***Supplemental Table A. Observed frequencies and unweighted and weighted distributions of baseline demographic and clinical variables of study participants (n=2596), stratified by*** ***presence of pelvic tilt/rotation and rHOA\****

|  | *Hip tilt or rotation and rHOA 4 level group* |
| --- | --- |
|  | *Not excessive, KLG<2 (n=1601)* | *Not excessive, KLG* ≥*2 (n=657)* | *Excessive, KLG<2 (n=235)* | *Excessive, KLG* ≥*2 (n=103)* |
|  | *Unweighted* | *Weighted\** | *Unweighted* | *Weighted\** | *Unweighted* | *Weighted\** | *Unweighted* | *Weighted\** |
| *Characteristic* | *Count* | *Mean or %* | *Mean or %* | *(95% CI)* | *Count* | *Mean or %* | *Mean or %* | *(95% CI)* | *Count* | *Mean or %* | *Mean or %* | *(95% CI)* | *Count* | *Mean or %* | *Mean or %* | *(95% CI)* |
| Age (years) | 1601 | 62.8 | 62.6 | (62.2, 63.1) | 657 | 66.3 | 66.0 | (65.3, 66.7) | 235 | 59.2 | 58.4 | (57.6, 59.2) | 103 | 63.2 | 63.9 | (62.1, 65.8) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Age group: 45-54 | 414 | 25.9% | 27.8% | (25.7, 30.0) | 110 | 16.7% | 19.2% | (16.7, 22.0) | 89 | 37.9% | 42.8% | (38.0, 47.7) | 32 | 31.1% | 30.3% | (24.0, 37.4) |
| Age group: 55-64 | 555 | 34.7% | 31.6% | (29.9, 33.4) | 178 | 27.1% | 25.3% | (22.9, 27.8) | 79 | 33.6% | 30.5% | (26.2, 35.1) | 25 | 24.3% | 22.2% | (16.7, 28.8) |
| Age group: 65-74 | 447 | 27.9% | 29.0% | (27.0, 30.9) | 228 | 34.7% | 34.1% | (31.5, 36.8) | 56 | 23.8% | 23.1% | (19.3, 27.4) | 29 | 28.2% | 28.0% | (22.0, 34.8) |
| Age group: ≥ 75 | 185 | 11.6% | 11.6% | (10.3, 13.1) | 141 | 21.5% | 21.4% | (19.1, 23.8) | 11 | 4.7% | 3.6% | (2.5, 5.2) | 17 | 16.5% | 19.6% | (13.1, 28.1) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Race: Caucasian | 1130 | 70.6% | 84.1% | (81.9, 86.0) | 458 | 69.7% | 81.1% | (78.7, 83.4) | 155 | 66.0% | 80.1% | (76.1, 83.5) | 56 | 54.4% | 68.7% | (62.1, 74.6) |
| Race: African-American | 471 | 29.4% | 15.9% | (14.0, 18.1) | 199 | 30.3% | 18.9% | (16.6, 21.3) | 80 | 34.0% | 19.9% | (16.5, 23.9) | 47 | 45.6% | 31.3% | (25.4, 37.9) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BMI (kg/m2) | 1595 | 28.8 | 28.6 | (28.4, 28.8) | 655 | 28.7 | 28.4 | (28.1, 28.7) | 233 | 28.4 | 28.3 | (27.8, 28.7) | 103 | 28.1 | 27.3 | (26.6, 28.1) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BMI group underweight: < 18.5 | 9 | 0.6% | 0.5% | (0.3, 0.8) | 9 | 1.4% | 1.1% | (0.8, 1.5) | 3 | 1.3% | 1.4% | (0.7, 3.1) | 3 | 2.9% | 3.4% | (1.8, 6.2) |
| BMI group normal: 18.5 - 24.9 | 381 | 23.9% | 23.5% | (22.0, 25.1) | 173 | 26.4% | 27.5% | (25.1, 30.0) | 57 | 24.5% | 23.7% | (20.0, 27.9) | 27 | 26.2% | 29.5% | (22.3, 37.8) |
| BMI group overweight: 25.0 - 29.9 | 653 | 40.9% | 42.8% | (40.9, 44.8) | 222 | 33.9% | 35.1% | (32.7, 37.6) | 90 | 38.6% | 40.3% | (35.8, 44.9) | 42 | 40.8% | 40.2% | (33.6, 47.3) |
| BMI group obese: ≥ 30.0 | 552 | 34.6% | 33.1% | (31.3, 35.0) | 251 | 38.3% | 36.3% | (33.8, 38.9) | 83 | 35.6% | 34.6% | (30.0, 39.5) | 31 | 30.1% | 26.9% | (21.4, 33.3) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sex: Males | 662 | 41.3% | 45.2% | (43.3, 47.1) | 225 | 34.2% | 39.3% | (36.4, 42.3) | 154 | 65.5% | 71.9% | (67.6, 75.7) | 72 | 69.9% | 69.7% | (61.4, 76.8) |
| Sex: Females | 939 | 58.7% | 54.8% | (52.9, 56.7) | 432 | 65.8% | 60.7% | (57.7, 63.6) | 81 | 34.5% | 28.1% | (24.3, 32.4) | 31 | 30.1% | 30.3% | (23.2, 38.6) |

