

Cumulative invasive pneumococcal disease case numbers reported by the GERMS-SA surveillance programme, 1 January 2012 to 30 July 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 *lytA* PCR¹ 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.

- 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

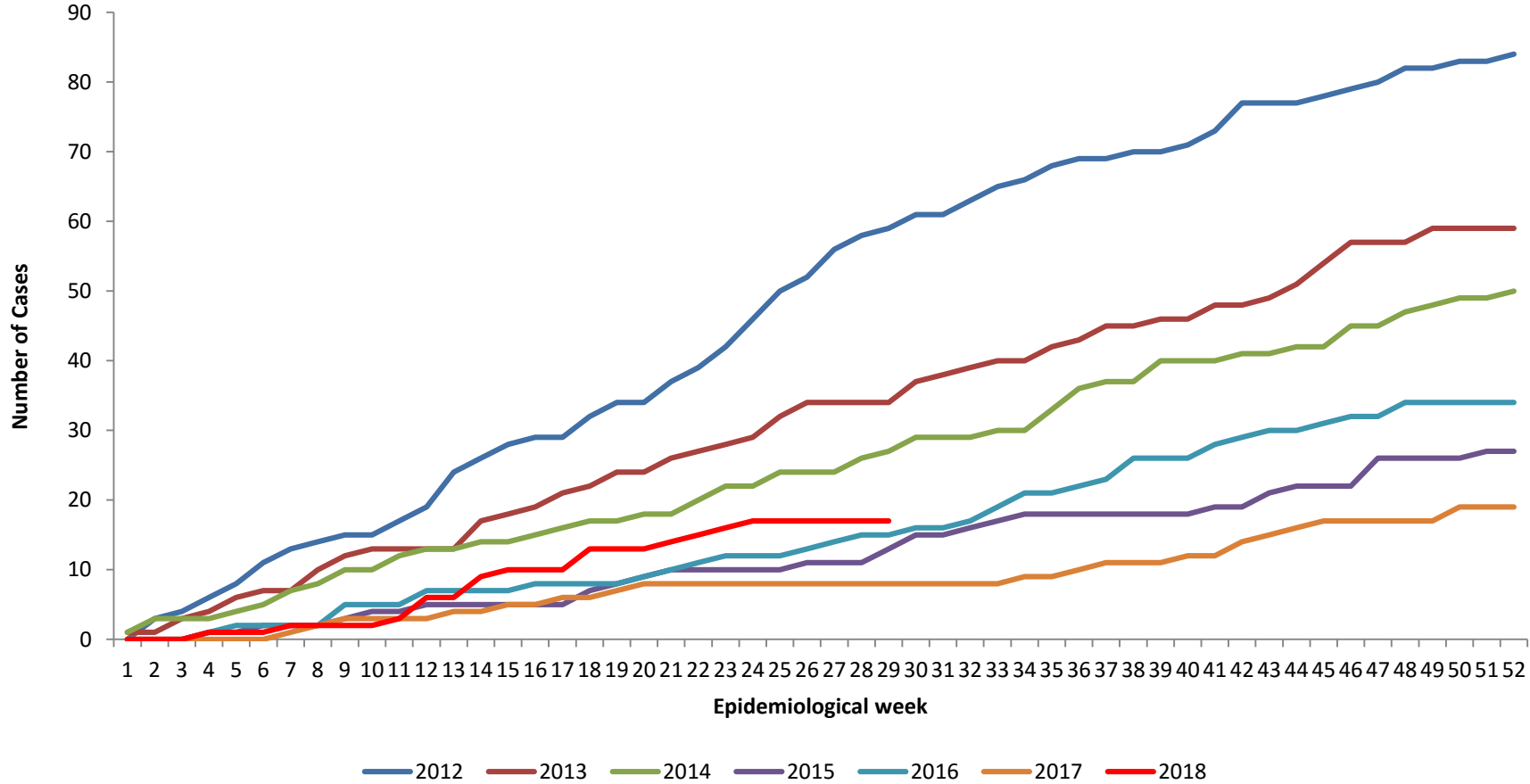


Figure 1. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the seven serotypes (4, 6B, 9V, 14, 18C, 19F and 23F) in PCV-7: children <5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included.

Data are provisional as reported to date.

