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## Strategic Partnerships for Change in an Environmental Justice Community: The ENRRICH Study

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### Abstract

**Background:** San Bernardino, California, is home to the San Bernardino Railyard (SBR), a major commerce hub with high associated air-pollution, identified as an environmental justice (EJ) issue by local community and air quality agencies. Alarming, one elementary school is located only a few hundred yards from SBR.

**Methods:** The school, university researchers, and a local community-based organization (CBO) established a partnership to assess potential adverse health impacts in the children and develop interventions and mitigation plans.

**Results:** Study results comparing target school with a demographically matched school verified community concerns finding significantly poorer respiratory health in children attending school near the railyard. Partners are working with local and state collaboratives, the school board, and funding

agencies to address the resulting needs of children through education, mitigation, and prevention in an environment where necessary systems changes involving the railyard are elusive.

**Conclusions:** This paper shares lessons learned in moving toward change when addressing an EJ community's health challenges.

### Keywords

Partnership, community based participatory research, air pollution, children, railyard, goods movement, community-based participatory research, community health partnerships, environmental health, health disparities, health promotion

The effects of international trade and the accompanying nationwide movement of goods are generally seen as positive, because they are believed to promote employment opportunities and cheaper goods. However, little attention has been given to potential health threats to the communities crisscrossed by the associated goods movement system, including railyards and rail lines. Residents living near major transportation corridors are likely exposed to high levels of airborne pollutants, potentially even greater than exposures for persons living in close proximity to major freeways or roads. In California, many minority and/or low-income children live near these major transportation corridors, making

it critical to assess the potential adverse health effects among this vulnerable population and develop strategic interventions addressing air pollution exposures.<sup>1</sup>

Children from low-income families face tremendous health challenges, which are magnified when they live near a significant source of air pollution. Children are a sensitive subpopulation for risk of adverse air pollution-related health effects owing to their still developing lungs, increased breathing rates, smaller body size, and tendency to spend more time outdoors than adults. Already, scientific evidence has linked exposure to automobile-related air pollution to increased respiratory symptoms, increased asthma-related hospitalizations, and even

initial development of asthma in children.<sup>2-10</sup> Additionally, many children who live close to a major transportation corridor are from low-income, minority households and have limited access to preventive and other health care services. Compounding the situation is that these children often already live stressful lives and, according to emerging evidence, are at even greater risk of adverse respiratory health effects associated with traffic-related air pollution.<sup>11,12</sup> Chen et al.<sup>3</sup> have reported that chronic traffic-related air pollution and stressors interact to predict biologic and clinical outcomes in asthma that are stronger than either factor alone.

With operations running 24/7, the SBR is one of the major freight railyards in California and a crucial shipping hub for the nation.<sup>13</sup> Air pollution emission sources at the SBR facility include diesel locomotives, on-road and off-road loading equipment, and associated machinery and typical roadway vehicles. Diesel particulate matter is the dominant air pollutant, although air toxics (e.g., benzene and 1,3-butadiene) are also emitted in small amounts.<sup>14</sup> The California Air Resources Board has estimated the SBR's combined diesel particulate matter emissions and other significant non-railyard (mobile and stationary) sources within a 1-mile radius of the facility at 33 tons per year.<sup>14</sup> Indeed, based on a risk assessments conducted by the California Air Resources Board, the SBR ranks among the top five most polluting rail yards in California, and first in terms of community health risk owing to the large population living in the immediate vicinity.<sup>14</sup> Given the nature and intensity of the work performed as well as the type and amount of pollutants emitted from the SBR,

significant implications exist for nearby community members, especially vulnerable populations such as children. Placing children at even greater risk for adverse health outcomes is the fact that the railyard community members face a host of other socioeconomic challenges.<sup>11,12</sup> Table 1 summarizes the key sociodemographic indicators of the community members residing within one-half mile of the surrounding railyard, obtained through Census 2010 data and modeled with geographic information system software. The population immediately around the SBR is defined primarily by young (including a large proportion of children), low-income, and largely Latino members.

