NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

Centre for Respiratory Diseases and Meningitis
National Institute for Communicable Diseases
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Cumulative invasive pneumococcal disease case numbers reported by the GERMS-SA surveillance programme, 1 January 2012 to 31 October 2018

GERMS-SA surveillance programme

- GERMS-SA is a national, active, laboratory-based surveillance system initiated in 2003.
- Invasive pneumococcal disease (IPD) cases defined as hospitalised individuals with *Streptococcus pneumoniae* cultured from normally sterile-site specimens (e.g. cerebrospinal fluid, blood or joint fluid).
- Repeat isolates from the same individual within 21 days were excluded.
- ~270 laboratories each year send reports and isolates.
- Age, sex, date of specimen collection, and source of specimen were captured.
- Pneumococci from culture positive isolates were serotyped by Quelling reaction using specific antisera (Statens Serum Institute, Copenhagen, Denmark); and culture-negative but latex agglutination positive, or isolates that lost viability were confirmed positive using a real-time *lyt*A PCR[1] and serotyped using an adaption from the method described by Azzari *et al*.[2] The molecular serotyping includes targets for 42 serotypes and covers all serotypes included in PCV13. Only serotypes from isolates with an initial *lytA* PCR ct value of ≤35 were included. Where ct value was ≤35 but no serotype could be identified by including the 42 targets, serotype was classified as non-vaccine type. Where *lytA* PCR ct value was ≥36, serotype was classified as unknown and was not included in graphs. Where the PCR target could not distinguish between vaccine and non-vaccine serotype, serotype was classified as unknown and not included in the graphs (targets: 18ABC, 18ABCF, 7AF, 9ALVN and 9AV).
- **Cumulative graph case numbers include viable isolates and those non-viable but characterised using molecular diagnostic techniques.**
- Graphs are presented for those younger than 5 years, and those 5 years and older. Cases with unknown age were also not included in cumulative graph case numbers.
- There are three graphs for each age group: disease caused by any of the seven serotypes in PCV-7 (4, 6B, 9V, 14, 18C, 19F and 23F); disease caused by any of the six additional serotypes in PCV-13 but not in PCV7 (1, 3, 5, 6A, 7F, 19A); and disease caused by any serotypes not in PCV-13.
- Graphs showing number of viable isolates submitted to GERMS-SA from 2008 to 2012 can be found in the appendix at the end of this report.
- More information on the GERMS-SA system available at: http://www.nicd.ac.za/index.php/germs-sa/

PCV vaccine introduction in South Africa

- The 7-valent pneumococcal conjugate vaccine (PCV-7) was introduced to the South African Expanded Programme on Immunisation in April 2009, with no catch-up vaccination campaign.
- There was a graded replacement of PCV-7 by 13-valent pneumococcal conjugate vaccine (PCV-13) in 2011. By June 2011 all provinces were using PCV-13.
- There was a limited PCV-13 catch-up campaign in 2011 and 2012.

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- WHO/UNICEF vaccine coverage estimates for receiving a third dose of the PCV vaccine in South Africa are 10% in 2008, 58% in 2009, 62% in 2011, 70% in 2012, 69% in 2013, 72% in 2014, 77% 2015, 69% in 2016 and 60% in 2017.[3]
- The effect of the vaccine on invasive pneumococcal diseases in South Africa has been described.[4]

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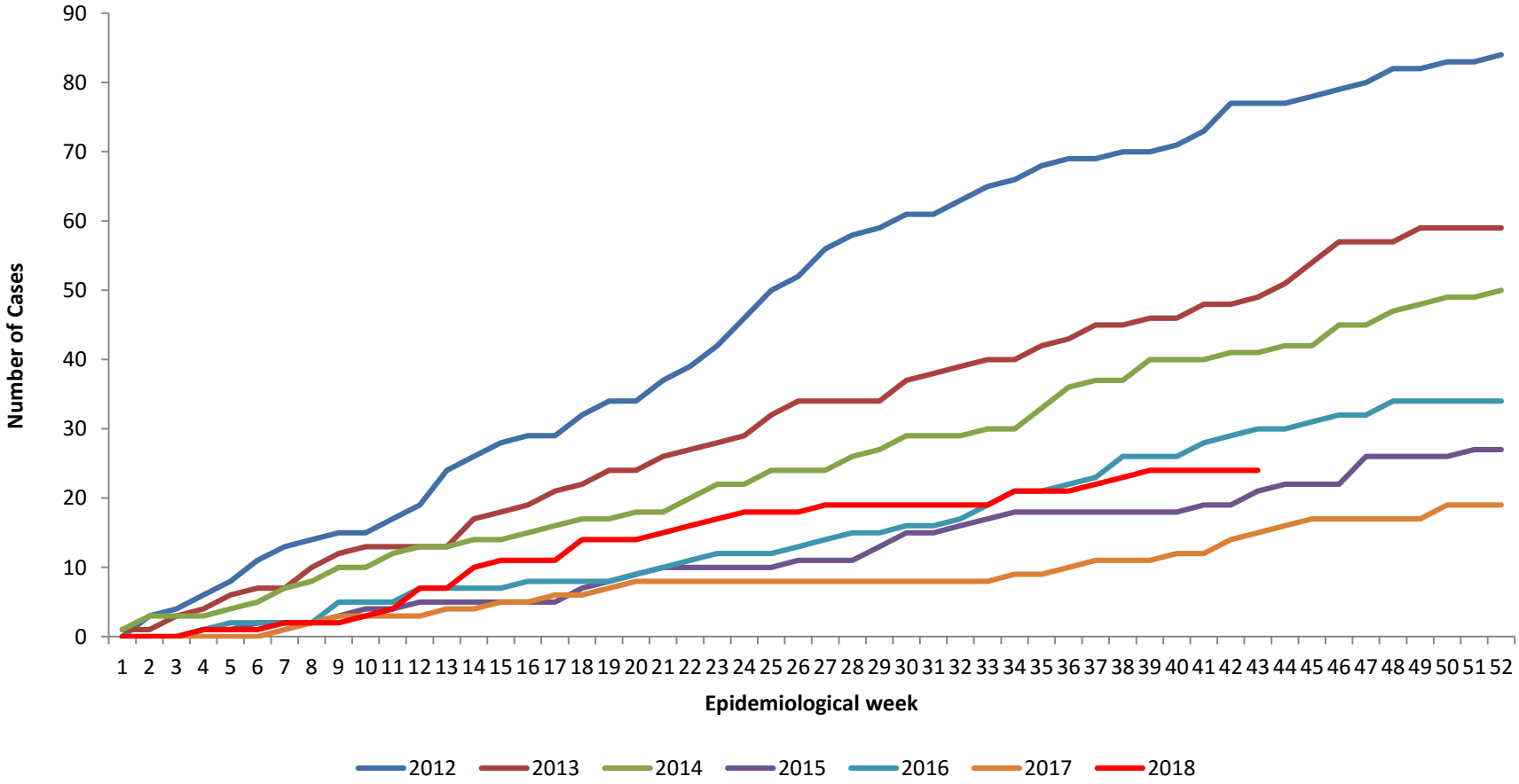

Figure 1. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the seven serotypes (4, 6B, 9V, 14, 18C, 19F and 23F) in PCV-7: children <5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included.

