

Child Health Evaluation
and Research Unit



University of Michigan



University of Michigan
C.S. Mott Children's Hospital

Evaluation of HL7 Interoperability with MCIR

*Using Geographic
Information Systems (GIS) in
an Evaluation of HL7
Message Data Quality*

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AIRA Conference 2016

Background: MCIR

- Michigan Care Improvement Registry (MCIR):
 - Created in 1996 as childhood immunization registry
 - Expanded to lifespan in 2006
 - Required reporting: All immunizations administered to every child:
 - Born after December 31, 1993 and
 - < 20 years old within 72 hours of administration

Background: HL7 in MCIR

- MCIR began accepting HL7 messages in 2012
- Current status:
 - Over 2,200 sites submitting by HL7
 - 23% of the total 9,732 sites in MCIR
 - 39 EHR vendors

Background: HL7

- High potential of HL7 messaging between EHRs and MCIR to improve data quality by:
 - Real-time reporting [Timeliness]
 - Automatic reporting [Completeness]
 - Link to EHR [Accuracy]
- HL7 automatically reports all immunizations of both children and adults
- Retail pharmacies are a common source of immunizations for a largely adult population

Study Objectives

- Explore the potential utility of GIS tools to better understand HL7 message and MCIR data quality issues
 - Which areas have better or worse quality?
 - Where is data quality for adults increasing?
- Identify potential public health implications
 - How can GIS be used to improve adult vaccination coverage?

Methods

- MCIR data
 - All immunizations administered by national retail pharmacy chains during flu seasons (Sept.- Feb.) 2012-13, 2013-14, or 2014-15
- Calculated number of immunization doses received at retail pharmacies per 1,000 census tract population
 - Mapped using home address of patients (required for HL7)

Retail Pharmacy Sites (2014-15)

