



## Report Highlights

- **36%** of clients enrolled in the Montana Asthma Home Visiting program live in rural counties.
- Significantly **more (47%)** clients living in metro counties had **well-controlled asthma** compared to clients living in rural counties (**32%**).
- **Clients** who completed **all 6 visits** experienced significant **improvements** in asthma control & had fewer ED visits.

## Upcoming Events

- Big Sky Pulmonary Conference, March 5<sup>th</sup>–7<sup>th</sup> at the Fairmont Hot Springs Resort near Anaconda.
- AAE’s National Asthma Educator Certification & Recertification Review Course, May 1-2 in Helena, Montana.

# Effectiveness of an asthma home visiting program in metropolitan, micropolitan, and rural MT counties.

## Background

Multi-trigger, multicomponent visiting programs in the homes of children with asthma effectively improve their asthma symptoms, self-management, and Emergency Department (ED) visits.<sup>1,2</sup> Few studies have assessed home visiting programs in U.S. rural areas, where program delivery can be logistically challenging and asthma morbidity and control are generally worse compared to urban areas.<sup>1,3-6</sup>

Between June 2010 and July 2019, 632 children aged 0-17 years were enrolled in the Montana Asthma Home Visiting Program (MAP). The program involved 6 contacts over a 12-month period with a nurse or respiratory therapist trained in asthma education and trigger removal. Program logistics and asthma outcomes were collected at each visit.

To assess the effectiveness of the MAP in noncore (referred to as rural) counties, client demographics and outcomes in these counties were compared to the client demographics and outcomes from small metropolitan and micropolitan MAP counties. This report discusses the findings of that analysis.

## Methods

The 26 counties of residence of MAP participants were classified according to the 2013 National Center for Health Statistics Urban-Rural scheme into three categories: (1) small metropolitan (small metro), (2) micropolitan (micro), and (3) rural. The three categories (county types) represent a population gradient ranging from metro, the most concentrated type of county, to micro, to rural, the least concentrated.

Visit completion percentage, one-way driving distance to a home visit, and minutes spent with a client during a visit were analyzed as logistical factors. Health outcomes included pre- and post-program ED visits in the past 6 months, asthma control status, and activity limitation due to asthma in the past month. The Asthma Control Test (ACT) was used to determine asthma control status; a score  $\geq 20$  indicated well-controlled asthma and a score  $< 20$  indicated uncontrolled asthma.

Frequencies and averages were used to describe the population. Correlation analyses assessed linear relationships between variables; the Pearson coefficient ( $\rho$ ) described the strength of the correlation. Chi-square, t-tests, and logistic regression analyses were performed to compare statistics across groups for significant ( $p < 0.05$ ) differences in logistics and health outcomes.

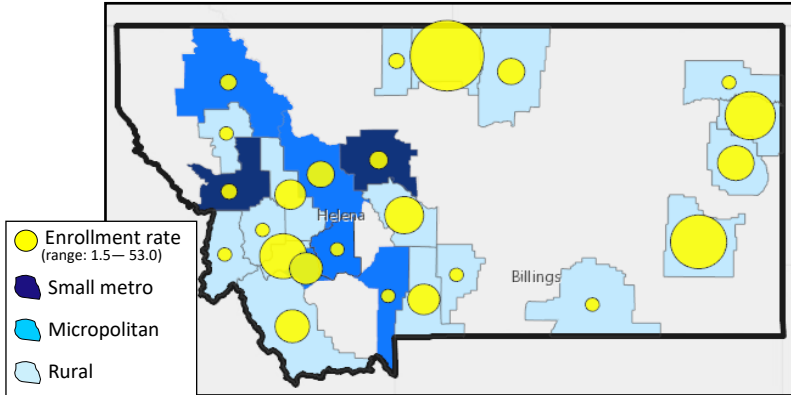
## Montana Asthma Control Program

1400 E Broadway  
Helena, Montana 59260-2951  
(406) 444-7465  
<https://dphhs.mt.gov/Asthma>

# Results

## 1. Characteristics of MAP clients

Figure 1. County classification and yearly client enrollment per 100,000 county residents.

