**Online Supplement**

**Trends of sexually acquired chlamydia infection and the role of testing in Sweden: a population-based time series analysis**

**Figure 1S.** Data on chlamydia cases and chlamydia tests included into the study



**Figure 2S.** Estimated Periodicity (Monthly Incidence Rate Ratio) From Fitted Model for the National Number of Chlamydia Cases in Sweden, 1992-2004 and 2009-2018.

****

**Table S1.** Compilation of the Counties by the Laboratory Test Used Until Discovery (2006) of new Swedish Variant of *Chlamydia trachomatis*

|  |  |
| --- | --- |
| **Laboratory test used**  | **Counties (n=21)** |
| **“Able-to-detect” group of counties**: used ProbecTec ET kit by Becton Dickinson (Could detect new genetic variant of *C.trachomatis)* prior and during 2006. | Blekinge, Jämtland, Jönköping, Norrbotten, Uppsala, Västerbotten, Västmanland, Västra Götaland |
| **“Unable-to-detect” group of counties**: used a Cobas Amplicor (Roche Diagnostics), Cobas TagMan48 (Roche Diagnostics) or Abbott m2000 (Abbott Laboratories) (Could not detect new genetic variant of *C.trachomatis*) prior and during 2006. | Dalarna, Gotland, Gävleborg, Halland, Kalmar, Kronoberg, Skåne, Stockholm, Södermanland, Värmland, Västernorrland, Örebro, Östergötland |

**Table S2.** Final Model for National Number of Chlamydia Cases, 1992-2004 and 2009-2018

|  |  |  |
| --- | --- | --- |
|  | 1992-2004 | 2009-2018 |
|  | coefficient | 95% CI lower | 95% CI upper | *P* value |  | coefficient | 95% CI lower | 95% CI upper | *P* value |
| Spline term (1st) | -0.005 | -0.006 | -0.003 | 0.000 | Spline term (1st) | -0.001 | -0.002 | 0.000 | 0.014 |
| Spline term (2nd) | 0.017 | 0.011 | 0.022 | 0.000 | Spline term (2nd) | 0.002 | -0.001 | 0.006 | 0.154 |
| Spline term (3rd) | -0.034 | -0.047 | -0.021 | 0.000 | Spline term (3rd) | -0.011 | -0.021 | -0.001 | 0.029 |
| Month-1 | -0.144 | -0.178 | -0.109 | 0.000 | Month-1 | -0.053 | -0.085 | -0.020 | 0.002 |
| Month-2 | 0.103 | 0.065 | 0.140 | 0.000 | Month-2 | 0.117 | 0.087 | 0.147 | 0.000 |
| Month-3 | 0.052 | 0.012 | 0.091 | 0.011 | Month-3 | -0.023 | -0.053 | 0.006 | 0.119 |
| Month-4 | -0.118 | -0.152 | -0.084 | 0.000 | Month-4 | -0.143 | -0.169 | -0.116 | 0.000 |
| Month-5 | -0.067 | -0.102 | -0.032 | 0.000 | Month-5 | -0.034 | -0.068 | 0.000 | 0.050 |
| Month-6 | -0.023 | -0.058 | 0.012 | 0.203 | Month-6 | -0.027 | -0.057 | 0.003 | 0.079 |
| Month-7 | -0.045 | -0.079 | -0.012 | 0.008 | Month-7 | -0.058 | -0.086 | -0.029 | 0.000 |
| Month-8 | -0.197 | -0.231 | -0.163 | 0.000 | Month-8 | -0.112 | -0.142 | -0.083 | 0.000 |
| Month-9 | 0.122 | 0.077 | 0.166 | 0.000 | Month-9 | 0.254 | 0.219 | 0.289 | 0.000 |
| Month-10 | 0.245 | 0.198 | 0.292 | 0.000 | Month-10 | 0.165 | 0.125 | 0.205 | 0.000 |
| Month-11 | 0.138 | 0.094 | 0.182 | 0.000 | Month-11 | 0.042 | -0.004 | 0.088 | 0.073 |
| Month-12 | 0.003 | -0.046 | 0.052 | 0.906 | Month-12 | -0.002 | -0.036 | 0.032 | 0.922 |
| Lag1month | 0.112 | -0.037 | 0.261 | 0.140 | Lag1month | 0.410 | 0.252 | 0.568 | 0.000 |
| Lag2months | 0.202 | 0.053 | 0.350 | 0.008 | Constant (β0) | -10.968 | -12.325 | -9.610 | 0.000 |
| Constant (β0) | -10.813 | -12.290 | -9.336 | 0.000 |  |  |  |  |  |