CVS 249

Kroger 112

Meijer 106

Rite Aid 288

Target 56

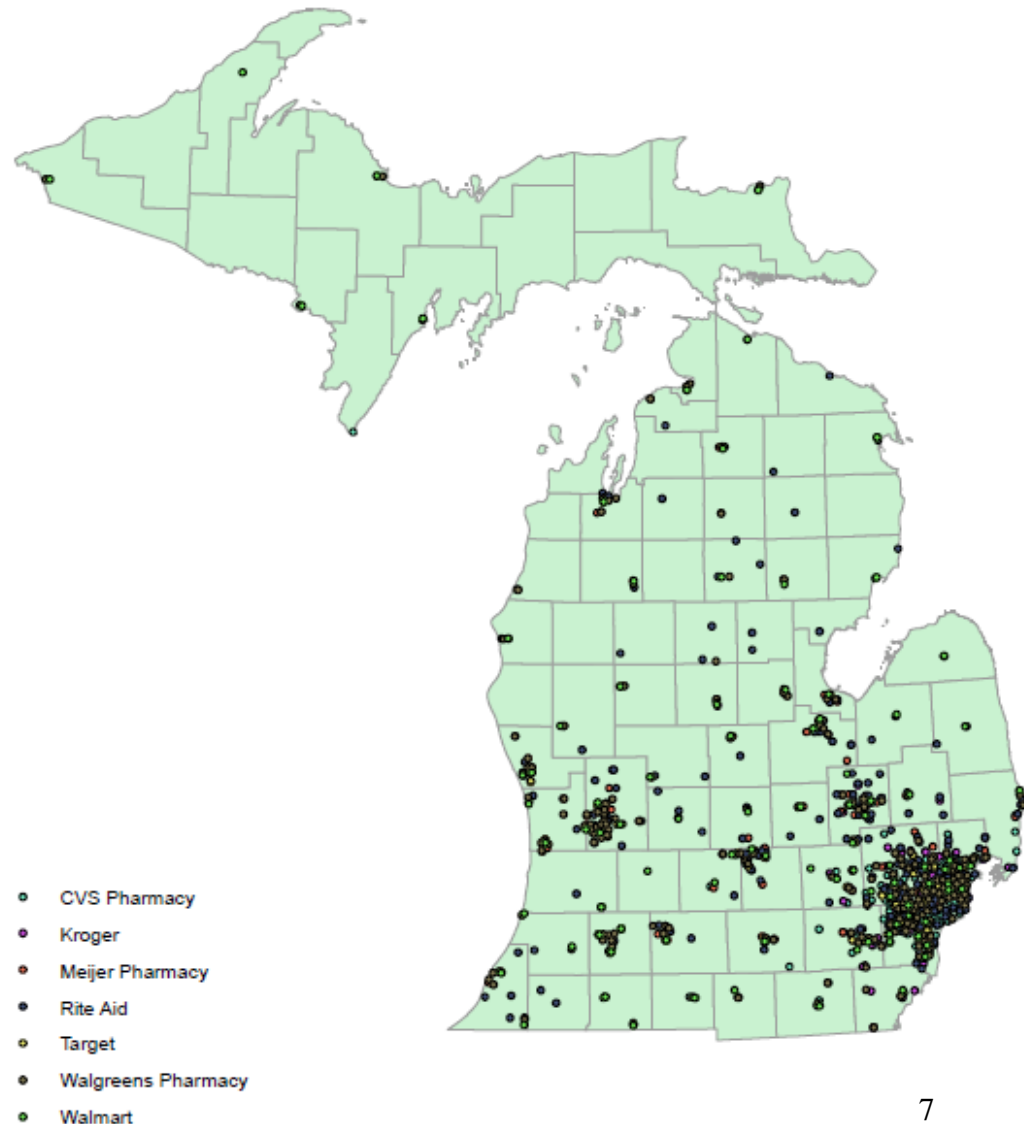
Walgreens 240

Walmart 94

Total 1,145

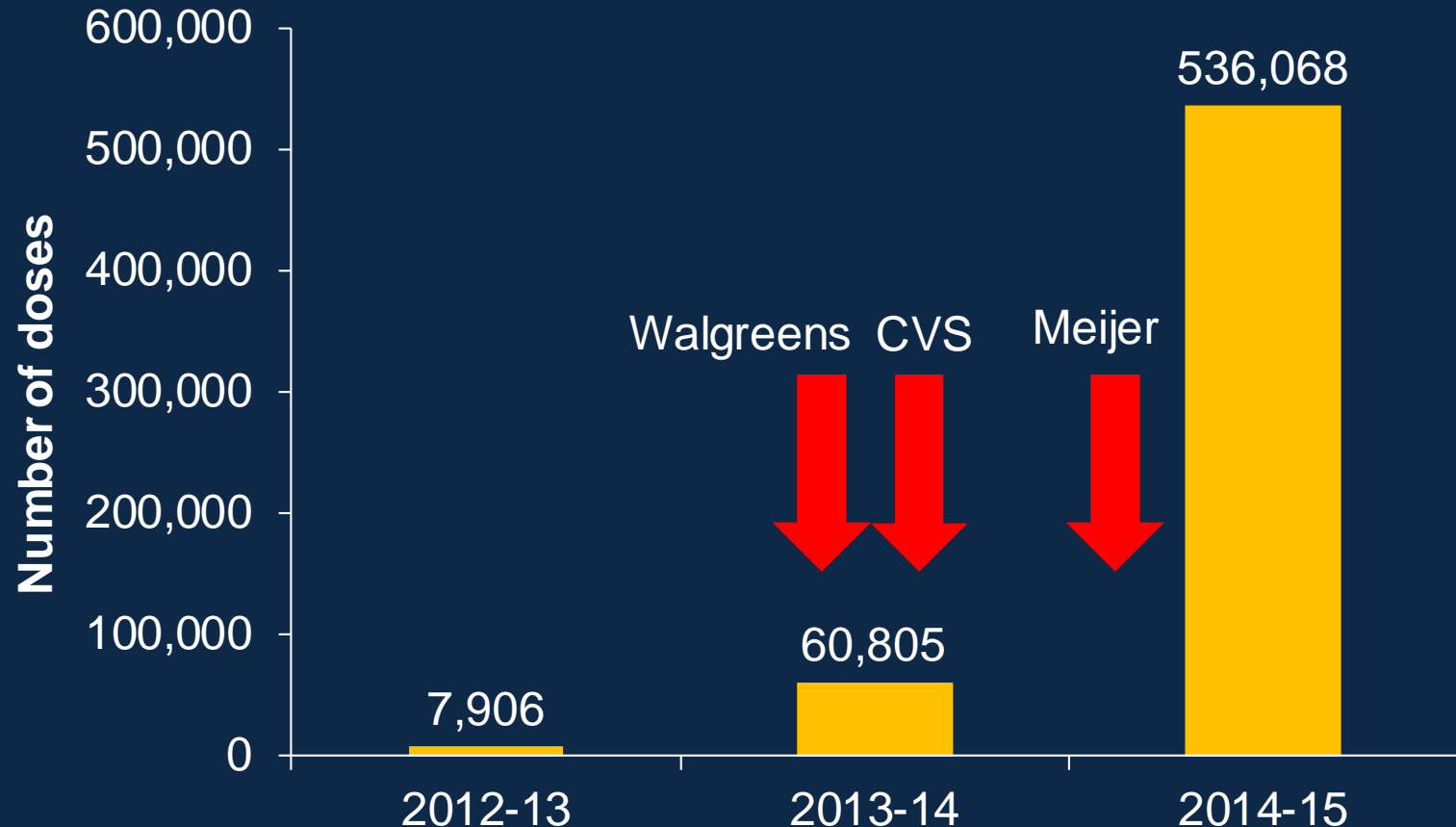
Retail Pharmacies, Michigan

9/1/2014 - 2/28/2015



Results

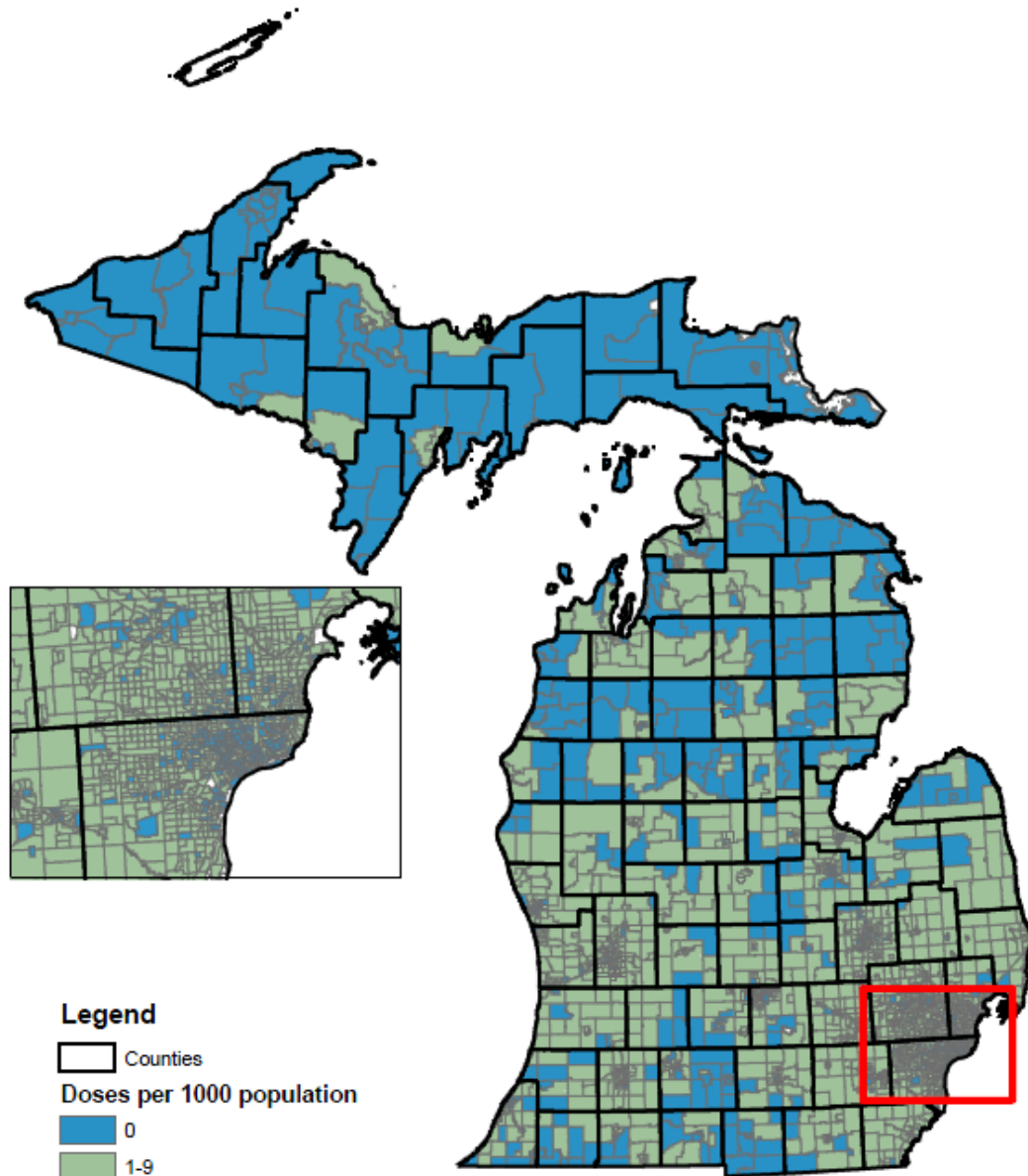
- Number of retail pharmacy doses reported to MCIR by flu season



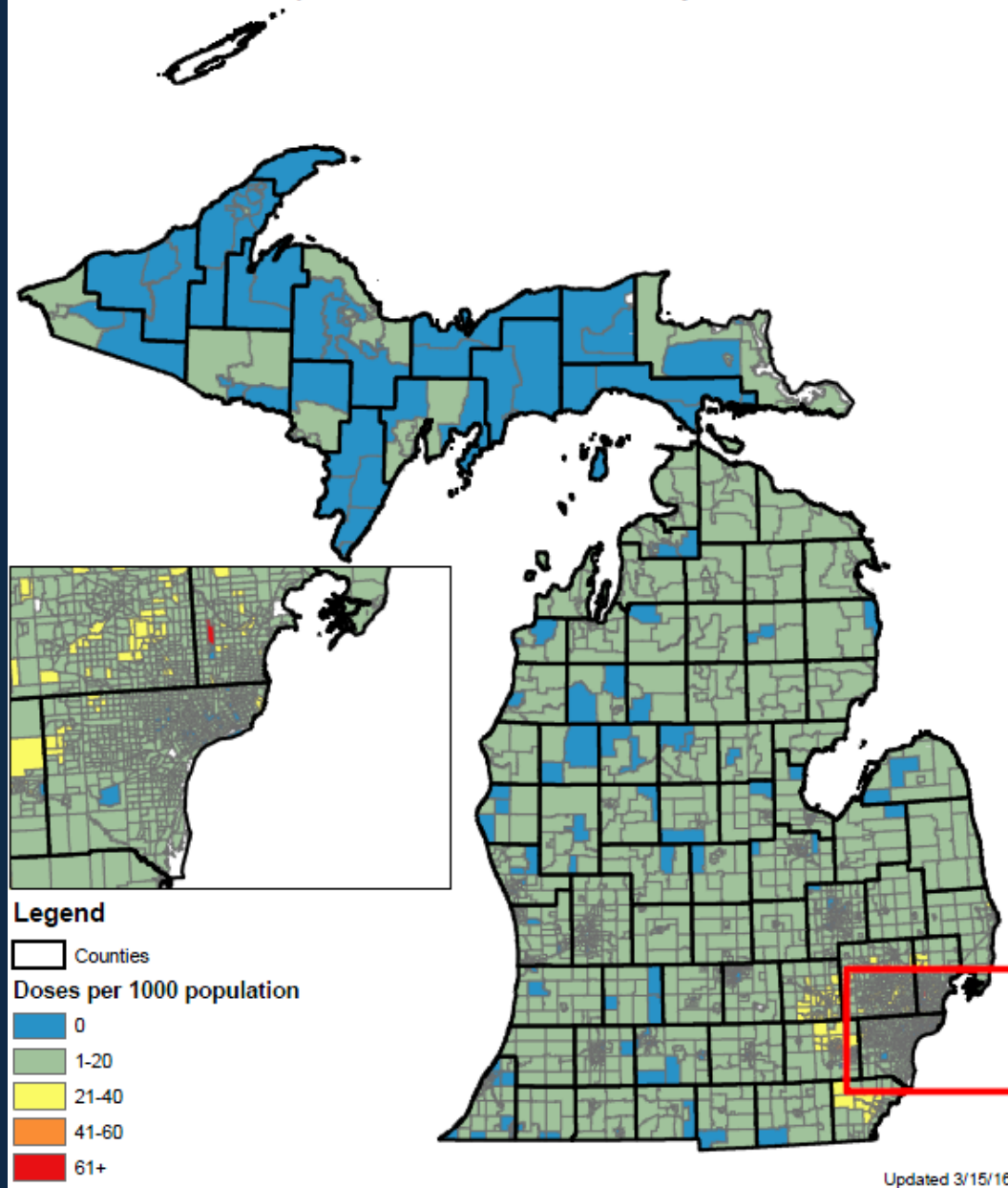
Mapping

- Geocode addresses to get latitude/longitude
- Spatially join to census tracts
- Calculate doses per 1000 population
- Display using color ramp in map

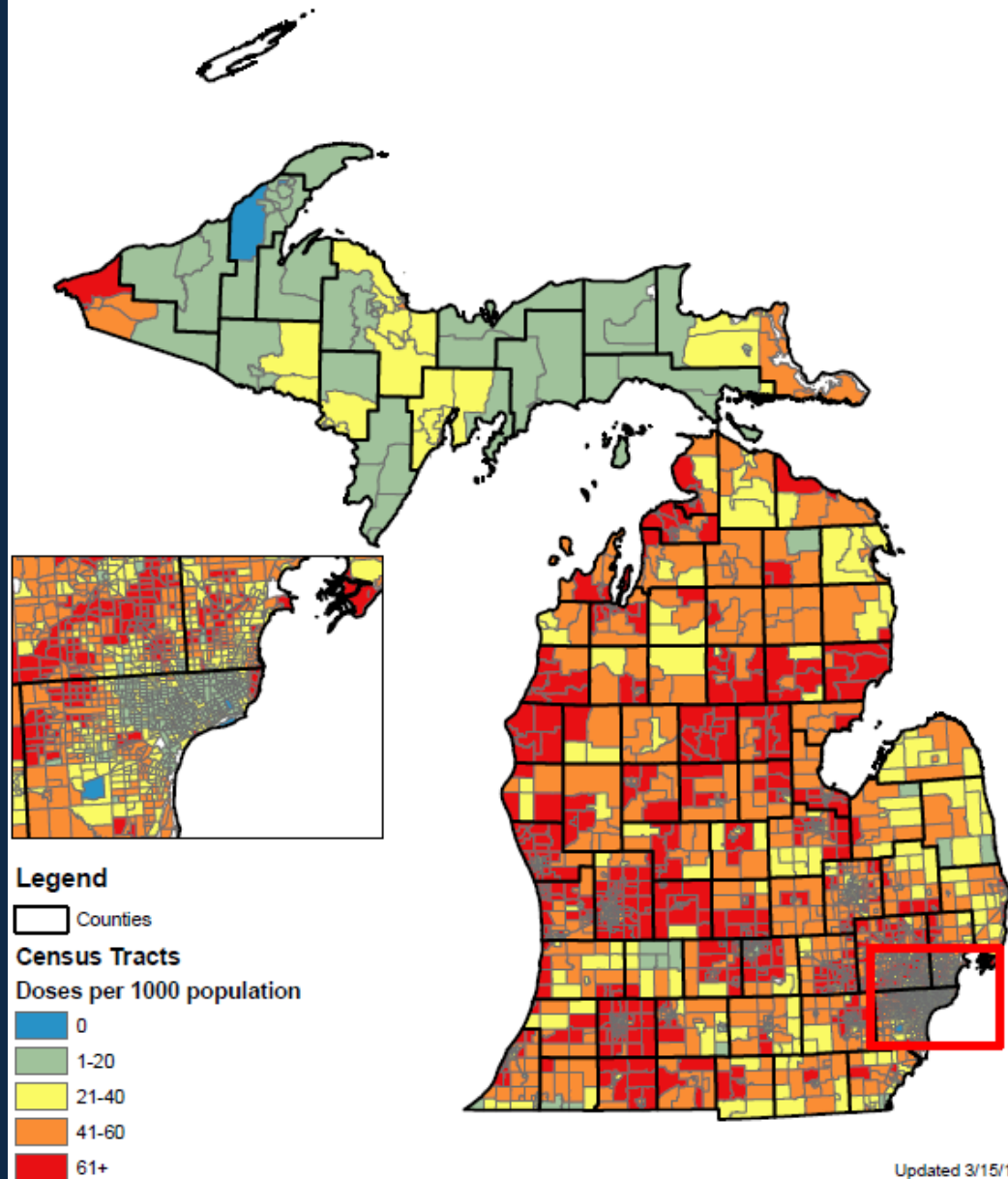
Retail Pharmacy Immunization Doses
per 1000 Census Tract Population
September 2012 - February 2013