Fueled by this report, community members voiced an urgent call to action to the city's mayor, politicians, and local researchers to address these EJ issues. In response, Loma Linda University researchers, in collaboration with community residents and a local CBO, formed the Environmental Railyard Research Impacting Community Health (ENRRICH) Project. Using a community-based participatory research (CBPR) approach, ENRRICH aimed to explore the health risks of residents living in close proximity to the railyard and support the development of a community response plan. One of the major goals of ENRRICH was to assess the respiratory health status of children living and attending school in close proximity to the SBR. In addition to working with a CBO, ENRRICH team members partnered with the school district and a local elementary school located only a few hundred yards from the SBR. The purpose of this paper is to share the experiences and lessons learned from this partnership for assessing respiratory health of children living in and attending school near a major freight railyard, and to highlight the traction gained for promoting positive, sustainable change for this EJ community.

#### Local CBO Collaboration

One of the key partnerships was with a local CBO as the community partner (CP). Because many EJ communities are composed of disadvantaged and underserved populations, it was important to take a CBPR approach in assessing health impacts and promoting sustainable change. The ENRRICH study CP was with a 31-year old, community-based, nonprofit organization whose focus is to bring communities together to find opportunities for cooperation, agreement, and problem

**Table 1. Sociodemographic Characteristics of the Community Residing Within One-Half Mile Surrounding the San Bernardino Railyard**

Sociodemographic Variable	
Total population ( <i>n</i> )	7,172
Households ( <i>n</i> )	1,895
African Americans (%)	9.0
Hispanics (%)	82.3
Children < 5 years of age (%)	11.7
Children 5–17 years of age (%)	27.5
Median age (yrs)	25.2
Average household size (persons)	3.9
Median household income	\$28,214

solving in improving their social and natural environment. The organization has offices located within the community center adjacent to the SBR. To best represent the community's issues, the CP employs residents living near the SBR. The CP uses a strategy of developing community action teams that empower community members to address place-based factors that impact individual and community wellness. Additionally, the CP has a community empowerment program, which is a community-based grassroots leadership incubator whereby community residents are engaged in systematic skill building covering a variety of health and leadership topics (e.g., advocacy, community assessments, strategic communication, and health impact assessments) with the purpose of empower-

ing community members to address environmental factors to reduce health inequities. Together with our CP, we then planned the project, developed protocols and instruments, collected data, collaborated in data analysis and interpretation, and disseminated the results, including the mitigation response activities and plans. In particular, our CP worked closely with the university team members by assisting in the training of community members on principles CBPR approaches and training community members in data collection methodologies, assisting with community engagement activities, assisting with the data collection process, and actively disseminating project activities and findings through our network of members, regular meetings, and special events.<sup>15</sup>

**Table 2. Key Challenges and Solutions**

Challenge	Solution
Getting the elementary schools to participate in the respiratory screening project.	Encouraging the schools and the school districts to take part in the screening study took patience and persistence. It was important that the principals were a champion for the project because they set the foundation and paved the way for the school's participation. Incentives for the schools included funding for library along with computer and printer. A meeting with key district officials was helpful to alleviate concerns to move the study forward.
The screening project was initially funded for screening a sample of the children at each school. The principal near the SBR requested offering respiratory health screening to all school children with parental consent.	ENRRICH team members approached the Aerocrine Pharmaceutical Company that supplied the testing devices and the Company provided additional tests free of charge, enabling screening for all children with parental consent.
Engaging and encouraging the children to participate in the screening project.	The principal at the school near the SBR suggested using an assembly to introduce the idea and to send home parental consent forms following the assembly. ENRRICH team members decided to develop a script for a health educational theater play to be performed at the assembly. Additionally, pizza parties were offered as an incentive for the class with the highest participation rate, with characters from the theatrical play onsite during the party.
Designing an educational theatrical play to perform at a school assembly, especially given that none of the ENRRICH team members have a background in theater.	ENRRICH team members working together developed the monologue for the theatrical script as well as the songs for the performance. Relied heavily on experience of one team member, also a mom with two young children, guiding script development. ENRRICH team members, additional university faculty and students, and members from our community partner took part in the school performance with many rehearsals conducted before the actual performance. ENRRICH team members, additional university faculty, students, family and friends pitched in to develop props as well as design and build the entire set.
Designing a respiratory screening clinic to ensure flow of students and offer screening to all children with parental consent in a timely manner.	The principal at the school near the SBR suggested running the clinic as a physical education class or as a picture day, both are unique events in which all classes must attend. The Breath-mobile clinic staff provided insight into how to set up an efficient screening clinic and offered their services in support of the screening project.
Occupying children who are waiting to be seen by staff in the respiratory health screening clinic or lacking parental consent to participate.	To occupy and educate children waiting to be screened or without signed parental consent, ENRRICH team members provided age appropriate, educational coloring workbooks as well as crayons and pencils to the children seated at tables near the screening clinic. The books were kindly donated by the Environmental Protection Agency.

