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# Supplemental Information

# Genome-wide Association Study of Three-Dimensional Facial Morphology Identifies a Variant in *PAX3* Associated with Nasion Position

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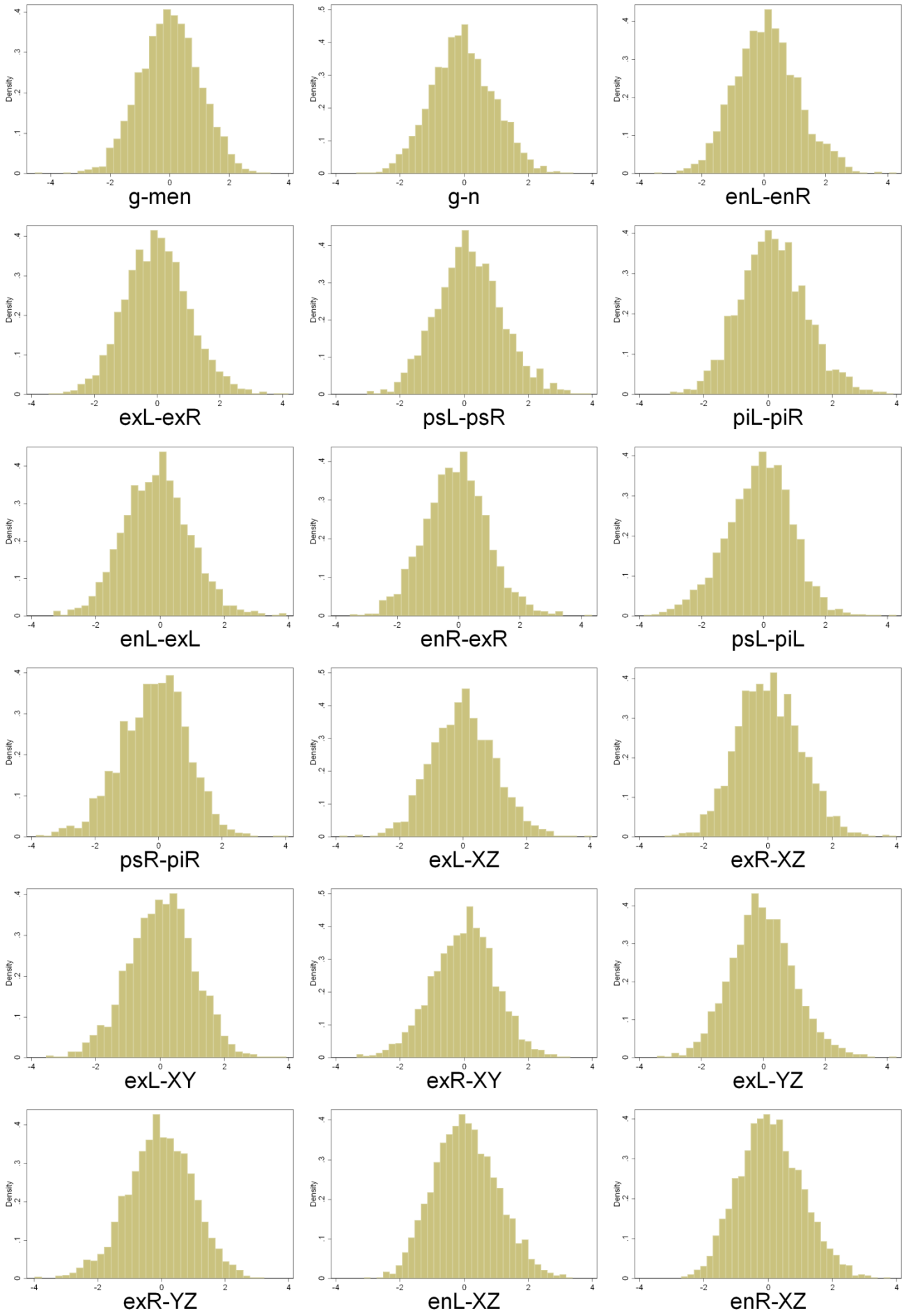
