Spatial Analysis Of Housing Problems And Asthma Control Among Children With Asthma In An Urban Environment

Amari McDuffie, BS[1], Shilpa J. Patel, MD, MPH[1,2], Rachel Margolis, PhD, LICSW[1,3], Shayla Stringfield, BS, CHES[1], Anandapadmanaba Gourishankar, MD[5], Parisa Kaviany, MD[1,4]

[1]IMPACT DC Asthma Clinic; [2]Divison of Emergency Medicine; [3]Center for Translational Research, Children's Research Institute; [4]Division of Pulmonary & Sleep Medicine, [5]Division of Hospital Medicine Children's National Health System; Washington, DC

BACKGROUND

- Striking socioeconomic health disparities persist in pediatric asthma in urban settings.
- 16% of Black children have asthma compared to 3.3% of non-Hispanic, White children in D.C.
- The D.C. Pediatric Asthma Registry shows the highest pediatric asthma- related ED visits occurs in Southeast D.C., where poverty and unemployment rate are highest.
- IMPACT DC (IDC) is an asthma program in Washington, D.C. dedicated to evaluation and treatment of children with recent ER visits, hospitalizations and/or uncontrolled asthma.

OBJECTIVES

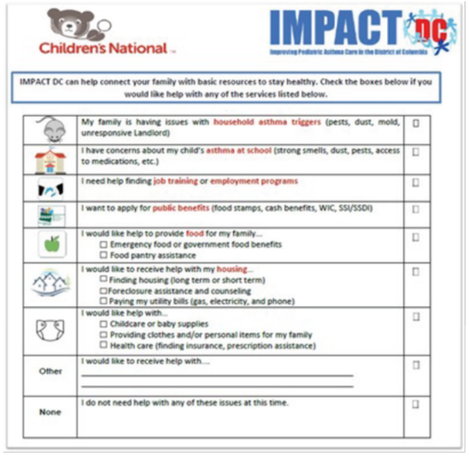
- To understand how deprivation of basic needs correlates asthma morbidity.
- To explore how deprivation of basic needs may contribute to health disparities in pediatric asthma.

METHODS

- A social needs questionnaire was developed and distributed in IMPACT DC clinic.
- 7 categories of social needs were assessed: household asthma triggers, asthma concerns at school, employment, public benefits, food insecurity, housing assistance and general assistance.
- Participants >4 years old completed the Asthma Control (ACT).
- Data was collected at initial in-person clinic visits at IMPACT DC February 2022 – June 2022.
- Analysis limited to participants living in Washington, DC.
- Participants addresses were geocoded onto a map of 46 Neighborhood Clusters defined by the D.C. Government Office of Planning.

RESULTS

- Of the 188 participants, average age was 7.6 years, 83% were Black, and 38% had moderate-severe persistent asthma.
- 54% reported >1 social need.
- Of those with at least 1 social need, 45% identified household triggers and 49% identified housing assistance.
- Housing assistance requests included finding housing (61%), paying utilities (51%), and foreclosure counseling (8%).
- Participants reporting household asthma triggers and/or housing assistance were concentrated within 5 neighborhood clusters in Washington, D.C., all located in Wards 7 and 8.
- ACT scores were on average 2.3 lower in participants who reported household asthma triggers compared to those who did not (p=0.02).


Children's National

IMPACT DC

IMPACT DC can help connect your family with basic resources to stay healthy. Check the boxes below if you would like help with any of the services listed below.

My family is having issues with household asthma triggers (pests, dust, mold, unresponsive Landlord)	☐
I have concerns about my child's asthma at school (strong smells, dust, pests, access to medications, etc.)	☐
I need help finding job training or employment programs	☐
I want to apply for public benefits (food stamps, cash benefits, WIC, SSI/SSDI)	☐
I would like help to provide food for my family… ☐ Emergency food or government food benefits ☐ Food pantry assistance	☐
I would like to receive help with my housing… ☐ Finding housing (long term or short term) ☐ Foreclosure assistance and counseling ☐ Paying my utility bills (gas, electricity, and phone)	☐
I would like help with… ☐ Childcare or baby supplies ☐ Providing clothes and/or personal items for my family ☐ Health care (finding insurance, prescription assistance)	☐
Other: I would like to receive help with….	☐
None: I do not need help with any of these issues at this time.	☐

Figure 1: Social needs survey.

