



UK Health
Security
Agency

Incubation and infectious period, asymptomatic or presymptomatic transmission and transmission route in human-to-human spread of hantavirus infection

A systematic evidence summary

Contents

Main messages.....	3
Purpose.....	5
Methods	5
Evidence	6
Health inequalities.....	12
Limitations.....	13
Evidence gaps	14
Conclusion	15
Acknowledgments.....	15
Disclaimer	16
References.....	16
Annexe A. Protocol	18
Annexe B. Study selection flowchart.....	40
Annexe C. Excluded full texts	42
Annexe D. Data extraction tables.....	51
About the UK Health Security Agency	64

Main messages

1. This systematic evidence summary (search up 1 May 2026) identified and summarised evidence relating to the incubation and infectious period, asymptomatic or presymptomatic transmission and transmission route in human-to-human transmission of hantavirus infection.
2. Human-to-human transmission was only reported for Andes virus.
3. Seventeen studies were identified to include ([1 to 17](#)). All studies were from South America (Argentina, Chile, Paraguay or Uruguay) from 1995 to 2024. Three sets of studies clearly reported on the same outbreak.
4. Seven studies reported the incubation period, or enough information to calculate the incubation period of Andes virus ([4](#), [6](#), [8](#), [10](#), [12](#), [13](#), [15](#), [17](#)). Four of these reported overlapping evidence, ([4](#), [8](#), [12](#), [17](#)) leaving 5 independent reports. The reported incubation period ranged from 9 to 40 days, with studies reporting a mean between 21.6 to 27.5 days.
5. Three studies reporting incubation period included children ([6](#), [10](#), [12](#)). When evidence for children was separated, the range was 14 to 26 days. The mean (and standard deviation, SD) from one study with data to calculate it was 19.8 days (3.7) in children and 21.9 days (7.4) in adults ([12](#)). The available evidence was insufficient to determine if there was a significant difference between adults and children and not all studies separated the results.
6. Twelve studies reported the serial interval or enough information to calculate the serial interval of Andes virus ([1](#), [2](#), [5](#), [9 to 14](#), [16](#), [17](#)). Four of these reported overlapping evidence, ([10](#), [11](#), [14](#), [17](#)) leaving 10 independent reports. The reported serial interval ranged from 4 to 40 days with means across studies from 19.6 to 25.7 days.
7. Six studies reporting serial interval included children ([2](#), [5](#), [9](#), [10](#), [12](#), [16](#)). When evidence for children was separated, the range was 16 to 29 days. The mean (and SD) from one study with data to calculate it was 19.7 (3.5) in children and 19.5 (8.1) in adults. The available evidence was insufficient to determine if there was a significant difference between adults and children and not all studies separated the results.
8. None of the studies reported confirmed route of transmission. Some hypothesised routes from exposures including the possibility of respiratory, direct contact via breastfeeding, other direct contact and sexual transmission. None ruled out respiratory or fomite transmission alongside other possible routes.
9. No studies reported evidence of asymptomatic or presymptomatic transmission.

10. Most studies included groups identified as being at risk of health inequalities, including children, pregnant women, people living in rural settings and people in occupations at higher risk of exposure such as agricultural workers or farmers and people working in healthcare settings. However, none of the studies provided a comparison between groups and it was not possible to determine if outcomes differed in these groups.
11. Critical appraisal was not performed, which restricts the interpretation of the findings, but important limitations have been highlighted. There were a limited number of cases with likely human-to-human transmission which limits the generalisability of the evidence. Many studies also highlighted the possibility that some of these cases also had environmental exposure, although human-to-human transmission was most likely. All studies rely on self-report of exposure and symptom onset dates, which may be subject to recall bias or misreporting. There was also discrepancy between some studies reporting on the same cases, which highlights the likelihood of misreporting of this evidence.
12. In summary, there was evidence from a limited number of cases to provide information of the incubation period and serial interval for human-to-human transmission of Andes virus. There was no information available that directly informed the infectious period in humans. Evidence suggested incubation period could range from 9 to 40 days, with studies reporting a mean between 21.6 to 27.5 days. The reported serial interval ranged from 4 to 40 days with means from 19.6 to 25.7 days. Although no studies were able to confirm route of transmission, some proposed routes through exposures, including the possibility of direct contact via breast-feeding, and sexual transmission or contact. No studies reported evidence of asymptomatic or presymptomatic transmission. All of the evidence is at risk of bias from misreport or recall bias, possible environmental exposure and ability to generalise due to small numbers of cases.

Purpose

The purpose of this systematic evidence summary was to identify and summarise the available evidence on the incubation and infectious period, asymptomatic or presymptomatic transmission and transmission route in human-to-human transmission of hantavirus infection.

The review question was:

1. What is the available evidence on the incubation and infectious period, asymptomatic or presymptomatic transmission and transmission route in human-to-human spread of hantavirus infection?

This systematic evidence summary was commissioned to help inform the UKHSA response to the outbreak of hantavirus on MV Hondius in April and May 2026.

Methods

A systematic evidence summary was conducted, following streamlined rapid systematic methods to accelerate the review process. A literature search was undertaken to look for relevant observational studies (cohort or case-control studies) and descriptive studies (case series, case reports or outbreak reports), published or available as preprints, up to 1 May 2026. Three databases were searched OVID Medline, OVID Embase, and Web of Science Preprint Citation Index.

Studies were included if they reported on human-to-human transmission of hantavirus (all species were searched for, including but not limited to, Andes virus).

The outcomes of interest for this evidence summary were any measure of infectious period (including culture positivity over time, serial interval, generation time, time to viral clearance, or viral load over time), any measure of incubation period, asymptomatic or presymptomatic transmission, routes of transmission (including infectious respiratory particles such as droplet or aerosols, direct contact, fomite, sexual or faecal-oral transmission, including from food contamination).

A protocol was produced before the literature search was conducted, including the review question, the eligibility criteria, and all other methods. Full details of the methodology are provided in the protocol in [Annexe A](#).

There were no deviations from the protocol. Screening of title and abstracts was undertaken in duplicate by 6 reviewers for 10% of records, with the remainder completed by one reviewer. Screening on full texts was undertaken by one reviewer, and excluded studies were checked by a second. Data extraction was performed by one reviewer and checked by a second.

For this evidence summary, the definitions that were used are:

- infectious period: the period where an individual can infect others
- incubation period: the time between exposure and symptom onset
- serial interval: the time between symptom onset in the index case and symptom onset in a secondary case
- generation time: the time from infection of an index case and infection of a secondary case

Where more than one study reported on the same data set, we have reported the study that included the most relevant and complete information for the review question in the main body of the report. All studies have been included, and complete data extraction is reported in [Annexe D](#), with detail of the overlapping data. Ranges were reported only where they were presented in the original study, and calculations were undertaken only where a known exposure date or symptom onset date was available.

Evidence

In total, 3,916 studies were screened at title and abstract and 116 studies were screened at full text. Of these, 17 studies met the inclusion criteria. The most common reason for exclusion was not reporting on human-to-human transmission (reporting animal-to-human instead). These studies were listed under the exclusion reason 'wrong context'. A PRISMA diagram showing the flow of studies through the review is shown in [Annexe B](#), and studies excluded on full text screening are available with the reasons why in [Annexe C](#). Study characteristics are available in [Annexe D](#).

Incubation period

Seven studies reported incubation period, or sufficient information to enable incubation period to be calculated, for human hantavirus infection (Andes virus) in the context of human-to-human transmission ([4](#), [6](#), [8](#), [10](#), [12](#), [13](#), [15](#), [17](#)). However, 2 pairs of studies reported on the same outbreak and cases (Enria and others, Wells and others ([4](#), [17](#)), Martinez 2020 and others, and Iglesias and others ([8](#), [12](#))). In those cases, we have reported the study that included the most complete and relevant information for the review question.

All studies were conducted in Argentina, Chile, Paraguay or Uruguay, a brief description of each study is given below with all incubation period results in [Table 1](#), separated for children and adults where possible. Full details are in [Annexe D](#).

Enria and others ([4](#)) reported an outbreak of hantavirus pulmonary syndrome caused by Andes virus in Argentina between September and December 1996. Transmission occurred within a hospital setting. Two secondary cases were confirmed by polymerase chain reaction (PCR)

test, both healthcare professionals involved in the care of the index case. One case was a man, the sex of the other case, nor the ages of either case were reported. The only reported known risk factor for case 1 was accidental contact (via ungloved hands) with the blood of the index case. Case 2 had attended the funeral of another case with hantavirus (the husband of the index case) as well as providing medical care to the index case. Wells and others (17) also reported incubation period in these cases, further details are provided in [Annexe D](#).

Ferres and others 2020 (6) reported on a family cluster of hantavirus cardiopulmonary syndrome caused by Andes virus in Chile, date not reported. Two cases were confirmed, both family members of an index case. Case 1 was a 21 year old woman and case 2 was a newborn baby (sex not reported). Cases were confirmed by PCR and serology. Transmission occurred within a household setting. No specific route of transmission was identified, however, reported exposures included caregiving contact between case 1 and the index case, and breastfeeding of case 2 by case 1.

Martinez and others 2020 (12) reported on hantavirus pulmonary syndrome caused by Andes virus (Epuyén/18-19 strain), in Argentina between November 2018 and February 2019. Thirty-four cases were identified: 41% men, ages ranged from 2 to 90 years (18% were 17 years old or under and 18% were 65 years and over). Cases were confirmed by PCR and serology. Transmission occurred at a birthday party and at a funeral (indoor or outdoor setting not reported for either) and within households or places of work or while sharing cars. Iglesias and others (8) also reported on incubation period in these cases, further details are provided in [Annexe D](#).

Martinez VP and others 2005 (10) reported an outbreak of hantavirus pulmonary syndrome caused by the Andes virus Sout and Cent species in Argentina between July and December 2002. Cases were laboratory confirmed. Five cases were identified across 2 clusters. Transmission occurred in an urban household setting (cluster 1) and a long-distance bus trip with close contact (cluster 2). All 5 cases were men and ages ranged between 14 and 58 years.

Martinez-Valdebenito and others 2014 (13) reported on an outbreak of hantavirus infection caused by Andes virus in Chile, between February and April 2011. Five cases were identified, 40% men, age range 31 to 73 years. Cases were confirmed by PCR. Transmission occurred in household and hospital settings. The study authors stated that human-to-human transmission was most likely, although 3 of the 5 cases also had possible environmental exposure.

Table 1. Incubation period of Andes virus in the context of human-to-human transmission

Study (linked study reporting same cases)	Number of cases (n children included)	Age (range)	Exposure setting	Incubation period (days)
Enria and others 1996 (4) (Wells and others 1997 (17))	2 Both adults	Not reported	Hospital	Mean (SD): 27.5 (0.7) Range: 27 to 28
Ferres and others 2020 (6)	2 (1 newborn)	0 to 21 years	Household	Newborn: 18 Adult: 17 to 26 (uncertainty in exposure dates)
Martinez VP and others 2005 (10)	5 (1 child)	14 to 58 years	Household and bus travel	Range: 15 to 26 (uncertainty in exposure dates)
Martinez-Valdebenito and others 2014 (13)	5 All adults	31 to 73 years	Household and hospital	Range 13 to 27 (uncertainty in exposure dates)
Martinez VP and others 2020 (12) (Iglesias and others (8))	34 (6 children)	2 to 90 years	Mixed indoor and outdoor	Calculated mean (SD): 21.6 (7.0) Adults: 21.9 (7.4) Children: 19.8 (3.7) Range: 9 to 40

Infectious period

Serial interval

Twelve studies reported the serial interval of cases, or provided enough information to calculate serial interval ([1](#), [2](#), [5](#), [9 to 14](#), [16](#), [17](#)). All of these studies were from Argentina or Chile. However, 2 pairs of studies reported on the same outbreak and cases (Martinez-Valdebenito 2005 and Martinez-Valdebenito 2010 ([10](#), [11](#)) and Padula 1998 and Wells 1997 ([14](#), [17](#)). In those cases, we have reported the study that included the most relevant and complete information.

A brief description of each study is given below, with all serial interval results in [Table 2](#), separated for children and adults where possible. Full details are in [Annexe D](#). One study also reported some limited information on change in viral load over time, which is described in the summary below ([2](#)).

Alonso and others ([1](#)) reported on 3 clustered cases of hantavirus pulmonary syndrome caused by Andes virus (South variant) in Argentina in 2014. Cases were confirmed by PCR. The clustered cases included 2 men and one woman with ages ranging from 53 to 71 years. The study reported that case 3, a nurse, provided care for case 2 during their hospitalisation and had no evidence of rodent exposure at home. Contact with case 2 at the hospital was considered the only source of infection for case 3.

Barrera A and others ([2](#)) reported on an outbreak of hantavirus cardiopulmonary syndrome, caused by Andes virus (CHI-Hu13724) in Chile between May and June 2024. An index case and 2 secondary cases were identified – one boy and one adult woman, ages not reported. Cases were confirmed by PCR. Exposure occurred in the household, transmission was reported as likely human-to-human transmission within the family cluster, but authors were unable to fully rule out environmental exposure. Barrera and others also measured viral load weekly for 6 weeks post-infection. A marked rise was reported at week 5, above baseline levels. Raw data was only available in graphical form.

Ferres and others 2007 ([5](#)) reported results from a prospective study of household clusters of hantavirus cardiopulmonary syndrome caused by Andes Virus in Chile. Sixteen household cases were identified. Cases were confirmed by PCR and serology. All 16 household cases were symptomatic. Six cases were men (37.5%), mean age was 37.3 years (plus or minus 17 years, range 2 to 67 years). Three of the cases were children, aged 2, 8 and 17 years. Transmission settings were households with close-contact exposure (both rural and urban settings).

Lazaro and others ([9](#)) reported on hantavirus pulmonary syndrome in Argentina between November 1993 and June 2005. Eighteen cases were identified in 9 clusters, of which 8 were suggestive of human-to-human transmission. Andes virus was identified in cases from 3 out of those 8 clusters, specific hantavirus species was not reported in the remaining 5 clusters. Cases were confirmed by PCR. All cases occurred in rural or semi-rural area, and all cases were household or intimate contacts of the index case. Cases were symptomatic in 6 clusters. Mean age of the cases was 28.3 years (plus or minus 16.3 years with a range of 7 months to 63 years).

Martinez VP and others 2005 ([10](#)), as reported above, reported symptom onset dates in the index cases and secondary cases. The serial interval is reported in [Table 2](#). Martinez and others ([11](#)) also reported on serial interval in the same cases. There is some unexplained discrepancy between Martinez VP 2005 and Martinez 2010 (a later report on the same cases by the same author) in terms of serial interval values, so these results should be interpreted with caution. Further details are provided in [Annexe D](#).

Martinez-Valdebenito and others 2014 ([13](#)), and Martinez and others ([12](#)), as reported above, also both reported symptom onset dates in the index cases and secondary cases from the respective outbreaks. The serial intervals are reported in [Table 2](#).

Padula and others 1998 ([14](#)) reported an outbreak of hantavirus pulmonary syndrome caused by Andes virus between September 1996 and January 1997 in Argentina. Sixteen cases were epidemiologically linked and associated with suspected human-to-human transmission. Age and sex of the cases was not reported. Cases were confirmed by PCR. All cases were symptomatic. Transmission occurred in household and hospital settings. The serial interval is reported in [Table 2](#). Wells and others ([17](#)) also reported on serial interval in these cases, further details are provided in [Annexe D](#).

Padula and others 2000 ([15](#)) reported evidence on hantavirus pulmonary syndrome caused by Andes virus, from 1995 to 1999 in Argentina, Chile, Paraguay and Uruguay. Details on transmission settings of individual cases and contacts were not reported. Cases were confirmed by PCR and serology data. Six cases were identified that met the criteria of no exposure to rodents for 50 days before symptom onset for secondary cases. The age and sex of the cases were not reported. The authors of the paper report this data as an 'incubation period' but define it as the interval between the onset of symptoms between cases and therefore it has been reported in this evidence summary as a serial interval.

Toro and others ([16](#)) reported on an outbreak of hantavirus pulmonary syndrome caused by Andes virus in Chile between July 1997 and January 1998. There were 7 cases in total from 2 family clusters. Cluster 1 contained an index case and 4 secondary cases: 2 men, 2 boys and one woman. Ages ranged from 2 to 39 years (although ages for one man and woman were not reported). There was one index case in cluster 2 (a man) and one secondary case (a woman). Ages for cluster 2 were not reported. Cases were confirmed by PCR and serology. The exposure setting was rural and semi-rural households, route of transmission was not reported.