*\* Weighted to the 1990 target population; Radiographic data were available for women only 50 years of age or older; BMI values for 10 participants are missing.*

***Supplemental Table B. Weighted and sex-stratified prevalence estimates of cam morphologies among those with normal pelvic alignment and rHOA (n=657)\****

|  |  |  |
| --- | --- | --- |
|  | *AP alpha angle > 60 degrees* | *Triangular index sign* |
|  | *Unilateral* | *Bilateral* | *Unilateral* | *Bilateral* |
| *Demographic Subgroup* | *%* | *95% CI* | *%* | *95% CI* | *%* | *95% CI* | *%* | *95% CI* |
| Males Overall | 23.4 | (19.9, 27.3) | 26.3 | (22.6, 30.4) | 14.1 | (11.3, 17.4) | 3.8 | (2.3, 6.3) |
| Age group: 45-54 years | 15.2 | (10.3, 21.9) | 33.3 | (25.2, 42.6) | 17.1 | (11.6, 24.5) | 5.7 | (2.4, 12.9) |
| Age group: 55-64 years | 21.4 | (15.6, 28.6) | 17.0 | (12.8, 22.3) | 6.5 | (4.2, 10.0) | 3.9 | (2.2, 6.8) |
| Age group: 65-74 years | 28.5 | (22.3, 35.6) | 26.2 | (20.2, 33.3) | 16.5 | (11.7, 22.8) | 3.3 | (1.3, 8.2) |
| Age group: ≥ 75 years | 35.3 | (25.4, 46.7) | 26.0 | (17.4, 36.9) | 13.9 | (6.8, 26.4) | 0.0 |  |
| Race: Caucasian | 24.7 | (20.5, 29.3) | 27.6 | (23.3, 32.3) | 15.9 | (12.6, 19.9) | 3.8 | (2.1, 6.6) |
| Race: African-American | 17.8 | (13.0, 23.9) | 20.5 | (14.8, 27.5) | 5.8 | (3.5, 9.5) | 4.1 | (1.6, 10.3) |
| BMI group underweight: < 18.5 kg/m2 | 0.0 |  | 0.0 |  | 0.0 |  | 0.0 |  |
| BMI group normal: 18.5 - 24.9 kg/m2 | 26.3 | (19.1, 34.9) | 31.5 | (24.8, 39.1) | 11.1 | (7.2, 16.7) | 0.0 |  |
| BMI group overweight: 25.0 - 29.9 kg/m2 | 19.9 | (15.2, 25.7) | 27.8 | (22.2, 34.2) | 19.6 | (14.7, 25.5) | 5.3 | (2.9, 9.4) |
| BMI group obese: ≥ 30.0 kg/m2 | 26.2 | (19.6, 34.1) | 20.0 | (13.7, 28.1) | 9.7 | (5.6, 16.3) | 5.6 | (2.4, 12.7) |
| Females Overall | 15.4 | (13.4, 17.6) | 9.4 | (7.6, 11.5) | 3.7 | (2.7, 5.0) | 0.3 | (0.2, 0.7) |
| Age group: 50-54 years | 16.1 | (10.8, 23.4) | 7.3 | (4.3, 12.3) | 5.3 | (2.9, 9.2) | 0.0 |  |
| Age group: 55-64 years | 14.5 | (11.1, 18.9) | 7.3 | (4.9, 10.8) | 2.7 | (1.2, 5.9) | 0.8 | (0.3, 2.3) |
| Age group: 65-74 years | 15.0 | (12.2, 18.4) | 7.8 | (5.8, 10.5) | 1.1 | (0.6, 2.0) | 0.0 |  |
| Age group: ≥ 75 years | 16.3 | (12.7, 20.6) | 14.2 | (10.2, 19.3) | 7.1 | (4.6, 11.0) | 0.5 | (0.2, 1.2) |
| Race: Caucasian | 15.1 | (12.8, 17.8) | 9.3 | (7.3, 11.8) | 3.3 | (2.2, 5.0) | 0.3 | (0.1, 0.8) |
| Race: African-American | 16.3 | (13.0, 20.3) | 9.8 | (7.3, 13.2) | 5.1 | (3.6, 7.1) | 0.7 | (0.3, 1.7) |
| BMI group underweight: < 18.5 kg/m2 | 39.2 | (24.8, 55.8) | 0.0 |  | 0.0 |  | 0.0 |  |
| BMI group normal: 18.5 - 24.9 kg/m2 | 13.0 | (10.1, 16.5) | 9.1 | (6.2, 13.2) | 2.6 | (1.6, 4.2) | 0.0 |  |
| BMI group overweight: 25.0 - 29.9 kg/m2 | 16.7 | (12.8, 21.6) | 13.4 | (9.7, 18.2) | 7.1 | (4.4, 11.2) | 1.1 | (0.5, 2.3) |
| BMI group obese: ≥ 30.0 kg/m2 | 15.0 | (12.5, 18.0) | 7.0 | (5.2, 9.3) | 1.9 | (1.2, 3.1) | 0.0 |  |

