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 2019

## 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* detected from normally sterile-site specimens (e.g. cerebrospinal fluid, blood or joint fluid).
- Repeat isolates from the same individual within 21 days were excluded.
- ~190 laboratories each year send reports and isolates.
- Age, sex, date of specimen collection, and source of specimen were captured.
- Pneumococcal isolates were serotyped by Quellung reaction using specific antisera (Statens Serum Institute, Copenhagen, Denmark). Culture-negative/bacterial antigen detection test 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] This molecular assay includes targets for 38 serotypes (42 serotypes prior to 2014) and covers all serotypes included in PCV13. Only samples 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 38 targets (42 targets prior to 2014), 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 figures (targets: 18ABC, 18ABCF, 7AF, 9ALVN and 9AV).
- **Cumulative graph case numbers include viable isolates and those non-viable but characterised using molecular diagnostic techniques.**
- Figures 1 – 3 are for cases < 5 years, and Figures 4 – 6 for cases 5 years and older. Cases with unknown age were excluded from the figures.
- There are three graphs for each age group:
  - Disease caused by any of the seven serotypes in PCV7 (4, 6B, 9V, 14, 18C, 19F and 23F)
  - Disease caused by any of the six additional serotypes in PCV13 but not in PCV7 (1, 3, 5, 6A, 7F, 19A)
  - Disease caused by any serotypes not in PCV13
- Figures 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/centres/division-of-public-health-surveillance-and-response/

## PCV vaccine introduction in South Africa

- The 7-valent pneumococcal conjugate vaccine (PCV7) was introduced into the South African Expanded Programme on Immunisation in April 2009, with no catch-up vaccination campaign.
- There was a graded replacement of PCV7 by 13-valent pneumococcal conjugate vaccine (PCV13) in 2011. By June 2011 all provinces were using PCV13.

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- There was a limited PCV13 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, 75% in 2012, 77% in 2013, 85% in 2014, 85% 2015, 77% in 2016, 68% in 2017 and 73% in 2018.[3]
- The effect of the vaccine on IPD in South Africa has been described.[4]

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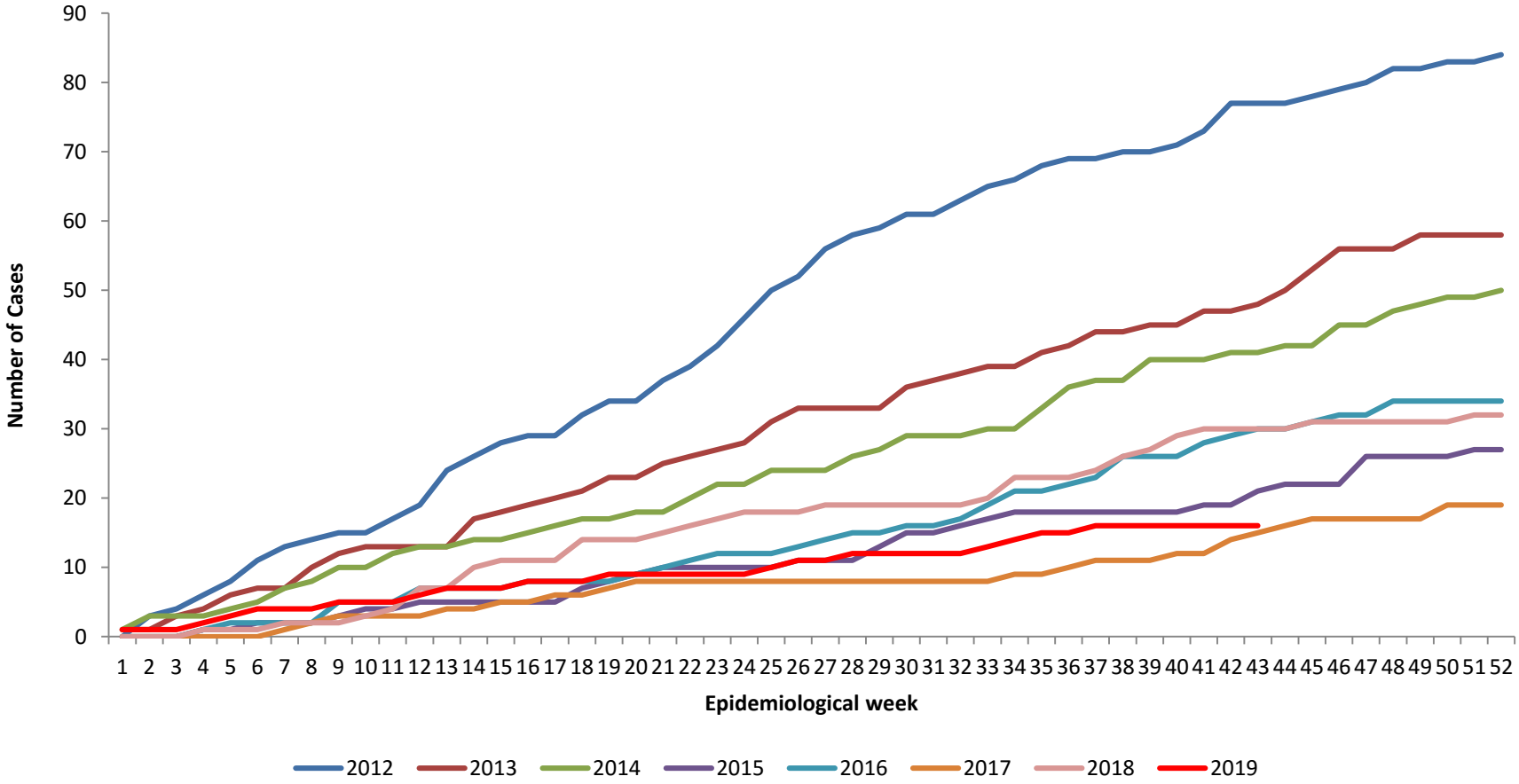


**Figure 1**. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the seven serotypes (4, 6B, 9V, 14, 18C, 19F and 23F) in PCV7: children <5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included.

Data are provisional as reported to date.

