THE HENRY J. KAISER FAMILY FOUNDATION

Filling the need for trusted information on national health issues...

October 2014 | Fact Sheet

Ebola Characteristics and Comparisons to Other Infectious Diseases

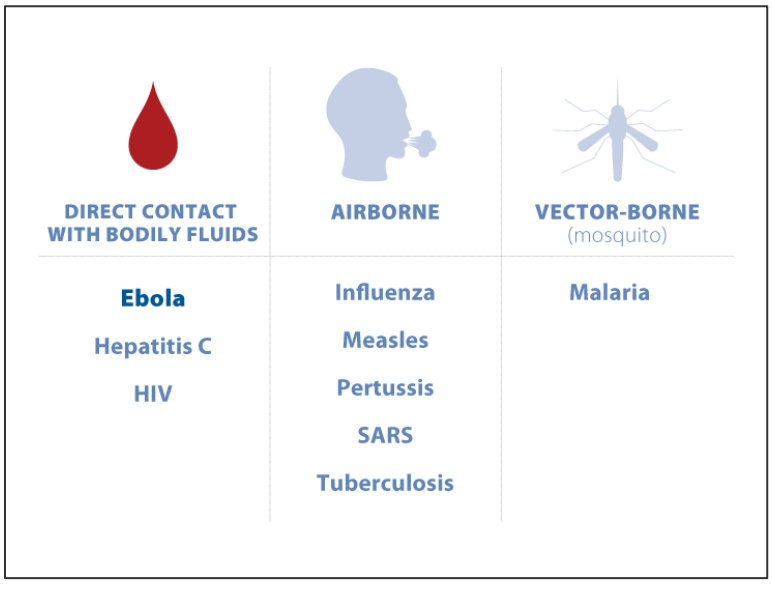
The current outbreak of Ebola virus in West Africa has been declared a public health emergency of international concern by the World Health Organization (WHO) and is the most severe such outbreak of Ebola to date. Almost eight in ten cases ever reported have been reported in the past few months alone, and there is increasing attention to and concern about its further escalation.

Ebola virus has a unique set of characteristics that determines how and why it spreads, and how deadly it can be. To better understand Ebola, we compare it to twelve other infectious diseases that continue to represent public health challenges today. These include diseases that have been around for thousands of years (the so-called "ancient diseases") as well as others that are much more recent (the so-called "emerging diseases"). They include viruses as well as bacteria and parasites, and vary in terms of how easily they are spread, how deadly they are, and whether there are vaccines, treatments, or cures to address them.

Five Key Take-Aways:

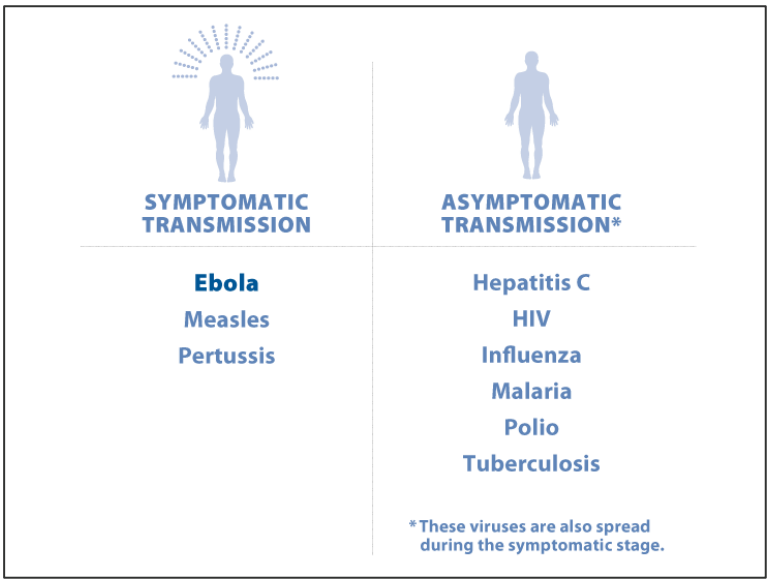
How is it Transmitted?

