**Supplementary figures**

**Fig.S1:** Decision tree classification of orthodontic treatment demand (DEMANDORTHO2: 0 No demand, 1 Demand) based on area (1 Downtown, 2 Urban, 3 Sub-urban), gender (0 Female, 1 Male), aesthetic component (AC-IOTN 10 levels) and dental health component (DHC-IOTN 5 levels). **A.** ROC curves. **B.** Andrews curves. **C.** Decision tree to determine orthodontic treatment demand; only areas, DHC-IOTN and AC-IOTN took importance to decide the demand.

**Fig.S2:** Decision tree classification of orthodontic treatment demand (DEMANDORTHO2: 0 No demand, 1 Demand) based on areas (I: urban center, II: para-center, III: peri-urban areas), gender (0 Female, 1 Male), orthodontic treatment need (AC-IOTN need3: 3 levels; DHC-IOTN need3: 3 levels; AC-IOTN need2: 0 No need, 1 Need; DHC-IOTN need2: 0 No need, 1 Need). A. ROC curves. B. Andrews curves. C. Decision tree to determine orthodontic treatment demand; only areas and DHC-IOTN need3 took importance to decide the demand.

**Supplemetary data S1:** Additional information of analysis

**Supplemetary tables**

**Table S1:** Distribution of children with respect to area and gender

|  | | | | **Areas** | | | | | | | | |  | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Gender** |  | | | **I** | | | **II** | | | **II** | | | **Total** | | |
| Male |  | n |  | | 93 |  | | 113 |  | | 121 |  | | 327 |  | |
| % |  | | 46.5 % |  | | 51.83 % |  | | 47.45 % |  | | 48.59 % |  | |
| Female |  | n |  | | 107 |  | | 105 |  | | 134 |  | | 346 |  | |
| % |  | | 53.5 % |  | | 48.17 % |  | | 52.55 % |  | | 51.41 % |  | |
| Total |  | n |  | | 200 |  | | 218 |  | | 255 |  | | 673 |  | |
| % |  | | 100 % |  | | 100 % |  | | 100 % |  | | 100 % |  | |
| *Chi-square test, p = 0.5* | | | | | | | | | | | | | | | |

**Table S2.** Prevalence of malocclusion and orthodontic treatment need (AC-IOTN need3) according to areas and AC-IOTN in 15 year-old schoolchildren in Ho Chi Minh City.

|  | | | | **Areas** | | | | | |  | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **AC-IOTN need3** | |  | | **I** | | **II** | | **III** | | **Total** | |
| No need for treatment: **Mild(a)** |  | n |  | 63 |  | 82 |  | 76 |  | 221 |  |
| % |  | 31.50 % |  | 37.61 % |  | 29.80 % |  | 32.84 % |  |
| Borderline need: **Moderate(b)** |  | n |  | 66 |  | 57 |  | 80 |  | 203 |  |
| % |  | 33 % |  | 26.15 % |  | 31.37 % |  | 30.16 % |  |
| Definite need for treatment: **Severe(c)** |  | n |  | 71 |  | 79 |  | 99 |  | 249 |  |
| % |  | 35.50 % |  | 36.24 % |  | 38.82 % |  | 37 % |  |
| Total |  | n |  | 200 |  | 218 |  | 255 |  | 673 |  |
| % |  | 100 % |  | 100 % |  | 100 % |  | 100 % |  |
| *Chi-square test, p = 0.34  (a): Grade 1,2,3,4; (b) : Grade 5,6,7; (c) : Grade 8,9,10 AC-IOTN* | | | | | | | | | | | |

**Table S3.** Prevalence of malocclusion and orthodontic treatment need (DHC-IOTN need3) according to DHC-IOTN and areas in 15-year-old schoolchildren in Ho Chi Minh City.

