

Supplementary Table 3. Percentile of UttMACr

|    | Total             |                     |                   |                     |                   |                     | Workers          |                  |                  | Non-smoker        |                     | Smoker            |                   |
|----|-------------------|---------------------|-------------------|---------------------|-------------------|---------------------|------------------|------------------|------------------|-------------------|---------------------|-------------------|-------------------|
|    | 3rd (2015–2017)   |                     | 4th (2018–2020)   |                     | 5th (2021–2023)   |                     | 3rd              | 4th              | 5th              | 3rd–5th           | 3rd–5th             | 3rd–5th           | 3rd–5th           |
|    | Male<br>(n=1,525) | Female<br>(n=1,808) | Male<br>(n=1,778) | Female<br>(n=2,008) | Male<br>(n=1,826) | Female<br>(n=2,113) | All<br>(n=1,985) | All<br>(n=2,377) | All<br>(n=2,488) | Male<br>(n=3,305) | Female<br>(n=5,508) | Male<br>(n=1,825) | Female<br>(n=421) |
| 1  | 13.1              | 16.5                | 11.7              | 14.2                | 9.9               | 10.5                | 15.9             | 12.2             | 10.2             | 9.9               | 11.6                | 12.7              | 14.4              |
| 2  | 17.9              | 22.1                | 13.7              | 17.1                | 10.8              | 12.1                | 19.8             | 14.9             | 11.6             | 11.2              | 13.9                | 15.3              | 15.2              |
| 3  | 19.8              | 25.2                | 14.9              | 19.1                | 11.9              | 13.9                | 23.2             | 16.7             | 12.7             | 12.2              | 14.9                | 18.8              | 16.5              |
| 4  | 23.1              | 27.9                | 16.1              | 20.4                | 12.8              | 14.6                | 26.1             | 18.1             | 13.3             | 12.8              | 16.3                | 20.0              | 20.0              |
| 5  | 24.7              | 29.6                | 17.3              | 21.5                | 13.2              | 15.4                | 28.5             | 19.6             | 14.3             | 13.4              | 18.1                | 20.7              | 21.6              |
| 6  | 27.2              | 32.8                | 18.5              | 23.5                | 14.0              | 15.9                | 30.0             | 20.8             | 15.3             | 14.1              | 19.1                | 22.2              | 24.7              |
| 7  | 28.9              | 35.0                | 19.9              | 24.2                | 15.0              | 17.7                | 31.5             | 21.8             | 16.0             | 15.1              | 19.7                | 23.4              | 26.4              |
| 8  | 30.4              | 36.2                | 20.8              | 24.7                | 15.5              | 18.8                | 33.2             | 22.7             | 17.1             | 15.6              | 20.7                | 26.5              | 27.5              |
| 9  | 31.8              | 36.6                | 21.7              | 25.4                | 16.2              | 19.2                | 34.8             | 23.8             | 18.1             | 16.2              | 21.7                | 27.8              | 28.6              |
| 10 | 34.0              | 38.0                | 22.6              | 26.2                | 16.9              | 19.7                | 36.2             | 24.5             | 18.9             | 16.7              | 22.5                | 29.1              | 29.2              |
| 11 | 35.7              | 39.7                | 23.6              | 27.0                | 17.6              | 20.6                | 37.8             | 25.5             | 19.6             | 17.3              | 23.1                | 31.0              | 31.0              |
| 12 | 36.7              | 42.0                | 24.5              | 27.7                | 18.3              | 21.6                | 39.6             | 26.6             | 20.6             | 18.1              | 23.9                | 32.1              | 32.5              |
