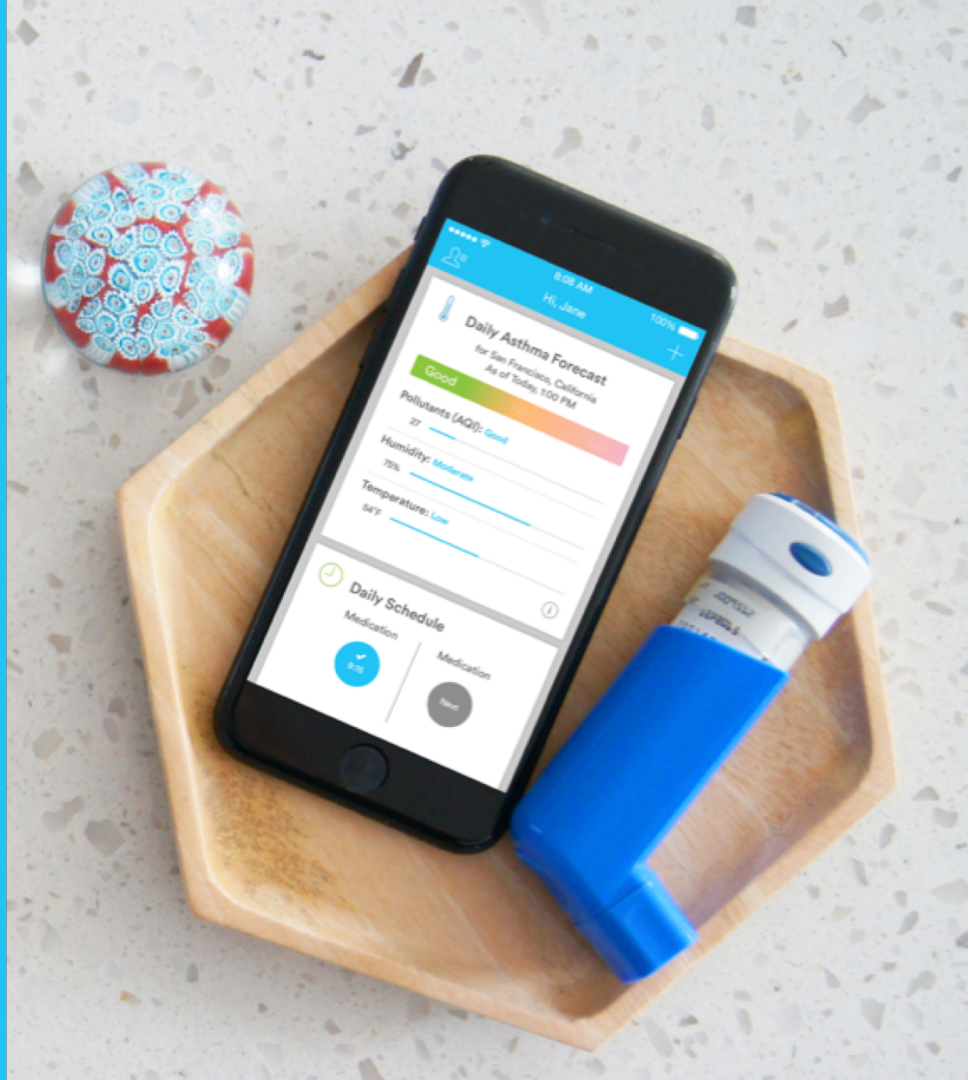


Evaluation of personalized and public communications about air quality and respiratory disease