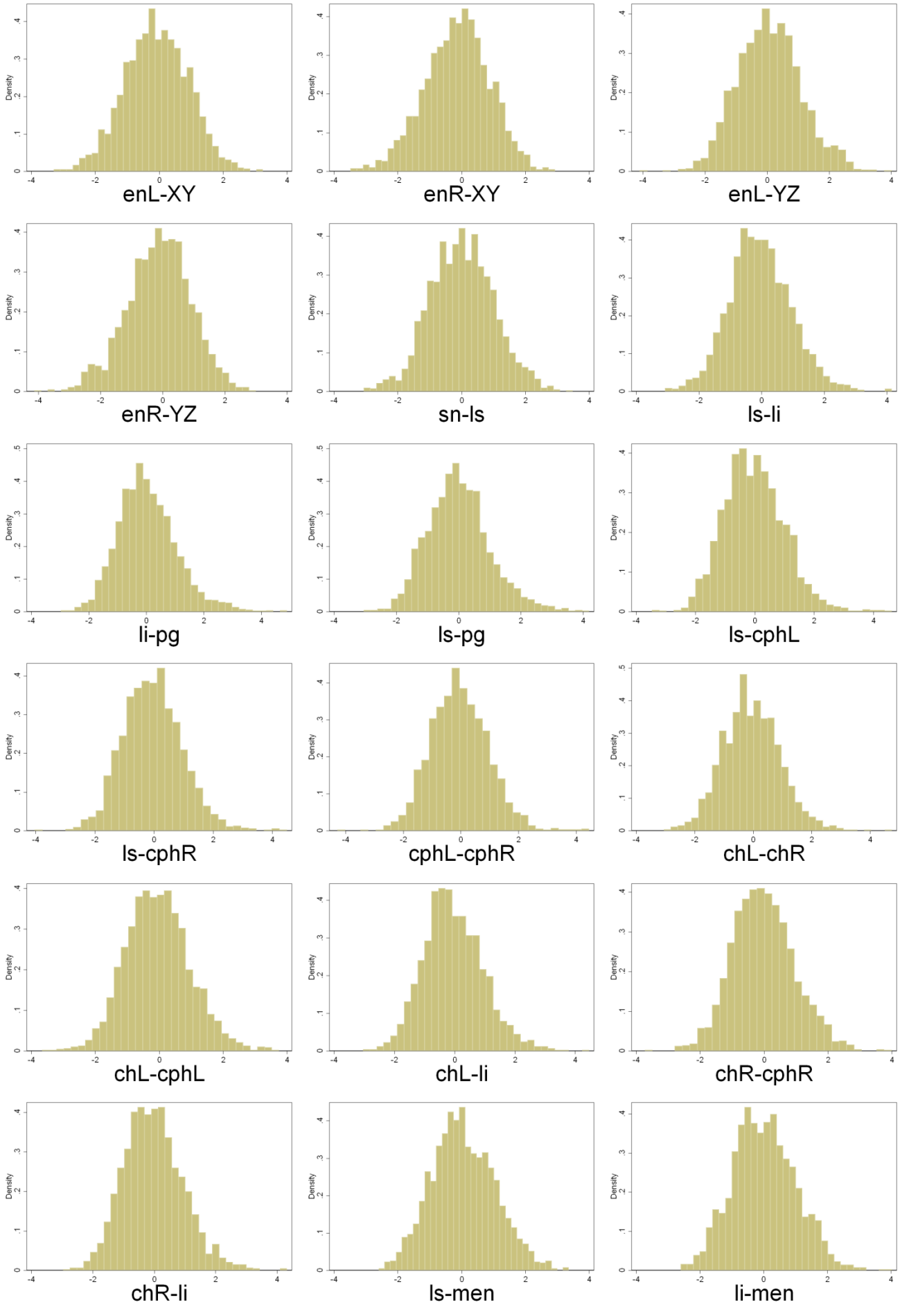
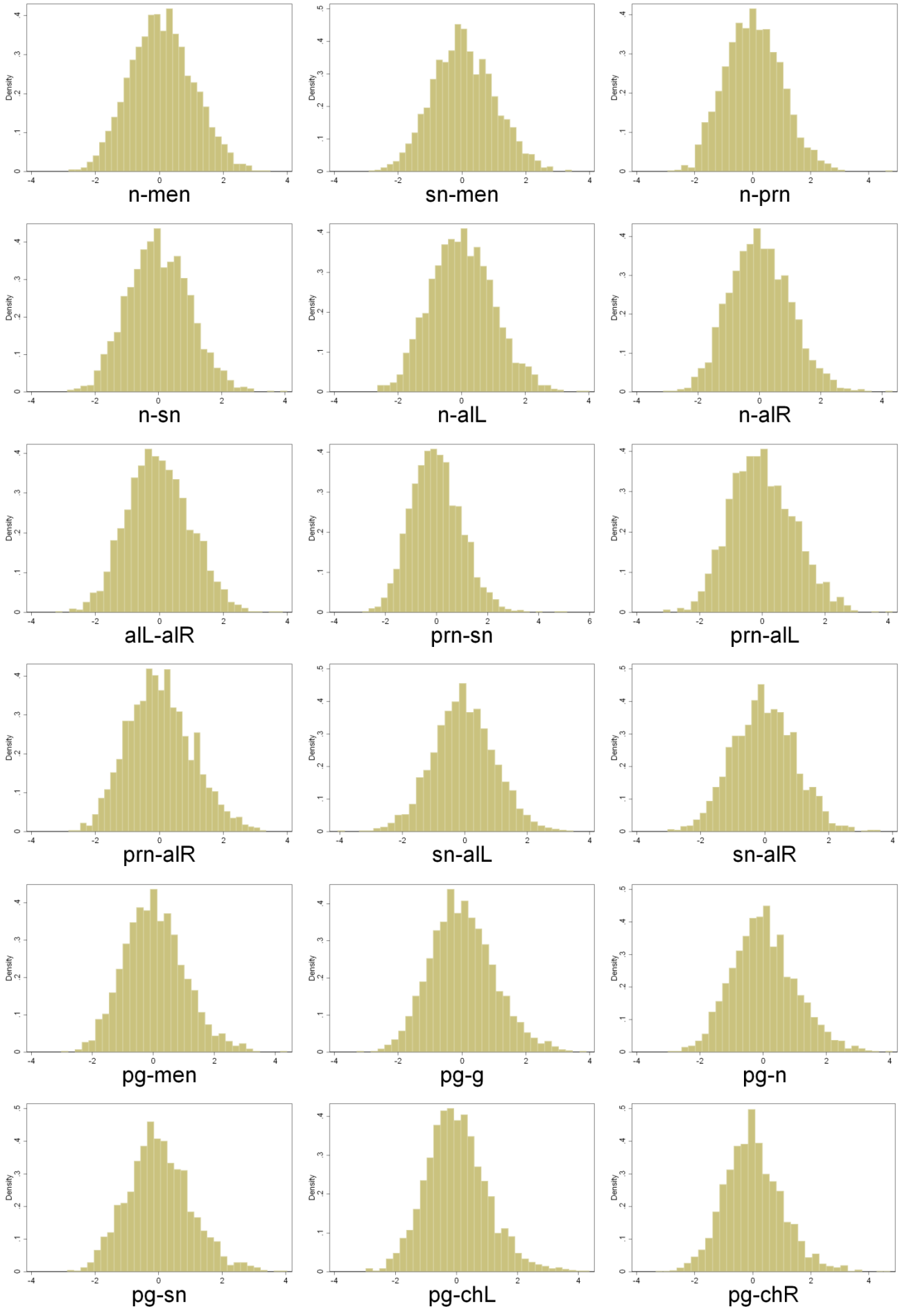
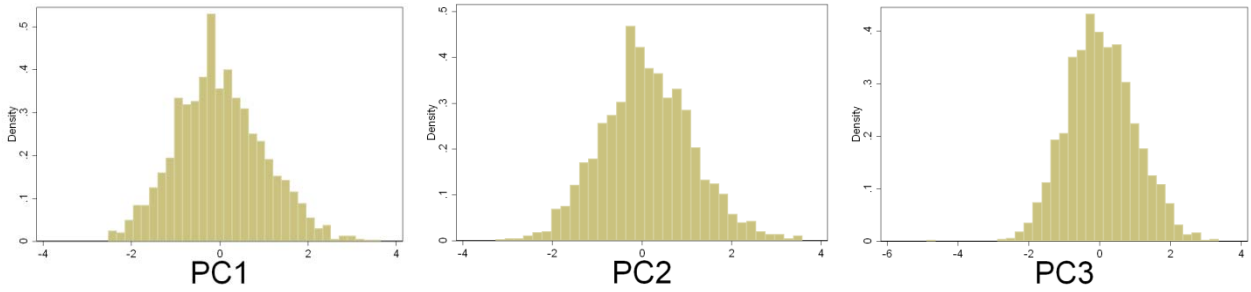
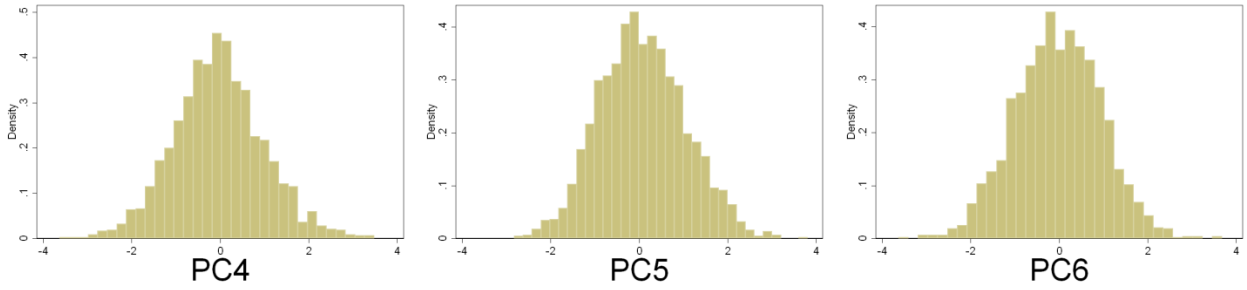
**Figure S1. Distributional plots for the 54 distances and 14 principal components in the discovery sample.**

