

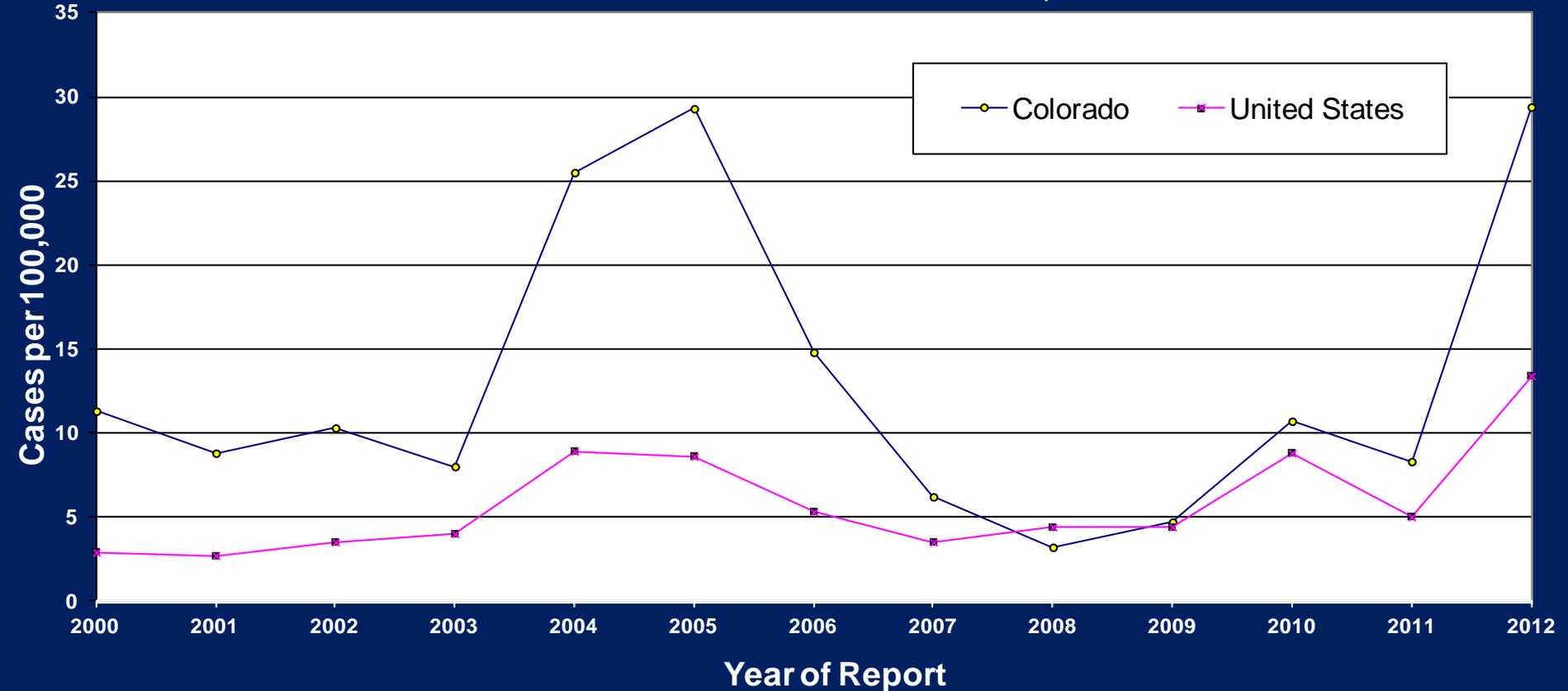
# **2012 Increase in Colorado Pertussis Cases: Epidemiology and Public Health Response**

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# Background

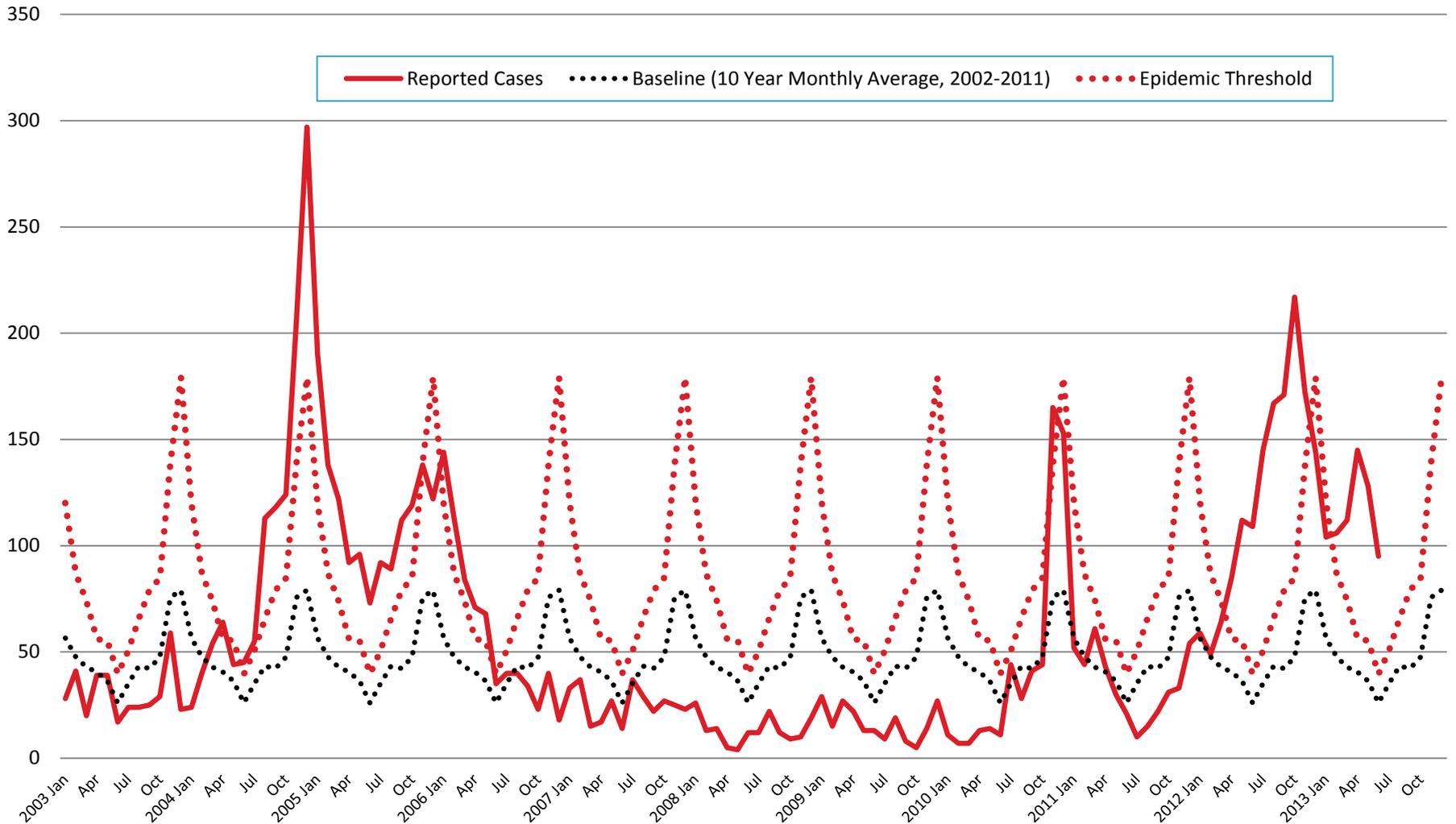
- During 2012, CDPHE observed a steady increase in reports of pertussis.
- A total of 1505 cases were reported in 2012.
- This represents a sharp increase from a 5 year average of 324 cases/year for 2007-2011 (4.7X).