|  | | | | **Areas** | | | | | |  | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DHC-IOTN need3** | |  | | **I** | | **II** | | **III** | | **Total** | |
| No need for treatment: **Mild(a)** |  | n |  | 49 |  | 71 |  | 57 |  | 177 |  |
| % |  | 24.50 % |  | 32.57 % |  | 22.35 % |  | 26.30 % |  |
| Borderline need: **Moderate(b)** |  | n |  | 50 |  | 53 |  | 77 |  | 180 |  |
| % |  | 25 % |  | 24.31 % |  | 30.20 % |  | 26.75 % |  |
| Definite need for treatment: **Severe(c)** |  | n |  | 101 |  | 94 |  | 121 |  | 316 |  |
| % |  | 50.50 % |  | 43.12 % |  | 47.45 % |  | 46.95 % |  |
| Total |  | n |  | 200 |  | 218 |  | 255 |  | 673 |  |
| % |  | 100 % |  | 100 % |  | 100 % |  | 100 % |  |
| *Chi-square test, p = 0.09  (a): Grade 1,2; (b): Grade 3; (c): Grade 4,5 DHC-IOTN* | | | | | | | | | | | |

**Table S4.** Orthodontic treatment demand (DEMANDORTHO5, 5 levels) in 15-year-old schoolchildren in Ho Chi Minh City, no level 1 observation.

|  | | | | **Area** | | | | | |  | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DEMANDORTHO5** | |  | | **I** | | **II** | | **III** | | **Total** | |
| 2 |  | n |  | 28.00 |  | 35.00 |  | 57.00 |  | 120.00 |  |
| % |  | 14.00 % |  | 16.06 % |  | 22.35 % |  | 17.83 % |  |
| 3 |  | n |  | 70.00 |  | 112.00 |  | 132.00 |  | 314.00 |  |
| % |  | 35.00 % |  | 51.38 % |  | 51.76 % |  | 46.66 % |  |
| 4 |  | n |  | 22.00 |  | 18.00 |  | 20.00 |  | 60.00 |  |
| % |  | 11.00 % |  | 8.26 % |  | 7.84 % |  | 8.92 % |  |
| 5 |  | n |  | 80.00 |  | 53.00 |  | 46.00 |  | 179.00 |  |
| % |  | 40.00 % |  | 24.31 % |  | 18.04 % |  | 26.60 % |  |
| Total |  | n |  | 200.00 |  | 218.00 |  | 255.00 |  | 673.00 |  |
| % |  | 100.00 % |  | 100.00 % |  | 100.00 % |  | 100.00 % |  |
| *Chi-square test, p = 3.27x10-6* | | | | | | | | | | | |

**Table S5.** Orthodontic treatment demand (DEMANDORTHO2, 2 levels) in 15-year-old schoolchildren in Ho Chi Minh City.

|  | | | | **Area** | | | | | |  | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DEMANDORTHO2** | |  | | **I** | | **II** | | **III** | | **Total** | |
| No |  | n |  | 98 |  | 147 |  | 189 |  | 434 |  |
| % |  | 49 % |  | 67.43 % |  | 74.12 % |  | 64.49 % |  |
| Yes |  | n |  | 102 |  | 71 |  | 66 |  | 239 |  |
| % |  | 51 % |  | 32.57 % |  | 25.88 % |  | 35.51 % |  |
| Total |  | n |  | 200 |  | 218 |  | 255 |  | 673 |  |
| % |  | 100 % |  | 100 % |  | 100 % |  | 100 % |  |
| *Chi-square test, p = 1.07x10-7* | | | | | | | | | | | |

**Table S6.** Decision Tree Classification of 4 models.

| **Test** | **Splits** | | **n(Train)** | | **n(Test)** | | **Test Accuracy** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DEMANDORTHO5 (1) | 22 |  | 539 |  | 134 |  | 0.66 |  |
| DEMANDORTHO5 (2) | 20 |  | 539 |  | 134 |  | 0.66 |  |
| DEMANDORTHO2 (1) | 12 |  | 539 |  | 134 |  | 0.67 |  |
| DEMANDORTHO2 (2) | 13 |  | 539 |  | 134 |  | 0.66 |  |