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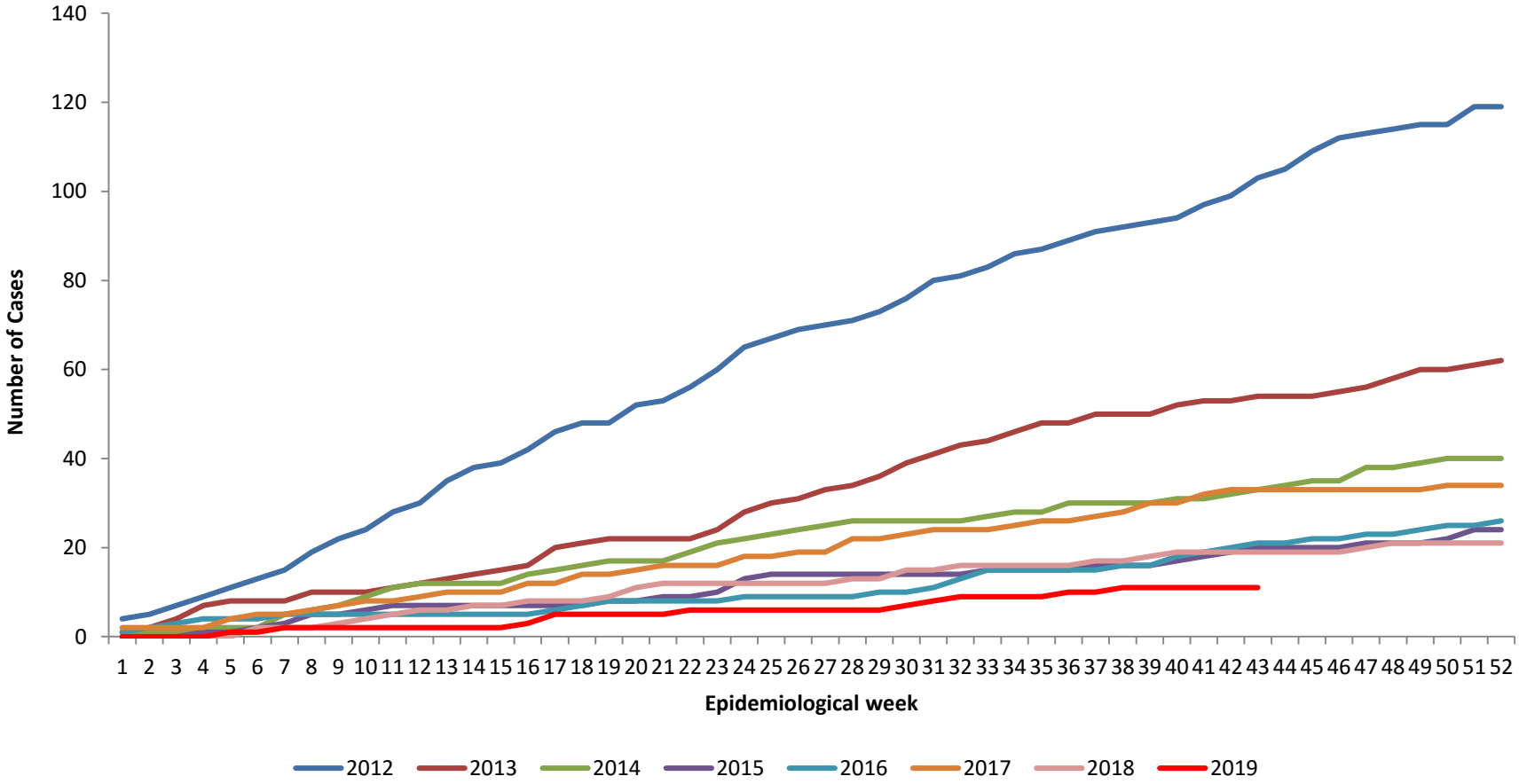


**Figure 2.** Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the six additional (1, 3, 5, 6A, 7F, 19A) serotypes in PCV13 but not in PCV7: children <5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included. (Note: There is reported cross protection between 6A and 6B which is included in PCV7[5])

Data are provisional as reported to date.

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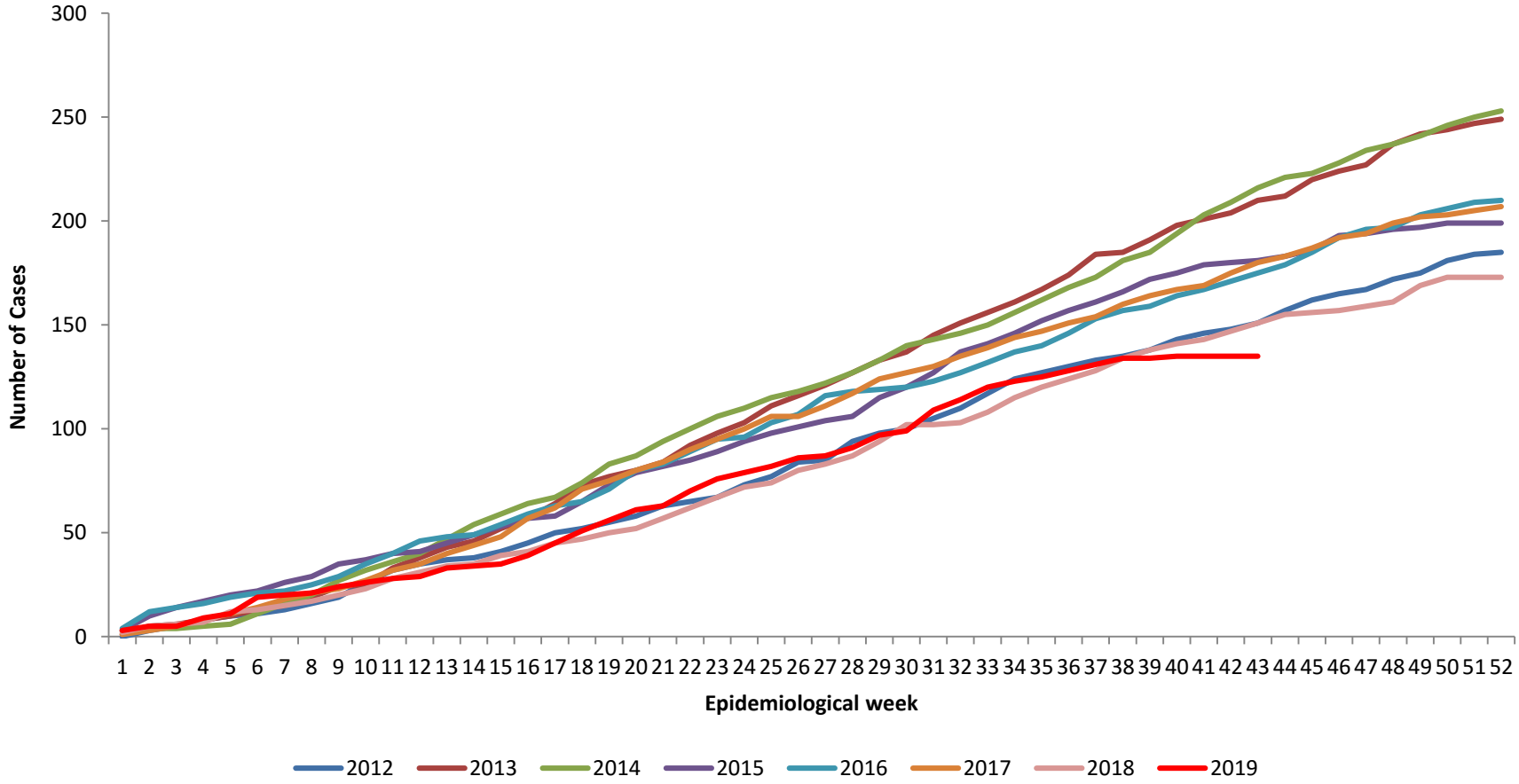


**Figure 3.** Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the serotypes not in PCV13: children <5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included.