| 13 | 39.4              | 43.8                | 25.6              | 28.7                | 19.0              | 22.0                | 41.9             | 27.4             | 21.4             | 18.5              | 24.3                | 33.3              | 35.0              |
| 14 | 41.0              | 45.5                | 26.8              | 29.6                | 19.5              | 22.5                | 43.8             | 28.3             | 21.9             | 19.3              | 25.0                | 34.4              | 36.9              |
| 15 | 43.2              | 46.1                | 27.7              | 30.4                | 20.2              | 23.0                | 45.9             | 29.2             | 22.5             | 19.9              | 25.5                | 35.6              | 37.3              |
| 16 | 45.2              | 47.4                | 28.4              | 31.0                | 21.0              | 23.5                | 47.7             | 30.3             | 23.0             | 20.9              | 26.3                | 37.4              | 38.1              |
| 17 | 47.3              | 48.8                | 28.8              | 32.1                | 21.9              | 24.1                | 49.4             | 30.9             | 23.5             | 21.6              | 27.1                | 39.4              | 38.2              |
| 18 | 48.6              | 49.4                | 30.2              | 32.6                | 22.5              | 24.8                | 50.6             | 32.3             | 24.5             | 22.1              | 27.7                | 40.7              | 38.8              |
| 19 | 50.2              | 50.9                | 30.8              | 33.3                | 23.2              | 25.5                | 51.7             | 32.6             | 25.2             | 22.8              | 28.6                | 41.3              | 40.4              |
| 20 | 51.5              | 51.7                | 31.5              | 34.2                | 24.4              | 26.2                | 53.5             | 33.2             | 25.7             | 23.5              | 29.2                | 42.5              | 41.8              |
| 21 | 53.0              | 53.2                | 32.6              | 35.1                | 25.4              | 26.9                | 55.5             | 34.0             | 26.6             | 24.3              | 29.7                | 43.3              | 42.3              |
| 22 | 54.8              | 54.6                | 32.9              | 36.0                | 26.0              | 27.4                | 56.8             | 34.9             | 27.3             | 25.3              | 30.3                | 44.8              | 44.0              |
| 23 | 56.1              | 56.2                | 33.7              | 36.8                | 26.9              | 28.4                | 58.4             | 35.7             | 27.7             | 25.7              | 30.9                | 45.6              | 45.7              |
| 24 | 57.4              | 57.4                | 34.1              | 37.3                | 27.3              | 28.8                | 59.3             | 36.7             | 28.6             | 26.5              | 32.1                | 46.2              | 47.4              |
| 25 | 58.6              | 59.5                | 35.2              | 38.3                | 28.0              | 29.2                | 61.0             | 37.3             | 29.4             | 27.1              | 32.6                | 47.7              | 47.9              |
| 26 | 59.3              | 60.7                | 35.8              | 38.9                | 29.0              | 29.7                | 63.1             | 38.3             | 30.0             | 27.5              | 33.6                | 48.8              | 48.5              |
| 27 | 61.7              | 62.7                | 36.7              | 39.4                | 29.5              | 30.2                | 64.8             | 38.8             | 30.7             | 28.2              | 34.4                | 49.8              | 51.0              |
| 28 | 63.2              | 63.9                | 38.0              | 40.4                | 30.3              | 30.9                | 66.1             | 39.3             | 31.7             | 28.6              | 35.2                | 51.7              | 52.9              |
| 29 | 64.6              | 65.6                | 38.9              | 40.8                | 30.9              | 32.1                | 67.4             | 40.0             | 32.4             | 29.2              | 36.0                | 53.2              | 54.7              |