How an infectious disease is transmitted – whether through direct contact with bodily fluids, through air, or other means, as well as whether human-to-human transmission is possible – is important for understanding how to prevent and track the disease. Ebola is transmitted only through direct contact with bodily fluids, as are HIV and Hepatitis C. Other diseases, such as measles and SARS, are transmitted through airborne means. Human- to-human transmission occurs for all of the diseases included in this profile except for malaria, which is transmitted by mosquitoes to humans.



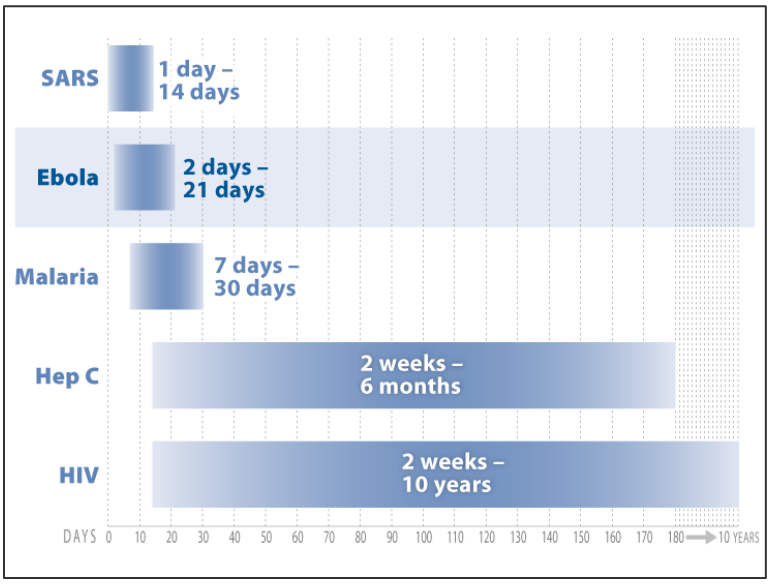
Is Asymptomatic Transmission Possible?

Some diseases can be transmitted only when symptoms are present while others can be transmitted even when a person does not yet have symptoms, known as being *asymptomatic*. Ebola can only be transmitted when symptoms are present, in contrast to diseases such as HIV, influenza, and malaria which have asymptomatic transmission.



How Long is the Incubation Period?

The incubation period of a disease is the time between initial infection and when symptoms first appear. Ebola's incubation period of 2 to 21 days is fairly short compared to other infectious diseases such as HIV, which can have an incubation period of 10 years or even longer. It is also shorter than the incubation period for Tuberculosis and Hepatitis C. However, some other infectious diseases, such as SARS and influenza, have, on average, shorter incubation periods than Ebola.



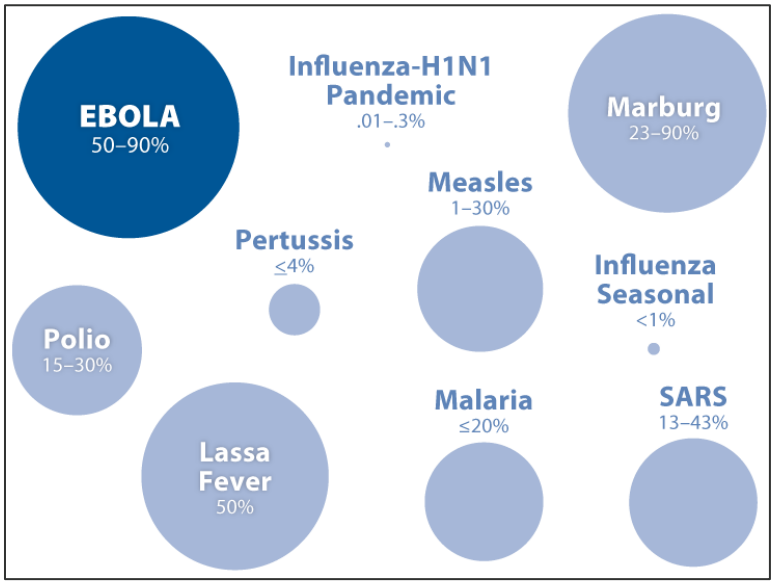
Are There Vaccines, Treatments, or Cures?

Currently, there is no vaccine to prevent Ebola, no treatment for the disease (other than treatments for its symptoms and some experimental treatments), and no cure. Other diseases have treatments but no vaccine and no cure (such as HIV), while still others have vaccines, but cannot be treated or cured (such as measles).