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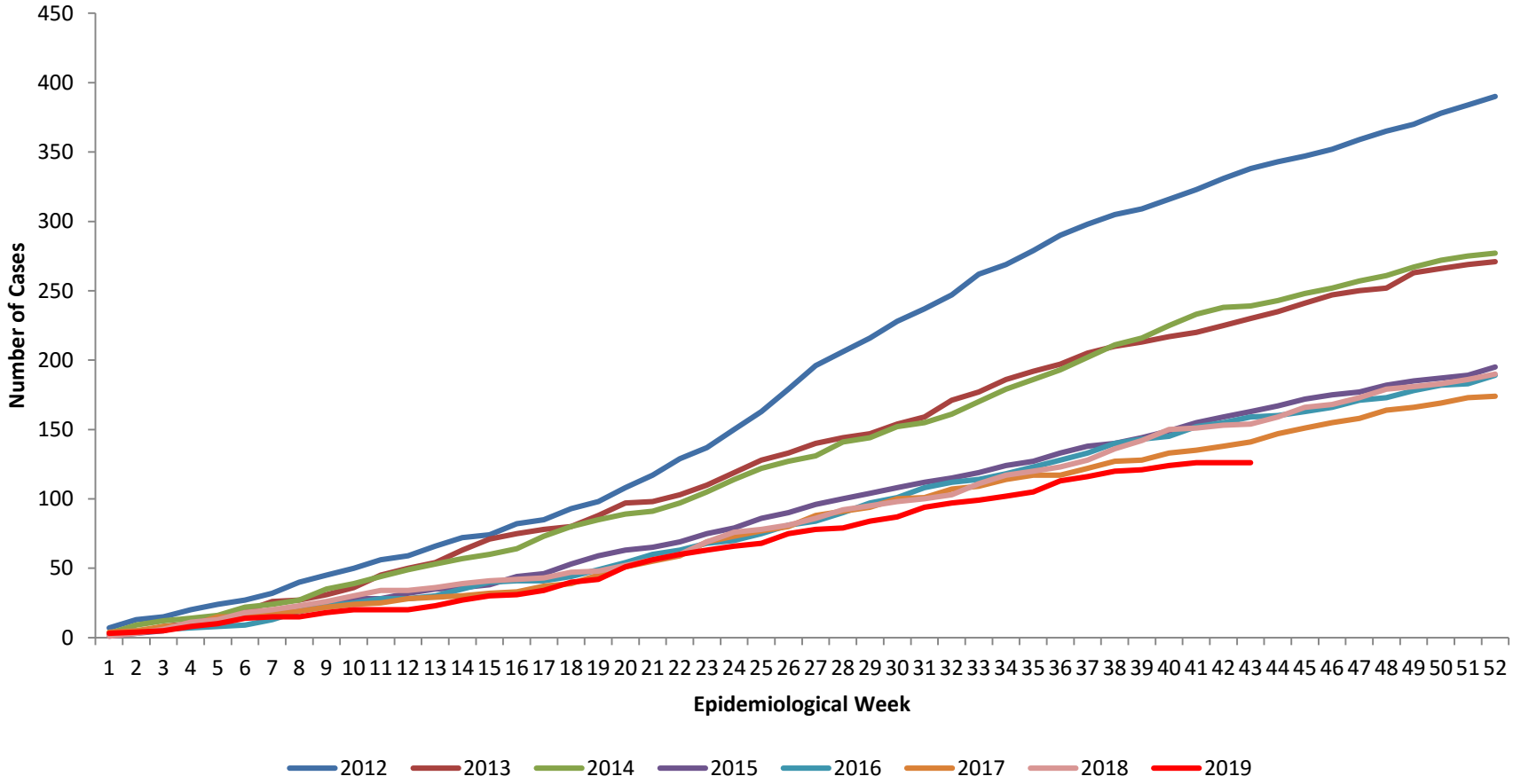


**Figure 4**. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the seven serotypes (4, 6B, 9V, 14, 18C, 19F and 23F) in PCV7: individuals ≥5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included.

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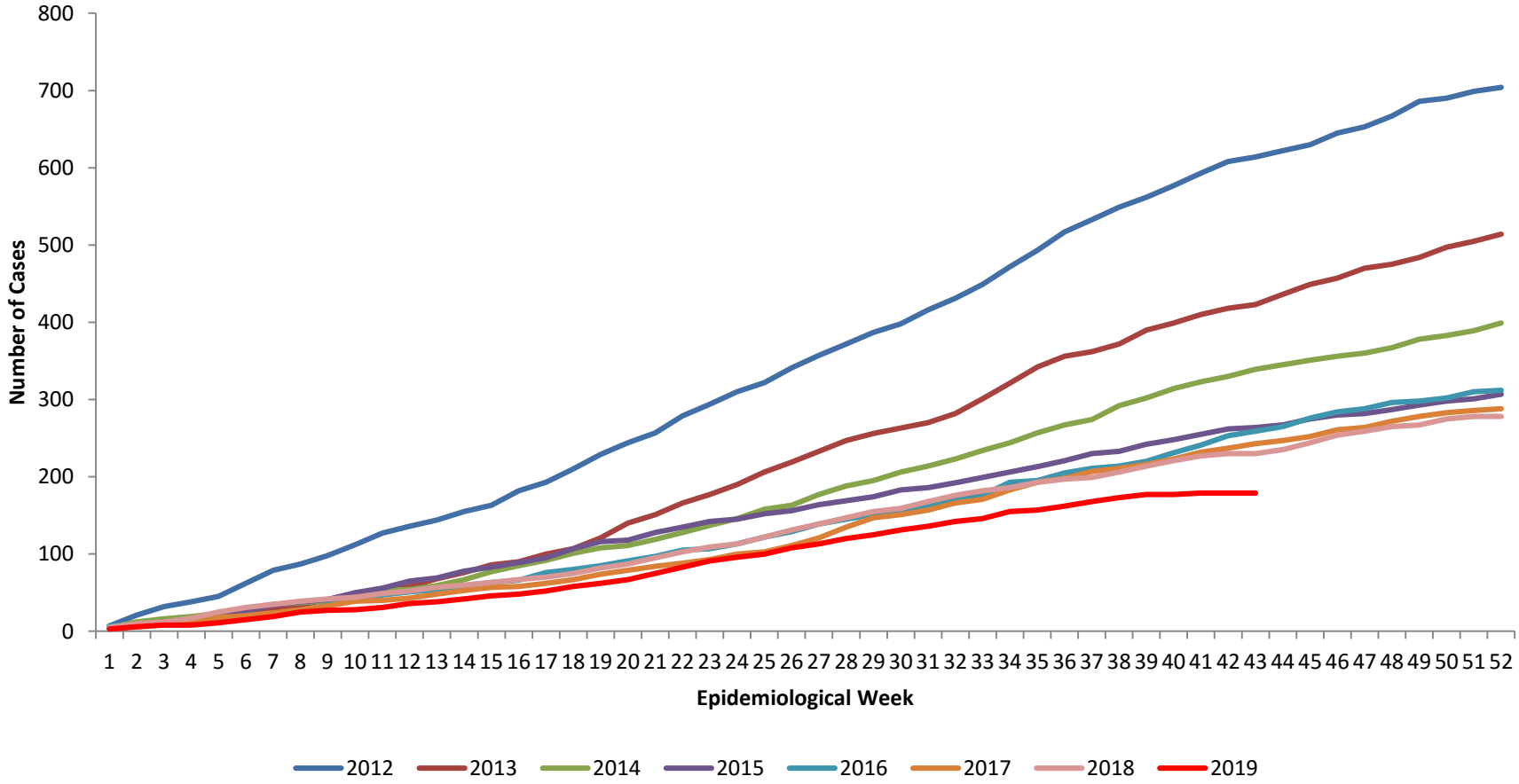