Data are provisional as reported to date.

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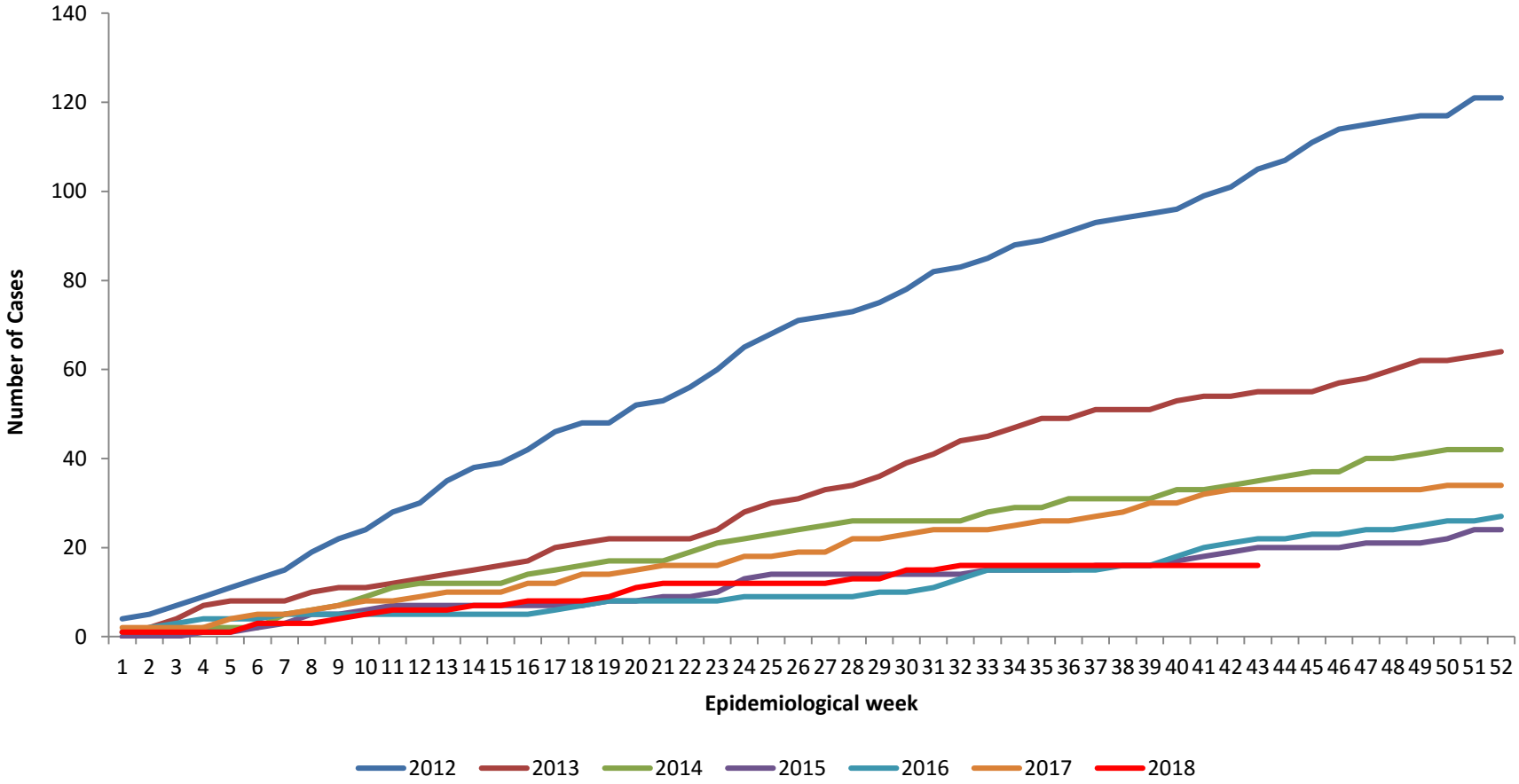

Figure 2. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the six additional (1, 3, 5, 6A, 7F, 19A) serotypes in PCV-13 but not in PCV-7: children <5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included. (Note: There is reported cross protection between 6A and 6B which is included in PCV-7[5])

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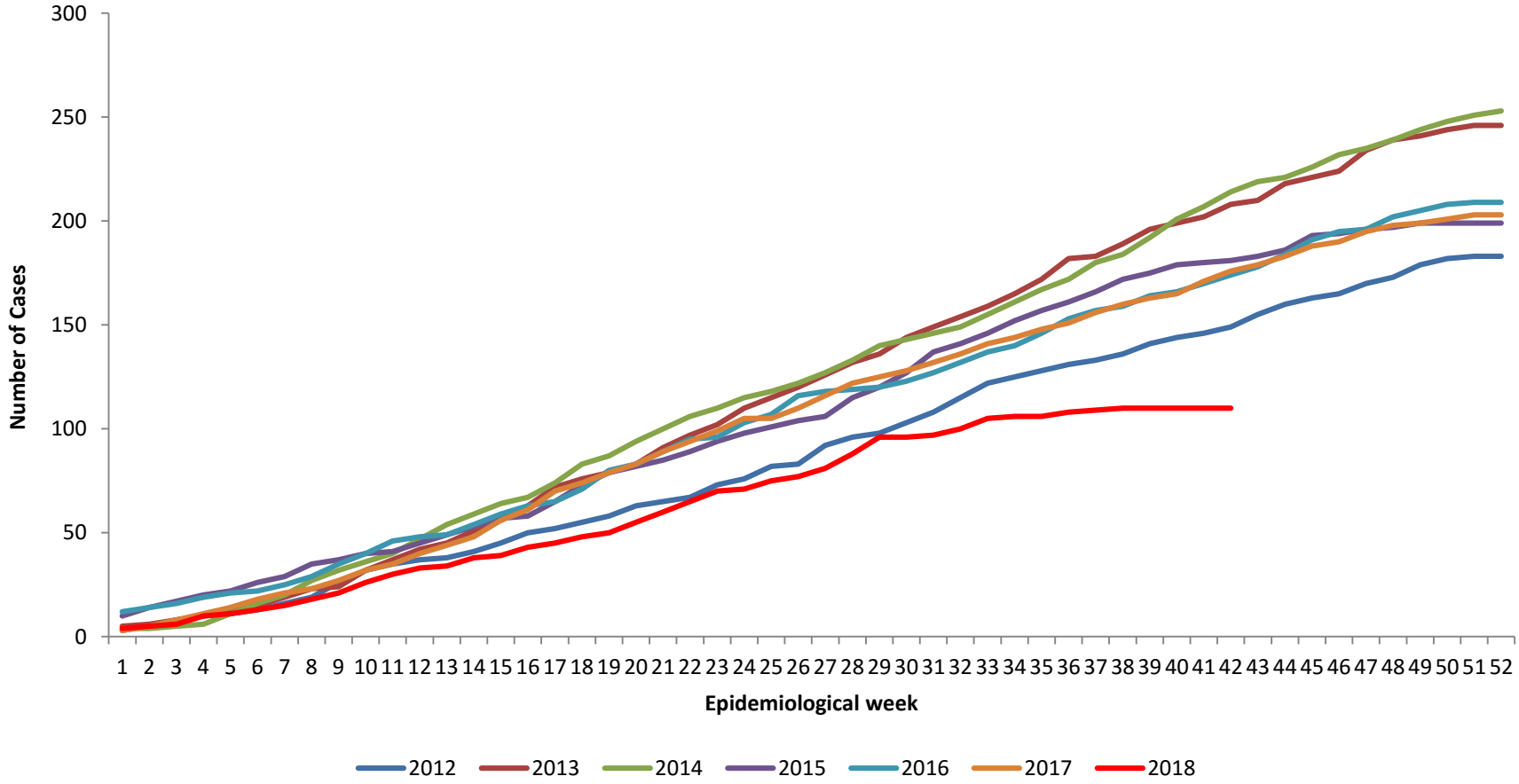

Figure 3. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the serotypes not in PCV-13: children <5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included.

