

**Supplement to: Zhang Z, Wang L, Zhou Y, Zhang J, Tan C. Associations between month/season of birth and health outcomes: an umbrella review of systematic reviews and meta-analyses. J Glob Health. 2026;16:04234.**

**Table S1. Search strategy from database inception to 2 July 2025**

| <b>PubMed</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Search                | Query                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Results   |
| #1                    | "birth s"[All Fields] OR "birthed"[All Fields] OR "birthing"[All Fields] OR "parturition"[MeSH Terms] OR "parturition"[All Fields] OR "birth"[All Fields] OR "births"[All Fields] OR "parturition"[MeSH Terms] OR "parturition"[All Fields] OR "born"[All Fields] OR "parturition"[MeSH Terms] OR "parturition"[All Fields] OR "childbirth"[All Fields] OR "childbirths"[All Fields]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 619,250   |
| #2                    | "season s"[All Fields] OR "seasonability"[All Fields] OR "seasonable"[All Fields] OR "seasonably"[All Fields] OR "seasonal"[All Fields] OR "seasonalities"[All Fields] OR "seasonality"[All Fields] OR "seasonally"[All Fields] OR "seasonals"[All Fields] OR "seasons"[MeSH Terms] OR "seasons"[All Fields] OR "season"[All Fields] OR "season s"[All Fields] OR "seasonability"[All Fields] OR "seasonable"[All Fields] OR "seasonably"[All Fields] OR "seasonal"[All Fields] OR "seasonalities"[All Fields] OR "seasonality"[All Fields] OR "seasonally"[All Fields] OR "seasonals"[All Fields] OR "seasons"[MeSH Terms] OR "seasons"[All Fields] OR "season"[All Fields] OR "season s"[All Fields] OR "seasonability"[All Fields] OR "seasonable"[All Fields] OR "seasonably"[All Fields] OR "seasonal"[All Fields] OR "seasonalities"[All Fields] OR "seasonality"[All Fields] OR "seasonally"[All Fields] OR "seasonals"[All Fields] OR "seasons"[MeSH Terms] OR "seasons"[All Fields] OR "season"[All Fields] OR "month"[All Fields] OR "months"[All Fields] OR "monthly"[All Fields] | 2,442,682 |
| #3                    | "systematic review"[Publication Type] OR "systematic reviews as topic"[MeSH Terms] OR "systematic review"[All Fields] OR "meta analysis"[Publication Type] OR "meta analysis as topic"[MeSH Terms] OR "meta analysis"[All Fields]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 547,085   |
| #4                    | #1 AND #2 AND #3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1,602     |
| <b>EMBASE</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |
| Search                | Query                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Results   |
| #1                    | birth OR born OR childbirth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 818419    |
| #2                    | seasonal OR season OR seasonality OR month OR monthly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1476517   |
| #3                    | systematic AND review OR 'meta analysis'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 948366    |
| #4                    | #1 AND #2 AND #3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 845       |
| <b>Web of Science</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |
| Search                | Query                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Results   |
| #1                    | TS=(Birth OR born OR childbirth)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1,098,024 |
| #2                    | TS=(Seasonal OR Season OR Seasonality OR month OR monthly)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2,354,540 |
| #3                    | TS=(systematic review OR meta-analysis)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 876       |
| #4                    | #1 AND #2 AND #3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2,017     |