**Figure 5**: Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the six additional (1, 3, 5, 6A, 7F, 19A) serotypes in PCV13 but not in PCV7: individuals ≥5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included (Note: There is reported cross protection between 6A and 6B which is included in PCV7[5])

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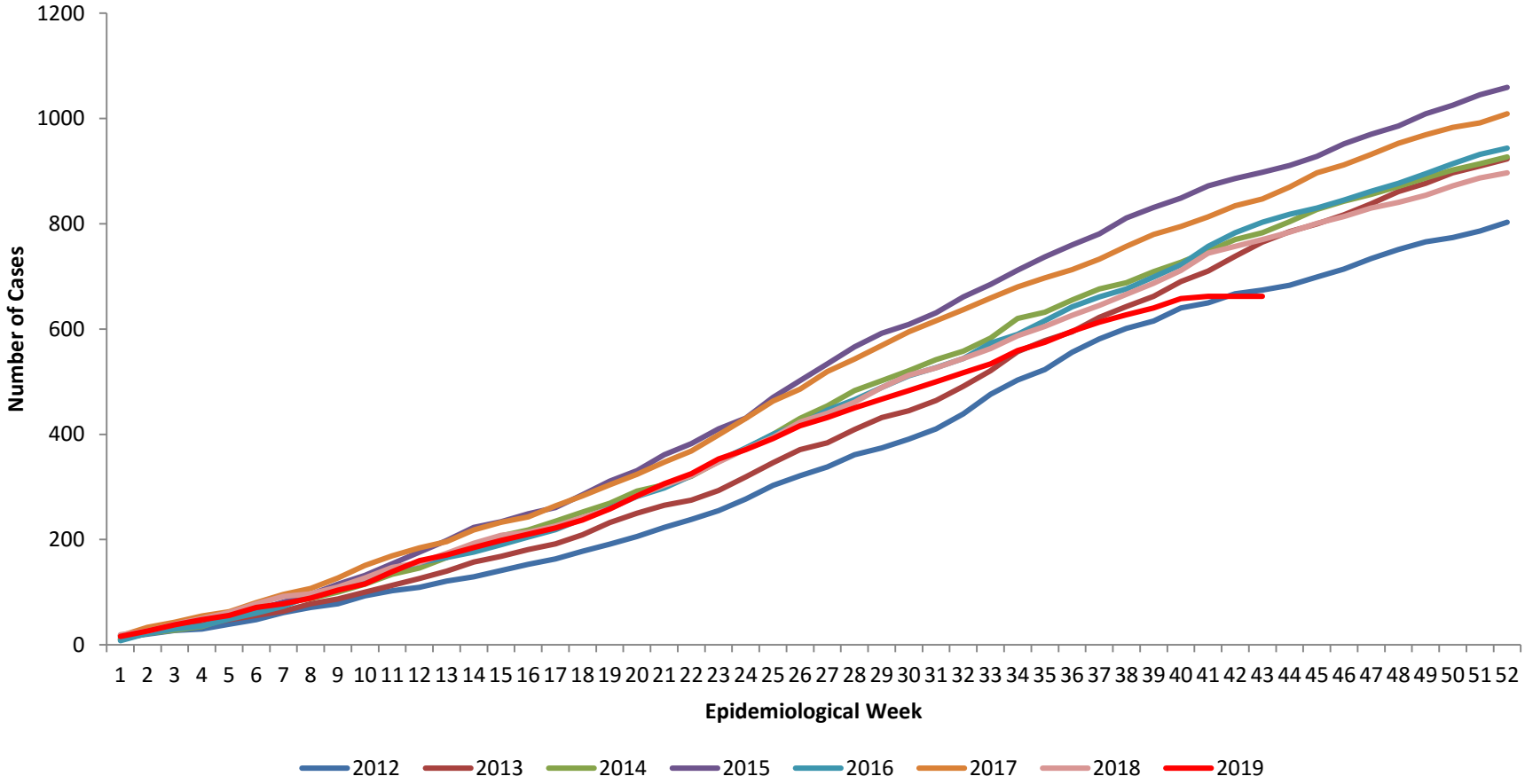


**Figure 6.** Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the serotypes not in PCV13: individuals ≥5 years of age in South Africa, from 2012 to date. Viable isolates and those serotyped using molecular techniques included.

Data are provisional as reported to date.

