcripts by two study staff (Supplemental Material). Data were coded by four researchers independently and any discrepancies within the coding were resolved through discussion. Agreement between coders ranged from 82%-100% for all codes within this study. All codes and data were organized in NVivo 12.5.0 software (QSR International). This study was approved by the Drexel University Institutional Review Board.

**Results:**

All focus groups and interviews were conducted in Vietnamese (N=19, Table 1). The mean age of participants was 43, with a range of 27 to 65 years. The majority of the participants were female (N=13) and had been working in the nail industry 9 years. Most of the participants were nail salon workers (N=11) and five of those interviewed were nail salon owners with two unreported. The majority (84%) of those interviewed worked full time (N=16). Coding from interviews and focus group revealed several themes and HBM constructs including; the lack of knowledge related to HBV (perceived susceptibility and perceived severity), barriers to health care access within the Vietnamese nail technician community (perceived barriers), discrimination and stigma related to those infected with HBV (perceived barriers), nail training and licensing, and recommendations from those interviewed for effective public health messaging in this community.

**Knowledge**

Interviews revealed an overall lack of knowledge related to HBV. Many individuals expressed misconceptions related to transmission, symptoms and prevention of HBV. Several participants thought that HBV is spread "*through food and water intake*," one suggested transmission occurs through "*mosquito*," and others thought HBV was "*spread genetically*." Another person noted, "*it is a type of sickness that is considered normal. It does not spread easily via any vectors.*" While

many disclosed that they do not know much about HBV, several individuals said, "*I have never seen it, so I don't know much about it*." A few individuals interviewed did know basic information related to HBV because they had personal experience. One individual said she had family members with liver-related issues and said, "*but it is genetic, my maternal grandfather has liver related issue… a couple of my uncles, two of my uncles also in Vietnam, one uncle passed due to liver disease, one uncle in Canada also passed because of liver disease. My mother also has liver issue, however, due to being female, it does not affect her much, only male. That is the extent of my understanding.*" This quote highlights the misconception that HBV is genetically passed on to family members.

One participant who noted a personal experience with a liver-related illness described, "*I went to be screened for hepatitis at a community charity screening event and they say I have it. So, then I went to the doctor, and the doctor said that I have to go to a big hospital because the family doctor does not treat that. So, when I went to the hospital, the hospital said… it's not hepatitis B but I have pebbles in the liver…it caused the weakening of my liver.*" For participants who may have had hepatitis, there was still much uncertainty and confusion regarding different types of liver disease and how they are treated: "*As for now, if you get sick, then you just go to the hospital, what else can you do?".* Another mentioned more casually that they have a family member who "*just goes every 6 months for testing."* In addition to the confusion surrounding the disease, many participants were also not aware that there is a vaccine available that can prevent HBV transmission.

**Barriers**

Many individuals did not regularly go to the primary care doctor or "*only go to the doctor when they get sick*." A few participants noted that this was "*because people are not worried about health. Most are people who haven't gone for a checkup for decades. They are afraid of finding some illness*." Another individual noted fear as a common theme to accessing health care in the U.S. "*the first thing is that they don't have time. The second thing is they are afraid.*" Others noted that the cost of health care was a barrier as well as not having health insurance. One participant stated, "*that's because… don't have insurance. I have insurance, but I'm afraid it will cost money if I go (to the doctor). I don't know, in general, even if I am sick, I will still not go to get a checkup*." Most participants described time as another barrier to accessing health care especially for the nail technician profession. One participant noted, "*inconvenience… like nail technicians usually have a hard time to schedule things around their work hours. They work 7 days a week, and the doctors usually opens late, sometimes not until 9am, and it is often crowded. That is why I do not want to go, because I have to wait in line and then be late for work. That is why many people in the nails field could not schedule for things to happen. The exception would be when they are really sick, only then will they take a day off to go*." Another echoed this barrier stating, "*Vietnamese in the U.S., we work day and night, day and night, we don't have time. It's very hard for you to sit down and talk with people. It's very difficult."* There is also the assumption expressed by several participants that if someone feels healthy, they do not need to go for a checkup. One participant described, "*there are some people who are normal and healthy, and they would think that if I am healthy and normal, why go for a check-up? Like my father, for example,* he *is normal at home,*

*and if you tell him to go to the hospital, he will not go, thinking that if he go, he will get sick for sure*."