*Abbreviation:* ENRRICH, Environmental Railyard Research Impacting Community Health; SBR, San Bernardino BNSF Railyard.

Overall challenges were overcome through team work among researchers, community partners and the elementary schools. All worked closely together in planning and conducting a school-wide comprehensive respiratory screening project.

A second key partner critical to the success of our study was a local entity that worked closely with children; for us, this partner was the elementary school near the SBR. In the formative phase of the grant application, we contacted both the school district as well as the site principal who provided letters of support for the grant application. However, in the period between the grant submission and receiving the grant award, the school district had a change in leadership, making it necessary to approach the district again to see if it still supported the project. In fact, the new administration did express concern about participating in the project, and for a time it seemed the study would not come to fruition. Table 2 includes a description of our key study challenges and the strategies used to address them. Ultimately, through a process of regular and open communication between our team and the district's key administrators, we were able to alleviate their concerns. The majority of the concerns surrounded the specifics of conducting the research study (number of children to be screened, obtaining parental consent, conducting the screening, etc.) and other administrative matters, which were discussed and resolved during a meeting with key administrative personnel and ENRRICH team members. Once these were addressed, administrators reaffirmed their support of the project, informing the district school board, which voted unanimously to approve the school's participation in the study. This was a result of persistent and patient efforts by everyone involved.

During the initial phase of the research study, our ENRRICH team members met with the principal of the school near the SBR to discuss the general components of the research screening project. The general plans included providing respiratory screening for a small number of children at two elementary schools: one near the railyard and a sociodemographically matched comparison school 7 miles away. Health screenings would include noninvasive respiratory testing for airway inflammation with NIOX (Aerocrine, Morrisville, North Carolina) equipment, lung function with a peak expiratory flow meter, and collection of height and weight measurements. A survey and consent form would be sent home to parents giving permission for their child to be screened as well as providing their child's health history and additional household information. Our school partners pro-

vided invaluable insight for accomplishing this ambitious task. Although generally agreeing with the procedures, the principals of both schools became so concerned that they requested to offer screening to all the children, not just a subset. The principals also suggested that we offer the screening in a timely and efficient manner by running the clinic like a "picture day," with all classes rotating through the screening clinic within a few days. Moreover, one principal suggested developing an entertaining school assembly to introduce the project to the students before sending the parental consent forms home. The same screening protocol was followed at both participating schools. For their participation in the screening, the schools each received small incentives, including funding for their school library, a new computer, and a printer.

### University Researchers

The third key partner of the ENRRICH team was our group of Loma Linda University researchers. Committing to a collaborative process with all partners, we played the role of the "drivers" that put it all together. We designed the framework for the ENRRICH study based on published best practices, developed the grant proposal and obtained funding, designed the screening logistics while incorporating the principals' suggestions, and developed an engaging assembly to encourage study participation.

