

## Report on the Environment

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### Infectious Diseases

Infectious diseases are human illnesses caused by viruses, bacteria, parasites, fungi, and other microbes. They can be spread by direct contact with an infected person or animal, through ingestion of contaminated food or water, by insects like mosquitoes or ticks (disease vectors), or by contact with contaminated surroundings such as through touching animal droppings or breathing in contaminated air. Demographic and environmental factors such as population growth, increased urbanization, and alteration of habitats of disease-carrying insects and animals (e.g., irrigation, deforestation) may promote the spread of infectious diseases (CDC, 1998a). The three broad infectious disease categories included here are those whose appearance and spread may be influenced to some extent by environmental conditions and change. They include gastrointestinal (GI) diseases, arthropod-borne diseases, and legionellosis.

- **Gastrointestinal diseases.** Eight notifiable GI diseases caused by microorganisms are discussed below: cholera, cryptosporidiosis, shiga toxin-producing *Escherichia coli* (*E. coli*) (STEC), giardiasis, hepatitis A, salmonellosis, shigellosis, and typhoid fever. The major environmental source of GI illness is water or food that is contaminated with pathogenic microorganisms. The primary means of transmission for these eight diseases is through ingestion of contaminated food and water or through contact with and accidental ingestion of fecal matter (CDC, 2018a).
- **Arthropod-borne diseases.** Three arthropod-borne diseases are included: Lyme disease (transmission of *Borrelia burgdorferi* by ticks), spotted fever rickettsiosis (transmission of *Rickettsia rickettsii* by ticks), and West Nile virus (transmitted by mosquitoes). Certain ticks and mosquitoes (arthropods) can carry bacteria and viruses that cause disease in humans. The arthropods acquire the bacteria or viruses when they bite an infected mammal or bird. Some studies indicate that spread of vector-borne disease may be influenced by land use and/or other environmental change (CDC, 2004). In recent years, both Lyme disease and West Nile virus appear to have spread across the U.S. (CDC, 1993, 2000, 2004, 2017b).
- **Legionellosis.** Legionellosis, or Legionnaires' disease, is a serious and sometimes fatal form of pneumonia. It is caused by *Legionella* bacteria, which are found naturally in the environment and thrive in warm water and warm damp places. They are commonly found in lakes, rivers, creeks, hot springs, and other bodies of water. This bacterium has been associated with outbreaks in the U.S. linked to poorly maintained artificial water systems (e.g., air conditioning and industrial cooling systems) and air ventilation systems. Infection results from inhalation of contaminated water sprays or mists (CDC, 2018b).

This indicator reflects occurrence of these 12 notifiable diseases for varying periods between 1995 and 2017 as reported by health departments to the National Notifiable Diseases Surveillance System (NNDSS). A notifiable disease is one for which regular, frequent, and timely information regarding individual cases is considered necessary for the prevention and control of the disease. Data are collected by all 50 states, five territories, New York City, and the District of Columbia, based on a list of recommended nationally notifiable infectious diseases, and compiled nationally (CDC, 2018c). The temporal and geographic coverage of the data varies by disease. The number of states

and territories reporting may also vary. For example, in 1995, when cryptosporidiosis was first nationally reported, only 27 states reported; by 2013, all 50 states, New York City, and the District of Columbia reported this disease (CDC, 1998b, 2015).

## **What the Data Show**

### **GI Diseases**

Exhibit 1 presents the number of reported cases for each of the eight notifiable GI diseases from 1995 to 2017.

*Cholera.* In comparison to the other GI diseases, the number of newly identified cholera cases reported each year is low. From 1995 to 2017, just 231 laboratory-confirmed cases of cholera in total were reported to CDC, with the highest number of cases during this period (40) being reported in 2011.

*Typhoid Fever.* The number of newly identified cases of typhoid fever fluctuated from 1995 to 2017, ranging between a low of 321 cases in 2002 and a high of 467 cases in 2010.