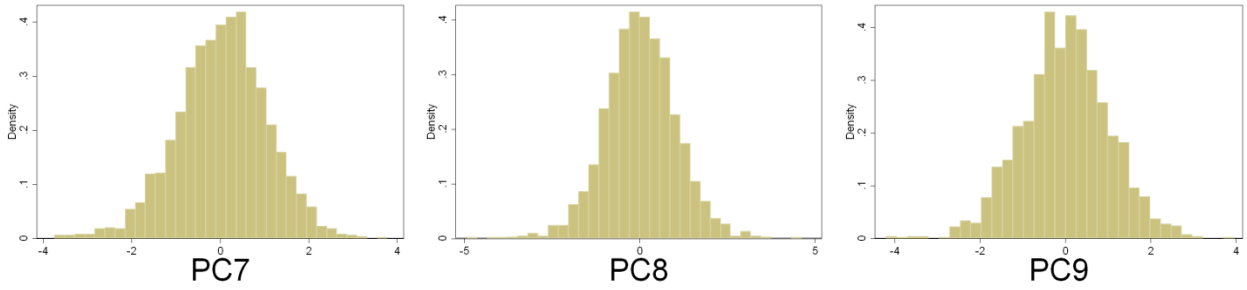


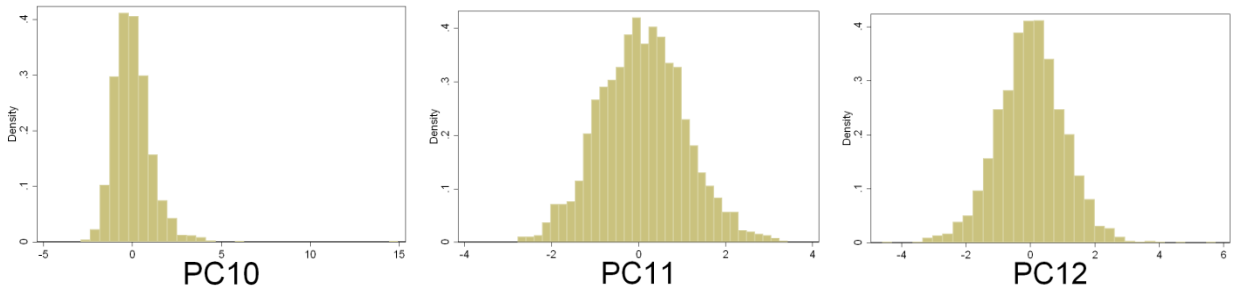

enL-XY
enR-XY
enL-YZ
enR-YZ
sn-ls
ls-li
li-pg
ls-pg
ls-cphL
ls-cphR
cphL-cphR
chL-chR
chL-cphL
chL-li
chR-cphR
chR-li
ls-men
li-men
Density