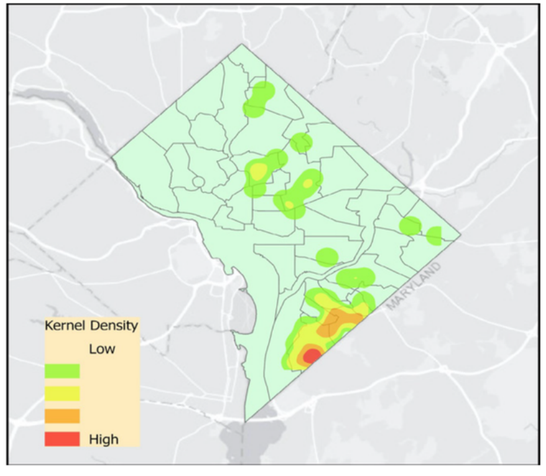


Figure 2: Kernel density map of participants who reported a need for assistance with household asthma triggers

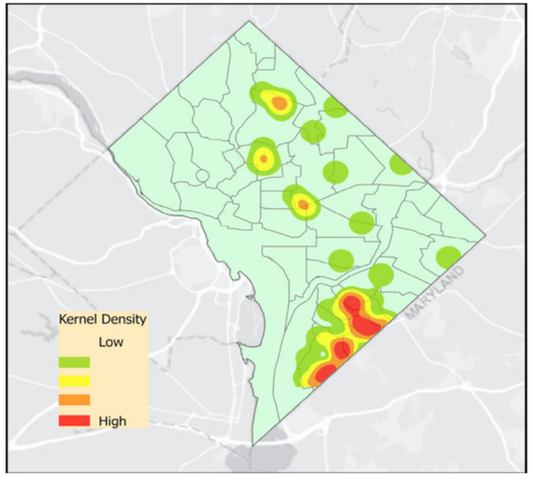


Figure 3: Kernel density map of participants who reported a need for assistance with housing issues.

CONCLUSION

- Identification of social needs associated with housing may provide additional insight when trying to identity children with poorly controlled asthma.
- These findings have the potential to impact policy change to elevate housing standards in Washington, D.C. and close the gap in health disparities of pediatric asthma.

Future Considerations

- Next steps involve exploring the distribution of each social need by ward and by neighborhood, in order to identify how to allocate resource centers .
- It will be important to characterize the neighborhoods with high needs, in order to better understand the drivers behind these social determinants of health.

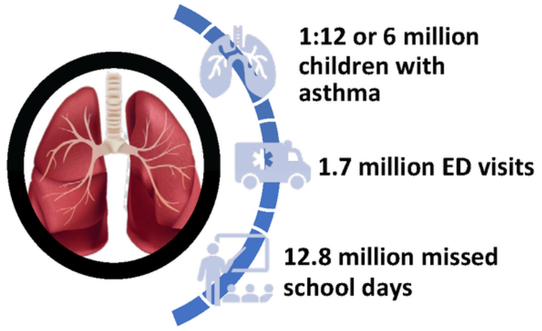
Acknowledgements

- Thank you to the IMPACT DC Clinic for administering the screeners during clinic.

Automated Wheeze Detection in Children Using Data-Efficient Deep Learning Models

[1]Shilpa J. Patel, [2]Youness Arjoune, Trong N. Nguyen, [3]Anha Telluri, [4]Jonathan J. Schroder, [4]Dinesh K. Pillai, [1,5]Stephen J. Teach, [2]Raj Shekhar
[1]Division of Emergency Medicine, [2]Sheikh Zayed Institute for Pediatric Surgical Innovation, [3]George Washington University School of Medicine and Health Sciences, [4]Division of Pulmonary and Sleep Medicine, [5]Center for Translational Research, Children's National Hospital, Washington, D.C.

