Supplementary Information
Prevalence of incidental intracranial findings on magnetic resonance imaging: A systematic review and meta-analysis

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Supplementary Methods I

Ovid MEDLINE – Inception to 24/05/2021 – 2,108 results

| #  | Query                                                                 | Results from 24 May 2021 |
|----|------------------------------------------------------------------------|--------------------------|
| 1  | incidental.ti,ab.                                                      | 28,619                   |
| 2  | exp Incidental Findings/                                              | 10,892                   |
| 3  | ct.ti,ab.                                                             | 362,366                  |
| 4  | exp Magnetic Resonance Imaging/ or exp Tomography, X-Ray Computed/     | 847,759                  |
| 5  | mri.ti,ab.                                                             | 258,115                  |
| 6  | magnetic resonance*.ti,ab.                                            | 358,887                  |
| 7  | computed tomography.ti,ab.                                           | 263,390                  |
| 8  | exp Brain/                                                            | 1,238,587                |
| 9  | neuroradiology.ti,ab.                                                | 2,783                    |
| 10 | neuro*.ti,ab.                                                         | 1,890,201                |
| 11 | brain.ti,ab.                                                          | 1,019,915                |
| 12 | head.ti,ab.                                                           | 334,357                  |
| 13 | cranial.ti,ab.                                                        | 76,967                   |
| 14 | cerebral.ti,ab.                                                       | 362,919                  |
| 15 | 1 or 2                                                                | 34,715                   |
| 16 | 3 or 4 or 5 or 6 or 7                                                 | 1,273,989                |
| 17 | 8 or 9 or 10 or 11 or 12 or 13 or 14                                  | 3,326,774                |
| 18 | 15 and 16 and 17                                                      | 2,486                    |
| 19 | limit 18 to humans                                                    | 2,108                    |
EMBASE – Inception to 24/05/2021 – 380 results

Search Queries

| No. | Query                                                                 | Results | Date      |
|-----|----------------------------------------------------------------------|---------|-----------|
| #17 | (('incidental finding'/exp OR 'incidental finding') AND ('computer assisted tomography'/exp OR 'ct':ab,ti OR 'computed tomography':ab,ti OR 'neuroradiology'/exp OR 'nuclear magnetic resonance imaging'/exp OR 'magnetic resonance imaging':ab,ti OR 'mri':ab,ti) AND ('brain'/exp OR neuro*:ab,ti OR head:ab,ti OR cranial:ab,ti)) AND [embase]/lim NOT ([embase]/lim AND [medline]/lim) NOT 'conference abstract'/it | 380     | 24 May 2021 |
| #16 | (('incidental finding'/exp OR 'incidental finding') AND ('computer assisted tomography'/exp OR 'ct':ab,ti OR 'computed tomography':ab,ti OR 'neuroradiology'/exp OR 'nuclear magnetic resonance imaging'/exp OR 'magnetic resonance imaging':ab,ti OR 'mri':ab,ti) AND ('brain'/exp OR neuro*:ab,ti OR head:ab,ti OR cranial:ab,ti)) AND [embase]/lim NOT ([embase]/lim AND [medline]/lim) | 1011    | 24 May 2021 |
| #15 | ('incidental finding'/exp OR 'incidental finding') AND ('computer assisted tomography'/exp OR 'ct':ab,ti OR 'computed tomography':ab,ti OR 'neuroradiology'/exp OR 'nuclear magnetic resonance imaging'/exp OR 'magnetic resonance imaging':ab,ti OR 'mri':ab,ti) AND ('brain'/exp OR neuro*:ab,ti OR head:ab,ti OR cranial:ab,ti) | 2249    | 24 May 2021 |
| #14 | 'brain'/exp OR neuro*:ab,ti OR head:ab,ti OR cranial:ab,ti            | 3758698 | 24 May 2021 |
| #13 | 'computer assisted tomography'/exp OR 'ct':ab,ti OR 'computed tomography':ab,ti OR 'neuroradiology'/exp OR 'nuclear magnetic resonance imaging'/exp OR 'magnetic resonance imaging':ab,ti OR 'mri':ab,ti | 2203543 | 24 May 2021 |
| #12 | cranial:ab,ti                                                      | 105073  | 24 May 2021 |
| #11 | head:ab,ti                                                        | 449588  | 24 May 2021 |
| #10 | neuro*:ab,ti                                                       | 2534691 | 24 May 2021 |
| #9  | 'brain'/exp                                                          | 1521819 | 24 May 2021 |
| #8  | 'mri':ab,ti                                                         | 443977  | 24 May 2021 |
| #7  | 'magnetic resonance imaging':ab,ti                                   | 292875  | 24 May 2021 |
| #6  | 'nuclear magnetic resonance imaging'/exp                            | 1023815 | 24 May 2021 |
| #5  | 'neuroradiology'/exp                                                | 90889   | 24 May 2021 |
| #4  | 'computed tomography':ab,ti                                         | 329440  | 24 May 2021 |
| #3  | 'ct':ab,ti                                                          | 610775  | 24 May 2021 |
| #2  | 'computer assisted tomography'/exp                                  | 1175732 | 24 May 2021 |
| #1  | 'incidental finding'/exp OR 'incidental finding'                     | 23805   | 24 May 2021 |
PubMed – Inception to 24/05/2021 – 1,902 results

Search: (((incidental[Title/Abstract]) OR ("incidental findings"[MeSH Major Topic]))) AND (((Brain[MeSH Terms]) OR (brain[Title/Abstract])) OR (head[Title/Abstract])) OR (cranial[Title/Abstract]) OR (neuro*[Title/Abstract])) AND (((MRI[Title/Abstract]) OR (magnetic resonance[Title/Abstract])) OR ("magnetic resonance imaging"[MeSH Major Topic])) OR (((computed tomography)[Title/Abstract]) OR (ct[Title/Abstract])) OR (computed tomography, x ray[MeSH Terms]))) Sort by: Most Recent
("incidental"[Title/Abstract] OR "incidental findings"[MeSH Major Topic]) AND ("brain"[MeSH Terms] OR "brain"[Title/Abstract] OR "head"[Title/Abstract] OR "cranial"[Title/Abstract] OR "neuro*"[Title/Abstract]) AND ("MRI"[Title/Abstract] OR "magnetic resonance"[Title/Abstract] OR "magnetic resonance imaging"[MeSH Major Topic] OR ("computed tomography"[Title/Abstract] OR "ct"[Title/Abstract] OR "tomography, x ray computed"[MeSH Terms]))

Translations
Brain[MeSH Terms]: "brain"[MeSH Terms]
computed tomography, x ray[MeSH Terms]: "tomography, x-ray computed"[MeSH Terms]

SCOPUS – Inception to 24/05/2021 – 1,966 results

1. TITLE-ABS-KEY("incidental") (52,804 results)
2. TITLE-ABS-KEY("MRI") OR TITLE-ABS-KEY("magnetic resonance") OR TITLE-ABS-KEY(mr*) (2,453,606 results)
3. TITLE-ABS-KEY("CT") OR TITLE-ABS-KEY("computed tomography") OR TITLE-ABS-KEY("computed tomographic") (827,684 results)
4. TITLE-ABS-KEY("head") OR TITLE-ABS-KEY("brain") OR TITLE-ABS-KEY("neuro*") OR TITLE-ABS-KEY("cranial") (5,055,724 results)
5. #2 OR #3 (3,104,347 results)
6. #1 AND #4 AND #5 (4,236 results)
7. #6 AND (EXCLUDE(DOCTYPE, "cp")) (4,169 results)
8. #7 AND LIMIT-TO(EXACTKEYWORD, "Incidental Finding") (1,966 results)
Supplementary Figure I
Forest plots depicting the findings of each study for each category.