## Missing information

Age was unknown for 971 of the cases (Table 1). By the time that this report was produced there were 2 viable isolates from cases from 2019 with pending serotype results (Table 2). For 238 isolates in the 8-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, January 2012 to date.

| | Age missing, n(%) | | Viable, n(%) | | Non-viable, n(%) | | Audit/missing isolates, n(%) | | Capture delays*, n(%) | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | 248 | (8) | 2,160 | (67) | 273 | (8) | 789 | (24) | 0 | (0) | 3,222 |
| 2013 | 138 | (5) | 1,932 | (67) | 268 | (9) | 665 | (23) | 0 | (0) | 2,865 |
| 2014 | 165 | (6) | 1,752 | (64) | 291 | (11) | 688 | (25) | 0 | (0) | 2,731 |
| 2015 | 157 | (6) | 1,700 | (65) | 208 | (8) | 727 | (28) | 0 | (0) | 2,635 |
| 2016 | 48 | (2) | 1,578 | (65) | 197 | (8) | 658 | (27) | 0 | (0) | 2,433 |
| 2017 | 70 | (3) | 1,535 | (63) | 280 | (11) | 625 | (26) | 0 | (0) | 2,440 |
| 2018 | 68 | (3) | 1,336 | (58) | 325 | (14) | 653 | (28) | 0 | (0) | 2,314 |
| 2019 | 77 | (5) | 1,075 | (64) | 278 | (17) | 250 | (15) | 79 | (5) | 1,682 |
| All | 971 | (5) | 13068 | (64) | 2120 | (10) | 5055 | (25) | 79 | (0) | 20322 |

*For 79 cases reported to CRDM, viability is unknown due to capturing delays.

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

| | Not typed | Unknown serotype | Viable, serotype pending | Non-viable, serotype pending | Viability unknown, serotype pending* | Total serotypes pending |
|---|---|---|---|---|---|---|
| **2012** | 827 | 9 | 0 | 0 | 0 | 0 |
| **2013** | 703 | 12 | 0 | 0 | 0 | 0 |
| **2014** | 689 | 39 | 0 | 0 | 0 | 0 |
| **2015** | 727 | 38 | 0 | 0 | 0 | 0 |
| **2016** | 660 | 30 | 0 | 0 | 0 | 0 |
| **2017** | 628 | 44 | 0 | 0 | 0 | 0 |
| **2018** | 0 | 38 | 0 | 0 | 0 | 0 |
| **2019** | 0 | 58 | 45 | 85 | 79 | 209 |
| **Total** | 4234 | 268 | 45 | 85 | 79 | 209 |

* 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: 1 November 2019**
**Next update: 31 January 2020**

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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 were excluded.
- ~190 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.**
- Figures 1 – 3 are for cases < 5 years, and Figures 4 – 6 for cases 5 years and older. Cases with unknown age were excluded from the figures.
- There are three graphs for each age group:
  - Disease caused by any of the seven serotypes in PCV7 (4, 6B, 9V, 14, 18C, 19F and 23F)
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- There was a graded replacement of PCV-7 by 13-valent pneumococcal conjugate (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, 75% in 2012, 77% in 2013, 85% in 2014, 85% 2015 and 77% in 2016.[1]

The effect of the vaccine on IPD in South Africa has been described.[2]

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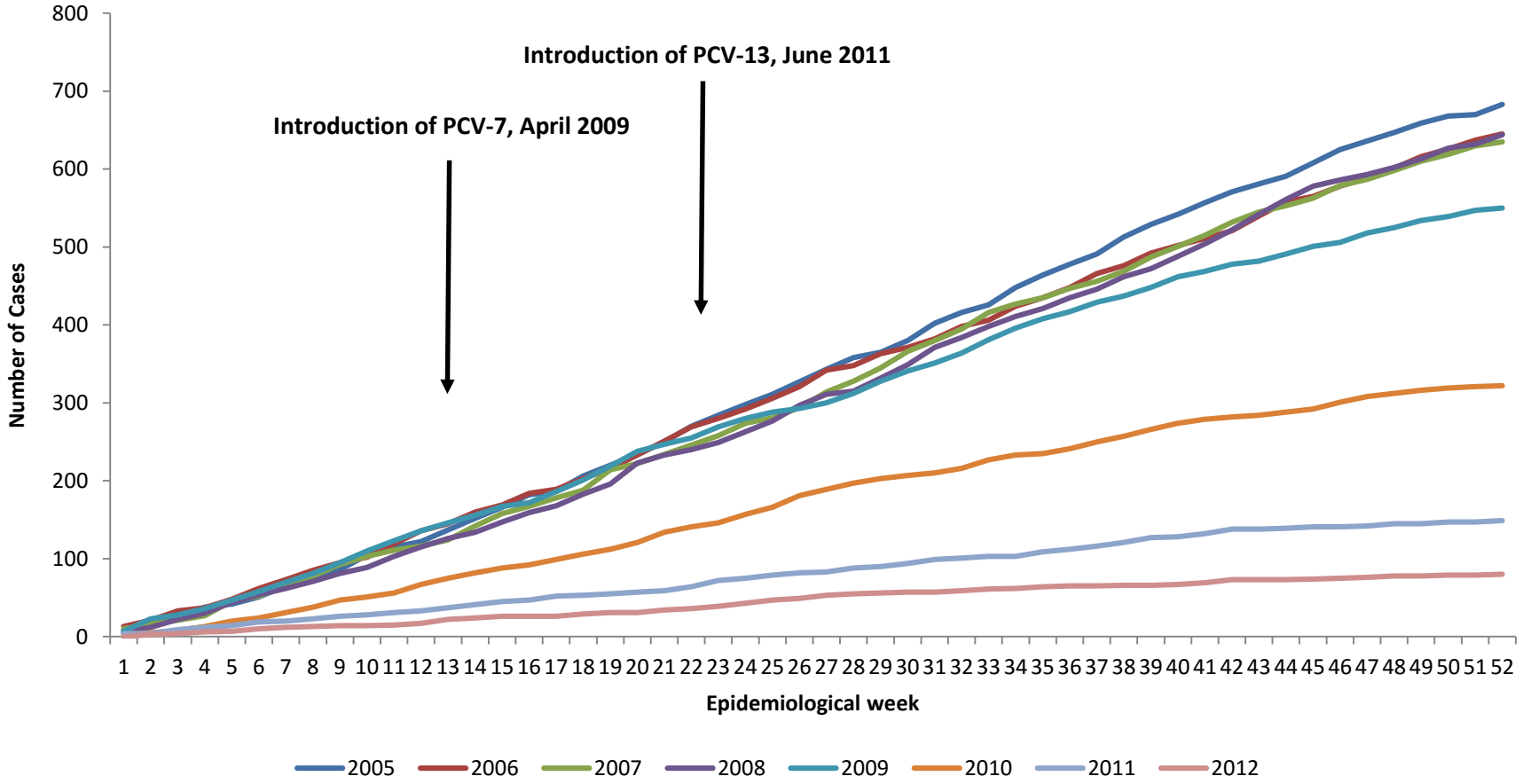


**Figure 1**. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the seven serotypes (4, 6B, 9V, 14, 18C, 19F and 23F) in PCV-7: children <5 years of age in South Africa, from 2005 to 2012. Only viable isolates serotyped using Quellung method included.