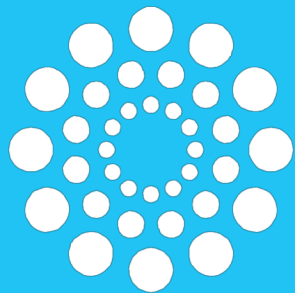
Rahul Gondalia, PhD, MPH
May 8, 2019

CSTE Climate & Respiratory Health Summit
Atlanta, GA



→ Conflict of Interest

- I receive compensation from my employer, Propeller Health



Introduction to Propeller

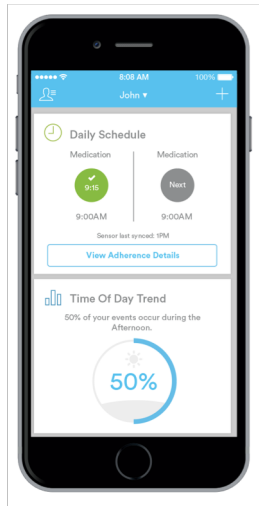
→ What is Propeller Health?

Propeller is a connected health platform for asthma & COPD patients

Bluetooth enabled sensors track rescue and controller medication use.



Sensors passively sync with a smartphone

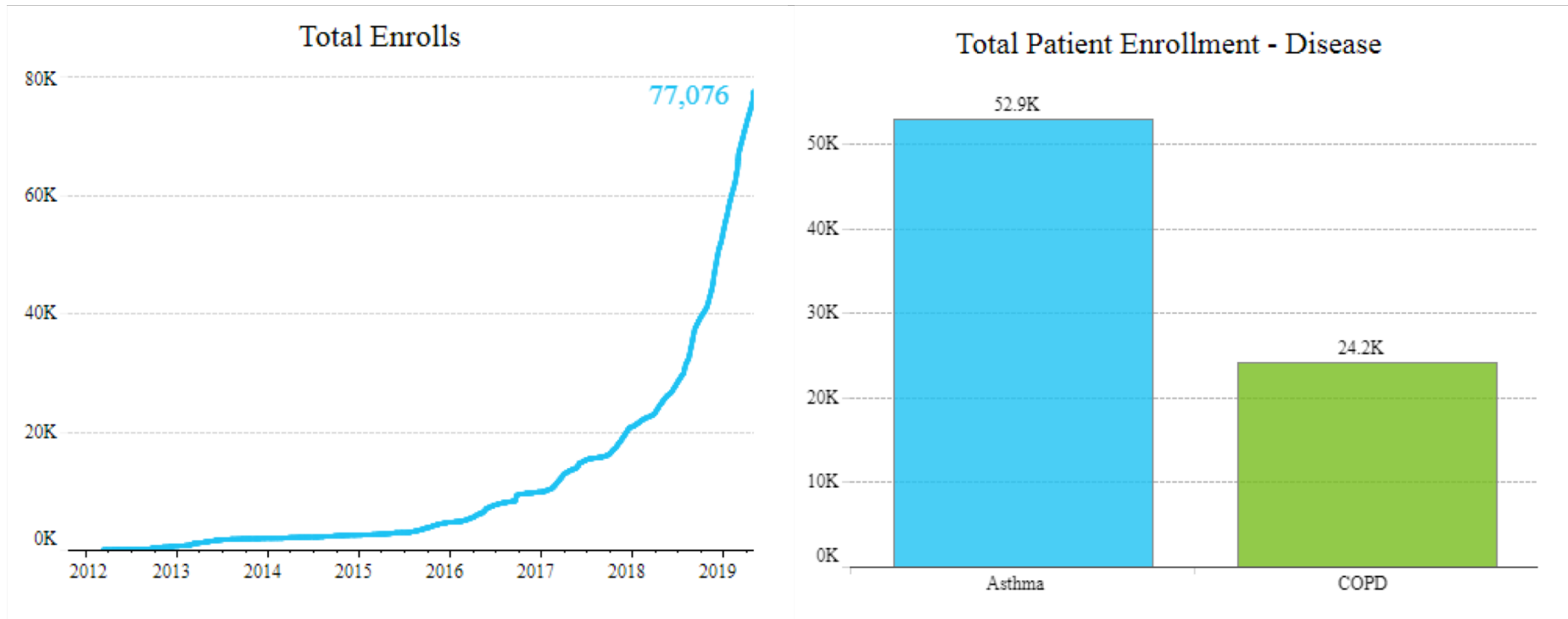


Produces objective reports of medication adherence & alerts to the health care team.