**Table S2. Characteristics of included studies**

| Author, year       | Search databases (time)                             | Quality for primary studies                     | No. of studies (major design)        | Participants/ Cases | Health outcome    | Exposure (comparison) | ES (95%CI)                                                               |
|--------------------|-----------------------------------------------------|-------------------------------------------------|--------------------------------------|---------------------|-------------------|-----------------------|--------------------------------------------------------------------------|
| Coury et al., 2023 | PubMed, Ovid, and Web of Science (June 22, 2020)    | NR (NOS)                                        | 43 (Cohort and case-control studies) | 14177395/440039     | Schizophrenia     | Season of birth:      | OR (NH vs. SH vs. Overall):                                              |
|                    |                                                     |                                                 |                                      |                     |                   | Spring vs. non-spring | 1.01 (0.99–1.03) vs. 0.99 (0.92–1.06) vs. 1.00 (0.98–1.03)               |
|                    |                                                     |                                                 |                                      |                     |                   | Summer vs. non-summer | <b>0.95 (0.93–0.98)</b> vs. 0.96 (0.92–1.01) vs. <b>0.96 (0.94–0.98)</b> |
|                    |                                                     |                                                 |                                      |                     |                   | Fall vs. non-fall     | 0.98 (0.95–1.01) vs. 1.00 (0.95–1.04) vs. 0.98 (0.96–1.00)               |
|                    |                                                     |                                                 |                                      |                     |                   | Winter vs. non-winter | <b>1.05 (1.03–1.07)</b> vs. 1.01 (0.96–1.07) vs. <b>1.05 (1.03–1.07)</b> |
|                    |                                                     |                                                 |                                      |                     |                   | Month of birth:       | OR(NH vs. SH):                                                           |
|                    |                                                     |                                                 |                                      |                     |                   | Jan. vs. non-Jan.     | <b>1.05(1.02-1.08)</b> vs. 1.01 (0.87-1.18)                              |
|                    |                                                     |                                                 |                                      |                     |                   | Feb. vs. non-Feb.     | 1.03(0.99-1.08) vs. 0.88(0.80-0.98)                                      |
|                    |                                                     |                                                 |                                      |                     |                   | Mar. vs. non-Mar.     | 1.00(0.95,1.04) vs. 0.97(0.86,1.11)                                      |
|                    |                                                     |                                                 |                                      |                     |                   | Apr. vs. non-Apr.     | 1.00(0.97,1.03) vs. 0.87(0.77,0.99)                                      |
|                    |                                                     |                                                 |                                      |                     |                   | May vs. non-May       | 1.00(0.97,1.03) vs. 0.97(0.86,1.10)                                      |
|                    |                                                     |                                                 |                                      |                     |                   | Jun. vs. non-Jun.     | 0.98(0.95,1.01) vs. 1.11(0.95,1.29)                                      |
|                    |                                                     |                                                 |                                      |                     |                   | Jul. vs. non-Jul.     | 0.98(0.95,1.00) vs. 0.95(0.85,1.06)                                      |
|                    |                                                     |                                                 |                                      |                     |                   | Aug. vs. non-Aug.     | <b>0.94(0.91,0.97)</b> vs. <b>0.85(0.78-0.93)</b>                        |
|                    |                                                     |                                                 |                                      |                     |                   | Sep. vs. non-Sep.     | 0.97(0.94,1.00) vs. 1.04(0.85,1.26)                                      |
|                    |                                                     |                                                 |                                      |                     |                   | Oct. vs. non-Oct.     | 0.98(0.97,1.00) vs. 1.01(0.92,1.11)                                      |
|                    |                                                     |                                                 |                                      |                     |                   | Nov. vs. non-Nov.     | 1.01(0.99,1.03) vs. 0.95(0.85,1.06)                                      |
|                    |                                                     |                                                 |                                      |                     |                   | Dec. vs. non-Dec.     | <b>1.06(1.02-1.10)</b> vs. 1.13(0.89-1.43)                               |
| Calov et al., 2020 | PubMed, Embase, and Web of Science (April 21, 2018) | 7 high-quality research (NOS)                   | 9 (cross-sectional)                  | 726,378/93,890      | Atopic Dermatitis | Season of birth:      | OR                                                                       |
|                    |                                                     |                                                 |                                      |                     |                   | Summer vs. Spring     | 1.04(0.95-1.13)                                                          |
|                    |                                                     |                                                 |                                      |                     |                   | Fall vs. Spring       | <b>1.16(1.06-1.28)</b>                                                   |
|                    |                                                     |                                                 |                                      |                     |                   | Winter vs. Spring     | <b>1.15(1.04-1.27)</b>                                                   |
| Hsu et al., 2021   | PubMed, Embase, and Cochrane (December 31, 2020)    | No high bias research (Hoy's risk of bias tool) | 51 (Observational studies)           | >29074024/465605    | Schizophrenia     | season of birth:      | RR                                                                       |
|                    |                                                     |                                                 |                                      |                     |                   | Spring vs. non-spring | 1.002 (0.984-1.021)                                                      |
|                    |                                                     |                                                 |                                      |                     |                   | Summer vs. non-summer | 0.974 (0.960-0.989)                                                      |

| Author, year | Search databases (time) | Quality for primary studies | No. of studies (major design) | Participants/<br>Cases | Health outcome      | Exposure (comparison) | ES (95%CI)                 |
|--------------|-------------------------|-----------------------------|-------------------------------|------------------------|---------------------|-----------------------|----------------------------|
|              |                         |                             |                               |                        |                     | Fall vs. non-fall     | 0.978 (0.966-0.990)        |
|              |                         |                             |                               |                        |                     | Winter vs. non-winter | 1.038 (1.019–1.057)        |
|              |                         |                             |                               |                        |                     | Month of birth:       | RR                         |
|              |                         |                             |                               |                        |                     | Jan. vs. non-Jan.     | <b>1.055 (1.033–1.077)</b> |
|              |                         |                             |                               |                        |                     | Feb. vs. non-Feb.     | 1.007 (0.963–1.052)        |
|              |                         |                             |                               |                        |                     | Mar. vs. non-Mar.     | 1.019 (0.979–1.060)        |
|              |                         |                             |                               |                        |                     | Apr. vs. non-Apr.     | 0.992 (0.965–1.020)        |
|              |                         |                             |                               |                        |                     | May vs. non-May       | 0.994 (0.973–1.016)        |
|              |                         |                             |                               |                        |                     | Jun. vs. non-Jun.     | 0.973 (0.945–1.002)        |
|              |                         |                             |                               |                        |                     | Jul. vs. non-Jul.     | 0.987 (0.965–1.010)        |
|              |                         |                             |                               |                        |                     | Aug. vs. non-Aug.     | <b>0.965 (0.941–0.991)</b> |
|              |                         |                             |                               |                        |                     | Sep. vs. non-Sep.     | <b>0.967 (0.942–0.993)</b> |
|              |                         |                             |                               |                        |                     | Oct. vs. non-Oct.     | <b>0.981 (0.969–0.994)</b> |
|              |                         |                             |                               |                        |                     | Nov. vs. non-Nov.     | 0.987 (0.965–1.010)        |
|              |                         |                             |                               |                        |                     | Dec. vs. non-Dec.     | <b>1.046 (1.014–1.078)</b> |
|              |                         |                             |                               | >29074024/<br>118397   | Bipolar I disorder* | season of birth:      | RR                         |
|              |                         |                             |                               |                        |                     | Spring vs. non-spring | 0.993 (0.970–1.016)        |
|              |                         |                             |                               |                        |                     | Summer vs. non-summer | 0.986 (0.968–1.004)        |
|              |                         |                             |                               |                        |                     | Fall vs. non-fall     | 1.000 (0.978–1.023)        |
|              |                         |                             |                               |                        |                     | Winter vs. non-winter | <b>1.020 (1.001–1.041)</b> |
|              |                         |                             |                               |                        |                     | Month of birth:       | RR                         |
|              |                         |                             |                               |                        |                     | Jan. vs. non-Jan.     | <b>1.039 (0.990–1.090)</b> |
|              |                         |                             |                               |                        |                     | Feb. vs. non-Feb.     | 1.013 (0.986–1.041)        |
|              |                         |                             |                               |                        |                     | Mar. vs. non-Mar.     | 1.031 (0.976–1.089)        |
|              |                         |                             |                               |                        |                     | Apr. vs. non-Apr.     | 0.972 (0.946–1.000)        |
|              |                         |                             |                               |                        |                     | May vs. non-May       | 0.983 (0.940–1.027)        |
|              |                         |                             |                               |                        |                     | Jun. vs. non-Jun.     | 0.990 (0.961–1.019)        |

