

THE LANCET

Supplementary appendix

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Supplement to: Evans JT, Evans JP, Walker RW, Blom AW, Whitehouse MR, Sayers A.
How long does a hip replacement last? A systematic review and meta-analysis of case
series and national registry reports with more than 15 years of follow-up. *Lancet* 2019;
393: 647-54.

Web Extra Material

Table 1: Search strategy formatted for search of Medline on Ovid Silver Platter

Hip replacement

Hip Prosthesis/ OR Arthroplasty, Replacement, Hip/ OR

(hip adj2 arthroplast\$.mp) OR (hip adj2 replacement?.mp) OR

THA.mp OR THR.mp OR (TJR\$.mp AND hip\$.mp)

AND

Survival

Prosthesis Failure/ OR Survival Analysis/ OR

cox.mp OR proportional?hazard?.mp OR proportional hazard?.mp OR

cumulative?incidence?function.mp OR cumulative incidence function.mp OR CIF.mp OR

failure.mp OR

survival.mp OR survivor?ship.mp OR

revision?.mp OR

re?operation.mp OR re operation.mp OR

Kaplan?meier.mp OR Kaplan meier.mp OR KM.mp OR

product?limit?method.mp OR product limit method.mp

AND

Case-series

exp Cohort Studies/ OR

follow?up.mp OR follow up.mp OR series.mp OR cohort.mp OR

registry.mp OR registries.mp

AND

Long-term (minimum 15 years)

long?term.mp OR long term.mp OR

(1#* adj1 year?.mp) OR (2#* adj1 year?.mp) OR (3#* adj1 year?.mp) OR (4#* adj1 year?.mp)

Survival Adjacent to Long term (within 20 words) AND Hip replacement AND Case-series

Table 2: Reasons for exclusion at screening

| Reason for exclusion | Number |
|---|--------|
| Insufficient follow-up | 897 |
| Not an article regarding primary THR e.g. revision/osteotomy | 882 |
| No survival analysis | 435 |
| Disease specific cohort other than osteoarthritis | 320 |
| Animal study | 3 |
| Solely paediatric study | 2 |
| n.b. some articles excluded for multiple reasons | |

Table 3: Reasons for exclusion at review of full text

| Reason for exclusion | Number |
|---|--------|
| Insufficient follow-up/no survival analysis | 121 |
| Systematic review | 22 |
| Article based on registry data | 20 |
| Article not in English language | 13 |
| Unable to retrieve full text | 3 |
| Total | 179 |

Table 4: Pooled estimates of survival for each available time point

| Time (years) | Number of series | Total number of hips at start of series | Pooled survival estimate (%) | 95% CI |
|--------------|------------------|---|------------------------------|-----------|
| 15 | 12 | 5792 | 85.7 | 84.9-86.5 |
| 15.9 | 1 | 104 | 98.9 | 96.7-100 |
| 16 | 1 | 84 | 78.0 | 74.0-82.0 |
| 17 | 8 | 1327 | 88.5 | 87.0-90.1 |
| 18 | 2 | 159 | 80.5 | 74.9-86.0 |
| 18.8 | 1 | 105 | 87.0 | 82.6-91.4 |
| 19.8 | 1 | 93 | 79.7 | 70.0-88.0 |
| 20 | 20 | 7192 | 78.8 | 77.8-79.9 |
| 20.8 | 1 | 109 | 84.4 | 56.0-100 |
| 22 | 2 | 386 | 77.3 | 71.8-82.8 |
| 24.6 | 1 | 102 | 87.0 | 77.8-92.7 |
| 25 | 8 | 4617 | 77.6 | 76.0-79.2 |
| 27 | 2 | 1764 | 60.5 | 54.0-67.0 |
| 30 | 5 | 2103 | 62.2 | 58.4-66.1 |
| 35 | 2 | 423 | 71.7 | 65.0-78.3 |
| 40 | 1 | 2000 | 72.0 | 67.0-77.0 |