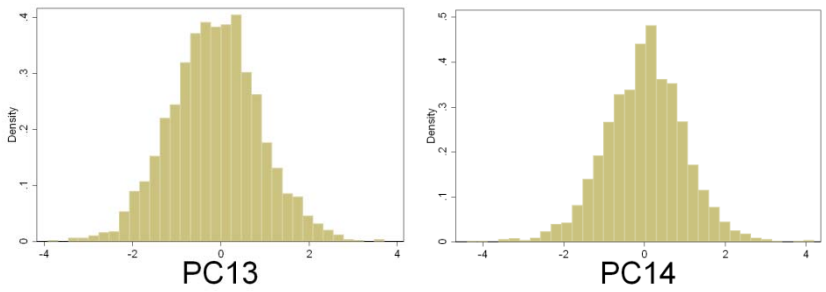

n-men
sn-men
n-prn
n-sn
n-alL
n-alR
alL-alR
prn-sn
prn-alL
prn-alR
sn-alL
sn-alR
pg-men
pg-g
pg-n
pg-sn
pg-chL
pg-chR


Density
PC1
PC2
PC3

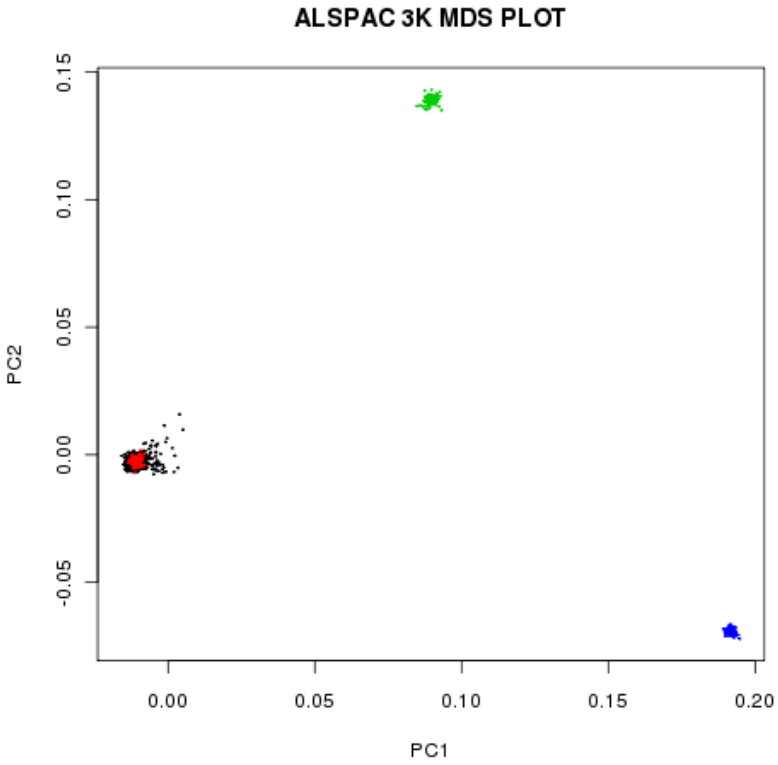

Density
PC4
PC5
PC6


Density
PC7
PC8
PC9


Density
PC10
PC11
PC12


Density
PC13
PC14

a.




b.

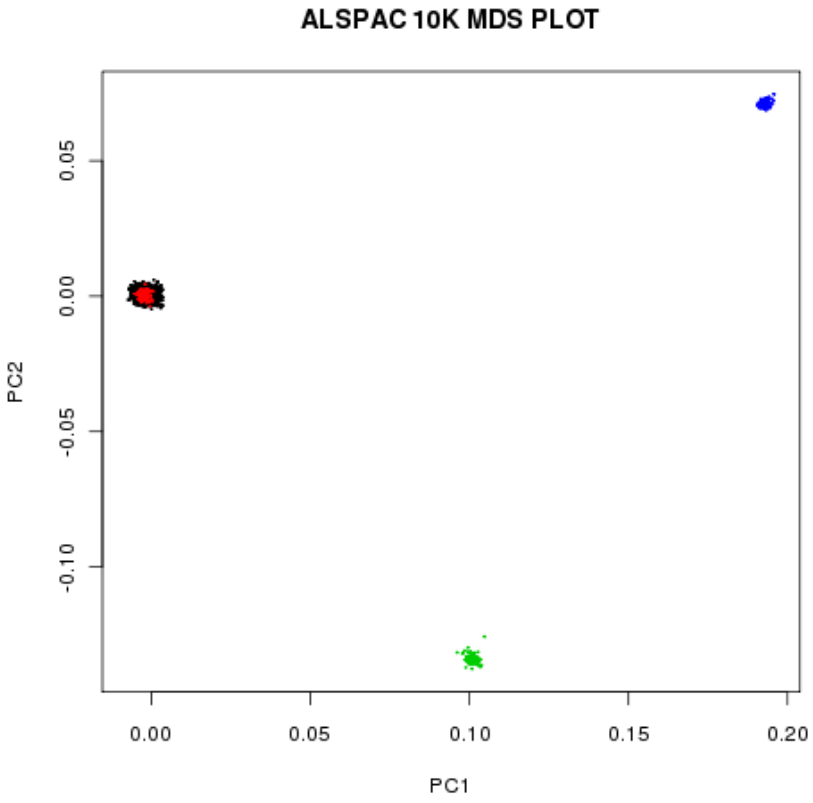



**Figure S2. Multidimensional scaling (MDS) analysis plots for the individuals included in the (a) discovery and (b) replication analyses.** Black points are the current participants, red points are the HapMap CEU individuals, green points are the Hapmap JPT/CHB individuals, blue points are the HapMap YRI individuals. As can be seen by the clusters of included individuals a less strict exclusion criteria was applied in the discovery sample (and EIGENSTRAT PC1 and PC2 were included in the analyses as covariates. Stricter ethnicity exclusion criteria were used for the replication sample and so it was not necessary to adjust for EIGENSTRAT values in the analyses.