Table 2. Serial interval of Andes virus in the context of human-to-human transmission

Study (linked study reporting same cases)	Number of cases (n children included)	Age (range)	Exposure setting	Serial interval (days)
Alonso and others, 2020 (1)	3 All adults	53 to 71 years	Hospital	22 (n=1)
Barerra and others, 2025 (2)	2 (assumed 1 child)	Not reported	Household	Child: 19 to 20 (uncertainty in dates) Adult: too much uncertainty to determine
Ferres and others, 2007 (5)	16 (3 children)	2 to 67 years	Household	Calculated mean (SD): 19.6 (7.4) Children: 19.7 (3.5)

Study (linked study reporting same cases)	Number of cases (n children included)	Age (range)	Exposure setting	Serial interval (days)
				Adults: 19.5 (8.1) Range: 4 to 30
Lazaro and others, 2007(9)	18 (5 children)	7 months to 63 years	Household	Mean (SD): 23.4 (6.8) Range: 19 to 40
Martinez-Valdebenito and others, 2005 (10) (Martinez-Valdebenito and others, 2010 (11))	5 (1 child)	14 to 58 years	Household and bus travel	Child: 29 Adult mean (n=2): (SD): 20.0 (4.2) Range: 17 to 29
Martinez-Valdebenito and others, 2014 (13)	5 All adults	31 to 73 years	Household and hospital	Mean (SD): 22.5 (4.4) Range: 16 to 25
Martinez VP and others, 2020 (12)	34 (6 children)	2 to 90 years	Mixed indoor and outdoor	Mean (SD): 23.0 (7.0) Range not reported
Padula and others, 1998 (14) (Wells and others, 1997 (17))	16 All adults	Not reported	Household and hospital	Mean (SD): 24.3 (4.6) Range: 20 to 31
Padula and others 2000 (15)	6 (no. children, not reported)	Not reported	Not reported	Mean (SD): 21 (4.8) Range: 16 to 29
Toro and others, 1998 (16)	7 (2 children)	Cluster 1 (n=5) 2 to 39 years Cluster 2 (n=2) ages not reported	Household	Cluster 1 (n=4): Mean (SD): 25.7 (8.0) Cluster 2: 22.0

Asymptomatic or presymptomatic transmission

No studies were identified that reported evidence of asymptomatic or presymptomatic transmission of hantavirus in the context of human-to-human transmission.

Route of transmission

No evidence was identified that confirmed a route of human-to-human transmission.

Some studies suggested possible transmission routes from known exposures. Martinez 2020 and others ([12](#)), reported above, included evidence on exposures. On the basis of evidence from 5 human-to-human transmission events, they suggested the route of infection in secondary cases could be through inhalation of droplets or virus particles in the air with possible airborne exposure described at birthday party, funeral and in hospital settings without direct contact. Sexual transmission was also considered a potential route of transmission in 2 case pairs. However, since both cases also transmitted the virus to other non-sexual contacts, close respiratory contact was considered the most probable route of infection.

Sexual transmission, including body fluid contact, was proposed as a route of transmission by 3 studies ([3](#), [5](#)) ([9](#)). Three studies proposed direct contact involving bodily fluids (breast milk) as the likely route of transmission ([6](#), [7](#), [9](#)). Evidence of contact with the blood of a confirmed case was identified in one study, reporting a doctor in hospital was accidentally exposed to the blood of a case via direct contact with the doctors ungloved hand ([4](#)). The doctor did not have any cuts or open wounds on the hand. One study proposed kissing and droplet spread as a likely route of transmission ([9](#)).

Most studies reported close or direct contact with a case, and none rule out potential for infectious respiratory particles (droplet or aerosol) or transmission from fomites.

Further details are provided in [Annexe D](#).

Health inequalities

There were a number of groups highlighted at risk of health inequalities with relation to hantavirus when developing the review protocol, including inequalities related to initial exposure or human-to-human exposure, susceptibility to the virus, and in the outcomes of infection. These included:

- geographical inequalities, for example rural or remote areas,
- people in occupations at higher risk of exposure including agriculture, farming, forestry, construction, cleaning waste management and pest control, healthcare workers
- people in circumstances under which transmission may occur, for example superspreader events such as weddings, nightclubs
- people who are immunosuppressed or have co-morbidities
- pregnancy
- age (children, compared to adults and older adults)

- characteristics which can result in densely networked communities and settings for example deprivation, ethnicity
- sex
- people with chronic conditions

However, there was limited information available within the included studies to assess the potential impact on any of these groups. Many of the studies included children and adults. Although it was possible to separate results for children and adults in some cases, none of the studies compared the 2 groups.

Many studies included people in rural settings, although not all studies reported this information. Three of these studies included people in occupations at higher risk of exposure, including farming, agricultural work. The high representation of these groups is likely to reflect the higher risk of initial zoonotic exposure ([9](#), [10](#), [13](#)).

Five studies include people who worked in healthcare settings who are at higher risk of exposure to human cases ([1](#), [3](#), [4](#), [14](#), [17](#)).

Two studies included pregnant women ([6](#), [9](#)) and 3 reported potential transmission to newborn babies and infants through direct contact and possibly breastfeeding ([3](#), [5](#)) ([9](#)).

However, it was not possible to tell from the available evidence whether outcomes differed in any of these groups. Further information is required to fully explore the potential health inequalities in relation to this review question.

Limitations

This systematic evidence summary used streamlined systematic methods to accelerate the review process. Sources of evidence searched included databases of peer-reviewed and preprint research, but an extensive search of other sources was not conducted and most article screening was completed without duplication, so it is possible relevant evidence may have been missed.

Critical appraisal was not performed due to the rapid completion of this work. This restricts the interpretation of the findings, although important limitations of the evidence are highlighted here.

All included studies only have a small number of cases in which human-to-human transmission is reported as the most likely exposure. As human-to-human transmission is considered to be uncommon with hantavirus, this is not unexpected, but it restricts the reliability of the findings. This also limits the ability to determine whether there are differences between groups, such as children and adults, as the results may not be generalisable.

Many studies also report possible environmental exposures. Although the study authors give reasons for assuming human-to-human transmission, it is possible some are due to environmental exposure.

None of the included studies report confirmed routes of transmission, although some suggest a route based on source of exposure.

There is considerable overlap between studies reporting on the same outbreaks and similar populations. There are discrepancies in reporting of some of the studies which clearly report on the same cases. This has been highlighted in the report where it is clear, and the study reporting the data that appears most accurate has been used (with reasons for decisions stated in [Annexe D](#)). However, it is possible that there are other overlapping cases within studies that aren't so clearly described and so there is the possibility of some double counting. The discrepancies between studies also highlights that there may be misreporting of data in some of these studies. A key limitation is the potential misclassification of epidemiological measures in some studies, with 'incubation period' estimates potentially reflecting serial intervals, compounded by uncertainty in exposure timing, which may introduce bias into the reported estimates. All studies rely on self-report of exposure and symptom onset dates, which can be subject to recall bias, or misreport by people.

Evidence gaps

No evidence was identified that reported asymptomatic or presymptomatic transmission. This may be a gap in the evidence, or it may reflect that only symptomatic transmission occurs. There was also no information available that directly informed the infectious period in humans.

All evidence was for Andes virus, rather than any of the other hantavirus species. This may also reflect that this is the only species at present with suggested human-to-human transmission, rather than an evidence gap.

There was no evidence that could reliably inform route of transmission in these cases.

Evidence for infectious period was limited to data on serial interval. There was no available evidence on culture positivity over time, generation time, time to viral clearance or viral load over time.

Conclusion

There was evidence available from 17 studies reporting on incubation period or serial interval of human-to-human transmission of Andes virus. There was no information available that directly informed the infectious period in humans. Available evidence on incubation period suggested a range of 9 to 40 days and means of 21.6 to 27.5 days across studies. Serial interval ranged from 4 to 40 days between studies with means of 19.6 to 25.7 days. Some studies provided enough information to separate evidence in children, however there was not enough information to determine whether there was a significant difference between children and adults.

The studies did not provide evidence on confirmed transmission route, but some suggested possible routes of transmission from the route of exposure. These included the possibility of respiratory transmission, sexual transmission, direct contact through breast feeding and other forms of direct contact. Studies did not rule out respiratory or fomite transmission having a role alongside other routes of transmission.

No evidence was available to suggest asymptomatic or presymptomatic transmission.

Many studies included groups identified as being at risk of inequalities, including pregnant women, people living in rural areas and people working in occupations with higher risk of exposure. However, it was not possible to determine whether outcomes differed in any of these groups.

The evidence had a number of limitations, including a small number of cases with likely human-to-human transmission, risk of recall bias and misreport in studies, potential for overlapping cases and double counting and the possibility of environmental exposure being responsible for transmission. The findings therefore may not be generalisable to wider populations and should be interpreted with caution due to the limitations highlighted.

Acknowledgments

We would like to thank Caroline de Brun (UKHSA Knowledge and Library Service), UKHSA Knowledge and Library Service colleagues, the Health Equity and Inclusion Health team and colleagues within the All Hazards Public Health Response division who either reviewed or input into aspects of the review.

Disclaimer

UKHSA's rapid reviews and systematic evidence summaries aim to provide the best available evidence to decision makers in a timely and accessible way, based on published peer-reviewed scientific papers, and papers on preprint servers. Note that the reviews and systematic evidence summaries:

- use accelerated methods and may not be representative of the whole body of evidence publicly available
- have undergone an internal independent peer review but not an external peer review
- are only valid as of the date stated on the review

In the event that this systematic evidence summary is shared externally, note additionally, to the greatest extent possible under any applicable law, that UKHSA accepts no liability for any claim, loss or damage arising out of, or connected with the use of, this review by the recipient or any third party including that arising or resulting from any reliance placed on, or any conclusions drawn from, the review.

References

1. Alonso DO and others. '[Person-to-Person Transmission of Andes Virus in Hantavirus Pulmonary Syndrome, Argentina, 2014](#)' Emerging Infectious Diseases 2020: volume 26, issue 4, pages 756 to 759
2. Barrera A and others. '[New Andes virus isolate haplotype obtained during prospective close contacts follow-up of an Hantavirus cardiopulmonary syndrome fatal case, Chile](#)' Current Research in Microbial Sciences 2025: volume 9, 100472
3. Cantoni G and others. '[Hantavirus pulmonary syndrome in the Province of Rio Negro, Argentina, 1993-1996](#)' Revista do Instituto de Medicina Tropical de São Paulo 1997: volume 39, issue 4, pages 191 to 196
4. Enria D and others. '[Hantavirus pulmonary syndrome in Argentina. Possibility of person to person transmission](#)' Medicina 1996: volume 56, issue 6, pages 709 to 711
5. Ferres M and others. '[Prospective evaluation of household contacts of persons with hantavirus cardiopulmonary syndrome in chile](#)' Journal of Infectious Diseases 2007: volume 195, issue 11, pages 1,563 to 1,571
6. Ferres M and others. '[Mother-to-Child Transmission of Andes Virus through Breast Milk, Chile](#)' Emerging Infectious Diseases 2020: volume 26, issue 8, pages 1,885 to 1,888
7. Ferres M and others. '[Viral shedding and viraemia of Andes virus during acute hantavirus infection: a prospective study](#)' The Lancet Infectious Diseases 2024: volume 24, issue 7, pages 775 to 782
8. Iglesias AA and others. '[Delayed viral clearance despite high number of activated T cells during the acute phase in Argentinean patients with hantavirus pulmonary syndrome](#)' EBioMedicine 2022: volume 75, 103765

9. Lazaro ME and others. '[Clusters of hantavirus infection, southern Argentina](#)' Emerging Infectious Diseases 2007: volume 13, issue 1, pages 104 to 110
10. Martinez VP and others. '[Person-to-person transmission of Andes virus](#)' Emerging Infectious Diseases 2005: volume 11, issue 12, pages 1,848 to 1,853
11. Martinez VP and others. '[Hantavirus pulmonary syndrome in Argentina, 1995-2008](#)' Emerging Infectious Diseases 2010: volume 16, issue 12, pages 1,853 to 1,860
12. Martinez VP and others. '["Super-Spreaders" and Person-to-Person Transmission of Andes Virus in Argentina](#)' New England Journal of Medicine 2020: volume 383, issue 23, pages 2,230 to 2,241
13. Martinez-Valdebenito C and others. '[Person-to-person household and nosocomial transmission of andes hantavirus, Southern Chile, 2011](#)' Emerging Infectious Diseases 2014: volume 20, issue 10, pages 1,629 to 1,636
14. Padula PJ and others. '[Hantavirus pulmonary syndrome outbreak in Argentina: molecular evidence for person-to-person transmission of Andes virus](#)' Virology 1998: volume 241, issue 2, pages 323 to 330
15. Padula PJ and others. '[Genetic diversity, distribution, and serological features of hantavirus infection in five countries in South America](#)' Journal of Clinical Microbiology 2000: volume 38, issue 8, pages 3,029 to 3,035
16. Toro J and others. '[An outbreak of hantavirus pulmonary syndrome, Chile, 1997](#)' Emerging Infectious Diseases 1998: volume 4, issue 4, pages 687 to 694
17. Wells RM and others. '[An unusual hantavirus outbreak in southern Argentina: person-to-person transmission? Hantavirus Pulmonary Syndrome Study Group for Patagonia](#)' Emerging Infectious Diseases 1997: volume 3, issue 2, pages 171 to 174

Annexe A. Protocol

Review question

The review question is:

1. What is the available evidence on the incubation and infectious period, asymptomatic or presymptomatic transmission and transmission route in human-to-human hantavirus infection?

A search for primary evidence to answer this systematic evidence summary question will be conducted up to 1 May 2026.

Definitions for terms included in this evidence summary are:

- infectious period: the period where an individual can infect others
- incubation period: the time between exposure and symptom onset
- serial interval: the time between symptom onset in the index case and symptom onset in a secondary case
- generation time: the time from infection of an index case and infection of a secondary case

Eligibility criteria

Table A.1 Inclusion and exclusion criteria

	Included	Excluded
Population	Humans (any age) <ul style="list-style-type: none">• children (aged up to and including 17 years)• adults (18 years and older)	Animals
Settings	Any	
Context	Human-to-human transmission	Animal-to-human transmission
Intervention or exposure	Hantavirus (all species), including, but not limited to: <ul style="list-style-type: none">• Andes virus [ANDV]<ul style="list-style-type: none">○ ANDV Sout○ ANDV Cent	
Outcomes	Any measure of incubation period	

	Included	Excluded
	<p>Any measure of infectious period including;</p> <ul style="list-style-type: none"> • culture positivity over time • serial interval • generation time • time to viral clearance • viral load over time <p>Asymptomatic or presymptomatic transmission</p> <p>Routes of transmission:</p> <ul style="list-style-type: none"> • sexual transmission • direct contact • fomite • infectious respiratory particles (droplet or aerosol) • faecal/oral (including from food contamination) 	
Language	English	Any other language
Date of publication	1 May 2026	
Study design	<ul style="list-style-type: none"> • observational studies: case-control, and cohort studies • outbreak reports (regardless of peer review status) • case series • case reports 	<ul style="list-style-type: none"> • experimental studies (randomised-controlled trials, quasi-experimental studies, cross-over designs, before-and-after studies) • systematic or Narrative reviews • modelling studies
Publication type	Peer-reviewed published research Preprints	<ul style="list-style-type: none"> • editorials • letters • news articles • clinical trial registries • grey literature • conference abstracts

Identification of studies

The following databases will be searched for studies published up to 1 May 2026: OVID Medline, OVID Embase, and Web of Science Preprint Citation Index. The [search strategy](#) is presented below.

Screening

Title and abstract screening will be undertaken in duplicate by 2 reviewers for at least 10% of the eligible studies, with the remainder completed by one reviewer. Disagreement will be resolved by discussion or with involvement of a third reviewer where necessary.

Screening on full text will be undertaken by one reviewer and checked by a second.

Data extraction

Summary information for each study will be extracted and reported in tabular form. Information to be extracted will include country, study period, study design, participants and their demographics, setting of transmission (including whether in or outside of the household), results relating to transmission, and any relevant contextual data. This will be undertaken by one reviewer and checked by a second.

Risk of bias assessment

Risk of bias of included studies will not be formally assessed in this systematic evidence summary due to time constraints but important limitations of the evidence will be highlighted.

Synthesis

Where studies are similar enough to combine and present data in a consistent format, a narrative synthesis will be produced to interpret the findings. The number of studies, the number of participants in each study, effect size and variance and a summary of study limitations across studies reporting each outcome will be summarised and presented. Alternatively, if studies present methodological differences that would make synthesis inappropriate, a narrative summary of each study will be provided.