**Discrimination/Stigma**

Within interviews, participants were also asked how people with HBV would be treated in their community. Most participants felt that people with HBV would not be treated differently but a few suggested otherwise. Participant perceptions seemed to be based on their personal experience with HBV. Those not as familiar with HBV mentioned that, *"… being infected, people will avoid you, they will not come close to you*." And other participants mentioned that "*if they have an illness, they often hide it, they will not talk about it,*" highlighting internal stigma related to HBV, associated with fear of being stigmatized or treated differently. Another described a family experience with HBV, "*in Vietnam, once had it, mother and father do not live together and separated. The children also separated. Eating and drinking is done separately as well. Then once treated, everybody got back together*." This break with traditional family meals seems due to the misconception that HBV is transmitted through sharing food and drink, and the stigmatizing fear of transmitting the virus among family members.

Misconceptions related to transmission of HBV were linked with perceptions about how people with HBV might be treated by others. Several participants noted, "*people are afraid of being infected. Like when talking, the saliva can do this or that. Eating/drinking, stuff like that, they don't like it. They don't like to use the same stuff as well*." Another mentioned, "*I am afraid of socializing with people as well*." Another participant stated "*Well, I will treat them as normal. I just have to be careful with my eating and drinking habit… when eating together, just to be careful.*" This further highlights the misconception and knowledge gaps related to transmission. (HBV is not spread through sharing meals with those infected). Another participant said, "*in my opinion, it is not discrimination, people are simply afraid that the illness will spread to them, that's all, not discrimination*," highlighting a fear of contracting HBV. One participant echoed this fear "*of course, I am afraid, because that illness is contagious, and everyone will try to avoid you. Can't work comfortably and a part of it, generally speaking, it's like there is something inside your body that would make you uncomfortable and have low self-esteem.*"

**Screening and Prevention**

Many participants did not know they should be tested, reported that it was not recommended to them by a doctor, or assumed that a blood test at their primary visit annually would include HBV. One participant stated, "*if the doctor tells me to get my blood tested, to get complete checkup, and the doctor says that everything okay, then I think nothing more of it, and I do not ask anything further. Due to the doctor saying everything is okay, there is really nothing to ask.*" Another participant noted similarly, "*when I go to the doctor, its usually the doctor draw the blood for testing. Then the doctor will let me know if my cholesterol is too high, high blood pressure, or diabetes, or other general things, that's all. I did not hear the doctor say anything about HBV*." Another example of this came from a participant stating, "*for high… high cholesterol and anything, the blood test will reveal everything*."

**Training**

A few participants had not received formal training and learned the trade on the job within a nail salon, while the majority had licenses and formal nail training. Individuals reported receiving training in Pennsylvania, New Jersey and Delaware. Almost all individuals explained that HBV was not specifically discussed within their formal training. One participant mentioned, "*I recently went through training, there is no talk of it (hepatitis B).*" Another participant mentioned, "*there were brief mentioning of things like HIV that are transmittable, but nothing else*." Others noted that there is only a general health overview mentioned rather than disease specific details of nail training, "*they did not about hepatitis B. They only talk about health in general."* Another participant mentioned that they were told that HBV transmission is prevented by wearing a mask, "*yes, I have heard about it. They told us that when we are working, we need to have face mask to separate… to prevent and things like that. They only briefly mentioned it*." While another mentioned, "*hepatitis B is talked about only in passing. They would talk around, like, don't cut the customer, because they have blood, bleeding, they get scared, stuff like that.*" Another participant shared, "*to be honest, they did not talk about this subject. They only talk about subjects such as fungus infections, bacteria, and the various viruses. They would teach you how to be careful cutting the skin. Not the hepatitis B to be honest, I have had the license for a long time now, so at times, I don't remember if there is such a portion or not*." Generally, most participants did not recall any information specific to HBV, including prevention, within their nail technician training and licensing process.

**Recommendations**

In an effort to better understand outreach within the Vietnamese nail salon community, we asked participants to provide recommendations for ideal public health campaigns to raise awareness for HBV. Many participants suggested postings in common areas like Vietnamese supermarkets, Vietnamese nail salons, or Vietnamese newspapers. Others suggested churches and temples, "*I think for the Vietnamese community; you can go to churches or temple. It is because the majority of people in our community visits the temples or churches more often. I think that if you go in there to outreach, like, let's say you want to open a day for free checkups for the Vietnamese community in the church, you want to talk to the priest*." Others suggested making the discussion around HBV "commonplace" and that sharing information from person to person by word of mouth could also be impactful. Some suggested social media, specifically Facebook was a positive venue for sharing information and that community members could "*like and share posts*" to reach a larger audience. Many individuals suggested leaflets or brochures were also helpful tools to distribute information to the public. One individual suggested, "*I think the schools can do outreach as well. The students can bring it home for their parents to see."* This same person noted, "*I think Americans would be very concerned with this*," referring to hepatitis B. There was a disconnect and lack of awareness on where to go for HBV information and what resources were available to them that could screen or provide vaccination for HBV. It was noted that more information is needed to address this gap and link people to existing resources.