	VACCINE	TREATMENT	CURE
Ebola	NO	NO	NO
Measles		NO	NO
Pertussis			
HIV	NO		NO
Influenza – Seasonal			NO

How Deadly is it?

Ebola is one of the most deadly infectious diseases, causing death in approximately 50-90 percent of those who become infected (its estimated case-fatality rate). This is much higher than almost every other infectious disease included. Case fatality rates for other diseases are much lower, including those for influenza (less than 1%) and SARS (13-43%).



EBOLA: Key Characteristics Compared to Other Infectious Diseases

	Ebola	Hepatitis C	HIV	Influenza - H1N1 Pandemic	Influenza - Seasonal	Lassa Fever	Malaria	Marburg	Measles	Pertussis	Polio	SARS	Tuberculosis
Causative Agent	Virus	Virus	Virus	Virus	Virus	Virus	Parasite	Virus	Virus	Bacteria	Virus	Virus	Bacteria
Year First Case Identified	1976	1989	1981	2009	Ancient disease	1969	Ancient disease	1967	Ancient disease	Ancient disease	Ancient disease	2003	Ancient disease
Primary Mode(s) of Transmission	Direct contact*	Direct contact*	Direct contact †	Airborne	Airborne	Direct contact*, ingestion or inhalation	Vector-borne (mosquito)	Direct contact*	Airborne	Airborne	Fecal-oral	Airborne	Airborne
Asymptomatic Transmission	No	Yes	Yes	Yes	Yes	Unlikely	Yes	No	No	No	Yes	Unlikely	Yes
Incubation Period	2-21 days	2 weeks-6 months	10 years	2-6 days	1-4 days	7-10 days	7-30 days	5-10 days	7-21 days	4-21 days	3-35 days	1-14 days	weeks to years
Transmission Potential (average # new cases generated by each case)	1.5-2.0	2-4	3-6	1.3–1.7	1.2-1.4	n.d.	n/a	1.6	12-40	16-18	6-7	3.6	1-40
Case Fatality Rate (estimate, range)	50-90%	Unknown	80-90%** (untreated)	0.01% - 0.3%	<0.1%	50%	≤20%	23-90%	1-30%	≤4%	Children: 3-5%; Adults: 15-30%	13%<60 yrs 43%>60 yrs	3.0%-9.2%
Available Vaccine to Prevent Infection	No	No	No	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No
Available Treatment	No ^	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	No	Yes
Can It Be Cured?	No	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes
Immunity After Infection?	Likely	No	No (can be infected with >1 strain)	Partial	Partial	Unknown, potential	No (possibility for re-infection)	Unknown, potential	Yes	No	Yes	Unknown	No (possibility for relapse)
Annual Cases Worldwide Per Year (latest year estimate)	8,997‡	n.d.	2.1 million	24% of global population (2009-2010)	3-5 million	100,000-300,000	207 million	Few; largest outbreak (Angola, 2004-2005) yielded 252 cases	226,722	16 million	406 (in 2013)	8,096 (in 2003)	8.6 million
Annual Deaths Worldwide Per Year (latest year estimate)	4,493‡	350,000-500,000	1.5 million	284,000 (2009-2010)	250,000-500,000	5,000	627,000	Few; largest outbreak (Angola, 2004-2005) yielded 227 deaths	122,000	195,000	None reported	774 (in 2003)	1.3 million

NOTES: n.d. = no data
n/a = not applicable due to no human-to-human transmission, only vector-borne transmission
* Direct Contact refers to the primary route of infection being through bodily fluids such as blood and feces; also includes monther-to-child transmission
† Primary routes of transmission for HIV are sexual contact, blood-borne, and mother-to-child
^ Experimental treatments have been used to treat Ebola patients
‡ Current West Africa Epidemic, data as of October 12, 2014
** Not fatal with early treatment

EBOLA AND OTHER DISEASES REFERENCES

Ebola:

WHO, Ebola virus disease fact sheet, September 2014. www.who.int/mediacentre/factsheets/fs103/en/

WHO, Ebola Response Roadmap Situation Report, October 2014. http://apps.who.int/iris/bitstream/10665/136508/1/roadmapsitrep15Oct2014.pdf?ua=1

New England Journal of Medicine. Ebola Virus Disease in West Africa — The First 9 Months of the Epidemic and Forward Projections, September 2014. www.nejm.org/doi/full/10.1056/NEJMoa1411100#t=article

Hepatitis C:

Pybus et al. The Epidemic Behavior of Hepatitis C Virus. Science Vol 292, 22 June 2001.