Health inequalities

Variations across the following populations and subgroups will be considered, where evidence is available: those of whom may have a differing level of exposure or susceptibility to the infection or those for whom the outcome of hantavirus infection or hantavirus pulmonary syndrome may differ, such as those with co-morbidities, immunosuppression or those in occupations with a higher risk of exposure (detailed below).

Potential inequalities related to transmission parameters:

1. Inequalities related to initial exposure or human-to-human exposure:

- geographical inequalities for example, rural or remote areas
- occupations at higher risk of exposure including agriculture, farming, forestry, construction, cleaning waste management and pest control, healthcare workers
- circumstances under which transmission may occur for example, superspreader events such as weddings, nightclubs

2. Inequalities related to susceptibility:

- immunosuppression or co-morbidities
- pregnancy
- age (children vs adults versus older adults)
- characteristics which can result in densely networked communities and settings for example, deprivation, ethnicity

To note, inequalities in **outcomes** of hantavirus are also likely to be affected by:

- sex
- chronic conditions
- age

Search strategy

Ovid MEDLINE(R) ALL (1946 to 4 May 2026)

1. exp Orthohantavirus/ (3,932)
2. Orthohantavir*.tw,kf. (422)
3. Hantaan virus/ (587)
4. Hantavirus Infections/ (1,526)
5. hantaan virus*.tw,kf. (823)
6. hantaanvir*.tw,kf. (4)
7. hantavir*.tw,kf. (4,117)

8. hanta vir*.tw,kf. (49)
9. Andes vir*.tw,kf. (248)
10. ANDV.tw,kf. (206)
11. ANDV?CHI-9717869.tw,kf. (0)
12. ANDV?ARG.tw,kf. (0)
13. ANDV?CHI-7913.tw,kf. (0)
14. ANDV?Epilink?96.tw,kf. (0)
15. ANDV?Epuyen?18?19.tw,kf. (0)
16. korean h?emorrhagic fever virus*.tw,kf. (10)
17. Hemorrhagic Fever with Renal Syndrome/ (2,954)
18. h?emorrhagic nephroso-nephritis virus*.tw,kf. (3)
19. (h?emorrhagic fever adj2 renal syndrome*).tw,kf. (2,395)
20. hfrs.tw,kf. (2,054)
21. Hantavirus Pulmonary Syndrome/ (671)
22. Hantavirus Pulmonary Syndrome.tw,kf. (801)
23. Puumala virus/ (493)
24. Puumala vir*.tw,kf. (627)
25. Seoul virus/ (166)
26. Seoul vir*.tw,kf. (309)
27. Sin Nombre virus/ (166)
28. sin nombre vir*.tw,kf. (345)
29. muerto canyon vir*.tw,kf. (8)
30. four corners vir*.tw,kf. (9)
31. Dobrava.tw,kf. (307)
32. castelo dos sonhos.tw,kf. (9)
33. CASV.tw,kf. (18)
34. Lechiguanas.tw,kf. (17)
35. LECV.tw,kf. (3)
36. Oran.tw,kf. (367)
37. ORNV.tw,kf. (32)
38. Laguna negra.tw,kf. (40)
39. LANV.tw,kf. (8)
40. Rio mamore.tw,kf. (28)
41. Araucaria.tw,kf. (426)
42. ARAUV.tw,kf. (2)
43. Araraquara.tw,kf. (230)
44. ARQV.tw,kf. (2)
45. Bermejo.tw,kf. (61)
46. BMJV.tw,kf. (0)
47. Juquitiba.tw,kf. (39)
48. JUQV.tw,kf. (9)
49. Bolivia vir*.tw,kf. (3)
50. BMIV.tw,kf. (14)

51. Anajatuba.tw,kf. (12)
52. Tunari.tw,kf. (9)
53. Andes central plata.tw,kf. (1)
54. Seewis.tw,kf. (30)
55. Saaremaa.tw,kf. (72)
56. or/1-55 [Hanta virus terms] (8,544)
57. exp Infectious Disease Incubation Period/ (425)
58. incubat*.tw,kf. (361,836)
59. Quarantine/ (6975)
60. quarantine*.tw,kf. (14,810)
61. (infectious* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (7,529)
62. (infectiv* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (2,222)
63. (contagio* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (407)
64. (isolat* adj3 (duration* or time* or length* or period*)).tw,kf. (12,888)
65. ((Transmis* or transmit*) adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (21,328)
66. (communicab* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (287)
67. (shed* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (4,763)
68. (culture* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (48,511)
69. (vir* proliferat* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (14)
70. (vir* replicat* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (1,377)
71. infector infectee pair*.tw,kf. (40)
72. exp Virus Shedding/ (4,638)
73. exp Viral Load/ (42,723)
74. ((virus* or viral*) adj3 shed*).tw,kf. (8,389)
75. (vir* adj5 clearance adj5 (duration* or time* or length* or period* or peak* or window*)).tw,kf. (516)
76. (vir* load* adj5 (duration* or time* or length* or period* or peak* or window*)).tw,kf. (3,259)
77. (peak* adj1 (vir* load* or vir* shed* or vir* concentration)).tw,kf. (525)
78. cycl* threshold*.tw,kf. (3,514)
79. CT value*.tw,kf. (6,872)
80. (PCR positiv* adj5 (duration* or time* or length* or period* or peak* or window*)).tw,kf. (535)
81. (chain adj2 (transmi* or infect*)).tw,kf. (1,573)

82. ((latent or latency or silent or asymptom*) adj5 (duration* or period* or length* or time* or window* or phase* or transmi*)).tw,kf. (43,779)
83. exp Asymptomatic Diseases/ (11,026)
84. exp Asymptomatic Infections/ (3,079)
85. exp Latent Infection/ (5,487)
86. exp Virus Latency/ (6,932)
87. (time adj5 (onset or clinical presentation or factor*)).tw,kf. (94,846)
88. (period adj5 (onset or clinical presentation)).tw,kf. (6,491)
89. exp Time Factors/ (1,269,158)
90. (Communicable Diseases/ or exp Disease Transmission, Infectious/ or transmission.fs.) and exp Time/ (14,812)
91. serial interval*.tw,kf. (512)
92. (generation adj3 (time* or interval*)).tw,kf. (8,635)
93. ((primary case* adj5 secondary case*) and (time or interval* or period*)).tw,kf. (81)
94. or/57-93 [incubation and infectious period search terms] (1,917,200)
95. Asymptomatic Diseases/ (7,958)
96. Asymptomatic Infections/ (3,079)
97. asymptomatic*.tw,kf. (216,608)
98. (non-symptomatic* or nonsymptomatic*).tw,kf. (1,796)
99. (pre-symptomatic* or presymptomatic*).tw,kf. (8,030)
100. (symptom* adj2 free).tw,kf. (13,379)
101. (before adj2 symptom*).tw,kf. (10,747)
102. symptomless.tw,kf. (2,987)
103. no symptom*.tw,kf. (12,734)
104. ((without or with-out) adj symptom*).tw,kf. (7,352)
105. symptom* status.tw,kf. (1,955)
106. paucisymptom*.tw,kf. (483)
107. pauci-symptom*.tw,kf. (236)
108. (subclinical* or sub-clinical*).tw,kf. (64,125)
109. (inapparent adj2 (infect* or disease* or condition*)).tw,kf. (649)
110. Carrier State/ (23,035)
111. (latent* adj3 (transmi* or symptom* or illness* or infect* or disease* or condition* or state* or coloni?ation* or carrier* or carrying)).tw,kf. (25,073)
112. (silent* adj3 (transmi* or symptom* or illness* or infect* or disease* or condition* or state* or coloni?ation* or carrier* or carrying)).tw,kf. (4,646)
113. (covert* adj3 (transmi* or symptom* or illness* or infect* or disease* or condition* or state* or coloni?ation* or carrier* or carrying)).tw,kf. (544)
114. ((mild* or minor) adj2 (symptom* or disease* or illness* or infection*)).tw,kf. (40,242)
115. ((without or with-out) adj3 manifest*).tw,kf. (4,577)
116. (no adj3 manifest*).tw,kf. (4,203)
117. or/95-116 [asymptomatic, presymptomatic search terms] (420,082)
118. exp Disease Transmission, Infectious/ (87,573)

119. (transmi* adj5 (route* or mode or modes or path or paths or pathway* or method* or way or ways or how or direct* or indirect* or primary or secondary or pattern* or vehicle* or window*)).tw,kf. (71,397)
120. transmi*.ti. (122,879)
121. (human adj1 human).tw,kf. (3,292,299)
122. (person adj1 person).tw,kf. (221,297)
123. transmi* between human*.tw,kf. (460)
124. transmi* between people.tw,kf. (57)
125. ((direct* or indirect* or close or transmi* or physical* or regular* or frequent* or prolonged or infect*) adj3 contact*).tw,kf. (64,687)
126. interhuman.tw,kf. (245)
127. "inter human".tw,kf. (154)
128. inter-person*.tw,kf. (872)
129. (between adj2 (person* or people or population*)).tw,kf. (56,917)
130. (within adj2 population*).tw,kf. (34,382)
131. ((communit* or disease* or infection* or population* or human* or people* or group*) adj3 spread*).tw,kf. (42,011)
132. ((communit* or disease* or infection* or population* or human* or people* or group*) adj3 contagio*).tw,kf. (7,676)
133. community acquired infection*.tw,kf. (2,704)
134. (skin adj1 skin).tw,kf. (732,306)
135. (mouth adj1 mouth).tw,kf. (97,902)
136. (mouth adj1 skin).tw,kf. (175)
137. (hand adj1 mouth).tw,kf. (170)
138. (face adj1 face).tw,kf. (331,287)
139. ((human* or person* or people* or adult* or child*) adj2 outbreak*).tw,kf. (3,374)
140. ((human* or person* or people* or adult* or child*) adj2 disease*).tw,kf. (168,283)
141. ((human* or person* or people* or adult* or child*) adj2 infect*).tw,kf. (145,450)
142. ((human* or person* or people* or adult* or child*) adj2 illness*).tw,kf. (13,548)
143. touch*.tw,kf. (49,758)
144. (horizontal* adj2 transmit*).tw,kf. (777)
145. exp Inhalation Exposure/ (11,098)
146. exp Inhalation/ (6,108)
147. exp Exhalation/ (5,433)
148. exp Respiration/ (126,282)
149. exp "Aerosolized Particles and Droplets"/ (45)
150. exp "Respiratory Aerosols and Droplets"/ (692)
151. droplet*.tw,kf. (78,688)
152. (respiratory adj3 transmi*).tw,kf. (2,242)
153. exp Aerosols/ (38,698)
154. exp Air Microbiology/ (9,023)
155. aerosol*.tw,kf. (64,290)
156. airborne.tw,kf. (31,050)

157. air borne.tw,kf. (1,170)
158. air* particle*.tw,kf. (3,523)
159. respiratory particle*.tw,kf. (137)
160. expiratory particle*.tw,kf. (8)
161. exhal*.tw,kf. (19,805)
162. inhal*.tw,kf. (142,567)
163. air sampl*.tw,kf. (8,920)
164. (respirat* adj (route* or mode* or path* or method* or transmi* or spread*)).tw,kf. (11,236)
165. (expirat* adj (route* or mode* or path* or method* or transmi* or spread*)).tw,kf. (36)
166. (airway* adj (route* or mode* or path* or method* or transmi* or spread*)).tw,kf. (1,964)
167. (air way* adj (route* or mode* or path* or method* or transmi* or spread*)).tw,kf. (0)
168. (breath* adj (route* or mode* or path* or method* or transmi* or spread*)).tw,kf. (1,847)
169. ((air flow* or airflow* or aerodynamic* or air condition* or cough* or sneez* or breath* or sing or singing or shout* or (air adj2 circulat*) or (air adj2 recirculation) or (air adj2 re-circulation)) and (transmission* or transmit* or distanc* or dispers*)).tw,kf. (13,349)
170. ((ventilation or ventilated) and (transmission* or distanc* or dispers*)).tw,kf. (5,599)
171. Air Conditioning/ (2,982)
172. air conditioning.tw,kf. (3,227)
173. bioaerosol*.tw,kf. (2,810)
174. exp Fomites/ (704)
175. (fomite* or fomes).tw,kf. (1,992)
176. ((contaminat* or transmi*) adj3 (surface* or environment* or touch* or object* or equipment or food or drink*)).tw,kf. (48,003)
177. ((Virus or viral*) adj5 (touch* or surface*)).tw,kf. (11,487)
178. exp Body Fluids/ (353,770)
179. exp Bodily Secretions/ (300,746)
180. ((body or bodily) adj fluid*).tw,kf. (32,409)
181. ((body or bodily) adj secretion*).tw,kf. (417)
182. exp Saliva/ (50,868)
183. exp Respiratory Mucosa/ (40,858)
184. exp Nasal Mucosa/ (29,720)
185. saliva*.tw,kf. (137,234)
186. spit*.tw,kf. (86,834)
187. (muc\$us or mucosa).tw,kf. (203,689)
188. (phlegm or sputum).tw,kf. (43,903)
189. ((nostril* or nasal) adj3 (discharge* or secretion*)).tw,kf. (6,664)
190. (kiss or kissing).tw,kf. (5,725)
191. ((mouth or tongue or lip*) adj3 contact*).tw,kf. (1,637)
192. ((shared or sharing) adj3 (utensil* or fork* or spoon* or knife or knives or cup* or mug* or glass* or tumbler* or food or drink*)).tw,kf. (1,131)
193. exp Blood/ (1,257,285)
194. (blood* adj3 (contact* or expose* or exposure or transmi*)).tw,kf. (20,745)

195. "blood borne".tw,kf. (8,508)
196. bloodborne.tw,kf. (1,904)
197. biofluid*.tw,kf. (6,836)
198. bio-fluid.tw,kf. (114)
199. (biological adj (fluid* or secretion* or excret*)).tw,kf. (14,533)
200. ((body or bodily) adj liquid*).tw,kf. (144)
201. exp Feces/ (119,124)
202. exp Urine/ (38,627)
203. ((f\$ecal* or f\$eces or orof\$ecal* or "oral f\$ecal*" or "f\$ecal oral*" or oral* or urine or urinary) adj3 (transmi* or transfer* or spread* or contact* or route* or infect*)).tw,kf. (99,437)
204. exp Sexually Transmitted Diseases/ (437,661)
205. exp Sexual Behavior/ (134,564)
206. (sexual* adj3 (transmi* or spread* or contact* or disease* or infect*)).tw,kf. (56,888)
207. exp Vaginal Discharge/ (1,944)
208. (Vagina* adj3 (fluid* or secret* or discharge* or transmi* or spread* or disease* or contact*)).tw,kf. (10,548)
209. ((penile or penis) adj3 (fluid* or secret* or discharge* or ejaculat* or transmi* or spread* or disease* or contact*)).tw,kf. (1,448)
210. (ejaculate* adj3 fluid*).tw,kf. (104)
211. seminal fluid*.tw,kf. (3282)
212. exp Semen/ (26,707)
213. semen.tw,kf. (41,572)
214. exp Infectious Disease Transmission, Vertical/ (20,219)
215. exp Pregnancy Complications, Infectious/ (53,556)
216. (vertical* adj2 transmi*).tw,kf. (12,155)
217. (mother* adj1 child* adj2 (transmi* or transfer*)).tw,kf. (139)
218. (parent* adj1 child* adj2 (transmi* or transfer*)).tw,kf. (105)
219. (maternal* adj2 (transmi* or transfer*)).tw,kf. (6,331)
220. ((f\$etal* or f\$etus or fetomaternal) adj2 (transmi* or transfer*)).tw,kf. (1,993)
221. ("in utero" adj2 (transmi* or transfer*)).tw,kf. (681)
222. (transplacental* adj2 (transmi* or transfer*)).tw,kf. (2,422)
223. ((intrapartum or postpartum) adj2 transmi*).tw,kf. (176)
224. ((intra-partum or post-partum) adj2 transmi*).tw,kf. (19)
225. ((perinatal* or postnatal*) adj2 transmi*).tw,kf. (2,817)
226. ((peri-natal* or post-natal*) adj2 transmi*).tw,kf. (27)
227. exp Milk, Human/ (25,100)
228. exp Breast Feeding/ (48,290)
229. (breastfeed* or breast feed* or breastfed or breast fed or breastmilk or breast milk or human milk).tw,kf. (84,737)
230. exp Cross Infection/ (68,732)
231. exp Infectious Disease Transmission, Patient-to-Professional/ (5,560)
232. exp Infectious Disease Transmission, Professional-to-Patient/ (1,916)