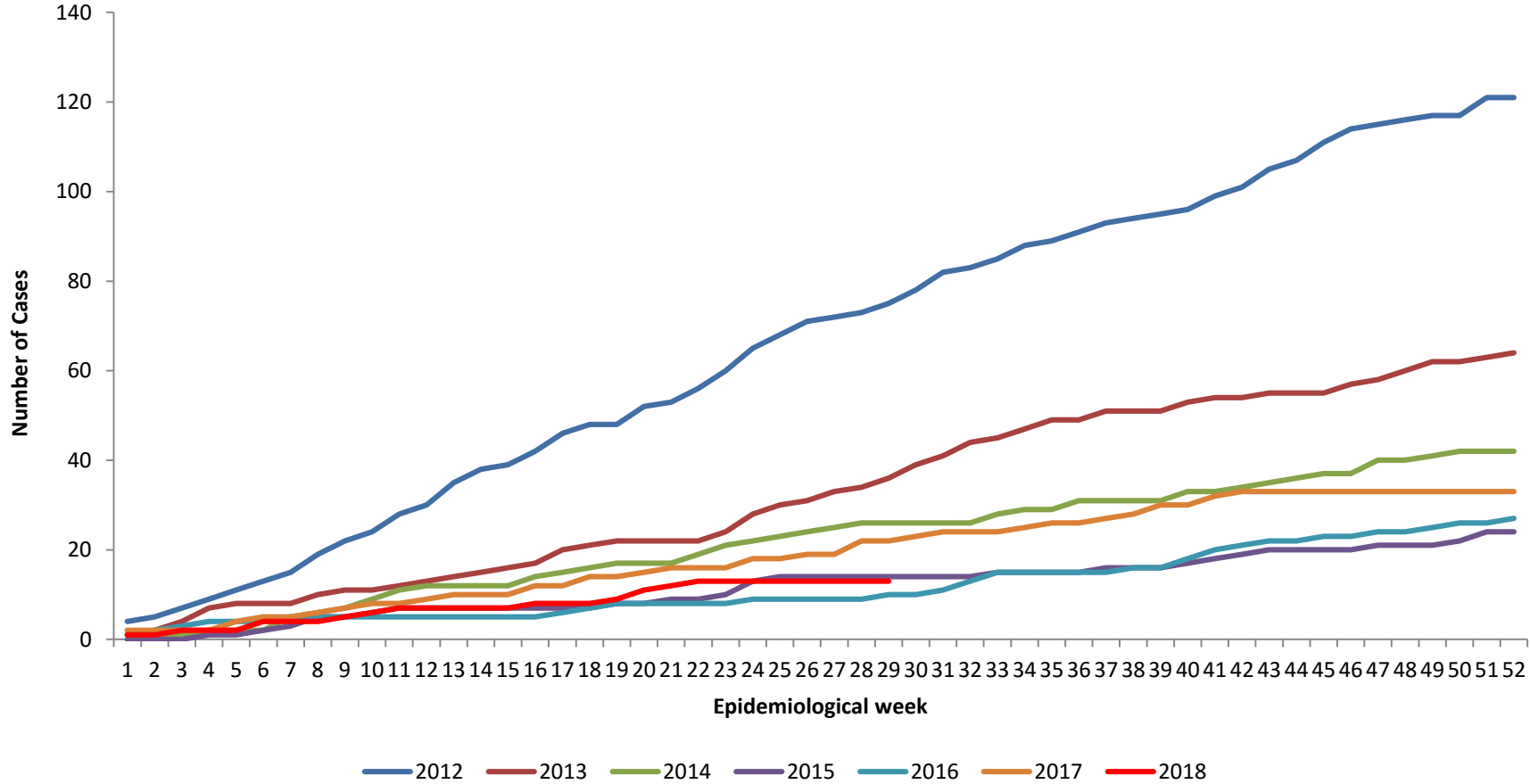


Figure 2. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the six additional (1, 3, 5, 6A, 7F, 19A) serotypes in PCV-13 but not in PCV-7: children <5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included. (Note: There is reported cross protection between 6A and 6B which is included in PCV-7⁵)

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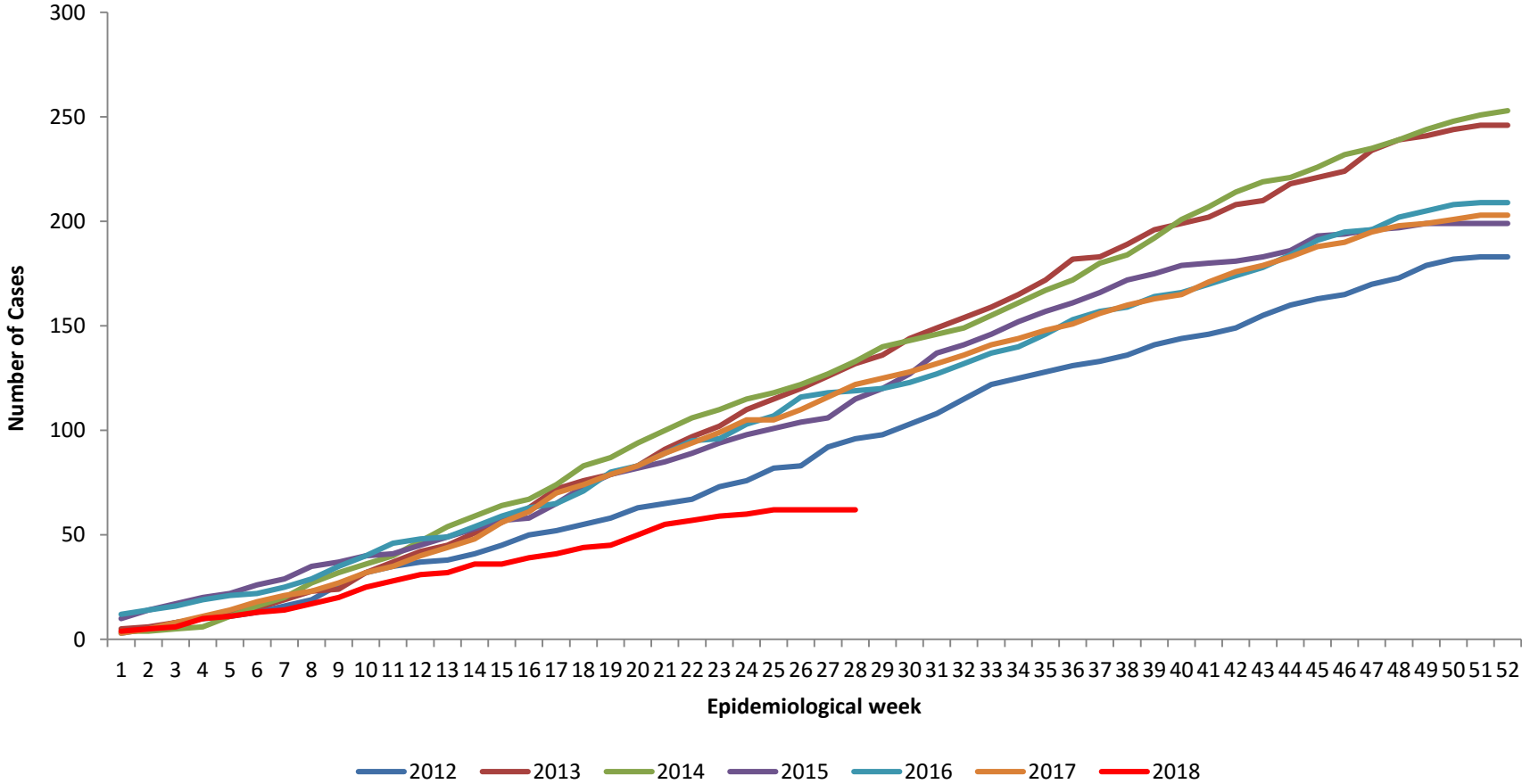


Figure 3. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the serotypes not in PCV-13: children <5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included.