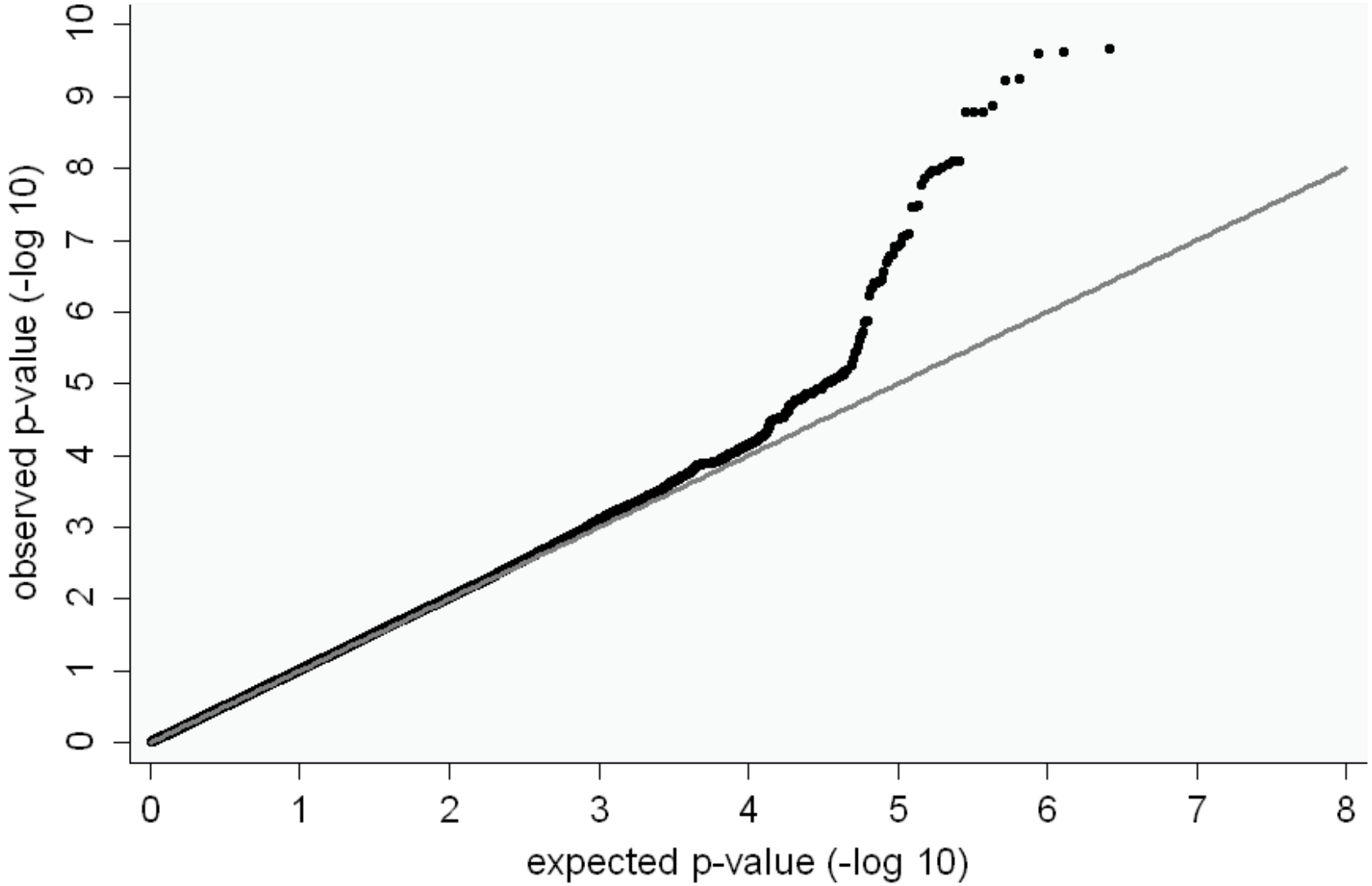



**Figure S3. QQ plot for the n-men GWA.** Lambda=1.02

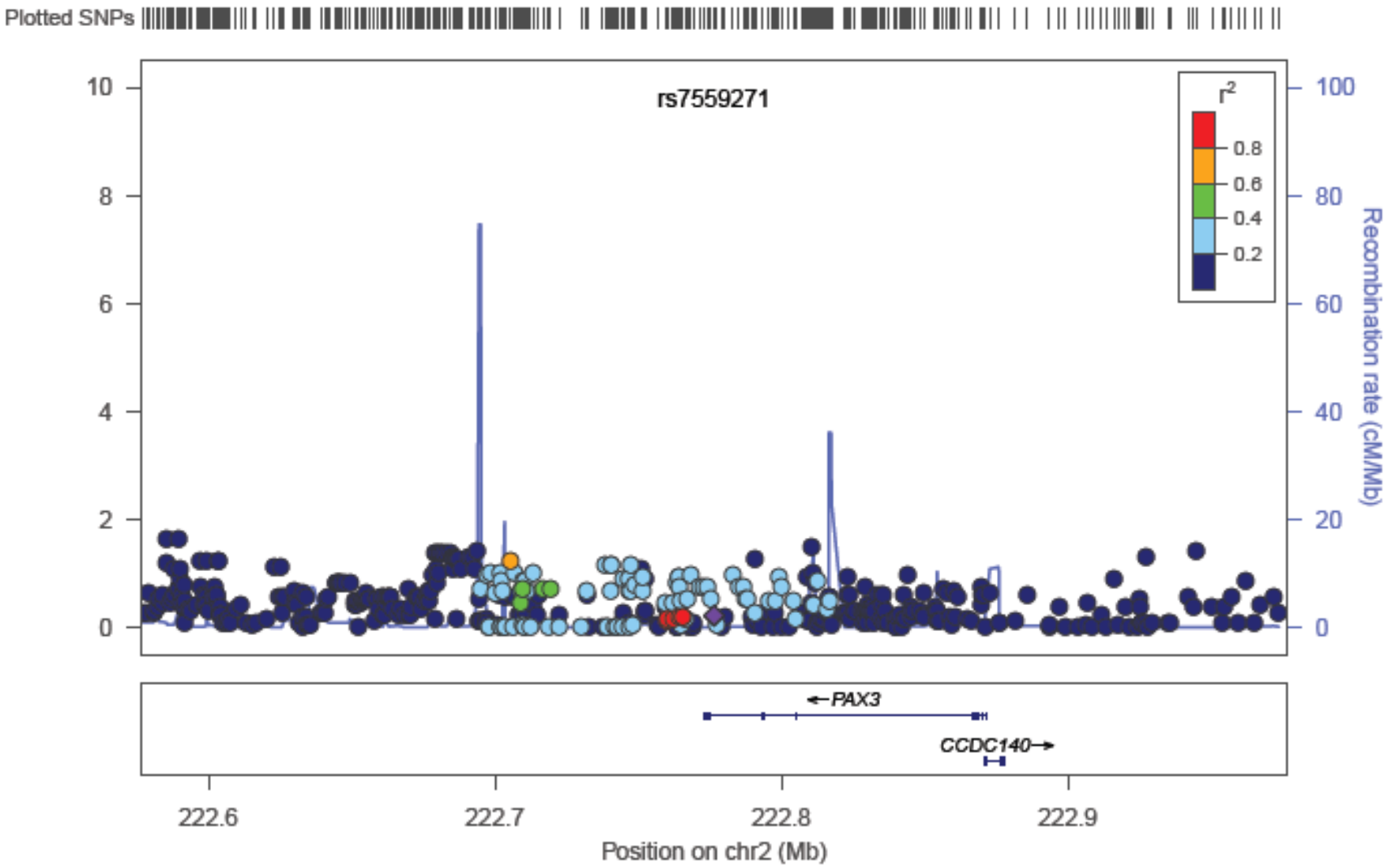



**Figure S4. Association plot of the region surrounding *PAX3* for the inter-canthal width (enL-enR).**

**Table S2. Principal Component Analysis (a) of Landmark Data and (b) brief description of the principal components extracted for the total sample.**

**a.**

| PC | x-y-z | Principal Components | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| PC1 | lsy | **-.851** | | .260 | | | | | | | .186 | | | | |
| | cphRy | **-.843** | | .243 | | | .102 | | | | .126 | | | | |
| | cphLy | **-.841** | | .240 | | | .107 | | | | .137 | | | | |
| | enLy | **.834** | .138 | -.112 | .165 | -.200 | -.155 | | | | | | | | -.105 |
| | enRy | **.829** | .160 | -.108 | .153 | -.176 | -.180 | | | | | | .106 | | .116 |
| | pgy | **-.822** | -.155 | | | | -.187 | | | | | | | | |
| | chRy | **-.816** | -.190 | | -.214 | | | | | | | | | | |
| | chLy | **-.814** | -.180 | | -.221 | | | -.100 | | | | | | -.121 | |
| | piRy | **.810** | | | .154 | -.151 | -.256 | | | | | | .125 | -.100 | .168 |
| | piLy | **.808** | | | .165 | -.170 | -.254 | | | | | | -.137 | -.104 | -.162 |
| | psLy | **.792** | | | | | -.278 | | | | | | -.123 | .332 | -.126 |
| | psRy | **.783** | | | | | -.276 | | | | | | .112 | .335 | .181 |
| | liy | **-.769** | -.124 | | -.386 | | | | | | | | | | |
| | exRy | **.759** | | | .189 | -.210 | -.309 | | | | | | .145 | | .197 |
| | exLy | **.748** | | | .194 | -.173 | -.313 | | | | | | -.184 | | -.220 |
| | gy | **.644** | .223 | | | .308 | -.130 | | | | | -.192 | | | |
| | ny | **.620** | .132 | -.468 | | .123 | | | | | | -.145 | | | |
| PC2 | psLx | .143 | **.939** | | | | | | -.125 | | | | | | |
| | psRx | -.139 | **-.939** | | | | | | -.116 | | | | | | |
| | piLx | .144 | **.933** | | | | | | -.135 | | | | | | |
| | piRx | -.150 | **-.932** | | | | | | -.127 | | | | -.126 | | |
| | enRx | | **-.837** | | | .129 | | | -.168 | | | | | .219 | |
| | enLx | .102 | **.830** | | | -.108 | | | -.126 | | | | | -.225 | |
| | exRx | -.192 | **-.810** | | | | | .123 | | | | -.116 | | -.391 | |
| | exLx | .184 | **.768** | | | | | -.123 | -.148 | | | .140 | | .432 | |
| PC3 | alLz | .209 | | **-.798** | | -.101 | -.171 | -.130 | | | | -.136 | | | |
| | alRz | .220 | | **-.786** | | | -.152 | -.144 | | | | -.132 | | | |
| | snz | .347 | | **-.706** | .260 | -.144 | | -.150 | | | | -.113 | | | |