CI – Confidence Interval

**Table S3.** Monthly Incidence Rate Ratio Compared to the Average Annual Incidence Rate for the National Chlamydia Cases, 1992-2004 and 2009-2018

|  |  |  |
| --- | --- | --- |
|   |  1992-2004 | 2009-2018 |
|  |  | IRR | 95% CI lower | 95% CI upper | IRR | 95% CI lower | 95% CI upper |
| Week 1-4 | Month-1 | 0.87 | 0.84 | 0.90 | 0.95 | 0.92 | 0.98 |
| Week 5-8 | Month-2 | 1.11 | 1.07 | 1.15 | 1.12 | 1.09 | 1.16 |
| Week 9-12 | Month-3 | 1.05 | 1.01 | 1.10 | 0.98 | 0.95 | 1.01 |
| Week 13-16 | Month-4 | 0.89 | 0.86 | 0.92 | 0.87 | 0.84 | 0.89 |
| Week 17-20 | Month-5 | 0.94 | 0.90 | 0.97 | 0.97 | 0.93 | 1.00 |
| Week 21-24 | Month-6 | 0.98 | 0.94 | 1.01 | 0.97 | 0.95 | 1.00 |
| Week 25-28 | Month-7 | 0.96 | 0.92 | 0.99 | 0.94 | 0.92 | 0.97 |
| Week 29-32 | Month-8 | 0.82 | 0.79 | 0.85 | 0.89 | 0.87 | 0.92 |
| Week 33-36 | Month-9 | 1.13 | 1.08 | 1.18 | 1.29 | 1.24 | 1.33 |
| Week 37-40 | Month-10 | 1.28 | 1.22 | 1.34 | 1.18 | 1.13 | 1.23 |
| Week 41-44 | Month-11 | 1.15 | 1.10 | 1.20 | 1.04 | 1.00 | 1.09 |
| Week 45-48 | Month-12 | 1.00 | 0.96 | 1.05 | 1.00 | 0.96 | 1.03 |
| Week 49-52 | Month-13 | 0.93 | 0.90 | 0.97 | 0.88 | 0.86 | 0.91 |