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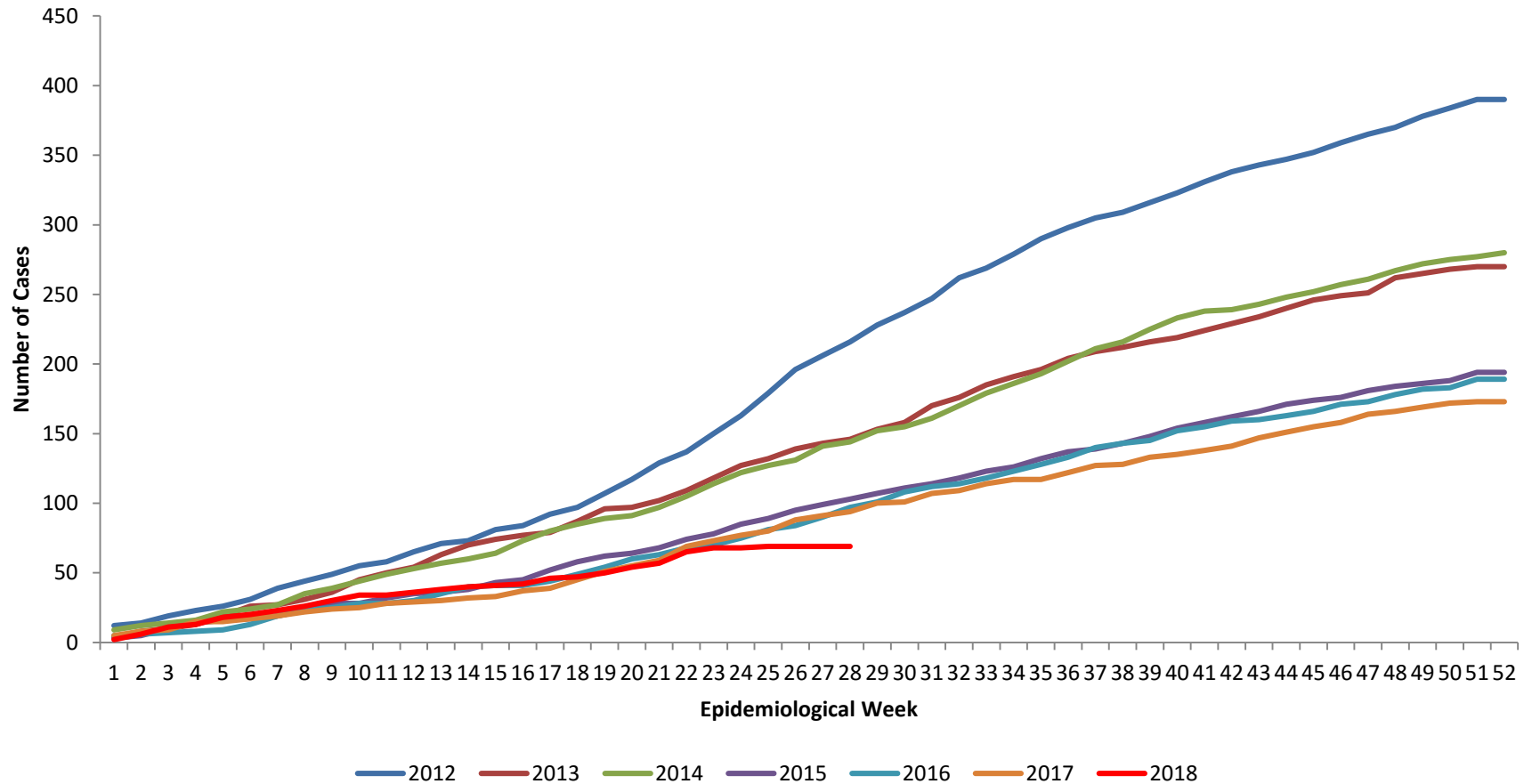


Figure 4. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the seven serotypes (4, 6B, 9V, 14, 18C, 19F and 23F) in PCV-7: individuals ≥ 5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included.

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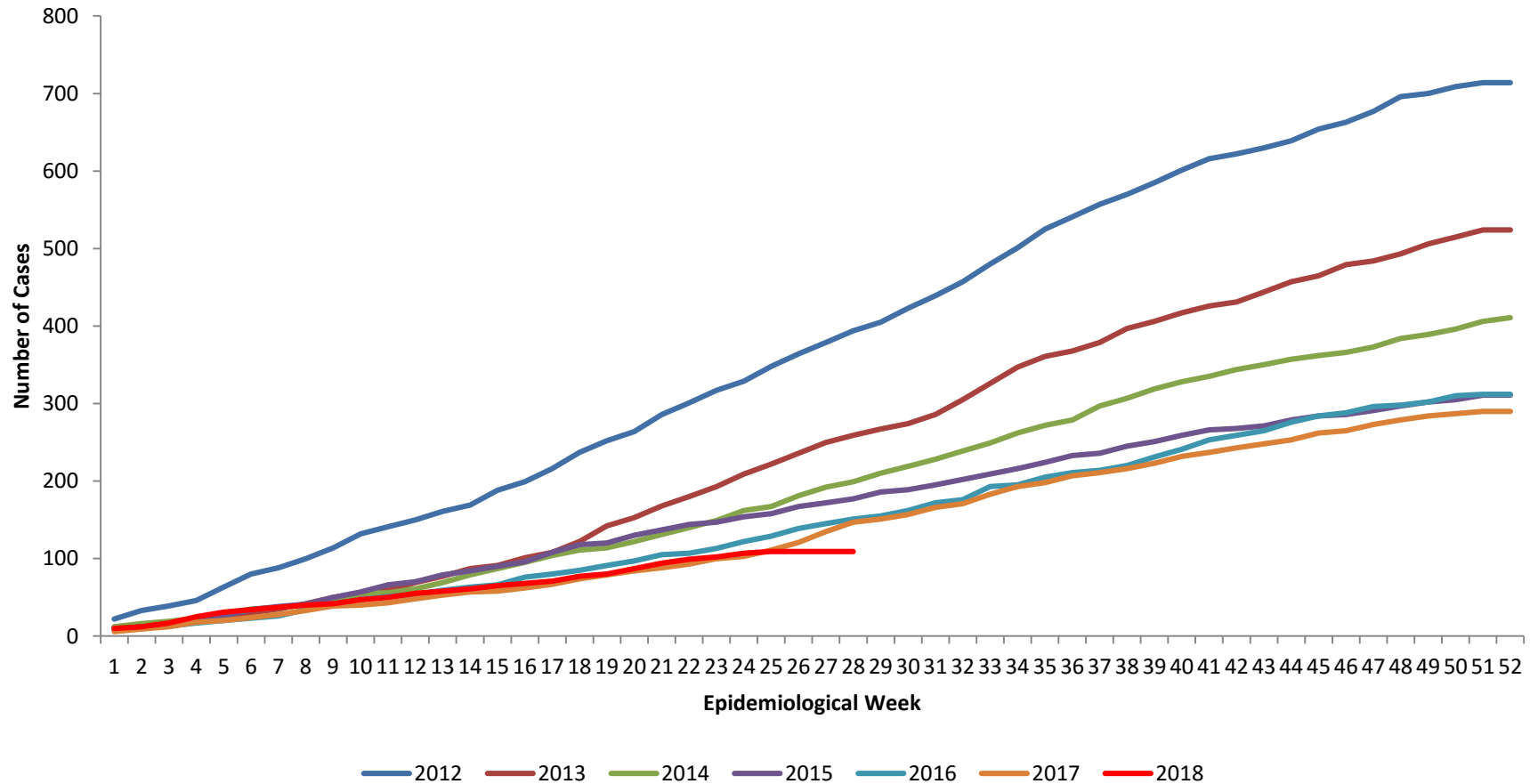