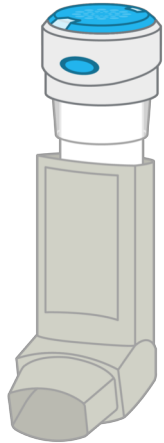


→ Propeller Health patient enrollment

- To date we have enrolled approximately 77k patients into Propeller



→ Rescue inhaler use tracking and analysis



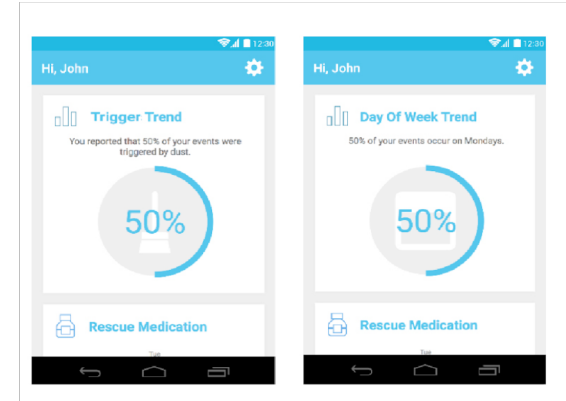
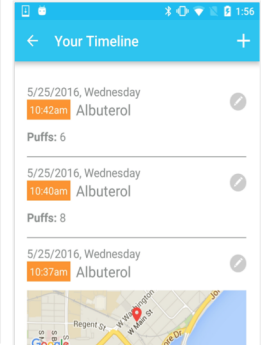
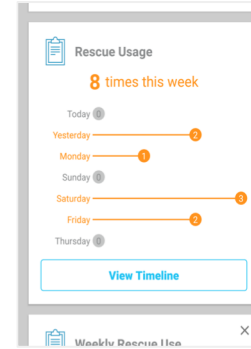
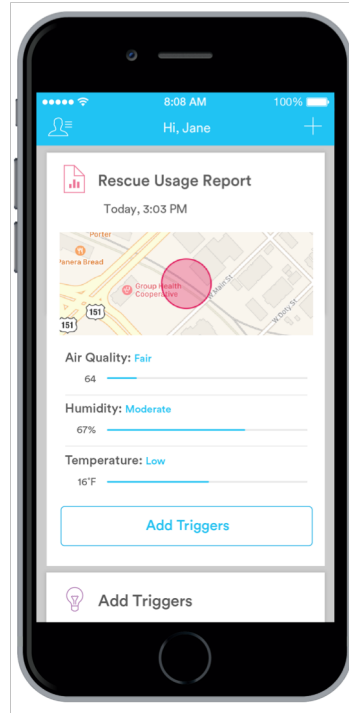
1:38:08 PM PST