# Rates of Reported Pertussis Cases by Year of Report, Colorado and United States, 2000 - 2012



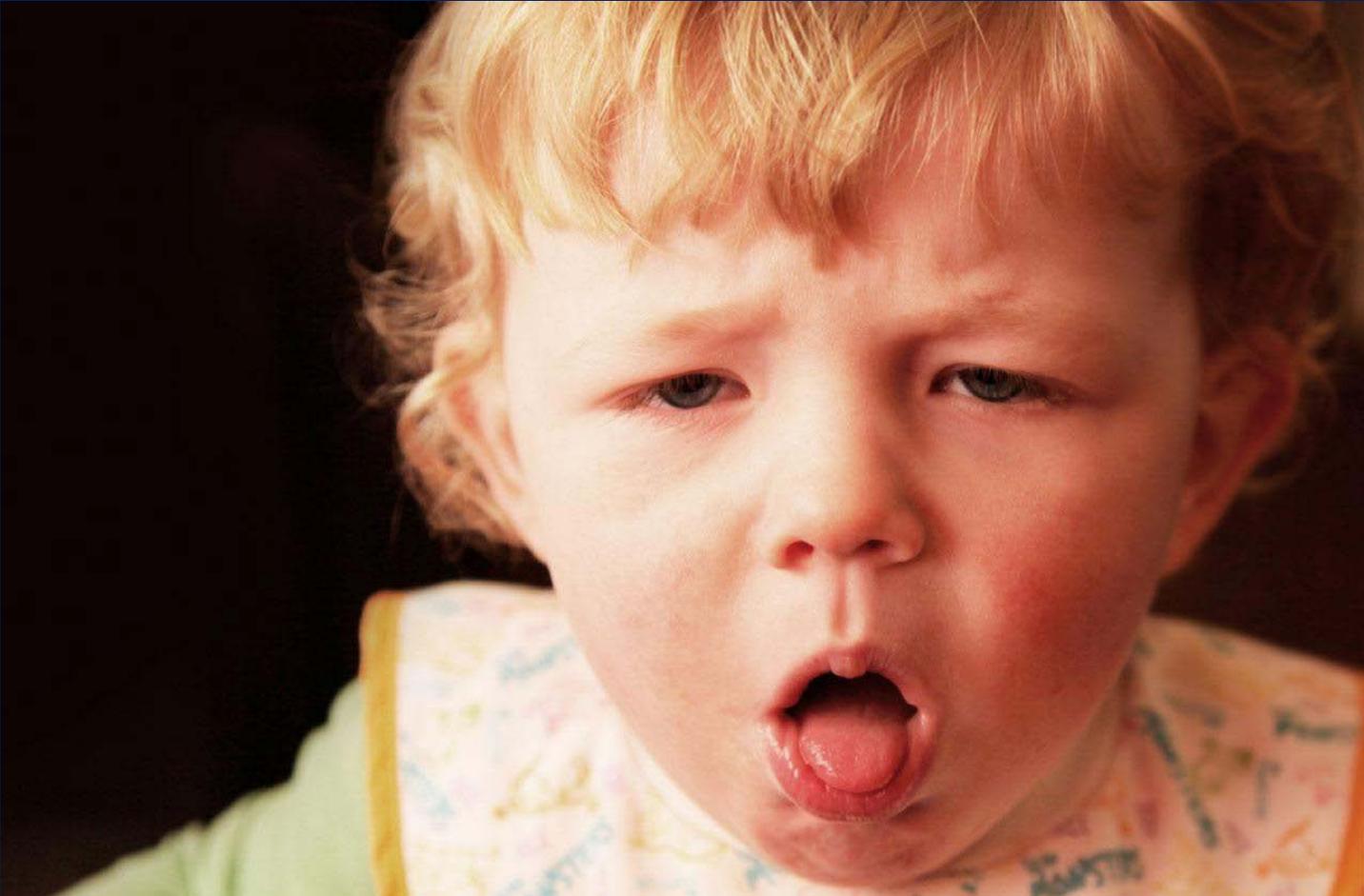
- Increased pertussis cases or outbreaks were reported in the majority of states during 2012.
- As of January 10, 2013, 49 states and Washington, D.C. had reported increases in disease compared with the same time period in 2011.
- In particular, Wisconsin, Vermont, Minnesota and Washington reported higher than average rates of pertussis in 2012.

# Reported Pertussis Cases by Month and Year with Projected Baseline and Epidemic Thresholds, Colorado, 2003-2011 and 2012/2013