### Development of an Educational Theatrical Production

To deliver on the principal's challenge to produce a fun and engaging assembly to introduce the children to the project, our research team wrote and produced an educational theatrical play about air quality and promoting a healthy environment. The result was a play, "Captain Jack Snuffles and the Coughing Crew," about pirates with asthma (Figure 1). It included a wide variety of colorful props, characters, and songs to engage and entertain the students and teachers. The majority of the materials and props were generously donated by local churches and ENRRICH team members who also took part as performers in the production. The play was met with unanticipated excitement from the students, with numerous children lining up afterward with paper and pencil in hand, determined to get an autograph from the performing characters. The children's overwhelmingly positive response also had a wonderful impact on the team that took part in the theatrical



production. When we first started to develop the theatrical assembly, we did not fully realize what an important role it played in encouraging children to participate in the research study. Indeed, we strongly believe that we inadvertently tapped into new way to effectively reach a hard to engage audience using a multiple intelligence approach—providing a learning environment through many different mediums: visual, verbal, kinetic—that not only was fun, but also resulted in our unusually high participation rate.

### Respiratory Screening Clinic

The actual screening clinic took place a few weeks after the theatrical production. ENRRICH team members met with staff from the San Bernardino Arrowhead Regional Medical Center Breathmobile Clinic to gain insight about running a respiratory health screening campaign. The Breathmobile is a mobile clinic that provides respiratory services at K–12 schools throughout San Bernardino County. Not only did the Breathmobile staff help us to design the final screening protocol, they also supported us with on-site high-risk screening and referrals for follow-up care.

During the first day of screening, we experienced tremendous support from the principals, teachers, families, and community members. An unanticipated number of classrooms from both schools had 100% of their students participating in the screening project. Of 1,440 children attending the two participating schools, the parents or guardians of 1,066 (74% overall participation) provided consent, a very high rate for a minority, low-income community.<sup>16–18</sup> In addition to offering the asthma screening, we also offered environmental education to all children, regardless of their participation

in the study. Children who had not brought their parent's consent form, along with the children waiting to be screened, received free, age-appropriate educational booklets donated by the Environmental Protection Agency. The coloring books included information on air quality and health, with reading, coloring, or drawing activities for the children to work on while they waited.

### Health Campaign and Exposure Mitigation Strategies

Since completion of the screening, we have continued collaborating with both elementary schools in the identification and development of pollution mitigation strategies and health promotion interventions. We have made formal presentations of the study findings to the principals and their respective school boards. ENRRICH study results indicated that, compared with children attending the school 7 miles away, children attending school near the railyard exhibited greater airway obstruction measured by peak expiratory flow (PR = 1.59; 95% confidence interval, 1.19–2.12) and presented with more respiratory symptoms.<sup>19</sup> The principals and the school boards were very interested in the findings and supportive of learning new ways to promote health among their students as well as reduce air pollutants from around their campus and extending into their buildings. Offered to and accepted by the school near the railyard, the Breathmobile Program now provides free, regular health services and follow-up care during school hours for the children in need. With the positive experience and knowledge gained in the ENRRICH study, team members working with another local CBO applied and were awarded a 4-year contract with the First 5 Commission to provide asthma education and management



**Figure 1. Captain Jack Snuffles' Educational Play**

Performed by community, university and CBO personnel at an elementary school in San Bernardino, the play teaches children and adults the ABCs of asthma and air quality.

support services targeting children (< 5 years of age) and their families, as well as child care providers. This contract incorporated elements of the ENRRICH study, including the educational theater component; for this project, the medium was puppet shows. The health services and the educational theater component in particular, of the First 5 contract have been highly praised and well-received throughout many Southern California communities.

Work also continues on developing and implementing mitigation strategies to reduce pollutants emitted from the railyard in reaching the school grounds. Our CP wrote and received a grant to retrofit air filtration systems at several area schools, including our target school next to the railyard, with advanced filters to block pollutants. Another mitigation strategy identified through our community discussions was the development of a vegetation border to reduce air pollutants as well as noise pollution. ENRRICH team members presented this need to the local Kiwanis Club, local businesses, and the school board. The Department of Landscape Architecture at a nearby university offered expert advice on the aesthetics, types of plants, and a special step-graded way of planting to trap pollutants in the vegetation border. A second university department with a botanical garden emphasis provided recommendations for the most child-safe tree and plant species. These plans were shared with the school district and the city and some seed funding was raised to begin the project.