| | prnz | .404 | | **-.690** | | -.253 | -.138 | -.204 | | | | -.185 | | | |
| | liz | .295 | | **.562** | | | | -.239 | | | | | | | |
| PC4 | lsz | .368 | | | **.863** | | | -.102 | | | -.163 | | | | |
| | cphRz | .391 | | | **.861** | -.112 | | -.110 | | | | | | | |
| | cphLz | .388 | | | **.861** | -.117 | | | | | | | -.109 | | |
| | pgz | -.151 | | .271 | **-.788** | | -.195 | -.321 | | | | | | | |
| PC5 | gz | -.103 | .198 | .176 | | **-.858** | | | | | | -.148 | | .158 | |
| | nz | | .157 | -.163 | | **-.822** | .103 | | | | | -.299 | | .167 | |
| | piRz | -.374 | | .352 | -.245 | **.673** | | | | | .114 | -.120 | | | |
| | piLz | -.376 | | .349 | -.242 | **.659** | | | .117 | | .105 | -.111 | .119 | | |
| | enLz | -.469 | | .244 | -.191 | **.521** | .154 | | .111 | | | -.139 | | .274 | |
| | enRz | -.458 | | .250 | -.185 | **.485** | .167 | | | -.105 | | -.140 | | .321 | |
| PC6 | prny | | | | | .120 | **.821** | | | | | .106 | | | |
| | alLy | -.284 | | | | | **.791** | | -.108 | | | | | | |
| | alRy | -.299 | | | | | **.768** | | | | | | | | |
| | sny | -.226 | | .184 | | | **.722** | | | | | .162 | | | |
| PC7 | chRx | -.123 | -.128 | | | | | **.835** | | | .196 | | | | |
| | chLx | .139 | .145 | | | | | **-.821** | | | -.205 | | | | |
| | chLz | .203 | | .230 | | | | **.814** | | | | | -.124 | | |
| | chRz | .195 | | .225 | | | | **.806** | | | | | .145 | | |
| PC8 | snx | | | | | | | | **.940** | | | | | | |
| | prnx | | | | | | | | **.906** | .167 | | | | | -.139 |
| PC9 | gx | | | | | | | | | **.974** | | | | | |
| | nx | | | | | | | | | **.967** | | | | | |
| PC10 | cphRx | -.164 | | | | | | .183 | | | **.809** | | .312 | | |
| | cphLx | .147 | | | | | | -.199 | | | **-.768** | | .422 | | |
| | alLx | .266 | .321 | | .158 | -.163 | | -.219 | .266 | | **-.488** | .188 | | | |
| | alRx | -.275 | -.332 | | -.162 | .158 | | .219 | .265 | | **.481** | -.189 | | | |
| PC11 | psLz | -.275 | | .207 | | .101 | .219 | | .109 | | | **.805** | .109 | | |
| | psRz | -.288 | | .237 | | | .209 | | -.116 | | | **.784** | -.125 | | |
| PC12 | lsx | | | | | | | | | | | | **.942** | | |
| PC13 | exLz | -.307 | -.252 | .278 | -.172 | .369 | | | .166 | .105 | | | .161 | **-.618** | |
| | exRz | -.320 | -.290 | .287 | -.186 | .368 | .109 | | -.129 | -.118 | | | -.146 | **-.598** | |
| PC14 | pgx | | | | | | | | -.180 | | | | -.153 | | **.926** |
| | lix | | | | | | | | -.104 | | | | .486 | | **.775** |