Table 5: Articles contributing to meta-analysis

| Author | Year of publication | Time point (years post op) | Survival Estimate | Lower confidence interval | Upper confidence interval |
|--|---------------------|----------------------------|-------------------|---------------------------|---------------------------|
| Abdel, M. P. ¹ | 2016 | 40.0 | 72.0 | 67.0 | 77.0 |
| Anseth, S. D. ² | 2010 | 20.0 | 84.7 | 74.7 | 91.5 |
| Belmont, P.J. ³ | 2008 | 20.0 | 74.3 | 67.6 | 81.0 |
| Berry, D. J. ⁴ | 2002 | 15.0 | 89.8 | 88.3 | 91.2 |
| Berry, D. J. ⁴ | 2002 | 20.0 | 84.1 | 82.2 | 85.9 |
| Berry, D. J. ⁴ | 2002 | 25.0 | 80.9 | 78.4 | 83.0 |
| Boyer, B. ⁵ | 2011 | 15.0 | 81.4 | 76.2 | 86.6 |
| Boyer, B. ⁵ | 2011 | 20.0 | 75.4 | 69.2 | 81.5 |
| Boyer, B. ⁵ | 2011 | 22.0 | 73.9 | 67.3 | 80.6 |
| Buckwalter, A. E. ⁶ | 2006 | 25 | 80 | 73 | 87 |
| Busch, V. J. ⁷ | 2012 | 17.0 | 89.0 | 85.0 | 93.0 |
| Callaghan, J. J. ⁸ | 2000 | 27.0 | 76.0 | 63.0 | 89.0 |
| Callaghan, J.J. ⁹ | 2009 | 35.0 | 78.0 | 70.0 | 86.0 |
| Clarius, M. ¹⁰ | 2010 | 17.0 | 75.0 | 65.0 | 85.0 |
| Clarius, M. ¹¹ | 2010 | 17.0 | 49.0 | 41.0 | 57.0 |
| Corten, K. ¹² | 2011 | 15.0 | 66.0 | 61.4 | 70.6 |
| Corten, K. ¹² | 2011 | 20.0 | 47.9 | 41.3 | 54.5 |
| Corten, K. ¹² | 2011 | 15.0 | 79.5 | 75.7 | 83.3 |
| Corten, K. ¹² | 2011 | 20.0 | 69.4 | 64.3 | 74.5 |
| Cruz-Pardos, A. ¹³ | 2017 | 20 | 84.1 | 73.91 | 94.29 |
| Devitt, A. ¹⁴ | 1997 | 20.0 | 75.0 | 66.0 | 84.0 |
| El Masri, F. ¹⁵ | 2010 | 17.0 | 90.5 | 84.2 | 96.8 |
| Georgiades, G. ¹⁶ | 2009 | 25 | 51 | 39 | 62 |
| Georgiades, G. ¹⁶ | 2009 | 30 | 47 | 35 | 59 |
| Gerritsma-Bleeker, C. L. ¹⁷ | 2000 | 15.0 | 91.0 | 86.0 | 97.0 |
| Gerritsma-Bleeker, C. L. ¹⁷ | 2000 | 17.0 | 91.0 | 86.0 | 97.0 |
| Gerritsma-Bleeker, C. L. ¹⁷ | 2000 | 22.0 | 85.0 | 75.0 | 95.0 |
| Hartofilakidis, G. ¹⁸ | 1997 | 16.0 | 78.0 | 74.0 | 82.0 |
| Hartofilakidis, G. ¹⁸ | 1997 | 18.0 | 73.3 | 65.5 | 81.1 |
| Hartofilakidis, G. ¹⁸ | 1997 | 20.0 | 67.0 | 58.0 | 76.0 |
| Hartofilakidis, G. ¹⁹ | 1997 | 17 | 73 | 67.7 | 78.3 |
| Hartofilakidis, G. ¹⁹ | 1997 | 20 | 60 | 51.7 | 68.3 |
| Hartofilakidis, G. ¹⁹ | 1997 | 17 | 86 | 82.5 | 89.5 |
| Hartofilakidis, G. ¹⁹ | 1997 | 20 | 80 | 71.7 | 88.3 |
| Hartofilakidis, G. ²⁰ | 2015 | 20.0 | 73.0 | 67.2 | 78.8 |
| Hartofilakidis, G. ²⁰ | 2015 | 30.0 | 53.0 | 43.2 | 62.8 |
| Ihle, M. ²¹ | 2008 | 19.8 | 79.7 | 70.0 | 88.0 |
| Kang, B. J. ²² | 2015 | 15.9 | 98.9 | 96.7 | 100.0 |
| Kawamura, H. ²³ | 2016 | 24.6 | 87.0 | 77.8 | 92.7 |
| Keener, J. D. ²⁴ | 2003 | 30.0 | 60.0 | 53.0 | 67.0 |