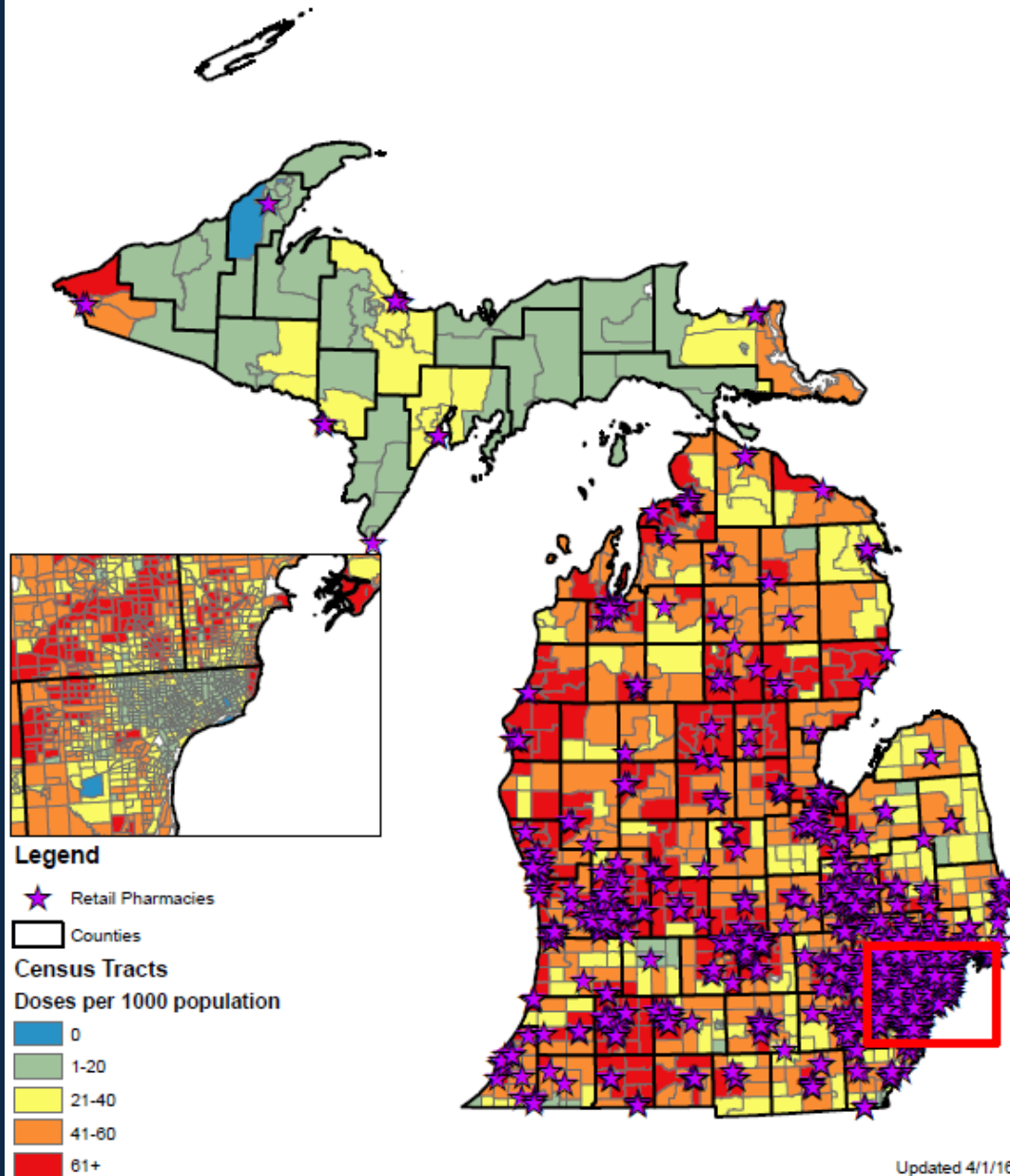
Retail Pharmacy Immunization Doses
per 1000 Census Tract Population
September 2013 - February 2014



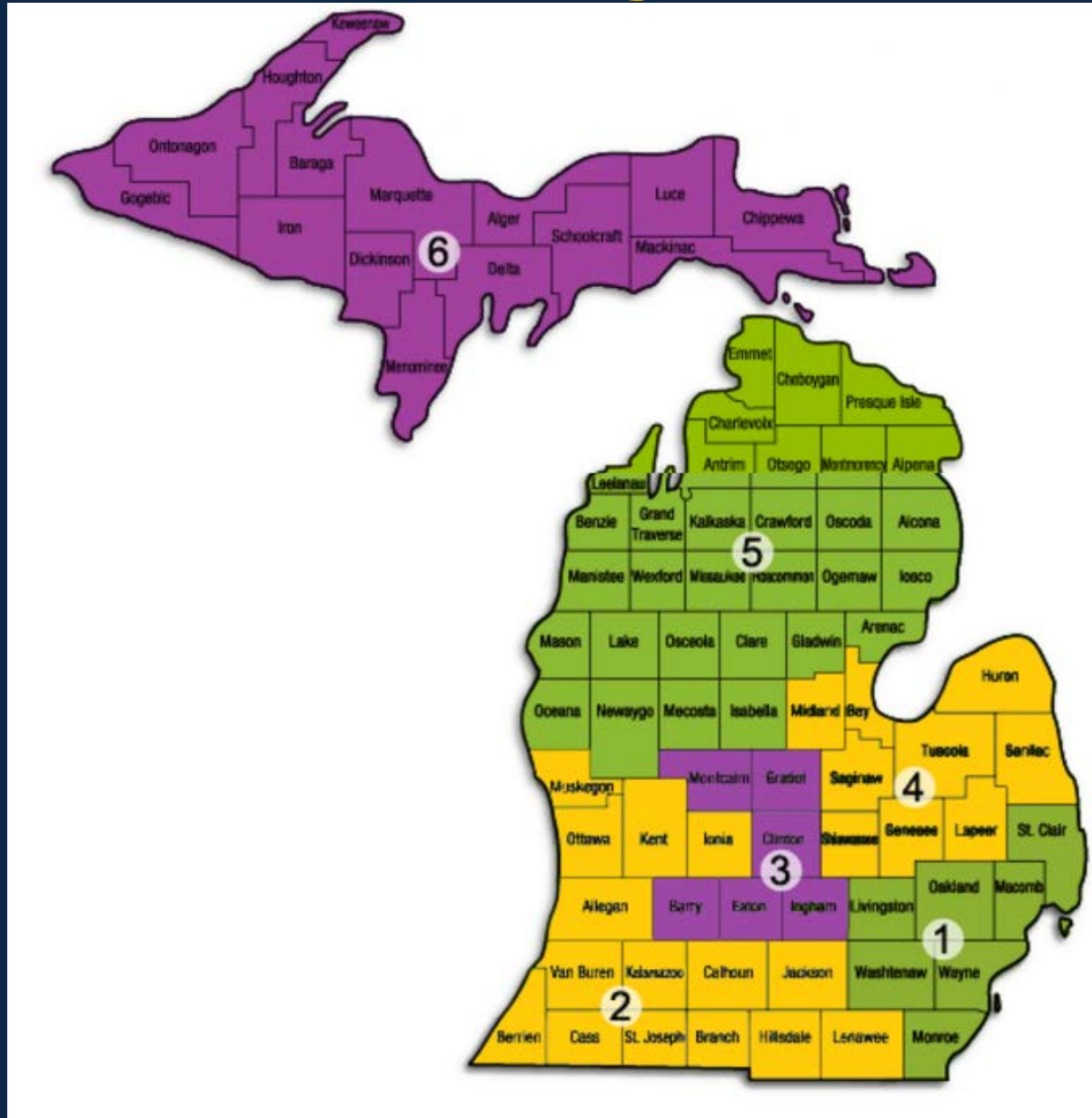
Retail Pharmacy Immunization Doses
per 1000 Census Tract Population
September 2014 - February 2015



Retail Pharmacy Immunization Doses
per 1000 Census Tract Population
September 2014 - February 2015