Figure 5: Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the six additional (1, 3, 5, 6A, 7F, 19A) serotypes in PCV-13 but not in PCV-7: individuals ≥ 5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included (Note: There is reported cross protection between 6A and 6B which is included in PCV-7⁵)

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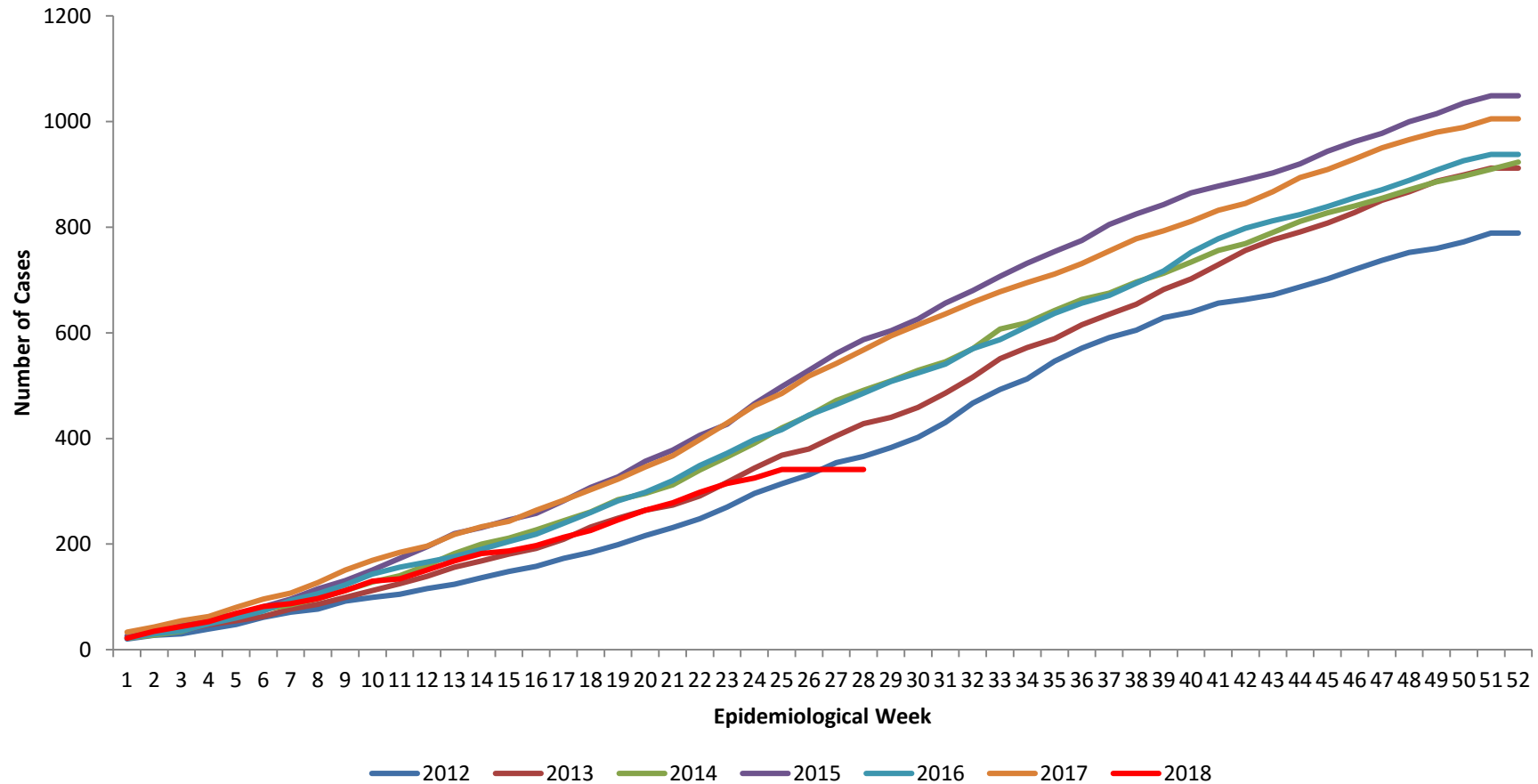


Figure 6. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the serotypes not in PCV-13: individuals ≥ 5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included.