AQI 102

Pollen Count 5.2

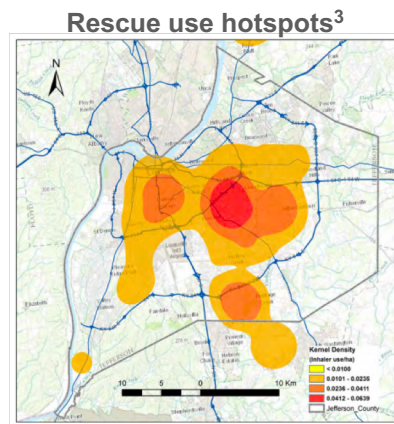
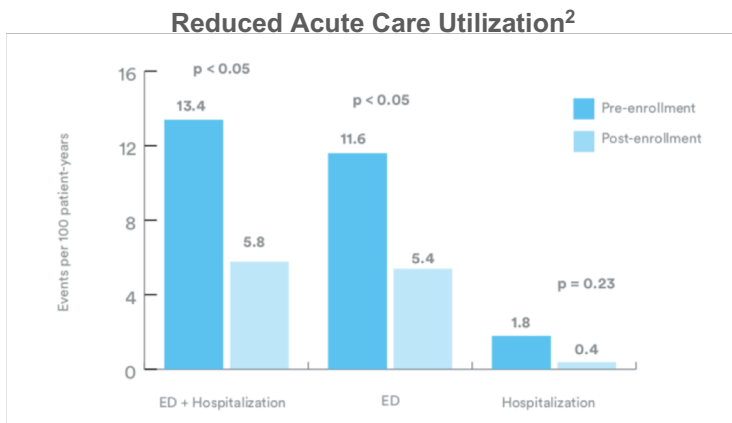
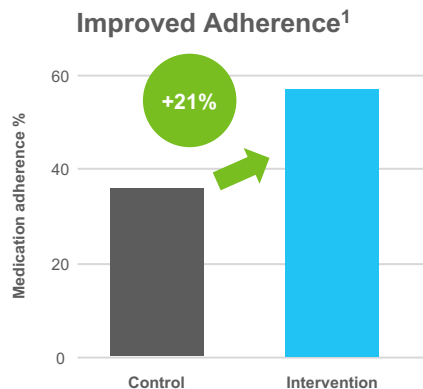
N47°34.4452, W110°77.8257
Winds from SW, 13mph

2 inhalations of ProAir (120mcg)
20 seconds apart



→ Propeller commitment to research

Propeller has validated its approach, platform and products in numerous published clinical studies.



63 Abstracts

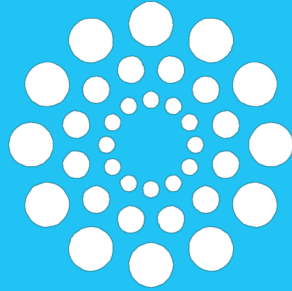
19 Peer-reviewed publications

8 Air pollution-related abstracts / publications

¹Van Sickle et al. European Respiratory Journal 2016 48: PA1018

²Merchant et al. World Allergy Organization Journal. 2018 Dec;11(1):28.

³Su et al. Environmental health perspectives. 2016 Jun 24;125(2):254-61.