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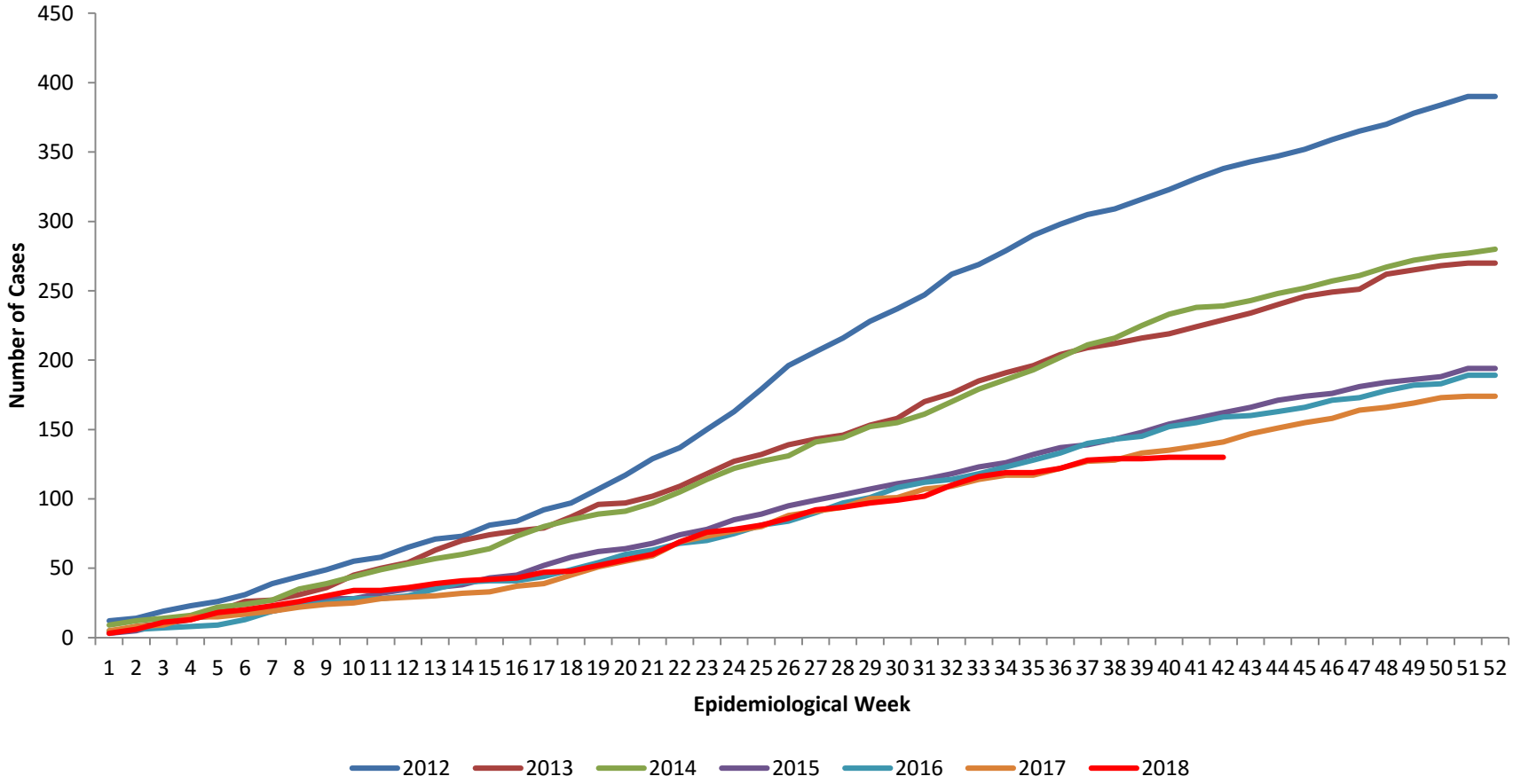

Figure 4. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the seven serotypes (4, 6B, 9V, 14, 18C, 19F and 23F) in PCV-7: individuals ≥5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included.

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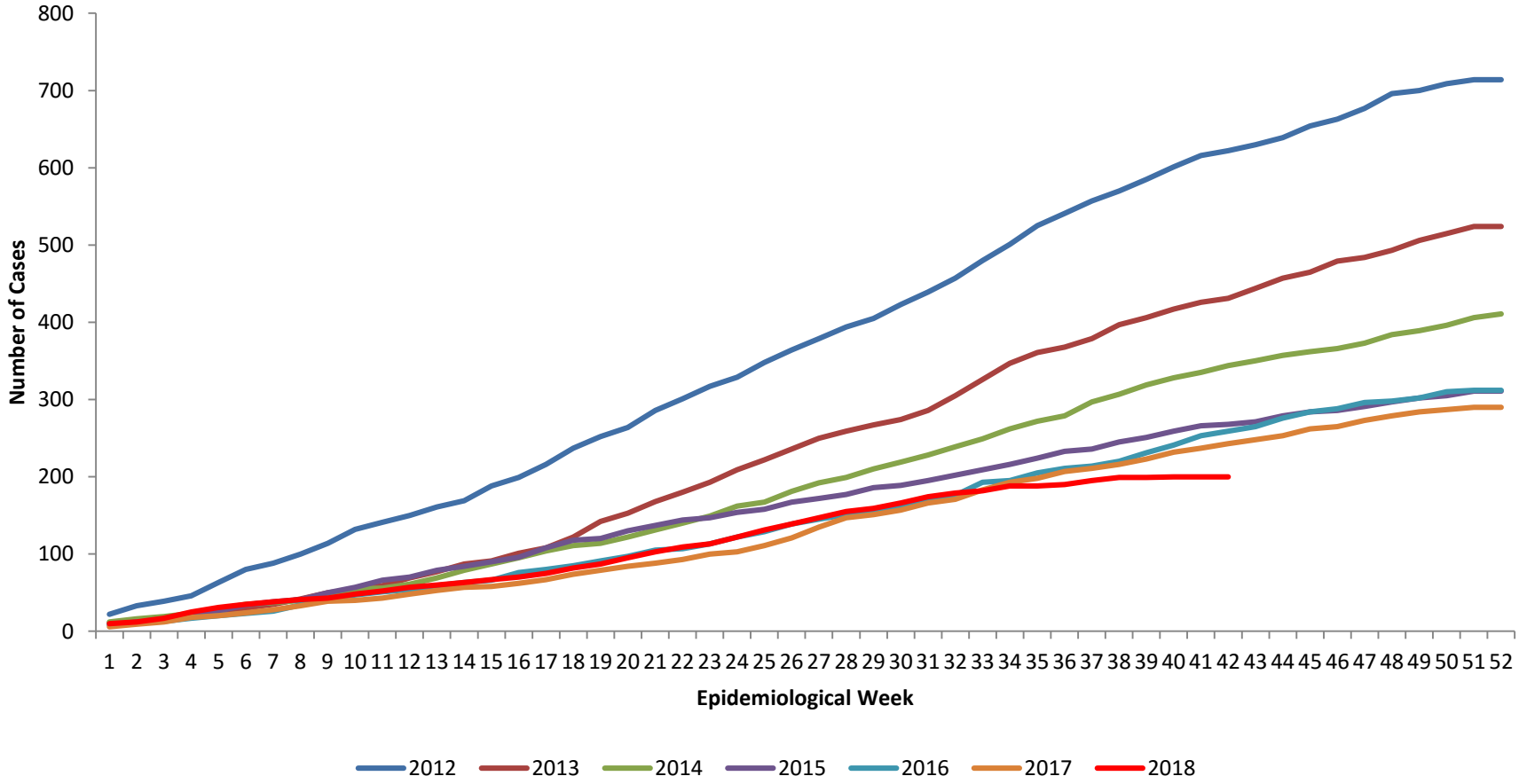