**Aneurysm**

| Study              | Events | Events Total | Events per 1000 observations | Events | 95%−CI          |
|--------------------|--------|--------------|------------------------------|--------|-----------------|
| Serag 2020         | 6      | 753          | 7.97 [2.03; 17.26]           |        |                 |
| Wang 2021          | 0      | 579          | 0.00 [0.00; 6.35]            |        |                 |
| Hanna 2020         | 0      | 125          | 0.00 [0.00; 29.08]           |        |                 |
| Vazquez–Justes 2020| 0      | 289          | 0.00 [0.00; 12.68]           |        |                 |
| Glasmacher 2019    | 2      | 514          | 3.89 [0.47; 13.98]           |        |                 |
| Li 2019            | 1      | 562          | 1.78 [0.05; 9.87]            |        |                 |
| Bost 2016          | 134    | 5800         | 23.10 [19.39; 27.30]         |        |                 |
| Li 2021            | 0      | 1167         | 0.00 [0.00; 0.32]            |        |                 |
| Weber 2006         | 0      | 2536         | 0.00 [0.00; 1.45]            |        |                 |
| Cohrs 2018         | 0      | 569          | 0.00 [0.00; 6.46]            |        |                 |
| Alturkustani 2020  | 0      | 275          | 0.00 [0.00; 13.32]           |        |                 |
| Yilmaz 2014        | 0      | 448          | 0.00 [0.00; 8.18]            |        |                 |
| Katzman 2019       | 1      | 1000         | 1.00 [0.03; 5.56]            |        |                 |
| Koncz 2018         | 1      | 400          | 2.50 [0.06; 13.65]           |        |                 |
| Lee 2008           | 15     | 2164         | 6.93 [3.88; 11.41]           |        |                 |
| Bruguat–Serrat 2017| 1      | 575          | 1.74 [0.04; 9.65]            |        |                 |
| Hoggard 2009       | 0      | 525          | 0.00 [0.00; 7.00]            |        |                 |
| Boutet 2017        | 1      | 503          | 1.99 [0.05; 11.03]           |        |                 |
| Haberg 2016        | 23     | 1006         | 22.86 [14.55; 34.11]         |        |                 |
| Kaiser 2015        | 0      | 114          | 0.00 [0.00; 51.64]           |        |                 |
| Cieszanowski 2014  | 6      | 666          | 1.50 [0.04; 8.34]            |        |                 |
| Sandeman 2013      | 5      | 700          | 7.14 [2.32; 16.59]           |        |                 |
| Potchen 2013       | 0      | 96           | 0.00 [0.00; 37.70]           |        |                 |
| Reneman 2012       | 0      | 208          | 0.00 [0.00; 18.01]           |        |                 |
| Hartwigsen 2010    | 0      | 208          | 0.00 [0.00; 17.75]           |        |                 |
| Lubman 2002        | 0      | 98           | 0.00 [0.00; 36.94]           |        |                 |
| Illes 2004         | 0      | 151          | 0.00 [0.00; 24.13]           |        |                 |
| Tsushima 2005      | 7      | 1113         | 6.29 [2.53; 12.92]           |        |                 |
| Alphs 2006         | 6      | 656          | 9.15 [3.36; 19.80]           |        |                 |

Heterogeneity: $I^2 = 94\%, \tau^2 = 0.0036$, p < 0.01

**Cavernoma**

| Study              | Events | Events Total | Events per 1000 observations | Events | 95%−CI          |
|--------------------|--------|--------------|------------------------------|--------|-----------------|
| Serag 2020         | 9      | 753          | 11.95 [5.48; 22.57]          |        |                 |
| Wang 2021          | 11     | 579          | 19.00 [9.52; 33.74]          |        |                 |
| Hanna 2020         | 0      | 125          | 0.00 [0.00; 29.08]           |        |                 |
| Vazquez–Justes 2020| 0      | 289          | 0.00 [0.00; 12.68]           |        |                 |
| Keuss 2019         | 3      | 471          | 6.37 [1.32; 18.50]           |        |                 |
| Glasmacher 2019    | 1      | 514          | 1.95 [0.05; 10.79]           |        |                 |
| Li 2019            | 1      | 562          | 1.78 [0.05; 8.87]            |        |                 |
| Bost 2016          | 37     | 5900         | 6.38 [4.50; 8.79]           |        |                 |
| Li 2021            | 6      | 11679        | 0.51 [0.19; 1.12]           |        |                 |
| Weber 2006         | 3      | 2536         | 1.18 [0.24; 3.45]           |        |                 |
| Cohrs 2018         | 3      | 569          | 5.27 [1.09; 13.53]          |        |                 |
| Alturkustani 2020  | 2      | 275          | 7.27 [0.88; 26.02]          |        |                 |
| Yilmaz 2014        | 0      | 448          | 0.00 [0.00; 8.16]           |        |                 |
| Katzman 1999       | 2      | 1000         | 2.00 [0.24; 7.21]           |        |                 |
| Koncz 2018         | 2      | 400          | 5.00 [0.61; 17.94]          |        |                 |
| Lee 2008           | 3      | 2164         | 1.39 [0.29; 4.05]           |        |                 |
| Bruguat–Serrat 2017| 15     | 575          | 26.09 [14.67; 42.66]         |        |                 |
| Hoggard 2009       | 3      | 525          | 5.71 [1.18; 16.61]          |        |                 |
| Boutet 2017        | 1      | 503          | 1.99 [0.05; 11.03]          |        |                 |
| Haberg 2016        | 3      | 1006         | 2.98 [0.62; 8.69]           |        |                 |
| Kaiser 2015        | 0      | 114          | 0.00 [0.00; 31.84]          |        |                 |
| Cieszanowski 2014  | 0      | 666          | 0.00 [0.00; 5.52]           |        |                 |
| Sandeman 2013      | 3      | 700          | 4.29 [0.88; 12.47]          |        |                 |
| Potchen 2013       | 0      | 96           | 0.00 [0.00; 37.70]          |        |                 |
| Reneman 2012       | 0      | 208          | 0.00 [0.00; 18.01]          |        |                 |
| Hartwigsen 2010    | 0      | 206          | 9.71 [1.18; 34.63]          |        |                 |
| Lubman 2002        | 0      | 98           | 0.00 [0.00; 36.94]          |        |                 |
| Illes 2004         | 1      | 151          | 6.62 [0.17; 36.34]          |        |                 |
| Tsushima 2005      | 0      | 1113         | 0.00 [0.00; 3.31]           |        |                 |
| Alphs 2006         | 0      | 656          | 0.00 [0.00; 5.61]           |        |                 |