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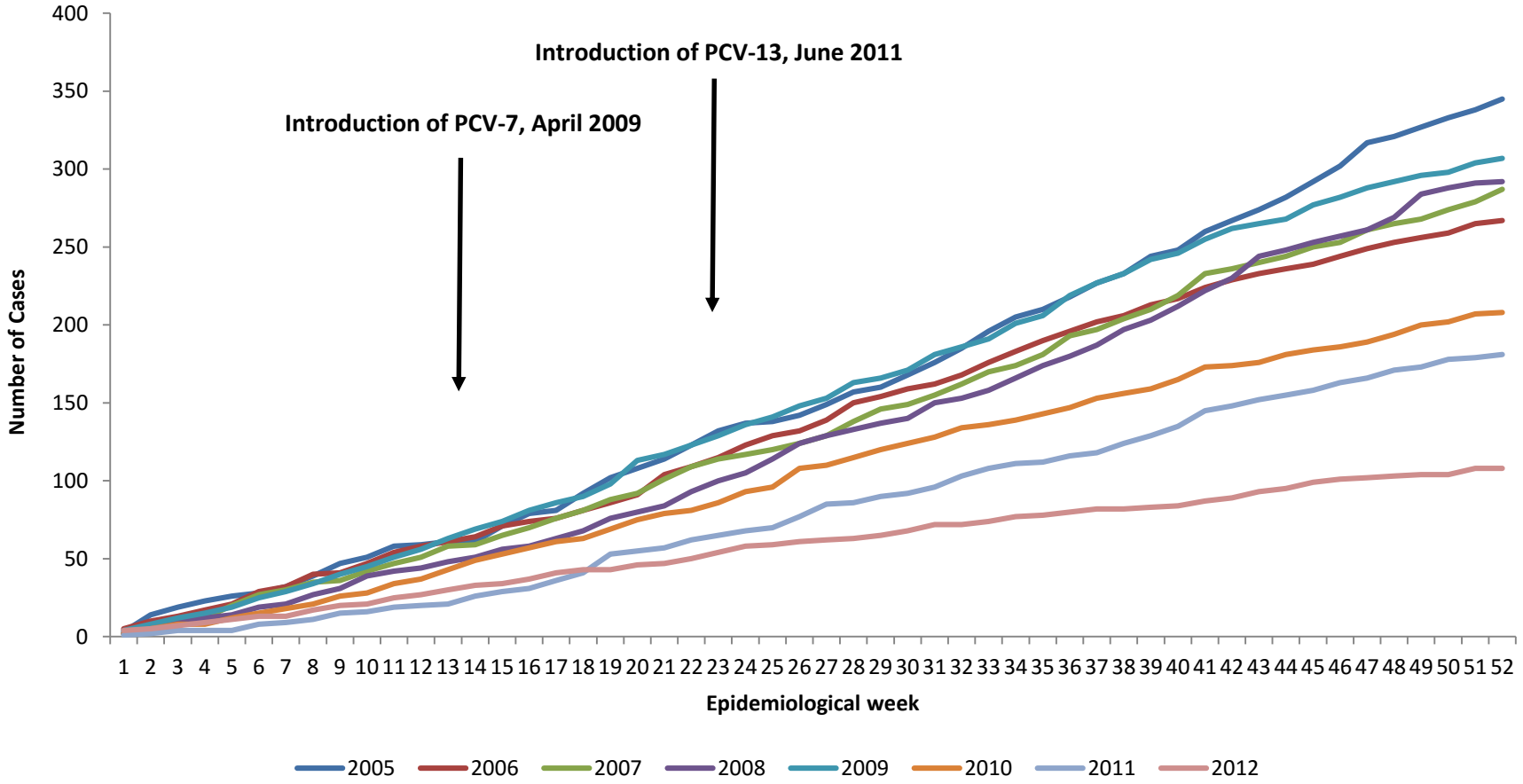


**Figure 2.** Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the six additional (1, 3, 5, 6A, 7F, 19A) serotypes in PCV-13 but not in PCV7: children <5 years of age in South Africa, from 2005 to 2012. Only viable isolates serotyped using Quellung method included. (Note: There is reported cross protection between 6A and 6B which is included in PCV7[5])

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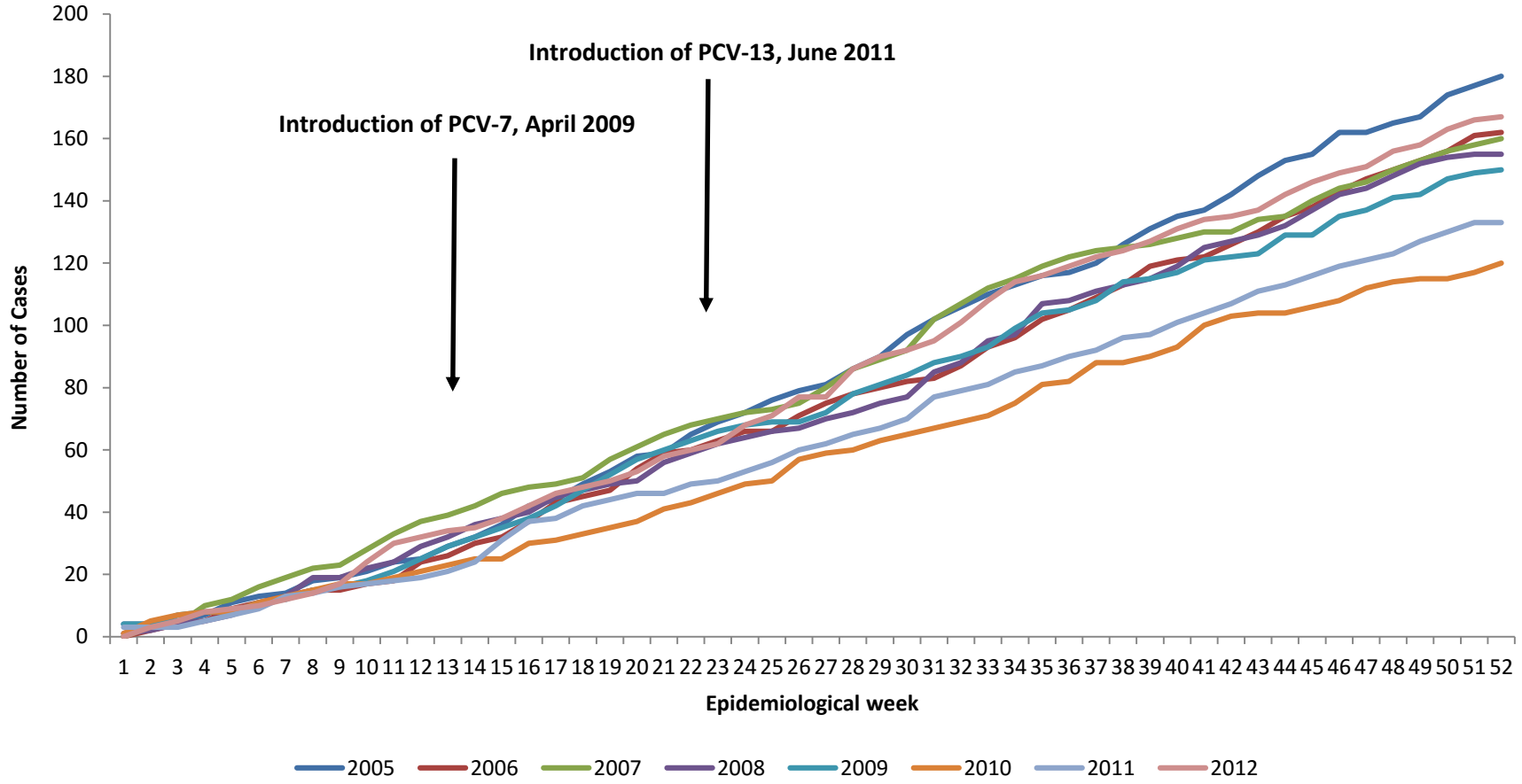