The highlighted cells (coefficients > 0.5 in magnitude) indicate landmark coordinates that contribute greatly to the facial variation; non-highlighted cells (coefficients < 0.5 in magnitude) indicate landmark coordinates that have less effect on facial variation (coefficients in the range 0.1 - 0.49 in magnitude are presented and coefficients < 0.1 in magnitude are not shown).

**b.**

| Principal Components | Percentage of variance |
|---|---|
| **PC1**, Face Height | 28.8 |
| **PC2**, Inter-Eyes Distance (Face Width) | 10.4 |
| **PC3**, Prominence of the nose | 6.7 |
| **PC4**, Protrusion of the upper lip relative to the chin | 5.3 |
| **PC5**, Prominence of the eyes relative to the nasal bridge | 4.8 |
| **PC6**, Vertical height of the nose | 4.4 |
| **PC7**, Ratio of the mouth width to mouth depth | 4.0 |
| **PC8**, Deviation of the nasal tip and columella base | 3.6 |
| **PC9**, Horizontal asymmetry of the nasal bridge | 3.2 |
| **PC10**, Philtrum-to-nose width ratio | 2.7 |
| **PC11**, Prominence of the upper eyelids | 2.4 |
| **PC12**, Horizontal asymmetry of the upper lip (philtrum) | 2.3 |
| **PC13**, Facial flatness (outer canthi depth) | 1.9 |
| **PC14**, Horizontal asymmetry of the chin and lower lip | 1.7 |

**Table S3. Discovery results for all associations with p<5x10-7.** Associations taken forward to replication are shaded grey.