WHO, Hepatitis C fact sheet, April 2014. www.who.int/mediacentre/factsheets/fs164/en/

CDC, Hepatitis C Information for Health Professionals: FAQs, July 2014. www.cdc.gov/hepatitis/hcv/hcvfaq.htm

WHO, Global Alert and Response: Hepatitis C: Surveillance and Control. www.who.int/csr/disease/hepatitis/whocdscsrlyo2003/en/index4.html

American Liver Foundation, The Basics About Hepatitis C Treatment. http://hepc.liverfoundation.org/treatment/the-basics-about-hepatitis-c-treatment/what-medications-are-used-to-treat-hepatitis-c/

HIV:

AIDS.gov, Stages of HIV Infection, December 2013. www.aids.gov/hiv-aids-basics/just-diagnosed-with-hiv-aids/hiv-in-your-body/stages-of-hiv/

CDC, HIV Transmission Rates fact sheet, July 2013. www.cdc.gov/nchhstp/newsroom/HIVFactsheets/progress/HIV-transmission.htm

Williams, Brian & Gouws, Eleanor. R0 and the elimination of HIV in Africa: Will 90-90-90 be sufficient?, July 2014. http://arxiv.org/abs/1304.3720

Jeffrey W. Eaton & Timothy B. Hallett. Why the proportion of transmission during early-stage HIV infection does not predict the long-term impact of treatment on HIV incidence, PNAS 2014; published ahead of print October 13, 2014, doi:10.1073/pnas.1323007111.

UNAIDS, Gap Report, July 2014. www.unaids.org/en/media/unaids/contentassets/documents/unaidspublication/2014/UNAIDS_Gap_report_en.pdf

Influenza- H1N1 Pandemic:

WHO, What is the pandemic (H1N1) 2009 virus?, February 2010. www.who.int/csr/disease/swineflu/frequently_asked_questions/about_disease/en/

Biggerstaff et al., Estimates of the reproduction number for seasonal, pandemic, and zoonotic influenza: a systematic review of the literature, BMC Infectious Diseases 2014, 14:480. www.biomedcentral.com/content/pdf/1471-2334-14-480.pdf

Van Kerkhove MD, Hirve S, Koukounari A, et al. Estimating age-specific cumulative incidence for the 2009 influenza pandemic: a meta-analysis of A(H1N1)pdm09 serological studies from 19 countries. Influenza Other Respi Viruses 2013 (early online publication Jan 21).

Dawood FS, Iuliano AD, Reed C, et al. Estimated global mortality associated with the first 12 months of 2009 pandemic influenza A H1N1 virus circulation: a modelling study. Lancet Infect Dis 2012 Jun 26.

CDC, H1N1 Flu: Antivirals, www.cdc.gov/H1N1flu/antivirals/

Tuite Ashleigh et al., Estimated epidemiologic parameters and morbidity associated with pandemic H1N1 influenza. CMAJ. Feb 9, 2010; 182(2): 131-136. www.ncbi.nlm.nih.gov/pmc/articles/PMC2817319/

Influenza- Seasonal:

CDC, Seasonal Influenza (Flu): Key Facts about Influenza (Flu) & Flu Vaccine, September 2014. www.cdc.gov/flu/keyfacts.htm

CDC, Seasonal Influenza (Flu): How Flu Spreads, September 2013. www.cdc.gov/flu/about/disease/spread.htm

Biggerstaff et al., Estimates of the reproduction number for seasonal, pandemic, and zoonotic influenza: a systematic review of the literature, BMC Infectious Diseases 2014, 14:480. www.biomedcentral.com/content/pdf/1471-2334-14-480.pdf

CDC, Seasonal Influenza (Flu): What You Should Know About Flu Antiviral Drugs, September 2013. www.cdc.gov/flu/antivirals/whatyoushould.htm

WHO, Influenza (Seasonal) fact sheet, March 2014. www.who.int/mediacentre/factsheets/fs211/en/

Lassa Fever:

CDC, Lassa Fever website, April 2014. www.cdc.gov/vhf/lassa/

CDC, Lassa Fever fact sheet. www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/Fact_Sheets/Lassa_Fever_Fact_Sheet.pdf

Viral Hemorrhagic Fevers (2010), edited by Sunit K. Singh, Daniel Ruzek, p.274.