## LESSONS LEARNED

Throughout our work we have learned a number of important lessons which are described in detail in Table 3. One of the first lessons learned was the importance of being persistent and encouraging open communication. With the change in school administrators, the initial ENRRICH study support was lost and needed to be regained. The ENRRICH principal investigators continued to reach out to key district personnel and eventually a meeting was convened. The meeting provided an opportunity to discuss the project and alleviate potential concerns, a critical point in moving the project forward. In the end it took approximately two months to regain the school district's support, showing the importance of persistence and good communication.

The second important lesson learned was to be flexible and stay open to suggestions from school officials. It was important

to seek advice from the school principals on how best to engage and introduce their students to the screening project. Within our ENRRICH study, one of the principals provided great advice about using an assembly to engage and encourage the students to participate, and his suggestions were incorporated into our ENRRICH project.

The third lesson learned was to plan well in advance. Planning in advance was especially important in light of the fact that screening was offered schoolwide to all students with a parental consent, rather than a smaller sample of students. Their advice led to a smooth flowing screening that fit the school's busy schedules.

Our fourth lesson learned, one of our most important, was that theater is potentially a powerful tool, especially for encouraging study participation. Researchers working with minority populations have published on the difficulty of encouraging minority and disadvantaged populations to take part in scientific research.<sup>16,18</sup> Our 74% study participation rate across both schools is highly uncommon for research involving minority populations. Follow-up studies are warranted to confirm our findings in the use of theater for engaging specific populations.

Our fifth lesson learned was that a CP can provide key linkages. The trust extended to our ENRRICH team by the community and by the schools was in large part owing to our collaboration with our CP, which employed members that lived in the community surrounding the railyard and had friends and family members that attended the local elementary school. The CP staff knew the school principal and were able to help open doors for the ENRRICH study.

Our sixth lesson learned was to be open to other partnerships that may arise during the preparation phase or even while the study is ongoing. During the preparation phase of the ENRRICH study, we identified a potential partner that we had not yet thought of, a mobile respiratory care clinic, the Breathmobile. The director of the Breathmobile approached members of the ENRRICH team during a meeting (unrelated to ENRRICH) to offer their services in support of the study, which was quickly accepted. ENRRICH team members had a number of preliminary meetings with the Breathmobile director in determining best methods for conducting the schoolwide health screening. The Breathmobile clinic became an active member of the ENRRICH team and was present every day at each of the schools assisting with the screening project.

Our seventh lesson learned was to work to impart sustainable, positive change. In being a good partner, it was important to be aware of potentially unmet needs within each school and to promote positive, sustainable change. For example, schools may have many unmet needs and could use help meeting those needs or connecting them with resources that could. For the ENRRICH study, we found an exceedingly high percentage of

children living with poorly managed or undiagnosed asthma. We simply could not only “report” this finding without trying to address this need. We helped to connect the Breathmobile director with the school principal to see if the school was interested in ongoing support. The Breathmobile is now delivering regular services at the railyard school and doing so free of charge for children.