**Discussion**

Our study identified several barriers to HBV-related education, screening, and vaccination among Vietnamese nail salon workers that were generally consistent with the literature [26]. Among these

were the lack of knowledge related to hepatitis B, including significant misconceptions related to symptoms, how hepatitis B is transmitted and prevented, cost of health care, lack of insurance, perceived inconvenience, and lack of knowledge of community resources. This lack of knowledge identifies where many people fall within the HBM related to HBV in terms of perceived threat (e.g., perceived susceptibility + perceived severity) and can serve as a significant challenge for moving people towards HBV testing and prevention through vaccination. Previous research has shown similarly low HBV knowledge in the Vietnamese community, including low awareness of the modes of HBV transmission and prevention of HBV through vaccination and low knowledge and transmission-related misconceptions [12,13,26].

A unique finding of this study among the nail salon worker population was that few participants recalled HBV training during their nail licensing curriculum. Currently, most nail technician licensing programs do not emphasize the importance of HBV education or other specific infectious diseases[17]. All states that require licensing have requirements to teach sanitation and disinfection; however, there is often no specific requirement to include HBV education. Pennsylvania and New Jersey are two states with no blood spill protocol requirements (do not have specified language describing how to handle contaminated materials) [17].

Based on our findings, we would like to suggest the following strategies for disseminating hepatitis B-related information and screening resources using the HBM as a guide to understand decision making. The suggestion first is to inform cosmetology and nail training schools of the benefits of HBV education to prevent transmission in the workplace, and encourage them to share information, screening and vaccination resources with students. By impacting nail training, itself, we believe that individuals will have an improved understanding of perceived susceptibility, severity and benefits of action related to HBV. Current curricula should include infectious disease training highlighting HBV prevention and transmission specifically within nail salons. Close collaboration between cosmetology and nail training schools and HBV outreach organizations/local health departments may improve overall education, screening and prevent transmission of HBV in nail salons.

In order to impact the larger Vietnamese community, the second strategy we suggest from study findings note the value of social media within the Vietnamese nail salon community. Nail technicians seek online channels to learn about new products, skills, and creative designs. Previous research in Vietnam found that of a sample of 1,080 individuals 66.02% used Facebook primarily to keep themselves updated with the latest news and 72.9% of those participants reported they were interested in the health information shared on Facebook [27].

The third strategy found from interviews suggests using the personal network of nail salon workers to expand HBV awareness, improve knowledge and dispel misconceptions. Our participants indicated their openness to sharing HBV information within their family and friend networks. Tailoring education messages to ensure that nail salon workers share the information with their family and friends' may further increase a program's impact. Past research within the Vietnamese community demonstrates the importance of family and friend's health recommendations and can be leveraged to reach the community at the individual level [28].

The final recommendation is to develop culturally competent materials and interventions to move people to understand their susceptibility to HBV, the severity of HBV and the benefits of HBV screening and vaccination. Previous research has applied health behavior theory to improve hepatitis B screenings among AAPI through lay health workers and is an opportunity within this population[29]. In addition to providing general information about HBV infection, tailored messages relevant to HBV prevention and individualized patient empowerment can work towards improving testing and vaccination for this high-risk community.

**Limitations:**

There are possible limitations within this study including recall bias, interviewer bias, social desirability bias and respondent bias. Snowball sampling was also used within this study and the results cannot be generalized to the Vietnamese nail salon community as a whole within the U.S. These data provide a snapshot of some of the HBV-related barriers faced within the Vietnamese community and provide areas for future research and study.

**Conclusion:**

This qualitative study found that overall, there is a low knowledge level associated with HBV within the Vietnamese nail salon community in the greater Philadelphia region. There are also significant misconceptions associated with transmission and prevention of HBV, which foster stigma and can lead to low vaccination and screening rates. In order to address these findings, culturally appropriate interventions should be used to increase awareness and knowledge and dispel misconceptions related to HBV in order to improve screening and vaccination rates within the Vietnamese community. Using the HBM as a guide to create future interventions in this community can work to address many of the knowledge gaps found within this research. Reaching community members is essential for effectively disseminating correct HBV-related information and increasing discussion around HBV to ultimately decrease HBV-related stigma. Future intervention should also focus on curricula for nail licensing to incorporate HBV and other infectious diseases in order to reduce risk of transmission within the workplace. Utilizing social media like Facebook and social networks within this tight-knit community has the potential to have a significant impact to promote health messaging. To our knowledge, no HBV specific information has been provided to Vietnamese nail salon workers in Philadelphia and this research sheds light on knowledge related to HBV, barriers to health care access within this population and provides direction for future public health interventions within this high-risk population.

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**Contributors:** CF, TH, and CC conceptualized the project. CF, TH, NG, TN participated in the data collection and data analysis. All authors contributed to the interpretation of the results and approved the manuscript.