| Author, year | Search databases (time) | Quality for primary studies | No. of studies (major design) | Participants/<br>Cases | Health outcome            | Exposure (comparison) | ES (95%CI)                 |
|--------------|-------------------------|-----------------------------|-------------------------------|------------------------|---------------------------|-----------------------|----------------------------|
|              |                         |                             |                               |                        |                           | Jul. vs. non-Jul.     | 0.983 (0.957–1.010)        |
|              |                         |                             |                               |                        |                           | Aug. vs. non-Aug.     | 0.968 (0.919–1.019)        |
|              |                         |                             |                               |                        |                           | Sep. vs. non-Sep.     | 0.977 (0.937–1.019)        |
|              |                         |                             |                               |                        |                           | Oct. vs. non-Oct.     | 1.007 (0.981–1.033)        |
|              |                         |                             |                               |                        |                           | Nov. vs. non-Nov.     | 1.022 (0.982–1.063)        |
|              |                         |                             |                               |                        |                           | Dec. vs. non-Dec.     | <b>1.026 (0.977–1.077)</b> |
|              |                         |                             |                               | >29074024/<br>751702   | Major depressive disorder | season of birth:      | RR                         |
|              |                         |                             |                               |                        |                           | Spring vs. non-spring | 0.994 (0.980–1.009)        |
|              |                         |                             |                               |                        |                           | Summer vs. non-summer | 0.993 (0.978–1.009)        |
|              |                         |                             |                               |                        |                           | Fall vs. non-fall     | 1.005 (0.993–1.016)        |
|              |                         |                             |                               |                        |                           | Winter vs. non-winter | <b>1.010 (1.004–1.017)</b> |
|              |                         |                             |                               |                        |                           | Month of birth:       | RR                         |
|              |                         |                             |                               |                        |                           | Jan. vs. non-Jan.     | 1.006 (0.995–1.017)        |
|              |                         |                             |                               |                        |                           | Feb. vs. non-Feb.     | <b>1.014 (1.004–1.025)</b> |
|              |                         |                             |                               |                        |                           | Mar. vs. non-Mar.     | 1.015 (0.984–1.047)        |
|              |                         |                             |                               |                        |                           | Apr. vs. non-Apr.     | 0.980 (0.959–1.001)        |
|              |                         |                             |                               |                        |                           | May vs. non-May       | 0.996 (0.965–1.027)        |
|              |                         |                             |                               |                        |                           | Jun. vs. non-Jun.     | 0.984 (0.952–1.017)        |
|              |                         |                             |                               |                        |                           | Jul. vs. non-Jul.     | 1.000 (0.972–1.030)        |
|              |                         |                             |                               |                        |                           | Aug. vs. non-Aug.     | 1.004 (0.987–1.021)        |
|              |                         |                             |                               |                        |                           | Sep. vs. non-Sep.     | 1.008 (0.993–1.024)        |
|              |                         |                             |                               |                        |                           | Oct. vs. non-Oct.     | 1.005 (0.986–1.025)        |
|              |                         |                             |                               |                        |                           | Nov. vs. non-Nov.     | 0.996 (0.966–1.027)        |
|              |                         |                             |                               |                        |                           | Dec. vs. non-Dec.     | 1.010 (1.000–1.021)        |
|              |                         |                             |                               | >29074024/<br>148793   | Alcohol use disorder      | season of birth:      | RR                         |
|              |                         |                             |                               |                        |                           | Spring vs. non-spring | <b>0.980 (0.961–0.999)</b> |
|              |                         |                             |                               |                        |                           | Summer vs. non-summer | 1.009 (0.985–1.032)        |