233. (nosocomial adj3 (transmi* or disease* or infect* or spread*)).tw,kf. (26,468)
234. ((hospital or healthcare or "health care") adj2 (acquire* or associat*) adj2 (infect* or disease*)).tw,kf. (18,578)
235. Foodborne Diseases/ (11,683)
236. Food Contamination/ or Food Microbiology/ (86,987)
237. ((food or foods or eat or eating or eaten) adj3 (poisoning or contamina* or virus or viral or infect*)).tw,kf. (26,723)
238. ((food or foods or eat or eating or eaten) adj3 (transmi* or transfer* or spread* or contact* or route*)).tw,kf. (7,953)
239. ((drink or drinks or drinking or beverage*) adj3 (poisoning or contamina* or virus or viral or infect*)).tw,kf. (4,930)
240. ((drink or drinks or drinking or beverage*) adj3 (transmi* or transfer* or spread* or contact* or route*)).tw,kf. (607)
241. exp "Food and Beverages"/ (1,688,942)
242. (water adj3 (poisoning or contamina* or virus or viral or infect*)).tw,kf. (28,802)
243. (water adj3 (transmi* or transfer* or spread* or contact* or route*)).tw,kf. (22,305)
244. foodborne.tw,kf. (22,471)
245. or/118-244 (9,018,149)
246. 56 and 245 (3,021)
247. 56 and 94 (587)
248. 56 and 117 (229)
249. 246 or 247 or 248 (3,411)
250. limit 249 to (comment or editorial or letter or news or newspaper article) (72)
251. 249 not 250 (3,339)

Embase (1974 to 1 May 2026)

1. Orthohantavir*.tw,kf. (451)
2. exp Hantavirus/ (5,467)
3. exp Hantavirus infection/ (3,288)
4. hantaan virus*.tw,kf. (946)
5. hantaanvir*.tw,kf. (7)
6. hantavir*.tw,kf. (4,785)
7. hanta vir*.tw,kf. (97)
8. Andes vir*.tw,kf. (284)
9. ANDV.tw,kf. (234)
10. ANDV?CHI-9717869.tw,kf. (0)
11. ANDV?ARG.tw,kf. (0)
12. ANDV?CHI-7913.tw,kf. (0)
13. ANDV?Epilink?96.tw,kf. (0)
14. ANDV?Epuyen?18?19.tw,kf. (0)
15. korean h?emorrhagic fever virus*.tw,kf. (14)
16. exp hemorrhagic fever with renal syndrome/ (1,561)
17. h?emorrhagic nephroso-nephritis virus*.tw,kf. (0)

18. (h?emorrhagic fever adj2 renal syndrome*).tw,kf. (2,725)
19. hfrs.tw,kf. (2,532)
20. Hantavirus pulmonary syndrome/ (1,014)
21. Hantavirus Pulmonary Syndrome.tw,kf. (891)
22. Puumala virus/ (1,039)
23. Puumala vir*.tw,kf. (720)
24. Seoul virus/ (343)
25. Seoul vir*.tw,kf. (343)
26. Sin Nombre virus/ (300)
27. sin nombre vir*.tw,kf. (371)
28. muerto canyon vir*.tw,kf. (9)
29. four corners vir*.tw,kf. (9)
30. Dobrava.tw,kf. (363)
31. castelo dos sonhos.tw,kf. (10)
32. CASV.tw,kf. (17)
33. Lechiguanas.tw,kf. (19)
34. LECV.tw,kf. (5)
35. Oran.tw,kf. (685)
36. ORNV.tw,kf. (29)
37. Laguna negra.tw,kf. (48)
38. LANV.tw,kf. (9)
39. Rio mamore.tw,kf. (35)
40. Araucaria.tw,kf. (470)
41. ARAUV.tw,kf. (2)
42. Araraquara.tw,kf. (308)
43. ARQV.tw,kf. (2)
44. Bermejo.tw,kf. (139)
45. BMJV.tw,kf. (1)
46. Juquitiba.tw,kf. (45)
47. JUQV.tw,kf. (10)
48. Bolivia vir*.tw,kf. (3)
49. BMIV.tw,kf. (17)
50. Anajatuba.tw,kf. (13)
51. Tunari.tw,kf. (11)
52. Andes central plata.tw,kf. (1)
53. Seewis.tw,kf. (34)
54. Saaremaa.tw,kf. (86)
55. or/1-54 (10193)
56. incubation time/ (65,887)
57. incubat*.tw,kf. (454,326)
58. exp quarantine/ (17,206)
59. quarantine*.tw,kf. (15,372)

60. (infectious* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (10,071)
61. (infectiv* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (2,744)
62. (contagio* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (434)
63. (isolat* adj3 (duration* or time or length* or period*)).tw,kf. (16,600)
64. ((Transmis* or transmit*) adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (23,192)
65. (communicab* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (316)
66. (shed* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (5,544)
67. (culture* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (63,954)
68. (vir* proliferat* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (17)
69. (vir* replicat* adj5 (duration* or time* or length* or period* or peak* or window* or phase*)).tw,kf. (1,714)
70. infector infectee pair*.tw,kf. (45)
71. virus shedding/ (12,434)
72. exp virus load/ (133,749)
73. ((virus* or viral*) adj3 shed*).tw,kf. (9,785)
74. (vir* adj5 clearance adj5 (duration* or time* or length* or period* or peak* or window*)).tw,kf. (731)
75. (vir* load* adj5 (duration* or time* or length* or period* or peak* or window*)).tw,kf. (5,403)
76. (peak* adj1 (vir* load* or vir* shed* or vir* concentration)).tw,kf. (843)
77. cycl* threshold*.tw,kf. (4,680)
78. CT value*.tw,kf. (10,867)
79. (PCR positiv* adj5 (duration* or time* or length* or period* or peak* or window*)).tw,kf. (730)
80. (chain adj2 (transmi* or infect*)).tw,kf. (1,885)
81. ((latent or latency or silent or asymptom*) adj5 (duration* or period* or length* or time* or window* or phase* or transmi*)).tw,kf. (60,239)
82. exp asymptomatic disease/ (38,498)
83. asymptomatic infection/ (8,955)
84. exp latent infection/ (144,69)
85. virus latency/ (5,535)
86. (time adj5 (onset or clinical presentation or factor*)).tw,kf. (144,051)
87. (period adj5 (onset or clinical presentation)).tw,kf. (9,713)
88. time factor/ (55,761)

89. (Communicable Diseases/ or exp Disease Transmission, Infectious/ or transmission.fs.) and exp Time/ (9,854)
90. serial interval*.tw,kf. (587)
91. (generation adj3 (time* or interval*)).tw,kf. (9,464)
92. ((primary case* adj5 secondary case*) and (time or interval* or period*)).tw,kf. (95)
93. or/56-92 (1,089,569)
94. asymptomatic disease/ (26,811)
95. asymptomatic infection/ (8,955)
96. asymptomatic*.tw,kf. (328,314)
97. (non-symptomatic* or nonsymptomatic*).tw,kf. (2,672)
98. (pre-symptomatic* or presymptomatic*).tw,kf. (12,439)
99. (symptom* adj2 free).tw,kf. (19,119)
100. (before adj2 symptom*).tw,kf. (17,465)
101. symptomless.tw,kf. (3,027)
102. no symptom*.tw,kf. (2,1013)
103. ((without or with-out) adj symptom*).tw,kf. (11,899)
104. symptom* status.tw,kf. (3,193)
105. paucisymptom*.tw,kf. (831)
106. pauci-symptom*.tw,kf. (360)
107. (subclinical* or sub-clinical*).tw,kf. (100,354)
108. (inapparent adj2 (infect* or disease* or condition*)).tw,kf. (663)
109. asymptomatic carrier/ (2,691)
110. (latent* adj3 (transmi* or symptom* or illness* or infect* or disease* or condition* or state* or coloni?ation* or carrier* or carrying)).tw,kf. (31,694)
111. (silent* adj3 (transmi* or symptom* or illness* or infect* or disease* or condition* or state* or coloni?ation* or carrier* or carrying)).tw,kf. (6,575)
112. (covert* adj3 (transmi* or symptom* or illness* or infect* or disease* or condition* or state* or coloni?ation* or carrier* or carrying)).tw,kf. (651)
113. ((mild* or minor) adj2 (symptom* or disease* or illness* or infection*)).tw,kf. (62,871)
114. ((without or with-out) adj3 manifest*).tw,kf. (7,254)
115. (no adj3 manifest*).tw,kf. (6,341)
116. or/94-115 (613120)
117. exp disease transmission/ (272,236)
118. (transmi* adj5 (route* or mode or modes or path or paths or pathway* or method* or way or ways or how or direct* or indirect* or primary or secondary or pattern* or vehicle* or window*)).tw,kf. (87,029)
119. transmi*.ti. (130550)
120. (human adj1 human).tw,kf. (4,072,573)
121. (person adj1 person).tw,kf. (325,212)
122. transmi* between human*.tw,kf. (523)
123. transmi* between people.tw,kf. (76)
124. ((direct* or indirect* or close or transmi* or physical* or regular* or frequent* or prolonged or infect*) adj3 contact*).tw,kf. (81,105)

125. interhuman.tw,kf. (302)
126. "inter human".tw,kf. (212)
127. inter-person*.tw,kf. (1,236)
128. (between adj2 (person* or people or population*)).tw,kf. (70,544)
129. (within adj2 population*).tw,kf. (42,954)
130. ((communit* or disease* or infection* or population* or human* or people* or group*) adj3 spread*).tw,kf. (49,756)
131. ((communit* or disease* or infection* or population* or human* or people* or group*) adj3 contagio*).tw,kf. (8,895)
132. (skin adj1 skin).tw,kf. (1,016,466)
133. (mouth adj1 mouth).tw,kf. (125,322)
134. (mouth adj1 skin).tw,kf. (325)
135. (hand adj1 mouth).tw,kf. (212)
136. (face adj1 face).tw,kf. (431,073)
137. ((human* or person* or people* or adult* or child*) adj2 outbreak*).tw,kf. (3,714)
138. ((human* or person* or people* or adult* or child*) adj2 disease*).tw,kf. (218,530)
139. ((human* or person* or people* or adult* or child*) adj2 infect*).tw,kf. (181,177)
140. ((human* or person* or people* or adult* or child*) adj2 illness*).tw,kf. (17,934)
141. touch*.tw,kf. (68,893)
142. (horizontal* adj2 transmit*).tw,kf. (835)
143. exp inhalational exposure/ (1,027)
144. exp inhalation/ (38,598)
145. exp exhalation/ (365,79)
146. exp breathing/ (299,139)
147. exp "aerosolized particles and droplets"/ (326)
148. exp "infectious droplets and aerosols"/ (149)
149. exp "respiratory droplets and aerosols"/ (866)
150. droplet*.tw,kf. (91,221)
151. (respiratory adj3 transmi*).tw,kf. (2,608)
152. exp aerosol/ (74,764)
153. air microbiolog*.tw,kf. (65)
154. airborne.tw,kf. (38,635)
155. air borne.tw,kf. (1,239)
156. air* particle*.tw,kf. (4,542)
157. respiratory particle*.tw,kf. (155)
158. expiratory particle*.tw,kf. (8)
159. exhal*.tw,kf. (32,338)
160. inhal*.tw,kf. (209,861)
161. air sampl*.tw,kf. (11,985)
162. (respirat* adj (route* or mode* or path* or method* or transmi* or spread*)).tw,kf. (14,912)
163. (expirat* adj (route* or mode* or path* or method* or transmi* or spread*)).tw,kf. (89)
164. (air way* adj (route* or mode* or path* or method* or transmi* or spread*)).tw,kf. (0)

165. (breath* adj (route* or mode* or path* or method* or transmi* or spread*)).tw,kf. (2,740)
166. ((air flow* or airflow* or aerodynamic* or air condition* or cough* or sneez* or breath* or sing or singing or shout* or (air adj2 circulat*) or (air adj2 recirculation) or (air adj2 re-circulation)) and (transmission* or transmit* or distanc* or dispers*)).tw,kf. (20,865)
167. ((ventilation or ventilated) and (transmission* or distanc* or dispers*)).tw,kf. (8,483)
168. air conditioning/ (26,024)
169. air conditioning.tw,kf. (3,897)
170. bioaerosol*.tw,kf. (3,855)
171. exp fomite/ (1,031)
172. (fomite* or fomes).tw,kf. (2,253)
173. ((contaminat* or transmi*) adj3 (surface* or environment* or touch* or object* or equipment or food or drink*)).tw,kf. (55,433)
174. ((Virus or viral*) adj5 (touch* or surface*)).tw,kf. (13,108)
175. exp body fluid/ (3,268,686)
176. exp bodily secretions/ (427,549)
177. ((body or bodily) adj fluid*).tw,kf. (37,308)
178. ((body or bodily) adj secretion*).tw,kf. (469)
179. exp saliva/ (52,611)
180. exp respiratory mucosa/ (37,986)
181. exp nose mucosa/ (20,166)
182. saliva*.tw,kf. (167,756)
183. spit*.tw,kf. (119,558)
184. (muc\$us or mucosa).tw,kf. (278,134)
185. (phlegm or sputum).tw,kf. (73,443)
186. ((nostril* or nasal) adj3 (discharge* or secretion*)).tw,kf. (87,79)
187. (kiss or kissing).tw,kf. (8,552)
188. ((mouth or tongue or lip*) adj3 contact*).tw,kf. (1,937)
189. ((shared or sharing) adj3 (utensil* or fork* or spoon* or knife or knives or cup* or mug* or glass* or tumbler* or food or drink*)).tw,kf. (1,299)
190. exp blood/ (2,937,901)
191. (blood* adj3 (contact* or expose* or exposure or transmi*)).tw,kf. (28162)
192. "blood borne".tw,kf. (11,199)
193. bloodborne.tw,kf. (2,443)
194. biofluid*.tw,kf. (8,535)
195. bio-fluid.tw,kf. (181)
196. (biological adj (fluid* or secretion* or excret*)).tw,kf. (17,139)
197. ((body or bodily) adj liquid*).tw,kf. (196)
198. exp feces/ (83,867)
199. exp urine/ (119,831)
200. ((f\$ecal* or f\$eces or orof\$ecal* or "oral f\$ecal*" or "f\$acal oral*" or oral* or urine or urinary) adj3 (transmi* or transfer* or spread* or contact* or route* or infect*)).tw,kf. (146,107)
201. exp sexually transmitted disease/ (128,845)

202. exp sexual behavior/ (287,383)
203. (sexual* adj3 (transmi* or spread* or contact* or disease* or infect*)).tw,kf. (7,3821)
204. exp vagina discharge/ (2,621)
205. (Vagina* adj3 (fluid* or secret* or discharge* or transmi* or spread* or disease* or contact*)).tw,kf. (14,455)
206. ((penile or penis) adj3 (fluid* or secret* or discharge* or ejaculat* or transmi* or spread* or disease* or contact*)).tw,kf. (2,091)
207. (ejaculate* adj3 fluid*).tw,kf. (110)
208. seminal fluid*.tw,kf. (4,062)
209. exp sperm/ (94,359)
210. semen.tw,kf. (54,774)
211. exp vertical transmission/ (23,848)
212. exp infectious pregnancy complication/ (35,310)
213. (vertical* adj2 transmi*).tw,kf. (15,227)
214. (mother* adj1 child* adj2 (transmi* or transfer*)).tw,kf. (298)
215. (parent* adj1 child* adj2 (transmi* or transfer*)).tw,kf. (120)
216. (maternal* adj2 (transmi* or transfer*)).tw,kf. (7,790)
217. ((f\$etal* or f\$tetus or fetomaternal) adj2 (transmi* or transfer*)).tw,kf. (2,663)
218. ("in utero" adj2 (transmi* or transfer*)).tw,kf. (965)
219. (transplacental* adj2 (transmi* or transfer*)).tw,kf. (3,040)
220. ((intrapartum or postpartum) adj2 transmi*).tw,kf. (224)
221. ((intra-partum or post-partum) adj2 transmi*).tw,kf. (22)
222. ((perinatal* or postnatal*) adj2 transmi*).tw,kf. (3,619)
223. ((peri-natal* or post-natal*) adj2 transmi*).tw,kf. (36)
224. exp breast milk/ (41,305)
225. (breastfeed* or breast feed* or breastfed or breast fed or breastmilk or breast milk or human milk).tw,kf. (108,876)
226. exp cross infection/ (22,773)
227. exp patient-to-professional transmission/ (64)
228. exp professional-to-patient transmission/ (18)
229. (nosocomial adj3 (transmi* or disease* or infect* or spread*)).tw,kf. (37,854)
230. ((hospital or healthcare or "health care") adj2 (acquire* or associat*) adj2 (infect* or disease*)).tw,kf. (26,772)
231. food poisoning/ (17,094)
232. food contamination/ (52,581)
233. ((food or foods or eat or eating or eaten) adj3 (poisoning or contamina* or virus or viral or infect*)).tw,kf. (28,463)
234. ((food or foods or eat or eating or eaten) adj3 (transmi* or transfer* or spread* or contact* or route*)).tw,kf. (8,681)
235. ((drink or drinks or drinking or beverage*) adj3 (poisoning or contamina* or virus or viral or infect*)).tw,kf. (5,863)
236. ((drink or drinks or drinking or beverage*) adj3 (transmi* or transfer* or spread* or contact* or route*)).tw,kf. (764)