Public Health England, Lassa fever: origins, reservoirs, transmission and guidelines, September 2014. www.gov.uk/lassa-fever-origins-reservoirs-transmission-and-guidelines

Malaria:

CDC, Malaria: Disease, February 2010. www.cdc.gov/malaria/about/disease.html

WHO, Factsheet on the World Malaria Report 2013, December 2013. www.who.int/malaria/media/world_malaria_report_2013/en/

Nadjm B, Behrens RH. Malaria: An update for physicians. Infect Dis Clin North Am. 2012;26(2):243–259. http://saludesa.org.ec/biblioteca/INFECTOLOGIA/malaria_actualizacion.pdf

Marburg:

WHO, Global Alert and Response: Marburg virus disease. www.who.int/csr/disease/marburg/en/

CDC, Marburg hemorrhagic fever: Signs and Symptoms, April 2014. www.cdc.gov/vhf/marburg/symptoms/index.html

Ajelli M, Merler S (2012) Transmission Potential and Design of Adequate Control Measures for Marburg Hemorrhagic Fever. PLoS ONE 7(12): e50948. doi:10.1371/journal.pone.0050948. www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0050948

CDC, Marburg hemorrhagic fever: Treatment, April 2014. www.cdc.gov/vhf/marburg/treatment/index.html

CDC, Chronology of Marburg Hemorrhagic Fever Outbreaks, October 2014. www.cdc.gov/vhf/marburg/resources/outbreak-table.html

Measles:

WHO, Measles fact sheet, February 2014. www.who.int/mediacentre/factsheets/fs286/en/

Bonačić Marinović AA, Swaan C, Wichmann O, van Steenbergen J, Kretzschmar M. Effectiveness and timing of vaccination during school measles outbreak. Emerg Infect Dis. 2012 September. wwwnc.cdc.gov/eid/article/18/9/11-1578_article#r1

Wolfson LJ, Grais RF, Luquero FJ, Birmingham ME, Strebel PM. Estimates of measles case fatality ratios: a comprehensive review of community-based studies. Int J Epidemiol. 2009 Feb;38(1):192-205.

Walter A. Orenstein, Robert T. Perry, and Neal A. Halsey, The Clinical Significance of Measles: A Review J Infect Dis. (2004) 189 (Supplement 1): S4-S16 doi:10.1086/377712. jid.oxfordjournals.org/content/189/Supplement_1/S4.full

CDC, Yellowbook: Chapter 3 Infectious Diseases Related To Travel, December 2013. http://wwwnc.cdc.gov/travel/yellowbook/2014/chapter-3-infectious-diseases-related-to-travel/measles-rubeola

CDC, Global Health - Measles, Rubella, and CRS, January 2014. www.cdc.gov/globalhealth/measles/

CDC, MMWR: Global Control and Regional Elimination of Measles, 2000–2012, February 2014. www.cdc.gov/mmwr/preview/mmwrhtml/mm6305a5.htm

WHO, Measles fact sheet, February 2014. www.who.int/mediacentre/factsheets/fs286/en/

Anderson RM & May RM, Infectious Diseases of Humans: Dynamics and Control, 11th ed. 2006.

Pertussis:

WHO, Health topics: Pertussis. www.who.int/topics/pertussis/en

CDC, Pertussis Fast Facts, February 2014. www.cdc.gov/pertussis/fast-facts.html

CDC, Pertussis: Epidemiology and Prevention of Vaccine-Preventable Diseases, September 2013. www.cdc.gov/vaccines/pubs/pinkbook/pert.html

Pertussis (continued):

WHO, Immunization, Vaccines and Biologicals: Pertussis, June 2011. www.who.int/immunization/topics/pertussis/en/

WHO, Immunization, Vaccines and Biologicals: WHO-recommended surveillance standard of pertussis, February 2003. www.who.int/immunization/monitoring_surveillance/burden/vpd/surveillance_type/passive/pertussis_standards/en/

Anderson RM & May RM, Infectious Diseases of Humans: Dynamics and Control, 11th ed. 2006.

