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| **Additional File 1. Trends in Proportions of MMN Supplement Use by Demographic Characteristics in Chaoyang District, Beijing, 2013-2017** |
|  | 2013 |  | 2014 |  | 2015 |  | 2016 |  | 2017 | Annual percent change (95 % CI)\* | P for heterogeneity\* |
|  | Users/Total | P (%) |  | Users/Total | P (%) |  | Users/Total | P (%) |  | Users/Total | P (%) |  | Users/Total | P (%) |
| Overall | 21212/37201 | 57.0 |  | 22722/36430 | 62.4 |  | 27811/46311 | 60.1 |  | 23428/38888 | 60.2 |  | 24465/38516 | 63.5 | 1.5 (1.2, 1.7) |  |
| Age (years) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | <0.001 |
|  < 25 | 1528/3644 | 41.9 |  | 1520/3258 | 46.7 |  | 1748/3565 | 49.0 |  | 1208/2385 | 50.7 |  | 1216/2169 | 56.1 | 5.7 (4.5, 7.0) |  |
|  25-29 | 9029/15941 | 56.6 |  | 8191/13116 | 62.5 |  | 11299/19270 | 58.6 |  | 8299/14078 | 59.0 |  | 8460/13783 | 61.4 | 1.1 (0.6, 1.5) |  |
|  30-34 | 8483/14020 | 60.5 |  | 9530/14781 | 64.5 |  | 10519/16763 | 62.8 |  | 9126/14583 | 62.6 |  | 9466/14341 | 66.0 | 1.7 (1.3, 2.1) |  |
|  35-39 | 1889/3122 | 60.5 |  | 3082/4683 | 65.8 |  | 3709/5872 | 63.2 |  | 4098/6713 | 61.1 |  | 4531/6962 | 65.1 | 0.7 (-0.1, 1.4) |  |
|  ≥ 40 | 283/474 | 59.7 |  | 399/592 | 67.4 |  | 536/841 | 63.7 |  | 697/1129 | 61.7 |  | 792/1261 | 62.8 | -0.4 (-2.2, 1.5) |  |
| Educational level |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | <0.001 |
|  < High school | 1281/3703 | 34.6 |  | 1581/3711 | 42.6 |  | 1850/4103 | 45.1 |  | 1446/3030 | 47.7 |  | 1478/2825 | 52.3 | 9.6 (8.3, 11.0) |  |
|  High school | 1996/4106 | 48.6 |  | 2185/4110 | 53.2 |  | 2911/5436 | 53.6 |  | 2383/4325 | 55.1 |  | 2442/4205 | 58.1 | 3.7 (2.8, 4.7) |  |
|  Bachelor degree | 13118/21617 | 60.7 |  | 13633/20856 | 65.4 |  | 17714/28667 | 61.8 |  | 14869/24162 | 61.5 |  | 15609/24092 | 64.8 | 0.6 (0.2, 0.9) |  |
|  Postgraduate | 3638/5676 | 64.1 |  | 3997/5792 | 69.0 |  | 4775/7320 | 65.2 |  | 4708/7314 | 64.4 |  | 4910/7339 | 66.9 | 0.3 (-0.2, 0.9) |  |
| Ethnicity |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.767 |
|  Han | 20058/35289 | 56.8 |  | 21316/34269 | 62.2 |  | 25883/43231 | 59.9 |  | 21817/36278 | 60.1 |  | 22687/35852 | 63.3 | 1.5 (1.2, 1.8) |  |
|  Manchu | 483/789 | 61.2 |  | 526/793 | 66.3 |  | 788/1276 | 61.8 |  | 720/1139 | 63.2 |  | 745/1110 | 67.1 | 1.1 (-0.4, 2.7) |  |
|  Other | 628/1056 | 59.5 |  | 834/1305 | 63.9 |  | 1104/1753 | 63.0 |  | 851/1415 | 60.1 |  | 991/1503 | 65.9 | 1.1 (-0.3, 2.4) |  |
| Occupation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.425 |
|  Unemployed | 2163/4786 | 45.2 |  | 2352/4619 | 50.9 |  | 2575/5158 | 49.9 |  | 2339/4206 | 55.6 |  | 2237/3775 | 59.3 | 6.1 (5.2, 7.0) |  |
|  Sales and Service | 2912/5126 | 56.8 |  | 3530/5808 | 60.8 |  | 5369/9402 | 57.1 |  | 4572/7862 | 58.2 |  | 4312/7111 | 60.6 | 1.0 (0.3, 1.7) |  |
|  Professional | 4197/7090 | 59.2 |  | 4090/6423 | 63.7 |  | 5153/8456 | 60.9 |  | 5101/8387 | 60.8 |  | 5875/8983 | 65.4 | 1.8 (1.3, 2.4) |  |
|  Business | 4423/7106 | 62.2 |  | 5001/7602 | 65.8 |  | 6407/9799 | 65.4 |  | 6064/9497 | 63.9 |  | 6170/9484 | 65.1 | 0.6 (0.1, 1.1) |  |
|  Management | 1773/2869 | 61.8 |  | 1932/2666 | 72.5 |  | 2684/3971 | 67.6 |  | 2370/3687 | 64.3 |  | 2863/4140 | 69.2 | 1.2 (0.5, 2.0) |  |
|  Other | 2829/4788 | 59.1 |  | 3463/5563 | 62.3 |  | 4276/7430 | 57.6 |  | 2725/4825 | 56.5 |  | 2777/4670 | 59.5 | -0.8 (-1.6, -0.1) |  |
| Parity |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | <0.001 |
|  ≥ 2 | 112/333 | 33.6 |  | 177/470 | 37.7 |  | 256/512 | 50.0 |  | 298/567 | 52.6 |  | 298/579 | 51.5 | 6.8 (3.2, 10.4) |  |
|  1 | 2967/6200 | 47.9 |  | 5589/9704 | 57.6 |  | 7580/13358 | 56.8 |  | 8192/14191 | 57.7 |  | 8271/13558 | 61.0 | 2.3 (1.7, 2.9) |  |
|  0 | 18133/30668 | 59.1 |  | 16956/26256 | 64.6 |  | 19975/32441 | 61.6 |  | 14938/24130 | 61.9 |  | 15896/24379 | 65.2 | 1.1 (0.8, 1.4) |  |