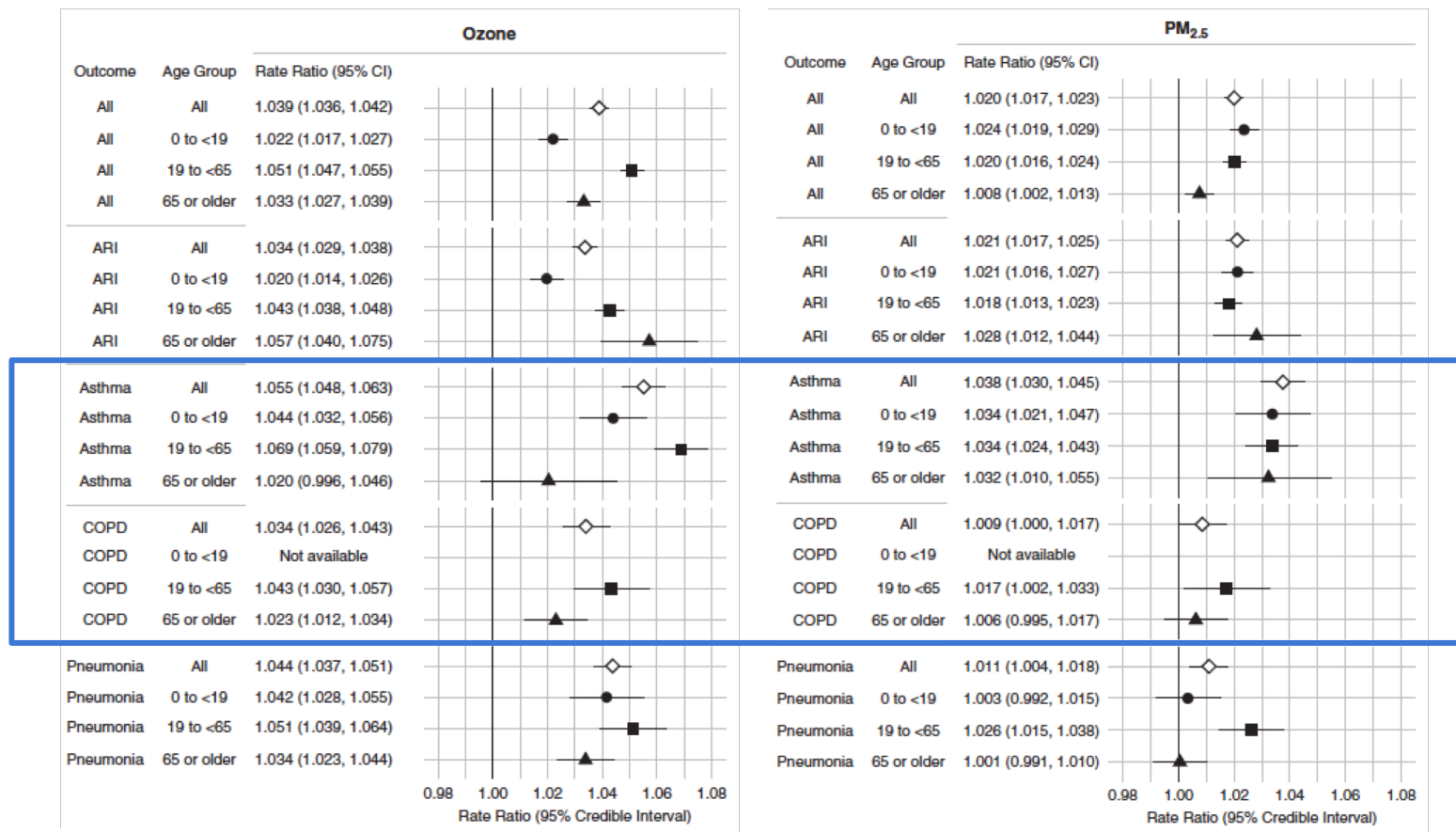
Background & Objectives

→ Background

- Short-term exposure to ambient air pollution has been consistently associated with adverse respiratory health
- Largely attributable to air pollution-related asthma and chronic obstructive pulmonary disease (COPD) morbidity and mortality⁴

⁴Strosnider et al. ARJCCM. 2019 Apr 1;199(7):882-90.

→ PM_{2.5} and O₃ associated w/ asthma & COPD ED visits



→ Background

- Short-term exposure to ambient air pollution has been consistently associated with adverse respiratory health
- Largely attributable to air pollution-related asthma and chronic obstructive pulmonary disease (COPD) morbidity and mortality⁴
- Susceptible groups are recommended to reduce exposure to poor air quality
- Only half of surveyed susceptible individuals (asthma / COPD / CVD) reported being aware of air quality alerts^{5,6}
 - Most common communication channels: television (76%), radio (30%), newspaper (24%), and internet (20%), **mobile phone / app (< 6%)**

⁴Strosnider et al. ARJCCM. 2019 Apr 1;199(7):882-90.

⁵Mirabelli et al. American journal of preventive medicine. 2018 May 1;54(5):679-87.

⁶Pennington et al. Preventive Medicine Reports. 2019 Mar 28;100860.