*Hepatitis A.* Reported cases of hepatitis A continued to decline from 1995 (31,582 cases) to 2011 (1,398 cases), but then slightly increased in 2012 (1,562 cases) and 2013 (1,781 cases). The number of cases reached a low of 1,239 in 2014, but has continually increased since 2015.

*Cryptosporidiosis.* Reported cryptosporidiosis cases showed a noticeable increase from 1995 to 2007, fluctuated between 2008 and 2015, spiked to their highest peak (13,453 cases) in 2016, and then decreased in 2017. It remains unclear whether the greater number of case reports between 2005 and 2017 reflects changes in reporting patterns and diagnostic testing practices or a real change in infection transmission. For example, the increase in 2005 (and possibly 2007) was attributable primarily to outbreak-related case reporting. However, increased testing for *Cryptosporidium* following the introduction of nitazoxanide (2002-2004), the first licensed treatment for the disease, alongside changes to the national case definitions in 2011 and 2012, may have led to a possible increase in subsequent case reporting (CDC, 2008a, 2017b).

*Shigellosis.* The lowest number of shigellosis cases observed from 1995 to 2017 occurred in 2013 with 12,729 cases reported, but this was followed by a variable trend with an increase to 23,590 cases in 2015 and a decrease to 14,912 cases in 2017.

*Giardiasis.* The number of cases observed for giardiasis remained relatively steady from 2002 to 2010, decreased continually to reach 14,485 cases in 2015, and then fluctuated between 2016 (16,310 cases) and 2017 (15,193 cases).

*Salmonellosis.* Reported salmonellosis cases have shown a variable trend from 1995 to 2017. The highest number of salmonellosis cases during the reporting period occurred in recent years, with numbers remaining above 50,000 cases since 2010 and reaching a high of 55,108 cases in 2015.

*STEC.* The number of reported cases of *E. coli* (presented in Exhibit 1 as shiga toxin-producing *E. coli*, or STEC) fluctuated from 1995 to 2009, and then increased almost every year up to 8,672 cases in 2017—the highest number of cases seen during the reporting period.

### **Arthropod-Borne Diseases**

Exhibit 2 presents the number of reported cases for three arthropod-borne diseases.

*Lyme disease.* The most commonly reported arthropod-borne disease in the U.S. is Lyme disease.

Surveillance for Lyme disease was initiated by the Centers for Disease Control and Prevention (CDC) in 1982 (CDC, 1993). It became nationally reportable with a standardized definition in 1991 (CDC, 2008b). The number of cases has fluctuated over time, but gradually increased from a low of 11,700 cases in 1995 to a high of 42,743 cases in 2017.

*Spotted fever rickettsiosis.* Rocky Mountain spotted fever began as a nationally notifiable condition in the 1920s (CDC, 2019). Starting in 2010, the category Rocky Mountain spotted fever changed to the category spotted fever rickettsiosis (including Rocky Mountain spotted fever). The number of new cases of Rocky Mountain spotted fever reported generally increased from 1995 to 2008, ranging between a low of 365 cases in 1998 and a high of 2,563 cases in 2008. The number of reported cases then fluctuated until reaching an all-time peak of 6,248 cases in 2017.

*West Nile virus.* Cases of West Nile virus were first documented in the U.S. in 1999, and the disease became nationally reportable in 2002. The lowest number of cases reported from 2002 to 2017 occurred in 2009 (386 cases), representing a continued notable decrease from 2007 (1,227 cases) and 2008 (689 cases). However, the number of reported cases increased noticeably again in 2012, to the largest number of cases reported (2,872). From 2013 to 2017, the number of cases has remained relatively stable.

### **Legionellosis**

Exhibit 3 presents the number of reported cases of legionellosis within the U.S. population from 1995 to 2017. From 1995 to 2002, the number of new cases of legionellosis was relatively stable, ranging from a low of 1,108 cases in 1999 to 1,355 cases in 1998. However, a general increase in the number of new cases was reported since 2003 (2,232 cases), with the highest number reported in 2017 (7,458 cases).