P (%): proportion (%);

\* With the adjustment for maternal age, educational level, ethnicity, occupation, and parity.

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| **Additional File 2. Trends in Proportions of Preconceptional and Regular MMN Supplement Use by Demographic Characteristics in Chaoyang District, Beijing, 2013-2017** |
|  | 2013 |  | 2014 |  | 2015 |  | 2016 |  | 2017 | Annual percent change (95 % CI)\* | P for heterogeneity\* |
|  | Users/Total | P (%) |  | Users/Total | P (%) |  | Users/Total | P (%) |  | Users/Total | P (%) |  | Users/Total | P (%) |
| Overall | 13290/21212 | 62.7 |  | 12375/22722 | 54.5 |  | 17063/27811 | 61.4 |  | 13984/23428 | 59.7 |  | 14170/24465 | 57.9 | -0.1 (-0.4, 0.3) |  |
| Age (years) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | <0.001 |
|  < 25 | 631/1528 | 41.3 |  | 494/1520 | 32.5 |  | 709/1748 | 40.6 |  | 461/1208 | 38.2 |  | 431/1216 | 35.4 | -3.8 (-6.1, -1.6) |  |
|  25-29 | 5694/9029 | 63.1 |  | 4208/8191 | 51.4 |  | 6910/11299 | 61.2 |  | 4811/8299 | 58.0 |  | 4745/8460 | 56.1 | -0.9 (-1.5, -0.3) |  |
|  30-34 | 5631/8483 | 66.4 |  | 5626/9530 | 59.0 |  | 6796/10519 | 64.6 |  | 5764/9126 | 63.2 |  | 5779/9466 | 61.1 | 0.6 (0.1, 1.1) |  |
|  35-39 | 1172/1889 | 62.0 |  | 1823/3082 | 59.1 |  | 2322/3709 | 62.6 |  | 2529/4098 | 61.7 |  | 2738/4531 | 60.4 | 1.7 (0.8, 2.6) |  |
|  ≥ 40 | 162/283 | 57.2 |  | 224/399 | 56.1 |  | 326/536 | 60.8 |  | 419/697 | 60.1 |  | 477/792 | 60.2 | 3.0 (0.5, 5.6) |  |
| Educational level |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | <0.001 |
|  < High school | 486/1281 | 37.9 |  | 524/1581 | 33.1 |  | 636/1850 | 34.4 |  | 582/1446 | 40.2 |  | 521/1478 | 35.3 | -1.4 (-3.8, 0.9) |  |
|  High school | 997/1996 | 49.9 |  | 935/2185 | 42.8 |  | 1385/2911 | 47.6 |  | 1029/2383 | 43.2 |  | 1054/2442 | 43.2 | -2.4 (-3.9, -0.9) |  |
|  Bachelor degree | 8566/13118 | 65.3 |  | 7642/13633 | 56.1 |  | 11266/17714 | 63.6 |  | 9108/14869 | 61.3 |  | 9213/15609 | 59.0 | -0.4 (-0.8, 0.1) |  |