| | | | | | |
|---------------------------------|------|------|------|------|-------|
| Klapach, A.S. ²⁵ | 2001 | 20.0 | 82.0 | 78.0 | 86.0 |
| Kolb, A. ²⁶ | 2012 | 20.0 | 65.0 | 55.0 | 73.0 |
| Lass, R. ²⁷ | 2014 | 18.8 | 87.0 | 82.6 | 91.4 |
| Madey, S.M. ²⁸ | 1997 | 15.0 | 86.0 | 82.0 | 90.0 |
| Mullins, M. M. ²⁹ | 2007 | 15.0 | 89.5 | 87.8 | 91.2 |
| Mullins, M. M. ²⁹ | 2007 | 20.0 | 84.1 | 81.3 | 86.9 |
| Mullins, M. M. ²⁹ | 2007 | 25.0 | 77.4 | 74.2 | 80.6 |
| Mullins, M. M. ²⁹ | 2007 | 30.0 | 73.3 | 67.2 | 79.4 |
| Nercessian, O. A. ³⁰ | 2005 | 15.0 | 84.2 | 81.4 | 87.0 |
| Nercessian, O. A. ³⁰ | 2005 | 20.0 | 66.2 | 60.5 | 71.9 |
| Neumann, L. ³¹ | 1994 | 15.0 | 91.8 | 88.0 | 95.6 |
| Neumann, L. ³¹ | 1994 | 20.0 | 89.3 | 84.6 | 94.0 |
| Petsatodis, G. E. ³² | 2010 | 20.8 | 84.4 | 56.0 | 100.0 |
| Reigstad, O. ³³ | 2008 | 18.0 | 88.0 | 80.0 | 96.0 |
| Schulte, K.R. ³⁴ | 1993 | 20.0 | 80.0 | 72.0 | 88.0 |
| Skutek, M. ³⁵ | 2007 | 25.0 | 83.0 | 77.0 | 89.0 |
| Sochart, D. H. ³⁶ | 1998 | 25.0 | 65.0 | 54.0 | 76.0 |
| Sochart, D. H. ³⁷ | 1997 | 20 | 67 | 61 | 74 |
| Sochart, D. H. ³⁷ | 1997 | 25 | 65 | 58 | 72 |
| Suckel, A. ³⁸ | 2009 | 17.0 | 97.0 | 94.0 | 99.0 |
| Toni, A. ³⁹ | 2017 | 15.0 | 93.2 | 89.0 | 97.3 |
| Trebse, R. ⁴⁰ | 2005 | 15.0 | 48.0 | 44.0 | 52.0 |
| Warth, L.C. ⁴¹ | 2014 | 35.0 | 57.6 | 45.7 | 69.5 |
| Wroblewski, B. M. ⁴² | 2002 | 15.0 | 84.7 | 82.4 | 87.1 |
| Wroblewski, B. M. ⁴² | 2002 | 20.0 | 74.2 | 70.5 | 78.0 |
| Wroblewski, B. M. ⁴² | 2002 | 25.0 | 65.6 | 58.4 | 72.8 |
| Wroblewski, B. M. ⁴² | 2002 | 27.0 | 55.3 | 45.5 | 60.5 |
| Wroblewski, B. M. ⁴² | 2002 | 30.0 | 47.0 | 29.4 | 64.7 |