237. (food and beverages).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word] (19,285)
238. exp *food/ (699,394)
239. ((drink or drinks or drinking or beverage*) adj3 (transmi* or transfer* or spread* or contact* or route*)).tw,kf. (764)
240. (water adj3 (transmi* or transfer* or spread* or contact* or route*)).tw,kf. (23,281)
241. foodborne.tw,kf. (22,490)
242. or/117-241 (1,1256,652)
243. 55 and 93 (548)
244. 55 and 116 (289)
245. 55 and 242 (4,433)
246. 243 or 244 or 245 (4,704)
247. limit 246 to ("clinical trial (clinicaltrials.gov)" or conference abstract or conference paper or "conference review" or editorial or letter) (692)
248. 246 not 247 (4,012)

Web of Science Preprint Citation Index (1990 to current)

Date of search: 4 May 2026

Search 1:

TS=(Orthohantavir*) OR TS=("hantaan virus*") OR TS=(hantaanvir*) OR TS=(hantavir*) OR TS=("hanta vir*") OR TS=("Andes vir*") OR TS=(ANDV) OR TS=(ANDV\$CHI-9717869) OR TS=(ANDV\$ARG) OR TS=(ANDV\$CHI-7913) OR TS=(ANDV\$Epilink 96) OR TS=(ANDV\$Epuyen 18\$19) OR TS=("korean h\$emorrhagic fever virus*") OR TS=("h\$emorrhagic nephroso-nephritis virus*") OR TS=((("h\$emorrhagic fever" NEAR/1 "renal syndrome*")) OR TS=(hfrs) OR TS=("Hantavirus Pulmonary Syndrome") OR TS=("Puumala vir*") OR TS=("Seoul vir*") OR TS=("sin nombre vir*") OR TS=("muerto canyon vir*") OR TS=("four corners vir*") OR TS=(Dobrava) OR TS=(Dobrava OR "castelo dos sonhos" OR CASV OR Lechiguanas OR LECV OR Oran OR ORNV OR "Laguna Negra" OR LANV OR "Rio Mamore" OR Araucaria OR ARAUV OR Araraquara OR ARQV OR Bermejo OR BMJV OR Juquitiba OR JUQV OR "Bolivia vir*" OR BMIV OR Anajatuba OR Tunari OR "Andes central plata" OR Seewis OR Saaremaa)

AND

TS=(incubat*) OR TS=(quarantine*) OR (TS=((infectious* NEAR/4 (duration* OR time* OR length* OR period* OR peak* OR window* OR phase*)))) OR (TS=((infectiv* NEAR/4 (duration* OR time* OR length* OR period* OR peak* OR window* OR phase*)))) OR (TS=((contagio* NEAR/4 (duration* OR time* OR length* OR period* OR peak* OR window* OR phase*)))) OR (TS=((isolat* NEAR/2 (duration* OR time OR length* OR period*)))) OR (TS=((Transmis* OR transmit*) NEAR/4 (duration* OR time* OR length* OR period* OR peak* OR window* OR

phase*)))) OR (TS=((communicab* NEAR/4 (duration* OR time* OR length* OR period* OR peak* OR window* OR phase*)))) OR (TS=((shed* NEAR/4 (duration* OR time* OR length* OR period* OR peak* OR window* OR phase*)))) OR (TS=((culture* NEAR/4 (duration* OR time* OR length* OR period* OR peak* OR window* OR phase*)))) OR (TS=((("vir* proliferat*" NEAR/4 (duration* OR time* OR length* OR period* OR peak* OR window* OR phase*)))) OR (TS=((("vir* replicat*" NEAR/4 (duration* OR time* OR length* OR period* OR peak* OR window* OR phase*)))) OR TS=("infectior infectee pair*") OR (TS=((("virus* OR viral*") NEAR/2 shed*))) OR (TS=((("vir* NEAR/4 clearance NEAR/4 (duration* OR time* OR length* OR period* OR peak* OR window*)))) OR (TS=((("vir* load*" NEAR/4 (duration* OR time* OR length* OR period* OR peak* OR window*)))) OR (TS=((("peak* NEAR/0 ("vir* load*" OR "vir* shed*" OR "vir* concentration*)))) OR TS=("cycl* threshold*") OR TS=("CT value*") OR (TS=((("PCR positiv*" NEAR/4 (duration* OR time* OR length* OR period* OR peak* OR window*)))) OR (TS=((("chain NEAR/1 (transmi* OR infect*)))) OR (TS=((("latent OR latency OR silent OR asymptom*" NEAR/4 (duration* OR period* OR length* OR time* OR window* OR phase* OR transmi*)))) OR (TS=((("time NEAR/4 (onset OR "clinical presentation" OR factor*)))) OR (TS=((("period NEAR/4 (onset OR "clinical presentation")))) OR TS=("serial interval*") OR (TS=((("generation NEAR/2 (time* OR interval*)))) OR (TS=((("primary case*" NEAR/4 "secondary case*") AND (time OR interval* OR period*))))

Search 2:

TS=(Orthohantavir*) OR TS=("hantaan virus*") OR TS=(hantaanvir*) OR TS=(hantavir*) OR TS=("hanta vir*") OR TS=("Andes vir*") OR TS=(ANDV) OR TS=(ANDV\$CHI-9717869) OR TS=(ANDV\$ARG) OR TS=(ANDV\$CHI-7913) OR TS=(ANDV\$Epilink 96) OR TS=(ANDV\$Epuyen 18\$19) OR TS=("korean h\$emorrhagic fever virus*") OR TS=("h\$emorrhagic nephroso-nephritis virus*") OR TS=((("h\$emorrhagic fever" NEAR/1 "renal syndrome*")) OR TS=(hfrs) OR TS=("Hantavirus Pulmonary Syndrome") OR TS=("Puumala vir*") OR TS=("Seoul vir*") OR TS=("sin nombre vir*") OR TS=("muerto canyon vir*") OR TS=("four corners vir*") OR TS=(Dobrava) OR TS=(Dobrava OR "castelo dos sonhos" OR CASV OR Lechiguanas OR LECV OR Oran OR ORNV OR "Laguna Negra" OR LANV OR "Rio Mamore" OR Araucaria OR ARAUV OR Araraquara OR ARQV OR Bermejo OR BMJV OR Juquitiba OR JUQV OR "Bolivia vir*" OR BMIV OR Anajatuba OR Tunari OR "Andes central plata" OR Seewis OR Saaremaa)

AND

TS=(asymptomatic*) OR (TS=((non-symptomatic* OR nonsymptomatic*))) OR (TS=((pre-symptomatic* OR presymptomatic*))) OR TS=((symptom* NEAR/1 free)) OR TS=((before NEAR/1 symptom*)) OR TS=(symptomless) OR TS=("no symptom*") OR (TS=((("without OR with-out) NEAR/0 symptom*))) OR TS=("symptom* status") OR TS=(paucisymptom*) OR TS=(pauci-symptom*) OR (TS=((subclinical* OR sub-clinical*))) OR (TS=((("inapparent NEAR/1 (infect* OR disease* OR condition*)))) OR (TS=((("latent* NEAR/2 (transmi* OR symptom* OR illness* OR infect* OR disease* OR condition* OR state* OR coloni\$ation* OR carrier* OR

carrying)))) OR (TS=((silent* NEAR/2 (transmi* OR symptom* OR illness* OR infect* OR disease* OR condition* OR state* OR coloni\$ation* OR carrier* OR carrying)))) OR (TS=((covert* NEAR/2 (transmi* OR symptom* OR illness* OR infect* OR disease* OR condition* OR state* OR coloni\$ation* OR carrier* OR carrying)))) OR (TS=((mild* OR minor) NEAR/1 (symptom* OR disease* OR illness* OR infection*)))) OR (TS=((without OR with-out) NEAR/2 manifest*)) OR TS=((no NEAR/2 manifest*))

Search 3:

TS=(Orthohantavir*) OR TS=("hantaan virus*") OR TS=(hantaanvir*) OR TS=(hantavir*) OR TS=("hanta vir*") OR TS=("Andes vir*") OR TS=(ANDV) OR TS=(ANDV\$CHI-9717869) OR TS=(ANDV\$ARG) OR TS=(ANDV\$CHI-7913) OR TS=(ANDV\$Epilink 96) OR TS=(ANDV\$Epuyen 18\$19) OR TS=("korean h\$emorrhagic fever virus*") OR TS=("h\$emorrhagic nephroso-nephritis virus*") OR TS(("h\$emorrhagic fever" NEAR/1 "renal syndrome*")) OR TS=(hfrs) OR TS=("Hantavirus Pulmonary Syndrome") OR TS=("Puumala vir*") OR TS=("Seoul vir*") OR TS=("sin nombre vir*") OR TS=("muerto canyon vir*") OR TS=("four corners vir*") OR TS=(Dobrava) OR TS=(Dobrava OR "castelo dos sonhos" OR CASV OR Lechiguanas OR LECV OR Oran OR ORNV OR "Laguna Negra" OR LANV OR "Rio Mamore" OR Araucaria OR ARAUV OR Araraquara OR ARQV OR Bermejo OR BMJV OR Juquitiba OR JUQV OR "Bolivia vir*" OR BMIV OR Anajatuba OR Tunari OR "Andes central plata" OR Seewis OR Saaremaa)

AND

TS=((transmi* NEAR/4 (route* OR mode OR modes OR path OR paths OR pathway* OR method* OR way OR ways OR how OR direct* OR indirect* OR primary OR secondary OR pattern* OR vehicle* OR window*))) OR (TS=((transmi* NEAR/4 (route* OR mode OR modes OR path OR paths OR pathway* OR method* OR way OR ways OR how OR direct* OR indirect* OR primary OR secondary OR pattern* OR vehicle* OR window*)))) OR TI=(transmi*) OR TS=((human NEAR/0 human)) OR TS=((person NEAR/0 person)) OR TS=("transmi* between human*") OR TS=("transmi* between people") OR (TS=((direct* OR indirect* OR close OR transmi* OR physical* OR regular* OR frequent* OR prolonged OR infect*) NEAR/2 contact*)) OR TS=(interhuman) OR TS=("inter human") OR TS=(inter-person*) OR (TS=((between NEAR/1 (person* OR people OR population*)))) OR TS=((within NEAR/1 population*)) OR (TS=((communit* OR disease* OR infection* OR population* OR human* OR people* OR group*) NEAR/2 spread*)) OR (TS=((communit* OR disease* OR infection* OR population* OR human* OR people* OR group*) NEAR/2 contagio*)) OR TS=((skin NEAR/0 skin)) OR TS=((mouth NEAR/0 mouth)) OR TS=((mouth NEAR/0 skin)) OR TS=((hand NEAR/0 mouth)) OR TS=((face NEAR/0 face)) OR (TS=((human* OR person* OR people* OR adult* OR child*) NEAR/1 outbreak*)) OR (TS=((human* OR person* OR people* OR adult* OR child*) NEAR/1 infect*)) OR (TS=((human* OR person* OR people* OR adult* OR child*) NEAR/1 illness*)) OR TS=(touch*) OR TS=((horizontal* NEAR/1 transmit*)) OR TS=(droplet*) OR TS=((respiratory

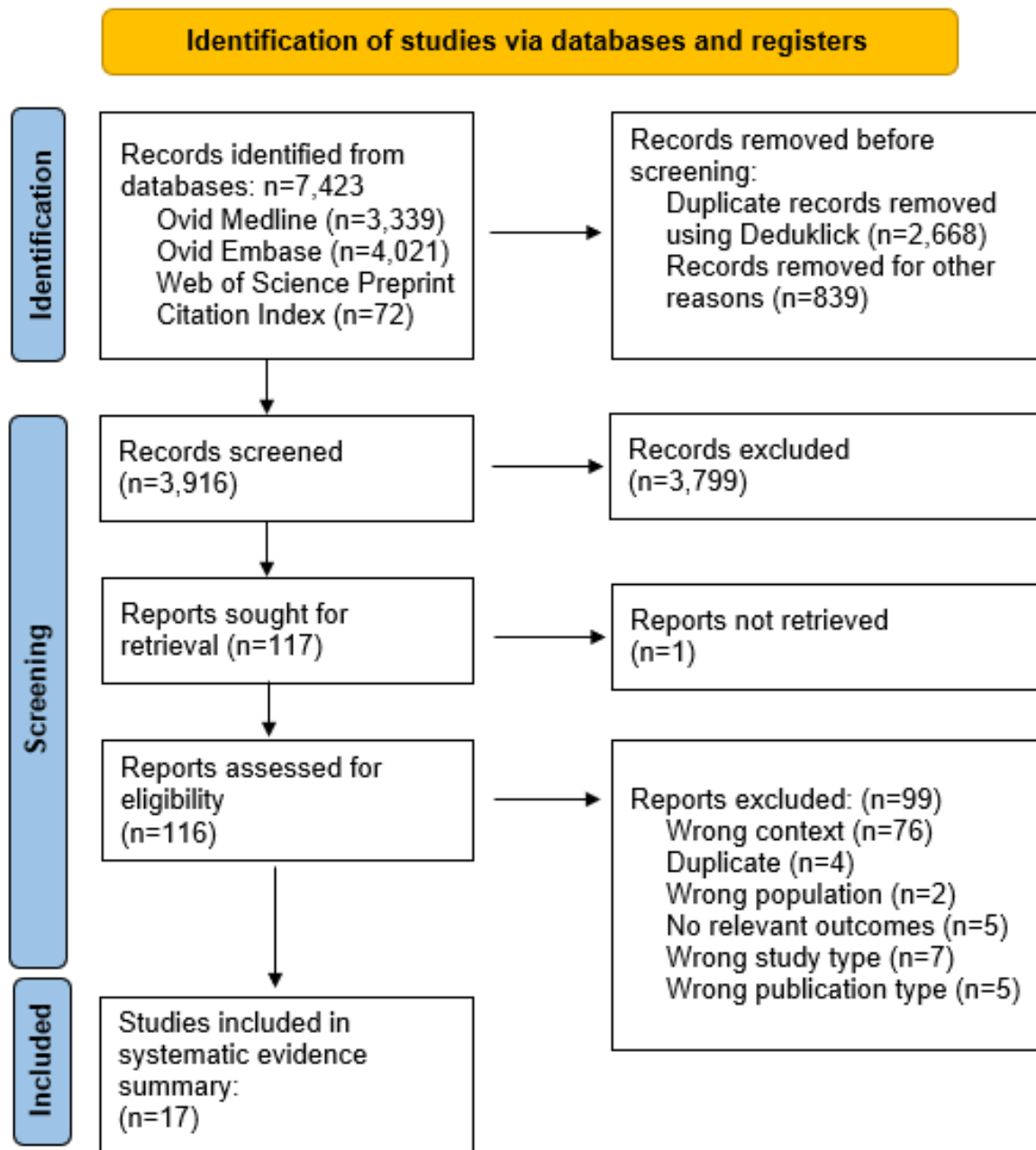
NEAR/2 transmi*)) OR TS=("air microbiolog*") OR TS=(airborne) OR TS=("air borne") OR TS=("air* particle*") OR TS=("respiratory particle*") OR TS=("expiratory particle*") OR TS=(exhal*) OR TS=(inhal*) OR TS=("air sampl*") OR (TS=((respirat* NEAR/0 (route* OR mode* OR path* OR method* OR transmi* OR spread*)))) OR (TS=((expirat* NEAR/0 (route* OR mode* OR path* OR method* OR transmi* OR spread*)))) OR (TS=((("air way*" NEAR/0 (route* OR mode* OR path* OR method* OR transmi* OR spread*)))) OR (TS=((breath* NEAR/0 (route* OR mode* OR path* OR method* OR transmi* OR spread*)))) OR (TS=((("air flow*" OR airflow* OR aerodynamic* OR "air condition*" OR cough* OR sneez* OR breath* OR sing OR singing OR shout* OR (air NEAR/1 circulat*) OR (air NEAR/1 recirculation) OR (air NEAR/1 re-circulation)) AND (transmission* OR transmit* OR distanc* OR dispers*)))) OR (TS=((ventilation OR ventilated) AND (transmission* OR distanc* OR dispers*)))) OR TS=("air conditioning") OR TS=(bioaerosol*) OR (TS=((fomite* OR fomes))) OR (TS=((contaminat* OR transmi*) NEAR/2 (surface* OR environment* OR touch* OR object* OR equipment OR food OR drink*)))) OR (TS=((Virus OR viral*) NEAR/4 (touch* OR surface*)))) OR (TS=((body OR bodily) NEAR/0 fluid*)) OR (TS=((body OR bodily) NEAR/0 secretion*)) OR TS=(saliva*) OR TS=(spit*) OR (TS=((muc\$us OR mucosa))) OR (TS=((phlegm OR sputum))) OR (TS=((nostril* OR nasal) NEAR/2 (discharge* OR secretion*)))) OR (TS=((kiss OR kissing))) OR (TS=((mouth OR tongue OR lip*) NEAR/2 contact*)) OR (TS=((shared OR sharing) NEAR/2 (utensil* OR fork* OR spoon* OR knife OR knives OR cup* OR mug* OR glass* OR tumbler* OR food OR drink*)))) OR (TS=((blood* NEAR/2 (contact* OR expose* OR exposure OR transmi*)))) OR TS=("blood borne") OR TS=(bloodborne) OR TS=(biofluid*) OR TS=(bio-fluid) OR (TS=((biological NEAR/0 (fluid* OR secretion* OR excret*)))) OR (TS=((body OR bodily) NEAR/0 liquid*)) OR (TS=((f\$ecal* OR f\$eces OR orof\$ecal* OR "oral f\$ecal*" OR "f\$ecal oral*" OR oral* OR urine OR urinary) NEAR/2 (transmi* OR transfer* OR spread* OR contact* OR route* OR infect*)))) OR (TS=((sexual* NEAR/2 (transmi* OR spread* OR contact* OR disease* OR infect*)))) OR (TS=((Vagina* NEAR/2 (fluid* OR secret* OR discharge* OR transmi* OR spread* OR disease* OR contact*)))) OR TS=((penile OR penis) NEAR/2 (fluid* OR secret* OR discharge* OR ejaculat* OR transmi* OR spread* OR disease* OR contact*)) OR TS=((ejaculate* NEAR/2 fluid*)) OR TS=("seminal fluid*") OR TS=(semen) OR TS=((vertical* NEAR/1 transmi*)) OR TS=((mother* NEAR/0 child* NEAR/1 (transmi* OR transfer*))) OR TS=((parent* NEAR/0 child* NEAR/1 (transmi* OR transfer*))) OR TS=((maternal* NEAR/1 (transmi* OR transfer*))) OR TS=((f\$etal* OR f\$etus OR fetomaternal) NEAR/1 (transmi* OR transfer*))) OR TS=((("in utero" NEAR/2 (transmi* OR transfer*))) OR (TS=((transplacental* NEAR/1 (transmi* OR transfer*)))) OR (TS=((intrapartum OR postpartum) NEAR/1 transmi*)) OR (TS=((intra-partum OR post-partum) NEAR/1 transmi*)) OR (TS=((perinatal* OR postnatal*) NEAR/1 transmi*)) OR (TS=((peri-natal* OR post-natal*) NEAR/1 transmi*)) OR (TS=((breastfeed* OR "breast feed*" OR breastfed OR "breast fed" OR breastmilk OR "breast milk" OR "human milk"))) OR (TS=((nosocomial NEAR/2 (transmi* OR disease* OR infect* OR spread*)))) OR (TS=((hospital OR healthcare OR "health care") NEAR/1 (acquire* OR associat*) NEAR/1 (infect* OR disease*)))) OR TS=((food or foods or eat or eating or eaten) NEAR/3 (poisoning or contamina* or virus or viral or infect*)) OR (TS=((food or foods or eat or eating or eaten) NEAR/3 (transmi* or transfer* or spread* or contact* or route*)) OR TS=((drink or drinks or drinking or beverage*) NEAR/3 (poisoning or contamina* or