Missing information

Age was unknown for 853 of the cases (Table 1). By the time that this report was produced there was only one viable isolate from 2017 and 36 viable isolates from cases from 2018 with pending serotype results (Table 2). For 61 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) | 1,534 (63) | 280 (11) | 626 (26) | 2,440 |
| 2018* | 27 (3) | 591 (74) | 89 (11) | 117 (15) | 797 |

* For 161 isolates reported to the laboratory, viability is unknown due to capturing delays. Total cases reported for 2018 to date = 958

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 | 2 | 36 | 21 | 161* | 218 |
| Total | 61 | 37 | 254 | 161 | 452 |

* Viability unknown due to capturing delays

Data Source

National Institute for Communicable Diseases | GERMS-SA

References

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: 30 July 2018

Next update: 30 October 2018

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

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- 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.
- ~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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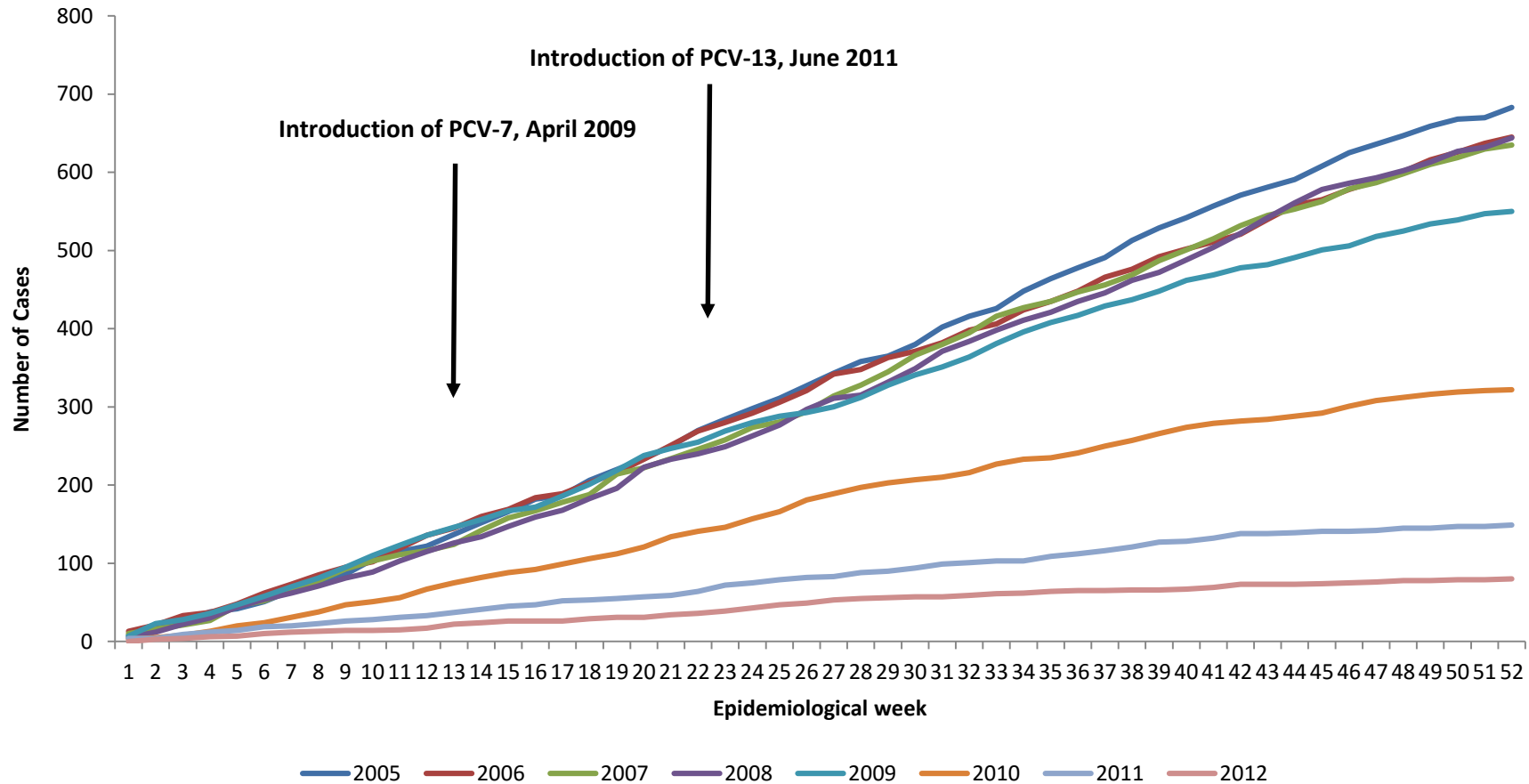