Heterogeneity: $I^2 = 80\%, \tau^2 = 0.0010$, p < 0.01
Other vascular

| Study                  | Events | Total | Events per 1000 observations | Events | 95%-CI          |
|-----------------------|--------|-------|-----------------------------|--------|-----------------|
| Serag 2020            | 0      | 753   | 0.00 (0.00; 4.89)           |        |                 |
| Wang 2021             | 14     | 579   | 24.18 (13.26; 40.24)        |        |                 |
| Hanna 2020            | 1      | 125   | 0.00 (0.00; 29.08)          |        |                 |
| Vazquez–Justes 2020   | 0      | 289   | 0.00 (0.00; 12.68)          |        |                 |
| Glasmacher 2019       | 0      | 514   | 0.00 (0.00; 7.15)           |        |                 |
| Li 2019               | 0      | 562   | 0.00 (0.00; 6.54)           |        |                 |
| Bos 2016              | 6      | 5800  | 1.03 (0.38; 2.26)           |        |                 |
| Weber 2006            | 7      | 2536  | 2.76 [1.11; 5.68]           |        |                 |
| Cohrs 2018            | 0      | 569   | 0.00 (0.00; 6.46)           |        |                 |
| Alturkustani 2020     | 1      | 275   | 3.64 (0.09; 20.09)          |        |                 |
| Yilmaz 2014           | 0      | 449   | 0.00 (0.00; 8.18)           |        |                 |
| Katzman 1999          | 0      | 1000  | 0.00 (0.00; 3.68)           |        |                 |
| Koncz 2018            | 0      | 400   | 0.00 (0.00; 9.18)           |        |                 |
| Lee 2008              | 21     | 2164  | 9.70 (6.02; 14.80)          |        |                 |
| Bruguilats-Serrat 2017| 0      | 575   | 0.00 (0.00; 6.39)           |        |                 |
| Hoggard 2009          | 1      | 526   | 1.90 (0.05; 10.57)          |        |                 |
| Boutet 2017           | 0      | 503   | 0.00 [0.00; 7.31]           |        |                 |
| Haberg 2016           | 9      | 1006  | 8.95 (4.10; 16.91)          |        |                 |
| Kaiser 2015           | 0      | 114   | 0.00 (0.00; 31.64)          |        |                 |
| Gieszanowski 2014     | 0      | 668   | 0.00 (0.00; 5.52)           |        |                 |
| Sandeman 2013         | 2      | 700   | 2.86 [0.35; 10.28]          |        |                 |
| Potchen 2013          | 0      | 96    | 0.00 (0.00; 37.70)          |        |                 |
| Reneman 2012          | 0      | 203   | 0.00 (0.00; 18.01)          |        |                 |
| Hartwigsen 2010       | 2      | 206   | 9.71 [1.18; 34.63]          |        |                 |
| Lubman 2002           | 0      | 98    | 0.00 (0.00; 35.94)          |        |                 |
| Illes 2004            | 1      | 151   | 6.62 [0.17; 36.34]          |        |                 |
| Tsushima 2005         | 1      | 1113  | 0.90 [0.02; 5.00]           |        |                 |
| Alpha 2006            | 1      | 656   | 1.52 [0.04; 8.46]           |        |                 |

Any vascular

| Study                  | Events | Total | Events per 1000 observations | Events | 95%-CI          |
|-----------------------|--------|-------|-----------------------------|--------|-----------------|
| Serag 2020            | 15     | 753   | 19.92 [11.19; 32.64]        |        |                 |
| Wang 2021             | 25     | 579   | 43.18 [28.13; 63.08]        |        |                 |
| Hanna 2020            | 0      | 125   | 0.00 (0.00; 29.08)          |        |                 |
| Vazquez–Justes 2020   | 1      | 289   | 3.46 [0.09; 13.13]          |        |                 |
| Glasmacher 2019       | 0      | 514   | 0.00 (0.00; 7.15)           |        |                 |
| Li 2019               | 0      | 568   | 0.00 (0.00; 6.54)           |        |                 |
| Bos 2016              | 177    | 5800  | 30.52 [26.24; 35.27]        |        |                 |
| Li 2021               | 19     | 11679 | 1.63 (0.98; 2.54)           |        |                 |
| Weber 2006            | 10     | 2536  | 3.94 [1.89; 7.24]           |        |                 |
| Cohrs 2018            | 3      | 569   | 5.27 [1.09; 15.33]          |        |                 |
| Alturkustani 2020     | 3      | 275   | 10.91 [2.26; 31.55]         |        |                 |
| Yilmaz 2014           | 0      | 445   | 0.00 (0.00; 8.18)           |        |                 |
| Katzman 1999          | 3      | 1000  | 3.00 [0.62; 8.74]           |        |                 |
| Koncz 2018            | 3      | 400   | 7.50 [1.55; 21.76]          |        |                 |
| Lee 2008              | 39     | 2164  | 18.02 [12.85; 24.36]        |        |                 |
| Bruguilats–Serrat 2017| 16     | 575   | 27.83 [15.99; 44.80]        |        |                 |
| Hoggard 2006          | 4      | 525   | 7.62 [2.06; 19.39]          |        |                 |
| Boutet 2017           | 2      | 503   | 3.98 [0.48; 14.29]          |        |                 |
| Haberg 2016           | 35     | 1006  | 34.79 [24.35; 48.06]        |        |                 |
| Kaiser 2015           | 0      | 114   | 0.00 [0.00; 31.84]          |        |                 |
| Gieszanowski 2014     | 1      | 668   | 1.50 [0.04; 8.34]           |        |                 |
| Gur 2013              | 36     | 1400  | 25.71 [18.07; 35.42]        |        |                 |
| Sandeman 2013         | 10     | 700   | 14.29 [6.87; 26.11]         |        |                 |
| Potchen 2013          | 0      | 98    | 0.00 (0.00; 37.70)          |        |                 |
| Reneman 2012          | 0      | 203   | 0.00 (0.00; 18.01)          |        |                 |
| Hartwigsen 2010       | 4      | 206   | 19.42 [5.32; 48.97]         |        |                 |
| Lubman 2002           | 0      | 98    | 0.00 (0.00; 36.94)          |        |                 |
| Illes 2004            | 2      | 151   | 13.25 [1.61; 47.02]         |        |                 |
| Tsushima 2005         | 8      | 1113  | 7.19 [3.11; 14.11]          |        |                 |
| Alpha 2006            | 7      | 656   | 10.67 [4.30; 21.86]         |        |                 |