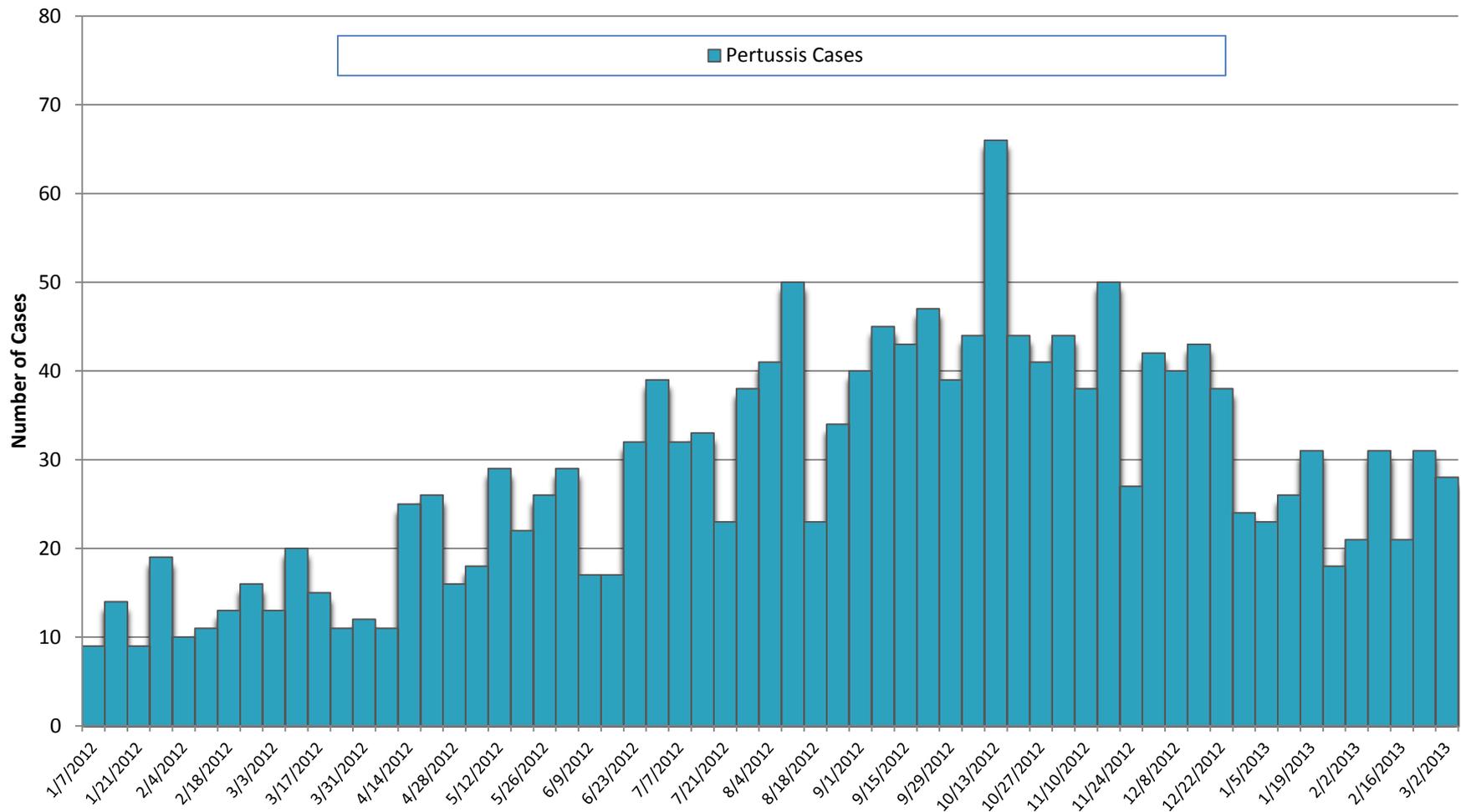


Updated 7/15/2013

# Observations



## Reported Pertussis Cases by Week of Report, Colorado, 2012/2013

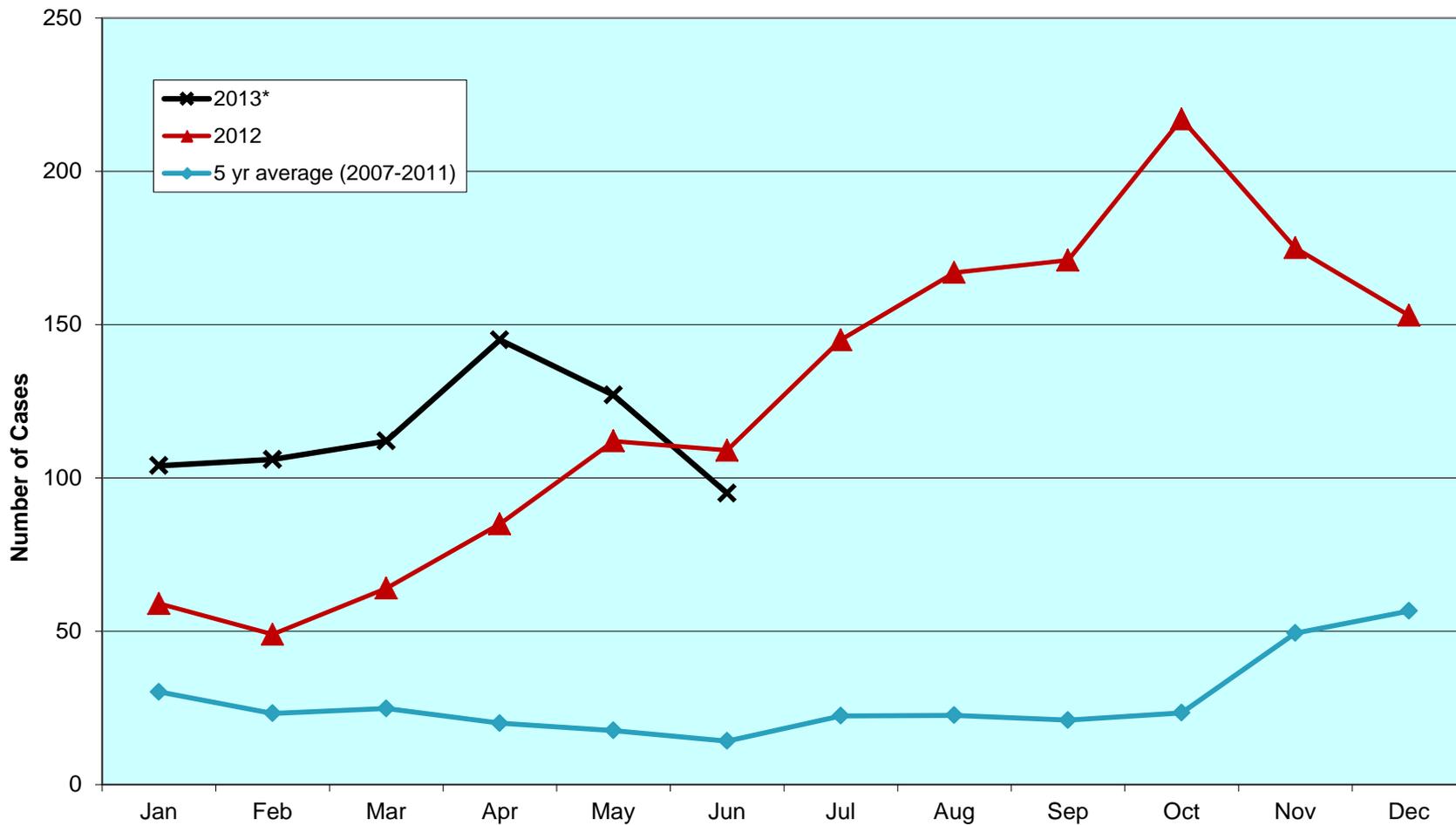


\*Current data are provisional 3/11/2013. Numbers may change as case investigations are completed.