Figure 5: Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the six additional (1, 3, 5, 6A, 7F, 19A) serotypes in PCV-13 but not in PCV-7: individuals ≥5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included (Note: There is reported cross protection between 6A and 6B which is included in PCV-7[5])

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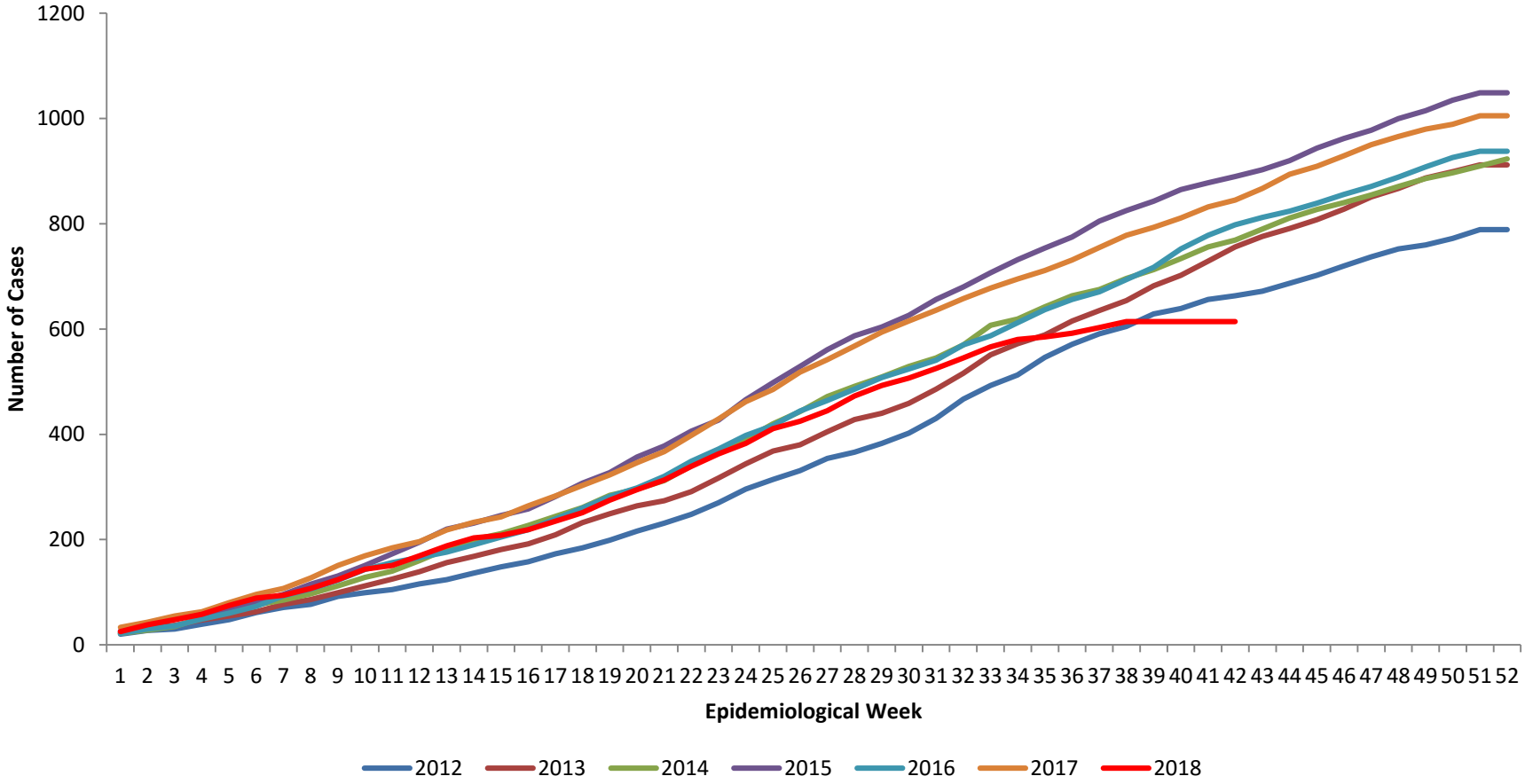

Figure 6. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the serotypes not in PCV-13: individuals ≥5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included.

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Missing information

Age was unknown for 878 of the cases (Table 1). By the time that this report was produced there was only one viable isolate from 2017 and 20 viable isolates from cases from 2018 with pending serotype results (Table 2). For 64 isolates in the 7-year period, serotype could not be identified due to high ct value during *lytA* PCR, or PCR serotype target not distinguishing between vaccine and non-vaccine serotype.