| Author, year | Search databases (time) | Quality for primary studies | No. of studies (major design) | Participants/<br>Cases | Health outcome      | Exposure (comparison) | ES (95%CI)                   |
|--------------|-------------------------|-----------------------------|-------------------------------|------------------------|---------------------|-----------------------|------------------------------|
|              |                         |                             |                               |                        |                     | Fall vs. non-fall     | <b>1.016 (1.003–1.030)</b>   |
|              |                         |                             |                               |                        |                     | Winter vs. non-winter | 0.996 (0.983–1.010)          |
|              |                         |                             |                               |                        |                     | Month of birth:       | RR                           |
|              |                         |                             |                               |                        |                     | Jan. vs. non-Jan.     | 0.995 (0.973–1.018)          |
|              |                         |                             |                               |                        |                     | Feb. vs. non-Feb.     | 0.996 (0.972–1.021)          |
|              |                         |                             |                               |                        |                     | Mar. vs. non-Mar.     | 0.993 (0.969–1.017)          |
|              |                         |                             |                               |                        |                     | Apr. vs. non-Apr.     | 0.973 (0.914–1.034)          |
|              |                         |                             |                               |                        |                     | May vs. non-May       | 0.989 (0.924–1.057)          |
|              |                         |                             |                               |                        |                     | Jun. vs. non-Jun.     | 0.984 (0.959–1.009)          |
|              |                         |                             |                               |                        |                     | Jul. vs. non-Jul.     | 1.001 (0.977–1.026)          |
|              |                         |                             |                               |                        |                     | Aug. vs. non-Aug.     | 1.027 (0.977–1.080)          |
|              |                         |                             |                               |                        |                     | Sep. vs. non-Sep.     | 1.012 (0.989–1.036)          |
|              |                         |                             |                               |                        |                     | Oct. vs. non-Oct.     | 1.013 (0.991–1.036)          |
|              |                         |                             |                               |                        |                     | Nov. vs. non-Nov.     | <b>1.023 (1.00002–1.047)</b> |
|              |                         |                             |                               |                        |                     | Dec. vs. non-Dec.     | 0.998 (0.974–1.021)          |
|              |                         |                             |                               | >29074024/<br>118743   | Alzheimer's disease | season of birth:      | RR                           |
|              |                         |                             |                               |                        |                     | Spring vs. non-spring | 0.985 (0.961–1.010)          |
|              |                         |                             |                               |                        |                     | Summer vs. non-summer | 0.978 (0.954–1.002)          |
|              |                         |                             |                               |                        |                     | Fall vs. non-fall     | 1.012 (0.993–1.031)          |
|              |                         |                             |                               |                        |                     | Winter vs. non-winter | 1.023 (0.995–1.051)          |
|              |                         |                             |                               |                        |                     | Month of birth:       | RR                           |
|              |                         |                             |                               |                        |                     | Jan. vs. non-Jan.     | 1.042 (0.991–1.095)          |
|              |                         |                             |                               |                        |                     | Feb. vs. non-Feb.     | 1.039 (0.975–1.107)          |
|              |                         |                             |                               |                        |                     | Mar. vs. non-Mar.     | 0.987 (0.961–1.013)          |
|              |                         |                             |                               |                        |                     | Apr. vs. non-Apr.     | 0.994 (0.922–1.072)          |
|              |                         |                             |                               |                        |                     | May vs. non-May       | 0.973 (0.909–1.042)          |
|              |                         |                             |                               |                        |                     | Jun. vs. non-Jun.     | 0.969 (0.917–1.023)          |

| Author, year | Search databases (time) | Quality for primary studies | No. of studies (major design) | Participants/<br>Cases | Health outcome   | Exposure (comparison) | ES (95%CI)                 |
|--------------|-------------------------|-----------------------------|-------------------------------|------------------------|------------------|-----------------------|----------------------------|
|              |                         |                             |                               |                        |                  | Jul. vs. non-Jul.     | 0.994 (0.954–1.037)        |
|              |                         |                             |                               |                        |                  | Aug. vs. non-Aug.     | 0.965 (0.920–1.014)        |
|              |                         |                             |                               |                        |                  | Sep. vs. non-Sep.     | <b>1.038 (1.001–1.075)</b> |
|              |                         |                             |                               |                        |                  | Oct. vs. non-Oct.     | 0.998 (0.972–1.025)        |
|              |                         |                             |                               |                        |                  | Nov. vs. non-Nov.     | 0.999 (0.972–1.026)        |
|              |                         |                             |                               |                        |                  | Dec. vs. non-Dec.     | 0.988 (0.962–1.015)        |
|              |                         |                             |                               | >29074024/6615         | anorexia nervosa | season of birth:      | RR                         |
|              |                         |                             |                               |                        |                  | Spring vs. non-spring | 0.987 (0.926–1.052)        |
|              |                         |                             |                               |                        |                  | Summer vs. non-summer | 0.981 (0.920–1.046)        |
|              |                         |                             |                               |                        |                  | Fall vs. non-fall     | 1.022 (0.960–1.088)        |
|              |                         |                             |                               |                        |                  | Winter vs. non-winter | 1.012 (0.950–1.078)        |
|              |                         |                             |                               |                        |                  | Month of birth:       | RR                         |
|              |                         |                             |                               |                        |                  | Jan. vs. non-Jan.     | 1.016 (0.909–1.135)        |
|              |                         |                             |                               |                        |                  | Feb. vs. non-Feb.     | 1.011 (0.885–1.156)        |
|              |                         |                             |                               |                        |                  | Mar. vs. non-Mar.     | 0.943 (0.845–1.053)        |
|              |                         |                             |                               |                        |                  | Apr. vs. non-Apr.     | 0.988 (0.883–1.106)        |
|              |                         |                             |                               |                        |                  | May vs. non-May       | 1.031 (0.924–1.150)        |
|              |                         |                             |                               |                        |                  | Jun. vs. non-Jun.     | 1.002 (0.896–1.120)        |
|              |                         |                             |                               |                        |                  | Jul. vs. non-Jul.     | 0.939 (0.839–1.051)        |
|              |                         |                             |                               |                        |                  | Aug. vs. non-Aug.     | 1.003 (0.899–1.118)        |
|              |                         |                             |                               |                        |                  | Sep. vs. non-Sep.     | 0.995 (0.892–1.109)        |
|              |                         |                             |                               |                        |                  | Oct. vs. non-Oct.     | 1.027 (0.909–1.161)        |
|              |                         |                             |                               |                        |                  | Nov. vs. non-Nov.     | 1.042 (0.934–1.163)        |
|              |                         |                             |                               |                        |                  | Dec. vs. non-Dec.     | 1.002 (0.897–1.118)        |
|              |                         |                             |                               | >29074024/10563        | bulimia nervosa  | season of birth:      | RR                         |
|              |                         |                             |                               |                        |                  | Spring vs. non-spring | 0.954 (0.904–1.006)        |
|              |                         |                             |                               |                        |                  | Summer vs. non-summer | 1.036 (0.983–1.091)        |