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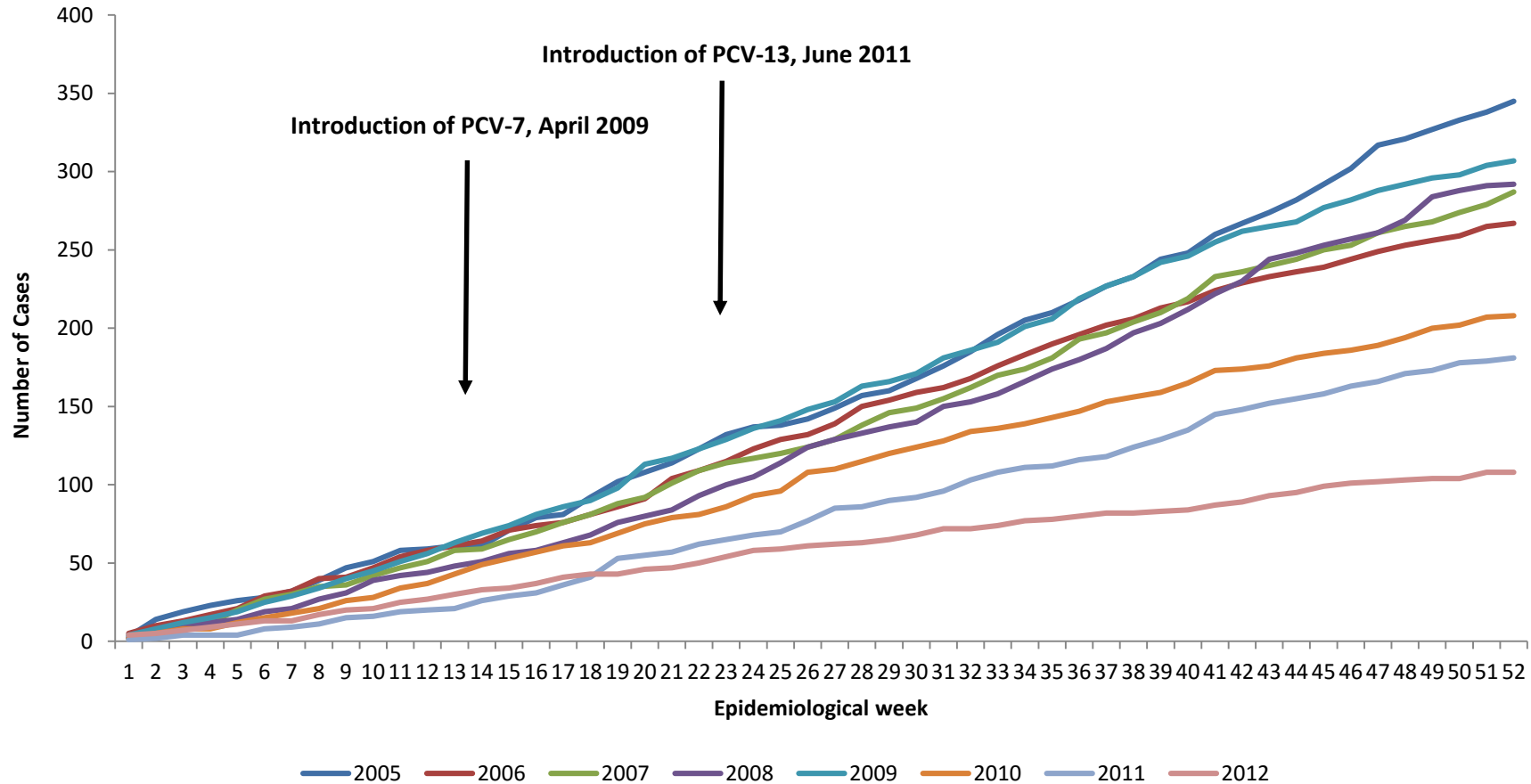


Figure 2. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the six additional (1, 3, 5, 6A, 7F, 19A) serotypes in PCV-13 but not in PCV-7: children <5 years of age in South Africa, from 2005 to 2012. Only viable isolates serotyped using Quelling method included. (Note: There is reported cross protection between 6A and 6B which is included in PCV-7⁵)