Table 1. Isolates with missing age; number of viable, non-viable isolates and audit cases identified, 2012-2018

	Age missing, n(%)	Viable, n(%)	Non-viable, n(%)	Audit/missing isolates, n(%)	Total
2012	248 (8)	2,160 (67)	273 (8)	789 (24)	3,222
2013	138 (5)	1,932 (67)	268 (9)	665 (23)	2,865
2014	165 (6)	1,752 (64)	291 (11)	688 (25)	2,731
2015	157 (6)	1,700 (65)	208 (8)	727 (28)	2,635
2016	48 (2)	1,578 (65)	197 (8)	658 (27)	2,433
2017	70 (3)	1,536 (63)	280 (11)	625 (26)	2,441
2018	52 (4)	987 (67)	212 (14)	268 (18)	1,467

For 172 isolates reported to the laboratory, viability is unknown due to capturing delays. Total cases reported for 2018 to date = 1,639

Table 2. Isolates where serotype was not available at the time this report was produced

	Unknown serotype	Viable, serotype pending	Non-viable, serotype pending	Viability unknown, serotype pending	Total serotypes pending
2012	12	0	39	0	39
2013	12	0	40	0	40
2014	10	0	41	0	41
2015	9	0	37	0	37
2016	7	0	31	0	31
2017	9	1	45	0	46
2018	5	20	56	172	248
Total	61	21	289	172	482

* Viability unknown due to capturing delays

Data Source

National Institute for Communicable Diseases | GERMS-SA

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1. Carvalho MdGS, Tondella ML, McCaustland K, Weidlich L, McGee L, Mayer LW, et al. Evaluation and improvement of real-time PCR assays targeting lytA, ply, and psaA genes for detection of pneumococcal DNA. J. Clin. Microbiol. 2007;45(8):2460-6.
2. Azzari C, Moriondo M, Indolfi G, Cortimiglia M, Canessa C, Becciolini L, et al. Realtime PCR is more sensitive than multiplex PCR for diagnosis and serotyping in children with culture negative pneumococcal invasive disease. PLoS One. 2010;5(2):e9282.
3. World Health Organization [Internet] WHO-UNICEF estimates of PCV3 coverage. 2017 [cited 21 July 2017]. Available from: http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tswucoveragepcv3.html.
4. von Gottberg A, de Gouveia L, Tempia S, Quan V, Meiring S, von Mollendorf C, et al. Effects of vaccination on invasive pneumococcal disease in South Africa. N. Engl. J. Med. 2014;371(20):1889-99.
5. Whitney CG, Pilishvili T, Farley MM, Schaffner W, Craig AS, Lynfield R, et al. Effectiveness of seven-valent pneumococcal conjugate vaccine against invasive pneumococcal disease: A matched case-control study. The Lancet. 2006;368(9546):1495-502.

Last updated: 1 November 2018
Next update: 31 January 2018

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Appendix: Cumulative invasive pneumococcal disease case numbers reported by the GERMS-SA surveillance programme, January 2005 to December 2012

GERMS-SA surveillance programme

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- Repeat isolates from the same individual within 21 days.
- ~270 laboratories each year send reports and isolates.
- Age, sex, date of specimen collection, and source of specimen were captured.
- Pneumococci were serotyped by Quellung reaction using specific antisera (Statens Serum Institute, Copenhagen, Denmark).
- **Only viable isolates are included in cumulative graph case numbers as molecular diagnostic techniques were only introduced in 2007.**
- Graphs are presented for those younger than 5 years, and those 5 years and older. Cases with unknown age were also not included in cumulative graph case numbers.
- There are three graphs for each age group: disease caused by any of the seven serotypes in PCV-7 (4, 6B, 9V, 14, 18C, 19F and 23F); disease caused by any of the six additional serotypes in PCV-13 but not in PCV7 (1, 3, 5, 6A, 7F, 19A); and disease caused by any serotypes not in PCV-13.
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The effect of the vaccine on invasive pneumococcal diseases in South Africa has been described.[2]

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Appendix: Cumulative invasive pneumococcal disease case numbers reported by the GERMS-SA surveillance programme, 1 January 2005 to December 2012

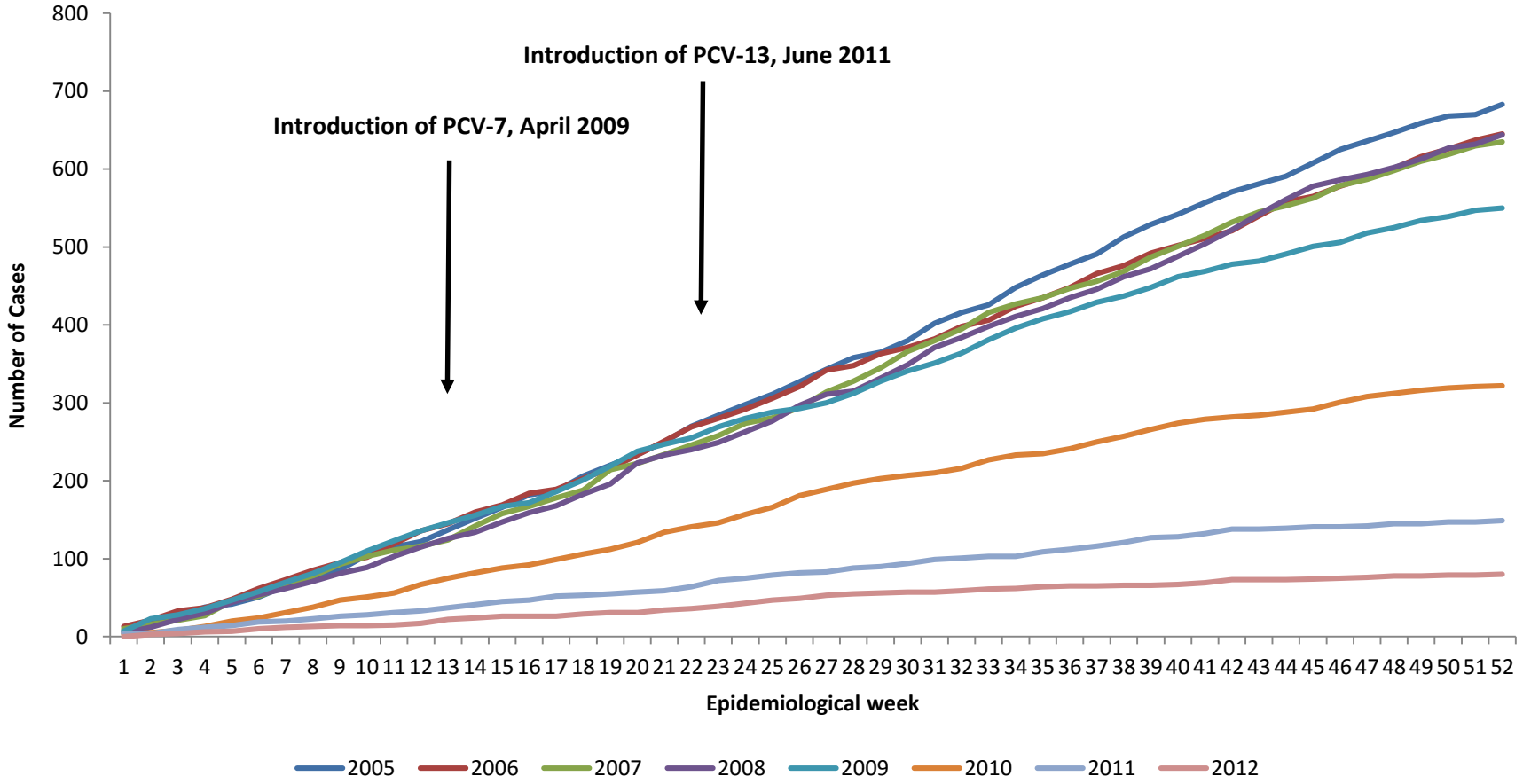

Figure 1. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the seven serotypes (4, 6B, 9V, 14, 18C, 19F and 23F) in PCV-7: children <5 years of age in South Africa, from 2005 to 2012. Only viable isolates serotyped using Quelling method included.