**Table 3. Lessons Learned**

Lesson	Comment
Persistence is important.	It may take significant amount of time to encourage school participation and gain their support. The initial support gained may be lost if there is a change in key administrative personnel. If difficulties or setbacks arise, meetings may be beneficial with key school personnel to discuss potential challenges and alleviate potential concerns. Persistence may be key in getting the study off the ground, especially during the early phases of a CBPR project.
Be flexible and open to suggestions.	Ask. Encourage suggestions from school administrators, especially principals in reaching and encouraging school participation. They may also offer critical advice on how to conduct the screening event to fit within their busy school day schedule, especially important if conducting a school wide screening event.
Plan well in advance.	With schools, timing is critically important and it is difficult, if not impossible for them to take part at various times throughout the year such as: during a major testing week, near major holiday, near end of the year, and so on. This is extremely important for good relationships and if significant time is needed for data collection activities.
Theater is potentially a powerful tool.	Theater may prove to be a powerful tool in engaging underserved populations and encouraging participation in health studies, more research is warranted in duplicating our findings. Additionally, theater has a positive impact on persons performing in the play as well. We found it helped with team building and encouraging enthusiasm.
The CP can provide key linkages.	CP members may know parents within local schools as well as members of Parent Teachers Associations and principles that are able to help open doors.
Be open to additional partnerships.	During the initial phases and ongoing aspect of the CBPR study, it is important to be aware that additional partners may arise. New partners may present themselves with ideas and support that can be an added benefit for the research study. It is good to be open, willing to share, engage, listen, and seek advice. For the ENRRICH study, the mobile respiratory clinic Breathmobile was an additional partner that joined the team and provided guidance and support.
Work to impart sustainable, positive change.	In conducting the research it is equally important to strive for needed changes in the community. Working toward the implementation of sustainable change will strengthen a lasting relationship between schools, CP and universities/researchers. When developing an initial budget, include funding for promotion of future needed community changes that may be identified through the research study. Through the ENRRICH study, the Breathmobile clinic now routinely services the railyard school, providing free respiratory care for children, several school district schools have pollution filtration systems, and an additional medical mobile clinic services the school's neighborhoods.
A CBPR approach may lead to unanticipated benefits.	There are so many positive benefits that can arise that are not even anticipated at the start of a CBPR collaboration (Table 4). Document and share with others both the expected and unexpected benefits.
Give more than required.	If possible, leave with the schools any additional resources, more than originally offered at the start of the study. Especially with tight school budgets teachers will be ever so appreciative (i.e., office or classroom supplies).
Thank everyone.	No matter how large or small their support, it is important to thank all (teachers, principals, administrators, volunteers, etc.) for supporting the project. Additionally, celebrate the success with the children as well as the research team.

*Abbreviations:* CBPR, community-based participatory research; CP, community partner; ENRRICH, Environmental Railyard Research Impacting Community Health.



Our eighth lesson learned was that a CBPR approach may lead to unanticipated benefits. In a community-based project like ours, we found many unanticipated benefits that can arise from the collaboration between all the different partners. Table 4 includes a description of the anticipated and the unanticipated positive study outcomes for the ENRRICH Project, and a few of the major unexpected benefits included: linking the Breathmobile to the railyard school to provide ongoing services, launching the Loma Linda University Educational Theatre Program, and expanding health services and screening. Sharing both the anticipated as well as the unanticipated

benefits may encourage other researchers to adopt a CBPR approach when working with community.

Our ninth lesson learned was to give more than required and support the schools as much as possible. When completing data collection activities, our ENRRICH team left with the schools extra resources (i.e., office or classroom supplies). Especially with the tight school budgets, teachers will be ever so appreciative.

Last, our tenth lesson learned was to thank everyone involved with the study, no matter how great or small their involvement. It was especially important to thank the princi-

