**Table S7** The231KAVs selected for cross-validation. Note some of the KAVs were identified by multiple approaches.

| **Order** | **SNPID** | **Method1** | **Bin2** | **Effect3** | **h24 (100%)** |
| --- | --- | --- | --- | --- | --- |
| 1 | 1\_3740636 | Bayesian-based | 1\_37 | -0.38 | 0.18 |
| 2 | 1\_3746867 | stepwise | 1\_37 | 0.01 | 0 |
| 3 | 1\_14416971 | Bayesian-based | 1\_144 | -0.47 | 0.333 |
| 4 | 1\_14416985 | stepwise | 1\_144 | -0.55 | 0.425 |
| 4 | 1\_14416985 | Bayesian-based | 1\_144 | -0.55 | 0.425 |
| 5 | 1\_15518012 | Bayesian-based | 1\_155 | -0.54 | 0.238 |
| 5 | 1\_15518012 | stepwise | 1\_155 | -0.54 | 0.238 |
| 6 | 1\_22688691 | Bayesian-based | 1\_227 | -0.61 | 1.03 |
| 7 | 1\_25401487 | Bayesian-based | 1\_254 | -0.67 | 0.612 |
| 8 | 1\_25422726 | Bayesian-based | 1\_254 | -0.59 | 0.522 |
| 9 | 1\_25439265 | Single-variant | 1\_254 | -0.29 | 0.087 |
| 10 | 1\_27193154 | Single-variant | 1\_272 | -0.38 | 0.256 |
| 11 | 1\_27193157 | Single-variant | 1\_272 | -0.38 | 0.256 |
| 12 | 1\_27193158 | Single-variant | 1\_272 | -0.38 | 0.256 |
| 13 | 1\_27193272 | Single-variant | 1\_272 | -0.38 | 0.256 |
| 14 | 1\_27193273 | Single-variant | 1\_272 | -0.42 | 0.354 |
| 15 | 1\_27193281 | Single-variant | 1\_272 | -0.38 | 0.256 |
| 16 | 1\_27205707 | Bayesian-based | 1\_272 | -0.79 | 0.812 |
| 17 | 1\_34263565 | Bayesian-based | 1\_343 | 0.3 | 0.124 |
| 17 | 1\_34263565 | stepwise | 1\_343 | 0.3 | 0.124 |
| 18 | 1\_68182349 | stepwise | 1\_682 | 0.21 | 0.063 |
| 19 | 1\_68182367 | Bayesian-based | 1\_682 | 0.21 | 0.063 |
| 20 | 1\_185874440 | stepwise | 1\_1859 | -0.5 | 0.446 |
| 21 | 1\_202396432 | Bayesian-based | 1\_2024 | 0.55 | 0.163 |
| 22 | 1\_202995760 | stepwise | 1\_2030 | 0.18 | 0.034 |
| 23 | 1\_202996451 | Bayesian-based | 1\_2030 | 0.36 | 0.107 |
| 24 | 1\_203086382 | Bayesian-based | 1\_2031 | -0.55 | 0.603 |
| 25 | 1\_209034237 | stepwise | 1\_2090 | -0.82 | 0.708 |
| 26 | 1\_293634086 | Bayesian-based | 1\_2936 | 0.44 | 0.447 |
| 27 | 1\_293806450 | stepwise | 1\_2938 | 0.41 | 0.204 |
| 28 | 1\_298276980 | stepwise | 1\_2983 | 0.39 | 0.157 |
| 29 | 1\_298329099 | Bayesian-based | 1\_2983 | 0.53 | 0.499 |
| 30 | 1\_300008663 | stepwise | 1\_3000 | 0.67 | 0.559 |
| 31 | 2\_16873627 | Bayesian-based | 2\_169 | 0.48 | 0.5 |
| 32 | 2\_17574448 | Bayesian-based | 2\_176 | 0.48 | 0.786 |
| 33 | 2\_18360174 | Bayesian-based | 2\_184 | 0.26 | 0.149 |
| 34 | 2\_18389066 | stepwise | 2\_184 | 0.13 | 0.021 |
| 35 | 2\_18420414 | Bayesian-based | 2\_184 | 0.19 | 0.076 |
| 36 | 2\_52724067 | stepwise | 2\_527 | 0.67 | 0.767 |
