**APPENDIX**

Appendix 1 The study variables

|  |  |  |
| --- | --- | --- |
| **Variables** | **Code/Category** | **Reference** |
| Helmet use | 1 = Yes | Ratanavaraha and Jomnonkwao (Ratanavaraha and Jomnonkwao 2013), Akaateba et al. (Akaateba, Amoh-Gyimah, and Yakubu 2014), Kumphong et al. (Kumphong, Satiennam, and Satiennam 2018), Kanitpong et al. (Kanitpong, Boontob, and Tanaboriboon 2008), Fuentes et al. (Fuentes et al. 2010), Hung et al. (Hung, Stevenson, and Ivers 2008), Li et al. (Li et al. 2008), Xuequn et al. (Xuequn et al. 2011) |
|  | 0 = No |
| Riding status | 1 = Driver | Akaateba et al. (Akaateba, Amoh-Gyimah, and Yakubu 2014), Kumphong et al. (Kumphong, Satiennam, and Satiennam 2018), Kanitpong et al. (Kanitpong, Boontob, and Tanaboriboon 2008), Fuentes et al. (Fuentes et al. 2010), Hung et al. (Hung, Stevenson, and Ivers 2008), Xuequn et al. (Xuequn et al. 2011) |
|  | 0 = Passenger |
| No. of passenger | 1 = None  0 = ≥One | Akaateba et al. (Akaateba, Amoh-Gyimah, and Yakubu 2014), Kumphong et al. (Kumphong, Satiennam, and Satiennam 2018), Xuequn et al. (Xuequn et al. 2011) |
| Riding gender | 1 = Female | Akaateba et al. (Akaateba, Amoh-Gyimah, and Yakubu 2014), Kumphong et al. (Kumphong, Satiennam, and Satiennam 2018), Li et al. (Li et al. 2008), Xuequn et al. (Xuequn et al. 2011) |
|  | 0 = Male |
| Apparent age | 1 = Adult | Kumphong et al. (Kumphong, Satiennam, and Satiennam 2018), Kanitpong et al. (Kanitpong, Boontob, and Tanaboriboon 2008), Fuentes et al. (Fuentes et al. 2010), Hung et al. (Hung, Stevenson, and Ivers 2008), Li et al. (Li et al. 2008) |
|  | 0 = Child |
| Motorcycle engine size | 1 = cc > 125  0 = cc < 125 | Kumphong et al. (Kumphong, Satiennam, and Satiennam 2018) and Li et al. (Li et al. 2008) |
| Traffic condition | 1 = Off-peak  (06.30 - 07.29 am) | Ratanavaraha and Jomnonkwao (Ratanavaraha and Jomnonkwao 2013) and Li et al., 2008 (Li et al. 2008) |
|  | 0 = Peak  (07.30 - 08.30 am) |
| Day of week | 1 = Weekday | Akaateba et al. (Akaateba, Amoh-Gyimah, and Yakubu 2014), Kumphong et al. (Kumphong, Satiennam, and Satiennam 2018), Li et al., 2008 (Li et al. 2008) |
|  | 0 = Weekend |
| Police inspection | 1 = Police inspection at intersection | Kumphong et al. (Kumphong, Satiennam, and Satiennam 2018) |
|  | 0 = Other |  |
| Installation of helmet use enforcement CCTV camera | 1 = Yes  0 = No | - |
| Implementation period | 0 = Before  1 = After 3 months | - |
|  | 2 = After 6 months |  |
|  | 3 = After 9 months |  |

Appendix 2 Rates of helmet use for periods before and during CCTV camera enforcement