**Table 4. Anticipated and Unanticipated Key Successful Outcomes**

Successful Achievements	Description	Identification of an Unexpected Benefit From the ENRRICH Project
San Bernardino County Arrowhead Regional Medical Center Breathmobile Clinic	Through the ENRRICH screening project, the Breathmobile clinic was linked to the schools, adding the school near the SBR as a routine site for their services.	×
High participation of children	Of the 1,440 children attending the two schools, a total of 1,066 (74%) children participated in the screening project.	×
Children receive health services	Children with poorly managed asthma were identified and offered free follow-up care with the Breathmobile clinic.	
Parents/guardians received training	Parents, grandparents and guardians received follow-up training provided at each of the schools to assist with asthma management.	
Principal received award	For his support and work with Project ENRRICH, the project team nominated the principal of the elementary school near the SBR for the 2012 Air Health Award of Achievement for his work in promoting an asthma friendly school. California Breathing, a California Department of Public Health asthma program, gives the Air Health Awards. He was 1 of 12 elementary school principals selected across the California to receive the award.	×
Positive study findings	The results obtained through the respiratory health screening project will be used to support positive community changes.	
School board supported	At a school board meeting, ENRRICH researchers presented results from the project and received a positive response from the board. Board members voiced their continued support in the research efforts to promote a healthy change in the community.	
LLU Health Theatre launched	Through the positive experience with this project, LLU faculty have developed theatrical vignettes on additional health topics.	×
Expansion of health services	Building on experience gained, members of the research team developed a comprehensive asthma screening and educational program, which was submitted for funding to First 5 Riverside County; the proposal received a 4-year contract (2012–2016) for \$1.6 million.	×
School near SBR “adopted”	LLUSPH “adopted” the elementary school near the SBR and conducted a silent auction to donate funds to support the principal and his school.	×
Increased awareness	As a result of the study, there is now an increase in awareness at local and national level for challenges facing this community.	

*Abbreviations:* ENRRICH, Environmental Railyard Research Impacting Community Health; LLU, Loma Linda University; SBR, San Bernardino BNSF Railyard.

pals for their support. In addition to the computer equipment and funds for the school library, we also gave each principal a small, personalized gift. Finally, we thought it was important to celebrate this tremendous accomplishment with the children as well as our ENRRICH team. At the end of data collection, we hosted a schoolwide party at each school, inviting classrooms that had 100% participation rates in the screening project. In addition to the snacks provided, the children received a surprise visit from “Sharkey” our theatrical play mascot and a big hit with the children. We also had a luncheon party for all the members of the ENRRICH team to celebrate.

## FUTURE WORK AND RESEARCH

With the results of the study in hand, there are many important and necessary next steps to be taken. Based on the significant findings from this study, there is a critical need for more in-depth research assessing the potential effect of close proximity to the railyard on the respiratory health and other health endpoints among the children attending schools nearby.<sup>19</sup> Future research studies should attempt to collect individual exposure measurements, such as equipping children with backpacks outfitted with instruments that measure air pollution, arguably a challenging but important next step.<sup>20,21</sup> In addition to studying the health effects of close proximity to the railyard, there is also a need to study the effectiveness of the resulting exposure mitigation activities. To date, limited research has been conducted on the use of vegetation borders in general to reduce air pollution, and to

our knowledge, no research has been conducted on the use of vegetation border to improve air quality at a school near a major source of pollution.<sup>22–25</sup> There is also a need for ongoing dialogue with the community and key stakeholders (locally and at the national level) regarding the results of the study, ways to promote health in an environmentally challenged community, and development of mitigation strategies.

## CONCLUSIONS

Working together through a collaborative team approach, university researchers, school administrators, and local CBOs can make significant impacts in promoting health for children living and growing in an EJ community. Furthermore, such collaborations can lead to innovation and strengthening of the community. The findings from the ENRRICH study as well as future studies can and will be used to help support positive changes supporting a community where children and adults can live and thrive.