Heterogeneity: $I^2 = 94\%$, $q^2 = 0.0037$, $p < 0.01$
### Meningioma

| Study                | Events | Total | Events per 1000 observations | Events | 95%−CI          |
|----------------------|--------|-------|-----------------------------|--------|---------------|
| Serag 2020           | 19     | 753   |                             | 25.23  | [15.26; 39.12]|
| Wang 2021            | 3      | 579   |                             | 5.18   | [1.07; 15.07] |
| Hanna 2020           | 0      | 126   |                             | 0.00   | [0.00; 29.08] |
| Vazquez–Justes 2020  | 2      | 289   |                             | 6.92   | [0.84; 24.77] |
| Glasmacher 2019      | 1      | 514   |                             | 1.95   | [0.05; 10.79] |
| Li 2019              | 5      | 562   |                             | 8.90   | [2.89; 20.64] |
| Bos 2016             | 143    | 5800  |                             | 24.66  | [20.82; 28.98]|
| Li 2021              | 0      | 11679 |                             | 0.00   | [0.00; 0.02]  |
| Weber 2006           | 0      | 2536  |                             | 0.00   | [0.00; 1.45]  |
| Cohrs 2018           | 0      | 568   |                             | 0.00   | [0.00; 6.46]  |
| Altukkustani 2020    | 8      | 275   |                             | 29.09  | [12.64; 56.51]|
| Katzman1999          | 0      | 1000  |                             | 0.00   | [0.00; 3.68]  |
| Ohnizuka 2001        | 6      | 4000  |                             | 1.50   | [0.55; 3.26]  |
| Koncz 2018           | 6      | 400   |                             | 15.00  | [5.52; 32.36] |
| Lee 2006             | 14     | 2164  |                             | 6.47   | [3.54; 10.83] |
| Brugulat–Serrat 2017 | 10     | 575   |                             | 17.39  | [8.37; 31.75] |
| Boutet 2017          | 10     | 503   |                             | 19.88  | [9.57; 36.26] |
| Haberg 2016          | 10     | 1006  |                             | 9.94   | [4.78; 18.20] |
| Kaiser 2015          | 0      | 114   |                             | 0.00   | [0.00; 31.84] |
| Gleszczkowski 2014   | 3      | 666   |                             | 4.50   | [0.93; 13.11] |
| Gur 2013             | 0      | 1400  |                             | 0.00   | [0.00; 2.63]  |
| Sandeman 2013        | 5      | 700   |                             | 7.14   | [2.32; 16.59] |
| Potchen 2013         | 0      | 98    |                             | 0.00   | [0.00; 3.70]  |
| Reneman 2012         | 0      | 297   |                             | 0.00   | [0.00; 18.01] |
| Hartwigsen 2010      | 0      | 206   |                             | 0.00   | [0.00; 17.75] |
| Lubman 2002          | 0      | 98    |                             | 0.00   | [0.00; 36.94] |
| ilies 2004           | 0      | 151   |                             | 0.00   | [0.00; 24.13] |
| Tsushima 2005        | 1      | 1119  |                             | 0.90   | [0.02; 5.00]  |

Heterogeneity: $\chi^2 = 95\%$, $\chi^2 = 0.0038$, $p < 0.01$

### Pituitary

| Study                | Events | Total | Events per 1000 observations | Events | 95%−CI          |
|----------------------|--------|-------|-----------------------------|--------|---------------|
| Serag 2020           | 9      | 753   |                             | 11.95  | [5.48; 22.57] |
| Wang 2021            | 11     | 579   |                             | 19.00  | [9.52; 33.74] |
| Hanna 2020           | 1      | 125   |                             | 8.00   | [0.20; 43.77] |
| Vazquez–Justes 2020  | 1      | 289   |                             | 3.46   | [0.99; 19.13] |
| Keuss 2019           | 1      | 471   |                             | 2.12   | [0.05; 11.77] |
| Glasmacher 2019      | 1      | 514   |                             | 1.95   | [0.05; 10.79] |
| Li 2019              | 0      | 562   |                             | 0.00   | [0.00; 6.54]  |
| Bos 2016             | 27     | 5800  |                             | 4.66   | [3.07; 6.77]  |
| Li 2021              | 11     | 11679 |                             | 0.94   | [0.47; 1.68]  |
| Weber 2006           | 4      | 2536  |                             | 1.58   | [0.43; 4.03]  |
| Cohrs 2018           | 0      | 569   |                             | 0.00   | [0.00; 6.46]  |
| Altukkustani 2020    | 2      | 275   |                             | 7.27   | [0.88; 26.02] |
| Katzman1999          | 0      | 1000  |                             | 0.00   | [0.00; 3.68]  |
| Ohnizuka 2001        | 3      | 4000  |                             | 0.75   | [0.15; 2.19]  |
| Koncz 2018           | 0      | 400   |                             | 0.00   | [0.00; 9.18]  |
| Lee 2006             | 1      | 2164  |                             | 0.46   | [0.01; 2.57]  |
| Brugulat–Serrat 2017 | 2      | 575   |                             | 3.48   | [0.42; 12.51] |
| Hoggard 2009         | 1      | 525   |                             | 1.90   | [0.05; 10.57] |
| Boutet 2017          | 2      | 503   |                             | 3.98   | [0.48; 14.29] |
| Haberg 2016          | 3      | 1006  |                             | 2.98   | [0.62; 8.69]  |
| Kaiser 2015          | 0      | 114   |                             | 0.00   | [0.00; 31.84] |
| Gur 2013             | 0      | 1400  |                             | 0.00   | [0.00; 2.63]  |
| Sandeman 2013        | 2      | 700   |                             | 2.86   | [0.35; 10.28] |
| Potchen 2013         | 0      | 96    |                             | 0.00   | [0.00; 37.70] |
| Reneman 2012         | 0      | 203   |                             | 0.00   | [0.00; 18.01] |
| Hartwigsen 2010      | 2      | 206   |                             | 9.71   | [1.18; 34.63] |
| Lubman 2002          | 0      | 98    |                             | 0.00   | [0.00; 36.94] |
| ilies 2004           | 0      | 151   |                             | 0.00   | [0.00; 24.13] |
| Tsushima 2005        | 3      | 1113  |                             | 2.70   | [0.56; 7.86]  |

Heterogeneity: $\chi^2 = 69\%$, $\chi^2 = 0.0005$, $p < 0.01$
### Glioma

| Study                  | Events | Total | Events per 1000 observations | Events | 95%−CI       |
|------------------------|--------|-------|-----------------------------|--------|--------------|
| Serag 2020             | 11     | 753   |                             | 14.61  | [7.31; 25.99]|
| Wang 2021              | 4      | 579   |                             | 6.91   | [1.89; 17.59]|
| Hanna 2020             | 0      | 125   |                             | 0.00   | [0.00; 29.08]|
| Vazquez−Justes 2020    | 2      | 289   |                             | 6.92   | [0.84; 24.77]|
| Keuss 2019             | 1      | 514   |                             | 1.95   | [0.05; 10.79]|
| Glasmacher 2019        | 0      | 562   |                             | 0.00   | [0.00; 6.54] |
| Li 2019                | 1      | 580   |                             | 1.03   | [0.38; 2.25] |
| Bos 2018               | 34     | 11679 |                             | 2.91   | [2.02; 4.07] |
| Weber 2006             | 1      | 2536  |                             | 0.39   | [0.01; 2.20] |
| Cohrs 2018             | 2      | 569   |                             | 3.51   | [0.43; 12.64]|
| Alturkustani 2020      | 1      | 275   |                             | 3.64   | [0.09; 20.09]|
| Katzman1999            | 3      | 1000  |                             | 3.00   | [0.62; 8.74] |
| Onizuka 2001           | 1      | 400   |                             | 0.25   | [0.01; 1.39] |
| Koncz 2018             | 1      | 400   |                             | 2.50   | [0.06; 13.85]|
| Lee 2008               | 0      | 216   |                             | 0.00   | [0.00; 1.70] |
| Haberg 2016            | 1      | 1006  |                             | 0.99   | [0.03; 5.53] |
| Kaiser 2015            | 0      | 114   |                             | 0.00   | [0.00; 31.84]|
| Cieszanowski 2014      | 1      | 666   |                             | 1.50   | [0.04; 8.34] |
| Gur 2013               | 0      | 1400  |                             | 0.00   | [0.00; 2.63] |
| Sanderman 2013         | 0      | 700   |                             | 0.00   | [0.00; 5.26] |
| Potchen 2013           | 0      | 96    |                             | 0.00   | [0.00; 37.70]|
| Reneman 2012           | 0      | 203   |                             | 0.00   | [0.00; 18.01]|
| Hartwigsen 2010        | 0      | 206   |                             | 0.00   | [0.00; 17.75]|
| Lubman 2002            | 0      | 98    |                             | 0.00   | [0.00; 36.94]|
| Ilies 2004             | 0      | 151   |                             | 0.00   | [0.00; 24.13]|
| Tsushima 2005          | 0      | 1113  |                             | 0.00   | [0.00; 3.31] |