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Figure 1: Forest plot of estimates for reported survival from case-series with reporting time rounded down to nearest 5 year interval

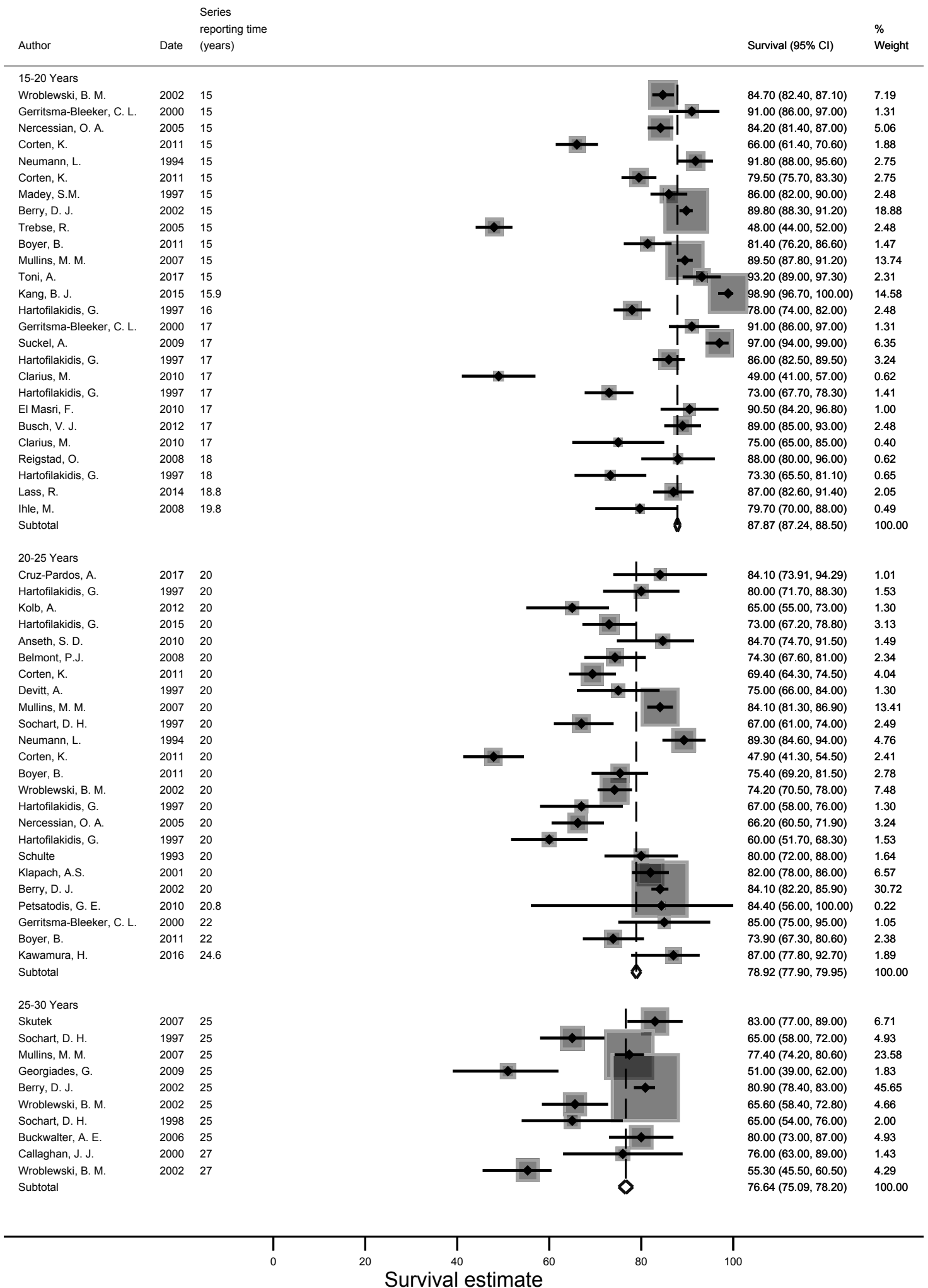


Figure 2: Forest plot of estimates for reported survival from registry annual reports at 15 years