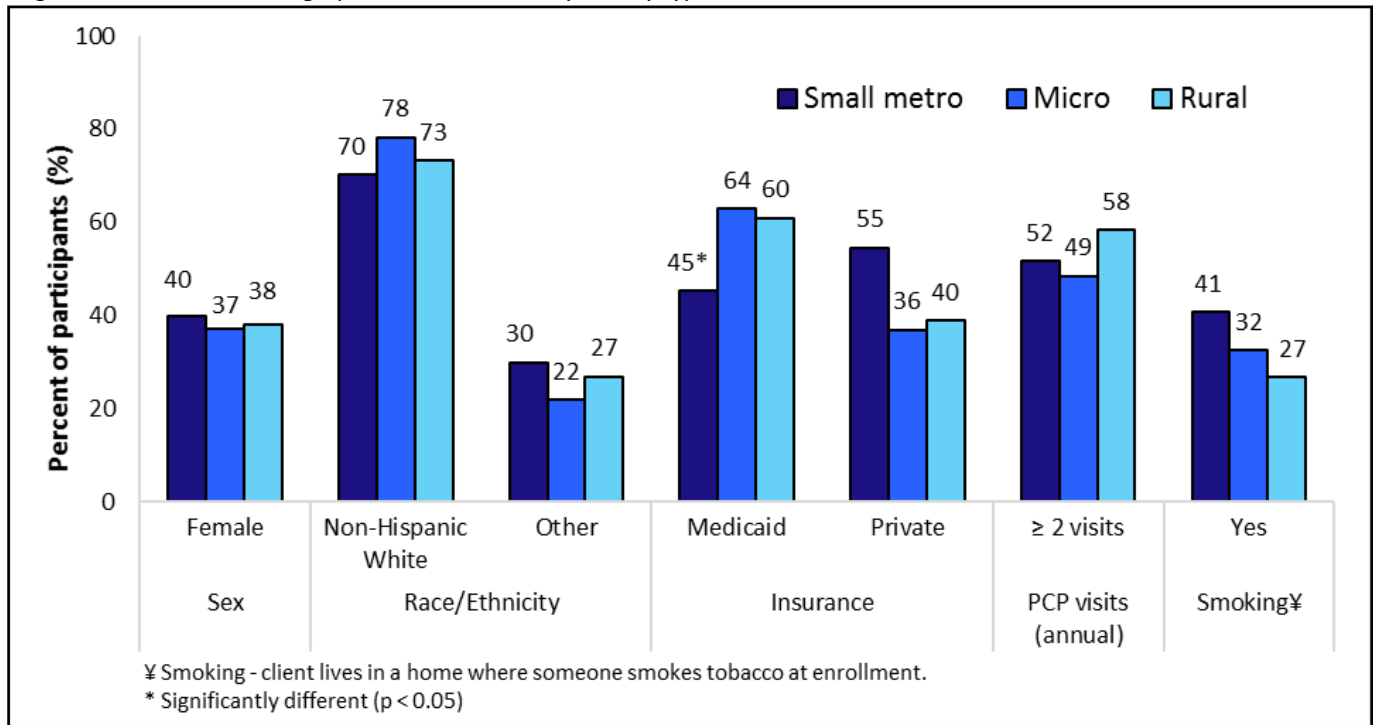


† Not all MAP sites originated at the same time.

The yearly rate of client recruitment varied geographically but was generally higher in rural counties<sup>†</sup> (Figure 1). Of the counties serviced:

- 2 counties (Cascade and Missoula) were classified as **small metro** and together had 155 (24%) MAP clients.
- 5 counties (Gallatin, Flathead, Silver Bow, Jefferson, and Lewis & Clark) were classified as **micro**. A total of 250 (40%) MAP clients lived in these counties.
- 17 counties were classified as **rural**. A total of 227 (36%) MAP clients lived in these counties.

Figure 2. MAP client demographic characteristics by county type.



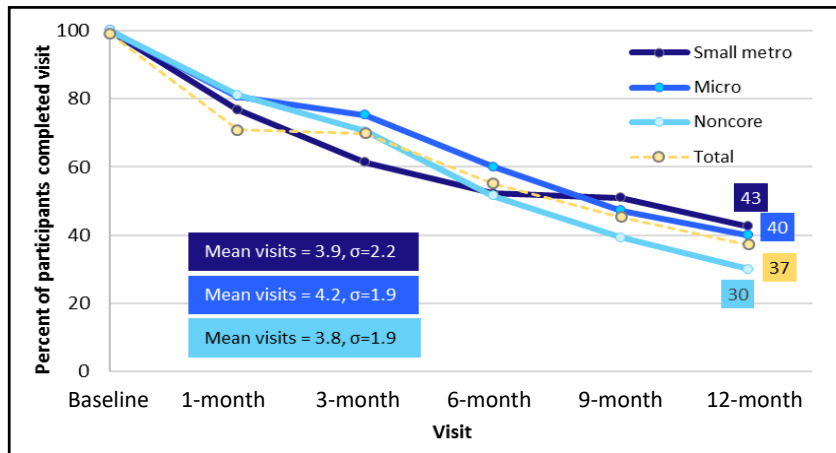
Demographic characteristics of the MAP clients were analyzed by county type (Figure 2). Two notable differences were seen between the types of counties:

- **Significantly fewer** ( $p < 0.05$ ) MAP clients living in **small metro** counties (45%) were **Medicaid members** compared to MAP clients in micro (64%) and rural (60%) counties.
- A higher, but not statistically significant, proportion of clients from **small metro** counties (41%) lived in a **home where someone smoked tobacco** compared to micro (32%) and rural (27%) counties.

## 2. Program logistics

- Client retention is difficult for asthma home visiting programs, particularly when engaging hard-to-reach populations.<sup>7</sup> In total, 235 MAP clients (38%) have completed all six visits.
- The percentage of **small metro** MAP clients (43%) who completed all six visits was **significantly higher** ( $p=0.0114$ ) than the percent of **rural** clients (30%) who completed all six (Figure 3).

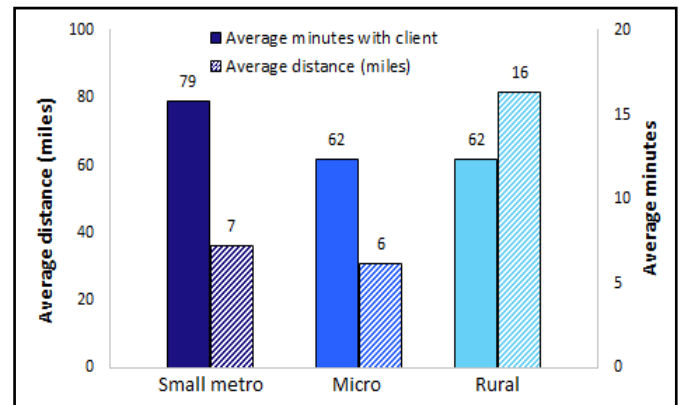
Figure 3. MAP client visit completion percentage by county type.



MAP sites maintain a yearly caseload of 15 clients. Previous research has described how greater driving distances to reach clients may impede the effectiveness of home visiting programs in sparsely populated areas.<sup>3,9</sup> Within the MAP:

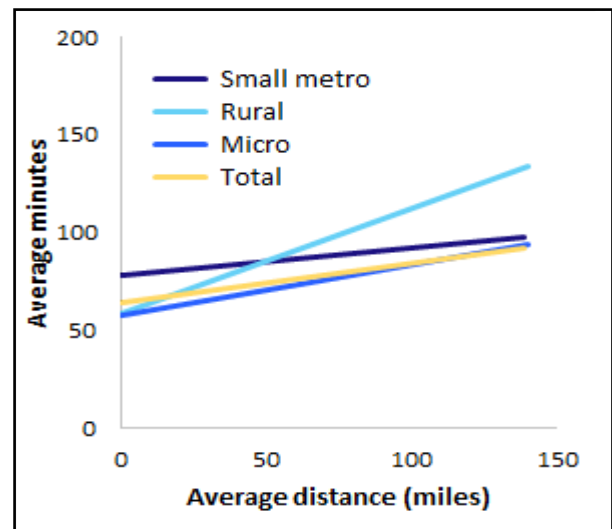
- **Rural** county staff averaged **16 miles**, one-way, to a visit, which was **significantly greater** than small metro and micro counties ( $p < .001$ ), 7 and 6 miles respectively (Figure 4).
- MAP home visitors in **small metro** counties averaged **79 minutes** per visit, **significantly greater** ( $p < .001$ ) than micro and rural home visitors, 62 minutes each (Figure 4).

Figure 4. Average miles driven to an asthma home visit and time spent with a client by county type.



Contrary to the research, average driving distance to and time spent with a MAP client, among all counties, were **positively correlated** ( $\rho=0.12$ ,  $p=0.0021$ ): MAP home visitors who drove further to reach a home tended to spend more time with the client (Figure 5).

Figure 5. The correlation between miles driven to a home visit and minutes spent at a home visit.