**Week Ending**

Source: Colorado Department of Public Health and Environment

### Pertussis Cases by Month of Report, Colorado Provisional 2013 (year-to-date) vs. 2012 vs. 5-Year Average (2007-2011)

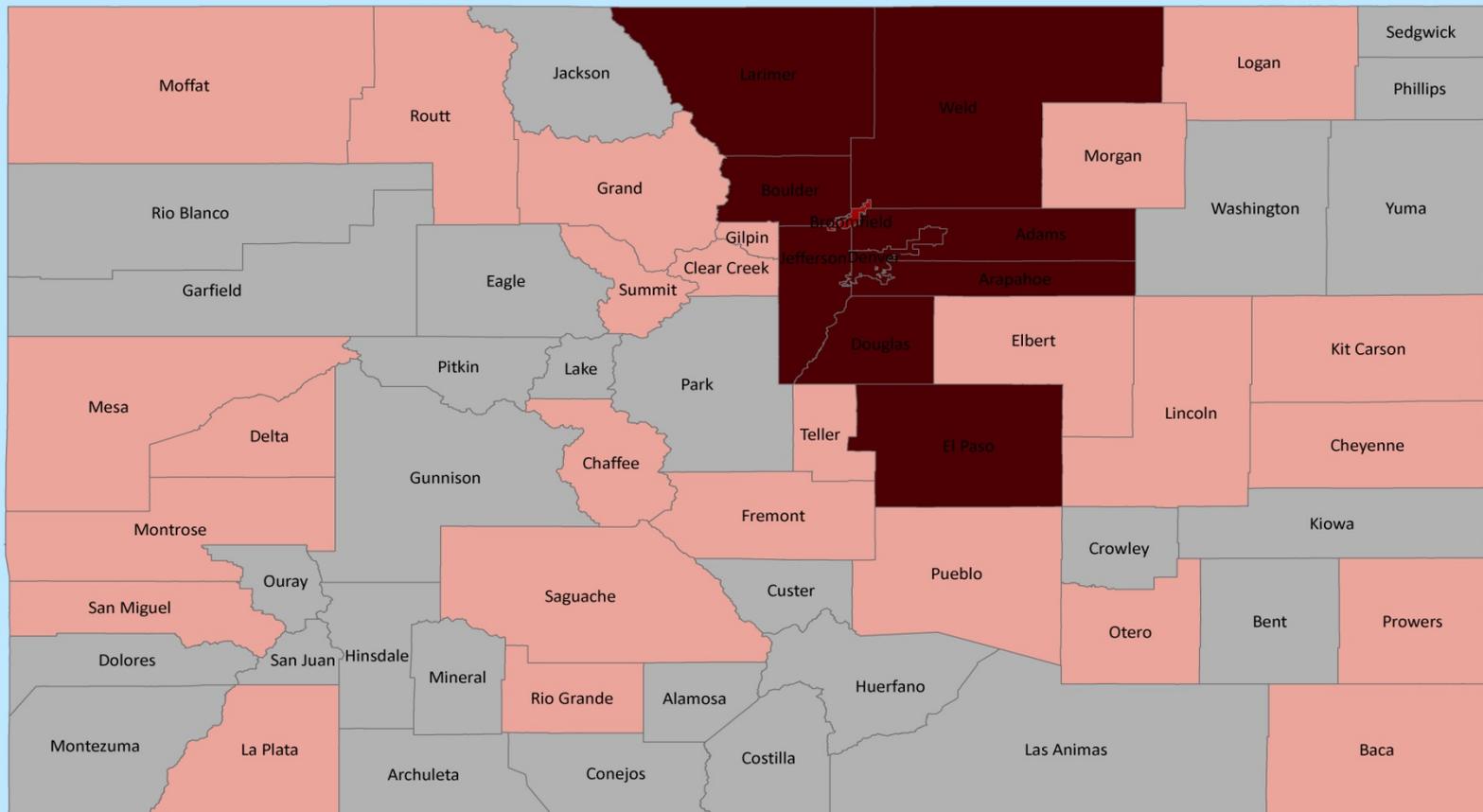


\*Current data are provisional. Numbers may change as case investigations are completed.