**References:**


1. Ryerson AB, Eheman CR, Altekruse SF, et al. Annual Report to the Nation on the Status of Cancer, 1975-2012, featuring the increasing incidence of liver cancer. *Cancer*. 2016;122(9):1312-1337. doi:10.1002/cncr.29936
2. El-Serag HB. Epidemiology of viral hepatitis and hepatocellular carcinoma. *Gastroenterology*. 2012;142(6):1264-1273.e1. doi:10.1053/j.gastro.2011.12.061
3. Cohen C, Evans AA, London WT, et. al. Underestimation of chronic hepatitis B virus infection in the United States of America. *J Viral Hepat*. 2008;15(1):12- 13. doi:10.1111/j.1365-2893.2007.00888.x
4. Kowdley K V, Wang CC, Welch S, et. al. Prevalence of Chronic Hepatitis B Among Foreign-Born Persons Living in the United States by Country of Origin. doi:10.1002/hep.24804
5. US Preventative Services Task Force, Hepatitis B Virus Infection and Screening Summary. https://www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/hepatitis-b-virus-infection-screening-2014, May 2014.
6. Asian Americans and Pacific Islanders and Chronic Hepatitis B | Populations and Settings | Division of Viral Hepatitis | CDC. https://www.cdc.gov/hepatitis/populations/api.htm. Accessed April 17, 2018.
7. McPhee SJ, Nguyen TT. Cancer, cancer risk factors, and community-based cancer control trials in Vietnamese Americans. Asian Am Pac Isl J Health. 2000;8(1):18–31.
8. Jenkins CN, McPhee SJ, Nguyen T, Wong C. Promoting hepatitis B catch-up immunizations among Vietnamese-American children: a controlled trial of two strategies. Asian Am Pac Isl J Health. 1998;6(2):216–8.
9. McPhee SJ, Nguyen T, Euler GL, et. al. Successful promotion of hepatitis B vaccinations among Vietnamese-American children ages 3 to 18: results of a controlled trial. Pediatrics. 2003;111(6 Pt 1):1278–88.
10. Jenkins CN, McPhee SJ, Wong C, et. al. Hepatitis B immunization coverage among Vietnamese-American children 3 to 18 years old. Pediatrics. 2000;106(6):e78.
11. Zhou F, Euler GL, McPhee SJ, et. al. Economic analysis of promotion of hepatitis B vaccinations among Vietnamese-American children and adolescents in Houston and Dallas. Pediatrics. 2003;111(6 Pt 1):1289–96.
12. Nguyen TT, Taylor V, Chen MS Jr, et. al. Hepatitis B awareness, knowledge, and screening among Asian Americans. J Cancer Educ. 2007;22(4):266–72.

13. Vaccination coverage among adults, excluding influenza vaccination—United States, 2013. *Morbidity and Mortality Weekly Report CDC Surveillance Summaries* 64(04):95-102.

14. Chen, D. S. 2010. Toward elimination and eradication of hepatitis B. *Journal of Gastroenterology and Hepatology* 25(1):19-25.

15. PhillyHepatitis - Hepatitis B. http://phillyhepatitis.org/hepatitis-b. Accessed April 18, 2018.

16. Hep B United Philadelphia – Improve awareness, vaccination, and treatment for hep B! http://hepbunitedphiladelphia.org/. Accessed April 17, 2018.

17. Ng E. The imapct of Nail Salon Industry Policies and Regulations on Hepatitis B Awareness and Prevention. Hepatitis B Foundation, 2018.

18. Yang, J., Hall, K., Nuriddin, A., & Woolard, D. (2014). Risk for hepatitis B and C virus transmission in nail salons and barbershops and state regulatory requirements to prevent such transmission in the United States. Journal of Public Health Management and Practice: JPHMP, 20(6), E20-30. https://doi.org/10.1097/PHH.0000000000000042

19. Quach, T., Gunier, R., Tran, A., et. al. Reynolds, P. (2011). Characterizing workplace exposures in Vietnamese women working in California nail salons. *American journal of public health*, *101 Suppl 1*(Suppl 1), S271–S276. doi:10.2105/AJPH.2010.300099

20. NAILS Magazine. (n.d.). NAILS Magazine 2017-2018 The Big Book. Industry Statistics 2017. Retrieved from http://files.nailsmag.com/Handouts/NABB2017-18stats-LR.pdf

21. UCLA Labor Center. (n.d.). NAIL FILES: A study of nail salon workers and industry in the United States. Retrieved October 30, 2019, from https://www.labor.ucla.edu/wp-content/uploads/2018/11/NAILFILES_FINAL.pdf

22. Huynh, T. B., Doan, N., Trinh, N., et. al. (2019). Factors influencing health and safety practices among Vietnamese nail salon technicians and owners: A qualitative study. American Journal of Industrial Medicine, 62(3), 244–252. https://doi.org/10.1002/ajim.22947

23. Becker MH. The Health Belief Model and personal health behavior. Health Education Monographs. 1974; 2:324–508.

24. Rosenstock IM. Historical origins of the health belief model. Health Education Monographs. 1974;2:328–335.10.1177/109019817400200403

25. Edberg, M. (2007). Essentials of health behavior: Social and behavioral theory in public health. Jones and Bartlett Publishers.