Heterogeneity: $I^2 = 0.88$, $t^2 = 0.0009$, $p < 0.05$

### Other neoplasm

| Study                  | Events | Total | Events per 1000 observations | Events | 95%−CI       |
|------------------------|--------|-------|-----------------------------|--------|--------------|
| Serag 2020             | 11     | 753   |                             | 14.61  | [7.31; 25.99]|
| Wang 2021              | 4      | 579   |                             | 6.91   | [1.89; 17.59]|
| Hanna 2020             | 0      | 125   |                             | 0.00   | [0.00; 29.08]|
| Vazquez−Justes 2020    | 2      | 289   |                             | 6.92   | [0.84; 24.77]|
| Glasmacher 2019        | 1      | 514   |                             | 1.95   | [0.05; 10.79]|
| Li 2019                | 0      | 562   |                             | 0.00   | [0.00; 6.54] |
| Bos 2016               | 11     | 580   |                             | 1.90   | [0.95; 3.89] |
| Li 2021                | 1      | 11679 |                             | 0.00   | [0.00; 0.32] |
| Weber 2006             | 4      | 2536  |                             | 1.58   | [0.43; 4.03] |
| Cohrs 2018             | 0      | 569   |                             | 0.00   | [0.00; 6.46] |
| Alturkustani 2020      | 1      | 275   |                             | 3.64   | [0.09; 20.09]|
| Yilmaz 2014            | 1      | 449   |                             | 2.23   | [0.06; 12.35]|
| Katzman1999            | 1      | 1000  |                             | 1.00   | [0.03; 5.56] |
| Onizuka 2001           | 0      | 400   |                             | 0.00   | [0.00; 0.92] |
| Koncz 2018             | 7      | 400   |                             | 17.50  | [7.06; 35.72]|
| Lee 2008               | 0      | 216   |                             | 0.00   | [0.00; 1.70] |
| Brugulat−Serrat 2017   | 2      | 575   |                             | 3.48   | [0.42; 12.51]|
| Hoggard 2009           | 4      | 525   |                             | 7.62   | [2.08; 19.39]|
| Boutet 2017            | 2      | 503   |                             | 3.98   | [0.48; 14.29]|
| Haberg 2016            | 0      | 1006  |                             | 0.00   | [0.00; 3.66] |
| Kaiser 2015            | 2      | 114   |                             | 17.54  | [2.13; 61.94]|
| Gur 2013               | 0      | 1400  |                             | 0.00   | [0.00; 2.63] |
| Sanderman 2013         | 3      | 700   |                             | 4.29   | [0.88; 12.47]|
| Potchen 2013           | 0      | 96    |                             | 0.00   | [0.00; 37.70]|
| Reneman 2012           | 0      | 203   |                             | 0.00   | [0.00; 18.01]|
| Hartwigsen 2010        | 0      | 206   |                             | 0.00   | [0.00; 17.75]|
| Lubman 2002            | 1      | 98    |                             | 10.20  | [0.26; 55.54]|
| Ilies 2004             | 0      | 151   |                             | 0.00   | [0.00; 24.13]|
| Tsushima 2005          | 1      | 1113  |                             | 0.90   | [0.02; 5.00] |
| Alphs 2006             | 6      | 656   |                             | 9.15   | [3.36; 19.80]|

Heterogeneity: $I^2 = 81%$, $t^2 = 0.0009$, $p < 0.05$
## Chiari malformation

| Study      | Events | Total | Events per 1000 observations | Events | 95%–CI |
|------------|--------|-------|------------------------------|--------|--------|
| Serag 2020 | 6      | 753   |                              | 7.97   | [2.93; 17.26] |
| Wang 2021  | 0      | 579   |                              | 0.00   | [0.00; 6.35]  |
| Hanna 2020 | 1      | 125   |                              | 8.00   | [0.20; 43.77] |
| Vazquez–Justes 2020 | 1 | 289   |                              | 3.46   | [0.09; 19.13] |
| Glasmacher 2019 | 0 | 514   |                              | 0.00   | [0.00; 7.15]  |
| Li 2019    | 0      | 562   |                              | 0.00   | [0.00; 6.54]  |
| Li 2021    | 23     | 11679 |                              | 1.97   | [1.25; 2.95]  |
| Weber 2006 | 43     | 2536  |                              | 16.96  | [12.30; 22.77]|
| Cohrs 2018 | 0      | 569   |                              | 0.00   | [0.00; 6.46]  |
| Alturkustani 2020 | 1 | 275   |                              | 3.64   | [0.09; 20.09] |
| Yilmaz 2014 | 3      | 449   |                              | 6.68   | [1.38; 19.40] |
| Katzmann1999 | 0    | 1000  |                              | 0.00   | [0.00; 3.68]  |
| Koncz 2018 | 0      | 400   |                              | 0.00   | [0.00; 9.18]  |
| Lee 2008   | 0      | 2164  |                              | 0.00   | [0.00; 1.70]  |
| Brugulat–Serrat 2017 | 6 | 575   |                              | 10.43  | [3.84; 22.57] |
| Hoggard 2009 | 0    | 525   |                              | 0.00   | [0.00; 7.00]  |
| Boutet 2017 | 0     | 503   |                              | 0.00   | [0.00; 7.31]  |
| Haberg 2016 | 2      | 1006  |                              | 1.99   | [0.24; 7.16]  |
| Kaiser 2015 | 2     | 114   |                              | 17.54  | [2.13; 61.94] |
| SoeMar 2013 | 16   | 375   |                              | 42.67  | [24.58; 68.36]|
| Sanderman 2013 | 1 | 700   |                              | 1.43   | [0.04; 7.93]  |
| Potchen 2013 | 0    | 96    |                              | 0.00   | [0.00; 3.70]  |
| Reneman 2012 | 2    | 203   |                              | 9.85   | [1.20; 35.13] |
| Hartwigsen 2010 | 2 | 206   |                              | 9.71   | [1.18; 34.63] |
| Lubman 2002 | 0      | 98    |                              | 0.00   | [0.00; 36.94] |
| Tsushima 2005 | 0   | 1113  |                              | 0.00   | [0.00; 3.31]  |

Heterogeneity: \( I^2 = 85\% \), \( \chi^2 = 0.0017 \), \( p < 0.01 \)
## Supplementary Table I
Results of univariable meta-regressions for each analysis.