Month of Report

June 30, 2013

# Total Confirmed and Probable Pertussis Cases By County, Colorado: 2012



NAD 1983  
Created 01/23/2013

## Legend

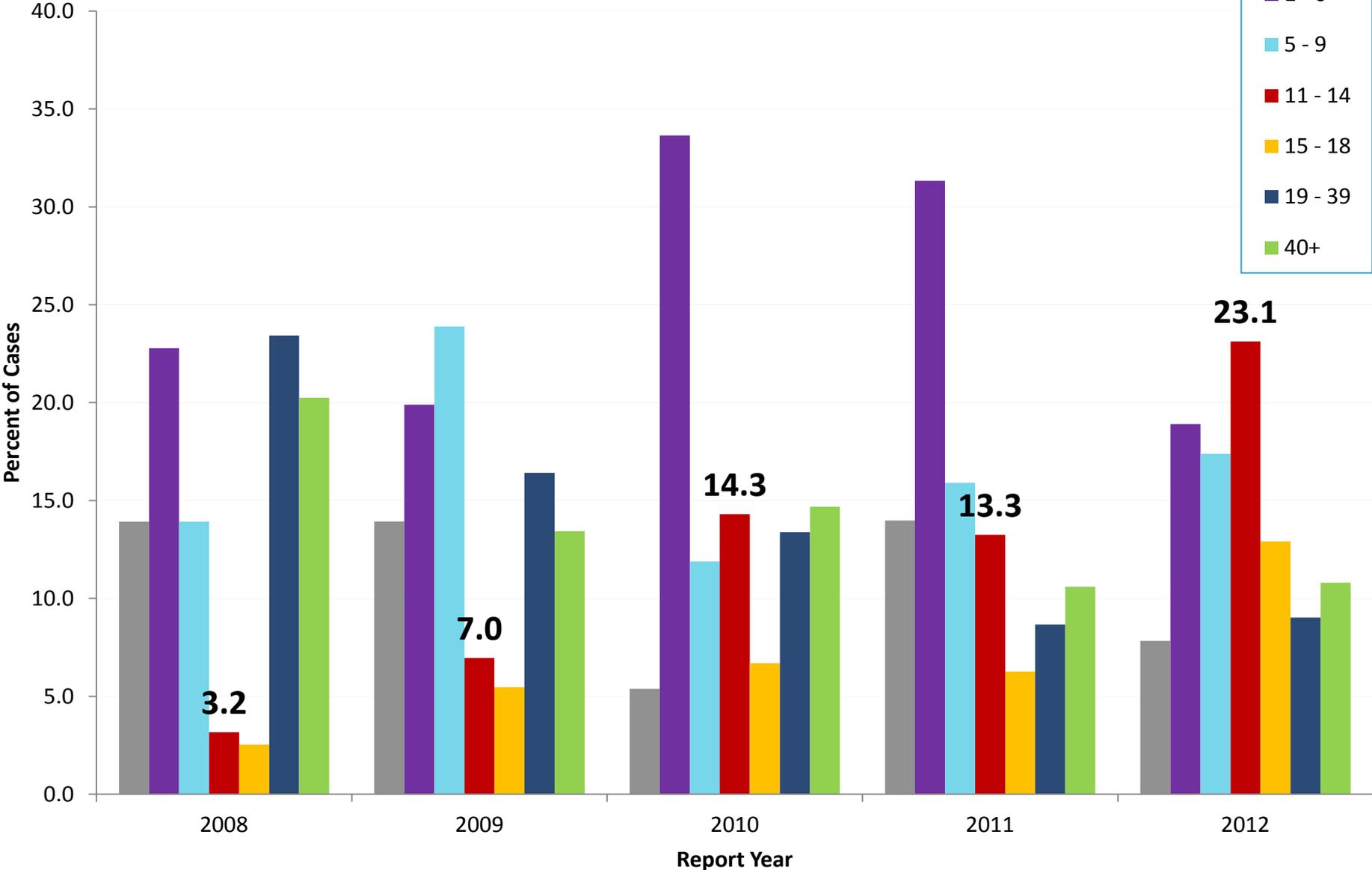
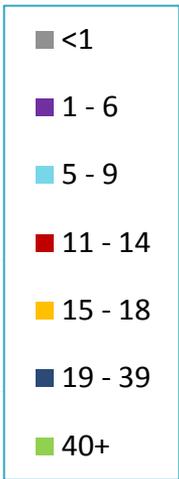
### Case Totals

- None
- 1 to 25
- 25 to 50
- 50 to 75
- 75 to 100+

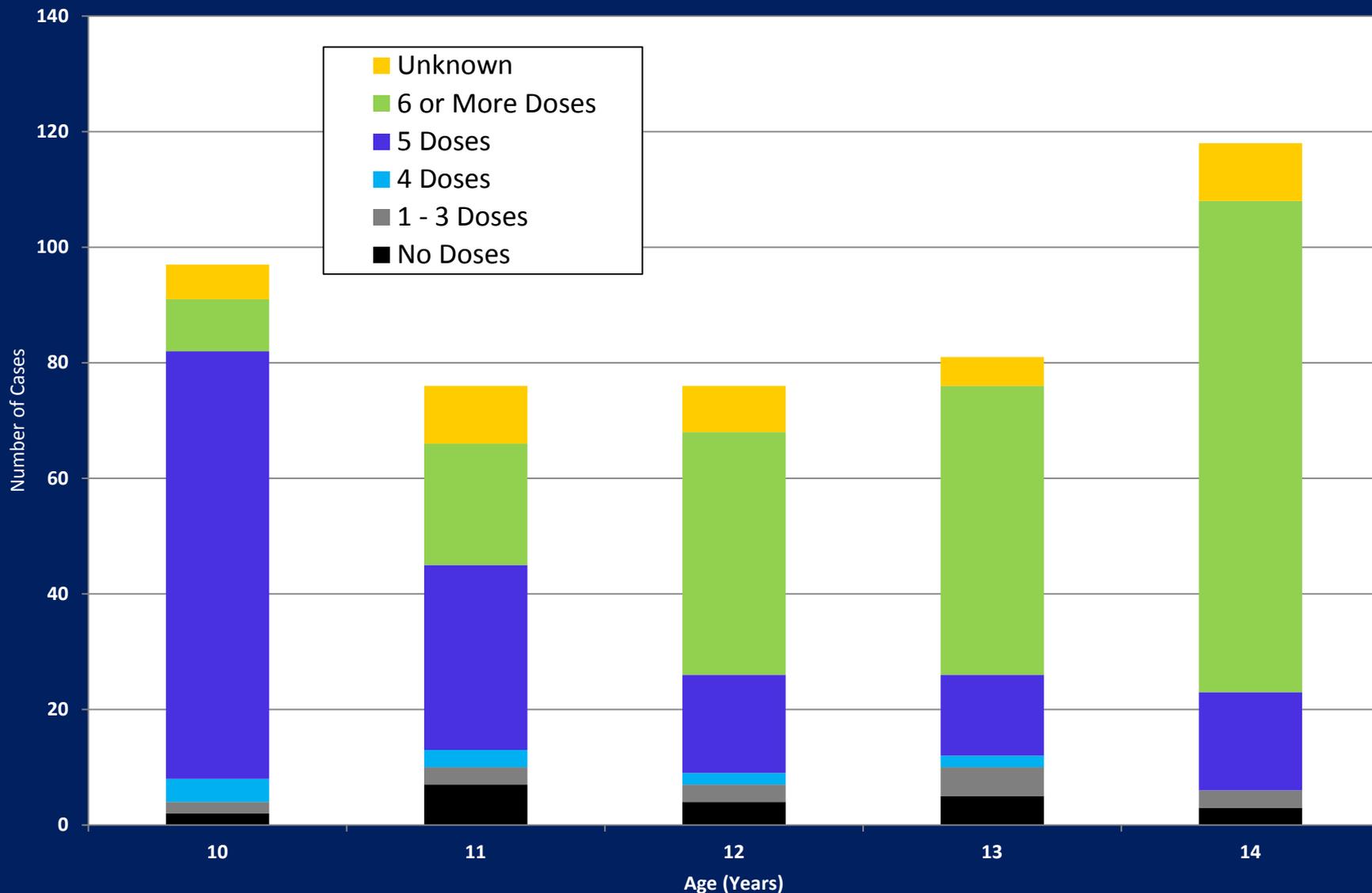
**Numbers and Rates of Reported Pertussis Cases by Age Group,  
Colorado, 01/01/2012 - 12/31/2012\***