BACKGROUND



- Initiation of "yellow zone" management on the asthma action plan (AAP) currently relies on subjective measures of acute asthma severity, often delaying initiation of rescue therapy
- Combining the current AAP with an objective mobile app that scores acute asthma severity (automated detection and assessment of wheeze severity + respiratory rate + pulse oximetry + measure of dyspnea) could provide parents with decision support and allow for more timely initiation of rescue therapy, ultimately decreasing ED utilization
- A key requirement for developing an objective mobile application for home management of acute asthma is automated wheeze detection

OBJECTIVE

To develop an automatic deep learning-based wheeze detection algorithm to assist parents/clinicians in assessing the severity of asthma in children

GREEN means Go Zone!
Use preventive medicine.

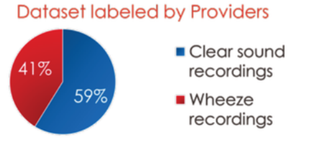
YELLOW means Caution Zone!
Add quick-relief medicine.

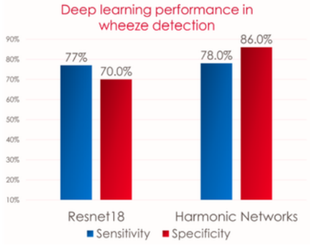
RED means Danger Zone!
Get help from a doctor.

RESULTS

Automatic wheeze detection with an accuracy of 84%

StethAid Lungs consists of a digital stethoscope, mobile app, website portals, and cloud storage. StethAid Lungs combined with oximeter was used to build asthma lung sound database.





Harmonic Networks data efficient models outperforms ReseNet18 model by about 10%

METHODS

Data Collection

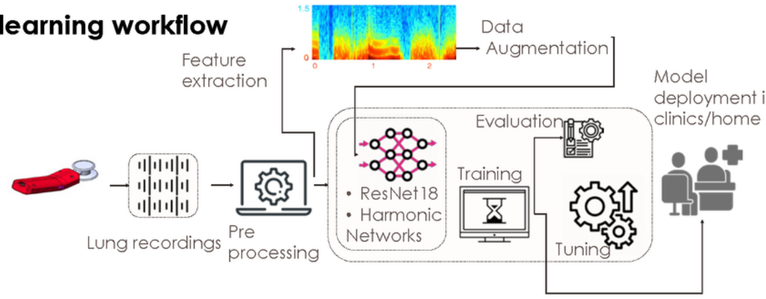
Enrolled children with asthma (2 -18yo), between 7/22-4/23, from the Emergency Department

Trained research assistants to collect lungs sound and voice recordings using the *StethAid Lungs* platform

- Each lung sound recording was 15 seconds in duration
- Recordings originated from 11 separate locations

Lung sound labels (ground truth) were provided by physicians at the bedside using their acoustic stethoscope and asynchronously by study physicians SP, DP and JS

Deep learning workflow



DISCUSSION

Potential applications of *StethAid for Lungs*:

❖ In Hospitals/Clinics

Minimizing ED visits for asthma
Tracking the efficacy of treatments
Extend care access to communities in underserved areas
Improving confidence in diagnoses

❖ At Home

Identifying symptoms early reducing severity of exacerbations
Lowering costs and improving medical outcomes

Ongoing Work:

1) Deep learning for dyspnea detection
2) Respiratory rate calculation
3) Asthma score calculation

CONCLUSIONS

- *StethAid Lungs* could assist parents in managing their child's asthma at home
- *StethAid Lungs* could be used in quickly identifying high risk patients and prevent asthma attacks
- *StethAid Lungs* could aid in reducing ED visits and school absenteeism

ACKNOWLEDGEMENTS

Current study: NIH grant R41NR019735; *StethAid Lungs* platform: CTSI, Board of Visitors

AusculTech Dx

Co-Host

Sponsors

Children's National

NIH National Institute of Allergy and Infectious Diseases