| 37 | 2\_52747025 | Bayesian-based | 2\_527 | 0.64 | 0.789 |
| 38 | 2\_52833051 | Bayesian-based | 2\_528 | 0.79 | 1.278 |
| 39 | 2\_179828557 | Single-variant | 2\_1798 | 0.48 | 0.332 |
| 40 | 2\_214659117 | Bayesian-based | 2\_2147 | -0.24 | 0.098 |
| 41 | 2\_214693907 | stepwise | 2\_2147 | -0.47 | 0.251 |
| 42 | 2\_227048681 | Bayesian-based | 2\_2270 | -0.36 | 0.183 |
| 42 | 2\_227048681 | stepwise | 2\_2270 | -0.36 | 0.183 |
| 43 | 2\_229528586 | Bayesian-based | 2\_2295 | -0.54 | 0.398 |
| 44 | 3\_2384984 | Bayesian-based | 3\_24 | 0.28 | 0.196 |
| 44 | 3\_2384984 | stepwise | 3\_24 | 0.28 | 0.196 |
| 45 | 3\_5953194 | Bayesian-based | 3\_60 | 0.03 | 0.001 |
| 46 | 3\_5989888 | stepwise | 3\_60 | -0.31 | 0.107 |
| 47 | 3\_5989897 | Bayesian-based | 3\_60 | -0.31 | 0.107 |
| 48 | 3\_20378172 | Bayesian-based | 3\_2038 | 0.37 | 0.116 |
| 49 | 3\_20591776 | stepwise | 3\_206 | 0.62 | 0.366 |
| 50 | 3\_20592157 | Bayesian-based | 3\_206 | 0.58 | 0.321 |
| 51 | 3\_133293491 | stepwise | 3\_1333 | 0.8 | 0.779 |
| 52 | 3\_166034352 | Bayesian-based | 3\_1660 | 0.82 | 0.92 |
| 52 | 3\_166034352 | stepwise | 3\_1660 | 0.82 | 0.92 |
| 53 | 3\_166808666 | stepwise | 3\_1668 | 0.47 | 0.426 |
| 54 | 3\_169044562 | Bayesian-based | 3\_1690 | 0.43 | 0.866 |
| 55 | 3\_190442492 | Bayesian-based | 3\_1904 | -0.22 | 0.039 |
| 55 | 3\_190442492 | stepwise | 3\_1904 | -0.22 | 0.039 |
| 56 | 3\_194042011 | Bayesian-based | 3\_1940 | 0.43 | 0.104 |
| 57 | 3\_201331174 | Bayesian-based | 3\_2013 | 0.72 | 1.016 |
| 58 | 3\_212606824 | Single-variant | 3\_2126 | 0.28 | 0.229 |
| 59 | 3\_212612168 | stepwise | 3\_2126 | 0.03 | 0.001 |
| 60 | 3\_217150864 | Bayesian-based | 3\_2172 | 0.65 | 0.929 |
| 61 | 3\_217212780 | Single-variant | 3\_2172 | 0.43 | 1.2 |
| 62 | 3\_217234748 | Bayesian-based | 3\_2172 | 0.74 | 1.424 |
| 63 | 3\_217237484 | Single-variant | 3\_2172 | 0.48 | 1.197 |
| 64 | 3\_217650733 | Bayesian-based | 3\_2177 | 0.7 | 1.3 |
| 65 | 3\_217651051 | Single-variant | 3\_2177 | 0.49 | 1.254 |
| 66 | 3\_217669317 | Single-variant | 3\_2177 | 0.41 | 1.096 |
| 67 | 3\_217896087 | Bayesian-based | 3\_2179 | 0.68 | 1.249 |
| 68 | 3\_217901194 | Single-variant | 3\_2179 | 0.41 | 1.077 |
| 69 | 3\_219169602 | Bayesian-based | 3\_2192 | 0.32 | 0.117 |
| 70 | 3\_219175933 | stepwise | 3\_2192 | 0.76 | 0.689 |
| 71 | 3\_219188285 | stepwise | 3\_2192 | 0.49 | 0.484 |
| 72 | 3\_226487911 | stepwise | 3\_2265 | 0.3 | 0.224 |
| 73 | 3\_226515826 | Bayesian-based | 3\_2265 | 0.42 | 0.574 |
| 74 | 3\_227131072 | stepwise | 3\_2271 | 0.71 | 0.705 |