virus or viral or infect*)) OR TS=((drink or drinks or drinking or beverage*) NEAR/3 (transmi* or transfer* or spread* or contact* or route*)) OR (water NEAR/3 (poisoning or contamina* or virus or viral or infect*)) OR TS=(water NEAR/3 (transmi* or transfer* or spread* or contact* or route*)) OR TS=(foodborne))

Search 1 or search 2 or search 3: 72 results

Annexe B. Study selection flowchart

Figure B.1. PRISMA diagram



Text version of Figure B.1. PRISMA diagram

A PRISMA diagram showing the flow of studies through this systematic evidence summary, ultimately including 17 studies.

From identification of studies via databases and registers, n=7,423 records identified from databases:

- Ovid Medline (n=3,339)
- Ovid Embase (n=4,021)
- Web of Science Preprint Citation Index (n=72)

From these, records removed before screening:

- duplicate records removed using Deduklick (n=2,668)
- records removed for other reasons (n=839)

n=3,916 records screened, of which n=3,799 were excluded, leaving n=117 papers sought for retrieval, of which n=1 was not retrieved.

No studies were identified from identification of studies via other methods.

Of the n=116 papers assessed for eligibility, n=99 reports were excluded:

- wrong context (n=76)
- duplicate (n=4)
- wrong population (n=2)
- no relevant outcomes (n=5)
- wrong study type (n=7)
- wrong publication type (n=5)

n=17 papers included in the review.

Annexe C. Excluded full texts

Wrong context (76 studies)

Abu Sin M and others. '[Risk factors for hantavirus infection in Germany, 2005](#)' Emerging Infectious Diseases 2007: volume 13, issue 9, pages 1,364 to 1,366

Anonymous. '[British soldier returns from Bosnia with HFRS](#)' Communicable disease report 1995: page 193

Bayard V and others. '[Hantavirus pulmonary syndrome - Panama, 1999-2000](#)' MMWR - Morbidity and Mortality Weekly Report 2000: volume 49, issue 10, pages 205 to 207

Bellomo CM and others. '[Viral load of patients with hantavirus pulmonary syndrome in Argentina](#)' Journal of Medical Virology 2015: volume 87, issue 11, pages 1,823 to 1,830

Bellomo CM and others. '[Andes Virus Genome Mutations That Are Likely Associated with Animal Model Attenuation and Human Person-to-Person Transmission](#)' Msphere 2023: volume 8, issue 3, e0001823

Castillo C and others. '[Andes Hantavirus as possible cause of disease in travellers to South America](#)' Travel Medicine and Infectious Disease 2007: volume 5, issue 1, pages 30 to 34

Castillo C and others. '[Hantavirus pulmonary syndrome due to Andes virus in Temuco, Chile: clinical experience with 16 adults](#)' Chest 2001: volume 120, issue 2, pages 548 to 554

Cekinovic Grbesa D and others. '[Epidemiology and Clinical Course of Haemorrhagic Fever with Renal Syndrome in New Endemic Area for Hantavirus Infection in Croatia](#)' Life 2023: volume 13, issue 8, page 18

Celebi G and others. '[Dynamics of Puumala hantavirus outbreak in Black Sea Region, Turkey](#)' Zoonoses and Public Health 2019: volume 66, issue 7, pages 783 to 797

Chandy S and others. '[A pilot study for serological evidence of hantavirus infection in human population in south India](#)' Indian Journal of Medical Research 2005: volume 122, issue 3, pages 211 to 215

Chaparro J and others. '[Assessment of person-to-person transmission of hantavirus pulmonary syndrome in a Chilean hospital setting](#)' Journal of Hospital Infection 1998: volume 40, issue 4, page 281 to 285

Chen T and others. '[The Viral Load Rather Than the Duration of Viremia Is Associated With the Severity of Hemorrhagic Fever With Renal Syndrome](#)' Journal of Medical Virology 2025: volume 97, issue 11, e70682

Cheney PR and others. '[Update on emerging infections from the centers for disease control and prevention](#)' Annals of Emergency Medicine 1999: volume 33, issue 1, pages 121 to 123

Coelho RM and others. '[Virological Characterization of a New Isolated Strain of Andes Virus Involved in the Recent Person-to-Person Transmission Outbreak Reported in Argentina](#)' medRxiv. 2024: volume 8

de Borba L and others. '[First evidence of asymptomatic infection related to the Araucaria \(Juquitiba-like\) hantavirus](#)' BMJ Case Reports 2013: volume 5, page 5

de Oliveira RC and others. '[A Fatal Hantavirus Pulmonary Syndrome Misdiagnosed as Dengue: An Investigation into the First Reported Case in Rio de Janeiro State, Brazil](#)' American Journal of Tropical Medicine and Hygiene 2017: volume 97, issue 1, pages 125 to 129

Douglas KO and others. '[First clinical reports of acute hantavirus and dengue infections among pregnant women in the Caribbean](#)' Infectious Diseases 2024: volume 56, issue 7, pages 564 to 574

Duchin JS and others. '[Hantavirus pulmonary syndrome: a clinical description of 17 patients with a newly recognized disease. The Hantavirus Study Group](#)' New England Journal of Medicine 1994: volume 330, issue 14, pages 949 to 955

Emmerich P and others. '[Human Dobrava-Belgrade hantavirus infection, Kosovo](#)' Journal of Clinical Virology 2014: volume 61, issue 3, pages 439 to 441

Engelthaler D and others. '[Hantavirus pulmonary syndrome - five states, 2006](#)' MMWR - Morbidity and Mortality Weekly Report 2006: pages 627 to 629

Fawcett SJ and others. '[Acute Hantavirus Infection Presenting With Fever and Altered Mentation in the Absence of Pulmonary or Renal Manifestations](#)' Open Forum Infectious Diseases 2022: volume 9, issue 9, ofac430

Ferreira MS and others. '[Hantavirus pulmonary syndrome in Brazil: clinical aspects of three new cases](#)' Revista do Instituto de Medicina Tropical de Sao Paulo 2000: volume 42, issue 1, pages 41 to 46

Garcia M and others. '[Innate lymphoid cells are activated in HFRS, and their function can be modulated by hantavirus-induced type I interferons](#)' PLOS Pathogens 2024: volume 20, issue 7, e1012390

Gardner SL and others. '[Low seroprevalence among farmers from Nebraska and vicinity suggests low level of human exposure to sin nombre virus](#)' Journal of Agromedicine 2005: volume 10, issue 1, pages 59 to 61

Glass GE and others. '[Domestic cases of hemorrhagic fever with renal syndrome in the United States](#)' Nephron 1994: volume 68, issue 1, pages 48 to 51

Godoy P and others. '[Andes virus antigens are shed in urine of patients with acute hantavirus cardiopulmonary syndrome](#)' Journal of Virology 2009: volume 83, issue 10, pages 5,046 to 5,055

Goeijenbier M and others. '[An unusual cause of a usual presentation. Hantavirus infection](#)' Netherlands Journal of Medicine 2011: volume 69, issue 6, pages 285 to 289

Groen J and others. '[Serological evidence of hantavirus in humans and rodents in Barbados](#)' Journal of Infection 2002: volume 45, issue 2, pages 109 to 110

Hecht G and others. '[Detection of Hantavirus during the COVID-19 Pandemic, Arizona, USA, 2020](#)' Emerging Infectious Diseases 2023: volume 29, issue 8, pages 1,663 to 1,667

Heyman P and others. '[A major outbreak of hantavirus infection in Belgium in 1995 and 1996](#)' Epidemiology and Infection 1999: volume 122, issue 3, pages 447 to 453

Heyman P and others. '[Incidence of hantavirus infections in Belgium](#)' Virus Research 2001: volume 77, issue 1, pages 71 to 80

Holmes EC and others. '[The evolution and emergence of hantaviruses](#)' Current Opinion in Virology 2015: volume 10, pages 27 to 33

Jackson BT and others. '[Epidemiologic and Environmental Investigations of Reported Hantavirus Cases Inform Exposure Risk in California, 1993-2020](#)' American Journal of Tropical Medicine and Hygiene 2025: volume 113, issue 6, pages 1,385 to 1,392

Janwadkar RS and others. '[Unexpected Challenges: A Case Report of Hantavirus Infection in a Pregnant Patient in a Rural Emergency Department](#)' Journal of Emergency Medicine 2025: volume 77, pages 84 to 88

Ji F and others. '[Hemorrhagic fever with renal syndrome caused by Hantaan virus infection in four pregnant Chinese women](#)' Journal of Medical Virology 2017: volume 89, issue 10, pages 1,865 to 1,870

Koren N and others. '[An increase in reported cases of haemorrhagic fever with renal syndrome in Slovenia in early 2008](#)' European Communicable Disease Bulletin 2008: volume 13, issue 17, page 24

Korva M and others. '[Viral load and immune response dynamics in patients with haemorrhagic fever with renal syndrome](#)' Clinical Microbiology and Infection 2013: volume 19, issue 8, pages E358 to E366

Koster F and others. '[Update: outbreak of hantavirus infection - southwestern United States, 1993](#)' MMWR - Morbidity and Mortality Weekly Report 1993: volume 42, issue 25, pages 495 to 6

Kuenzli AB and others. '[Hantavirus Cardiopulmonary Syndrome Due to Imported Andes Hantavirus Infection in Switzerland: A Multidisciplinary Challenge, Two Cases and a Literature Review](#)' Clinical Infectious Diseases 2018: volume 67, issue 11, pages 1,788 to 1,795

Kumar A and others. '[Hantavirus infection among children hospitalized for febrile illness suspected to be dengue in Barbados](#)' Journal of Infection and Public Health 2016: volume 9, issue 1, pages 81 to 87

Laine O and others. '[Hantavirus infection-induced thrombocytopenia triggers increased production but associates with impaired aggregation of platelets except for collagen](#)' Thrombosis Research 2015: volume 136, issue 6, pages 1,126 to 1,232

Latus J and others. '[Clinical course and long-term outcome of hantavirus-associated nephropathia epidemica, Germany](#)' Emerging Infectious Diseases 2015: volume 21, issue 1, pages 76 to 83

Lee HW. '[Hemorrhagic fever with renal syndrome in Korea](#)' Reviews of Infectious Diseases 1989: volume 11, pages S864 to S876

Levy DL. '[Hantavirus pulmonary syndrome. Outbreak of a new disease caused by a new virus](#)' Postgraduate Medicine 1995: volume 97, issue 3, pages 127 to 130, 133 to 134 and 139

Lewis RM and others. '[Changes in populations of immune effector cells during the course of haemorrhagic fever with renal syndrome](#)' Transactions of the Royal Society of Tropical Medicine and Hygiene 1991: volume 85, issue 2, pages 282 to 286

Lindgren T and others. '[Longitudinal analysis of the human T cell response during acute hantavirus infection](#)' Journal of Virology 2011: volume 85, issue 19, pages 10,252 to 10,260

Mace G and others. '[Severe Seoul hantavirus infection in a pregnant woman, France, October 2012](#)' Euro Surveillance Bulletin Europeen sur les Maladies Transmissibles European Communicable Disease Bulletin 2013: volume 18, issue 17, page 20,464

Manigold T and others. '[Case report: T-cell responses during clearance of Andes virus from blood cells 2 months after severe hantavirus cardiopulmonary syndrome](#)' Journal of Medical Virology 2008: volume 80, issue 11, pages 1,947 to 1,951

Martinez-Valdebenito C and others. '[Characterization of Oral Immunity in Cases and Close Household Contacts Exposed to Andes Orthohantavirus \(ANDV\)](#)' *Frontiers in Cellular and Infection Microbiology* 2020: volume 10, 557273

Marx G and others. '[Notes from the Field: Hantavirus Pulmonary Syndrome in a Migrant Farm Worker - Colorado, 2016](#)' *MMWR Morbidity and Mortality Weekly Report* 2017: pages 62 to 63

Matheus S and others. '[Maripa Virus RNA Load and Antibody Response in Hantavirus Pulmonary Syndrome, French Guiana](#)' *Emerging Infectious Diseases* 2018: volume 24, issue 9, pages 1,734 to 1,736

Medina RA and others. '[Ecology, genetic diversity, and phylogeographic structure of Andes virus in humans and rodents in Chile](#)' *Journal of Virology* 2009: volume 83, issue 6, pages 2,446 to 2,459

Murua R and others. '[Hantavirus pulmonary syndrome - Chile, 1997](#)' *MMWR - Morbidity and Mortality Weekly Report* 1997: volume 46, issue 40, pages 949 to 951