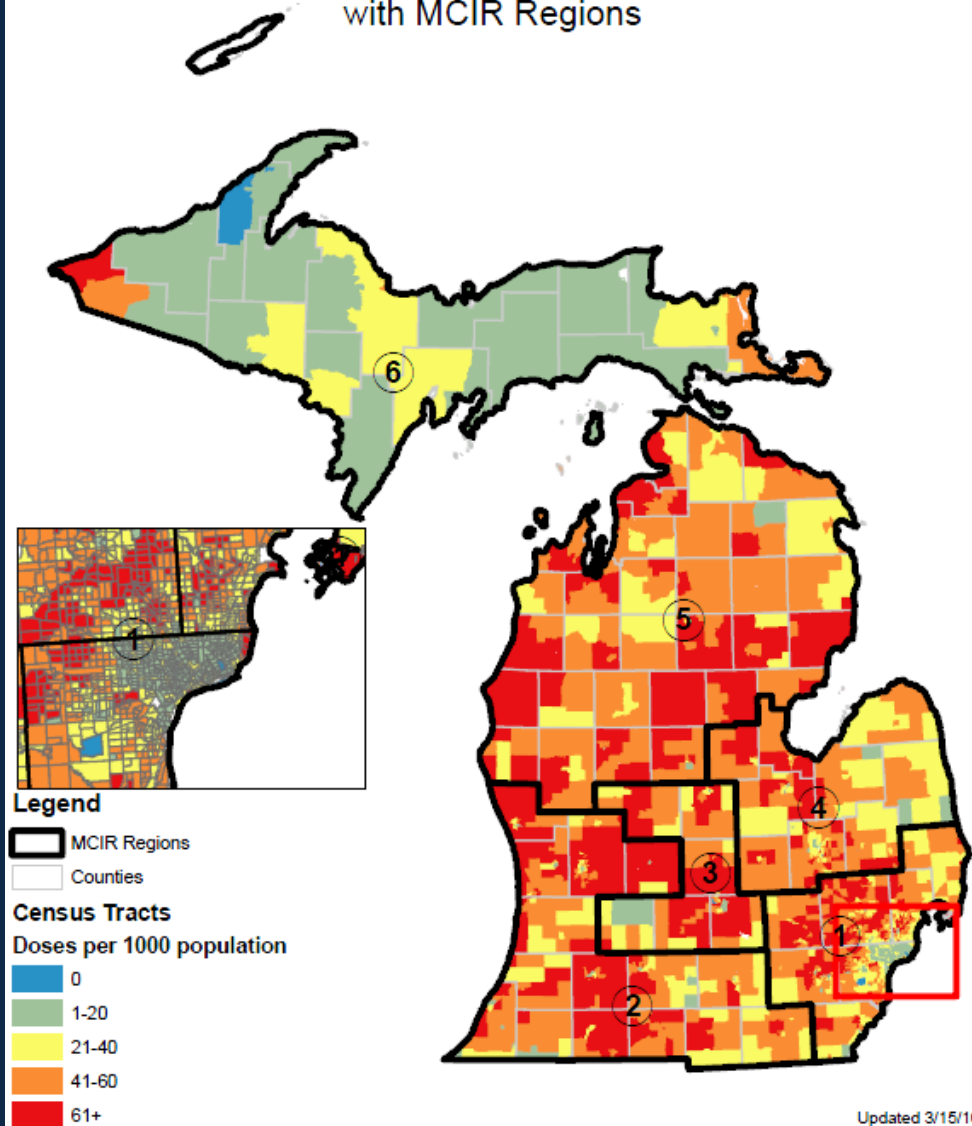


MCIR Regions

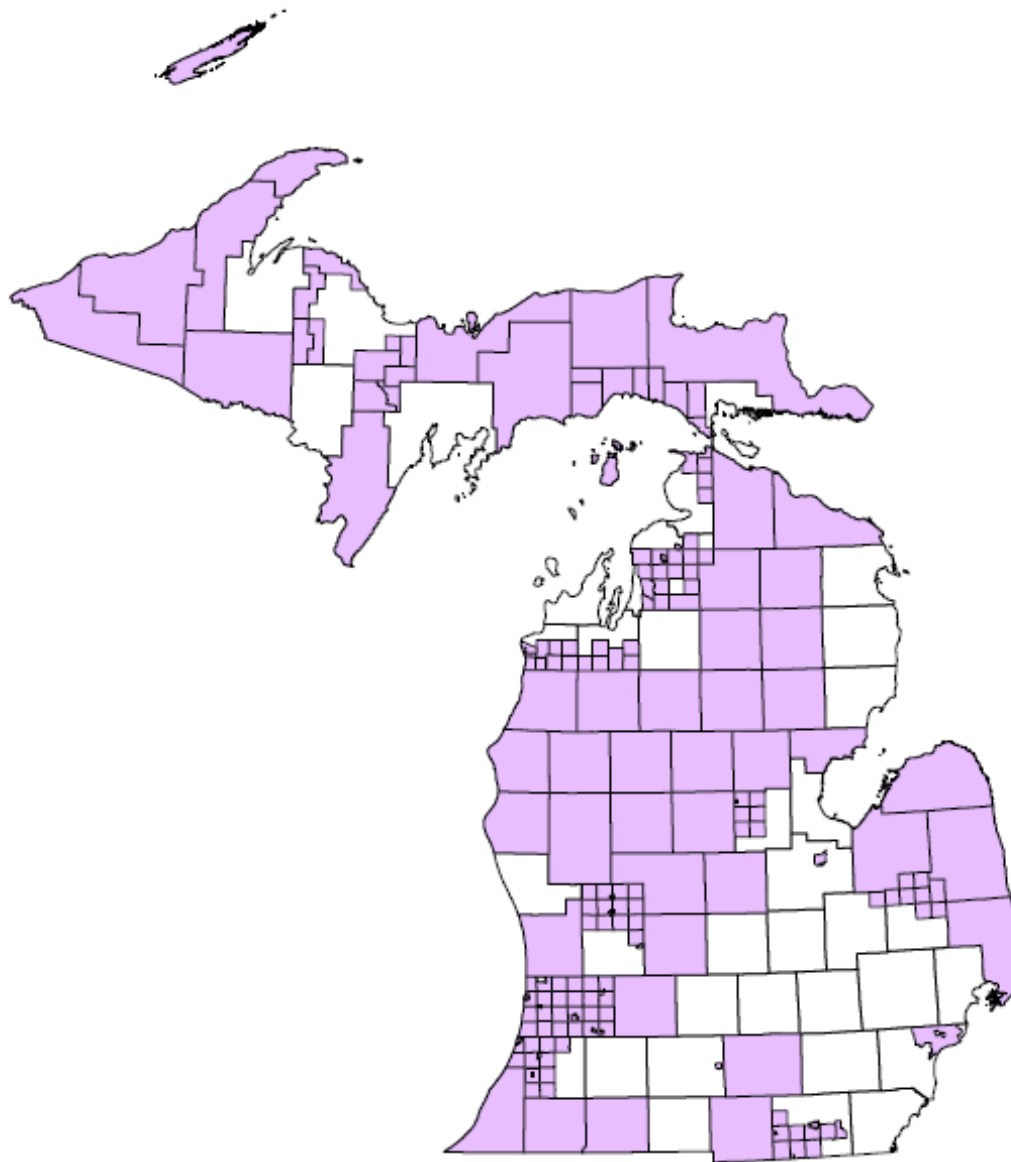


MCIR Regions

Retail Pharmacy Immunization Doses
per 1000 Census Tract Population
September 2014 - February 2015
with MCIR Regions