IRR – Incidence Rate Ratio

CI – Confidence Interval

**Table S4.** Final Model by Group of Counties, 1992 - 2004

|  |  |  |
| --- | --- | --- |
|  | “Able-to-detect” group of counties | “Unable-to-detect” group of counties |
|  | coefficient | 95% CI lower | 95% CI upper | *P* value |  | coefficient | 95% CI lower | 95% CI upper | *P* value |
| Spline term (1st) | -0.010 | -0.011 | -0.008 | 0.000 | Spline term (1st) | -0.003 | -0.005 | -0.002 | 0.000 |
| Spline term (2nd) | 0.032 | 0.028 | 0.037 | 0.000 | Spline term (2nd) | 0.014 | 0.008 | 0.019 | 0.000 |
| Spline term (3rd) | -0.068 | -0.081 | -0.055 | 0.000 | Spline term (3rd) | -0.026 | -0.038 | -0.014 | 0.000 |
| Month-1 | -0.115 | -0.163 | -0.067 | 0.000 | Month-1 | -0.154 | -0.190 | -0.117 | 0.000 |
| Month-2 | 0.094 | 0.047 | 0.141 | 0.000 | Month-2 | 0.103 | 0.063 | 0.143 | 0.000 |
| Month-3 | 0.033 | -0.014 | 0.080 | 0.168 | Month-3 | 0.053 | 0.011 | 0.095 | 0.013 |
| Month-4 | -0.074 | -0.122 | -0.026 | 0.002 | Month-4 | -0.129 | -0.165 | -0.093 | 0.000 |
| Month-5 | -0.086 | -0.134 | -0.038 | 0.000 | Month-5 | -0.056 | -0.094 | -0.019 | 0.003 |
| Month-6 | -0.048 | -0.095 | 0.000 | 0.050 | Month-6 | -0.022 | -0.059 | 0.015 | 0.250 |
| Month-7 | -0.080 | -0.128 | -0.032 | 0.001 | Month-7 | -0.039 | -0.074 | -0.004 | 0.028 |
| Month-8 | -0.217 | -0.266 | -0.168 | 0.000 | Month-8 | -0.196 | -0.231 | -0.160 | 0.000 |
| Month-9 | 0.057 | 0.010 | 0.104 | 0.018 | Month-9 | 0.137 | 0.091 | 0.182 | 0.000 |
| Month-10 | 0.230 | 0.184 | 0.276 | 0.000 | Month-10 | 0.232 | 0.183 | 0.281 | 0.000 |
| Month-11 | 0.170 | 0.124 | 0.217 | 0.000 | Month-11 | 0.137 | 0.093 | 0.182 | 0.000 |
| Month-12 | 0.060 | 0.013 | 0.107 | 0.012 | Month-12 | 0.005 | -0.044 | 0.054 | 0.836 |
| Constant (β0) | -8.249 | -8.367 | -8.130 | 0.000 | Lag1month | 0.125 | -0.023 | 0.274 | 0.098 |
|  |  |  |  |  | Lag2months | 0.200 | 0.054 | 0.347 | 0.007 |
|  |  |  |  |  | Constant (β0) | -10.824 | -12.174 | -9.474 | 0.000 |

CI – Confidence Interval

**Table S5.** Final Model by Group of Counties, 2009 – 2018

|  |  |  |
| --- | --- | --- |
|  | “Able-to-detect” group of counties | “Unable-to-detect” group of counties |
|  | coefficient | 95% CI lower | 95% CI upper | *P* value |  | coefficient | 95% CI lower | 95% CI upper | *P* value |
| Spline term (1st) | 0.001 | 0.000 | 0.001 | 0.107 | Spline term (1st) | -0.002 | -0.003 | -0.001 | 0.000 |
| Spline term (2nd) | -0.002 | -0.003 | -0.001 | 0.000 | Spline term (2nd) | 0.004 | 0.001 | 0.008 | 0.021 |
| Month-1 | -0.095 | -0.137 | -0.054 | 0.000 | Spline term (3rd) | -0.016 | -0.026 | -0.005 | 0.004 |
| Month-2 | 0.131 | 0.092 | 0.171 | 0.000 | Month-1 | -0.053 | -0.089 | -0.017 | 0.004 |
| Month-3 | 0.007 | -0.037 | 0.051 | 0.764 | Month-2 | 0.098 | 0.067 | 0.130 | 0.000 |
| Month-4 | -0.146 | -0.184 | -0.109 | 0.000 | Month-3 | -0.014 | -0.045 | 0.017 | 0.373 |
| Month-5 | -0.037 | -0.078 | 0.003 | 0.072 | Month-4 | -0.148 | -0.177 | -0.119 | 0.000 |
| Month-6 | -0.003 | -0.041 | 0.036 | 0.890 | Month-5 | -0.052 | -0.088 | -0.015 | 0.005 |
| Month-7 | -0.049 | -0.086 | -0.013 | 0.008 | Month-6 | -0.038 | -0.070 | -0.006 | 0.022 |
| Month-8 | -0.125 | -0.162 | -0.087 | 0.000 | Month-7 | -0.062 | -0.093 | -0.032 | 0.000 |
| Month-9 | 0.256 | 0.215 | 0.298 | 0.000 | Month-8 | -0.111 | -0.143 | -0.080 | 0.000 |
| Month-10 | 0.219 | 0.159 | 0.278 | 0.000 | Month-9 | 0.242 | 0.207 | 0.278 | 0.000 |
| Month-11 | 0.010 | -0.039 | 0.060 | 0.682 | Month-10 | 0.184 | 0.142 | 0.227 | 0.000 |
| Month-12 | -0.036 | -0.085 | 0.012 | 0.142 | Month-11 | 0.074 | 0.026 | 0.122 | 0.003 |
| Lag1month | 0.347 | 0.182 | 0.512 | 0.000 | Month-12 | 0.010 | -0.026 | 0.047 | 0.589 |
| Lag2months | 0.211 | 0.047 | 0.374 | 0.012 | Lag1month | 0.298 | 0.135 | 0.462 | 0.000 |
| Constant (β0) | -12.189 | -13.282 | -11.096 | 0.000 | Constant (β0) | -9.660 | -11.039 | -8.280 | 0.000 |