*\* Weighted to the 1990 target population; Radiographic data were available for women only 50 years of age or older; BMI values for 10 participants are missing; no data for AP alpha angle or triangular index in 4 participants*

***Supplemental Table C. Weighted and sex-stratified prevalence estimates of pincer morphologies among those with normal pelvic alignment and rHOA (n=657)\****

|  |  |  |  |
| --- | --- | --- | --- |
|  | *LCEA ≤ 25 degrees* | *LCEA > 40 degrees* | *Protrusio acetabula* |
|  | *Unilateral* | *Bilateral* | *Unilateral* | *Bilateral* | *Unilateral* | *Bilateral* |
| *Demographic Subgroup* | *%* | *95% CI* | *%* | *95% CI* | *%* | *95% CI* | *%* | *95% CI* | *%* | *95% CI* | *%* | *95% CI* |
| Males Overall | 22.0 | (18.7, 25.6) | 14.0 | (11.3, 17.3) | 8.4 | (6.3, 11.1) | 3.9 | (2.2, 6.9) | 0.2 | (0.1, 0.6) |  |  |
| Age group: 45-54 years | 24.4 | (18.0, 32.1) | 14.2 | (9.4, 20.8) | 4.7 | (2.6, 8.5) | 7.7 | (3.5, 15.8) | 0.0 |  |  |  |
| Age group: 55-64 years | 11.5 | (7.1, 18.3) | 16.3 | (10.5, 24.5) | 7.7 | (3.7, 15.0) | 3.2 | (0.8, 11.8) | 0.0 |  |  |  |
| Age group: 65-74 years | 29.1 | (23.0, 36.1) | 10.7 | (7.2, 15.6) | 10.5 | (6.4, 16.7) | 1.3 | (0.7, 2.2) | 0.6 | (0.2, 1.9) |  |  |
| Age group: ≥ 75 years | 15.3 | (9.5, 23.7) | 18.9 | (10.5, 31.7) | 14.1 | (9.0, 21.4) | 2.7 | (0.9, 7.6) | 0.0 |  |  |  |
| Race: Caucasian | 23.5 | (19.7, 27.7) | 14.6 | (11.4, 18.5) | 8.7 | (6.3, 12.0) | 4.3 | (2.2, 7.9) | 0.0 |  |  |  |
| Race: African-American | 15.2 | (10.8, 21.0) | 11.5 | (7.5, 17.3) | 6.9 | (4.4, 10.9) | 2.4 | (1.4, 4.1) | 1.2 | (0.4, 3.6) |  |  |
| BMI group underweight: < 18.5 kg/m2 | 0.0 |  | 0.0 |  | 100.0 |  | 0.0 |  | 0.0 |  |  |  |
| BMI group normal: 18.5 - 24.9 kg/m2 | 24.2 | (18.6, 30.9) | 14.3 | (10.4, 19.3) | 10.7 | (6.8, 16.3) | 1.6 | (0.8, 3.4) | 0.0 |  |  |  |