| Author, year          | Search databases (time)         | Quality for primary studies | No. of studies (major design) | Participants/ Cases | Health outcome     | Exposure (comparison) | ES (95%CI)               |
|-----------------------|---------------------------------|-----------------------------|-------------------------------|---------------------|--------------------|-----------------------|--------------------------|
|                       |                                 |                             |                               |                     |                    | Fall vs. non-fall     | 1.023 (0.973–1.075)      |
|                       |                                 |                             |                               |                     |                    | Winter vs. non-winter | 0.988 (0.938–1.040)      |
|                       |                                 |                             |                               |                     |                    | Month of birth:       | RR                       |
|                       |                                 |                             |                               |                     |                    | Jan. vs. non-Jan.     | 0.969 (0.884–1.063)      |
|                       |                                 |                             |                               |                     |                    | Feb. vs. non-Feb.     | 1.002 (0.919–1.092)      |
|                       |                                 |                             |                               |                     |                    | Mar. vs. non-Mar.     | 0.957 (0.874–1.047)      |
|                       |                                 |                             |                               |                     |                    | Apr. vs. non-Apr.     | 0.937 (0.853–1.030)      |
|                       |                                 |                             |                               |                     |                    | May vs. non-May       | 0.967 (0.882–1.061)      |
|                       |                                 |                             |                               |                     |                    | Jun. vs. non-Jun.     | 1.046 (0.954–1.148)      |
|                       |                                 |                             |                               |                     |                    | Jul. vs. non-Jul.     | 1.009 (0.921–1.106)      |
|                       |                                 |                             |                               |                     |                    | Aug. vs. non-Aug.     | 1.052 (0.964–1.148)      |
|                       |                                 |                             |                               |                     |                    | Sep. vs. non-Sep.     | 1.040 (0.953–1.135)      |
|                       |                                 |                             |                               |                     |                    | Oct. vs. non-Oct.     | 1.045 (0.960–1.137)      |
|                       |                                 |                             |                               |                     |                    | Nov. vs. non-Nov.     | 0.982 (0.899–1.073)      |
|                       |                                 |                             |                               |                     |                    | Dec. vs. non-Dec.     | 0.990 (0.906–1.082)      |
| Pantavou et al., 2020 | Pubmed and Scopus (August 2018) | NR(NR)                      | 22(Case-control studies)      | 75315222/145672     | multiple sclerosis | season of birth:      | OR                       |
|                       |                                 |                             |                               |                     |                    | Spring vs. Fall       | <b>1.14 (1.04, 1.24)</b> |
|                       |                                 |                             |                               |                     |                    | Summer vs. Fall       | <b>1.08 (1.00, 1.17)</b> |
|                       |                                 |                             |                               |                     |                    | Winter vs. Fall       | 1.07 (0.99,1.15)         |
|                       |                                 |                             |                               |                     |                    | Month of birth:       | OR                       |
|                       |                                 |                             |                               |                     |                    | Jan. vs. Oct.         | 1.01(0.97,1.06)          |
|                       |                                 |                             |                               |                     |                    | Feb. vs. Oct.         | 1.02(0.97,1.06)          |
|                       |                                 |                             |                               |                     |                    | Mar. vs. Oct.         | <b>1.05 (1.00, 1.11)</b> |
|                       |                                 |                             |                               |                     |                    | Apr. vs. Oct.         | <b>1.12 (1.05, 1.21)</b> |
|                       |                                 |                             |                               |                     |                    | May vs. Oct.          | <b>1.07 (1.00, 1.14)</b> |
|                       |                                 |                             |                               |                     |                    | Jun. vs. Oct.         | 1,02(0,98,1.05)          |
|                       |                                 |                             |                               |                     |                    | Jul. vs. Oct.         | 1.02(0.98,1.05)          |