| Var         | Analysis               | Studies | N      | β     | 95%CI                  | R²    | p-value |
|-------------|------------------------|---------|--------|-------|------------------------|-------|---------|
| Age         | Any neoplastic         | 30      | 39,040 | -0.000316 | (0.000701 - 0.00234)   | 36.72 | 0.079   |
| Male        | Any neoplastic         | 30      | 39,040 | -0.018000 | (-0.221 - 0.0529)      | 2.16  | 0.53    |
| Age         | Any vascular           | 30      | 35,706 | 0.001680 | (8.02e-05 - 0.00189)   | 12.84 | <0.001  |
| Male        | Any vascular           | 30      | 35,706 | -0.140000 | (-0.17 - 0.0935)       | 0.00  | 0.059   |
| Age         | Aneurysm               | 29      | 34,306 | 0.000499 | (0.000531 - 0.00184)   | 38.93 | 0.12    |
| Male        | Aneurysm               | 29      | 34,306 | 0.020900 | (-0.114 - 0.0924)      | 0.00  | 0.65    |
| Age         | Arachnoid cyst         | 30      | 36,367 | 0.000232 | (-0.000995 - 0.000706) | 0.00  | 0.53    |
| Male        | Arachnoid cyst         | 30      | 36,367 | -0.010100 | (-0.135 - 0.157)       | 0.00  | 0.82    |
| Age         | Cavernoma              | 30      | 34,777 | -0.000610 | (-0.000122 - 0.00118)  | 10.20 | 0.55    |
| Male        | Cavernoma              | 30      | 34,777 | -0.262000 | (-0.174 - -0.0102)     | 19.03 | 0.14    |
| Age         | Chiari malformation    | 26      | 27,408 | -0.000561 | (-0.00184 - -0.00019)  | 18.30 | 0.032   |
| Male        | Chiari malformation    | 26      | 27,408 | -0.050300 | (-0.152 - 0.145)       | 0.00  | 0.28    |
| Age         | Glioma                 | 27      | 37,469 | -0.000316 | (-0.000669 - 3.7e-05)  | 25.62 | 0.079   |
| Male        | Glioma                 | 27      | 37,469 | -0.018000 | (-0.0746 - 0.0386)     | 0.00  | 0.53    |
| Age         | Meningioma             | 28      | 38,076 | 0.001680 | (0.000961 - 0.0024)    | 51.64 | <0.001  |
| Male        | Meningioma             | 28      | 38,076 | -0.140000 | (-0.286 - 0.00513)     | 11.77 | 0.059   |
| Age         | Other neoplastic       | 30      | 39,040 | 0.000499 | (-0.000136 - 0.00113)  | 10.39 | 0.12    |
| Male        | Other neoplastic       | 30      | 39,040 | 0.020900 | (-0.0705 - 0.112)      | 0.00  | 0.65    |
| Age         | Other vascular         | 28      | 22,627 | 0.000232 | (-0.00049 - 0.000954)  | 0.00  | 0.53    |
| Male        | Other vascular         | 28      | 22,627 | -0.010100 | (-0.0963 - 0.0761)     | 0.00  | 0.82    |
| Age         | Pineal cyst            | 31      | 32,170 | -0.000610 | (-0.0026 - 0.00138)    | 0.00  | 0.55    |
| Male        | Pineal cyst            | 31      | 32,170 | -0.262000 | (-0.612 - 0.0879)      | 3.91  | 0.14    |
| Age         | Pituitary              | 29      | 38,406 | 0.000561 | (4.95e-05 - 0.00107)   | 26.38 | 0.032   |
| Male        | Pituitary              | 29      | 38,406 | -0.050300 | (-0.141 - 0.0407)      | 0.00  | 0.28    |
### Supplementary Table II

Results of multivariable meta-regressions for each analysis.

| Var         | Analysis                      | Studies | N    | \( \beta \)       | 95%CI                | \( R^2 \) | p-value |
|-------------|-------------------------------|---------|------|-------------------|----------------------|---------|---------|
| Age         | Any neoplastic                | 30      | 39,040 | 0.001500          | (0.000692 - 0.00231) | 38.22   | <0.001 |
| Male        | Any neoplastic                | 30      | 39,040 | -0.078400         | (-0.191 - 0.0338)   | 0.17    |         |
| Age         | Any vascular                  | 30      | 35,706 | 0.000983          | (7.03e-05 - 0.0019) | 11.03   | 0.035  |
| Male        | Any vascular                  | 30      | 35,706 | -0.039100         | (-0.163 - 0.0853)   | 0.54    |         |
| Age         | Aneurysm                      | 29      | 34,306 | 0.001180          | (0.000509 - 0.00185)| 35.96   | <0.001 |
| Male        | Aneurysm                      | 29      | 34,306 | -0.004390         | (-0.0898 - 0.0811)  | 0.92    |         |
| Age         | Arachnoid cyst                | 30      | 36,367 | -0.000140         | (-0.00101 - 0.000731)| 0.00    | 0.75    |
| Male        | Arachnoid cyst                | 30      | 36,367 | 0.008380          | (-0.141 - 0.157)    | 0.91    |         |
| Age         | Cavernoma                     | 30      | 34,777 | 0.000470          | (-0.000142 - 0.00108)| 25.42   | 0.13    |
| Male        | Cavernoma                     | 30      | 34,777 | -0.085900         | (-0.166 - -0.00623) | 0.035   |         |
| Age         | Chiari malformation           | 26      | 27,408 | -0.001030         | (-0.00188 - -0.000179)| 12.87   | 0.018  |
| Male        | Chiari malformation           | 26      | 27,408 | -0.017000         | (-0.154 - 0.12)     | 0.81    |         |
| Age         | Glioma                        | 27      | 37,469 | -0.000378         | (-0.000715 - -3.99e-05)| 45.24   | 0.028  |
| Male        | Glioma                        | 27      | 37,469 | -0.033000         | (-0.083 - 0.0169)   | 0.19    |         |
| Age         | Meningioma                    | 28      | 38,076 | 0.001560          | (0.000838 - 0.00228)| 54.23   | <0.001 |
| Male        | Meningioma                    | 28      | 38,076 | -0.091600         | (-0.204 - 0.021)    | 0.11    |         |
| Age         | Other neoplastic              | 30      | 39,040 | 0.000509          | (-0.000132 - 0.00115)| 8.49    | 0.12    |
| Male        | Other neoplastic              | 30      | 39,040 | 0.025800          | (-0.0615 - 0.113)   | 0.56    |         |
| Age         | Other vascular                | 28      | 22,627 | 0.000222          | (-0.000521 - 0.000966)| 0.00    | 0.56    |
| Male        | Other vascular                | 28      | 22,627 | -0.006650         | (-0.0945 - 0.0812)  | 0.88    |         |
| Age         | Pineal cyst                   | 31      | 32,170 | -0.000603         | (-0.00255 - 0.00135)| 1.82    | 0.54    |
| Male        | Pineal cyst                   | 31      | 32,170 | -0.261000         | (-0.615 - 0.0922)   | 0.15    |         |
| Age         | Pituitary                     | 29      | 38,406 | 0.000511          | (-3.79e-05 - 0.00106)| 17.99   | 0.068  |
| Male        | Pituitary                     | 29      | 38,406 | -0.027100         | (-0.114 - 0.0597)   | 0.54    |         |
Supplementary Figure II

Relationship between proportions for each finding and age in each analysis, containing studies in healthy volunteers only. Points represent the findings of the individual studies, with size of the point proportional to the sample size of the study. The black line represents the fitted restricted cubic spline model, and the shaded area its 95% confidence interval.
### Supplementary Table III

Age-stratified estimates of proportions for each finding from restricted cubic spline models, limited to studies in healthy volunteers only.