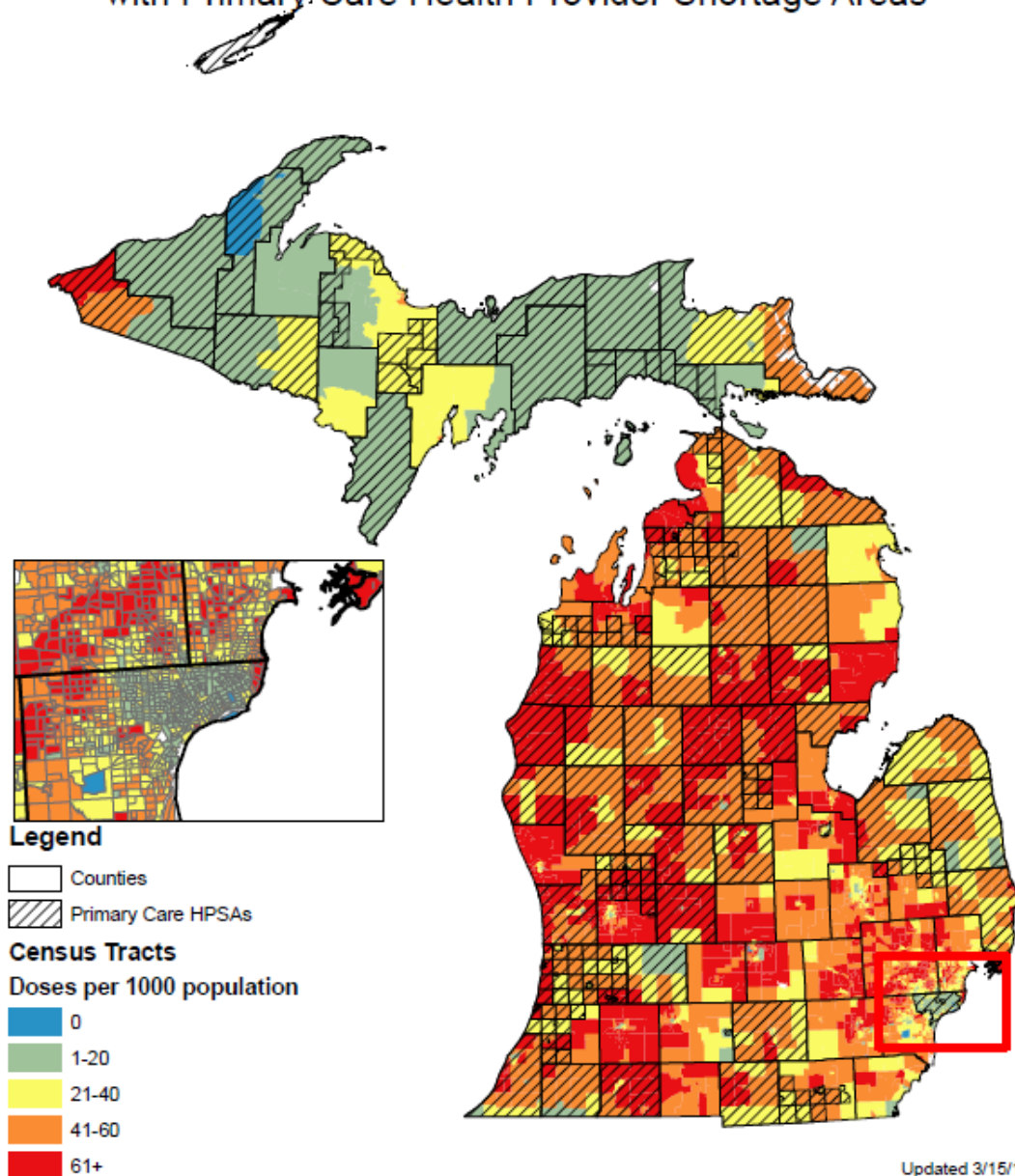


Primary Care Health Provider Shortage Areas (HPSAs) Michigan



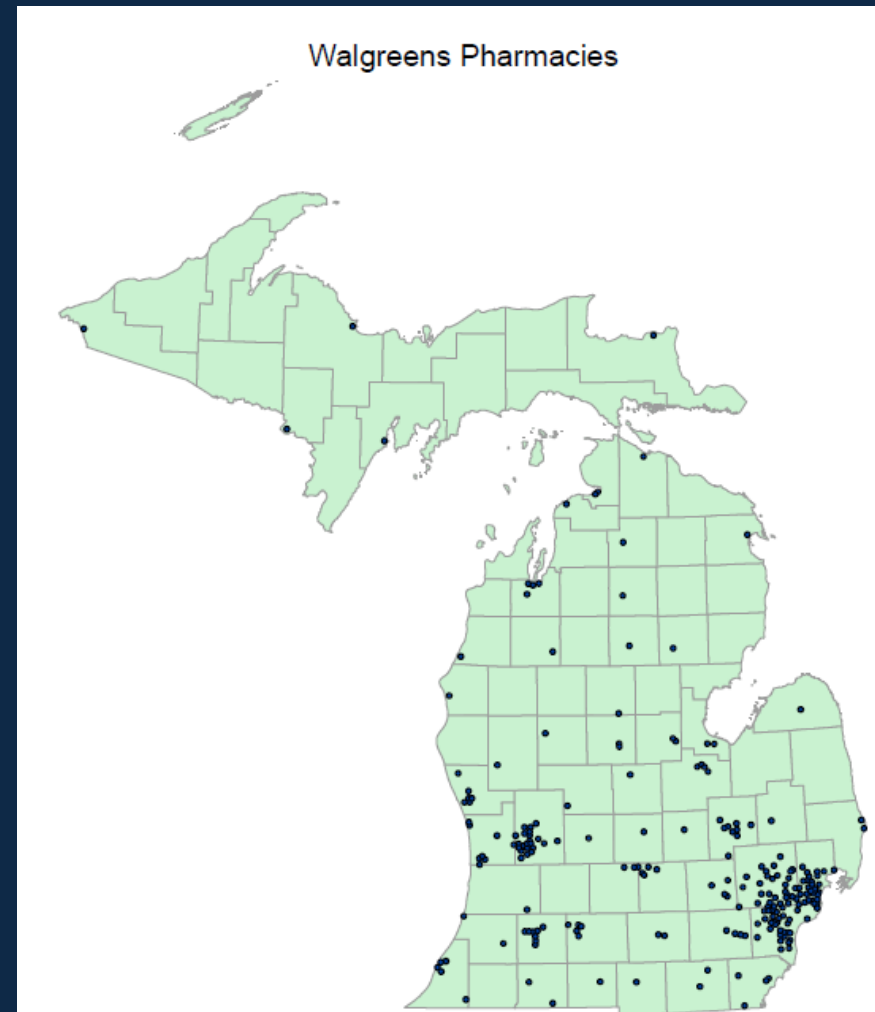
Updated 3/4/16

Retail Pharmacy Immunization Doses
per 1000 Census Tract Population
September 2014 - February 2015
with Primary Care Health Provider Shortage Areas



Subanalysis: Background

- Walgreens Pharmacies
 - HL7 reporting to MCIR began Oct. 24, 2013
 - First retail pharmacy to go live with HL7 in MCIR
 - 235 sites went live with HL7 in 2013-14

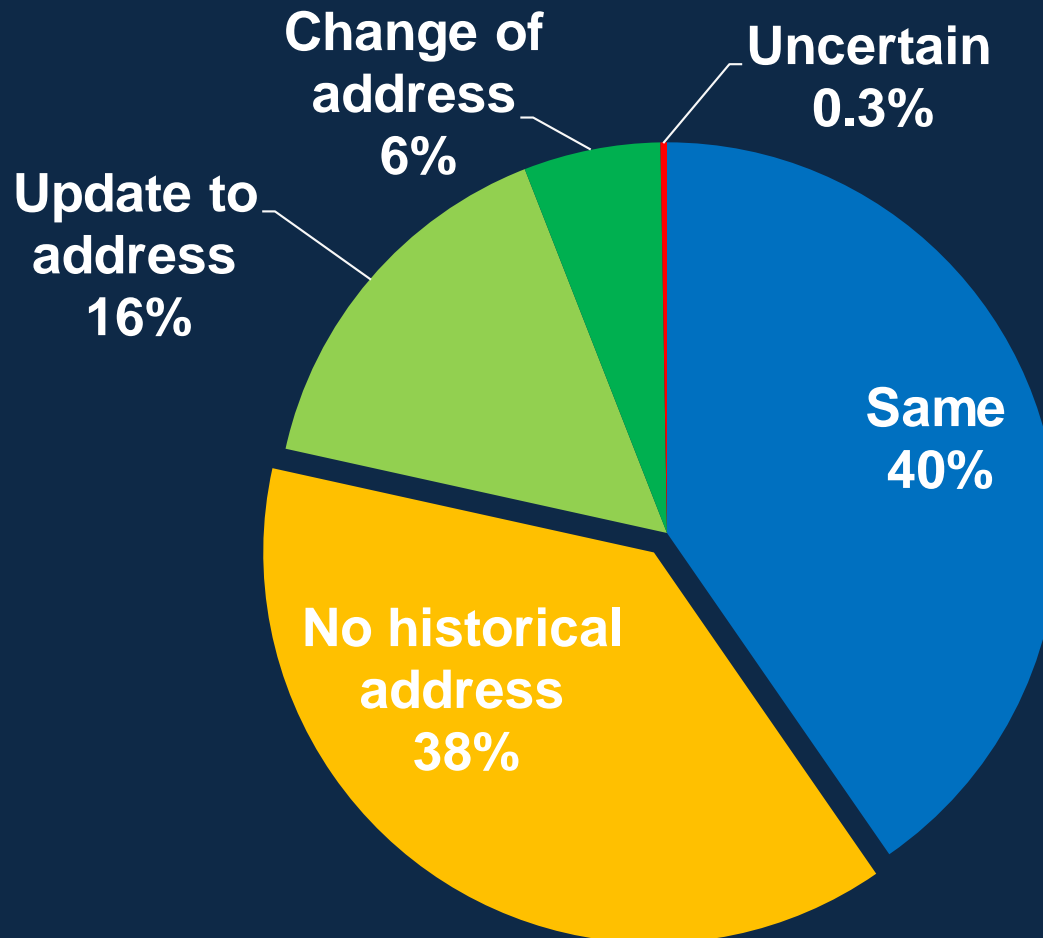


Subanalysis: Methods

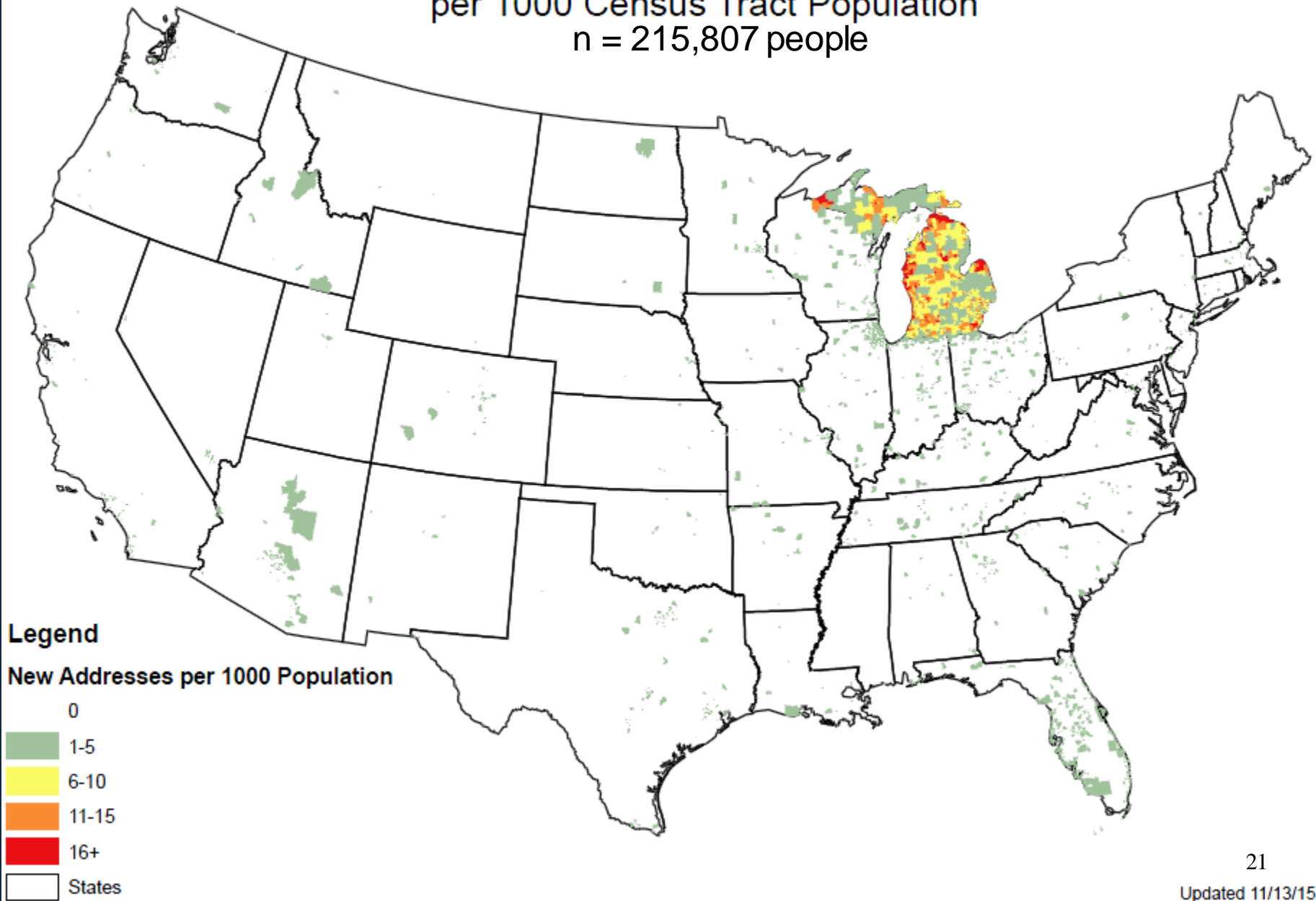
- MCIR data from Walgreens immunizations
 - All patients who had immunizations entered into MCIR at Walgreens pharmacies during the 2013-14 flu season
- Patient address & phone number changes
 - Per 1000 census tract population, and as percent of immunizations
 - Stratified by:
 - Geographic area
 - Age
 - HL7 status