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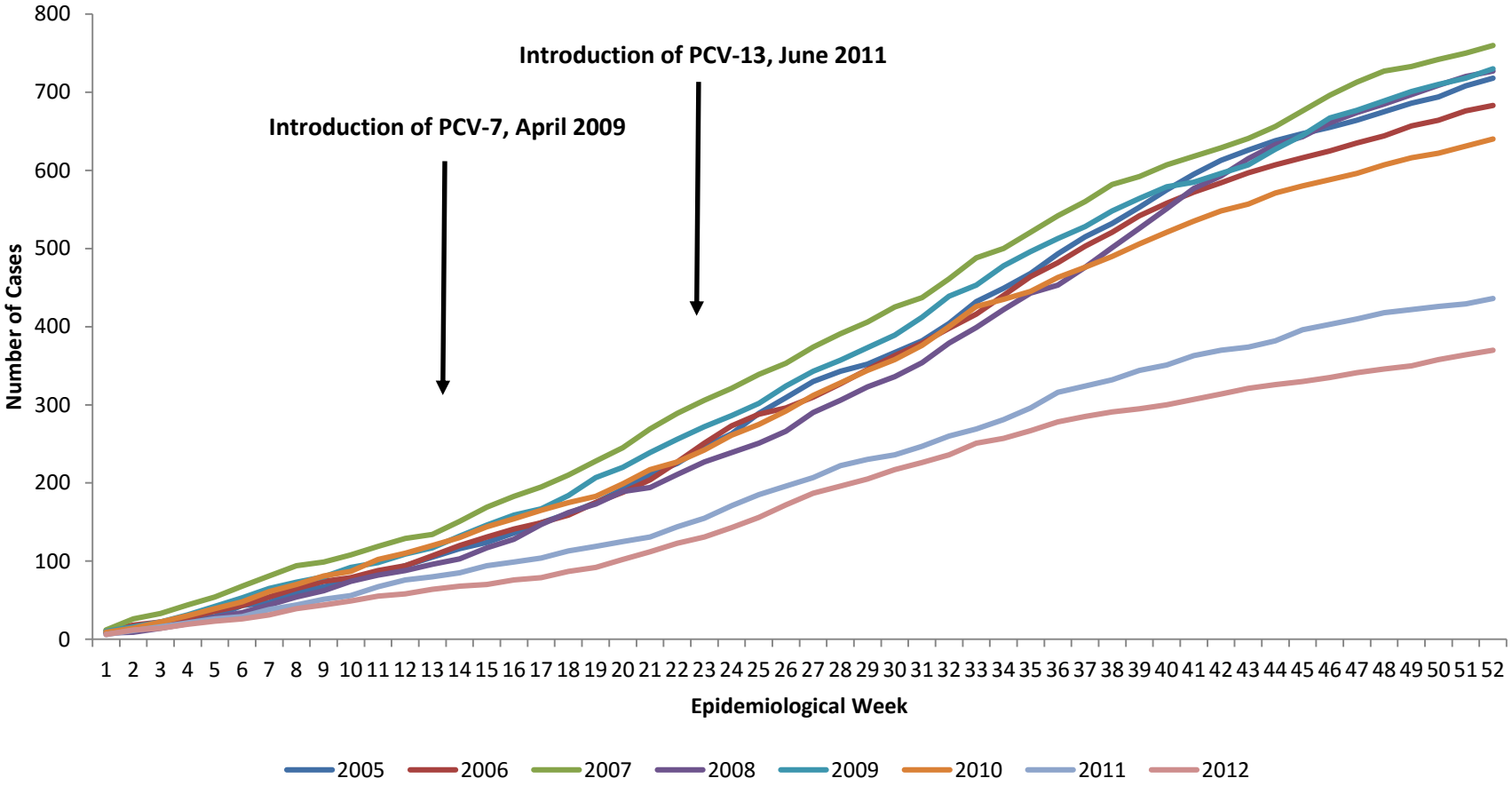


**Figure 4**. Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the seven serotypes (4, 6B, 9V, 14, 18C, 19F and 23F) in PCV-7: Individuals ≥5 years of age in South Africa, from 2005 to 2012. Only viable isolates serotyped using Quellung method included.