### **Limitations**

- State and territory health departments report cases of notifiable diseases to CDC; reporting policies (and compliance with those policies) can vary by disease or reporting jurisdiction.
- Disease reporting likely underestimates the actual number of cases for a given time period because reporting nationally notifiable diseases to CDC is voluntary. Additionally, the completeness of reporting likely varies by disease. The degree of completeness of data reporting is influenced by many factors such as the diagnostic facilities available, the control measures in effect, public awareness of a specific disease, and the interests, resources, and priorities of state, territory, and local officials responsible for disease control and public health surveillance (CDC, 2017b).
- Factors such as changes in case definitions for public health surveillance, introduction of new diagnostic tests, or discovery of new disease entities can cause changes in disease reporting that are independent of the true incidence of disease (CDC, 2017b).
- Prior to 2001, shiga toxin-producing *Escherichia coli* (STEC) represents *E. coli* O157:H7, which was the only serotype that was nationally notifiable. From 2001 to 2005, STEC represents the sum of the three nationally notifiable shiga toxin-positive *E. coli* forms (O157:H7, non-O157, and not serogrouped). As of 2006, serogrouped *E. coli* cases are no longer nationally notifiable; STEC represents the notifiable form. These differences in reporting should be considered when making cross-year comparisons.
- Prior to 2005, only confirmed “neuroinvasive” cases of West Nile virus—the most severe form of the condition—were reported. Beginning in 2005, non-neuroinvasive domestic arboviral diseases for the six domestic arboviruses listed were added to the list of nationally notifiable diseases; these included West Nile fever, a non-neuroinvasive form of West Nile

virus (CDC, 2015). In order to maintain reporting consistency, only neuroinvasive cases are presented for this indicator.

## Data Sources

The data for this indicator were obtained from CDC annual reports that summarize data on nationally notifiable infectious diseases reported to CDC by state and territorial health agencies across the country (CDC, 1996, 1997, 1998b, 1999, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008a, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017a, 2017b, 2018c). Data are collected and compiled from reports sent by state and territorial health departments to the NNDSS, which is operated by CDC. The NNDSS is neither a single surveillance system nor a method of reporting. Certain NNDSS data are reported to CDC through separate surveillance information systems and different reporting mechanisms; however, these data are aggregated and compiled for publication purposes (CDC, 2017b).