- The **correlation was stronger among rural county clients** ( $\rho=0.27$ ,  $p < .001$ ) compared to micro county clients ( $\rho=0.16$ ,  $p=0.0116$ ).

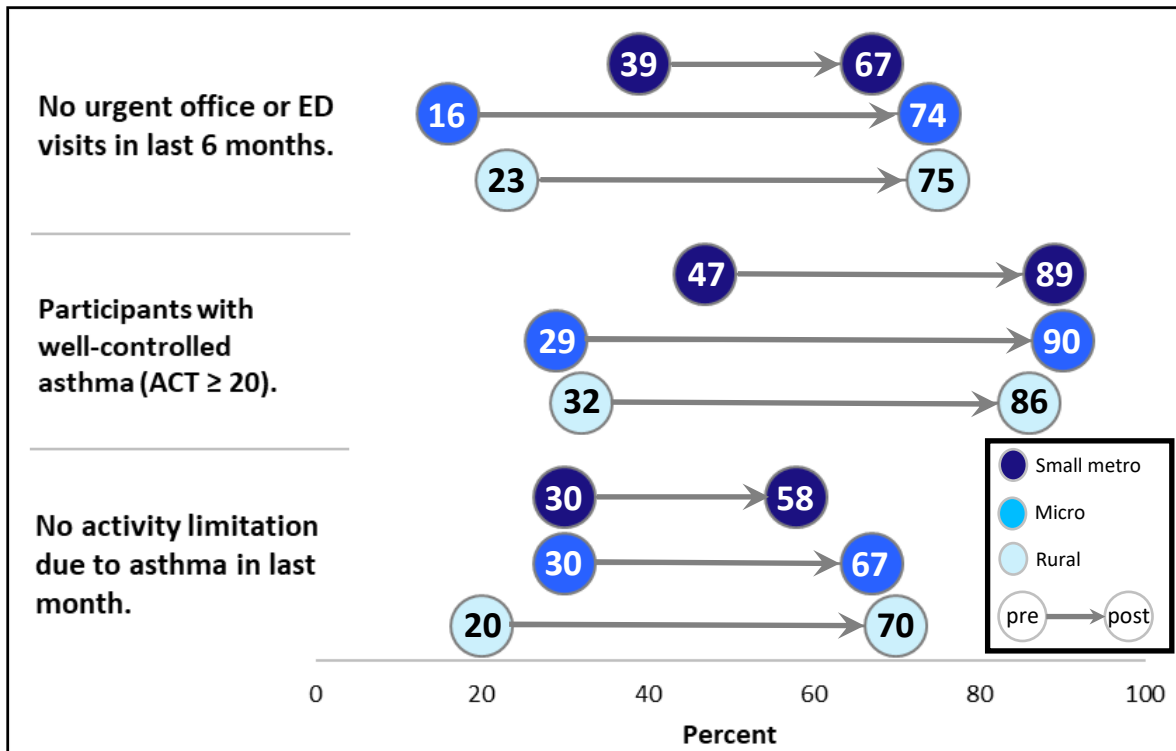
- There was no significant correlation among clients living in small metro counties ( $\rho=0.05$ ,  $p=0.5383$ ).

Neither driving distance nor time with a client were significantly correlated with improvements in asthma (data not shown).

### 3. Program health outcomes

The MAP has historically demonstrated significant health improvements and reductions in health care usage among clients.<sup>8</sup> Pre (baseline) and post (12-month) data for three key measures of morbidity, stratified by county type, are presented below (Figure 6).

Figure 6. Pre and post MAP outcomes by small metro, micro, and rural classification.



MAP clients in small metro, micro, and rural counties all showed statistically significant improvements in outcomes from baseline to program completion (Figure 6). There were no significant differences in 12-month ED visits, asthma control status (ACT score), or activity limitation by county type. Small metro county clients showed the least amount of pre-to-post improvement but demonstrated remarkably better health at baseline:

- **Significantly more** clients in **small metro** counties had **no ED visits at baseline** than clients living in **micro** ( $p=0.001$ ) and **rural** counties ( $p=0.050$ ).
- **Significantly more** clients in **small metro** counties had **well-controlled asthma at baseline** than clients living in **micro** counties ( $p=0.049$ ).

MAP clients from micro and rural counties had similar program logistics and outcomes. The findings of this report support the scientific literature, that clients living in rural areas suffer from a greater asthma burden and delivering asthma care to these patients is more challenging. However, MAP sites in rural areas are still able to effectively improve the health of their clients; despite varying levels of asthma burden at baseline, all clients achieved statistically similar outcomes by the end of the program, regardless of their location.