| 30 | 66.1              | 66.9                | 39.5              | 41.9                | 31.7              | 32.9                | 69.2             | 40.8             | 32.9             | 30.1              | 36.6                | 53.8              | 55.4              |
| 31 | 67.1              | 69.2                | 40.6              | 43.0                | 32.4              | 34.2                | 71.2             | 41.4             | 33.7             | 30.5              | 37.1                | 54.9              | 55.9              |
| 32 | 68.6              | 71.1                | 41.0              | 43.9                | 33.2              | 35.1                | 72.6             | 42.3             | 34.7             | 30.9              | 37.6                | 56.0              | 56.5              |
| 33 | 70.5              | 73.2                | 41.7              | 44.7                | 33.9              | 35.6                | 74.4             | 42.9             | 35.4             | 31.6              | 38.3                | 57.8              | 57.4              |
| 34 | 71.5              | 75.3                | 42.6              | 45.4                | 34.6              | 36.5                | 76.6             | 44.2             | 36.1             | 32.3              | 38.9                | 58.8              | 58.3              |
| 35 | 72.2              | 77.5                | 43.7              | 46.0                | 35.2              | 36.8                | 79.5             | 45.3             | 36.9             | 32.8              | 39.6                | 60.1              | 59.7              |
| 36 | 73.8              | 79.4                | 45.2              | 47.3                | 36.0              | 37.4                | 81.8             | 45.7             | 37.6             | 33.3              | 40.2                | 61.1              | 61.0              |
| 37 | 76.0              | 81.1                | 45.8              | 48.2                | 36.7              | 37.7                | 83.3             | 46.2             | 38.3             | 34.0              | 40.8                | 62.1              | 62.2              |
| 38 | 77.8              | 82.6                | 46.3              | 49.3                | 37.3              | 38.2                | 85.4             | 47.6             | 39.1             | 34.4              | 41.7                | 63.1              | 63.7              |
| 39 | 80.3              | 85.1                | 47.6              | 50.0                | 38.4              | 38.7                | 86.6             | 48.5             | 40.2             | 35.2              | 42.5                | 64.5              | 63.9              |
| 40 | 82.9              | 86.9                | 48.5              | 50.8                | 39.6              | 39.6                | 87.7             | 50.0             | 41.4             | 35.7              | 43.5                | 66.1              | 64.1              |
| 41 | 84.1              | 89.4                | 49.9              | 52.3                | 40.7              | 40.1                | 90.1             | 51.5             | 42.1             | 36.4              | 44.1                | 67.5              | 64.5              |
| 42 | 86.2              | 91.6                | 51.7              | 53.2                | 41.5              | 40.6                | 92.2             | 53.0             | 42.8             | 36.8              | 45.0                | 68.1              | 65.1              |
| 43 | 87.4              | 92.4                | 53.3              | 54.2                | 42.4              | 41.6                | 94.5             | 53.6             | 43.9             | 37.5              | 45.6                | 68.6              | 66.2              |
| 44 | 88.4              | 95.3                | 54.7              | 54.9                | 43.4              | 42.1                | 96.5             | 54.7             | 44.9             | 38.5              | 46.4                | 71.2              | 67.4              |
| 45 | 91.0              | 97.3                | 55.9              | 55.5                | 44.3              | 42.8                | 99.4             | 56.0             | 45.5             | 39.3              | 47.3                | 72.3              | 67.9              |
| 46 | 93.8              | 100.5               | 57.2              | 56.7                | 45.1              | 44.0                | 101.0            | 57.2             | 46.1             | 40.0              | 48.0                | 73.4              | 71.0              |