| 75 | 3\_229120153 | Bayesian-based | 3\_2291 | 0.07 | 0.011 |
| 76 | 4\_1223785 | Bayesian-based | 4\_12 | 0.4 | 0.887 |
| 77 | 4\_1223794 | Single-variant | 4\_12 | 0.39 | 0.885 |
| 78 | 4\_1223829 | Bayesian-based | 4\_12 | 0.4 | 0.887 |
| 79 | 4\_5964871 | Single-variant | 4\_60 | 0.39 | 0.982 |
| 80 | 4\_5974740 | Bayesian-based | 4\_60 | 0.71 | 0.819 |
| 81 | 4\_5976338 | Bayesian-based | 4\_60 | 0.98 | 0.945 |
| 82 | 4\_7480416 | stepwise | 4\_75 | 0.92 | 0.727 |
| 83 | 4\_7488177 | Bayesian-based | 4\_75 | 0.95 | 0.958 |
| 84 | 4\_33075579 | stepwise | 4\_331 | 1.05 | 1.632 |
| 85 | 4\_41355316 | Bayesian-based | 4\_414 | 0.69 | 0.279 |
| 86 | 4\_179606232 | stepwise | 4\_1796 | 0.87 | 1.353 |
| 87 | 4\_179614951 | Bayesian-based | 4\_1796 | 0.86 | 0.888 |
| 88 | 4\_179761734 | Bayesian-based | 4\_1798 | 1.2 | 2.05 |
| 89 | 4\_179790632 | Bayesian-based | 4\_1798 | 0.64 | 0.646 |
| 90 | 4\_179790733 | Bayesian-based | 4\_1798 | 0.59 | 0.441 |
| 91 | 4\_179792165 | stepwise | 4\_1798 | 1.14 | 1.955 |
| 92 | 4\_197617071 | Bayesian-based | 4\_1976 | 1.6 | 6.107 |
| 93 | 4\_198426700 | Bayesian-based | 4\_1984 | 1.21 | 7.892 |
| 94 | 4\_198471018 | Bayesian-based | 4\_1985 | 1.67 | 5.392 |
| 95 | 4\_198490330 | stepwise | 4\_1985 | 1.64 | 3.084 |
| 96 | 4\_198999400 | Bayesian-based | 4\_1990 | 1.89 | 5.721 |
| 97 | 4\_198999779 | Single-variant | 4\_1990 | 1.1 | 8.213 |
| 98 | 4\_199073074 | Single-variant | 4\_1991 | 1.1 | 8.223 |
| 99 | 4\_199076568 | Single-variant | 4\_1991 | 1.1 | 8.223 |
| 100 | 4\_199077448 | Single-variant | 4\_1991 | 1.1 | 8.223 |
| 101 | 4\_199078546 | stepwise | 4\_1991 | 1.4 | 8.524 |
| 102 | 4\_199079132 | Single-variant | 4\_1991 | 1.1 | 8.223 |
| 103 | 4\_199082836 | Single-variant | 4\_1991 | 1.1 | 8.223 |
| 104 | 4\_199278901 | Single-variant | 4\_1993 | 1.1 | 8.164 |
| 105 | 4\_200186670 | Single-variant | 4\_2002 | 1.17 | 8.58 |
| 106 | 4\_200188747 | Single-variant | 4\_2002 | 1.17 | 8.58 |
| 107 | 4\_200188840 | Single-variant | 4\_2002 | 1.17 | 8.58 |
| 108 | 4\_200191570 | Bayesian-based | 4\_2002 | 1.64 | 7.748 |
| 109 | 4\_200203564 | Bayesian-based | 4\_2002 | 1.37 | 5.475 |
| 110 | 4\_228447998 | Single-variant | 4\_2284 | 0.97 | 6.378 |
| 111 | 4\_228622417 | Single-variant | 4\_2286 | 0.97 | 6.358 |
| 112 | 4\_228628647 | Single-variant | 4\_2286 | 0.97 | 6.412 |
| 113 | 4\_228646766 | Bayesian-based | 4\_2286 | 1.35 | 5.297 |
| 114 | 4\_228653398 | Bayesian-based | 4\_2287 | 1.7 | 4.892 |
| 115 | 4\_228662791 | Single-variant | 4\_2287 | 0.98 | 6.437 |