Ratnapalan S, Parkin PC, Allen U. Case 1: The deadly danger of pertussis. Paediatr Child Health. 2005 Apr;10(4):221-2. www.ncbi.nlm.nih.gov/pmc/articles/PMC2722530/

CDC, MMWR: Pertussis Epidemic — Washington, 2012, July 2012. www.cdc.gov/mmwr/preview/mmwrhtml/mm6128a1.htm

Polio:

WHO, Poliomyelitis fact sheet, October 2014. www.who.int/mediacentre/factsheets/fs114/en/

CDC, Pinkbook: Poliomyellitis. www.cdc.gov/vaccines/pubs/pinkbook/downloads/polio.pdf

WHO, Biologicals: Poliomyelitis, July 2014. www.who.int/biologicals/areas/vaccines/poliomyelitis/en/

Anderson RM & May RM, Infectious Diseases of Humans: Dynamics and Control, 11th ed. 2006.

SARS:

WHO, Global Alert and Response: Severe Acute Respiratory Syndrome (SARS) - multi-country outbreak - Update 25, April 2003. www.who.int/csr/don/2003_04_09/en/

WHO, Immunization, Vaccines and Biologicals: Severe Acute Respiratory Syndrome (SARS), December 2013. www.who.int/immunization/topics/sars/en/

Different Epidemic Curves for Severe Acute Respiratory Syndrome Reveal Similar Impacts of Control Measures. Am. J. Epidemiol. (2004) 160 (6): 509-516 doi:10.1093/aje/kwh255.

World Health Organization (2003) Consensus document on the epidemiology of severe acute respiratory syndrome (SARS), Department of Communicable Disease Surveillance and Response, WHO; pg 10. www.who.int/csr/sars/en/WHOconsensus.pdf

Hsueh-Ling Janice Oh et al., Understanding the T cell immune response in SARS coronavirus infection, Emerging Microbes & Infections, September 2012. www.nature.com/emi/journal/v1/n9/full/emi201226a.html

WHO, Global Alert and Response: Summary of probable SARS cases with onset of illness from 1 November 2002 to 31 July 2003. www.who.int/csr/sars/country/table2004_04_21/en/

Christl A Donnelly, Azra C Ghani, Gabriel M Leung, et al. Epidemiological determinants of spread of causal agent of severe acute respiratory syndrome in Hong Kong. Lancet, Volume 361, Issue 9371, 24 May 2003, Pages 1761-1766.

Tuberculosis:

CDC, Tuberculosis: Basic TB Facts, March 2012. www.cdc.gov/tb/topic/basics/default.htm

Uncertainty and sensitivity analysis of the basic reproductive rate. Tuberculosis as an example. Am J Epidemiol. 1997 Jun 15;145(12): 1127-37.

The intrinsic transmission dynamics of tuberculosis epidemics. Nature Medicine 1, 815-821 doi:10.1038/nm0895-815

Straetemans M, Glaziou P, Bierrenbach AL, Sismanidis C, van der Werf MJ (2011) Assessing Tuberculosis Case Fatality Ratio: A Meta-Analysis. PLoS ONE 6(6): e20755. doi:10.1371/journal.pone.0020755.

CDC, Tuberculosis: Vaccine and Immunizations, August 2012. www.cdc.gov/TB/topic/vaccines/default.htm

WHO, Tuberculosis fact sheet, March 2014. www.who.int/mediacentre/factsheets/fs104/en/

The Henry J. Kaiser Family Foundation Headquarters: 2400 Sand Hill Road, Menlo Park, CA 94025 | Phone 650-854-9400
Washington Offices and Barbara Jordan Conference Center: 1330 G Street, NW, Washington, DC 20005 | Phone 202-347-5270

www.kff.org | Email Alerts: kff.org/email | facebook.com/KaiserFamilyFoundation | twitter.com/KaiserFamFound

Filling the need for trusted information on national health issues*, the Kaiser Family Foundation is a nonprofit organization based in Menlo Park, California.*