| Author, year          | Search databases (time)                                                | Quality for primary studies  | No. of studies (major design) | Participants/ Cases | Health outcome   | Exposure (comparison) | ES (95%CI)                                                 |
|-----------------------|------------------------------------------------------------------------|------------------------------|-------------------------------|---------------------|------------------|-----------------------|------------------------------------------------------------|
|                       |                                                                        |                              |                               |                     |                  | Aug. vs. Oct.         | 1.03(0.99,1.08)                                            |
|                       |                                                                        |                              |                               |                     |                  | Sep. vs. Oct.         | 1.05(0.99,1.11)                                            |
|                       |                                                                        |                              |                               |                     |                  | Nov. vs. Oct.         | <b>0.96 (0.93, 0.99)</b>                                   |
|                       |                                                                        |                              |                               |                     |                  | Dec. vs. Oct.         | 1.00(0.96,1.06)                                            |
| Susanto et al., 2017  | PubMed, Web of Science, Scopus, Google Scholar and ProQuest Health(NR) | >70% high quality (Cochrane) | 10(Cohort studies)            | 119979/1834         | cord blood IgE   | season of birth       | OR                                                         |
|                       |                                                                        |                              |                               |                     |                  | Spring vs. Summer     | 1.05(0.81,1.35)                                            |
|                       |                                                                        |                              |                               |                     |                  | Fall vs. Summer       | 1.17(0.92,1.48)                                            |
|                       |                                                                        |                              |                               |                     |                  | Winter vs. Summer     | <b>1.24(1.01,1.52)</b>                                     |
| Karalexi et al., 2020 | unpublished primary data(NR)                                           | NR(NR)                       | 10(cohort studies )           | 18211601/4987       | Total CNS tumors | season of birth       | IRR (Total vs. Boys vs. Girls)                             |
|                       |                                                                        |                              |                               |                     |                  | Spring vs. non-spring | 1.04 (0.98–1.11) vs. 1.09 (0.96–1.23) vs. 1.03 (0.92–1.14) |
|                       |                                                                        |                              |                               |                     |                  | Summer vs. non-summer | 0.94 (0.87–1.01) vs. 0.93 (0.85–1.02) vs. 0.96 (0.83–1.10) |
|                       |                                                                        |                              |                               |                     |                  | Fall vs. non-fall     | 0.98 (0.90–1.07) vs. 0.94 (0.85–1.03) vs. 0.94 (0.85–1.05) |
|                       |                                                                        |                              |                               |                     |                  | Winter vs. non-winter | 1.06 (0.99–1.14) vs. 1.07 (0.98–1.18) vs. 1.08 (0.98–1.20) |
|                       |                                                                        |                              |                               | 18211601/1507       | Astrocytomas     | Spring vs. non-spring | 1.06 (0.95–1.19) vs. 0.95 (0.75–1.21) vs. 1.23 (1.03–1.46) |
|                       |                                                                        |                              |                               |                     |                  | Summer vs. non-summer | 1.03 (0.92–1.16) vs. 1.07 (0.90–1.26) vs. 1.04 (0.86–1.25) |
|                       |                                                                        |                              |                               |                     |                  | Fall vs. non-fall     | 0.94 (0.78–1.14) vs. 0.92 (0.77–1.10) vs. 0.88 (0.66–1.18) |
|                       |                                                                        |                              |                               |                     |                  | Winter vs. non-winter | 1.03 (0.90–1.17) vs. 1.08 (0.91–1.28) vs. 1.10 (0.82–1.46) |
|                       |                                                                        |                              |                               | 18211601/1463       | Embryonal tumors | Spring vs. non-spring | 0.99 (0.88–1.12) vs. 1.00 (0.84–1.19) vs. 1.00 (0.81–1.24) |
|                       |                                                                        |                              |                               |                     |                  | Summer vs. non-summer | 0.90 (0.80–1.02) vs. 0.89 (0.75–1.06) vs. 0.94 (0.76–1.16) |
|                       |                                                                        |                              |                               |                     |                  | Fall vs. non-fall     | 1.00 (0.89–1.13) vs. 0.96 (0.77–1.19) vs. 1.08 (0.88–1.33) |