Nunes-Araujo FR and others. '[Absence of interhuman transmission of hantavirus pulmonary syndrome in Minas Gerais, Brazil: evidence from a serological survey](#)' *Clinical Infectious Diseases* 1999: volume 29, issue 6, pages 1,588 to 1,589

Osadebe L and others. '[Hantavirus pulmonary syndrome in visitors to a national park Yosemite Valley, California, 2012](#)' *MMWR - Morbidity and Mortality Weekly Report* 2012: volume 61, issue 46, page 952

Padula PJ and others. '[Complete nucleotide sequence of the M RNA segment of Andes virus and analysis of the variability of the termini of the virus S, M and L RNA segments](#)' *Journal of General Virology* 2002: volume 83, issue Pt 9, pages 2,117 to 2,122

Pai RK and others. '[Absence of infection in a neonate after possible exposure to sin nombre hantavirus in breast milk](#)' *Clinical Infectious Diseases* 1999: volume 29, issue 6, page 1,577 to 1,579

Pettersson L and others. '[Hantavirus RNA in saliva from patients with hemorrhagic fever with renal syndrome](#)' *Emerging Infectious Diseases* 2008: volume 14, issue 3, pages 406 to 411

Pettersson L and others. '[Hantavirus-specific IgA in saliva and viral antigen in the parotid gland in patients with hemorrhagic fever with renal syndrome](#)' *Journal of Medical Virology* 2011: volume 83, issue 5, pages 864 to 870

Incubation and infectious period, asymptomatic or presymptomatic transmission and transmission route in human-to-human spread of hantavirus infection: a systematic evidence summary

Pettersson L and others. '[Viral load and humoral immune response in association with disease severity in Puumala hantavirus-infected patients--implications for treatment](#)' Clinical Microbiology and Infection 2014: volume 20, issue 3, pages 235 to 241

Princk C and others. '[Cluster of human Puumala orthohantavirus infections due to indoor exposure?-An interdisciplinary outbreak investigation](#)' Zoonoses and Public Health 2022: volume 69, issue 5, page 579 to 586

Ravi-Caldwell N and others. '[Notes from the Field: First Reports of Locally Transmitted Seoul Hantavirus Infection - District of Columbia, May 2018-December 2018](#)' MMWR - Morbidity and Mortality Weekly Report 2022: volume 71, issue 9, pages 359 to 360

Rooney J and others. '[Two cases of Hantavirus pulmonary syndrome - Randolph County, West Virginia, July 2004](#)' MMWR - Morbidity and Mortality Weekly Report 2004: volume 53, issue 46, pages 1,086 to 1,089

Rose AM and others. '[Patterns of Puumala virus infection in Finland](#)' Euro Surveillance: European Communicable Disease Bulletin 2003: volume 8, issue 1, pages 9 to 13

Salehi-Vaziri M and others. '[Hantavirus infection in Iranian patients suspected to viral hemorrhagic fever](#)' Journal of Medical Virology 2019: volume 91, issue 10, pages 1,737 to 1,742

Salimovic-Besic I and others. '[Expansion of hantavirus infection during the SARS-CoV-2 pandemic in Bosnia and Herzegovina, 2021](#)' Journal of Medical Microbiology 2023: volume 72, issue 5

Shastri B and others. '[Domestically Acquired Seoul Virus Causing Hemophagocytic Lymphohistiocytosis-Washington, DC, 2018](#)' Open Forum Infectious Diseases 2019: volume 6, issue 10, ofz404

Silberberg L and others. '[Haemorrhagic fever with renal syndrome and pregnancy: a case report](#)' Transactions of the Royal Society of Tropical Medicine and Hygiene 1993: volume 87, issue 1, page 65

Singh AE and others. '[Hantavirus pulmonary syndrome: Report of four Alberta cases](#)' Canadian Journal of Infectious Diseases 1995: volume 6, issue 4, pages 184 to 190

Steier KJ and others. '[Hantavirus pulmonary syndrome \(HPS\): Report of first case in Louisiana](#)' Journal of the American Osteopathic Association 1993: volume 93, issue 12, pages 1,286 to 1,289

Stephen C and others. '[First reported cases of hantavirus pulmonary syndrome in Canada](#)' Canada communicable disease report 1994: volume 20, issue 15, pages 121 to 125

Usami T and others. '[Systemic infection resembling hemorrhagic fever with the renal syndrome caused by adenovirus type 11](#)' Journal of Urology 1997: volume 157, issue 2, pages 617 to 618

Vial PA and others. '[Incubation period of hantavirus cardiopulmonary syndrome](#)' Emerging Infectious Diseases 2006: volume 12, issue 8, pages 1,271 to 1,273

Vitek CR and others. '[Evidence against person-to-person transmission of hantavirus to health care workers](#)' Clinical Infectious Diseases 1996: volume 22, issue 5, pages 824 to 826

Wu H and others. '[Spatial-temporal characteristics and the epidemiology of haemorrhagic fever with renal syndrome from 2007 to 2016 in Zhejiang Province, China](#)' Scientific Reports 2018: volume 8, issue 1, page 10,244

Zelena H and others. '[Hantavirus infection during a stay in a mountain hut in Northern Slovakia](#)' Journal of Medical Virology 2011: volume 83, issue 3, page 496 to 500

Duplicate (4 studies)

Bayard V and others. '[Hantavirus pulmonary syndrome - Panama, 1999-2000](#)' MMWR - Morbidity and Mortality Weekly Report 2000: pages 205 to 207

Koster F and others. '[Update: outbreak of hantavirus infection - southwestern United States, 1993](#)' MMWR - Morbidity and Mortality Weekly Report 1993: pages 441 to 443

Koster F and others. '[Update: outbreak of hantavirus infection - southwestern United States, 1993](#)' MMWR - Morbidity and Mortality Weekly Report 1993: pages 477 to 479

Murua R and others. '[Hantavirus pulmonary syndrome - Chile, 1997](#)' MMWR - Morbidity and Mortality Weekly Report 1997: pages 949 to 951

Wrong population (2 studies)

Gligic A and others. '[Epidemic hemorrhagic fever with renal syndrome in Yugoslavia, 1986](#)' American Journal of Tropical Medicine & Hygiene 1989: volume 41, issue 1, pages 102 to 108

Riesle-Sbarbaro SA and others. '[Human-to-Human Transmission of Andes Virus Modeled in Syrian Hamsters](#)' Emerging Infectious Diseases 2023: volume 29, issue 10, pages 2,159 to 2,163

No relevant outcome (5 studies)

Ciancaglini M and others. '[Hantavirus pulmonary syndrome in Tucuman province associated to an unexpected viral genotype](#)' Medicina 2017: volume 77, issue 2, pages 81 to 84

Hofmann J and others. '[Hantavirus infections by Puumala or Dobrava-Belgrade virus in pregnant women](#)' Journal of Clinical Virology 2012: volume 55, issue 3, pages 266 to 269

Howard MJ and others. '[Hantavirus pulmonary syndrome in pregnancy](#)' Clinical Infectious Diseases 1999: volume 29, issue 6, pages 1,538 to 1,544

Partanen T and others. '[Long-term hormonal follow-up after human Puumala hantavirus infection](#)' Clinical Endocrinology 2016: volume 84, issue 1, page 85 to 91

Pini NC and others. '[Hantavirus infection in children in Argentina](#)' Emerging Infectious Diseases 1998: volume 4, issue 1, page 85 to 7

Wrong study type (7 studies)

Butler JC and others. '[Hantaviruses and hantavirus pulmonary syndrome](#)' Clinical Infectious Diseases 1994: volume 19, issue 3, pages 387 to 395

Chertcoff J and others. '[Hantavirus cardiopulmonary syndrome](#)' Clinical Pulmonary Medicine 2002: volume 9, pages 75 to 80

Glass GE. '[Hantaviruses](#)' Current Opinion in Infectious Diseases 1997: volume 10, issue 5, pages 362 to 366

Krautkramer E and others. '[Recent outbreaks of hantavirus disease in Germany and in the United States](#)' Kidney International 2012: volume 82, issue 12, pages 1,243 to 1,245

Overturf GD. '[Clinical sin nombre hantaviral infections in children](#)' Pediatric Infectious Disease Journal 2005: volume 24, issue 4, pages 373 to 374

Pizarro E and others. '[Immunocytochemical and Ultrastructural Evidence Supporting That Andes Hantavirus \(ANDV\) Is Transmitted Person-to-Person Through the Respiratory and/or Salivary Pathways](#)' Frontiers in Microbiology 2019: volume 10, page 2,992

Sundstrom KB and others. '[Andes Hantavirus-Infection of a 3D Human Lung Tissue Model Reveals a Late Peak in Progeny Virus Production Followed by Increased Levels of Proinflammatory Cytokines and VEGF-A](#)' PLOS ONE 2016: volume 11, issue 2, e0149354

Wrong publication type (5 studies)

Ferres M and others. '[Correction to Lancet Infect Dis 2024; 24: 775-82 \(The Lancet Infectious Diseases \(2024\) 24\(7\) \(775-782\), \(S1473309924001427\), \(10.1016/S1473-3099\(24\)00142-7\)\)](#)' The Lancet Infectious Diseases. 2026

Ferres M and others. '[Correction to Lancet Infect Dis 2024; published online April 3.
https://doi.org/10.1016/S1473-3099\(24\)00142-7 \(The Lancet Infectious Diseases \(2024\) 24\(7\) \(775-782\), \(S1473309924001427\), \(10.1016/S1473-3099\(24\)00142-7\)\)](#)' The Lancet Infectious Diseases 2024: volume 24, page e419

Fritz CL and others. '[Estimated incubation period for hantavirus pulmonary syndrome](#)' The American journal of tropical medicine and hygiene 2001: volume 65, issue 5, page 403

Garrido JL and others. '[Erratum for the Research Article: "Two recombinant human monoclonal antibodies that protect against lethal Andes hantavirus infection in vivo" by J. L. Garrido, J. Presscott, M. Calvo, F. Bravo, R. Alvarez, A. Salas, R. Riquelme, M. L. Rioseco, B. N. Williamson, E. Haddock, H. Feldmann, M. I. Barria](#)' Science Translational Medicine 2019: volume 11, issue 475, page 16

Zhang WY and others. '[Correction: Spatiotemporal transmission dynamics of hemorrhagic fever with renal syndrome in China, 2005-2012](#)' PLOS Neglected Tropical Diseases 2015: volume 9, issue 3, e0003599

Annexe D. Data extraction tables

Table D.1. Summary of transmission parameters of hantavirus

Abbreviations: ELISA: Enzyme-Linked Immunosorbent Assay, PCR: Polymerase chain reaction, SD: standard deviation

Note: for asymptomatic and presymptomatic transmission data extractions: ‘not reported’ was used when the information was not available for symptoms at the time of transmission for some or all of the transmission events

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
Alonso DO and others, 2020 (1) Argentina, 2014 (month not reported)	3 clustered cases of hantavirus pulmonary syndrome were reported in El Bolsón, Rio Negro over a 43-day period in 2014. 2 unrelated cases were included for comparison, both from the same area. Cases: 3 (including 2 index cases) Index cases (Cases 1 and 2): 71 year old twin brothers Secondary case 3: 53 year old woman, nurse who attended case 2 during hospitalisation and had no evidence of rodent exposure at home. On the basis of epidemiologic findings, the only source of infection for case 3 was contact with case 2 at the hospital	Andes virus (South variant), confirmed by PCR	Not reported	All symptomatic	Serial interval: Case 3: 22 days	Not reported	1 case was a healthcare worker
Barrera A and others, 2025 (2) Chile, May to June, 2024	Outbreak of hantavirus cardiopulmonary syndrome was reported in a family cluster in Los Ríos region, Chile. Cases: 2 secondary cases Secondary case 1: boy, age not reported (grandson of index case) Secondary case 2: woman, age not reported (daughter of index case)	Andes virus (CHI-Hu13724 strain), confirmed by PCR	Not reported	Not reported	Serial interval: Case 1: 19 to 20 days Case 2: not determined due to uncertainty about dates	Not reported	1 case was a child (age not reported)

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
	Family lived in same household				Viral load over time: measured weekly for 6 weeks post-infection. A marked rise reported at week 5, above baseline levels (raw data only available in graphical form)		
Cantoni G and others, 1997 (3) Argentina, 22 September to 14 December 1996	<p>Outbreak of hantavirus pulmonary syndrome was reported in province of Rio Negro, Argentina.</p> <p>Cluster of family, friends and doctors in the El Bolsón/Bariloche area (household and hospital settings)</p> <p>Cases: 4 secondary cases</p> <p>1 woman (sex of 3 other cases not reported)</p> <p>Ages not reported</p>	Andes virus, confirmed by PCR	Not reported	Not reported	Not reported	<p>Routes of transmission unclear, but exposures stated: 4 cases appeared to have become infected following interaction with other cases. Authors suggested respiratory or sexual transmission: Case 10 had access to a vehicle that was parked at the home of Case 1 and used for a trip by a number of relatives. 3 doctors (Case 2, 11 and 12) contracted illness following caring</p>	3 cases were healthcare workers

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
						for other cases. (Note: one other doctor also contracted the illness, but they also lived with case 1) All other cases shared risky environments (work, homes, high risk area) that could have led to infection.	
Enria D and others, 1996 (4) Argentina, September to December 1996	2 doctors in Buenos Aires, Argentina who contracted hantavirus pulmonary syndrome in a hospital following treatment of a patient with hantavirus from the El Bolsón outbreak region. Cases: 2 secondary cases Secondary case 1: man, age not reported Secondary case 2: age and sex not reported	Andes virus, confirmed by PCR	Case 1: 27 days since contact with index case Case 2: 28 days since contact with index case Mean (SD): 27.5 (0.71)	All symptomatic	Not reported	Routes of transmission unclear, but exposures stated: Case 1 was exposed to the blood of the index case via ungloved hands (hands had no cuts or wounds)	2 cases were healthcare workers
Ferres M and others, 2007 (5) Chile, November 2001 to June 2005	Prospective study of household clusters of hantavirus cardiopulmonary syndrome across central and southern Chile. 14 household clusters identified (12 clusters with 2 cases and 2 clusters with 3 cases). Cases: 16 secondary household cases Men: 6 Women: 10	Andes virus, confirmed by PCR and serology	Not reported	Not reported	Serial interval: Median (range): 19.5 (4 to 30) days based on 16 cluster intervals All but 2 intervals were 14 days or more (2 intervals: 4 and 6 days)	Routes of transmission unclear, but exposures stated: Sex partner: 9 out of 16 secondary cases	3 cases were under 18 years old

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
	<p>Mean (SD) age: 37.3 (17) years, range: 2 to 67 years</p> <p>Children: 3 (aged 2, 8 and 17 years)</p> <p>Ethnicity: 14 Hispanic, 2 Native American</p> <p>Household exposure in rural and urban settings</p>				<p>Calculated from raw data: Mean (SD): 19.6 (7.4) days</p> <p>Removing those with shared environmental exposure: Mean (SD): 20 (6.6) days</p> <p>Children: Mean (SD): 19.7 (3.5) days</p> <p>Adults: Mean (SD) 19.5 (8.1) days</p>	<p>Body fluid contact (saliva, semen or urine): 9 out of 16</p> <p>7 out of 16 secondary cases were both sex partners and had body fluid contact</p>	
<p>Ferres and others, 2020 (6)</p> <p>Chile, time period not reported</p>	<p>Family cluster of hantavirus cardiopulmonary syndrome caused by Andes virus. Transmission described between family members in household settings.</p> <p>Cases: 2 secondary cases</p> <p>Secondary case 1 (mother): 21 year old woman</p> <p>Secondary case 2 (child): newborn infant (sex not reported)</p> <p>First secondary case developed infection after caring for father (index case) with hantavirus infection</p>	Andes virus, confirmed by PCR and serology	<p>Case 1: 18 days</p> <p>Case 2: 17 to 26 days</p>	All symptomatic	Not reported	<p>Routes of transmission unclear, but exposures stated:</p> <p>Caring for father with hantavirus infection</p> <p>Newborn infant was breastfed</p>	<p>1 secondary case was pregnant when they contracted the virus from their father</p> <p>1 secondary case was a newborn infant</p>
<p>Ferres and others, 2024 (7)</p> <p>Chile, 2008 to 2022</p>	<p>People with hantavirus infection enrolled from 10 national health centres across 5 regions in Chile (Metropolitan region, Biobío, Araucanía, Los Ríos, Los Lagos).</p> <p>Cases: 3 secondary cases</p>	Andes virus, confirmed by PCR and serology	Not reported	All symptomatic	Not reported	Routes of transmission unclear, but exposures stated:	All reported secondary cases were children (including 2 young infants)