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## REFERENCES

1. Hricko AM. Ships, trucks, and trains: effects of goods movement on environmental health. *Environ Health Perspect* 2006;114(4):A204–5.
2. Edwards J, Walters S, Griffiths RK. Hospital admissions for asthma in preschool children: relationship to major roads in Birmingham, United Kingdom. *Arch Environ Health* 1994; 49(4):223–7.
3. Chen E, Schreier HM, Strunk RC, et al. Chronic traffic-related air pollution and stress interact to predict biologic and clinical outcomes in asthma. *Environ Health Perspect* 2008;116(7):970–5.
4. Brauer M, Hoek G, Smit HA, et al. Air pollution and development of asthma, allergy and infections in a birth cohort. *Eur Respir J* 2007;29(5):879–88.
5. Ritz B, Yu F, Chapa G, Fruin S. Effect of air pollution on preterm birth among children born in Southern California between 1989 and 1993. *Epidemiology* 2000;11(5):502–11.
6. Ritz B, Yu F, Fruin S, et al. Ambient air pollution and risk of birth defects in Southern California. *Am J Epidemiol* 2002; 155(1):17–25.
7. McConnell R, Islam T, Shankardass K, et al. Childhood incident asthma and traffic-related air pollution at home and school. *Environ Health Perspect* 2010;118(7):1021–6.
8. Salam MT, Islam T, Gilliland FD. Recent evidence for adverse effects of residential proximity to traffic sources on asthma. *Curr Opin Pulm Med* 2008;14(1):3–8.
9. Bateson TF, Schwartz J. Children's response to air pollutants. *J Toxicol Environ Health A* 2008;71(3):238–43.
10. Gehring U, Wijga AH, Brauer M, et al. Traffic-related air pollution and the development of asthma and allergies during the first 8 years of life. *Am J Respir Crit Care Med* 2010; 181(6):596–603.
11. Shankardass K, McConnell R, Jerrett M, et al. Parental stress increases the effect of traffic-related air pollution on childhood asthma incidence. *Proc Natl Acad Sci U S A* 2009; 106(30):12406–11.
12. Islam T, Urman R, Gauderman WJ, et al. Parental stress increases the detrimental effect of traffic exposure on children's lung function. *Am J Respir Crit Care Med* 2011;184(7):822–7.
13. BNSF Railway [homepage on the Internet; cited 2013 Aug 25]. Available from: <http://www.bnsf.com>
14. Castaneda H, Yang E, Mahmood A, et al. Health risk assessment for the BNSF San Bernardino Railyard [cited 2013 Aug 25]. California Air Resources Board: Sacramento; 2008. Available from: [www.arb.ca.gov/railyard/hra/bnsf\\_sb\\_final.pdf](http://www.arb.ca.gov/railyard/hra/bnsf_sb_final.pdf)
15. Spencer-Hwang R, Soret S, Halstead L, et al. Making human subject protection training community responsive: experiences delivering on the community-based participatory research promise. *Prog Community Health Partnersh* 2014;8(2):215–24.
16. UyBico S, Pavel S, Gross C. Recruiting vulnerable populations into research: A systematic review of recruitment interventions. *J Gen Intern Med* 2007;22:852–63.
17. Loue S, Sajatovic M. Research with severely mentally ill Latinas: Successful recruitment and retention strategies. *J Immigr Minor Health* 2008;10(2):145–53.
18. George S, Duran N, Norris K. A systematic review of barriers and facilitators to minority research participation among African Americans, Latinos, Asian Americans, and Pacific Islanders. *Am J Public Health* 2014;104(2):e16–31.
19. Spencer-Hwang R, Soret S, Knutsen S, et al. Respiratory health risks for children living near a major rail yard. *J Community Health* 2015;40:1015–23.
20. Spira-Cohen A, Chen LC, Kendall M, et al. Personal exposures to traffic-related air pollution and acute respiratory health among Bronx schoolchildren with asthma. *Environ Health Perspect* 2011;119(4):559–65.
21. van Roosbroeck S, Wichmann J, Janssen NA, et al. Long-term personal exposure to traffic-related air pollution among school children, a validation study. *Sci Total Environ* 2006;368(2–3): 565–73.
22. Pugh TA, Mackenzie AR, Whyatt JD, et al. Effectiveness of green infrastructure for improvement of air quality in urban street canyons. *Environ Sci Technol* 2012;46(14):7692–9.
23. Tiwary A, Sinnett D, Peachey C, et al. An integrated tool to assess the role of new planting in PM10 capture and the human health benefits: a case study in London. *Environ Pollut* 2009; 157(10):2645–53.
24. Tong Z, Baldauf RW, Isakov V, et al. Roadside vegetation barrier designs to mitigate near-road air pollution impacts. *Sci Total Environ* 2016;541:920–7.
25. Wu J, Xie W, Li W, et al. Effects of Urban Landscape Pattern on PM2.5 Pollution-A Beijing Case Study. *PLoS One* 2015; 10(11):e0142449.