|  Postgraduate | 2520/3638 | 69.3 |  | 2537/3997 | 63.5 |  | 3327/4775 | 69.7 |  | 3247/4708 | 69.0 |  | 3363/4910 | 68.5 | 1.8 (1.1, 2.5) |  |
| Ethnicity |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.107 |
|  Han | 12516/20058 | 62.4 |  | 11581/21316 | 54.3 |  | 15850/25883 | 61.2 |  | 13003/21817 | 59.6 |  | 13122/22687 | 57.8 | 0 (-0.4, 0.4) |  |
|  Manchu | 327/483 | 67.7 |  | 281/526 | 53.4 |  | 488/788 | 61.9 |  | 423/720 | 58.8 |  | 436/745 | 58.5 | -1.2 (-3.3, 0.8) |  |
|  Other | 417/628 | 66.4 |  | 480/834 | 57.6 |  | 700/1104 | 63.4 |  | 529/851 | 62.2 |  | 582/991 | 58.7 | -1.2 (-3.0, 0.5) |  |
| Occupation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.001 |
|  Unemployed | 1099/2163 | 50.8 |  | 1090/2352 | 46.3 |  | 1200/2575 | 46.6 |  | 1072/2339 | 45.8 |  | 935/2237 | 41.8 | -2.3 (-3.7, -0.9) |  |
|  Sales and Service | 1734/2912 | 59.5 |  | 1699/3530 | 48.1 |  | 3092/5369 | 57.6 |  | 2430/4572 | 53.1 |  | 2116/4312 | 49.1 | -1.1 (-2.1, -0.2) |  |
|  Professional | 2784/4197 | 66.3 |  | 2334/4090 | 57.1 |  | 3212/5153 | 62.3 |  | 3119/5101 | 61.1 |  | 3516/5875 | 59.8 | -0.1 (-0.8, 0.6) |  |
|  Business | 2938/4423 | 66.4 |  | 3038/5001 | 60.7 |  | 4215/6407 | 65.8 |  | 3960/6064 | 65.3 |  | 3781/6170 | 61.3 | 0.2 (-0.5, 0.8) |  |
|  Management | 1252/1773 | 70.6 |  | 1183/1932 | 61.2 |  | 2109/2684 | 78.6 |  | 1660/2370 | 70.0 |  | 1989/2863 | 69.5 | 1.7 (0.8, 2.5) |  |
|  Other | 1822/2829 | 64.4 |  | 1699/3463 | 49.1 |  | 2334/4276 | 54.6 |  | 1560/2725 | 57.2 |  | 1640/2777 | 59.1 | 0.9 (-0.1, 1.9) |  |
| Parity |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.731 |
|  ≥ 2 | 36/112 | 32.1 |  | 64/177 | 36.2 |  | 95/256 | 37.1 |  | 127/298 | 42.6 |  | 94/298 | 31.5 | -7.6 (-14.1, -1.1) |  |
|  1 | 1342/2967 | 45.2 |  | 2343/5589 | 41.9 |  | 3606/7580 | 47.6 |  | 4085/8192 | 49.9 |  | 3931/8271 | 47.5 | 0.4 (-0.6, 1.3) |  |
|  0 | 11912/18133 | 65.7 |  | 9968/16956 | 58.8 |  | 13362/19975 | 66.9 |  | 9772/14938 | 65.4 |  | 10145/15896 | 63.8 | -0.1 (-0.5, 0.3) |  |

P (%): proportion (%);

\* With the adjustment for maternal age, educational level, ethnicity, occupation, and parity.