Subanalysis Results: No Historical Address

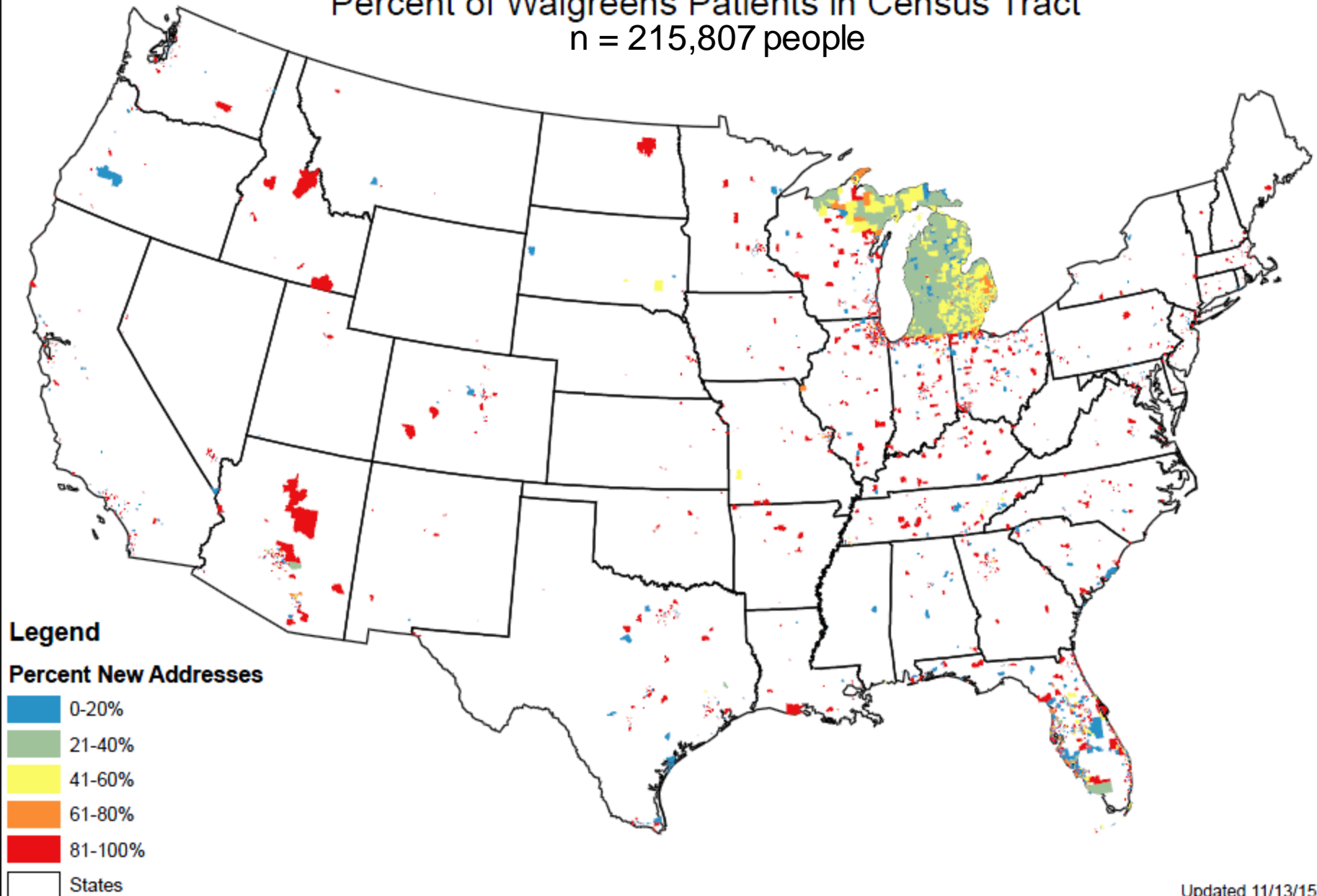
- N = 215,807 people



Walgreens Patients with no Historical Address in MCIR
September 2013 - February 2014
per 1000 Census Tract Population
n = 215,807 people

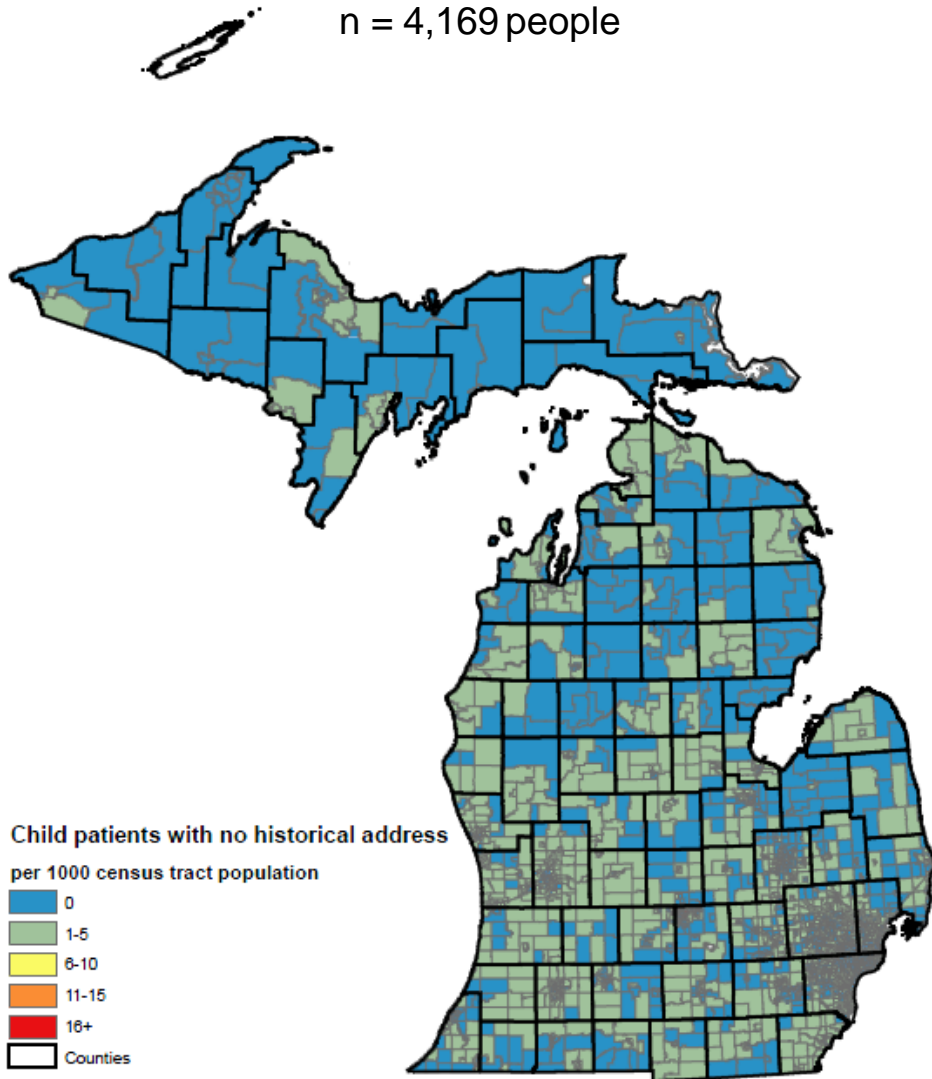


Walgreens Patients with no Historical Address in MCIR
September 2013 - February 2014
Percent of Walgreens Patients in Census Tract
n = 215,807 people



Kids

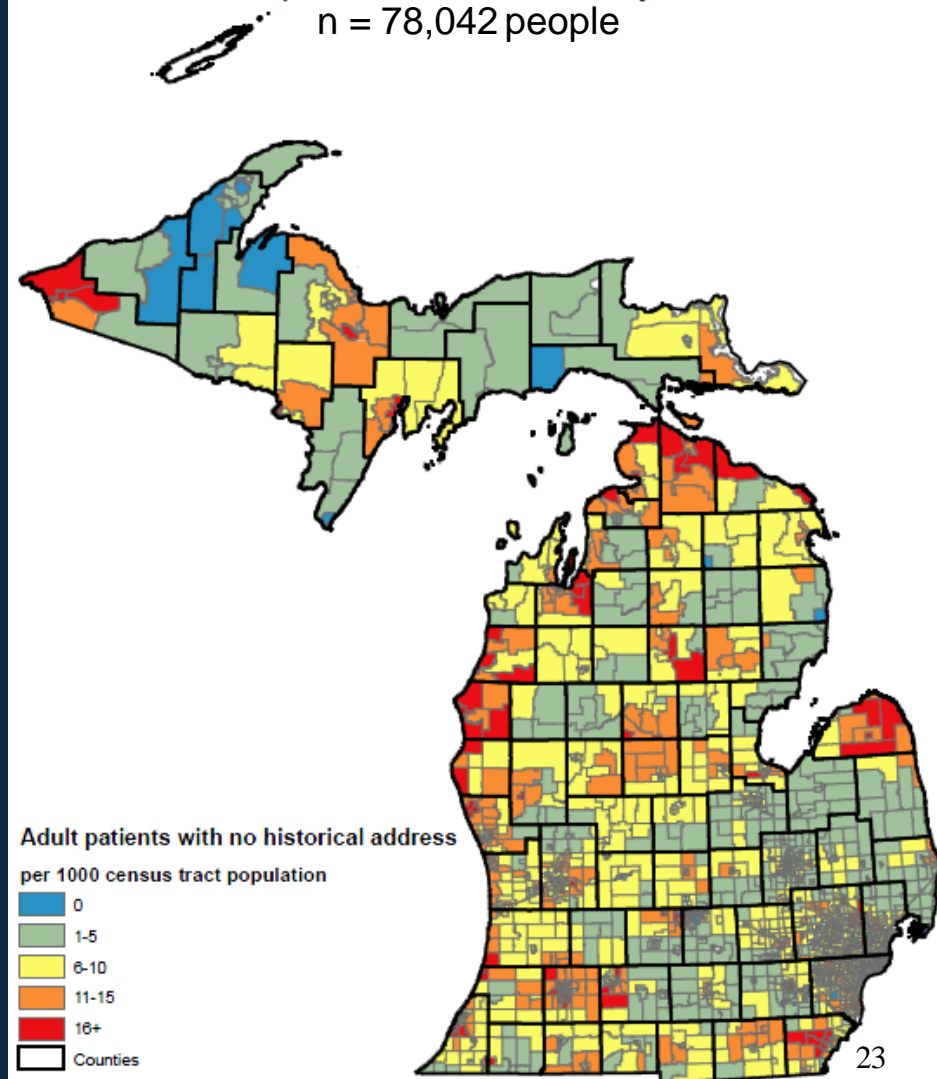
Michigan Children with No Historical Address
who Received Immunizations at Walgreens Pharmacies
September 2013 - February 2014
n = 4,169 people