→ Objectives

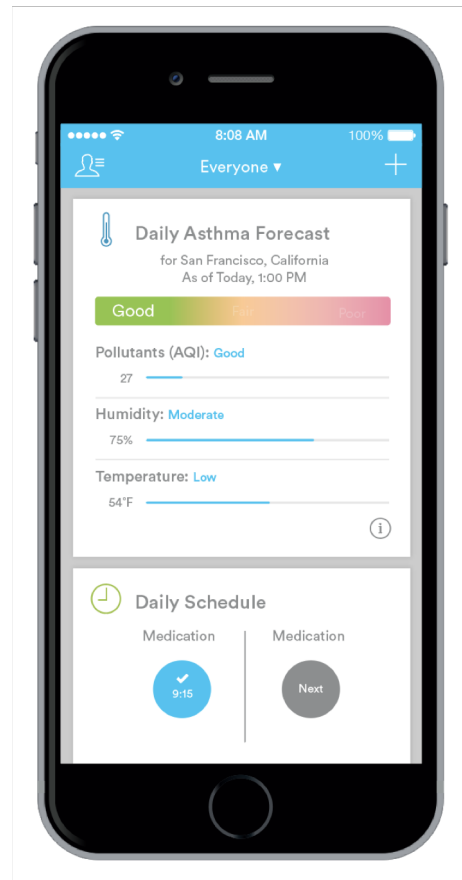
1. Evaluate patient experience with air pollution-related features on the Propeller Health mobile application
 - a. Asthma Forecast
 - b. Trigger tracking and trends
 - c. Educational content
2. Evaluate how inhaler use outcomes vary by engagement
3. Reach of public health communication
4. Synthesizing lessons learned

→ Objective 1

- 1. Evaluate patient experience with air pollution-related features on the Propeller Health mobile application**
 - a. Asthma Forecast**
 - b. Trigger tracking and trends**
 - c. Educational content**
2. Evaluate how inhaler use outcomes vary by engagement
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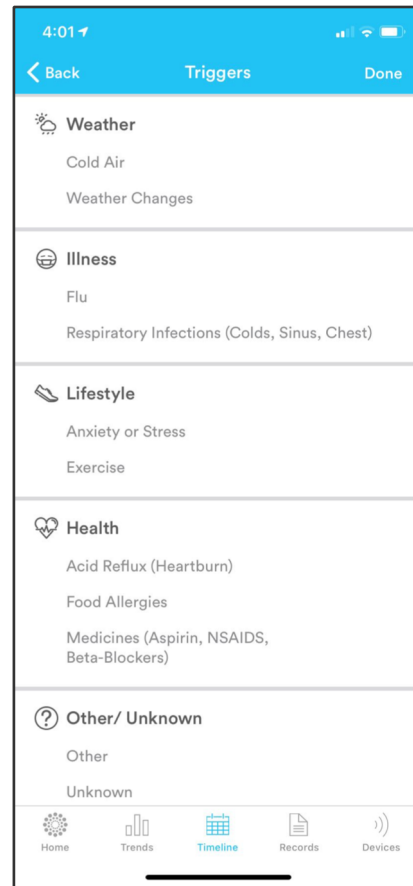
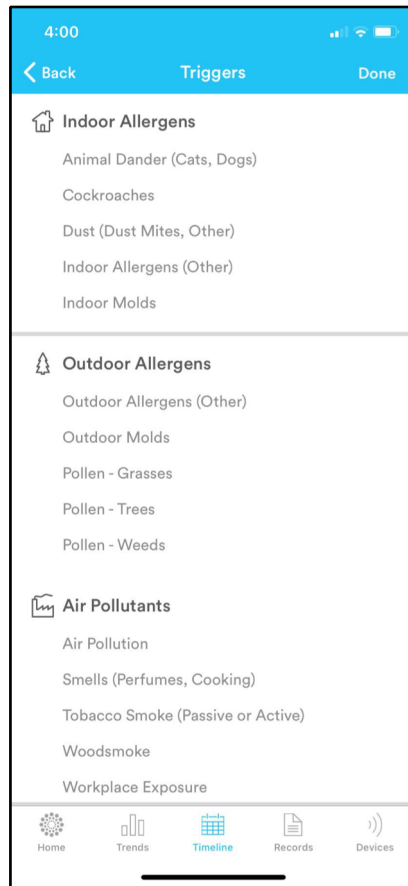
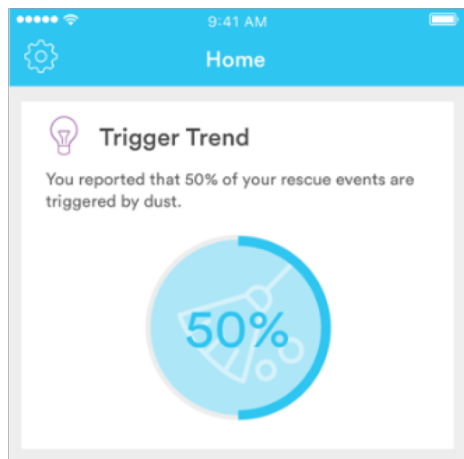
→ Asthma Forecast