| Finding                  | 1   | 5   | 10  | 20  | 30  | 40  | 50  | 60  | 70  | 80  |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| **Vascular**             |     |     |     |     |     |     |     |     |     |     |
| Aneurysm                 | 0   | 0   | 0   | 0   | 0.8 | 0.1 | 5   | 6   | 4   | 3   |
| Cavernoma                | 0   | 0.03| 0.2 | 0.8 | 2   | 3   | 3   | 4   | 5   | 6   |
| Other vascular           | 3   | 2   | 1   | 0.7 | 0.6 | 1   | 2   | 2   | 1   |     |
| Any vascular             | 5   | 5   | 4   | 4   | 7   | 12  | 15  | 15  | 15  | 15  |
| **Neoplastic**           |     |     |     |     |     |     |     |     |     |     |
| Meningioma               | 0   | 0   | 0   | 0.009| 1   | 5   | 9   | 12  | 16  | 16  |
| Pituitary                | 0   | 0.007| 0.5 | 1   | 2   | 2   | 2   | 3   | 4   | 4   |
| Glioma                   | 0.6 | 0.6 | 0.5 | 0.3 | 0.01| 0   | 0   | 0   | 0.05| 0.4 |
| Other neoplastic         | 0   | 0   | 1   | 3   | 2   | 0.4 | 0.8 | 4   | 9   |     |
| Any neoplastic           | 1   | 2   | 4   | 5   | 7   | 9   | 15  | 25  | 36  |     |
| **Chiari malformation**  | 9   | 8   | 7   | 4.7 | 3   | 2   | 1   | 0.6 | 0.07| 0.06|
| Pineal cyst              | 19  | 19  | 20  | 20  | 13  | 2   | 0.4 | 22  | 74  |     |
| Arachnoid cyst           | 13  | 11  | 10  | 6   | 4   | 4   | 5   | 8   | 10  | 12  |
Supplementary Figure III
Relationship between age and proportion of findings derived from conventional linear regression models.
## Supplementary Table IV
Age-stratified estimates of proportions, derived from univariable linear regression models.

| Finding                | Age - Findings /1,000 scans (95%CI) |
|------------------------|-------------------------------------|
|                        | 1 (0 - 0.9) | 0 (0 - 1) | 0 (0 - 1) | 0.005 (0 - 2) | 0.5 (0 - 2) | 1 (0.2 - 3) | 3 (1 - 5) | 4 (2 - 8) | 6 (3 - 11) | 9 (3 - 16) |
| Vascular               |            |          |           |             |             |             |          |          |           |
| Aneurysm               | 0.03 (0 - 3) | 0.1 (0 - 3) | 0.3 (0 - 3) | 0.8 (0 - 4) | 1 (0.07 - 4) | 2 (0.7 - 4) | 3 (1 - 5) | 4 (2 - 7) | 5 (2 - 10) | 7 (2 - 13) |
| Cavernoma              | 0.8 (0 - 7) | 0.9 (0 - 7) | 0.9 (0 - 6) | 1 (0 - 5) | 1 (0 - 4) | 1 (0.04 - 3) | 1 (0.1 - 3) | 1 (0.07 - 4) | 2 (0 - 5) | 2 (0 - 7) |
| Other vascular         | 2 (0 - 10) | 2 (0 - 10) | 3 (0 - 10) | 5 (0.7 - 11) | 6 (2 - 12) | 8 (4 - 13) | 11 (6 - 16) | 13 (7 - 20) | 16 (8 - 26) | 19 (8 - 33) |
| Any vascular           | 0 (0 - 0) | 0 (0 - 0.02) | 0 (0 - 0.2) | 0 (0 - 1) | 0.6 (0 - 2) | 2 (0.8 - 4) | 5 (3 - 8) | 8 (5 - 12) | 12 (7 - 18) | 17 (10 - 25) |
| Meningioma             | 0.0004 (0 - 2) | 0.02 (0 - 2) | 0.09 (0 - 2) | 0.3 (0 - 2) | 0.7 (0.002 - 2) | 1 (0.2 - 2) | 2 (0.6 - 3) | 2 (0.8 - 4) | 3 (0.9 - 5) | 4 (1 - 7) |
| Pituitary              | 0.6 (0 - 2) | 0.5 (0 - 2) | 0.4 (0 - 2) | 0.3 (0 - 1) | 0.2 (0 - 0.7) | 0.06 (0 - 0.4) | 0.007 (0 - 0.3) | 0 (0 - 0.2) | 0 (0 - 0.2) | 0 (0 - 0.3) |
| Glioma                 | 0.07 (0 - 3) | 0.1 (0 - 3) | 0.2 (0 - 3) | 0.4 (0 - 3) | 0.7 (0 - 3) | 1 (0.07 - 3) | 1 (0.2 - 3) | 2 (0.3 - 4) | 2 (0 - 6) | 3 (0.1 - 8) |
| Other neoplastic       | 0.2 (0 - 5) | 0.5 (0 - 6) | 1 (0 - 6) | 3 (0.2 - 8) | 6 (2 - 10) | 9 (5 - 13) | 12 (8 - 17) | 16 (11 - 23) | 21 (13 - 31) | 26 (15 - 40) |
| Any neoplastic         | 7 (1 - 17) | 7 (1 - 15) | 6 (1 - 13) | 4 (1 - 9) | 3 (0.8 - 7) | 2 (0.4 - 5) | 1 (0.03 - 3) | 0.5 (0 - 3) | 0.05 (0 - 2) | 0 (0 - 2) |
| Chiari malformation    | 14 (0 - 56) | 14 (0 - 51) | 13 (0 - 45) | 12 (0.3 - 35) | 10 (0.9 - 28) | 9 (1 - 23) | 8 (0.5 - 22) | 7 (0 - 24) | 6 (0 - 28) | 5 (0 - 33) |
| Pineal cyst            | 6 (0.2 - 16) | 6 (0.4 - 15) | 6 (0.8 - 14) | 6 (2 - 13) | 7 (3 - 12) | 7 (4 - 11) | 7 (4 - 12) | 8 (4 - 13) | 8 (3 - 15) | 9 (3 - 18) |
| Arachnoid cyst         | 14 (0 - 56) | 14 (0 - 51) | 13 (0 - 45) | 12 (0.3 - 35) | 10 (0.9 - 28) | 9 (1 - 23) | 8 (0.5 - 22) | 7 (0 - 24) | 6 (0 - 28) | 5 (0 - 33) |
Supplementary Figure IV
Relationship between age and proportions for each finding, derived from linear regression models adjusted for both age and gender. Models are fitted with gender proportion held at an equal number of males and females.
### Supplementary Table V

Age-stratified estimates of proportions for each finding, derived from multivariable linear regression models adjusted for age and gender proportion. Estimates are derived from predictions assuming each and an equal distribution of males and females.