| 116 | 4\_228847332 | Single-variant | 4\_2288 | 0.98 | 6.426 |
| 117 | 4\_228848859 | Bayesian-based | 4\_2288 | 1.06 | 2.275 |
| 118 | 4\_229000838 | Bayesian-based | 4\_2290 | 1.67 | 4.848 |
| 118 | 4\_229000838 | stepwise | 4\_2290 | 1.67 | 4.848 |
| 119 | 4\_229029859 | Single-variant | 4\_2290 | 1.07 | 6.911 |
| 120 | 4\_229031964 | Single-variant | 4\_2290 | 1.04 | 6.746 |
| 121 | 4\_229033656 | Single-variant | 4\_2290 | 0.97 | 6.418 |
| 122 | 4\_229034519 | Single-variant | 4\_2290 | 1.07 | 6.911 |
| 123 | 4\_229900055 | Single-variant | 4\_2299 | 0.97 | 6.375 |
| 124 | 4\_232926192 | Single-variant | 4\_2329 | 0.98 | 6.089 |
| 125 | 4\_232943199 | Single-variant | 4\_2329 | 0.92 | 5.705 |
| 126 | 4\_232943203 | Single-variant | 4\_2329 | 0.92 | 5.705 |
| 127 | 4\_233002861 | Single-variant | 4\_2330 | 0.92 | 5.697 |
| 128 | 4\_233222027 | Single-variant | 4\_2332 | 0.92 | 5.745 |
| 129 | 4\_233222931 | Single-variant | 4\_2332 | 0.92 | 5.745 |
| 130 | 4\_233254296 | Single-variant | 4\_2333 | 0.92 | 5.745 |
| 131 | 4\_233443376 | Single-variant | 4\_2334 | 0.92 | 5.773 |
| 132 | 4\_233760445 | Single-variant | 4\_2338 | 0.92 | 5.771 |
| 133 | 4\_233853010 | Single-variant | 4\_2339 | 0.92 | 5.783 |
| 134 | 4\_235604701 | stepwise | 4\_2356 | 1.89 | 4.768 |
| 135 | 4\_236080691 | Bayesian-based | 4\_2361 | 0.9 | 1.334 |
| 136 | 4\_236091061 | Bayesian-based | 4\_2361 | 1.02 | 5.569 |
| 137 | 4\_236097278 | stepwise | 4\_2361 | 1.51 | 3.417 |
| 138 | 4\_236097864 | Bayesian-based | 4\_2361 | 1.36 | 4.919 |
| 139 | 4\_236387000 | Bayesian-based | 4\_2364 | 1.05 | 4.499 |
| 140 | 5\_15322714 | stepwise | 5\_153 | 0.44 | 0.386 |
| 141 | 5\_16418530 | Bayesian-based | 5\_164 | 0.7 | 0.839 |
| 142 | 5\_16420194 | Bayesian-based | 5\_164 | 0.7 | 0.599 |
| 143 | 5\_18628601 | stepwise | 5\_186 | 1 | 1.557 |
| 144 | 5\_18633669 | Single-variant | 5\_186 | 0.49 | 1.583 |
| 145 | 5\_18633670 | Single-variant | 5\_186 | 0.49 | 1.583 |
| 146 | 5\_19050196 | Single-variant | 5\_191 | 0.48 | 1.516 |
| 147 | 5\_19131028 | Bayesian-based | 5\_191 | 0.89 | 0.603 |
| 148 | 5\_19198790 | stepwise | 5\_192 | 0.78 | 0.914 |
| 149 | 5\_19237019 | Bayesian-based | 5\_192 | 1.06 | 1.309 |
| 150 | 5\_23184913 | Single-variant | 5\_232 | 0.51 | 0.296 |
| 151 | 5\_50086739 | Single-variant | 5\_501 | 0.54 | 1.826 |
| 152 | 5\_50088075 | Single-variant | 5\_501 | 0.54 | 1.826 |
| 153 | 5\_50088542 | Single-variant | 5\_501 | 0.54 | 1.826 |
| 154 | 5\_50122418 | stepwise | 5\_501 | 0.84 | 1.229 |
| 155 | 5\_57250790 | stepwise | 5\_573 | -0.01 | 0 |