<b>Age Group (years)</b>	<b>Number of Cases</b>	<b>Percent of Cases</b>	<b>Rate per 100,000 population</b>
<b>&lt;6 months</b>	76	5.0	228.5
<b>6 - 11 months</b>	42	2.8	126.3
<b>1 - 6</b>	283	18.8	68.0
<b>7 - 10</b>	263	17.5	93.5
<b>11 - 14</b>	350	23.3	129.2
<b>15 - 18</b>	194	12.9	70.4
<b>19 - 39</b>	134	8.9	8.9
<b>40 - 64</b>	144	9.6	8.4
<b>65+</b>	19	1.3	3.3
<b>TOTAL</b>	1505	100.0	29.4

# Percent of Reported Pertussis Cases by Age Group and Report Year, Colorado, 2008-2012



# Reported Cases of Pertussis by Selected Single Year of Age and Doses of Pertussis Vaccine, Colorado, 1/1/2012 - 12/31/2012



- The increasing number of cases in adolescents suggests immunity wanes after Tdap vaccination in age groups fully vaccinated with acellular vaccines.
- Acellular and whole-cell vaccines both have high efficacy during the first 2 years after vaccination, but recent changes suggest diminished duration of protection in those given acellular vaccine (DTaP) compared to those given DTP vaccine.

- Whole cell pertussis vaccines (DTP) introduced in the 1940s drastically reduced the incidence of pertussis in the US.
- Concerns about adverse events associated with DTP led to the gradual replacement of DTP doses with DTaP doses.
- By 1997, the DTP doses in the primary series were completely replaced with DTaP vaccine.

- Unvaccinated children have an eightfold greater risk for pertussis than children fully vaccinated with DTaP.
- Vaccinated children can develop pertussis, but they are less infectious, have milder symptoms, shorter illness duration, and are at reduced risk for severe outcomes.
- Vaccination continues to be the single most effective strategy to reduce morbidity and mortality caused by pertussis.
- Vaccination of pregnant women and contacts of infants protects infants too young to be vaccinated.

# Prevention and Control of Pertussis: Objectives

- **Primary:** Preventing death and serious complications in individuals at increased risk of severe and/or complicated disease, including infants <12 months
- **Secondary:**
  - Limit transmission in outbreak setting
  - Limit further spread and duration of transmission within closed communities
  - Decrease morbidity in affected populations
  - Lower risk of dissemination to unaffected groups within an outbreak
- **Vaccination is the safest and most effective tool we have to achieve our objectives.**

# Action



# Healthcare Provider Outreach

- Health Alert (HAN) for medical providers to consider a diagnosis of pertussis in patients with a paroxysmal cough.
- Recommendations on who to test/not test.
- Make sure patients and health care staff are up-to-date on pertussis vaccination, especially if they have close contact with infants.
- Recommend Tdap instead of Td or TT.

# Schools and Childcare Outreach

- Make sure students and staff are up-to-date on vaccination.
- Refer students who may have pertussis to their primary care provider.
- Students who are sick should stay home so they don't transmit their illness to others.

# STATE OF COLORADO

John W. Hickenlooper, Governor  
Karin McGowan  
Interim Executive Director

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Located in Glendale, Colorado      (303) 692-3090  
<http://www.cdphe.state.co.us>



Colorado Department  
of Public Health  
and Environment

## **Pertussis Information and Guidelines for Schools and Child Care Settings**

August 2013

The state of Colorado is experiencing a record number of cases of pertussis (also known as whooping cough). During 2012, 1505 cases of pertussis were reported in Colorado, with a rate of 29.4/100,000 population. In comparison, an average of 324 cases a year was reported during 2007-2011. The most recent year during which Colorado experienced a similar increase in numbers of pertussis cases was 2005; during which there was a total of 1383 cases with a rate of 29.7/100,000 population. There was one pertussis fatality in 2012 which was the first since 2005, when 2 infants died of the disease. So far in 2013, there have been 664 cases of pertussis reported through June 22 with a rate of 13.0/100,000, and are distributed throughout 31 Colorado counties. Most cases are reported from Jefferson County, (n=120), Boulder County (n=107), Arapahoe County (n=68), Denver (n=63), Adams County (n=61), El Paso County (n=45), Weld County (n=39), Douglas County (n=35) and Larimer County (n=31). Rates of pertussis continue to be highest among infants < 6 months of age, followed by children 11-14 years and infants 6-11 months of age. Of the 32 cases < 6 months of age reported since January 1, 2013, 9 cases (28%) were hospitalized.

For more information on pertussis, please go to:

<http://www.colorado.gov/cs/Satellite/CDPHE-DCEED/CBON/1251611026285>

Colorado Immunization Law requires schools and child cares to review and collect up-to-date immunization records for children and adolescents, and it is strongly recommended that staff is up-to-date on their immunizations as well. Immunizations offer protection for students and others in the community, particularly infants, who are most at risk of hospitalization and death from pertussis. It is extremely important to assure persons who have contact with infants are vaccinated against pertussis to protect infants who have not yet received the vaccine series. Because of the epidemic levels of pertussis, the Colorado Department of Public Health and Environment (CDPHE) is strongly recommending child care providers, school health officials and health care providers pay special attention to pertussis immunization status in addition to routine immunizations.

### **Clinical Pertussis Information**

- Incubation period: after exposure to pertussis, symptoms typically begin in 7-10 days.
- The illness typically progresses as follows:
  - Initial symptoms can include a runny nose, sneezing, low-grade fever, and mild cough which gradually become more severe over a period of 1-2 weeks.
  - The cough is characterized by coughing fits which may be followed by a high-pitched inspiratory whoop, vomiting, and/or a pause in breathing. This severe cough usually lasts 1-6 weeks and then gradually improves over a few weeks.
  - Note that young infants can present without classic cough symptoms and may present with gasping or apnea only.

# Guidance for Local Health Departments

- The primary objective of Postexposure prophylaxis (PEP) should be to prevent death and serious complications from pertussis in individuals at increased risk of severe disease.
- Extensive contact tracing and broad scale use of PEP among contacts may not be an effective use of limited public health resources.

# Guidance for Local Health Departments

- **Prioritize investigations** by assigning the highest priority to those at high-risk or who may expose those at highest risk.
- Facilitate evaluation, testing and treatment and education for those HH and high-risk contacts that are symptomatic.