| Finding              | Findings /1,000 scans (95% CI) |
|----------------------|--------------------------------|
|                      | 1     | 5     | 10    | 20    | 30    | 40    | 50    | 60    | 70    | 80    |
| Vascular             |       |       |       |       |       |       |       |       |       |       |
| Aneurysm             | 0 (0 - 2) | 0 (0 - 2) | 0 (0 - 2) | 0.08 (0 - 3) | 0.7 (0 - 3) | 2 (0.2 - 4) | 3 (1 - 5) | 4 (2 - 8) | 6 (2 - 11) | 8 (3 - 16) |
| Cavernoma            | 0.5 (0 - 5) | 0.7 (0 - 5) | 0.9 (0 - 5) | 1 (0 - 5) | 2 (0.3 - 5) | 3 (1 - 5) | 4 (2 - 6) | 4 (2 - 7) | 5 (2 - 9) | 6 (2 - 12) |
| Other vascular       | 1 (0 - 9) | 1 (0 - 9) | 1 (0 - 8) | 1 (0 - 5) | 1 (0.01 - 4) | 1 (0.1 - 4) | 1 (0.06 - 4) | 2 (0.5 - 5) | 2 (0 - 7) |       |
| Any vascular         | 3 (0 - 12) | 3 (0 - 12) | 4 (0 - 12) | 5 (0.9 - 12) | 7 (3 - 13) | 2 (0.2 - 4) | 3 (1 - 5) | 4 (2 - 8) | 6 (2 - 11) | 8 (3 - 16) |
| Neoplastic           |       |       |       |       |       |       |       |       |       |       |
| Meningioma           | 0 (0 - 0.1) | 0 (0 - 0.3) | 0 (0 - 0.7) | 0.02 (0 - 2) | 1 (0 - 3) | 3 (1 - 5) | 5 (3 - 8) | 8 (5 - 12) | 12 (7 - 18) | 16 (9 - 25) |
| Pituitary            | 0.04 (0 - 2) | 0.09 (0 - 2) | 0.2 (0 - 2) | 0.5 (0 - 2) | 0.8 (0.002 - 2) | 1 (0.2 - 3) | 2 (0.6 - 3) | 2 (0.8 - 4) | 3 (0.9 - 6) | 3 (0.9 - 7) |
| Glioma               | 0.9 (0.003 - 3) | 0.8 (0.003 - 2) | 0.7 (0.002 - 2) | 0.4 (0.0004 - 1) | 0.3 (0.0 - 0.9) | 0.1 (0 - 0.6) | 0.02 (0 - 0.3) | 0 (0 - 0.2) | 0 (0 - 0.2) |       |
| Other neoplastic     | 0.07 (0 - 4) | 0.1 (0 - 4) | 0.2 (0 - 3) | 0.5 (0 - 3) | 0.7 (0 - 3) | 1 (0.04 - 3) | 1 (0.2 - 3) | 2 (0.3 - 5) | 2 (0.2 - 6) | 3 (0.1 - 8) |
| Any neoplastic       | 0.4 (0 - 6) | 0.9 (0 - 7) | 2 (0 - 7) | 4 (0.3 - 9) | 6 (2 - 11) | 9 (5 - 14) | 12 (8 - 18) | 16 (11 - 24) | 21 (13 - 31) | 26 (15 - 40) |
| Chiari malformation  | 6 (0.7 - 17) | 6 (0.7 - 15) | 5 (0.6 - 13) | 4 (0.6 - 9) | 3 (0.5 - 7) | 2 (0.2 - 4) | 1 (0.003 - 3) | 0.4 (0 - 3) | 0.06 (0 - 2) | 0 (0 - 2) |
| Pineal cyst          | 17 (0 - 61) | 17 (0.01 - 55) | 16 (0.2 - 49) | 14 (1 - 39) | 12 (2 - 31) | 11 (2 - 26) | 9 (1 - 24) | 8 (0.03 - 26) | 7 (0 - 29) | 6 (0 - 34) |
| Arachnoid cyst       | 5 (0.01 - 16) | 5 (0.1 - 16) | 6 (0.4 - 15) | 6 (1 - 13) | 6 (2 - 12) | 7 (3 - 11) | 7 (4 - 12) | 8 (4 - 13) | 8 (3 - 15) | 9 (3 - 18) |
Supplementary Figure V
Funnel plots for each analysis. Funnel plots are plots of sample size versus log odds, as conventional funnel plots may be inaccurate in estimates of rare proportions.

Vascular findings

Neoplastic findings

Other findings
**Supplementary Table VI**
Regression coefficients for publication year (newer versus older) from multivariable meta-regression models additionally adjusted for age.

| Analysis            | $\beta$ (95%CI)                                                                 | p-value |
|---------------------|--------------------------------------------------------------------------------|---------|
| **Vascular**        |                                                                                   |         |
| Aneurysm            | -0.000774 (-0.00301 - 0.00147)                                                    | 0.498   |
| Cavernoma           | 0.00171 (-0.000445 - 0.00386)                                                     | 0.120   |
| Other vascular      | -0.000431 (-0.0029 - 0.00204)                                                     | 0.732   |
| Any vascular        | 3.73e-05 (-0.00323 - 0.00331)                                                     | 0.982   |
| **Neoplastic**      |                                                                                   |         |
| Meningioma          | 0.00289 (0.000934 - 0.00485)                                                      | 0.004   |
| Pituitary           | 0.00166 (0.00023 - 0.00308)                                                       | 0.023   |
| Glioma              | 0.000947 (7.06e-05 - 0.00182)                                                     | 0.034   |
| Other neoplastic    | 0.00102 (-0.00102 - 0.00307)                                                     | 0.326   |
| Any neoplastic      | 0.00416 (0.00206 - 0.00627)                                                       | <0.001  |
| **Chiari malformation** |                                                                                   |         |
| Pineal cyst         | 0.00302 (-0.00462 - 0.0107)                                                      | 0.438   |
| Arachnoid cyst      | 0.00122 (-0.00194 - 0.00438)                                                     | 0.450   |
Supplementary Table VII
Proportions (findings per 1,000 scans) for each analysis with versus without contrast estimated from meta-regression regression models additionally adjusted for age. Proportions relate to the median age for the analysis in question.

| Analysis          | $\beta$ (95%CI)       | Contrast          | No contrast       | p-value |
|-------------------|-----------------------|-------------------|-------------------|---------|
| **Vascular**      |                       |                   |                   |         |
| Aneurysm          | 0.0111 (-0.0224 - 0.0447) | 2.87 (0.466 - 6.68) | 1.62 (0.086 - 4.34) | 0.515   |
| Cavernoma         | -0.00663 (-0.0385 - 0.0252) | 2.66 (0.409 - 6.24) | 3.51 (1.22 - 6.67) | 0.683   |
| Other vascular    | 0.0067 (-0.0258 - 0.0392) | 1.08 (0 - 3.73)   | 0.561 (0 - 2.61)  | 0.686   |
| Any vascular      | -0.0026 (-0.0472 - 0.042) | 8.25 (2.82 - 16)  | 8.76 (3.87 - 15.3) | 0.909   |
| **Neoplastic**    |                       |                   |                   |         |
| Meningioma        | 0.0056 (-0.0298 - 0.041) | 6.44 (2.54 - 11.8) | 5.5 (2.21 - 9.96) | 0.756   |
| Pituitary         | 0.00537 (-0.019 - 0.0297) | 2.45 (0.621 - 5.11)| 1.85 (0.528 - 3.73)| 0.666   |
| Glioma            | -0.00526 (-0.0211 - 0.0105) | 0.0484 (0 - 0.645)| 0.244 (0 - 0.951)| 0.514   |
| Other neoplastic  | -0.00105 (-0.0321 - 0.03) | 1.82 (0.0913 - 4.9)| 1.93 (0.285 - 4.53)| 0.947   |
| Any neoplastic    | 0.00215 (-0.0394 - 0.0437) | 13.2 (6.56 - 21.8)| 12.7 (7.03 - 19.7)| 0.919   |
| **Chiari malformation** | 0.0153 (-0.026 - 0.0567) | 4.01 (0.607 - 9.52)| 2.06 (0.0606 - 5.8)| 0.467   |
| Pineal cyst       | 0.0445 (-0.147 - 0.0578) | 2.99 (0 - 20.1)   | 10.7 (1.06 - 28.1) | 0.394   |
| Arachnoid cyst    | 0.0242 (-0.0175 - 0.0658) | 11.5 (5.03 - 20.1) | 6.63 (2.89 - 11.6) | 0.255   |