26. Taylor VM, Choe JH, Yasui Y, et. al. Hepatitis B awareness, testing, and knowledge among Vietnamese American men and women. J Community Health. 2005;30(6):477–90.

27. Zhang MW, Tran BX, Le HT, et al. Perceptions of Health-Related Information on Facebook: Cross-Sectional Study Among Vietnamese Youths. *Interact J Med Res*. 2017;6(2):e16. Published 2017 Sep 7. doi:10.2196/ijmr.8072

28. Dam, L., Cheng, A., Tran, P., et. al. (2016). Hepatitis B Stigma and Knowledge among Vietnamese in Ho Chi Minh City and Chicago [Research article]. https://doi.org/10.1155/2016/1910292

29. Juon H-S, Strong C, Kim F, et. al. Lay Health Worker Intervention Improved Compliance with Hepatitis B Vaccination in Asian Americans: Randomized Controlled Trial. *PLoS One*. 2016;11(9):e0162683. doi:10.1371/journal.pone.0162683

## Aim 2: Develop the training videos using theory-based intervention-development framework.

I initially encountered some challenges finding the right video production company to produce the training videos. In the summer of 2018, I reached out the Drexel's video production team but quickly learned that the use of all-American video production team to make all Vietnamese language videos was very time-consuming and inefficient. A lot of time was spent translating back and forth, explaining cultural nuances, and the company did not already have connection with trained talents who speak Vietnamese. I researched and ended up working with an all-Vietnamese film production company and distributor, called 3388 FILMS, in California to produce the training videos. The experience was much better. I provided the company with the drafts of the Vietnamese scripts and they took care of talents recruitment, location rental and all the production editing. I flew out to California for a couple days to prepare for the shooting. On the day of the shooting, I observed and provided feedback on the training actions and scenes. The shooting took place in the summer of 2019 and final edited videos were completed a few months later. My main takeaway from this whole experience is if I ever need to produce more Vietnamese training videos, I would work with a professional Vietnamese production company with bilingual staff.

I was on maternity leave the entire fall of 2019 and was still slowly recovering from the surgery much of the winter 2019. In the spring of 2020, my community partner, Vietlead, and I started to co-create the training materials modules that incorporated the videos. Then, COVID-19 pandemic hit March 2019. The shutdown and lack of daycare lasted for at least 3 months. The team managed to slowly work on the training modules during the summer, and were able to recruit seven Vietnamese nail salon owners and employees from various salons to participate in the pre-test phase which I will discuss in aim 3.

## Aim 3: Determine the feasibility of conducting a larger randomized intervention study to assess the efficacy of the training module.

### Background

In the original proposal, I proposed to conduct a pilot study to assess feasibility for a larger randomized intervention study using the online video training format. The original plan also called for recruiting about 100 participants (approximately 10 salons per treatment arm). After two years working on this project, I learned that it would not be financially feasible to implement this aim without paying our community partner's staff time and collaboration with fellow colleagues such as a statistician and a program evaluator.

I submitted my first R21 application to NIH/NIEHS on February 2018, proposing to implement the feasibility study in collaboration with Vietlead, the Hepatitis B Foundation, and other colleagues with expertise in statistics, program evaluation and occupational epidemiology. The proposal was not discussed. I resubmitted revised R21 application to CDC/NISOH in July 2018. The proposal earned a score of 20 at 4 percentile but was not funded. I resubmitted the revised application again November 2019 and was notified that the R21 proposal will be funded at the last minute near the end of August, 2019. This was a desperately needed good news because even though our research team could not do a larger feasibility study as originally proposed, we were able to at least pre-test the online training format with a small group of participants to obtain the initial feedback on the content and the online format. I believe we are even more equipped to proceed with the R21 implementation of the feasibility study. It should be noted that our new statistician redid the sample size calculation that took in consideration of recruitment feasibility informed our team that we only need to recruit 12 salons for our updated feasibility study.

### Method

*Implementation of the training*

We conducted a three-part training series to a small group of Vietnamese nail salon owners (N=3) and workers (N=4) to obtain initial feedback on the training between October and November of 2020. We had two main objectives for this pre-test phase. One was to solicit feedback from the participants on the training content, and the other was to conduct a dry run of the online training format. We learned many challenges conducting online training with this population as well as opportunities to explore in the future.