**Additional File 3. Composition and other key features of prenatal MMN supplements predominantly sold on the Chinese market**

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|  |  | ChuangYing Gold Scrianen Multivitamin Tablets | Kangnaide Vitamins With Minerals Tablets (13) | By-health Multi-vitamin & Mineral #1 | By-health Multi-vitamin & Mineral #2 | Elevit Pronatal Vitamin Complex Tablets | Materna Multivitamin and Elements Tablets | Forceval Capsules | UNI-MMAP |
| Nutrients\* |  |  |  |  |  |  |
|  | Iron | 4.8 mg | 19.8 mg | 9.1 mg | 16.3 mg | 60 mg | 60 mg | 10 mg | 30 mg |
|  | Folic acid | 0.4 mg | 0.8 mg | 0.4 mg | 0.3 mg | 0.8 mg | 1 mg | 0.4 mg | 0.4 mg |
|  | Vitamin A† | - | 1.2 mg | 0.4 mg | 0.5 mg | 1.2 mg | 0.5 mg | 0.6 mg | 0.8 mg |
|  | Vitamin B1 | 1.4 mg | 1.5 mg | 0.7 mg | 0.9 mg | 1.6 mg | 3 mg | 1.4 mg | 1.4 mg |
|  | Vitamin B2 | 1.4 mg | 1.7 mg | 1 mg | 0.6 mg | 1.8 mg | 3.4 mg | 1.4 mg | 1.4 mg |
|  | Vitamin B6 | 1.9 mg | 2.6 mg | 1 mg | 1 mg | 2.6 mg | 10 mg | 2 mg | 1.9 mg |
|  | Vitamin B12 | - | 4 μg | 1.6 μg | 1.5 μg | 4 μg | 12 μg | 3 μg | 2.6 μg |
|  | Vitamin C | 78.6 mg | 100 mg | 62 mg | 57 mg | 100 mg | 100 mg | 60 mg | 70 mg |
|  | Vitamin D | 4.6 μg | 10 μg | 1.9 μg | 4.8 μg | 12.5 μg | 6.3 μg | 5 μg | 5 μg |
|  | Zinc | 9.2 mg | 20 mg | 5.5 mg | 7.7 mg | 7.5 mg | 25 mg | 10 mg | 15 mg |
|  | Calcium | 170 mg | 28.8 mg | 459.7 mg | 463.8 mg | 125 mg | 250 mg | - | - |
|  | Niacinamide | - | - | 8.7 mg | 8.7 mg | 19 mg | 20 mg | 14 mg | 18 mg |
|  | Biotin | - | 18 mg | 13.3 μg | 17.1 μg | 200 μg | 30 μg | 100 μg | - |
|  | Pantothenate | - | - | 3.5 mg | 3.6 mg | 10 mg | 10 mg | 4 mg | - |
|  | Vitamin E | - | 11 mg | 8.6 mg | 9.1 mg | 15 mg | 30 mg | 8 mg | 10 mg |
|  | Magnesium | - | - | 183.6 mg | 144.3 mg | 100 mg | 50 mg | 30 mg |  |
|  | Copper | - | - | - | - | 1 mg | 2 mg | 2 mg | 2 mg |
|  | Manganese | - | - | - | - | 1 mg | 5 mg | 3 mg | - |
|  | Phosphorus | - | - | - | - | 125 mg | - | 77 mg | - |
|  | Chromium | - | - | - | - | - | 25 μg | 100 μg | - |
|  | Selenium | - | - | - | - | - | 25 μg | 30 μg | 65 μg |
|  | Iodine | - | - | - | - | - | 150 μg | - | 150 μg |
|  | Molybdenum | - | - | - | - | - | 25 μg | 100 μg | - |
|  | Potassium | - | - | - | - | - | - | 4 mg | - |
| Other key features |  |  |  |  |  |  |
|  | Application periods | Reproductive age, gestation & lactation | Gestation & lactation | The first trimester of pregnancy | The second and third trimester of pregnancy and lactation | Reproductive age, gestation & lactation | Gestation & lactation | Gestation & lactation | - |
|  | Daily costs ($)‡ | 0.6 | 0.3 | 0.6 | 0.6 | 0.5 | 0.3 | 1.1 |
|  | Manufacturer | Silian | Hebeihengli | By-health | By-health | Bayer S.A. | Wyeth | Fushifu |
|  | Approval number| | (2003) 0316 | H10980252 | G20120082 | G20120414 | JX20140155 | H20050875 | (1998) 009 |

\* Amount of each nutrient per daily serving was calculated by the ingredients of each tablet multiplied by the number of tablets that should be taken per day.

† For ease of comparison, the volume of Beta-carotene in some products has been converted and added to Vitamin A.

‡ Daily cost was calculated by the prices and daily dosage, assuming individuals in full compliance with the instructions.

| The third and fourth digits of the approval number represents the year of approval.