| BMI group overweight: 25.0 - 29.9 kg/m2 | 14.6 | (10.4, 20.2) | 17.5 | (12.9, 23.3) | 6.8 | (4.1, 11.2) | 2.9 | (0.9, 8.9) | 0.5 | (0.2, 1.5) |  |  |
| BMI group obese: ≥ 30.0 kg/m2 | 30.8 | (22.9, 40.0) | 7.4 | (3.6, 14.6) | 7.5 | (4.3, 12.9) | 7.7 | (3.5, 16.0) | 0.0 |  |  |  |
| Females Overall | 11.7 | (9.7, 13.9) | 7.0 | (5.7, 8.6) | 9.9 | (8.0, 12.2) | 8.2 | (6.5, 10.5) | 12.9 | (10.9, 15.2) | 3.1 | (2.0, 5.0) |
| Age group: 50-54 years | 10.0 | (5.1, 18.6) | 10.7 | (7.0, 16.2) | 5.5 | (2.8, 10.4) | 2.0 | (1.1, 3.6) | 4.8 | (2.2, 10.3) | 2.0 | (1.1, 3.6) |
| Age group: 55-64 years | 17.2 | (13.1, 22.2) | 5.6 | (3.9, 8.1) | 3.2 | (1.8, 5.8) | 5.6 | (3.5, 8.7) | 12.3 | (8.8, 16.9) | 3.4 | (1.7, 6.4) |
| Age group: 65-74 years | 9.8 | (7.3, 13.2) | 7.8 | (5.8, 10.3) | 12.4 | (8.8, 17.3) | 8.3 | (5.8, 11.7) | 14.2 | (10.9, 18.4) | 3.0 | (1.1, 7.8) |
| Age group: ≥ 75 years | 9.3 | (6.5, 13.2) | 5.9 | (3.2, 10.5) | 15.0 | (10.8, 20.3) | 13.2 | (8.8, 19.2) | 15.1 | (11.5, 19.7) | 3.6 | (1.5, 8.7) |
| Race: Caucasian | 11.9 | (9.6, 14.6) | 5.7 | (4.4, 7.4) | 8.4 | (6.5, 10.7) | 7.0 | (5.1, 9.6) | 10.1 | (8.2, 12.3) | 2.5 | (1.3, 4.9) |
| Race: African-American | 10.9 | (8.5, 13.9) | 12.3 | (8.5, 17.3) | 16.4 | (11.2, 23.3) | 13.4 | (10.3, 17.2) | 24.9 | (20.3, 30.2) | 5.8 | (3.6, 9.2) |
| BMI group underweight: < 18.5 kg/m2 | 13.8 | (6.3, 27.6) | 0.0 |  | 7.1 | (2.4, 19.1) | 0.0 |  | 34.2 | (17.9, 55.3) | 0.0 | (., .) |
| BMI group normal: 18.5 - 24.9 kg/m2 | 8.8 | (5.7, 13.4) | 3.1 | (1.9, 5.0) | 12.3 | (8.1, 18.1) | 6.8 | (3.8, 11.9) | 11.0 | (7.8, 15.2) | 1.4 | (0.6, 3.3) |
| BMI group overweight: 25.0 - 29.9 kg/m2 | 13.9 | (10.6, 18.0) | 6.2 | (4.2, 9.1) | 7.7 | (5.1, 11.6) | 5.9 | (4.1, 8.4) | 15.3 | (11.5, 20.1) | 0.4 | (0.1, 1.1) |
| BMI group obese: ≥ 30.0 kg/m2 | 11.8 | (8.5, 16.3) | 10.4 | (8.1, 13.4) | 10.2 | (7.5, 13.9) | 11.4 | (8.1, 15.8) | 11.7 | (8.9, 15.3) | 6.6 | (3.9, 11.0) |