| Author, year      | Search databases (time)                                                  | Quality for primary studies                     | No. of studies (major design) | Participants/ Cases | Health outcome                      | Exposure (comparison) | ES (95%CI)                                                                           |
|-------------------|--------------------------------------------------------------------------|-------------------------------------------------|-------------------------------|---------------------|-------------------------------------|-----------------------|--------------------------------------------------------------------------------------|
|                   |                                                                          |                                                 |                               |                     |                                     | Winter vs. non-winter | <b>1.13 (1.01–1.27)</b> vs. 1.24 (1.05–1.46) vs. 1.04 (0.84–1.28)                    |
| Tung et al., 2022 | PubMed, Cochrane Library and EMBASE(October 20, 2021)                    | 5 high-quality research(NOS )                   | 5(Cohort studies)             | 103986/12343        | Postpartum depression               | season of childbirth  | RR                                                                                   |
|                   |                                                                          |                                                 |                               |                     |                                     | Spring vs. Winter     | 0.96 (0.92–1.00)                                                                     |
|                   |                                                                          |                                                 |                               |                     |                                     | Summer vs. Winter     | 0.88 (0.73–1.05)                                                                     |
|                   |                                                                          |                                                 |                               |                     |                                     | Fall vs. Winter       | <b>0.86 (0.75–0.99)</b>                                                              |
|                   |                                                                          |                                                 |                               |                     |                                     | non-winter vs. Winter | <b>0.83 (0.78–0.88)</b>                                                              |
| Liao et al., 2023 | Cochrane Library, PubMed, EMBASE, and Web of Science(September 29, 2021) | 8 high-quality research(NOS )                   | 11(Cohort studies)            | 2,816,293/87,466    | Hypertensive Disorders in Pregnancy | season of childbirth  | OR                                                                                   |
|                   |                                                                          |                                                 |                               |                     |                                     | Spring vs.Summer      | 1.09(0.97-1.22)                                                                      |
|                   |                                                                          |                                                 |                               |                     |                                     | Fall vs.Summer        | 1.01(0.92-1.11)                                                                      |
|                   |                                                                          |                                                 |                               |                     |                                     | Winter vs.Summer      | <b>1.18(1.02-1.38)</b>                                                               |
| Hsu et al., 2022* | PubMed, Embase, and Cochrane (September 30,2021)                         | No high bias research (Hoy’s risk of bias tool) | 8 (Observational studies)     | >29074024/3776      | narcolepsy                          | season of birth:      | RR(Overall vs. Asia vs. North America vs. Europe)                                    |
|                   |                                                                          |                                                 |                               |                     |                                     | Spring vs. non-spring | 1.04 (0.96–1.12) vs.0.95 (0.85–1.06) vs. <b>1.21 (1.06–1.38)</b> vs.1.05 (0.92–1.19) |
|                   |                                                                          |                                                 |                               |                     |                                     | Summer vs. non-summer | 1.01 (0.93–1.09) vs.0.95 (0.85–1.06) vs.1.02 (0.89–1.17) vs.1.06 (0.92–1.21)         |
|                   |                                                                          |                                                 |                               |                     |                                     | Fall vs. non-fall     | 0.98 (0.91–1.06) vs.1.09 (0.99–1.21) vs.0.87 (0.74–1.01) vs.0.91 (0.79–1.05)         |
|                   |                                                                          |                                                 |                               |                     |                                     | Winter vs. non-winter | 1.02 (0.94–1.10) vs.1.04 (0.94–1.16) vs.0.97 (0.84–1.13) vs.1.01 (0.89–1.16)         |
|                   |                                                                          |                                                 |                               |                     |                                     | Month of birth:       | RR(Overall vs. Asia vs. North America vs. Europe)                                    |
|                   |                                                                          |                                                 |                               |                     |                                     | Jan. vs. non-Jan.     | 1.06 (0.94–1.20) vs.1.05 (0.89–1.23) vs.0.88 (0.67–1.15) vs.1.14 (0.91–1.43)         |
|                   |                                                                          |                                                 |                               |                     |                                     | Feb. vs. non-Feb.     | 0.96 (0.84–1.10) vs.0.99 (0.84–1.17) vs.0.95 (0.73–1.24) vs.0.93 (0.73–1.18)         |
|                   |                                                                          |                                                 |                               |                     |                                     | Mar. vs. non-Mar.     | 1.11 (0.99–1.26) vs.0.91 (0.77–1.08) vs. <b>1.47 (1.20–1.79)</b> vs.1.13 (0.91–1.40) |
|                   |                                                                          |                                                 |                               |                     |                                     | Apr. vs. non-Apr.     | 0.90 (0.78–1.03) vs. <b>0.80 (0.66–0.97)</b> vs.0.96 (0.74–1.25) vs.0.97 (0.77–1.23) |



**Table S3. Excluded studies and reasons for exclusion after full-text review**

| ID | Title                                                                                                                                                                  | Reason for exclusion                                                              |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| 1  | Association between relative age at school and persistence of ADHD in prospective studies: an individual participant data meta-analysis                                | No data for specific months                                                       |
| 2  | Associations of Meteorology with Adverse Pregnancy Outcomes: A Systematic Review of Preeclampsia, Preterm Birth and Birth Weight                                       | No forest plot for sub-studies                                                    |
| 3  | Association between maternal depression and maternal sensitivity from birth to 12 months: a meta-analysis                                                              | Analyzes only absolute age without considering the specific birth month or season |
| 4  | Pregnancy in Systemic Sclerosis: Results of a Systematic Review and Meta-analysis                                                                                      | Focuses only on birth weight                                                      |
| 5  | Female Reproductive Performance and Maternal Birth Month: A Comprehensive Meta-Analysis Exploring Multiple Seasonal Mechanisms                                         | Discusses birth temperature and rainfall without specific months                  |
| 9  | A systematic review and meta-analysis of Northern Hemisphere season of birth studies in schizophrenia                                                                  | Missing values in the forest plot                                                 |
| 10 | Season of birth and anorexia nervosa                                                                                                                                   | No forest plot for sub-studies                                                    |
| 11 | Timing of neonatal mortality and severe morbidity during the postnatal period: a systematic review                                                                     | Review without meta-analysis                                                      |
| 12 | Confounding in association studies: month of birth and multiple sclerosis                                                                                              | Review without meta-analysis                                                      |
| 13 | Geographical and seasonal correlation of multiple sclerosis to sporadic schizophrenia                                                                                  | Review without meta-analysis                                                      |
| 14 | Season of birth and primary central nervous system tumors: a systematic review of the literature with critical appraisal of underlying mechanisms                      | No meta-analysis                                                                  |
| 15 | A systematic review on the association of month and season of birth with future anthropometric measures                                                                | Review without meta-analysis                                                      |
| 18 | Perinatal Risk Factors for Asthma and Allergic Rhinitis in Children and Adolescents                                                                                    | No meta-information for birth month                                               |
| 20 | Analysis of DNA methylation at birth and in childhood reveals changes associated with season of birth and latitude                                                     | Is an epigenome-wide meta-analysis study                                          |
| 21 | Short-term ambient temperature variations and incidence of preterm birth: A systematic review and meta-analysis                                                        | Focuses on environmental temperature rather than specific months                  |
| 22 | A systematic review and meta-analysis of heat exposure impacts on maternal fetal and neonatal health                                                                   | Involves heat exposure with no analysis of months or seasons                      |
| 23 | Perinatal light imprinting of circadian clocks and systems (PLICCS): A signature of photoperiod around birth on circadian system stability and association with cancer | Review without meta-analysis                                                      |
| 24 | Perinatal photoperiod associations with bipolar disorder and depression: A systematic literature review and cross-sectional analysis of the UK Biobank database        | Review without meta-analysis                                                      |
| 25 | The Association Between Season and Hypertensive Disorders in Pregnancy: a Systematic Review and Meta-analysis                                                          | Forest plots not included                                                         |
| 26 | Food allergy is linked to season of birth, sun exposure, and vitamin D deficiency                                                                                      | Only a systematic review without meta-analysis                                    |
| 27 | Season of birth and schizophrenia: a systematic review and meta-analysis of data from the Southern Hemisphere                                                          | The article is older, and the forest plot lacks numbers                           |
| 28 | Effects of temperature, weather, seasons, atmosphere, and climate on the exacerbation of inflammatory bowel diseases: A systematic review and meta-analysis            | Studies general climate levels, not birth-related factors                         |
| 30 | Seasonality of month of birth in patients with autoimmune endocrine diseases: A systematic review                                                                      | Review without meta-analysis                                                      |
| 31 | Association between a large change between the minimum and maximum monthly values of solar insolation and a history of suicide attempts in bipolar I disorder          | Focuses only on birth location                                                    |
| 32 | The impact of relative age effects on psychosocial development: A systematic review                                                                                    | Only relative age without specific birth month or season                          |
| 33 | The role of latitude and infections in the month-of-birth effect linked to schizophrenia                                                                               | No forest plot                                                                    |
| 34 | Attention Deficit Hyperactivity Disorder and Relative Age: A Meta-Analysis                                                                                             | Relative age cannot calculate the season                                          |