| 47 | 96.4              | 101.1               | 58.8              | 57.8                | 45.9              | 44.7                | 102.8            | 58.1             | 47.4             | 40.8              | 49.0                | 74.7              | 72.4              |
| 48 | 98.8              | 102.8               | 60.0              | 58.7                | 47.2              | 45.5                | 104.2            | 59.1             | 48.0             | 41.5              | 50.0                | 76.0              | 74.1              |
| 49 | 101.3             | 105.3               | 61.1              | 59.5                | 47.9              | 46.1                | 105.8            | 60.3             | 49.2             | 42.3              | 50.9                | 77.3              | 75.3              |
| 50 | 103.3             | 106.6               | 62.5              | 60.6                | 48.9              | 46.8                | 107.1            | 62.0             | 50.1             | 43.2              | 52.1                | 78.0              | 77.1              |
| 51 | 104.3             | 108.3               | 63.5              | 62.0                | 49.6              | 47.5                | 109.2            | 62.8             | 51.6             | 44.3              | 53.1                | 79.2              | 77.9              |
| 52 | 105.6             | 109.7               | 65.6              | 63.3                | 51.1              | 48.4                | 112.6            | 64.0             | 53.1             | 45.2              | 54.2                | 80.7              | 78.6              |
| 53 | 108.4             | 110.9               | 67.4              | 64.5                | 52.7              | 49.3                | 115.0            | 66.0             | 54.0             | 45.8              | 55.1                | 81.8              | 79.2              |
| 54 | 112.7             | 113.0               | 68.1              | 65.7                | 53.3              | 50.1                | 116.8            | 67.5             | 55.1             | 46.7              | 56.0                | 83.0              | 80.5              |
| 55 | 115.1             | 114.5               | 70.1              | 66.6                | 54.4              | 51.4                | 119.1            | 68.6             | 56.1             | 47.6              | 57.7                | 84.2              | 81.6              |
| 56 | 117.3             | 116.7               | 72.2              | 67.8                | 55.3              | 52.6                | 121.4            | 70.9             | 57.5             | 48.5              | 58.7                | 85.4              | 82.5              |
| 57 | 120.8             | 118.5               | 73.9              | 69.3                | 56.2              | 54.0                | 124.5            | 72.0             | 58.8             | 49.3              | 59.7                | 87.3              | 82.8              |
| 58 | 124.5             | 120.6               | 75.4              | 70.6                | 57.7              | 55.4                | 126.4            | 73.8             | 60.1             | 51.1              | 61.0                | 89.6              | 85.4              |
| 59 | 125.7             | 123.0               | 76.7              | 71.9                | 59.0              | 56.8                | 128.7            | 74.9             | 61.6             | 52.6              | 62.5                | 91.1              | 86.0              |
| 60 | 128.3             | 127.1               | 78.3              | 72.8                | 60.2              | 58.6                | 131.5            | 76.1             | 63.4             | 53.8              | 63.8                | 92.1              | 87.7              |
| 61 | 131.3             | 129.5               | 80.0              | 74.3                | 61.9              | 59.6                | 133.3            | 78.1             | 64.6             | 54.8              | 65.5                | 93.5              | 89.0              |

|    |       |        |       |       |       |       |       |       |       |       |       |       |       |
|----|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 62 | 133.7 | 133.0  | 81.3  | 75.2  | 63.5  | 61.0  | 135.7 | 79.9  | 66.5  | 55.7  | 66.7  | 94.6  | 91.6  |
