Residential and local mobility among pregnant women with and without asthma

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Main findings

- **Residential and local mobility are independent of baseline asthma status**
- **About 24% moved during pregnancy and post-partum, with most moving within 50km and between the 3rd trimester to 4 months post-partum**
- **About 9 in 10 movers relocated to a different census tract, with >1/3 to areas with lower income and 1/4 to areas with higher pollution**
- **GPS analyses show women generally stayed within 10km of their homes but spent about half their time outside their neighborhood**
- **Mobility varied with employment, age, marital status, lifestyle, and BMI**

Introduction

- Studies evaluating environmental effects on perinatal health often estimate exposures based on residential address at one point (usually at delivery), assuming that pregnant women are stationary
- Studies have estimated that between 9% and 32% of pregnant women move during pregnancy
  - Prior findings suggest most moves occur in the 2nd trimester and within 10km
- Asthma affects ~8% of pregnancies, and requires significant lifestyle modifications
- Women with and without asthma may have different residential and local mobility but no studies have examined such patterns

Objectives

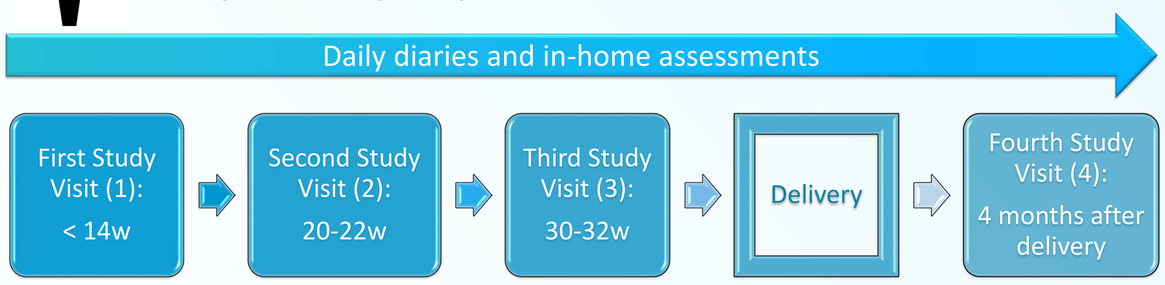
- **Simultaneously explore residential and local mobility in a prospective cohort of pregnant women with and without asthma**
- **Investigate factors associated with residential and local mobility**

Methodology

1. Study design and participants:

- 414 participants with and without asthma came from the Breath—Wellbeing, Environment, Lifestyle and Lung Functions study (B-WELL-MOM, 2015-2019, USA)

- No asthma (n=106): no history or current asthma as indicated on medical records
- Well controlled (n=146): Asthma Control Test (ACT) score ≥20
- Poorly controlled (n=162): ACT score <20



	Visit 1	Visit 2	Visit 3	Visit 4
Participants with address	414	374	351	363
Participants with GPS data	271	113	80	19
Participants who relocated	-	26	27	55

2. Residential mobility assessment

- Participants updated their addresses at each visit, which were geocoded and overlaid with US Census 2010 data
- Parameters assessed:
  - Whether women relocated from address recorded at their previous study visit (yes/no)
  - Distance moved (km)
  - Whether they moved to a neighborhood with lower SES or higher pollution

3. Local mobility assessment

- Participants carried a GPS-enabled mobile device for 1 week during each trimester and during the post-partum period
- GPS locations were geocoded and overlaid with the US Census 2010 data
- Parameters assessed:
  - Average distance relative to current address (km)
  - Proportion of time participants spent outside their home neighborhood

4. Other variables of interests

- Demographics and clinical characteristics were also obtained from in-home assessments, visit-specific questionnaires, and in-person examination

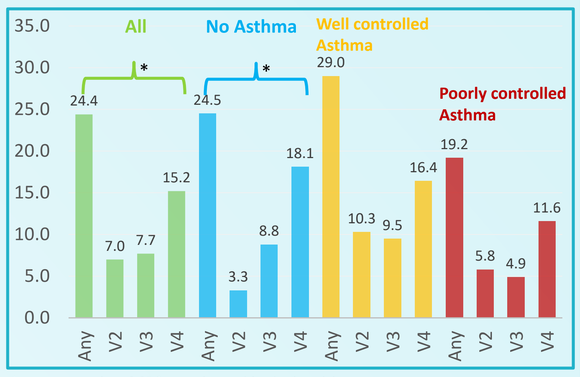
5. Analyses:

- Generalized mixed linear models were used to investigate maternal characteristics associated with mobility patterns