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Before CCTV camera enforcement | | |  | During CCTV camera enforcement | | | Diff. |
| Total | | Helmet use |  | Total | | Helmet use |
| N | % | % |  | N | % | % | % |
| Riding status |  |  |  |  |  |  |  |  |
| Driver | 13,748 | 83.9 | 81.6 |  | 29,073 | 88.8 | 84.9 | 3.3 |
| Passenger | 2,632 | 16.1 | 46.2 |  | 3,675 | 11.2 | 51.6 | 5.5 |
| No. of passenger |  |  |  |  |  |  |  |  |
| None | 11,207 | 68.4 | 83.3 |  | 25,854 | 78.9 | 85.7 | 2.4 |
| ≥1 | 5,173 | 31.6 | 60.0 |  | 6,894 | 21.1 | 64.4 | 4.4 |
| Gender |  |  |  |  |  |  |  |  |
| Male | 10,973 | 67.0 | 78.0 |  | 20,048 | 61.2 | 81.9 | 3.9 |
| Female | 5,407 | 33.0 | 71.6 |  | 12,700 | 38.8 | 80.1 | 8.5 |
| Apparent age |  |  |  |  |  |  |  |  |
| Adult | 15,956 | 97.4 | 77.2 |  | 31,777 | 97.0 | 82.4 | 5.2 |
| Child | 424 | 2.6 | 28.5 |  | 971 | 3.0 | 41.5 | 13.0 |
| Engine size |  |  |  |  |  |  |  |  |
| Size (cc) > 125 | 422 | 2.6 | 87.4 |  | 2,809 | 8.6 | 75.3 | -12.1 |
| < 125 | 15,958 | 97.4 | 75.6 |  | 29,939 | 91.4 | 81.7 | 6.1 |
| Traffic condition |  |  |  |  |  |  |  |  |
| AM Peak | 9,779 | 59.7 | 77.5 |  | 13,479 | 41.2 | 80.6 | 3.1 |
| AM Off-peak | 6,601 | 40.3 | 73.5 |  | 19,269 | 58.8 | 79.0 | 5.5 |
| Day of week |  |  |  |  |  |  |  |  |
| Weekend | 7,217 | 44.1 | 72.9 |  | 9,766 | 29.8 | 78.0 | 5.1 |
| Weekday | 9,163 | 55.9 | 78.2 |  | 22,982 | 70.2 | 82.6 | 4.3 |
| Police inspection at intersection |  |  |  |  |  |  |  |  |
| Yes | 12,249 | 74.8 | 76.6 |  | 13,936 | 42.6 | 78.9 | 2.4 |
| No | 4,131 | 25.2 | 73.9 |  | 18,812 | 57.4 | 82.9 | 9.0 |
| Intersection |  |  |  |  |  |  |  |  |
| 1.Mordindang\* | 2,542 | 15.5 | 77.7 |  | 6,247 | 19.1 | 81.3 | 3.6 |
| 2.Kanlapaphruek | 1,589 | 9.7 | 67.8 |  | 1,782 | 5.4 | 73.7 | 5.9 |
| 3.Phatumuang\* | 5,573 | 34.0 | 82.4 |  | 10,783 | 32.9 | 85.3 | 2.9 |
| 4.Bankok | 2,869 | 17.5 | 72.0 |  | 2,906 | 8.9 | 80.5 | 8.5 |
| 5.Charoensri\* | 3,807 | 23.2 | 71.6 |  | 11,030 | 33.7 | 78.5 | 7.0 |
| \*With detection system |  |  |  |  |  |  |  |  |
| Installation of enforcement CCTV camera |  |  |  |  |  |  |  |  |
| Yes | 11,919 | 72.8 | 77.9 |  | 28,060 | 85.7 | 81.7 | 3.8 |
| No | 4,458 | 27.2 | 70.5 |  | 4,688 | 14.3 | 77.9 | 7.4 |
| Enforcement period |  |  |  |  |  |  |  |  |
| Before | 16,380 | 100.0 | 75.9 |  | - | - | - |  |
| After 3 months | - | - | - |  | 16,376 | 50.0 | 81.3 | 5.4 |
| After 6 months | - | - | - |  | 7,514 | 22.9 | 81.4 | 5.5 |
| After 9 months | - | - | - |  | 8,858 | 27.0 | 80.9 | 5.0 |
| **Total** | **16,380** |  | **75.9** |  | **32,748** |  | **81.2** | **5.3** |

Appendix 3 Results of binary logistic analysis of helmet use

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Variables | Category/Unit | Before CCTV enforcement (N=16,380) | | | During CCTV enforcement  (N=32,748) | | |
| Coeff. | *p*-value | Odd Ratio | Coeff. | *p*-value | Odd Ratio |
| Riding status | Passenger |  |  | 1.000 |  |  | 1.000 |
| Driver | 1.226 | <0.001\*\* | 3.408 | 1.146 | <0.001\*\* | 3.147 |
| Number of passengers | ≥ 1 |  |  | 1.000 |  |  | 1.000 |
| None | 0.535 | <0.001\*\* | 1.708 | 0.494 | <0.001\*\* | 1.639 |
| Day of week | Weekend |  |  | 1.000 |  |  | 1.000 |
| Weekday | 0.272 | <0.001\*\* | 1.313 | 0.370 | <0.001\*\* | 1.447 |
| Engine size | Size (cc) < 125 |  |  | 1.000 |  |  |  |
| Size (cc) > 125 | 0.763 | <0.001\*\* | 2.144 | - | - |  |
| Traffic condition | Peak |  |  | 1.000 |  |  | 1.000 |
| Off-peak | -0.245 | <0.001\*\* | 0.783 | -0.222 | <0.001\*\* | 0.801 |
| Apparent age | Child |  |  |  |  |  | 1.000 |
| Adult | - | - | - | 0.997 | <0.001\*\* | 2.710 |
| Police inspection | No |  |  |  |  |  | 1.000 |
| Yes | - | - | - | -0.230 | <0.001\*\* | 0.795 |
| Constant |  | -0.219 | <0.001\*\* | 0.804 | -0.872 | <0.001\*\* | 0.418 |
| *ρ*2 |  | 0.135 | | |  | 0.121 |  |
| -2LL |  | 16,535.990 | | |  | 29,111.817 |  |

\*statistically significant at 5%, \*\*statistically significant at 1%