*\* Weighted to the 1990 target population; Radiographic data were available for women only 50 years of age or older; BMI values for 10 participants are missing; no data for LCEA in 1 participant, missing protrusio for 15 participants*

***Supplemental Table D. Weighted and sex-stratified prevalence estimates of dysplasia morphology, defined as LCEA ≤ 20 degrees, among those with normal pelvic alignment and no rHOA (n=1601)\****

|  |  |  |
| --- | --- | --- |
|  |  | *LCEA ≤ 20 degrees**Unilateral Bilateral* |
| *Demographic Subgroup* | *%* | *95% CI* | *%* | *95% CI* |
| Males Overall | 8.5 | (7.0, 10.2) | 1.6 | (1.0, 2.5) |
| Age group: 45-54 years | 9.5 | (7.0, 12.8) | 2.3 | (1.2, 4.2) |
| Age group: 55-64 years | 7.5 | (5.4, 10.5) | 1.6 | (0.7, 3.8) |
| Age group: 65-74 years | 7.3 | (5.1, 10.3) | 0.0 |  |
| Age group: ≥ 75 years | 10.4 | (6.2, 17.0) | 2.8 | (0.8, 9.8) |
| Race: Caucasian | 8.5 | (6.9, 10.5) | 1.4 | (0.8, 2.5) |
| Race: African-American | 8.1 | (5.7, 11.2) | 2.4 | (1.5, 3.9) |
| BMI group underweight: < 18.5 kg/m2 | 0.0 |   | 0.0 |  |
| BMI group normal: 18.5 - 24.9 kg/m2 | 11.1 | (7.9, 15.3) | 1.4 | (0.4, 4.1) |
| BMI group overweight: 25.0 - 29.9 kg/m2 | 9.1 | (6.9, 11.8) | 1.0 | (0.4, 2.3) |
| BMI group obese: ≥ 30.0 kg/m2 | 5.8 | (3.9, 8.5) | 2.4 | (1.1, 5.0) |
| Females Overall | 5.8 | (4.8, 7.0) | 3.1 | (2.4, 4.0) |
| Age group: 50-54 years | 8.6 | (6.0, 12.1) | 5.1 | (3.0, 8.4) |
| Age group: 55-64 years | 7.4 | (5.5, 9.9) | 3.9 | (2.8, 5.4) |
| Age group: 65-74 years | 3.7 | (2.3, 5.8) | 2.0 | (1.2, 3.1) |
| Age group: ≥ 75 years | 3.0 | (1.6, 5.8) | 1.0 | (0.4, 2.4) |
| Race: Caucasian | 5.5 | (4.4, 6.8) | 3.0 | (2.2, 4.0) |
| Race: African-American | 7.3 | (5.6, 9.5) | 3.6 | (2.3, 5.7) |
| BMI group underweight: < 18.5 kg/m2 | 19.7 | (5.6, 50.4) | 0.0 | (., .) |
| BMI group normal: 18.5 - 24.9 kg/m2 | 7.7 | (5.5, 10.9) | 3.9 | (2.6, 6.0) |
| BMI group overweight: 25.0 - 29.9 kg/m2 | 5.7 | (4.2, 7.7) | 1.8 | (1.1, 3.2) |
| BMI group obese: ≥ 30.0 kg/m2 | 4.5 | (3.3, 6.1) | 3.9 | (2.8, 5.6) |

*\* Weighted to the 1990 target population; Radiographic data were available for women only 50 years of age or older; BMI values for 10 participants are missing; no data for LCEA in 1 participant, missing protrusio for 15 participants*