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
	<p>Secondary case 1: 9 month old, sex not reported</p> <p>Secondary case 2: 1 month old, sex not reported</p> <p>Secondary case 3: 10 year old girl</p> <p>All 3 cases were children whose mothers had contact with them during acute or prodromal infection (household setting assumed)</p>					Both infant cases were breastfed	
<p>Iglesias AA and others, 2022 (8)</p> <p>Argentina, November 2018 to February 2019</p>	<p>Outbreak reported in Epuyén, southwestern Argentina caused by Andes virus.</p> <p>Cases: 34</p> <p>Sex and age not reported</p>	Andes virus, confirmed by serology	<p>Median: 26 days</p> <p>Range: 9 to 40 days</p> <p>Individual incubation periods only reported in graphical form</p>	Not reported	Not reported	Not reported	Not reported
<p>Lazaro ME and others, 2007 (9)</p> <p>Argentina, November 1993 to June 2005</p>	<p>Study of hantavirus pulmonary syndrome in endemic areas of Neuquén, Río Negro, Chubut and Santa Cruz, Argentina. 9 clusters were identified, of which 8 clusters (type B) were considered suggestive of human-to-human transmission. Andes virus was identified in 3 of the 8 clusters.</p> <p>Cases: 18 (including 8 index cases)</p> <p>Clusters: 8</p> <p>Average age, mean (SD): 28.3 (16.3) years</p> <p>Cluster B1:</p> <p>Index case: 21 year old woman.</p> <p>Secondary case (daughter): 7 month old girl</p>	Andes virus identified in cases from 3 clusters (Cluster B2, B3, B4), confirmed by PCR. Species not reported for remaining clusters	Not reported	Not reported	<p>Cluster B2 serial interval:</p> <p>Pregnant woman: 19 days</p> <p>Boy: 25 days</p> <p>Girl: 27 days</p> <p>Individual serial intervals for other clusters only reported graphically</p> <p>Mean serial interval (SD) for 7 of 8 clusters: 23.4 (6.8) days</p>	<p>Routes of transmission not explicitly stated, but hypothesised based on exposures:</p> <p>B1: Direct contact through breastfeeding</p> <p>B2: Sexual transmission hypothesised for one contact; daily kissing, touching, hugging and</p>	<p>All cases occurred in rural or semi-rural areas</p> <p>5 secondary cases were children</p> <p>1 secondary case was pregnant</p> <p>4 index cases were agricultural workers, rural workers or gardeners</p>

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
	<p>Cluster B2: Index case: 38 year old man 3 family contacts: Secondary contact 1: 25 year old pregnant woman Secondary contact 2 (son): 9 year old boy Secondary contact 3 (daughter): 15 year old girl</p> <p>Cluster B3: Index case: 41 year old man. Secondary case: 31 year old woman</p> <p>Cluster B4: Index case: 26 year old woman Secondary case: 63 year old man</p> <p>Cluster B5: Index case (mother): 36 year old woman Secondary case (daughter): 3 year old girl</p> <p>Cluster B6: Index case (father): 46 year old man Secondary case (son): 10 year old boy</p> <p>Cluster B7: Index case: 42 year old man Secondary case: 44 year old woman</p> <p>Cluster B8: Index case: 31 year old man. Secondary case: 28 year old woman</p> <p>All cases occurred in rural or semi-rural areas and involved household or intimate contacts</p>				Median (range): 21 (19 to 40) days	<p>droplet exposure also reported. Some contacts may also have had shared environmental exposure during a fishing trip</p> <p>B5: Direct contact including breastfeeding; daily kissing, touching, hugging and droplet exposure reported</p> <p>B6: Direct contact including daily kissing, touching, hugging and droplet exposure</p> <p>Sexual transmission hypothesised for adult contacts, but not confirmed</p>	

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
<p>Martinez VP and others, 2005 (10)</p> <p>Argentina, July to December 2002</p>	<p>Hantavirus pulmonary syndrome cases reported in Buenos Aires and Neuquén provinces, Argentina.</p> <p>Cases: 5 (including 2 index cases)</p> <p>Cluster 1 (urban household setting in Buenos Aires province): Index case (father): 41 year old man Secondary case (son): 14 year old boy</p> <p>Cluster 2 (long-distance bus travel and close-contact social setting between Neuquén and Buenos Aires provinces): Index case: 39 year old man Case B: 58 year old man Case C: 38 year old man</p>	Andes virus South and Central , laboratory confirmed	<p>Cluster 1: 24 to 26 days (range due to 2 possible exposure points)</p> <p>Cluster 2: Index case to case B: 15 days Case B to case C: exposure uncertain, estimated range 2 to 22 days</p>	All symptomatic	<p>Serial interval (calculated from figure):</p> <p>Cluster 1: 29 days.</p> <p>Cluster 2: Index case to case B: 17 days Case B to case C: 23 days</p> <p>Adult mean: (SD): 20.0 (4.2)</p>	<p>Routes of transmission unclear, but exposures stated:</p> <p>Cluster 1: father-to-son exposure. Son slept in same bed as father while father was severely ill. Son lived in urban setting with no evidence of rodent exposure</p> <p>Cluster 2: Index case and case B sat together on a 14-hour bus journey, shared a taxi and luggage handling</p> <p>Case C had repeated contact with case b after return from Neuquen</p>	<p>Cluster 1 index case worked as a veterinarian on a farm</p> <p>1 secondary case in Cluster 1 was a child</p>
<p>Martinez VP and others, 2010 (11)</p> <p>Argentina, 1995 to 2008</p>	<p>Human-to-human hantavirus pulmonary syndrome transmission reported in Central and Patagonia regions of Argentina.</p> <p>Cases: 5 (including 2 index cases)</p> <p>Cluster 1 (household setting):</p>	Hantavirus pulmonary syndrome confirmed by ELISA and PCR. All samples tested for	Not reported	Not reported	<p>Serial interval:</p> <p>Cluster 1: Father to son: 27 days</p> <p>Cluster 2:</p>	Not reported	1 secondary case in Cluster 1 was a child

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
	<p>Index case (father): 41 year old man Secondary case (son): 14 year old boy</p> <p>Cluster 2 in a friend and roommate pair (household setting assumed): Index case: 39 year old man Secondary case 1: 58 year old man Secondary case 2: 39 year old man</p>	Andes virus, though species not specifically reported			Index case to case b: 15 days Case b to case c: 23 days		
<p>Martinez VP and others, 2020 (12)</p> <p>Argentina, November 2018 to February 2019</p>	<p>Human-to-human hantavirus outbreak in Epuyén, a small rural village and municipality in Chubut, southwest Argentina.</p> <p>Cases: 34 (4 transmission chains linked to 1 index case)</p> <p>Men: 14 (41%) Women: 20 (59%)</p> <p>Age range: 2 to 90 years 17 years or below: 6 cases 18 to 64 years: 22 cases 65 years or above: 6 cases</p> <p>First transmission event occurred at a birthday party (indoor or outdoor setting not reported) Second transmission event occurred at a funeral (indoor or outdoor setting not reported). Settings for remaining transmission events not reported.</p>	Andes virus (Epuyén/18-19 strain), confirmed by PCR and serology	<p>Study reported: 15 days or less: 5 cases 16 to 21 days: 10 cases 22 to 28 days: 13 cases 29 days or more: 6 cases</p> <p>Overall range: 9 to 40 days</p> <p>Calculated from raw data: Mean (SD): 21.6 (7.0) days</p> <p>Removing uncertain estimates: 21.5 (6.0) days</p> <p>Adults: 21.9 (7.4) days</p>	All symptomatic	Serial interval: Mean (SD): 23 (7) days	<p>Droplet or aerosol exposure: 6 cases (18%) Close contact: 26 cases (76%) Unknown: 1 case (3%)</p> <p>Evidence from 5 person-to-person transmission events: the route of infection in secondary cases was possibly through inhalation of droplets or virus particles in the air (airborne exposure described at birthday party, funeral and in hospital settings without direct contact)</p>	<p>Outbreak occurred in a small rural village and municipality</p> <p>Children aged 17 years or below represented 18% of cases</p> <p>Additional medical history available for 7 cases included chronic asthma, recent pneumonia, previous cancer and Epstein-Barr virus co-infection</p>

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
			Children: 19.8 (3.7) days			Shared hospital rooms and confined indoor spaces (within households, places of work or while sharing cars) considered possible exposure settings Sexual transmission considered possible in 2 case pairs, although authors considered close respiratory contact more likely	
Martinez-Valdebenito C and others, 2014 (13) Chile, February to April 2011	Outbreak of hantavirus infection in a small rural community in Corral, Los Ríos, Chile. Cases: 5 (including 1 index case) Cases occurred in both household and hospital settings Men: 2 Women: 3 Index case (A): 73 year old man Case B: 31 year old woman, healthcare provider for case A	Andes virus, confirmed by PCR	Overall range: 13 to 27 days Index case to case B: 19 to 21 days Index case to case D: 18 to 20 days Other exposure periods uncertain	All symptomatic	Serial interval: Range: 16 to 25 days Case B: 24 days Case C: 25 days Case D: 25 days Case E: 16 days Calculated mean (SD): 22.5 (4.4) days	No confirmed transmission route, but exposures reported: Case A to case B: direct hospital contact, including changing clothes and bedding and greeting with a kiss on the cheek Case A to case D: direct and indirect hospital	Outbreak occurred in a small rural community Index case was a farmer 1 case (case B) was a nursing assistant 1 case (case D) was hospital cleaning personnel

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
	<p>Case C: 53 year old woman, wife of case A</p> <p>Case D: 60 year old woman, hospital cleaning personnel</p> <p>Case E: 34 year old man, husband of case B</p>					<p>contact while changing bedclothes and cleaning</p> <p>Case B to case E: direct household contact</p>	
<p>Padula PJ and others, 1998 (14)</p> <p>Argentina, September 1996 to January 1997</p>	<p>26 hantavirus pulmonary syndrome cases identified in southwestern Argentina between September 1996 and January 1997.</p> <p>16 cases were epidemiologically linked and associated with suspected human-to-human transmission.</p> <p>Cases occurred in El Bolsón, Bariloche and Buenos Aires (household and hospital setting).</p> <p>Cases: 16 epidemiologically linked cases</p> <p>6 cases had a single epidemiological link; remaining cases had multiple potential contacts or exposures.</p> <p>Age and sex not reported</p>	Andes virus (Epilink/96), confirmed by PCR	Not reported	Not reported	<p>Serial interval:</p> <p>Calculated only for 6 cases with a single identified source of exposure</p> <p>Mean (SD): 24.3 (4.6) days</p> <p>Range: 20 to 31 days</p> <p>Index case (case I) to doctor (case A): 20 days</p> <p>Index case to mother (case B): 21 days</p> <p>Index case to friend (case K): 31 days</p> <p>Doctor (case A) to spouse (case C): 27 days</p> <p>Spouse (case C) to doctor (case D): 27 days</p>	<p>Not reported</p>	<p>Cases occurred in El Bolsón, a rural area in southern Argentina</p> <p>Of the linked cases, 3 were doctors</p>

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
					Spouse (case C) to doctor (case E): 20 days		
Padula PJ and others, 2000 (15) Argentina, Chile, Paraguay and Uruguay, 1995 to 1999	Hantavirus pulmonary syndrome case data collected over 4 years from Argentina, Chile, Paraguay and Uruguay for Andes virus cases. Cases: 6 Age and sex not reported Details of setting of individual cases and contacts not reported	Andes virus, confirmed by PCR and serology	NB although the study reported data labelled as incubation period, the description indicated that it was actually serial interval (Intervals between the onset of symptoms in the index case and secondary case).	Not reported	Serial interval: Mean (SD): 21 (4.8) days Range: 16 to 29 days Case 1: 16 days Case 2: 18 days Case 3: 19 days Case 4: 21 days Case 5: 25 days Case 6: 29 days	Not reported	Not reported
Toro J and others, 1998 (16) Chile, 1 July 1997 to 22 January 1998	Outbreak of hantavirus pulmonary syndrome in southern Chile between July 1997 and January 1998. Cases: 7 (including 2 index cases) 2 family clusters with evidence suggestive of human-to-human transmission. Cases occurred in rural and semi-rural households Cluster 1 Cases: 5 (including 1 index case) Index case (father): 39 year old man	Andes virus, confirmed by PCR and serology	Not reported	Not reported	Serial interval: Cluster 1 mean (SD): 25.7 (8.0) days Wife of index case: 18 days 2 year old son: 25 days 12 year old son: 34 days Fourth secondary case: not reported	Routes of transmission unclear, but exposures stated: Cluster 1: family members became ill after contact with the index case and after leaving the original household	Cluster 1 occurred in a rural household in Cisne Medio,. Aysén region 2 secondary cases were children in Cluster 1 Cluster 2 index case worked in a rural area

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
	<p>Secondary case 1 (son): 12 year old boy</p> <p>Secondary case 2 (son): 2 year old boy</p> <p>Secondary case 3 (wife): woman, age not reported</p> <p>Secondary case 4 (brother-in-law): man, age not reported</p> <p>Cluster 2</p> <p>Cases: 2 (including 1 index case)</p> <p>Index case: man, age not reported</p> <p>Secondary case: woman age not reported</p>				Cluster 2 secondary case mean: 22 days	Cluster 2: the only reported exposure was washing the husband's clothing and caring for him while he was ill	
<p>Wells RM and others, 1997 (17)</p> <p>Argentina, 22 September to 5 December 1996</p>	<p>Outbreak of hantavirus pulmonary syndrome caused by Andes virus in southern Argentina (El Bolsón, Bariloche and Esquel). The outbreak began with an index case in El Bolsón. Several cases had no clear rodent exposure and low rodent density was reported in the area.</p> <p>Cases: 20 (semi-rural household setting, hospital setting and during car travel)</p> <p>Men: 11 out of 20 (55%)</p> <p>Mean age: 38 years (range 13 to 70 years)</p>	Andes virus, confirmed by ELISA or PCR	<p>24 days for a doctor following exposure to an infected patient. Study authors considered this the most reliable estimate for confirmed human-to-human transmission because no other exposure source was identified.</p> <p>3 contacts (parents and daughter) were exposed during a car journey with a</p>	Not reported	<p>Serial interval:</p> <p>Range: 20 to 27 days</p> <p>Of 5 cases with a single epidemiological link:</p> <p>Calculated mean (SD): 23 (3.8) days</p> <p>Index case to mother: 21 days</p> <p>Index case to doctor: 20 days</p> <p>Doctor to spouse: 27 days</p> <p>Spouse to doctor in hospital: 27 days</p> <p>Spouse to second doctor in hospital: 20 days</p>	<p>Routes unclear, but exposures stated:</p> <p>Patient C to patient D involved direct hospital contact without reported body fluid exposure</p>	<p>Outbreak occurred in rural towns in southern Argentina (El Bolsón, Bariloche and Esquel)</p> <p>5 cases were doctors, including 3 directly involved in care of hantavirus pulmonary syndrome patients</p> <p>One case was a child</p>

Study, year Country, time period	Population and setting	Hantavirus species	Incubation period	Asymptomatic and presymptomatic transmission	Infectious period	Route of transmission	Health inequalities
			symptomatic case, but exposure periods were uncertain because 2 also stayed with the index case		Other contacts had multiple possible exposures and transmission measures could not be determined		

About the UK Health Security Agency

UK Health Security Agency (UKHSA) prevents, prepares for and responds to infectious diseases and environmental, radiological and chemical hazards, to keep all our communities safe, save lives and protect livelihoods. We provide scientific and operational leadership, working with local, national and international partners to protect the public's health.

[UKHSA](#) is an executive agency, sponsored by the [Department of Health and Social Care](#)

© Crown copyright 2026

Prepared by Susannah C. Brown, Aishwarya Bhatia, Aina Madathinal Shaju, Lily Gabriel, Jennifer Hill, Jodie Walker and Serena Carville

For queries relating to this document, contact: enquiries@ukhsa.gov.uk

Completed: 8 May 2026

Published: May 2026

Publication reference: GOV-21047 (PHR046)

Suggested citation: Brown S, Bhatia A, Shaju AM, Gabriel L, Hill J, Walker J and Carville S 'Transmission parameters of hantavirus disease in human-to-human transmission contexts: a systematic evidence summary' UKHSA 2026



You may re-use this information (excluding logos) free of charge in any format or medium, under the terms of the Open Government Licence v3.0. To view this licence, visit [OGL](#). Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.



UKHSA supports the UN
Sustainable Development Goals