CI – Confidence Interval

**Table S6.** Monthly Incidence Rate Ratio Compared to the Average Annual Incidence Rate by Group of Counties, 1992-2004

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | “Able-to-detect” group of counties | “Unable-to-detect” group of counties |
|   |   | IRR | 95% CI lower | 95% CI upper | IRR | 95% CI lower | 95% CI upper |
| Week 1-4 | Month-1 | 0.89 | 0.85 | 0.94 | 0.86 | 0.83 | 0.89 |
| Week 5-8 | Month-2 | 1.10 | 1.05 | 1.15 | 1.11 | 1.06 | 1.15 |
| Week 9-12 | Month-3 | 1.03 | 0.99 | 1.08 | 1.05 | 1.01 | 1.10 |
| Week 13-16 | Month-4 | 0.93 | 0.89 | 0.97 | 0.88 | 0.85 | 0.91 |
| Week 17-20 | Month-5 | 0.92 | 0.87 | 0.96 | 0.95 | 0.91 | 0.98 |
| Week 21-24 | Month-6 | 0.95 | 0.91 | 1.00 | 0.98 | 0.94 | 1.02 |
| Week 25-28 | Month-7 | 0.92 | 0.88 | 0.97 | 0.96 | 0.93 | 1.00 |
| Week 29-32 | Month-8 | 0.81 | 0.77 | 0.85 | 0.82 | 0.79 | 0.85 |
| Week 33-36 | Month-9 | 1.06 | 1.01 | 1.11 | 1.15 | 1.10 | 1.20 |
| Week 37-40 | Month-10 | 1.26 | 1.20 | 1.32 | 1.26 | 1.20 | 1.32 |
| Week 41-44 | Month-11 | 1.19 | 1.13 | 1.24 | 1.15 | 1.10 | 1.20 |
| Week 45-48 | Month-12 | 1.06 | 1.01 | 1.11 | 1.01 | 0.96 | 1.06 |
| Week 49-52 | Month-13 | 0.98 | 0.93 | 1.02 | 0.93 | 0.89 | 0.97 |