| ID | Title                                                                                                                                                                                                                 | Reason for exclusion                                                |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| 35 | Prevalence and risk factors of respiratory syncytial virus in children under 5 years of age in the WHO European Region: A systematic review and meta-analysis                                                         | No meta-analysis on months and seasons                              |
| 36 | The prevalence of long-term neurodevelopmental outcomes in preterm-born children in low- and middle-income countries: a systematic review and meta-analysis of developmental outcomes in 72 974 preterm-born children | No meta-analysis on the birth month and season of premature infants |
| 39 | Month of birth as a risk factor for multiple sclerosis: an update                                                                                                                                                     | Review without meta-analysis                                        |
| 41 | Do prenatal factors shape the risk for dementia?: A systematic review of the epidemiological evidence for the prenatal origins of dementia                                                                            | Review without meta-analysis                                        |
| 42 | Prevalence of Babies Born With Neural Tube Defects and Geospatial Mapping of Therapeutic Services: A Systematic Review                                                                                                | Review without meta-analysis                                        |

**Table S4. AMSTAR 2 assessment of included meta-analyses**

| Study                          | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 | Q16 | Overall |
|--------------------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|---------|
| Córdova-Palomera et al., 2015* | Y  | N  | N  | PY | Y  | N  | N  | PY | Y  | N   | Y   | Y   | Y   | Y   | Y   | Y   | CL      |
| Susanto et al., 2017           | Y  | N  | N  | PY | Y  | Y  | N  | PY | PY | N   | Y   | Y   | Y   | Y   | Y   | Y   | CL      |
| Pantavou et al., 2020          | Y  | N  | N  | PY | Y  | Y  | N  | PY | N  | N   | Y   | N   | Y   | Y   | Y   | Y   | CL      |
| Karalexi et al., 2020          | Y  | N  | N  | N  | N  | N  | PY | PY | N  | N   | Y   | Y   | Y   | Y   | Y   | Y   | CL      |
| Calov et al., 2020             | Y  | N  | N  | PY | Y  | Y  | N  | PY | PY | N   | N   | Y   | Y   | N   | Y   | Y   | CL      |
| Hsu et al., 2021               | Y  | PY | PY | PY | Y  | PY | Y  | Y  | Y  | N   | Y   | Y   | Y   | Y   | Y   | Y   | L       |
| Tung et al., 2022              | Y  | N  | N  | PY | Y  | Y  | N  | PY | Y  | N   | Y   | Y   | Y   | Y   | Y   | Y   | CL      |
| Liao et al., 2023              | Y  | PY | N  | PY | Y  | PY | N  | PY | Y  | N   | Y   | Y   | Y   | Y   | Y   | Y   | L       |
| Hsu et al., 2022*              | Y  | PY | N  | PY | Y  | PY | Y  | Y  | Y  | N   | Y   | Y   | Y   | Y   | Y   | Y   | CL      |
| Coury et al., 2023*            | Y  | PY | N  | PY | Y  | Y  | N  | PY | PY | N   | Y   | Y   | Y   | Y   | Y   | Y   | CL      |

AMSTAR 2 - A Measurement Tool to Assess Systematic Reviews 2; CL - critically low; H - high; L - low; M - moderate; N - no; NMA - no meta-analysis conducted; PY - partial yes; Q - question; Y - yes.

\*Included in the general analysis but excluded from the final evidence-grading analysis because of insufficient data.