- Machine learning algorithm that incorporates individual-level rescue medication use and the environmental data to estimate risk of experiencing symptoms
- Help plan their day, make decisions about where & when to exercise, and lead to avoided symptoms through trigger mitigation or avoidance.
- Asthma patients and caregiver users receive push notifications about forecast daily



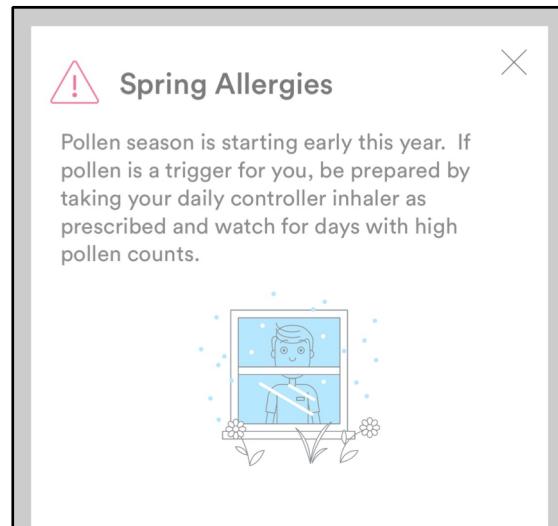
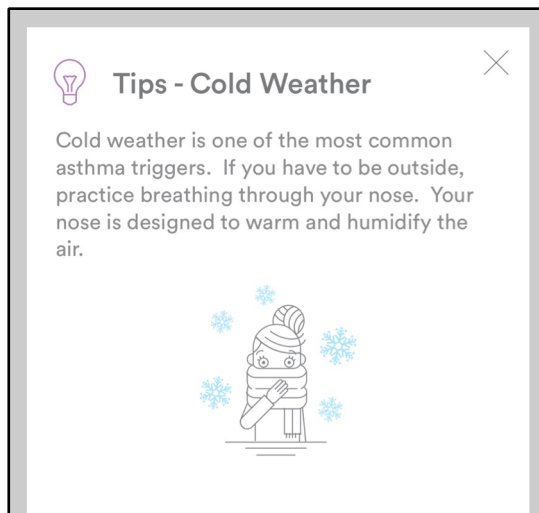
→ Trigger tracking and trends

- All patients & caregivers can record specific triggers
- All patients can review their personal trigger trends



→ Educational content

- All patients have access to “cards” that contain educational content or tips to support their management
- A portion focus on air quality or environmental conditions as it relates to respiratory disease



→ Objective 1 evaluation

- Surveys (n = 300)
 - Asking questions about the app content focused on air quality
 - Satisfaction, perception, awareness, impact on behavior, ways it could be improved, etc
- Mobile app usage patterns
 - E.g., syncing duration, frequency, and engagement within the platform
- Detailed interviews
 - Small subset of survey respondents
 - Capture stories
 - Collect feedback on the type, format and frequency of communication that is most effective

→ Objective 2

1. Evaluate patient experience with air pollution-related features on the Propeller Health mobile application
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2. **Evaluate how inhaler use outcomes vary by engagement**
3. Reach of public health communication
4. Synthesizing lessons learned