Results

Fig 1. Distribution of residential locations

Fig 2. Proportion of participants relocated



*represent p-value <0.05 for trend test with mixed models

Fig 3. Distance moved

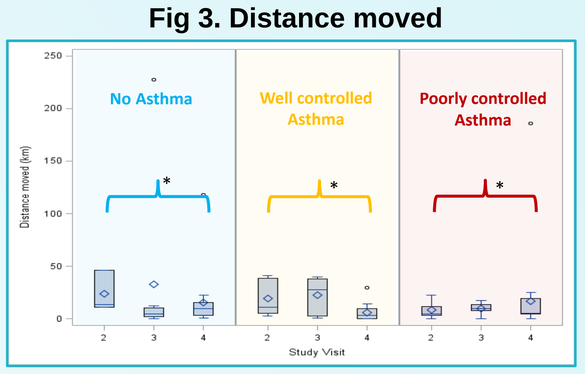


Fig 4. Distribution of Local mobility

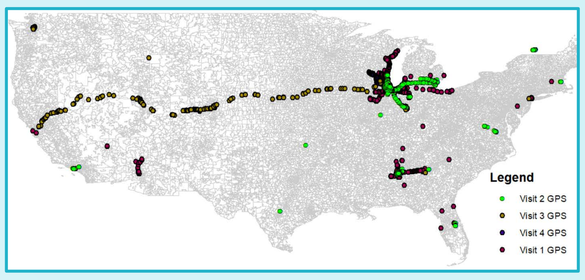
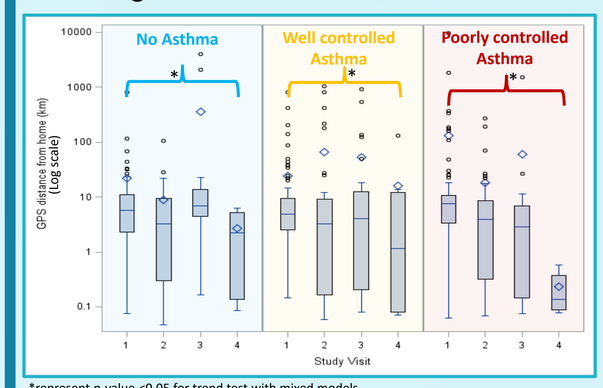
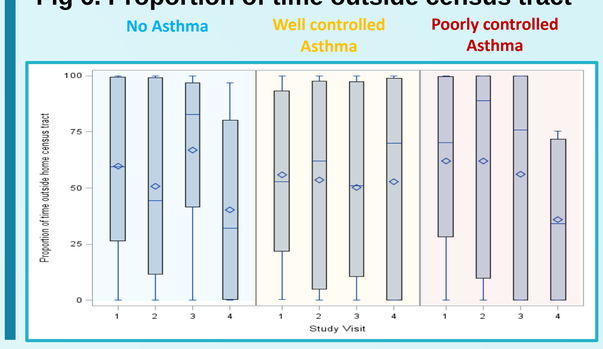


Fig 5. GPS distance from home



*represent p-value <0.05 for trend test with mixed models

Fig 6. Proportion of time outside census tract



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Among movers (n=101):

- >85% moved to a different neighborhood
- 32-44% moved to an area with lower income
- ~24% moved to a neighborhood with higher annual $PM_{2.5}$ concentration

Table 1. Factors associated with mobility parameters[a]

Significant predictors	Odds ratio (95% CI)			% difference (95% CI)
	Relocation	Relocated to lower income neighborhood	Relocated to neighborhood with higher annual $PM_{2.5}$	GPS distance from home
BMI (reference: <25)				
Overweight	0.38 (0.21 - 0.67)			
Obese	0.57 (0.36 - 0.91)			
Alcohol (reference: no)				
Yes	2.17 (1.35 - 3.51)		2.86 (1.19 - 6.88)	
Cigarette (reference: no)				
Yes				-63.15 (-85.01--9.39)
Work distance (reference: <5 mi)				
5-10 miles (8-16km)	0.46 (0.23 - 0.90)	0.21 (0.05 - 0.96)		
>10miles (>16km)	0.80 (0.44 - 1.45)	0.90 (0.35 - 2.36)		
Age (year)	0.96 (0.93 - 0.99)	0.93 (0.88 - 0.98)	0.93 (0.87 - 0.99)	
Marital status (ref: married/cohabit)				
Single/divorced/widowed		2.05 (1.10 - 3.80)	2.24 (1.00 - 5.02)	
Employment status (ref: full time)				
Employed, part-time			3.99 (1.50 - 10.61)	-51.47 (-72.29--14.98)
On leave or unemployed			1.78 (0.62 - 5.12)	-53.65 (-72.71--21.28)

[a]Estimates were obtained using generalized mixed models

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