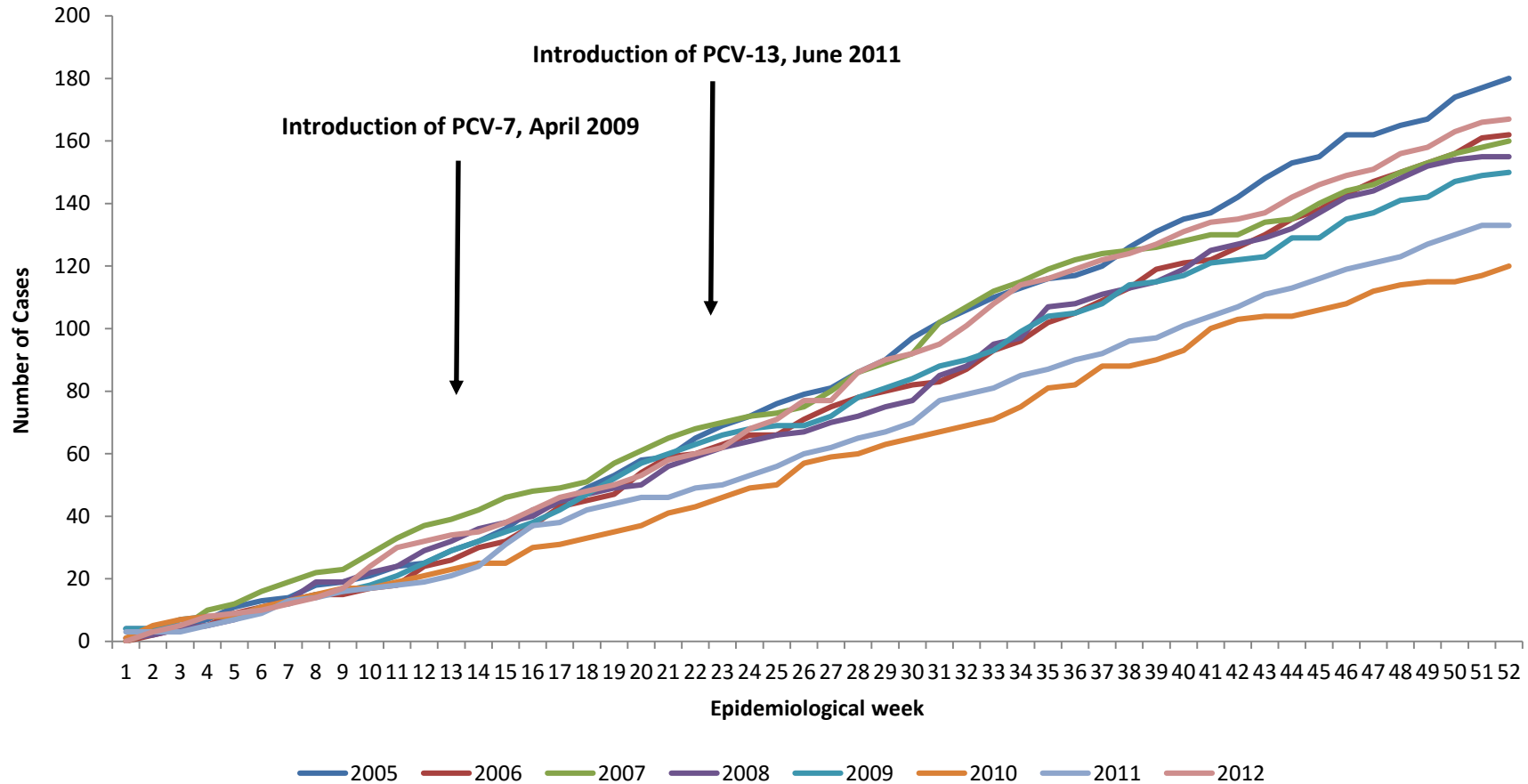


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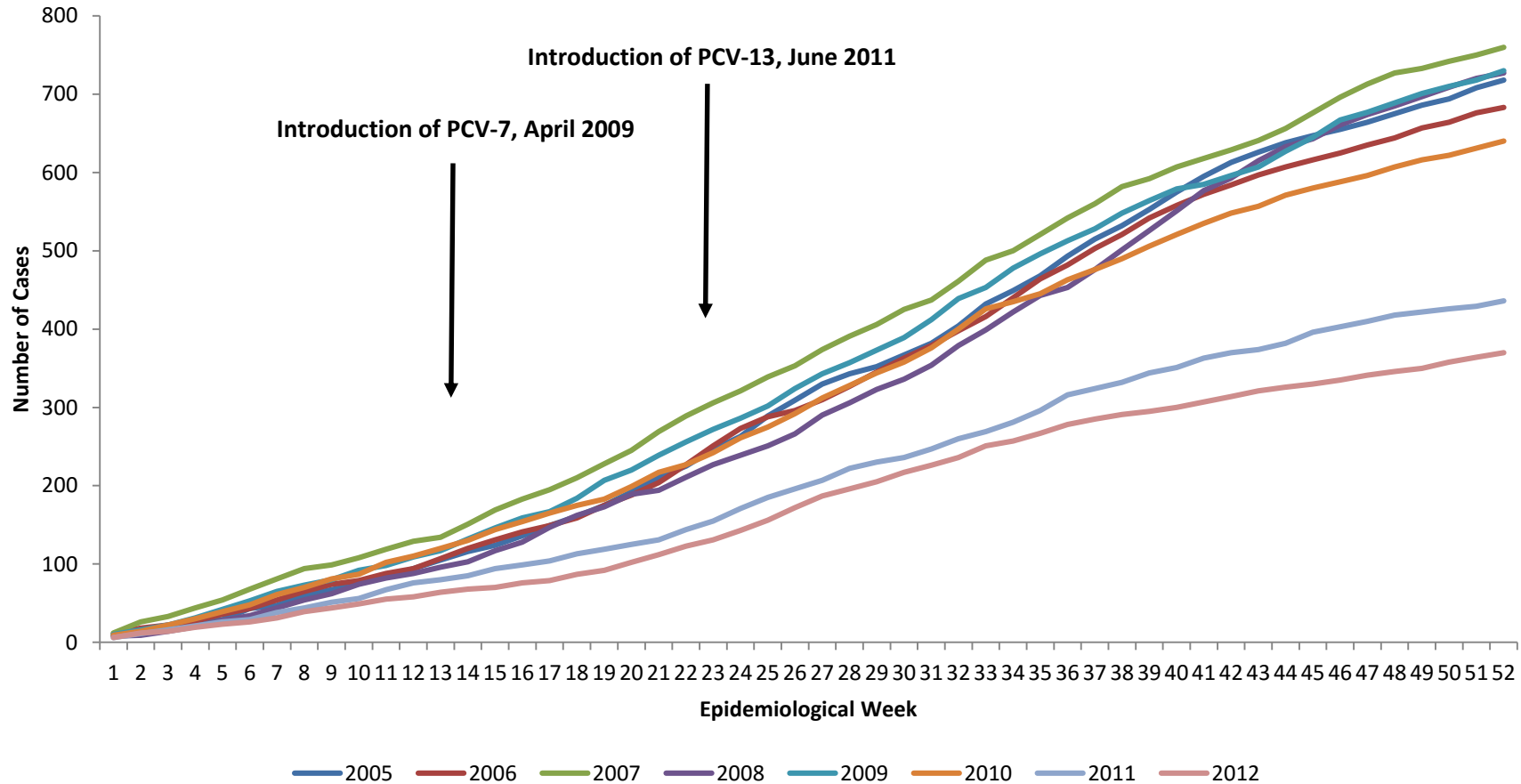


Figure 4. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the seven serotypes (4, 6B, 9V, 14, 18C, 19F and 23F) in PCV-7: Individuals ≥ 5 years of age in South Africa, from 2005 to 2012. Only viable isolates serotyped using Quelling method included.