## References

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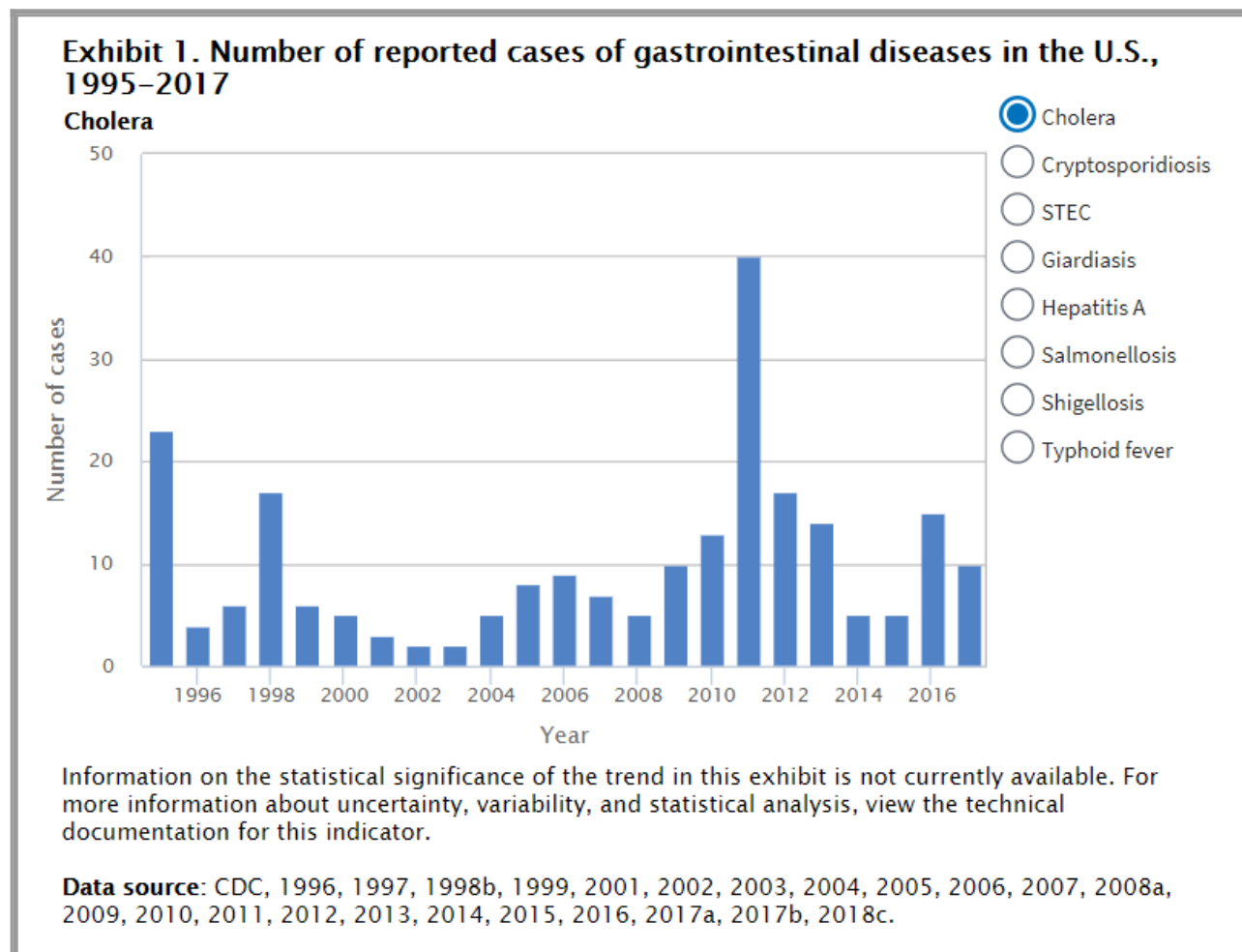
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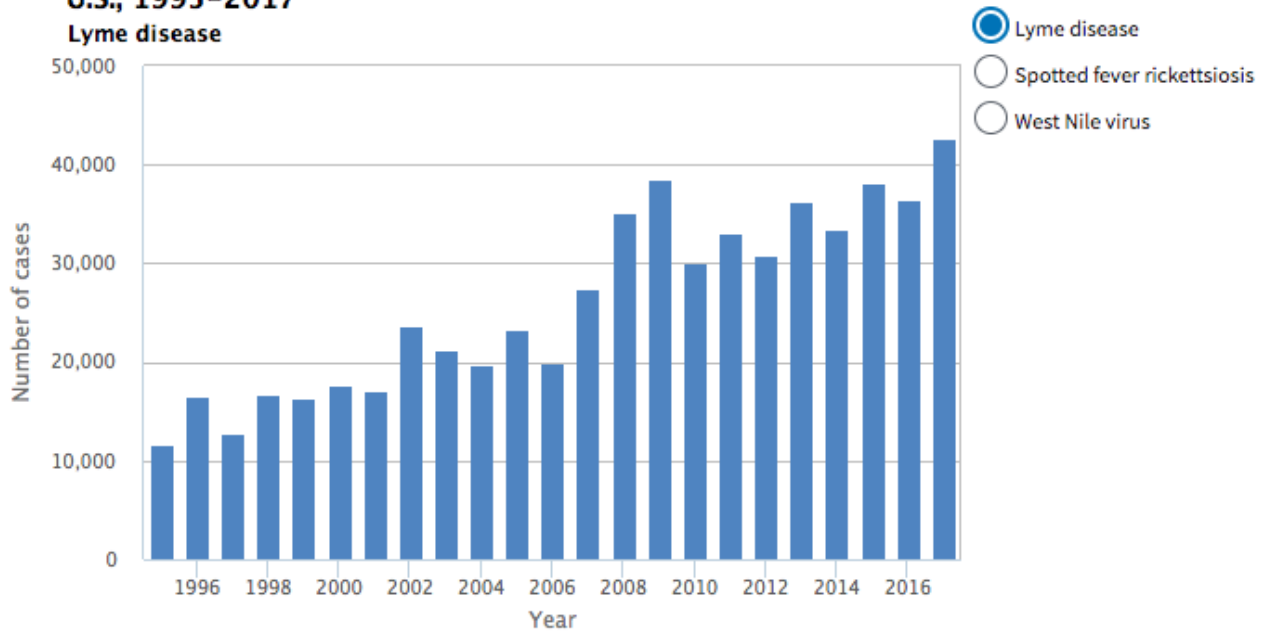
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## Exhibit 2. Number of reported cases of arthropod-borne diseases in the U.S., 1995-2017