| 156 | 5\_94095865 | Bayesian-based | 5\_9410 | 0.74 | 1.631 |
| 157 | 5\_149155149 | stepwise | 5\_1492 | 0.56 | 0.83 |
| 158 | 5\_166858167 | Bayesian-based | 5\_1669 | 0 | 0 |
| 159 | 5\_166892345 | stepwise | 5\_1669 | 0.38 | 0.242 |
| 160 | 5\_167659027 | Single-variant | 5\_1677 | 0.77 | 0.681 |
| 161 | 5\_167671178 | stepwise | 5\_1677 | 0.81 | 0.464 |
| 162 | 5\_206887315 | stepwise | 5\_2069 | 0.14 | 0.025 |
| 163 | 5\_206887599 | Bayesian-based | 5\_2069 | 0.06 | 0.009 |
| 164 | 5\_207729392 | Bayesian-based | 5\_2077 | -0.14 | 0.029 |
| 165 | 5\_207729685 | stepwise | 5\_2077 | -0.18 | 0.037 |
| 166 | 5\_207732263 | Bayesian-based | 5\_2077 | -0.2 | 0.065 |
| 167 | 5\_212351905 | stepwise | 5\_2124 | -0.64 | 0.416 |
| 168 | 5\_212352078 | Bayesian-based | 5\_2124 | -0.49 | 0.327 |
| 169 | 6\_154785052 | stepwise | 6\_1548 | 0.47 | 0.253 |
| 170 | 6\_158863400 | Bayesian-based | 6\_1589 | -0.4 | 0.267 |
| 171 | 7\_17695966 | Bayesian-based | 7\_177 | -0.51 | 0.771 |
| 172 | 7\_17696158 | stepwise | 7\_177 | -0.67 | 1.045 |
| 172 | 7\_17696158 | Bayesian-based | 7\_177 | -0.67 | 1.045 |
| 173 | 7\_21150976 | Single-variant | 7\_212 | -0.33 | 0.67 |
| 174 | 7\_21151002 | Single-variant | 7\_212 | -0.33 | 0.67 |
| 175 | 7\_21151167 | Single-variant | 7\_212 | -0.33 | 0.67 |
| 176 | 7\_21199251 | Bayesian-based | 7\_212 | -0.34 | 0.625 |
| 177 | 7\_118228658 | stepwise | 7\_1182 | -0.4 | 0.19 |
| 178 | 7\_138758449 | Bayesian-based | 7\_1388 | -0.34 | 0.338 |
| 179 | 7\_162950028 | Bayesian-based | 7\_1630 | 0.29 | 0.221 |
| 180 | 7\_162950288 | Bayesian-based | 7\_1630 | 0.28 | 0.218 |
| 181 | 7\_162960897 | stepwise | 7\_1630 | 0.38 | 0.187 |
| 182 | 7\_162981507 | Bayesian-based | 7\_1630 | 0.38 | 0.294 |
| 183 | 8\_26275 | stepwise | 8\_0 | 0.36 | 0.151 |
| 183 | 8\_26275 | Bayesian-based | 8\_0 | 0.36 | 0.151 |
| 184 | 8\_19657455 | Bayesian-based | 8\_197 | -0.36 | 0.226 |
| 185 | 8\_19673483 | stepwise | 8\_197 | -0.4 | 0.23 |
| 186 | 8\_36684547 | stepwise | 8\_367 | 0.19 | 0.04 |
| 187 | 8\_73919477 | stepwise | 8\_739 | -0.4 | 0.249 |
| 188 | 8\_124937344 | stepwise | 8\_1249 | 0.59 | 0.454 |
| 189 | 8\_151255307 | Single-variant | 8\_1513 | -0.08 | 0.007 |
| 190 | 8\_154993136 | Single-variant | 8\_1550 | -0.11 | 0.015 |
| 191 | 8\_165169146 | Single-variant | 8\_1652 | -0.39 | 0.97 |
| 192 | 8\_165180453 | stepwise | 8\_1652 | -0.73 | 0.919 |
| 193 | 8\_167561571 | Single-variant | 8\_1676 | -0.38 | 0.935 |
| 194 | 8\_167613440 | Bayesian-based | 8\_1676 | -0.7 | 1.009 |
| 195 | 8\_167756476 | Single-variant | 8\_1678 | -0.41 | 1.036 |