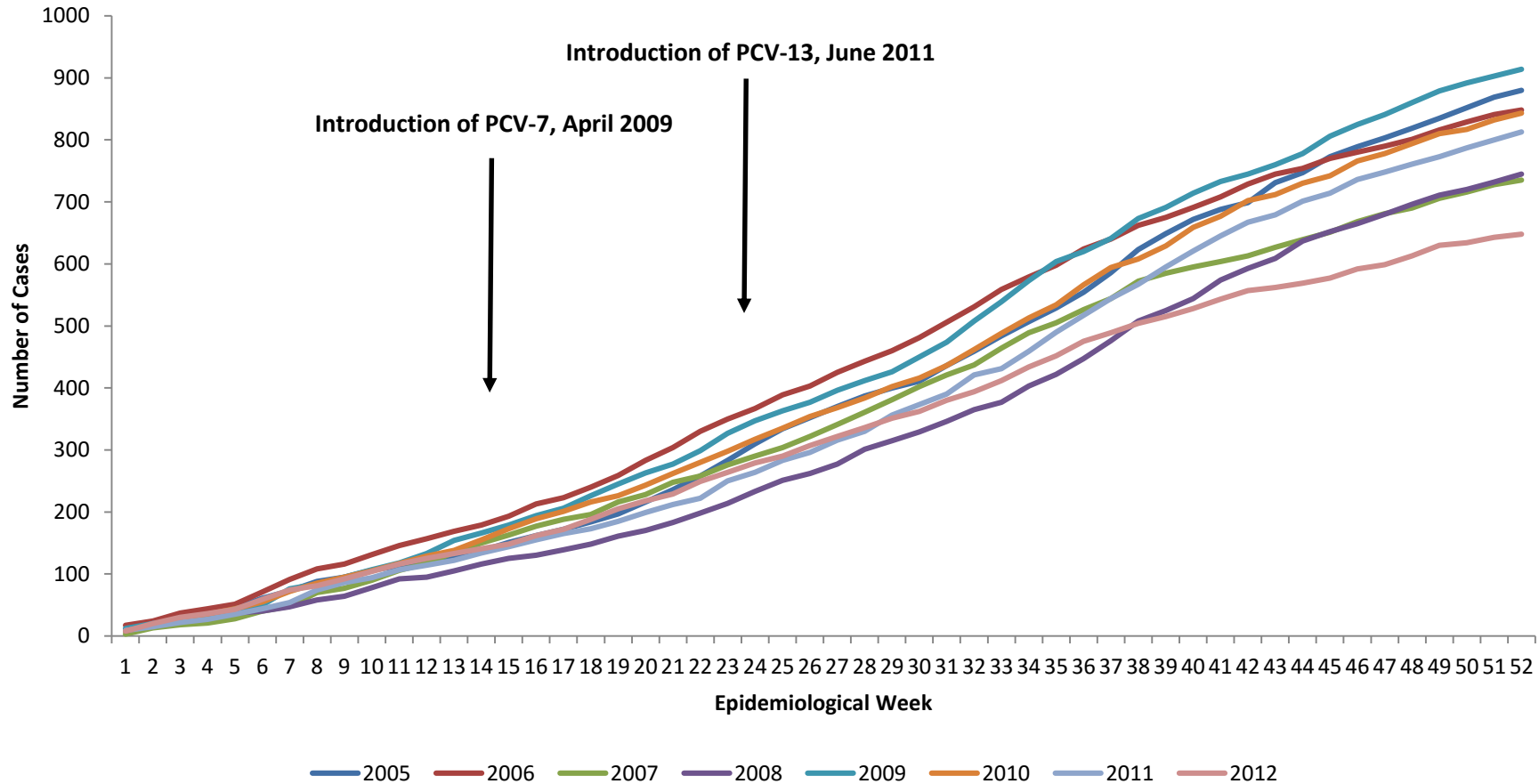


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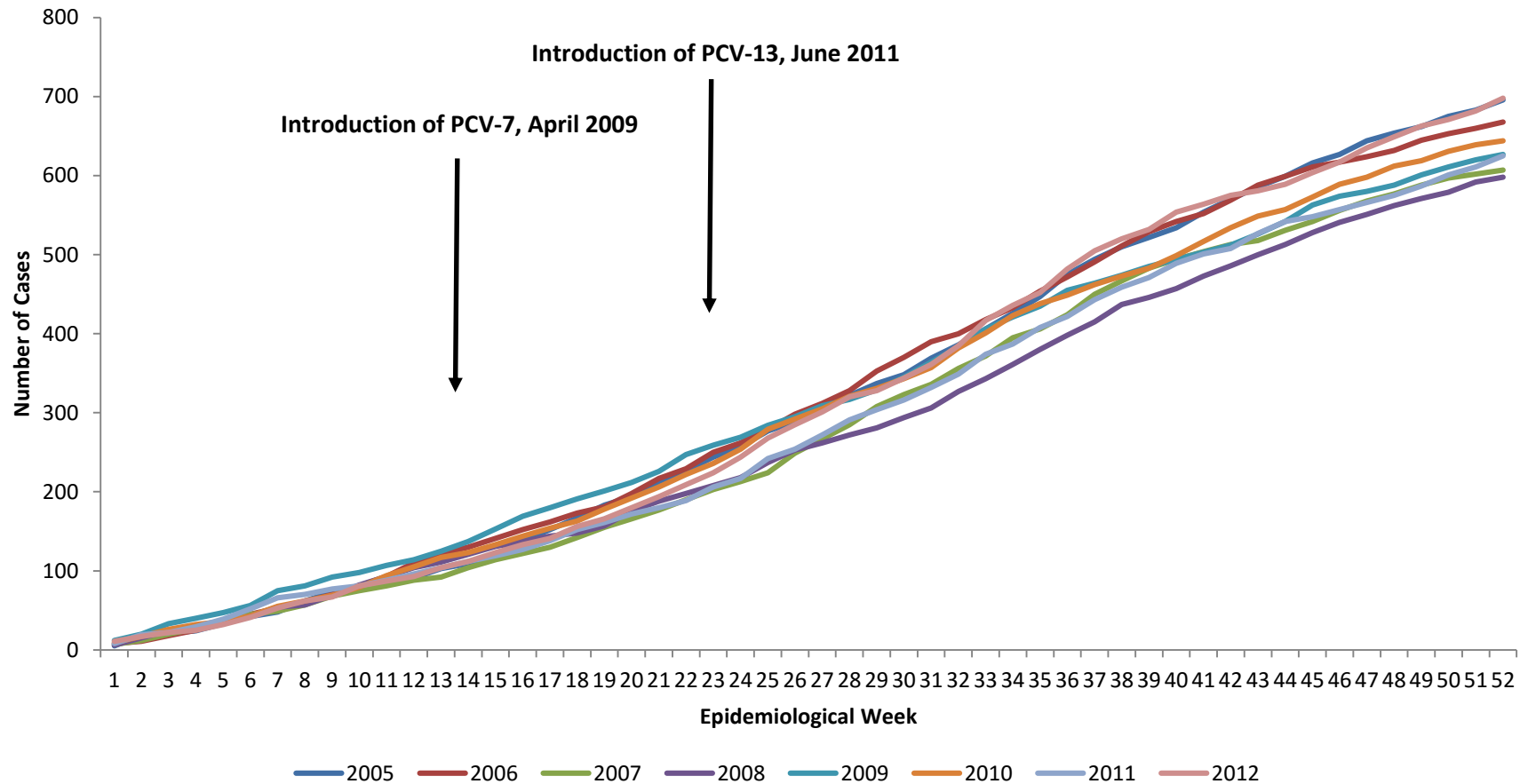


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Missing information

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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