Lyme disease

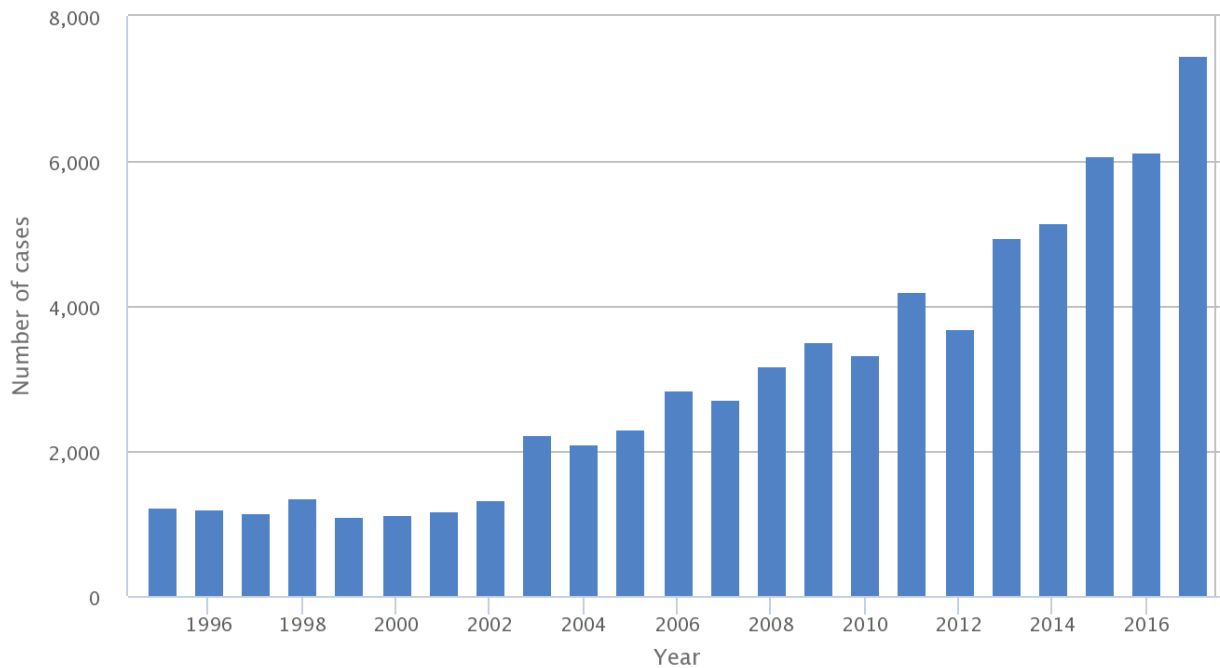


Information on the statistical significance of the trend in this exhibit is not currently available. For more information about uncertainty, variability, and statistical analysis, view the technical documentation for this indicator.

**Data source:** CDC, 1996, 1997, 1998b, 1999, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008a, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017a, 2017b, 2018c.

Visit <https://www.epa.gov/roe> to see the full exhibit.

**Exhibit 3. Number of reported cases of legionellosis in the U.S., 1995–2017**



Information on the statistical significance of the trends in this exhibit is not currently available. For more information about uncertainty, variability, and statistical analysis, view the technical documentation for this indicator.

**Data source:** CDC, 1996, 1997, 1998b, 1999, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008a, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017a, 2017b, 2018c.