| 196 | 8\_167758219 | Bayesian-based | 8\_1678 | -0.71 | 1.161 |
| 197 | 8\_167780775 | Bayesian-based | 8\_1678 | -0.43 | 1.056 |
| 198 | 8\_168020350 | Single-variant | 8\_1680 | -0.41 | 1.081 |
| 199 | 8\_168023686 | Bayesian-based | 8\_1680 | -0.47 | 1.233 |
| 200 | 8\_173171425 | stepwise | 8\_1732 | -0.51 | 0.293 |
| 201 | 8\_173176795 | Bayesian-based | 8\_1732 | -0.45 | 0.413 |
| 202 | 8\_173180987 | Bayesian-based | 8\_1732 | -0.44 | 0.465 |
| 203 | 9\_5028060 | stepwise | 9\_50 | 0.68 | 0.58 |
| 204 | 9\_5028491 | Bayesian-based | 9\_50 | 0.64 | 0.82 |
| 205 | 9\_5028525 | Bayesian-based | 9\_50 | 0.56 | 0.815 |
| 206 | 9\_5042680 | Bayesian-based | 9\_50 | 0.62 | 0.82 |
| 207 | 9\_18607818 | Bayesian-based | 9\_186 | -0.23 | 0.079 |
| 208 | 9\_18628761 | stepwise | 9\_186 | -0.17 | 0.039 |
| 209 | 9\_53605430 | stepwise | 9\_536 | 0.45 | 0.195 |
| 210 | 9\_99293471 | Bayesian-based | 9\_993 | -0.1 | 0.046 |
| 211 | 9\_99358245 | stepwise | 9\_994 | -0.22 | 0.073 |
| 212 | 9\_140994782 | stepwise | 9\_1410 | 0.5 | 0.367 |
| 213 | 9\_148646606 | Bayesian-based | 9\_1486 | -0.3 | 0.213 |
| 214 | 9\_154100781 | Single-variant | 9\_1541 | 0.19 | 0.094 |
| 215 | 9\_154100783 | Single-variant | 9\_1541 | 0.19 | 0.094 |
| 216 | 10\_9360960 | stepwise | 10\_94 | 0.6 | 0.411 |
| 217 | 10\_9362813 | Single-variant | 10\_94 | 0.03 | 0.006 |
| 218 | 10\_54742641 | stepwise | 10\_547 | 0.43 | 0.294 |
| 218 | 10\_54742641 | Bayesian-based | 10\_547 | 0.43 | 0.294 |
| 219 | 10\_121407133 | Bayesian-based | 10\_1214 | 0.42 | 0.477 |
| 220 | 10\_135043790 | Bayesian-based | 10\_1350 | 0.94 | 1.002 |
| 221 | 10\_137881930 | Bayesian-based | 10\_1379 | 0.97 | 1.155 |
| 222 | 10\_137903044 | Single-variant | 10\_1379 | 0.53 | 1.501 |
| 223 | 10\_137943511 | Bayesian-based | 10\_1379 | 0.74 | 1.029 |
| 224 | 10\_137951908 | Bayesian-based | 10\_1380 | 0.77 | 1.122 |
| 225 | 10\_137955409 | Bayesian-based | 10\_1380 | 0.72 | 1.074 |
| 226 | 10\_137989336 | Single-variant | 10\_1380 | 0.5 | 1.436 |
| 227 | 10\_137998831 | Bayesian-based | 10\_1380 | 0.89 | 1.127 |
| 228 | 10\_138019385 | Single-variant | 10\_1380 | 0.52 | 1.54 |
| 229 | 10\_139310781 | Bayesian-based | 10\_1393 | 0.44 | 0.877 |
| 230 | 10\_141509779 | Bayesian-based | 10\_1415 | 0.88 | 1.17 |
| 231 | 10\_141509800 | stepwise | 10\_1415 | 1 | 1.224 |

1 Statistical approaches originally used for identification of the KAVs.

2 Binsize equal to 100-kb.

3 KAV effects were calculated using B73 subtracting non-B73 alleles.

4 Phenotypic variation explained by the KAVs.