IRR – Incidence Rate Ratio

CI – Confidence Interval

**Table S7.** Monthly Incidence Rate Ratio Compared to the Average Annual Incidence Rate by Group of Counties, 2009-2018

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | “Able-to-detect” group of counties | “Unable-to-detect” group of counties |
|   |   | IRR | 95% CI lower | 95% CI upper | IRR | 95% CI lower | 95% CI upper |
| Week 1-4 | Month-1 | 0.91 | 0.87 | 0.95 | 0.95 | 0.92 | 0.98 |
| Week 5-8 | Month-2 | 1.14 | 1.10 | 1.19 | 1.10 | 1.07 | 1.14 |
| Week 9-12 | Month-3 | 1.01 | 0.96 | 1.05 | 0.99 | 0.96 | 1.02 |
| Week 13-16 | Month-4 | 0.86 | 0.83 | 0.90 | 0.86 | 0.84 | 0.89 |
| Week 17-20 | Month-5 | 0.96 | 0.92 | 1.00 | 0.95 | 0.92 | 0.98 |
| Week 21-24 | Month-6 | 1.00 | 0.96 | 1.04 | 0.96 | 0.93 | 0.99 |
| Week 25-28 | Month-7 | 0.95 | 0.92 | 0.99 | 0.94 | 0.91 | 0.97 |
| Week 29-32 | Month-8 | 0.88 | 0.85 | 0.92 | 0.89 | 0.87 | 0.92 |
| Week 33-36 | Month-9 | 1.29 | 1.24 | 1.35 | 1.27 | 1.23 | 1.32 |
| Week 37-40 | Month-10 | 1.24 | 1.17 | 1.32 | 1.20 | 1.15 | 1.25 |
| Week 41-44 | Month-11 | 1.01 | 0.96 | 1.06 | 1.08 | 1.03 | 1.13 |
| Week 45-48 | Month-12 | 0.96 | 0.92 | 1.01 | 1.01 | 0.97 | 1.05 |
| Week 49-52 | Month-13 | 0.88 | 0.84 | 0.91 | 0.88 | 0.85 | 0.90 |

IRR – Incidence Rate Ratio

CI – Confidence Interval

**Table S8.** Proportion of Tested for Chlamydia by Sex in Sweden, 1996-2018

|  |  |  |  |
| --- | --- | --- | --- |
|  | Men | Women | Unknown sex |
| 1996 | 20.0 | 80.0 | 0.0 |
| 1997 | 20.0 | 80.0 | 0.0 |
| 1998 | 20.0 | 80.0 | 0.0 |
| 1999 | 20.0 | 80.0 | 0.0 |
| 2000 | 23.0 | 77.0 | 0.5 |
| 2001 | 24.0 | 76.0 | 0.7 |
| 2002 | 25.0 | 75.0 | 0.8 |
| 2003 | 25.0 | 75.0 | 0.6 |
| 2004 | 26.0 | 74.0 | 0.6 |
| 2005 | 26.3 | 73.0 | 0.7 |
| 2006 | 26.3 | 71.8 | 1.9 |
| 2007 | 28.0 | 70.0 | 2.0 |
| 2008 | 27.6 | 70.7 | 1.7 |
| 2009 | 28.3 | 69.7 | 2.1 |
| 2010 | 26.2 | 66.9 | 6.9 |
| 2011 | 26.7 | 65.1 | 8.2 |
| 2012 | 28.1 | 63.7 | 8.2 |
| 2013 | 27.5 | 64.1 | 8.5 |
| 2014 | 28.7 | 68.6 | 2.6 |
| 2015 | 29.5 | 67.9 | 2.6 |
| 2016 | 29.2 | 70.3 | 0.5 |
| 2017 | 27.9 | 69.6 | 2.5 |
| 2018 | 29.5 | 70.4 | 0.1 |
| Average, 1996-2004 | 22.6 | 77.4 | 0.4 |
| Median, 1996-2004 | 23.0 | 77.0 | 0.5 |
| Average, 2009-2018 | 28.1 | 67.6 | 4.2 |
| Median, 2009-2018 | 28.2 | 68.3 | 2.6 |