## Citations

1. Crocker D, Kinyota S., Dumitru G., Ligon C., Herman E., Ferdinands J., Hopkins D., Lawrence B., Sipe T. (2011) *Effectiveness of Home-Based, Multi-Trigger, Multicomponent Interventions with an Environmental Focus for Reducing Asthma Morbidity A Community Guide Systematic Review*. American Journal of Prevention Medicine 2011; 41 (2S1):S5-S32. doi: 10.1016/j.ampre.2011.05.012
2. Tran Q. K., Bayrum J., Boonyasai R., Case M., Connor C., Doggett D., Fawole O., Ijagbemi O.M., Levin S., Wu A., Pham J.C. (2016) *Pediatric Emergency Department Return A literature Review of Risk Factors and Interventions*. Journal of Pediatric Emergency care 2016; 32: 570-577. Doi: 10.1097/PEC.0000000000000876.
3. Brainard J.S., Ford J., Steel N., Jones A. (2016) *A systematic review of health service interventions to reduce use of unplanned health care in rural areas*. Journal of Evaluation of Clinical Practices 2016; 22: 145-155. doi:10.1111/jep.12470.
4. Lawson J., Pennie D., Cockcroft D., Dyck R., Afanasieva A., Oluwole O., Afsana J. (2017) *Childhood asthma, asthma severity indicators, and related conditions along an urban-rural gradient: a cross-sectional study*. Journal of BMC Pulmonary Medicine 2017; 17:4. DOI 10.1186/s12890-016-0355-5.
5. Pesek R., Vargas P., Halterman J., Jones S., McCracken A., Perry T. (2010) *A comparison of asthma prevalence and morbidity between rural and urban schoolchildren in Arkansas*. Annals of Allergy Asthma and Immunology 2010; 104(2): 125-131. doi:10.1016/j.anai.2009.11.038.
6. Valet R., Gebretsadik T., Carroll K., Wu P., Dupont W., Mitchel E., Harter T. (2011) *High asthma prevalence and morbidity among rural children in a Medicaid cohort*. Annals of Allergy, Asthma, and Immunology 2011; 106(6): 467-473. doi:10.1016/j.anai.2011.02.013.
7. Goldman H., Fagnano M., Perry T.T., Weisman A., Drobica A., Halterman J.S. (2018) Recruitment and retention of the Hardest-to-Reach families in community-based asthma interventions. *Journal Society for Clinical Trials* 2018 December; 15(6): 543-550. DOI: 10.1177/1740774518793598.
8. Fernandes J.C., Biskupiak W.W., Carpenedo D., Loveland K.M., Tysk S., Vogl S. (2018) Outcomes of the Montana Asthma Home Visiting Program: A home-based asthma education program. *Journal of Asthma* 2019 January; 56(1): 104-110. DOI: 1080/02770903.2018.1426766.
9. Leipert B.D, Klosec M., McWilliam C., Forbes D., Kothari A., Oudshoorn A. (2007) Fitting a Round Peg into a Square Hole: Exploring Issues, Challenges, and Strategies for Solutions in Rural Home Care Settings. *Journal of Rural Nursing and Health Care*, vol. 7, no. 2, Fall 2007. DOI: 10.14574/ojrnhc.v7i2.134.

For more information contact:

**Charlie Reed**  
 Asthma Epidemiologist  
 (406) 444 7304  
 Charles.Reed@mt.gov

## Clinical Recommendations

- Provide asthma care according to the Third Expert Panel Report (EPR-3) Guidelines for the Diagnosis and Management of Asthma created by the National Heart, Lung, and Blood Institute.
- Provide asthma self-management education at every opportunity, including emergency department visits and outpatient visits.
- Originally the Montana Asthma Home Visiting Program was only available to children, but it has been expanded to include children and adults with asthma. Please refer any patients with uncontrolled asthma or an ED visit in the past year. More info can be found online: <https://dphhs.mt.gov/asthma/asthmahomevisiting>
- Be aware of how the location of someone’s home may impact their asthma and their access to health care resources.

## Report Highlights:

- Clients with asthma who live in rural settings are more likely experience greater asthma burden.
- Asthma home visitors in rural counties have to drive significantly farther to reach their patients than home visitors in other counties.
- Despite worse health at baseline, home visiting clients living in rural counties experience greater health improvement during the course of the program.