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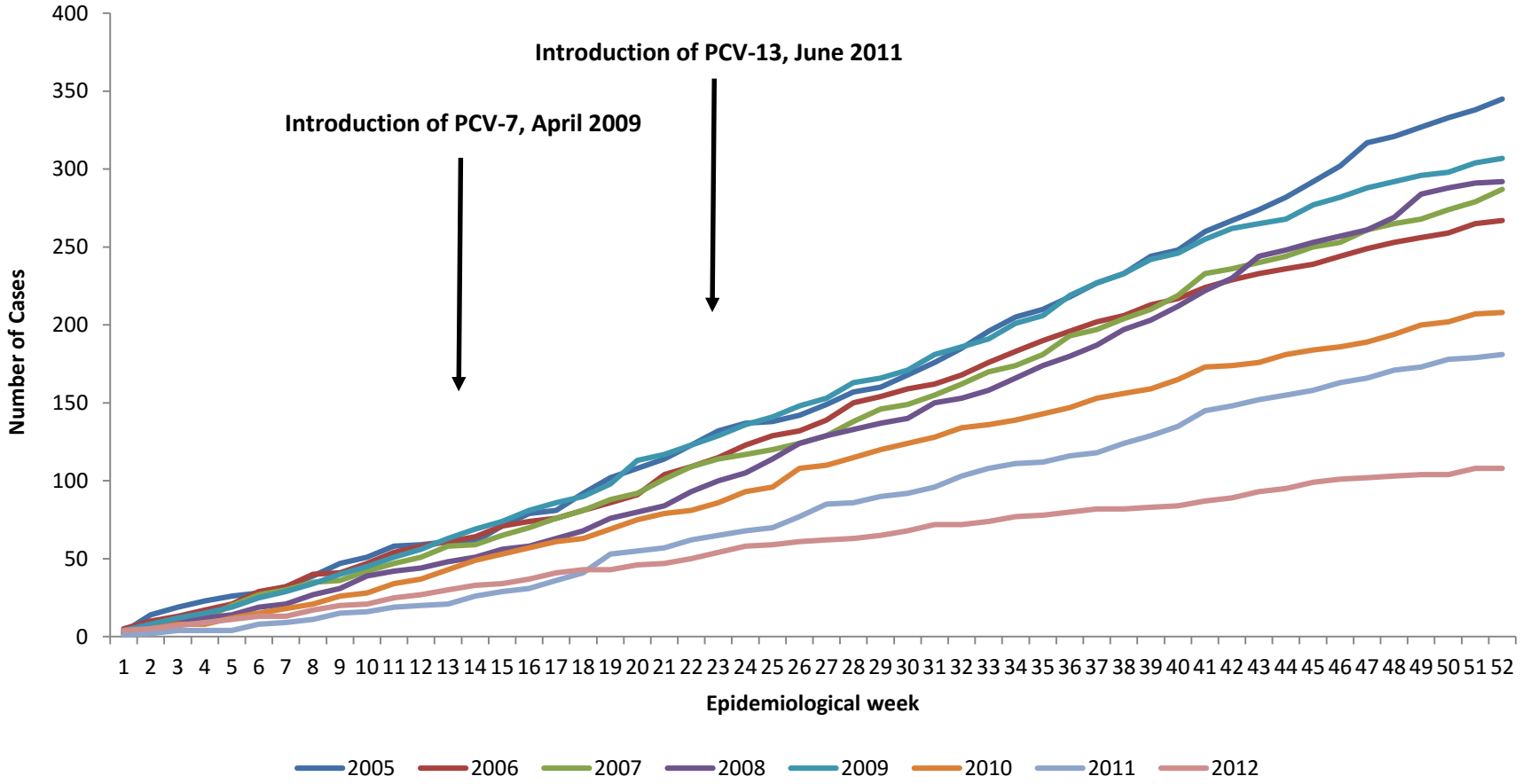

Figure 2. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the six additional (1, 3, 5, 6A, 7F, 19A) serotypes in PCV-13 but not in PCV-7: children <5 years of age in South Africa, from 2005 to 2012. Only viable isolates serotyped using Quelling method included. (Note: There is reported cross protection between 6A and 6B which is included in PCV-7[5])

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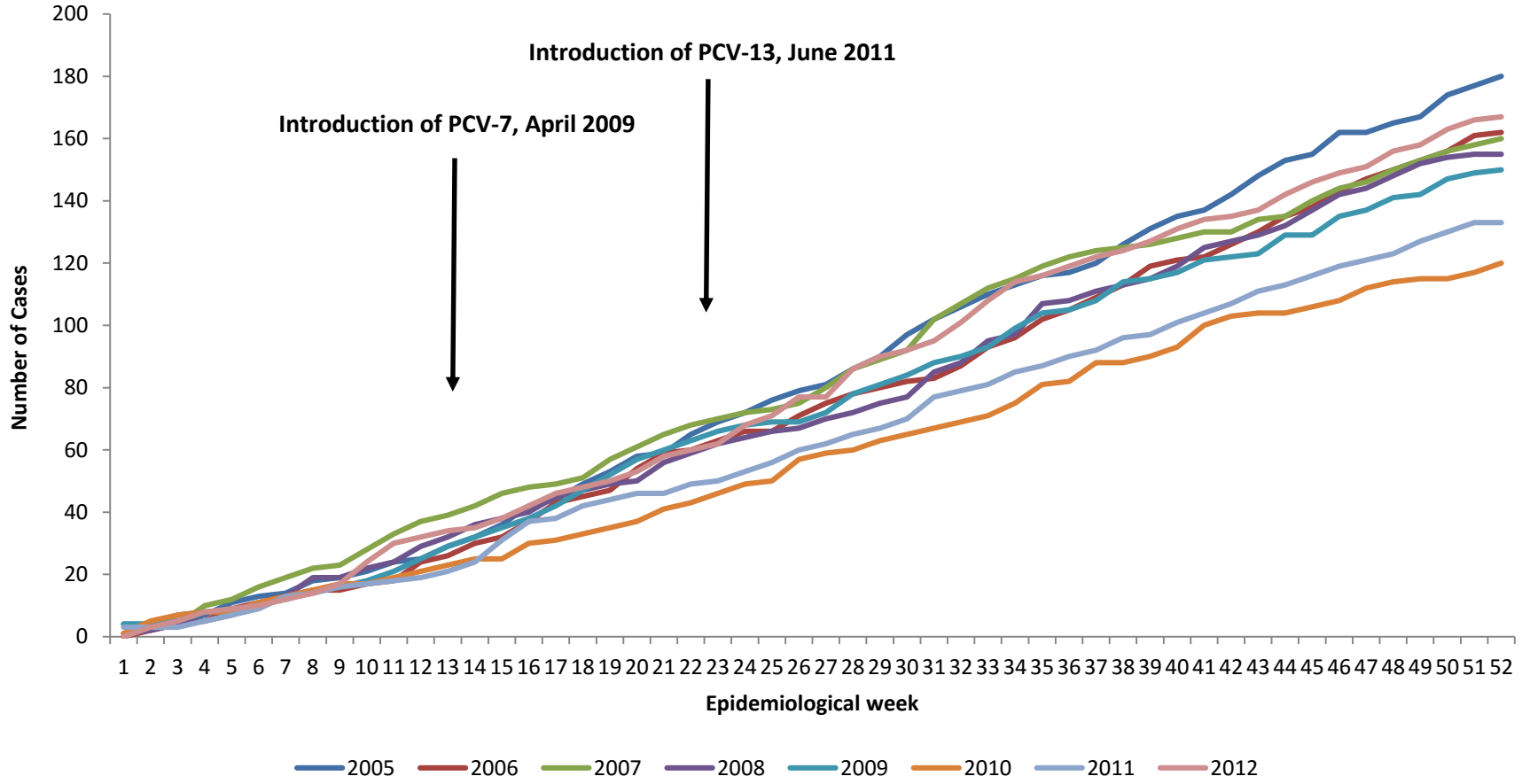