Updated 3/15/16

Adults

Michigan Adults with No Historical Address
who Received Immunizations at Walgreens Pharmacies
September 2013 - February 2014
n = 78,042 people



Updated 11/9/15

Non-HL7

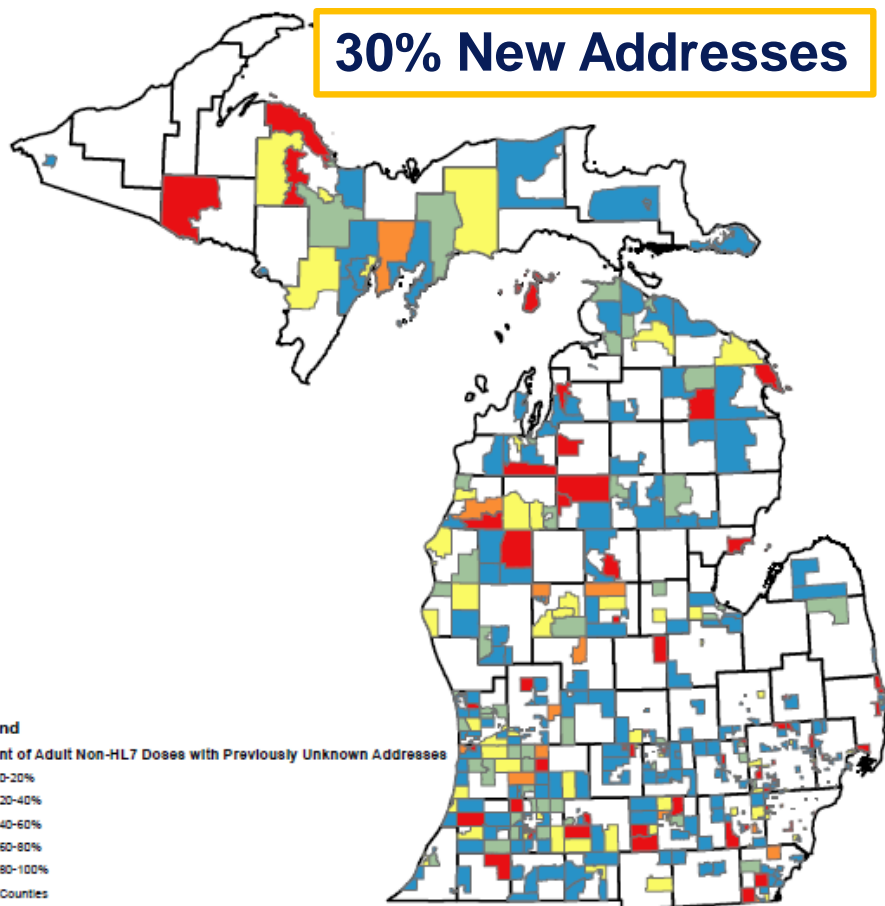
Adults

HL7

Walgreens Patients with no Historical Address in MCIR
September 2013 - February 2014
Percent of Adult Non-HL7 Doses Reported

31,275 New Addresses
103,863 All Non-HL7 Adults

30% New Addresses

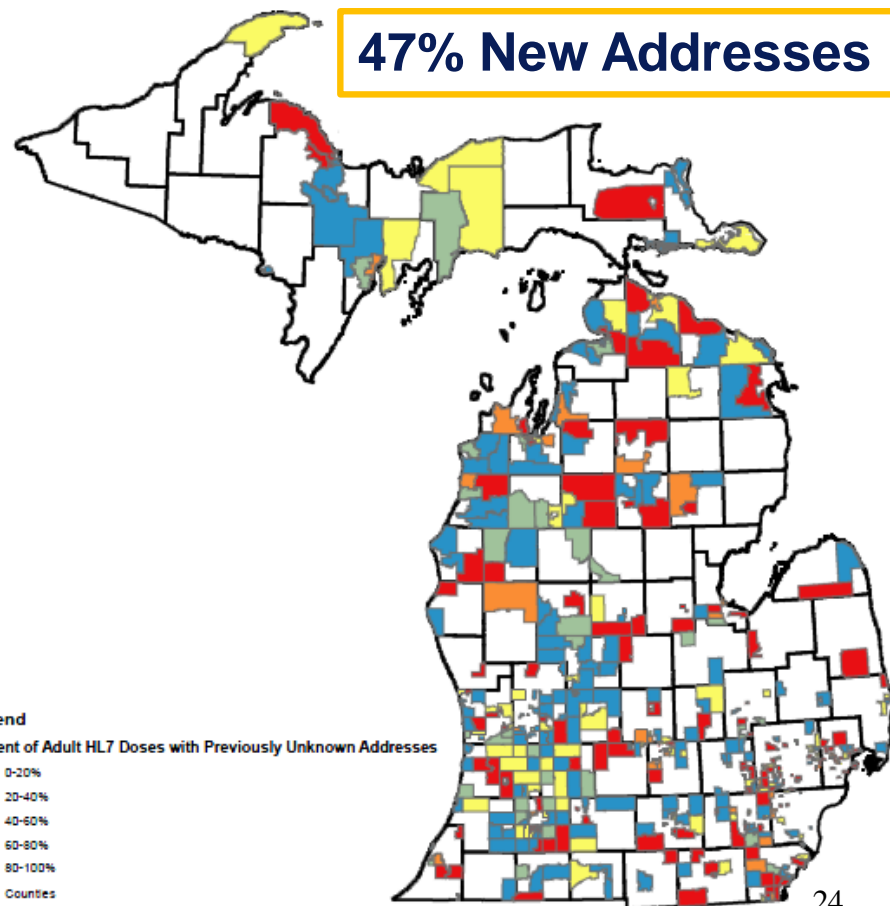


Updated 3/14/16

Walgreens Adults with no Historical Address in MCIR
September 2013 - February 2014
Percent of Adult HL7 Doses Reported