| 63 | 137.3 | 135.6  | 82.6  | 77.3  | 65.5  | 62.8  | 141.9 | 82.2  | 67.6  | 57.1  | 68.1  | 96.1  | 94.5  |
| 64 | 141.9 | 139.1  | 84.1  | 79.1  | 66.5  | 63.8  | 145.2 | 83.8  | 69.2  | 58.6  | 69.5  | 97.0  | 98.8  |
| 65 | 145.1 | 144.5  | 85.3  | 81.0  | 68.0  | 65.6  | 149.2 | 85.7  | 71.9  | 59.8  | 71.1  | 98.2  | 100.3 |
| 66 | 147.6 | 150.7  | 87.6  | 82.7  | 69.8  | 67.0  | 153.3 | 87.9  | 73.9  | 61.5  | 72.6  | 99.8  | 106.7 |
| 67 | 150.3 | 152.8  | 90.9  | 85.7  | 72.0  | 68.2  | 156.7 | 91.0  | 76.2  | 63.4  | 74.6  | 101.4 | 112.2 |
| 68 | 155.0 | 156.8  | 92.7  | 87.7  | 73.5  | 69.7  | 160.4 | 92.8  | 77.7  | 65.5  | 76.2  | 102.3 | 112.5 |
| 69 | 158.5 | 161.4  | 94.5  | 89.0  | 75.9  | 72.2  | 162.0 | 95.2  | 79.4  | 66.9  | 79.0  | 103.7 | 113.6 |
| 70 | 161.4 | 164.3  | 96.9  | 91.6  | 77.6  | 74.8  | 164.7 | 97.2  | 81.2  | 68.3  | 80.3  | 106.0 | 117.1 |
| 71 | 163.9 | 168.5  | 99.4  | 93.6  | 79.2  | 77.8  | 167.5 | 99.6  | 82.5  | 71.1  | 82.3  | 106.8 | 119.0 |
| 72 | 166.6 | 172.5  | 102.2 | 96.3  | 81.2  | 79.6  | 173.3 | 102.3 | 84.3  | 73.8  | 85.3  | 109.4 | 124.2 |
| 73 | 173.2 | 177.8  | 103.9 | 98.2  | 83.1  | 81.0  | 176.8 | 103.6 | 86.6  | 75.6  | 87.4  | 113.4 | 131.7 |
| 74 | 175.7 | 182.1  | 106.4 | 100.1 | 84.6  | 82.4  | 181.8 | 104.8 | 88.9  | 77.7  | 89.1  | 116.1 | 134.8 |
| 75 | 180.9 | 189.1  | 108.2 | 102.5 | 86.7  | 85.6  | 187.8 | 107.0 | 90.2  | 80.6  | 92.1  | 118.4 | 136.8 |
| 76 | 184.0 | 193.4  | 114.5 | 104.3 | 89.7  | 87.4  | 192.2 | 113.8 | 92.3  | 82.4  | 95.4  | 120.3 | 139.7 |
| 77 | 191.7 | 199.1  | 117.0 | 107.3 | 91.2  | 89.7  | 200.2 | 116.9 | 94.5  | 83.9  | 97.7  | 123.0 | 141.5 |
| 78 | 200.2 | 207.8  | 118.9 | 114.6 | 92.9  | 93.9  | 207.1 | 119.6 | 97.0  | 85.6  | 100.3 | 124.9 | 147.5 |
| 79 | 206.3 | 221.7  | 121.6 | 118.5 | 94.6  | 97.2  | 209.7 | 121.8 | 99.7  | 89.0  | 103.1 | 128.4 | 157.6 |
| 80 | 209.3 | 225.4  | 124.5 | 121.8 | 96.8  | 100.7 | 224.9 | 124.7 | 102.0 | 91.8  | 105.4 | 131.3 | 163.3 |
| 81 | 221.6 | 242.3  | 126.0 | 127.3 | 99.4  | 104.9 | 228.5 | 128.1 | 104.5 | 93.9  | 110.4 | 134.4 | 163.8 |
| 82 | 227.2 | 254.0  | 130.3 | 131.2 | 101.9 | 108.3 | 234.0 | 131.4 | 108.1 | 98.9  | 114.7 | 139.7 | 164.7 |
| 83 | 230.8 | 267.6  | 133.6 | 138.0 | 103.1 | 112.2 | 242.8 | 137.3 | 111.9 | 102.6 | 119.1 | 143.8 | 166.6 |
| 84 | 238.1 | 275.0  | 137.3 | 141.9 | 106.1 | 115.0 | 250.8 | 141.6 | 115.0 | 105.1 | 122.5 | 149.5 | 169.6 |
| 85 | 243.9 | 286.4  | 143.7 | 147.4 | 111.7 | 119.4 | 268.4 | 149.5 | 120.7 | 112.6 | 126.9 | 153.7 | 180.9 |
| 86 | 250.7 | 300.1  | 149.3 | 150.8 | 115.4 | 123.5 | 274.4 | 151.5 | 124.0 | 117.1 | 132.0 | 157.7 | 186.7 |
| 87 | 265.9 | 312.7  | 153.4 | 164.2 | 121.7 | 126.8 | 288.5 | 159.8 | 131.6 | 121.7 | 140.2 | 161.8 | 195.2 |
| 88 | 273.0 | 343.9  | 160.7 | 173.4 | 128.3 | 133.0 | 304.6 | 172.4 | 141.8 | 127.4 | 145.3 | 170.2 | 196.9 |
| 89 | 288.4 | 366.7  | 165.5 | 183.6 | 137.2 | 141.7 | 315.4 | 181.1 | 147.8 | 134.4 | 150.4 | 177.7 | 209.3 |
| 90 | 304.6 | 383.9  | 175.3 | 192.6 | 144.1 | 145.3 | 338.6 | 189.0 | 157.9 | 143.5 | 161.4 | 183.9 | 234.5 |
| 91 | 317.7 | 399.8  | 185.5 | 205.9 | 154.0 | 152.7 | 372.0 | 198.5 | 162.9 | 149.2 | 176.0 | 192.0 | 256.7 |
| 92 | 338.7 | 424.1  | 192.4 | 225.8 | 160.5 | 164.1 | 394.8 | 212.9 | 176.8 | 160.8 | 189.2 | 202.1 | 262.9 |
| 93 | 370.9 | 445.3  | 210.9 | 243.6 | 167.1 | 178.7 | 409.3 | 229.5 | 185.8 | 169.3 | 203.4 | 217.6 | 266.1 |
| 94 | 391.4 | 496.7  | 226.2 | 260.9 | 182.7 | 197.0 | 440.6 | 251.4 | 204.8 | 183.1 | 224.4 | 234.9 | 273.2 |
| 95 | 406.2 | 528.3  | 249.1 | 275.9 | 207.8 | 214.6 | 478.8 | 263.5 | 225.5 | 208.6 | 242.4 | 252.9 | 285.4 |
| 96 | 456.9 | 599.2  | 264.5 | 292.1 | 227.9 | 233.5 | 518.3 | 284.7 | 246.7 | 229.8 | 264.0 | 290.6 | 300.6 |
| 97 | 508.1 | 709.3  | 292.4 | 334.4 | 261.6 | 263.7 | 632.0 | 320.8 | 288.1 | 258.2 | 298.5 | 321.8 | 305.4 |
| 98 | 605.7 | 920.0  | 333.2 | 422.1 | 318.6 | 332.6 | 722.2 | 378.7 | 367.8 | 293.7 | 379.3 | 368.6 | 371.1 |
| 99 | 741.3 | 1179.3 | 429.4 | 671.1 | 405.7 | 432.8 | 996.7 | 492.7 | 447.1 | 430.7 | 522.8 | 408.9 | 503.5 |

UttMACr: creatinine-adjusted urinary trans,trans-muconic acid (µg/g Cr). Weighted percentiles using sampling weights.  
Total: all participants with urinary creatinine 0.3–3.0 g/L (excl. students/military). Workers: Economically active (occupation groups 1–8) population.  
Non-smoker: COT < 50 µg/L AND self-reported never or former smoker. Smoker: COT ≥ 50 µg/L OR self-reported current smoker. Both pooled across cycles 3–5.