# Guidance for Local Health Departments

- **Target PEP antibiotic use to those at high-risk of developing severe disease and to those who have close contact with those at high-risk of developing severe disease**
  - Infants
  - Women in their third trimester of pregnancy
  - Those with pre-existing health conditions
  - Contacts who themselves have close contact with the previously mentioned high-risk groups
  - All contacts in high-risk settings that include any of the previously mentioned high-risk groups
  - HH contacts



## Guidelines for Pertussis Postexposure Antimicrobial Prophylaxis and Public Health Investigations in Colorado

### Updated June 2013

The purpose of this document is to provide guidance to local public health agencies regarding pertussis postexposure prophylaxis (PEP) and to assist in the prioritization of pertussis investigations. The Pertussis Public Health Investigation algorithm at the end of this document is meant to assist local public health agencies with focusing on reducing transmission to those most at risk for severe complications or death from pertussis. The algorithm is not meant to be comprehensive of every situation encountered, and local public health agencies are encouraged to use their own judgment in prioritization. Regional epidemiologists and state health department staff are available for consultation.

### **Pertussis Postexposure Antimicrobial Prophylaxis**

The primary objective of postexposure antimicrobial prophylaxis (PEP) should be to prevent death and serious complications from pertussis in individuals at increased risk of severe disease. With increasing incidence and widespread community transmission of pertussis, **extensive contact tracing and broad scale use of PEP among contacts may not be an effective use of limited public health resources.** While antibiotics may prevent pertussis disease if given prior to symptom onset, there are no data to indicate that widespread use of PEP among contacts effectively controls or limits the scope of pertussis outbreaks.

Another important consideration is the overuse of antibiotics; the Colorado Department of Public Health and Environment (CDPHE) is supportive of promoting the judicious use of antibiotics. Given these considerations, CDPHE supports the Centers for Disease Control and Prevention recommendation of **targeting postexposure antibiotic use to persons at high risk of developing severe pertussis and to persons who will have close contact with those at high risk of developing severe pertussis.** CDPHE has modified the description of high risk and those having close contact to those at high risk to take into consideration specific Colorado situations.

Accordingly, CDPHE supports the following:

- **Providing PEP to all household contacts of a pertussis case.** Within families, secondary attack rates have been demonstrated to be high, even when household contacts are current with immunizations. Administration of antimicrobial prophylaxis to asymptomatic household contacts within 21 days of onset of cough in the index patient can prevent symptomatic infection.
- **Providing PEP to persons exposed to pertussis who are at high risk of severe illness or who will have close contact with a person at high risk of severe illness.** These include,
  - **Infants and women in their third trimester of pregnancy** -- severe and sometimes fatal pertussis-related complications occur in infants aged <12 months, especially among infants aged <4 months. Women in their third trimester of pregnancy may be a source of pertussis to their newborn infant.
  - **All persons with pre-existing health conditions that may be exacerbated by a pertussis infection (for example, but not limited to immunocompromised persons, patients with neuromuscular disease and moderate to severe lung disease including those with moderate to severe medically treated asthma)**

# General Public

- Press release
- Social media



Colorado Department  
of Public Health  
and Environment

# NEWS RELEASE

Office of Communications  
Colorado Department of Public Health and Environment

4300 Cherry Creek Dr. S.  
Denver, CO 80246

FOR IMMEDIATE RELEASE: Dec. 18, 2012

**CONTACT:**

Mark Salley  
Communications Director  
303-692-2013

[Mark.salley@state.co.us](mailto:Mark.salley@state.co.us)

## **Colorado whooping cough cases highest in 60 years, include one death**

DENVER – With 1,407 reported cases as of Dec. 8, Colorado's pertussis epidemic has exceeded the number of cases seen in the state going back at least six decades. The last time Colorado experienced this level of pertussis, commonly referred to as whooping cough, was in 1948 with 1,833 cases.

There was one pertussis death in October of this year – an older adult in Larimer County. This is the first whooping cough death in the state since 2005, when there were two infant deaths. Whooping cough is typically most dangerous for babies and young children, but can affect people of all ages.

"Usually at this time of year we focus on reminding residents to get their flu immunizations, but this year we need to couple that with a message for people also to protect themselves and their loved ones from whooping cough," said Dr. Rachel Herlihy, director of the Immunization Section at the Colorado Department of Public Health and Environment. "Immunization is the best method of protection against both the flu and whooping cough."

It is recommended all adults and children receive the whooping cough booster vaccine, Tdap.

According to Herlihy, it's especially important for those who have contact with young children to talk to their doctors about their whooping cough immunization status, because young children are more vulnerable to the disease. In young children, particularly infants, whooping cough can lead to difficulty breathing, hospitalization and even death. Child care workers, health care workers, parents, grandparents and siblings of young children all must make sure they are up to date on their whooping cough vaccinations. Immunity to pertussis wanes over time, so booster doses of the vaccine are necessary, even for people who have had the disease in the past.

Whooping cough cases are distributed throughout 31 Colorado counties, with most cases reported in Jefferson (242), Denver (207), Adams (195), Arapahoe (160) and Boulder (158). The case counts are from Jan. 1 through Dec. 8, 2012.

resources in Colorado's rural counties. Though four formal public health district agencies were formed decades ago, local control has prevented others from forming.

Our Office... See More



**Valley enters health partnership**  
www.alamosanews.com  
Courier staff writer VALLEY — A national interest in improving public health is granting the San Luis Valley an opportunity to step up its key core services. Saguache County Public Health Director Della Vieira

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Frances Newberry, Ola Bovin and 2 others like this.



**Clint Cresawn** Very cool stuff!  
Monday at 3:45pm



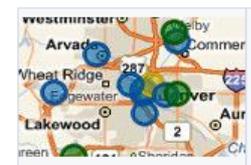
**Colorado Department of Public Health and Environment**  
Thanks Clint Cresawn  
Monday at 5:14pm



**Colorado Department of Public Health and Environment**  
shared a link via Cdphe Air Pollution Control Division.  
January 23

From our Air Pollution Control staff: Three ACTION DAYS are in effect in differing Colorado locales on Wednesday afternoon, January 23.

The ACTION DAY for FINE PARTICULATES for MESA COUNTY has been continued through at least 4 p.m. Thursday, January 24.



**Air Pollution Control Division - TSP Program**  
www.colorado.gov  
Technical Services is responsible for the collection and analysis of air quality data throughout the state. The program is also

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Barbara Beiser, Heather Wilcox and Emily Casteel like this.