Recruitment: We collaborated with Vietlead, our community partner, to help us recruit participants from their existing network. Vietlead staff knew most of the participants from previous health projects that they did for the community. The participants were from New Jersey, Delaware, and Philadelphia. The original plan was to recruit two salons, the owners and technicians within those salons for the training. However, we quickly learned that when the owners agreed to participate, there was no guarantee that all of their employees would happily participate in the training. Conversely, we also had a nail technician from a different salon enrolled in our study but her owner did not want to participate. There were other workers interested in being in our study but we

decided to wait-list them for the next training. This recruiting experience completely changed our expectation for how we would recruit participants in the actual pilot study.

During the recruiting, Vietlead staff also asked them about their technology needs and level of comfort with using Zoom. All participants had either a laptop, an iPad or a tablet and access to the internet at home. Most young participants know how to use Zoom but five out of seven participants needed in-person assistance to set up Zoom and a 10 minute pre-test Zoom session with a research team member to practice using the Zoom platform. We had originally scheduled for a Zoom testing session with all participants at once, but this plan did not work because we needed to show participants how to download the software and log on Zoom first. Our Vietlead staff also had to schedule individual appointments with those participants at a time most convenient for them. During that time, our community partner also assisted them filling out the online registration form.

Training: The first training on infection control, hepatitis B, and MSD prevention was offered on Oct 7th, 2020 from 7:30 – 9pm to both owners and workers. We received positive feedback on the first training but also had some technical issues. During the training, we experienced, on several occasions, internet connectivity issue with one of the team members who happened to be the presenter for that training. The pace of the training was also rushed as a result. Because we had planned to cover two topics in one session and leave about 15 minutes for breakout sessions for feedback, our presenter had to rush through some of the contents near the end. After the first training, we decided to do a three-part series as opposed to a two-part series originally planned.

The second training on chemical safety was offered on Oct 21st, 2020 from 7:30 pm to 9 pm to both workers and owners. The last topic on nail salon regulations and workers' rights was offered to the owners only on Oct 27th from 7:30- 9:00 and the workers only on Nov 4th from 7:30 – 9pm.

At the end of each training, participants were invited to join small breakout rooms with the research team members for 15 minutes to provide feedback on the training content. Each participant was also asked to complete a guided semi-qualitative questionnaire about some of the implementation challenges and level of organizational readiness for the program.

Each owner participant was gifted with $150 and each worker participant gifted $100 gift card for their time. All were presented with a certificate of completion at the end of the training

## Results

*Training time*: All workers participated in all three training sessions. Two owners missed one of the sessions and had requested to attend them later. Most participants were able to log on on-time, but a few were late due to having to rush home from work. The time was chosen based our understanding that most nail technicians/owners would want to save the weekend for family time and grocery shopping after work. Tuesday and Wednesday nights are typically slowest days. Training time after work were preferred among young participants who do not have children yet or older participants who have independent adult children. The chosen training time was more problematic to participants with young children. Because most salons open late (until 8pm during

the work week), the timing interfered with family dinner for some. Young owners were still at the salon while attending the training

*Online training format*: On-line training format was preferred among young owners because of the time flexibility but older worker participants preferred in-person training,

*Training content*:

Infection control and musculoskeletal prevention module: Participants felt that the training was helpful, and they learned new things from the webinars. Participants mentioned that the training content covered safety details that they have overlooked in their work. One worker participant said, "I am shocked that I have been doing these things without getting the infection thus far. I will be more mindful at work".

Most participants liked the videos more than the lecture format. The pace in the video narrative was just about right, not too slow and not too fast. The videos were also professional.

The scenarios to show how to respond to a customer if you accidently bleed a customer's nails were good but need more clarifications on how to help clients clean up the blood. Otherwise, asking clients to clean the blood themselves seems unpractical.

One participant noted that the training was too rushed. Too much time was spent on the hepatitis B module but not other infectious diseases such HIV, fungal infections that we mentioned.

The worker participants would recommend the training to other people in their network, but they are unsure if their co-workers would make the time to attend the training. The workers said that the state board should require all the workers and owners attend this training because without requirement from a government entity, nail salon workers and owners would not prioritize attending these sessions.

Perceived barriers to implementing the change: The worker participants mentioned that the owners should be responsible for 90% of the changes. As a worker, they cannot do anything to change the work environment. For instance, the cleaning instructions mentioned soaking spas for at least 10 minutes but during busy hours, the owners do not give enough time to clean. One owner participant mentioned that the owners need help with how to convince and show workers how to clean correctly.

Most participants mentioned that the ergonomics suggestions were simple and easiest to implement.