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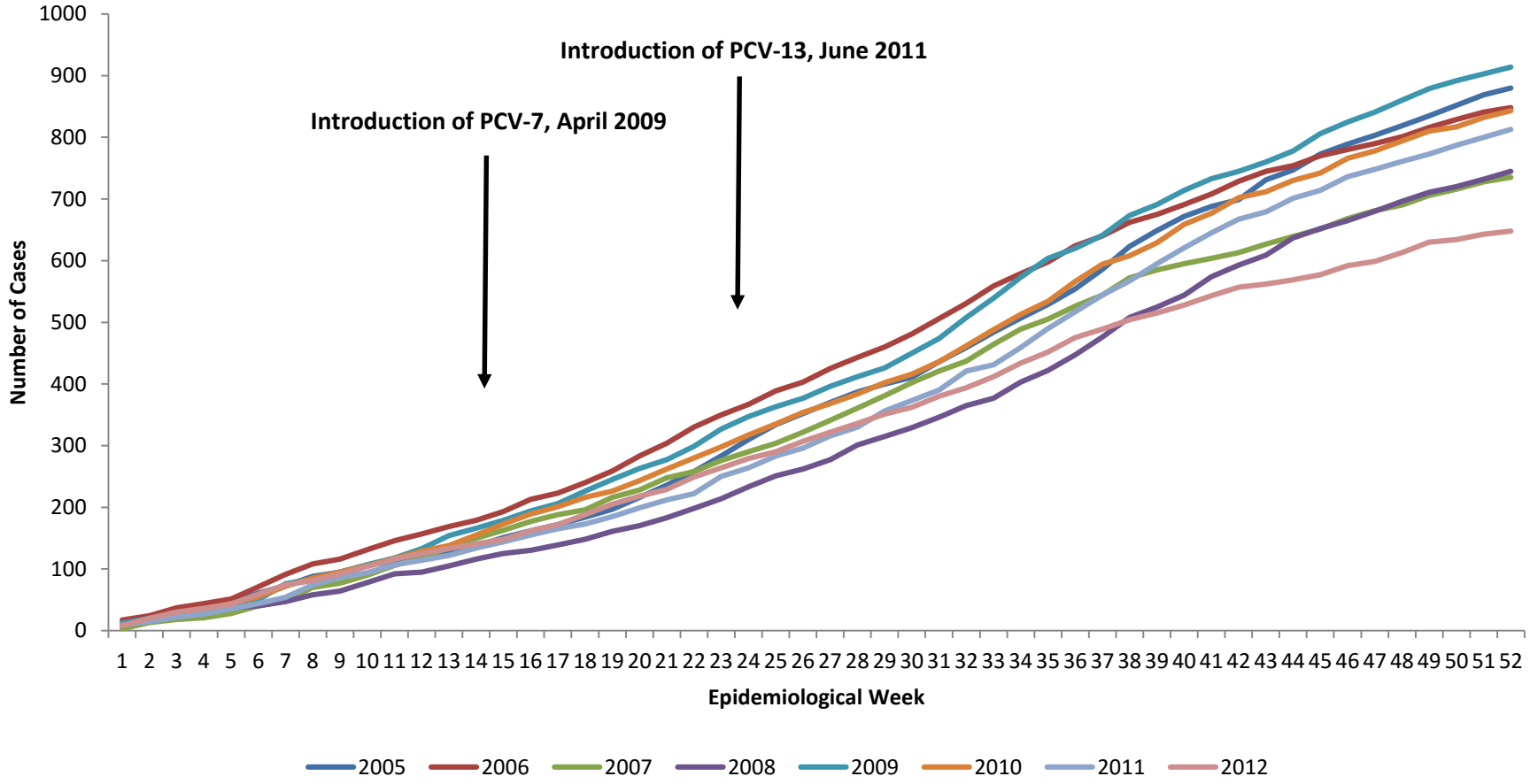


**Figure 5**: Cumulative weekly number of disease episodes of invasive pneumococcal disease due to any of the six additional (1, 3, 5, 6A, 7F, 19A) serotypes in PCV-13 but not in PCV-7: individuals ≥5 years of age in South Africa, from 2005 to 2012. Only viable isolates serotyped using Quelling method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

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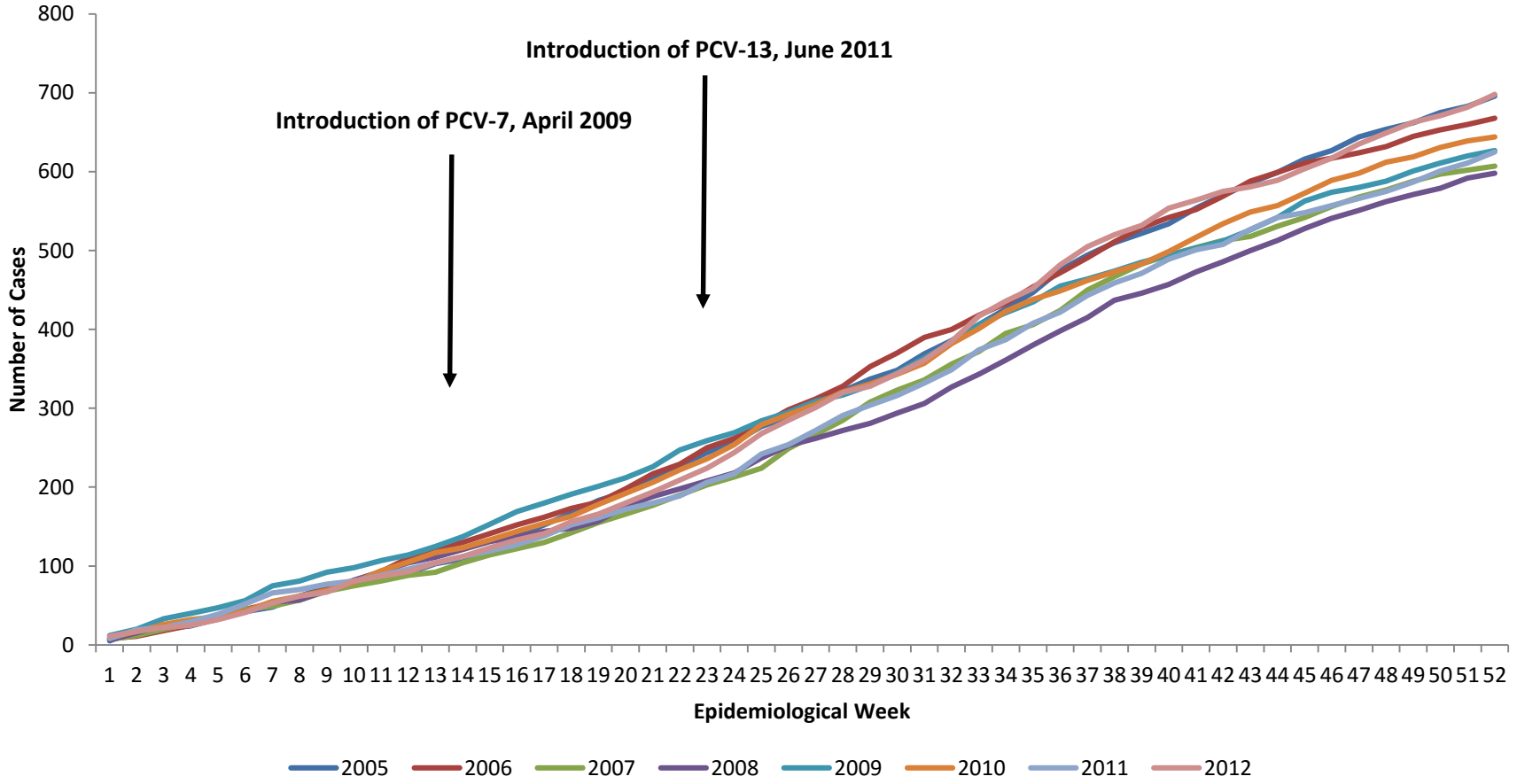


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## Appendix: Cumulative invasive pneumococcal disease case numbers reported by the GERMS-SA surveillance programme, 1 January 2005 to December 2012

### 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 |
| All | 1,652 | (5) | 24,554 | (67) | 3,839 | (12) | 6,784 | (20) | 35,177 |

### 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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