**Colorado Department of Public Health and Environment**  
shared a link.  
January 25

During 2012, 1519 cases of pertussis were reported in Colorado, compared to an average of 324 cases a year 2007-2011. While pertussis occurs in all age groups, infants less than 6 months of age have the highest rate of disease and usually ... See More

**Disease Control and Environmental Epidemiology - Pertussis (Whooping Cough)**  
www.colorado.gov

Pertussis, or whooping cough, is a contagious disease that can cause a prolonged and sometimes severe cough illness. It is caused by the bacterium, Bordetella pertussis, and is found in the nose and throat of an

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**Colorado Department of Public Health and Environment**  
shared a link.  
January 23

Annie's Rising Crust Frozen Pizza voluntarily recalled due to possible metal fragments

We are announcing a voluntary recall by Annie's Inc. of Berkeley, Calif., affecting all varieties of Annie's Rising Crust Frozen Pizza with a "best by" ... See More



**Annie's Homegrown Frozen Pizza Recall**  
www.annies.com  
All varieties of Annie's RISING CRUST FROZEN PIZZA with a best buy date including and in between 09Jan13 and 14Sep13 (January 9, 2013 and September 14, 2013) are affected. Recalled varieties are:



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[@pvnshews](#) Congratulations and we look forward to working with you. And thanks to [@cdphepsd](#) for their work as well.

[View conversation](#)



**CDPHE** [@CDPHE](#) 20 Sep

75 cases of [#WestNile](#) virus identified in CO as of Sept. 17. More data, statistics, and resources on WNV here:

[colorado.gov/cs/Satellite/C...](http://colorado.gov/cs/Satellite/C...)

[Expand](#)



**CDPHE** [@CDPHE](#) 18 Sep

What's the big whoop about [#pertussis](#)? Check out [@CDCgov](#) FAQs to learn more about the re-emergence of this disease:

[cdc.gov/pertussis/about...](http://cdc.gov/pertussis/about...)

[Expand](#)



**CDPHE** [@CDPHE](#) 18 Sep

System built for Bioterrorism confirms and reacts to [#Plague](#) in 7 y/o CO girl. [aphiblog.org/2012/09/system...](http://aphiblog.org/2012/09/system...)

[Expand](#)



**CDPHE** [@CDPHE](#) 18 Sep

[#CDCFluChat](#) given pertussis increase, flu clinics are good opportunity to give Tdap, too.

[Expand](#)



**CDPHE** [@CDPHE](#) 18 Sep

[@AlfoPernia](#) [#CDCFluChat](#) Try your local health departments for low-cost vaccine

[View conversation](#)



**CDPHE PSD** [@cdphepsd](#) 18 Sep

CDPHE staff learning and participating in [#cdcfluchat](#) - thanks for hosting [@CDCFlu](#) [#cohealth](#) [pic.twitter.com/WqCYfGOq](http://pic.twitter.com/WqCYfGOq)

Retweeted by CDPHE

[View photo](#)



**CDPHE** [@CDPHE](#) 18 Sep

[@HMHBCoalition](#) [#CDCFluChat](#) and it's important for those around that child to be vaccinated.

[View conversation](#)

# Conclusion

- Pertussis continues to be a significant public health problem in Colorado, though the epidemiology is evolving.
- Vaccination is our best prevention tool
- Goal is no infant deaths
  - Improve Tdap coverage in adults and adolescents
  - Maintain high levels of coverage with DTaP in children

# Questions?



# Rates of Reported Pertussis Cases by Age Group and Report Year, Colorado, 2007 - 2012



## California VE Study

- ❑ Cases & controls 4-10 yrs at illness onset or enrollment
- ❑ Reported pertussis cases in 15 CA counties
- ❑ Unmatched controls from case-patient providers (3:1)
- ❑ Vaccine histories collected by in-person visits to providers
- ❑ Logistic regression, accounting for clustering
- ❑ 250 provider offices, 4,000 charts abstracted

## Vaccination Characteristics

	Case (%) N=682	Control (%) N=2,016	P-Value
Unvaccinated			
Yes	7.8	0.9	< 0.0001
Vaccinated age at 5 <sup>th</sup> Dose	N=629	N=1,997	
4	68.7	71.9	0.11*
5	31.1	27.3	
6	0.5	0.8	

# Pertussis Disease among Unvaccinated compared to Vaccinated Children

Vaccination Status	Pertussis		OR (95% CI) *
	Case	Control	
Unvaccinated	53	19	8.9 (4.9 – 16.1)
5 DTaP doses	629	1,997	

\* Accounting for clustering by county and provider

## Overall VE & Duration of Protection Estimates

Model *	Case (n)	Control (n)	VE, %	95% CI
Overall VE, All Ages				
0 dose	53	19	Ref	--
5 doses	629	1,997	88.7	79.4 – 93.8
Time since 5 <sup>th</sup> dose				
0 doses	53	19	Ref	--
< 12 months	19	354	98.1	96.1 – 99.1
12 – 23 months	51	391	95.3	91.2 – 97.5
24 – 35 months	79	366	92.3	86.6 – 95.5
36 – 47 months	108	304	87.3	76.2 – 93.2
48 – 59 months	141	294	82.8	68.7 – 90.6
60+ months	231	288	71.2	45.8 – 84.8

\* Accounting for clustering by county and provider

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60+ months	231	288	71.2	45.8 – 84.8

\* Accounting for clustering by county and provider

# Epi Data Suggests Tdap Isn't a Perfect Solution

- The increasing number of cases in adolescents suggests immunity wanes even after Tdap vaccination in age groups fully vaccinated with acellular vaccines.
- Results of Washington State Tdap effectiveness study anticipated soon

# Vaccination is Effective

- Unvaccinated children have an eightfold greater risk for pertussis than children fully vaccinated with DTaP.
- Vaccinated children can develop pertussis, but they are less infectious, have milder symptoms, shorter illness duration, and are at reduced risk for severe outcomes.
- Vaccination continues to be the single most effective strategy to reduce morbidity and mortality caused by pertussis.
- Vaccination of pregnant women and contacts of infants protects infants too young to be vaccinated is an important strategy to protect those most at risk.

# What else may be contributing to the epidemic?

- Better awareness and more testing- **Probably**
- Changes in surveillance from newer testing methods- **Probably**
- Under-vaccination- **To some extent**
- Strain variation- **Being studied**

# Other Vaccination Recommendations

- Development of new vaccines, vaccine targets?
- Additional DTaP doses?
- Timing, frequency of Tdap doses?

# Education of Providers, Public

- Pertussis vaccination remains an effective intervention
- Current vaccination recommendations
  - Only 12% of adults have received Tdap
  - Healthcare workers
  - Childcare workers
- Diagnosis, testing, treatment guidelines
- ED/Urgent Care use of Tdap vs. Td for wound prophylaxis