46,873 New Addresses
100,023 All HL7 Adults

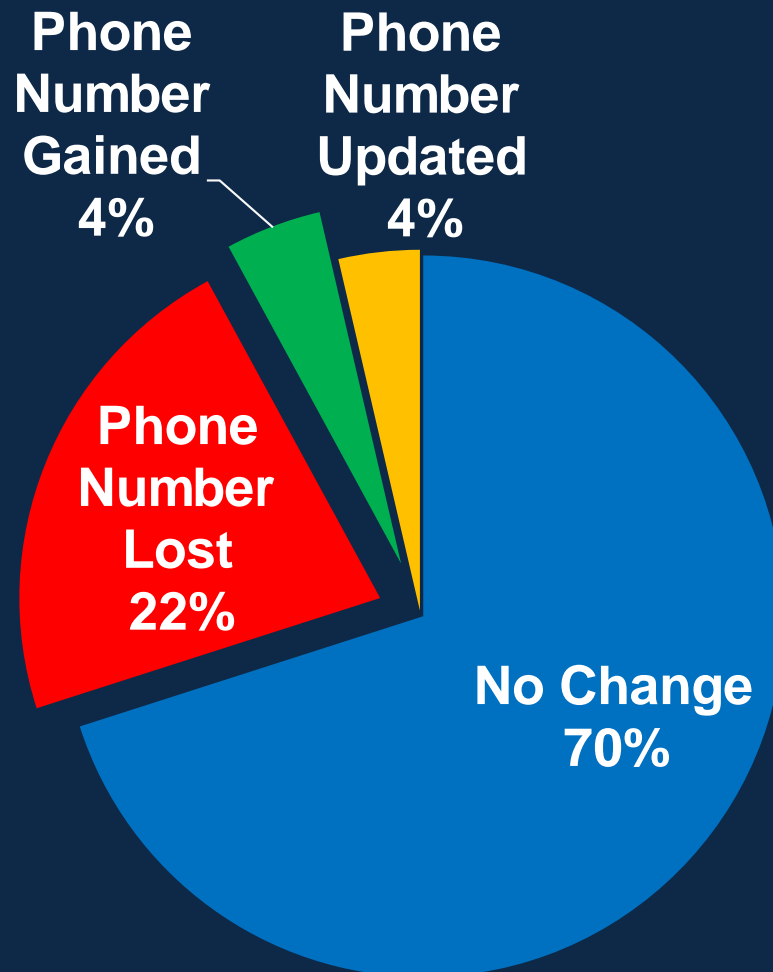
47% New Addresses



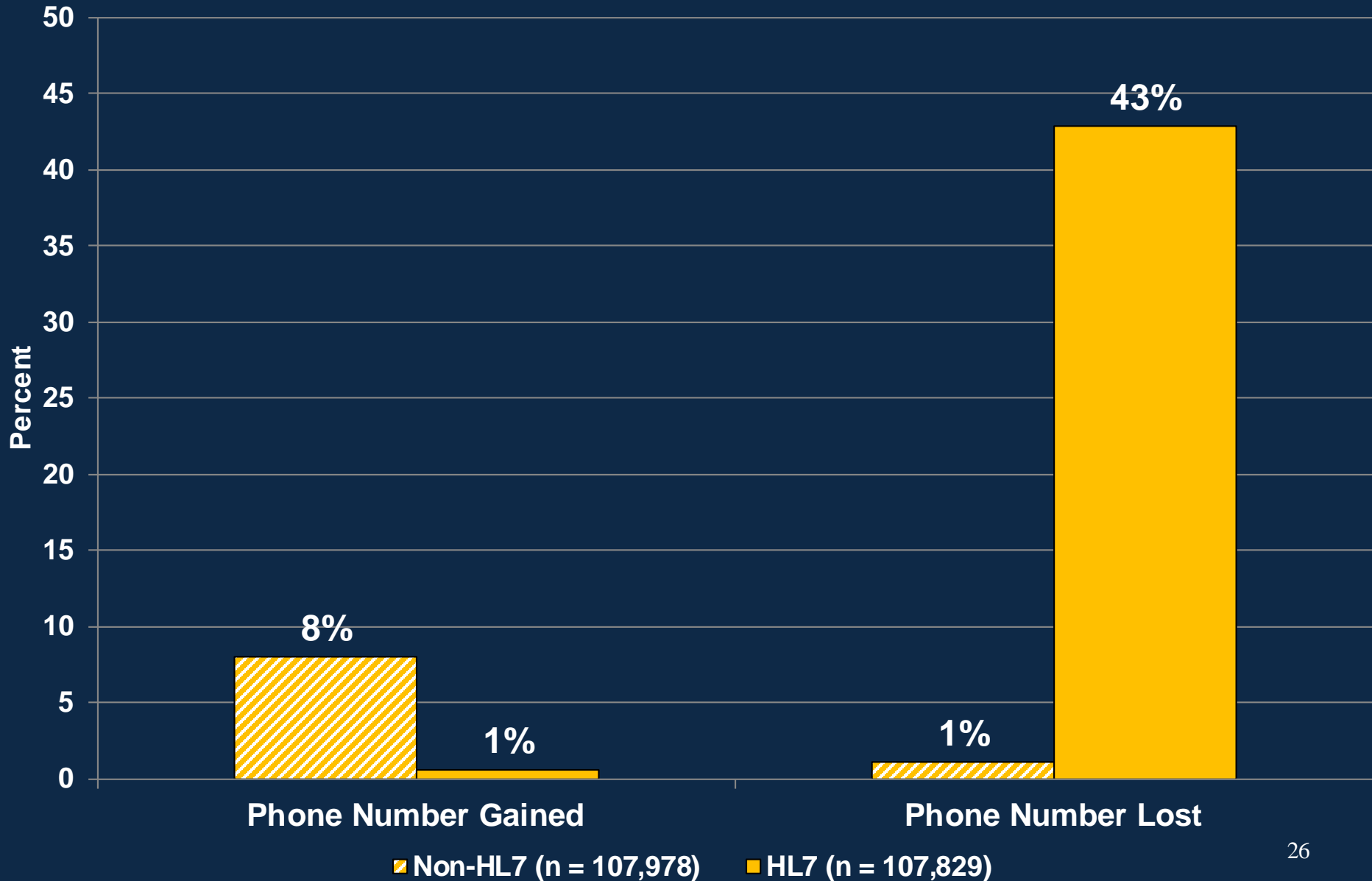
Updated 3/14/16

Subanalysis Results: Phone Number Gained/Lost

- N = 215,807 people



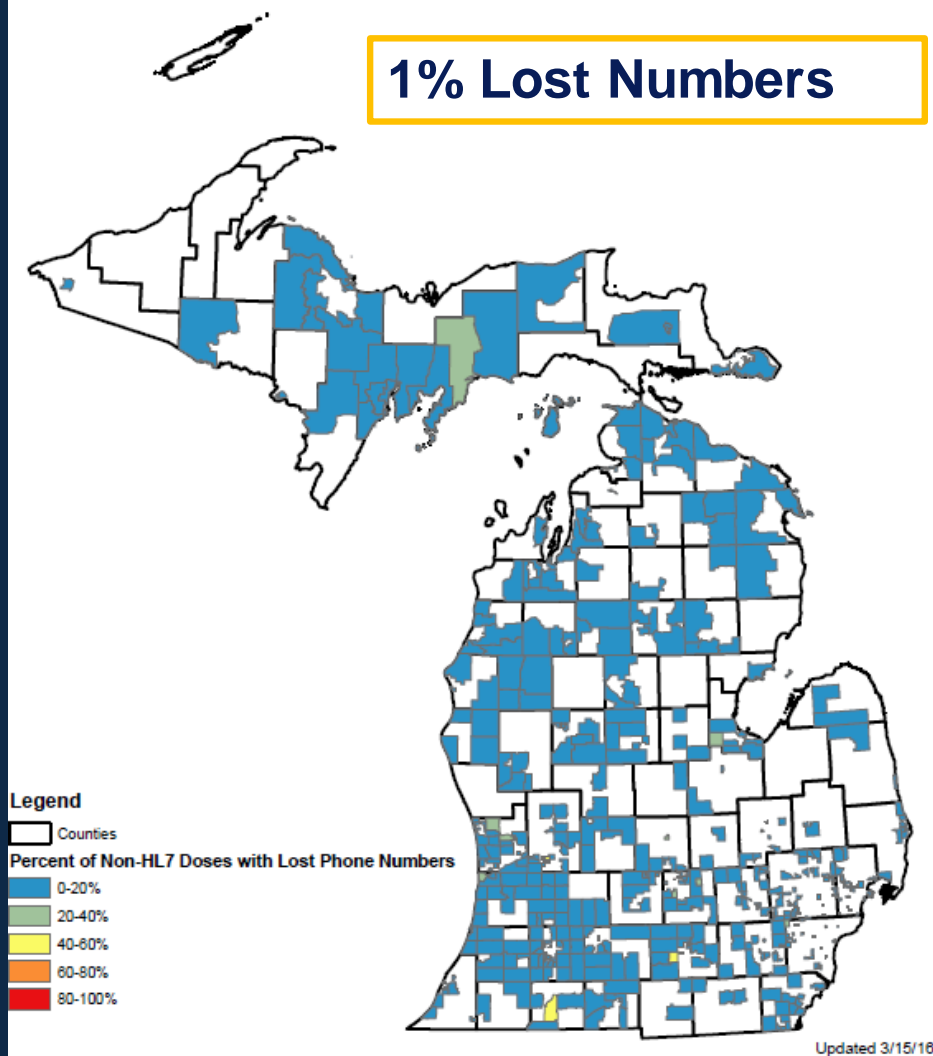
Phone Number History Gain or Loss to MCIR By Reporting Method



Non-HL7

Walgreens Patients whose
Phone Numbers Changed from Known to Unknown in MCIR
September 2013 - February 2014
Percent of Non-HL7 Doses Reported

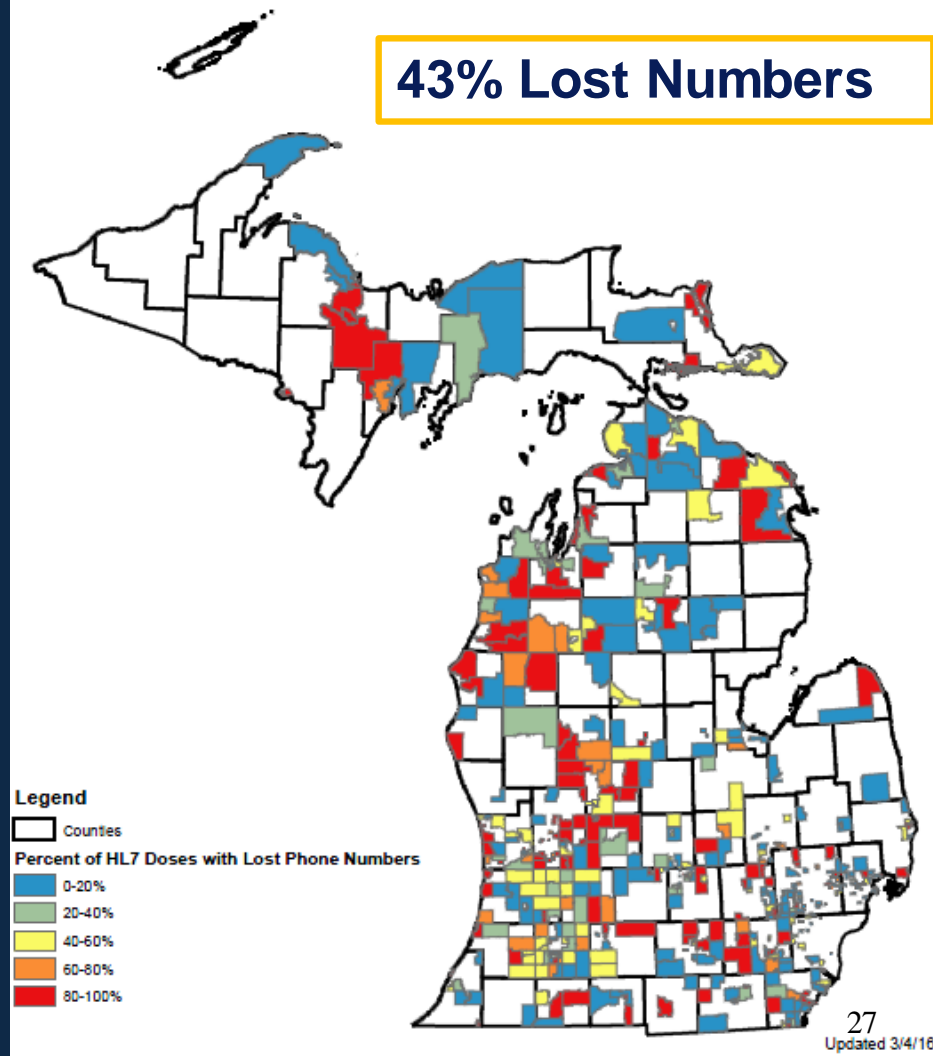
1% Lost Numbers



HL7

Walgreens Patients whose
Phone Numbers Changed from Known to Unknown in MCIR
September 2013 - February 2014
Percent of HL7 Doses Reported

43% Lost Numbers



Conclusions: Data Quality Analysis

- Completeness of MCIR data has increased with the advent of HL7 immunization reporting to MCIR
 - Reported adult immunizations have increased
- Walgreens Pharmacies showed mixed results for completeness of contact information following HL7 implementation
 - More addresses have been added to MCIR
 - More phone numbers have been lost to MCIR

Conclusions: GIS

- GIS can help evaluate timeliness, completeness, and accuracy of MCIR HL7 messages
- GIS may assist regional staff in identifying and prioritizing opportunities for improvement

Public Health Implications

- Benefits of GIS approach:
 - Enables comparison of immunizations to other geographically oriented features
 - Facilitates communication with the public and stakeholders
 - Identifies areas of concern in cases of pandemic or reminder/recall

Acknowledgements

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