→ Objective 2 evaluation

- Describe inhaler use outcome patterns and how they vary by app engagement
- Inhaler use outcomes:
 - 1) Rescue use: short-acting beta agonists (SABA)
 - SABA use (puffs/day)
 - Nighttime SABA use (puffs/night)
 - SABA-free days (0 or 1)
 - 2) Adherence to controller medications (%)
 - Total number of puffs / total number of puffs prescribed

→ Objective 3

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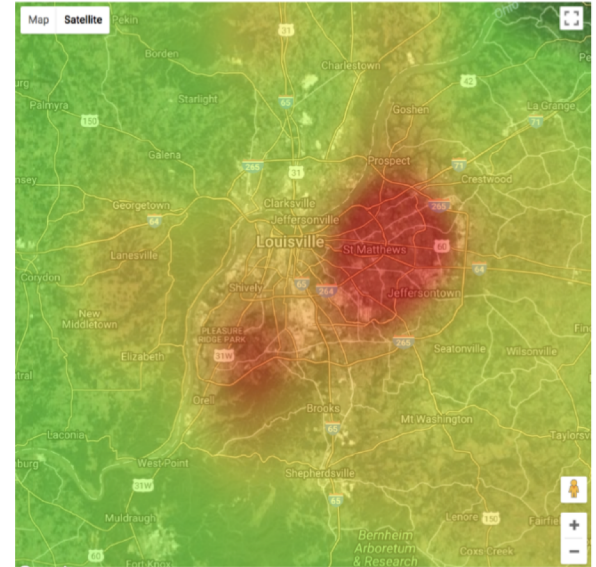
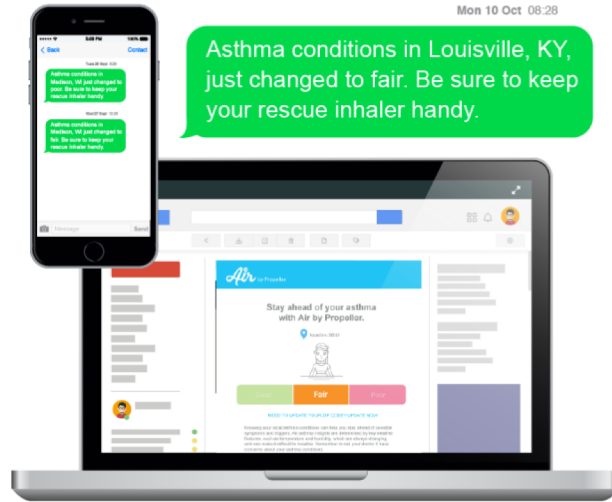
→ Objective 3 evaluation

- Number of people who received the communications and how it has been spread and shared
 - Generalized forecast model (Air by Propeller)
 - AIR Louisville policy summits
 - AIR Louisville report card
 - Propeller Health peer-reviewed publications
 - Media coverage
 - Documentaries, for example Crowd & the Cloud PBS series



<http://crowdandcloud.org/watch-the-episodes/episode-three>

→ Air by Propeller – real time regional risk forecast



→ Objective 4

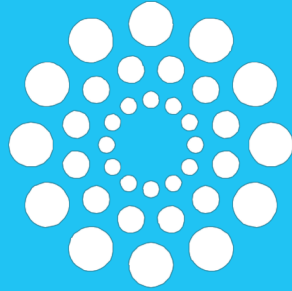
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4. **Synthesizing lessons learned**

→ Objective 4 evaluation

- 1) Describe lessons learned that can be used to inform future campaigns focused on communication and outreach on the impact of air quality and respiratory disease
- 2) Explore how and to what extent patients use and value features within the mobile app (i.e. asthma forecast, trigger tracking, education content)
- 3) Describe themes that emerge from the survey and interview data
 - User preferences on how they receive this information
 - Ways to visualize data
 - How are patients making use of this information day-to-day
- 4) Misc: satisfaction, preferences, age, disease type, region

→ Acknowledgements

- Meredith Barrett, Kelly Henderson and the Propeller Health team
- CSTE Climate & Health Working Group



Thank you! Questions?