Figure 3. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the serotypes not in PCV-13: Children <5 years of age in South Africa, from 2005 to 2012. Only viable isolates serotyped using Quelling method included.

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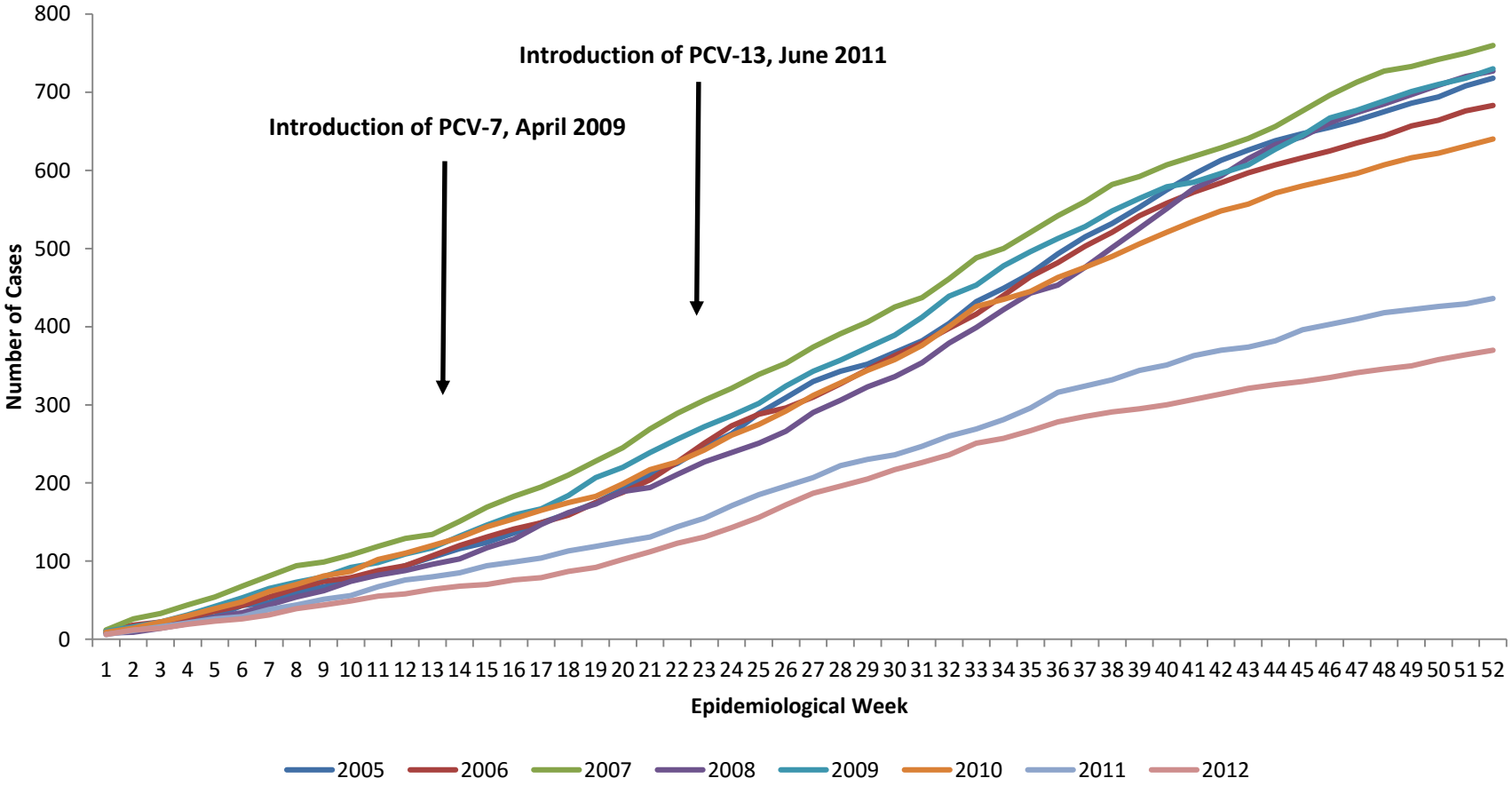

Figure 4. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the seven serotypes (4, 6B, 9V, 14, 18C, 19F and 23F) in PCV-7: Individuals ≥5 years of age in South Africa, from 2005 to 2012. Only viable isolates serotyped using Quelling method included.