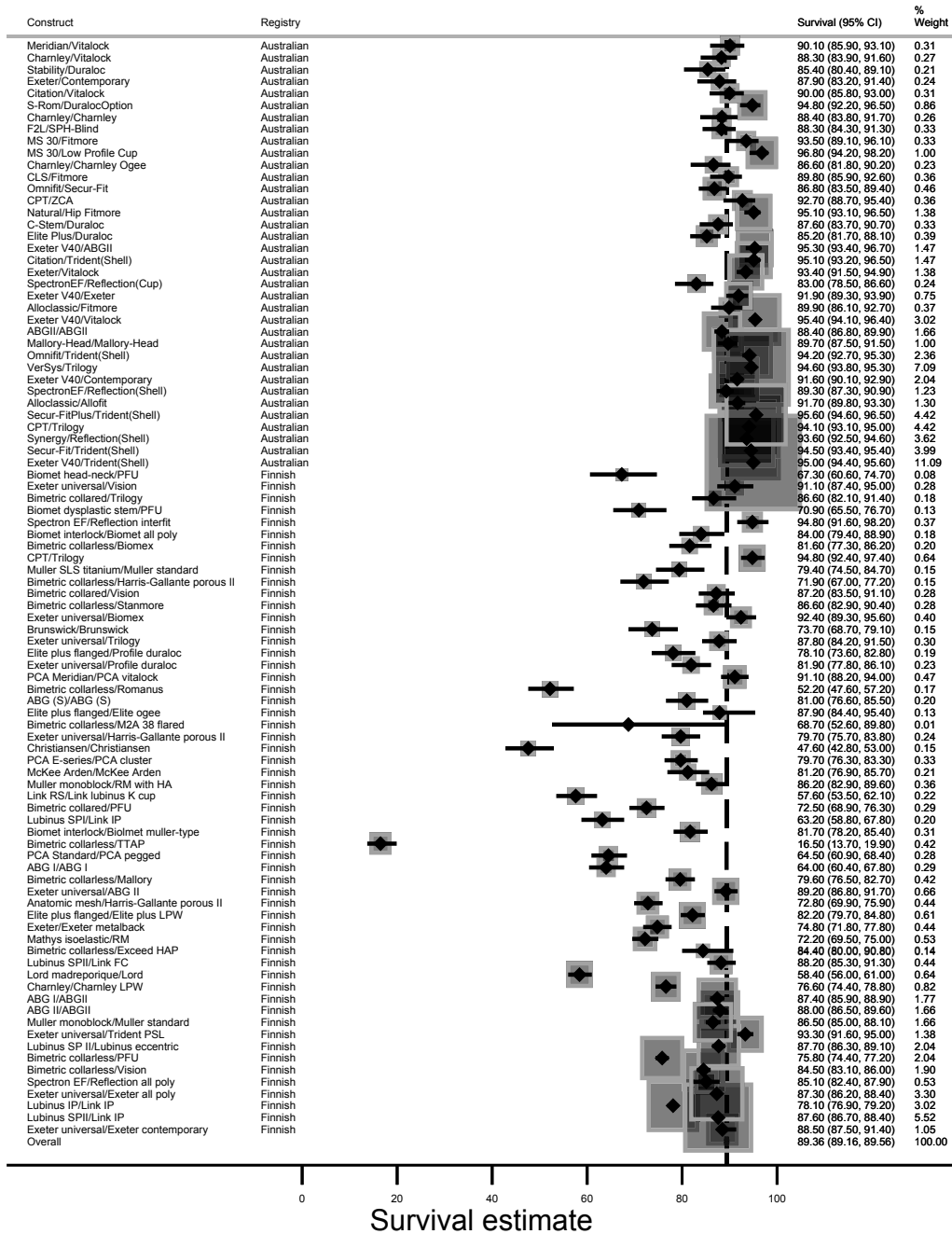


Figure 3: Forest plot of estimates for reported survival from registry annual reports at 20 years