Chemical safety

The participants indicated that the content was very helpful. However, the availability of these products at Vietnamese nail suppliers may be limited because Vietnamese nail suppliers might not carry safer products and we might need to buy them from neighboring states.

One participant commented that the content of this training was a bit long. More pictures and interaction would make the training less boring.

Nail salon regulations and worker rights

Owners group:

The perceived difficulty of implementation of the recommendations on overtime pay, paid sick leave, W-2 vs 1099 varied by participants. One owner mentioned that most owners would not like to hear about this and probably think they do not need to do this immediately. The owners will need to talk to a tax/payroll expert on this issue. All owners participants mentioned that they already have all of their employees on W-2.

After this training, most owners said that they would do more research on nail regulations

With regards to the practice of hiring unlicensed employees, this is also a sensitive topic because this is a mutually beneficial partnership. Some new nail technicians are desperate for a job and want to work right away. Other reasons mentioned include the difficulty of the test and preference to learn by working in the salon.

All participants supported the idea of creating a group so they can learn from other owners. It would be helpful to discuss topics appliable to their state.

Most worker participants appreciated learning about the regulations but felt most of the implementation should fall on the owners. As workers, they would love to have overtime pay, paid sick leave, health insurance but those things are difficult to implement in the nail salons. They would love Vietlead or Drexel to intervene by using scare tactic to encourage salon owners to implement those things. A couple of worker participants liked the idea of having a support group, while the other thought it was unnecessary since they can not do anything about it.

**Discussion**

The COVID-19 pandemic has made the decision to provide the online training a necessity during the pandemic. Our research team conducted a pre-test of the on-line training with a small group of Vietnamese nail salon owners and workers in the Greater Philadelphia area, and gathered valuable insights from the process for improvement.

Vietnamese nail salon workers and owners often work long hours so finding a time that works for everyone was difficult. It is typically not ideal to offer training during the work hours that could potentially cause missed appointments with clients. Evening time on a slow workday like Wednesday was chosen to avoid people losing too much work hours but that time appeared to only work well for young and older participants who do not have children yet or have grown children. In the future, we might consider offering multiple training sessions at different times, mornings (before the salon opens), or early evenings on the weekend, and no more than 1 hour.

The Vietnamese nail community is a diverse group of people of different ages, English language capability, technology accessibility, and educational attainment. Programs that cater to this diverse audience need to consider their current needs so that we do not exclude certain group of workers. For instance, extra effort will be needed to ensure that workers with no or limited access to technology get the needed assistance. Some younger workers might prefer online training because of the flexibility but older workers might absorb the information better through in-person teaching.

Consideration of hybrid approaches to meet people where they are at will be critical to the success of the program.

Vietnamese owners tend to rely on Vietnamese suppliers and service providers for their business needs. If the products that the research team recommended are not available at the local nail suppliers, it would create a barrier fir them to take the next step. Future outreach will need collaborations with local nail suppliers and service providers in order to reduce barriers to implementing the recommended changes in the salons.

**Conclusions**

The COVID-19 pandemic has made the need for online training greater than ever before. We experimented with the online training format with a small group of Vietnamese nail salon workers and owners and gained many valuable insights from this experience. The online training format offers many advantages that include the ability to reach a larger audience in wider geographic areas, potential savings on staff time and effort, and being flexible with the training schedules. However, we also encountered several challenges including not being able reach those with no/limited access to technology, demand on staff time to assist with technology prior to the training, limited opportunity to model safety procedures to enhance effectiveness of the training. Technical assistance to follow the training will be critical to the success of the program. Lessons learned from this pre-test study will be used to improve the quality of the training for the next cohort.

## Publications

**Journal Article**

Two peer-reviewed articles relating to the nail salon projects were published during the duration of the grant:

1. **Huynh TB**, Doan N^, Ngan T^, Verdecias, N.*, Stalford, S*., Carroll-Scott, A. Factors influencing health and safety practices among Vietnamese nail technicians: a qualitative study. *Am J Ind Med.* *2019;1–9.* Link
2. Freeland, C.*, **Huynh, T**., Vu, N., Nguyen, T., & Cohen, C. (2020). Understanding Knowledge and Barriers Related to Hepatitis B for Vietnamese Nail Salon Workers in the City of Philadelphia and Some of Its Environs. Journal of Community Health. https://doi.org/10.1007/s10900-020-00878-w

In addition, the protected time under the career development award agreement has enabled the PI to continue to work on the GuLF STUDY project which resulted in several publications during the duration of this grant

3. **Huynh TB,** Ramachandran, G., Stenzel, M., Stewart P.A.,Groth, C., Banerjee, S., Sandler, D., Kwok R., Engel, L., Blair A., Estimates of workers' exposures on the supporting during the Deepwater Horizon oil spill cleanup." [In press at the *Annals of Work Exposures and Health* and will appear in the Journal Special Edition on the GuLF STUDY].