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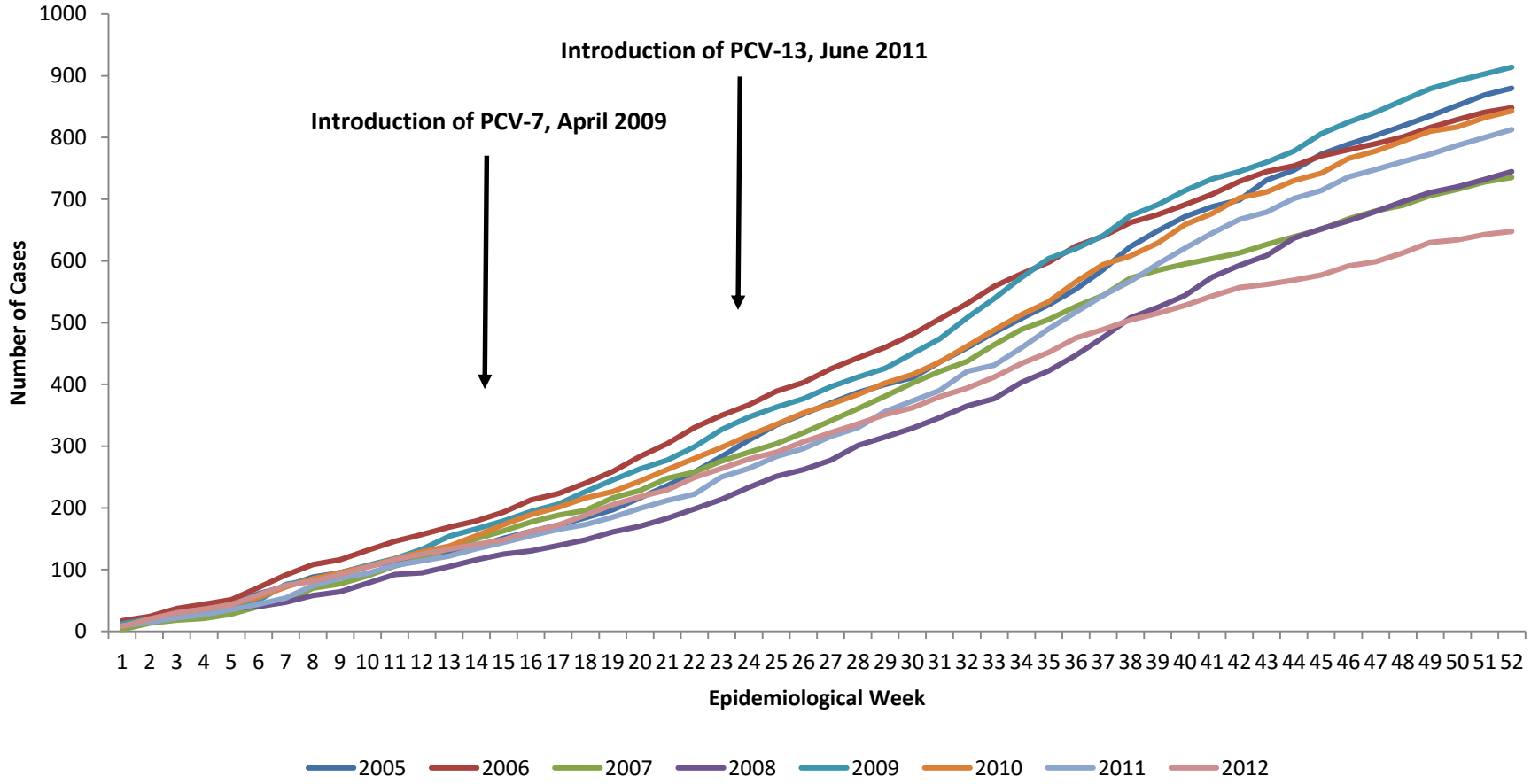

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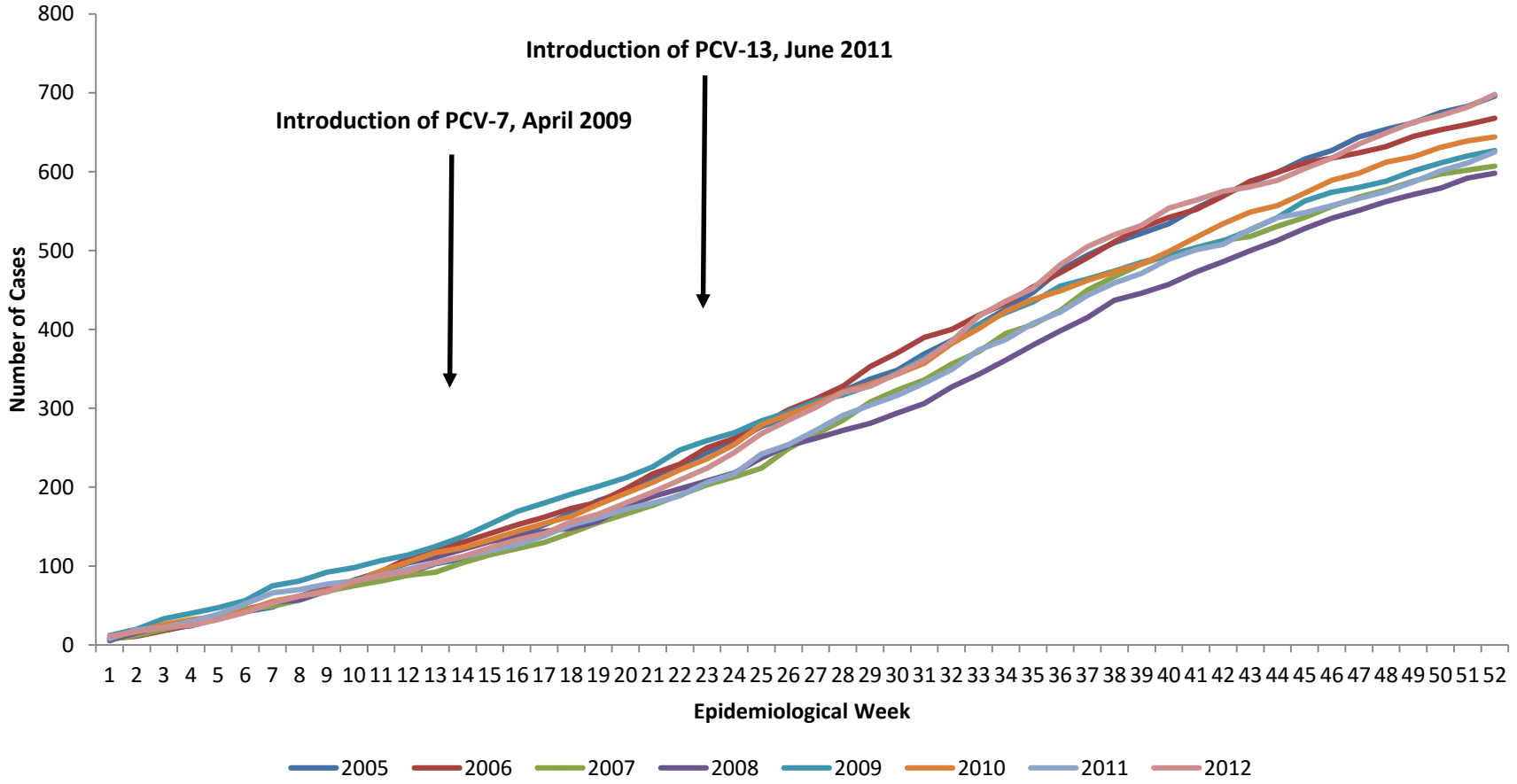

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Missing information

Table 1. Isolates with missing age; number of viable and non-viable isolates and audit cases identified, 2005-2012

	Age missing, n(%)	Viable, n(%)	Non-viable, n(%)	Audit, n(%)	Total
2005	236 (5)	3,650 (75)	380 (8)	856 (18)	4,886
2006	223 (5)	3,419 (72)	444 (9)	868 (18)	4,731
2007	217 (5)	3,329 (70)	597 (13)	816 (17)	4,742
2008	208 (4)	3,327 (69)	576 (12)	932 (19)	4,835
2009	161 (3)	3,387 (71)	532 (11)	841 (18)	4,760
2010	141 (3)	2,873 (68)	515 (12)	809 (19)	4,197
2011	218 (6)	2,409 (63)	451 (12)	944 (25)	3,804
2012	248 (8)	2,160 (67)	344 (11)	718 (22)	3,222

References

1. World Health Organization [Internet] WHO-UNICEF estimates of PCV3 coverage. 2017 [cited 21 July 2017]. Available from: http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tswucoveragepcv3.html.

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