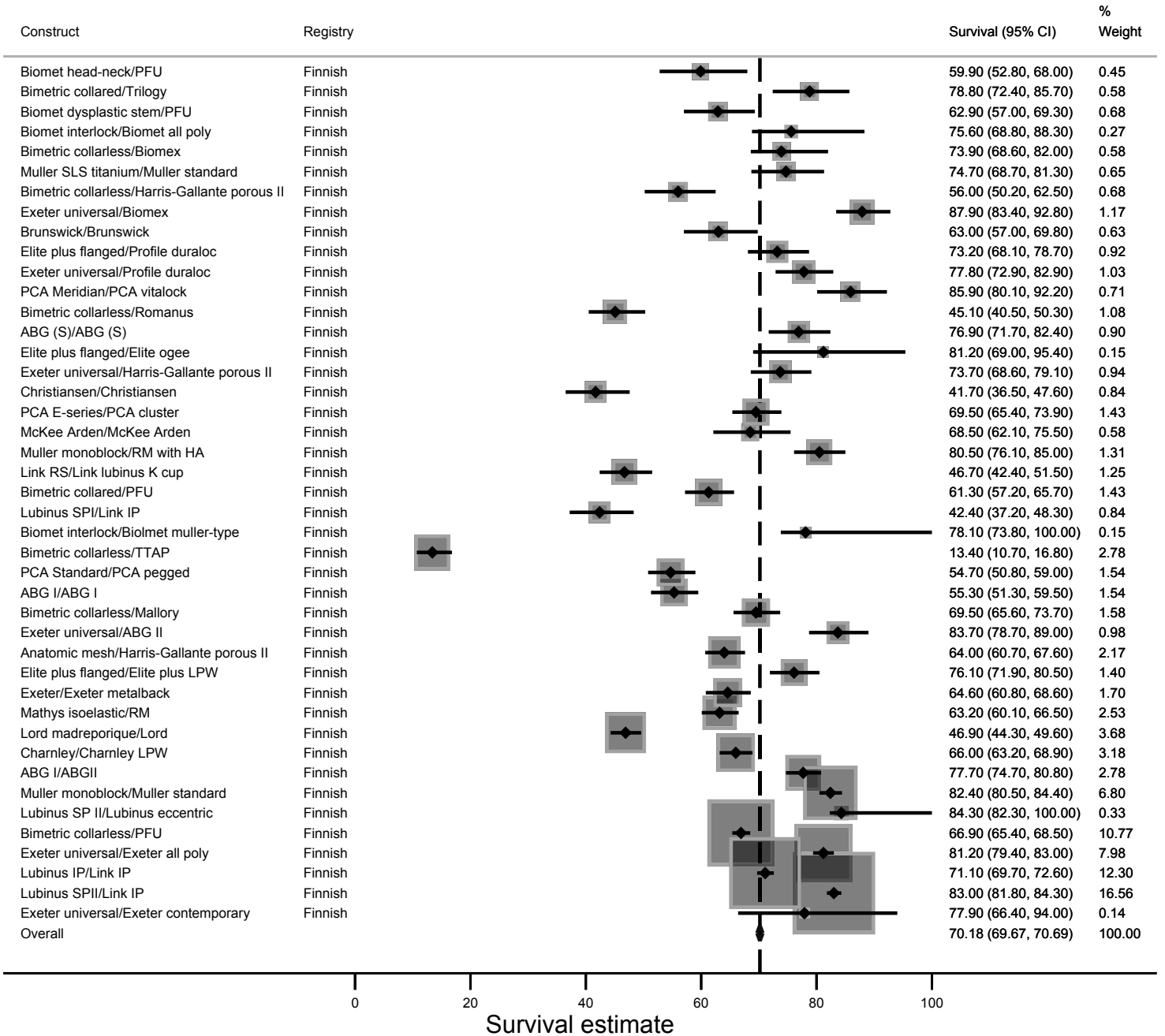


Figure 4: Forest plot of estimates for reported survival of constructs used more than 250 times in 2016 from registry annual reports at 15 years