**Table S9.** Proportion of 15-29 Years Old Among All Tested for Chlamydia (for Counties Reporting Age Groups), 2009-2018

|  |  |  |
| --- | --- | --- |
|   | Proportion of 15-29 years old among all tested  | Number of reporting counties |
| 2009 | 67 | 19 |
| 2010 | 71 | 21 |
| 2011 | 69 | 16 |
| 2012 | 69 | 20 |
| 2013 | 68 | 20 |
| 2014 | 63 | 16 |
| 2015 | 62 | 20 |
| 2016 | 60 | 20 |
| 2017 | 64 | 19 |
| 2018 | 65 | 17 |
| Average | 65.8 |  |
| Median | 66 |  |

**Table S10.** Adjusted† Models of Chlamydia Incidence Rate Ratios by Group of Counties. 1992-2004 and 2009-2018.

|  |  |  |
| --- | --- | --- |
|  | 1992-2004 | 2009-2018 |
|  | IRR | 95% CI | *P* -value  | IRR | 95% CI | *P* -value |
| Model for national Chlamydia IRR |
| Proportion population tested | **1.07** | **1.04. 1.09** | **0.000** | 1.001 | 0.988. 1.014 | 0.892 |
| Year# | **0.97** | **0.94. 0.99** | **0.015** | 1.012 | 0.995. 1.030 | 0.165 |
| Proportion population tested \* Year# | **0.996** | **0.993. 0.999** | **0.019** | NA | NA | NA |
| Year \* Year | **1.01** | **1.008. 1.010** | **0.000** | **0.995** | **0.993. 0.997** | **0.000** |
| Model for Chlamydia IRR in “able-to-detect” group of counties |
| Proportion population tested | **1.102** | **1.043. 1.164** | **0.000** | 1.001 | 0.971. 1.031 | 0.964 |
| Year# | 0.98 | 0.93. 1.03 | 0.469 | **1.045** | **1.017. 1.073** | **0.002** |
| Proportion population tested \* Year# | **0.99** | **0.98. 0.997** | **0.004** | NA | NA | NA |
| Year \* Year | **1.011** | **1.008. 1.014** | **0.000** | **0.992** | **0.989. 0.995** | **0.000** |
| Model for Chlamydia IRR in “unable-to-detect” group of counties |
| Proportion population tested | **1.048** | **1.021. 1.077** | **0.001** | 1.004 | 0.989. 1.019 | 0.639 |
| Year# | **0.966** | **0.939. 0.993** | **0.015** | 0.993 | 0.972. 1.015 | 0.536 |
| Proportion population tested \* Year# | 0.998 | 0.996. 1.002 | 0.512 | NA | NA | NA |
| Year \* Year | **1.008** | **1.007. 1.009** | **0.000** | **0.996** | **0.994. 0.999**  | **0.003** |

† - Models adjusted for the individual counties.

NA – Not applicable. Without a statistically significant main effect for proportion population tested. no interaction with calendar year was retained in the model.

Abbreviation: CI. Confidence Interval; IRR. Incidence Rate Ratio.

# - 1992 is a reference year for the modelling the joint testing- and calendar effects in the model

**Equation 1S:** Model specification for monthly incidence rates of chlamydia with cubic spline trend. fixed effects of months and autocorrelation from the preceding months

where:

* t: running month of study period (t=1. 2. .... )
* mk: month *k* (k=1. 2.…. 13). required to sum to 0
* yt: number of reported cases of chlamydia in month *t*
* si(t): function of month *t*. as an additive component of the cubic spline term (i=3. 4. 5)
* y(t-j): lagged reported cases of chlamydia in month *t-j* (j=1. 2. 3. 4)
* pop*t*: population count in month *t*

**Equation 2S:** Model specification for annual incidence rates of chlamydia as function of calendar year and proportion of subjects tested

where:

* z: calendar year of study period
* c: index of county (c=1. .... 21)
* yzc: number of reported cases of chlamydia during year *z* in county *c*
* wzc: proportion of tested individuals aged 15–64 years during year *z* in county *c*
* λc: fixed effect for baseline IR in county *c* (c = 1. …. 21)
* *popzc*: population count during year *z* in county *c*