4. **Huynh TB,** Ramachandran, G., Stenzel, M., Stewart P.A., Groth, C., Banerjee, S., Sandler, D., Kwok R., Engel, L., Blair A., Estimates of occupational inhalation exposures on the four rig vessels during the Deepwater Horizon oil spill and clean-up." (In press at the Annals of Work Exposures and Health's Special Edition on the GuLF STUDY)

5. Stewart PA, Stenzel MR, Ramachandran G, Banerjee S, **Huynh TB**, Groth C, Kwok R, Blair A, Engel L, and Sandler D. Development of a total hydrocarbon ordinal job-exposure matrix for workers responding to the Deepwater Horizon disaster: The GuLF STUDY. *Journal of Exposure Science and Environmental Epidemiology* (2017) 00, 1-8. Link

6. Kwok RK, Engel LS, Miller AK, et al. **The GuLF STUDY**: A Prospective Study of Persons Involved in the Deepwater Horizon Oil Spill Response and Clean-Up. *Environmental Health Perspectives*. 2017;125(4):570-578. doi:10.1289/EHP715, Link

**Op-Ed**

Pennsylvania's nail salon laws need an update. Philadelphia Inquirer. June 5 2019. https://www.inquirer.com/opinion/commentary/nail-salon-laws-regulations-pennsylvania-new-york-20190605.html

**Presentations**

Presentation for scientific audience

1. Development of an evidence-based an intervention program for Vietnamese nail salon workers. *American Industrial Hygiene Conference and Exposition*, Philadelphia, PA, May 2018.
2. **Huynh TB**, Ramachandran G, Raynor P, et al. Real-time fine aerosol exposures in taconite mining operations. *International Epidemiology in Occupational Health (EPICOH) Conference*, Edinburgh, UK, Aug 2017.
3. Freeland C., Nguyen N, Vu N, Nguyen T, Cohen C., **Huynh T.** Qualitative assessment to understand knowledge associated with hepatitis B among Vietnamese nail salon workers in southern New Jersey and Philadelphia, PA. Urban Health Symposium, Sep 2019
4. Doan N^, Trinh N^**, Huynh T**† Factors associated with health and safety practices among Vietnamese nail technicians. . *Urban Health Collaborative Symposium,* Drexel University, Sept 2017
5. **Huynh, TB.** "Expanding knowledge related to Hepatitis B among nail salon workers in the United States" Webinar hosted by the Hepatitis B Foundation and Hep B United Coalition which is a national coalition of community organizations working on elimination of hepatitis B in the U.S. May 5, 2020.
6. "What implementation strategies can be used to accelerate outreach to improve the health of nail salon workers?" *Drexel Implementation Science Interest Group Meeting*, Drexel University, Philadelphia, PA April 8, 2019.

7. Development of an evidence-based an intervention program for Vietnamese nail salon workers – Progress Report. *Urban Health Collaborative Seminar*, Drexel University, Philadelphia, PA, April 2018
8. A framework for developing an intervention program for Vietnamese nail salon workers. *Departmental of Environmental an Occupational Health Research Seminar*, Drexel University, Philadelphia, PA, April 2017

**Presentations for the community**

1. Webinar on safe re-opening for businesses in Philadelphia & New Jersey (focus on restaurants and nail salon industry) – a collaboration of Vietlead, Drexel University, and the Philadelphia Chamber of Commerce. June 25, 2020
2. **"**A framework for developing a multilevel health and safety intervention program for Vietnamese nail salon workers." Presented to the *Air Pollution Control Board at the Philadelphia Department of Public Health*, Philadelphia, PA, May 17, 2017.
3. **"** Brief overview of nail salon policies in the U.S." Presented to the *Air Pollution Control Board at the Philadelphia Department of Public Health*, Philadelphia, PA, Oct 26, 2017.

## Other documents

**Cumulative Inclusion Enrollment Table (Please see attachment)**

**Inclusion of gender and minority study subjects**

Our research participants in this study were Vietnamese adults (N=43) who either currently or previously work in the nail industry. Most of our research participants were female (N=32, 74.4%), which closely reflect the gender composition of the Vietnamese nail salon workforce consisting of mostly women.

**Inclusion of Children (a child is defined as an individual under the age of 21 years)**

No children under the age of 18 were included in the study

**Materials available for other investigators**

Study IRB protocol and de-identified transcripts of the two qualitative needs assessment studies may be shared with other investigators upon request. Other investigators may need to enter a data user agreement to assure that the data will be used for research purposes only and certain data protection measures are in place to protect the data.