| Trait | SNP | Chr | position | Allele 1,2 | Allele 1 freq | R2 | Beta (allele 2) | SE | P-value |
|---|---|---|---|---|---|---|---|---|---|
| g-men | rs12146102 | 1 | 114601393 | A,G | 0.9062 | 0.8141 | 0.283 | 0.055 | 2.74E-07 |
| g-men | rs6666714 | 1 | 114596380 | C,T | 0.9073 | 0.8371 | 0.281 | 0.055 | 2.82E-07 |
| enL-exR | rs3828294 | 2 | 207338149 | A,G | 0.2572 | 0.9902 | 0.171 | 0.034 | 4.64E-07 |
| exL-exR | rs4716593 | 7 | 155704176 | A,G | 0.3727 | 0.9992 | -0.164 | 0.032 | 2.65E-07 |
| exL-exR | rs4717020 | 7 | 155704226 | A,G | 0.3727 | 0.999 | -0.164 | 0.032 | 2.68E-07 |
| exL-exR | rs4717021 | 7 | 155704640 | C,T | 0.6272 | 0.9987 | 0.163 | 0.032 | 2.76E-07 |
| exL-exR | rs12050594 | 15 | 48560028 | A,T | 0.869 | 0.8501 | -0.254 | 0.05 | 3.62E-07 |
| psR-piR | rs4375631 | 15 | 85239778 | C,T | 0.0625 | 0.4648 | 0.504 | 0.1 | 4.31E-07 |
| exR.yz | rs4716593 | 7 | 155704176 | A,G | 0.3727 | 0.9992 | 0.165 | 0.032 | 2.30E-07 |
| exR.yz | rs4717020 | 7 | 155704226 | A,G | 0.3727 | 0.999 | 0.165 | 0.032 | 2.33E-07 |
| exR.yz | rs4717021 | 7 | 155704640 | C,T | 0.6272 | 0.9987 | -0.165 | 0.032 | 2.40E-07 |
| exR.yz | rs2901850 | 2 | 77637083 | G,T | 0.8246 | 0.9463 | -0.207 | 0.041 | 4.58E-07 |
| enL.xz | rs9907335 | 17 | 62359090 | A,G | 0.5217 | 0.8718 | -0.137 | 0.026 | 1.61E-07 |
| enR.yz | rs10862567 | 12 | 81946483 | A,T | 0.6875 | 0.963 | 0.181 | 0.033 | 4.43E-08 |
| enR.yz | rs10746265 | 12 | 81944579 | C,G | 0.3126 | 0.9701 | -0.18 | 0.033 | 4.76E-08 |
| enR.yz | rs892540 | 12 | 81941606 | C,T | 0.6881 | 0.9779 | 0.179 | 0.033 | 5.43E-08 |
| enR.yz | rs2020370 | 12 | 81942025 | A,G | 0.6871 | 0.9937 | 0.176 | 0.033 | 6.02E-08 |
| enR.yz | rs10862569 | 12 | 81947239 | A,T | 0.3428 | 0.871 | -0.182 | 0.034 | 9.68E-08 |
| enR.yz | rs10862568 | 12 | 81946655 | A,G | 0.3432 | 0.8938 | -0.178 | 0.034 | 1.22E-07 |
| enR.yz | rs11115550 | 12 | 81946617 | C,T | 0.6565 | 0.9142 | 0.175 | 0.033 | 1.50E-07 |
| enR.yz | rs10862566 | 12 | 81946435 | C,T | 0.6564 | 0.9187 | 0.174 | 0.033 | 1.56E-07 |
| enR.yz | rs4374000 | 12 | 81945470 | A,C | 0.3436 | 0.9192 | -0.174 | 0.033 | 1.57E-07 |
| enR.yz | rs10862545 | 12 | 81939361 | A,T | 0.6586 | 0.9095 | 0.175 | 0.033 | 1.63E-07 |
| enR.yz | rs10862548 | 12 | 81939850 | C,G | 0.6576 | 0.9212 | 0.173 | 0.033 | 1.73E-07 |
| enR.yz | rs7965643 | 12 | 81938025 | C,T | 0.6445 | 0.894 | 0.174 | 0.033 | 1.74E-07 |
| enR.yz | rs17740709 | 12 | 81947471 | A,G | 0.7991 | 0.8368 | 0.216 | 0.041 | 1.75E-07 |
| enR.yz | rs10862560 | 12 | 81943799 | C,T | 0.6562 | 0.9341 | 0.172 | 0.033 | 1.81E-07 |
| enR.yz | rs11115544 | 12 | 81943635 | A,G | 0.3438 | 0.936 | -0.171 | 0.033 | 1.84E-07 |
| enR.yz | rs11115545 | 12 | 81943731 | A,G | 0.3438 | 0.9353 | -0.171 | 0.033 | 1.84E-07 |
| enR.yz | rs11115542 | 12 | 81943390 | A,G | 0.3439 | 0.9425 | -0.17 | 0.033 | 1.95E-07 |
| enR.yz | rs3913351 | 15 | 85556598 | A,G | 0.4223 | 0.9984 | -0.161 | 0.031 | 2.37E-07 |
| enR.yz | rs7176553 | 15 | 85549546 | A,T | 0.5773 | 0.9863 | 0.161 | 0.031 | 2.81E-07 |
| enR.yz | rs12101402 | 15 | 85543102 | A,G | 0.5774 | 0.9839 | 0.161 | 0.031 | 2.83E-07 |
| enR.yz | rs17796608 | 12 | 81938282 | C,T | 0.2131 | 0.8633 | -0.203 | 0.04 | 3.52E-07 |
| n-men | rs7559271 | 2 | 222776530 | A,G | 0.6156 | 0.9956 | 0.169 | 0.027 | 2.20E-10 |
| n-men | rs6741414 | 2 | 222765382 | C,G | 0.3841 | 0.9926 | -0.169 | 0.027 | 2.42E-10 |
| n-men | rs10209141 | 2 | 222764612 | A,C | 0.3839 | 0.9914 | -0.169 | 0.027 | 2.55E-10 |
| n-men | rs10178871 | 2 | 222762245 | A,G | 0.6179 | 0.9881 | 0.166 | 0.027 | 5.75E-10 |
| n-men | rs11677206 | 2 | 222760227 | C,T | 0.382 | 0.9884 | -0.166 | 0.027 | 6.07E-10 |
| n-men | rs10176525 | 2 | 222747296 | A,T | 0.2395 | 0.9647 | -0.191 | 0.031 | 1.37E-09 |
| n-men | rs986430 | 2 | 222740886 | G,T | 0.7605 | 0.9676 | 0.19 | 0.031 | 1.65E-09 |
| n-men | rs986429 | 2 | 222740643 | A,T | 0.2395 | 0.9676 | -0.189 | 0.031 | 1.65E-09 |
| n-men | rs1370926 | 2 | 222738746 | C,G | 0.7605 | 0.9676 | 0.189 | 0.031 | 1.68E-09 |
| n-men | rs6730989 | 2 | 222787588 | A,G | 0.154 | 0.9986 | -0.21 | 0.036 | 8.05E-09 |
| n-men | rs2578449 | 2 | 222788436 | A,G | 0.154 | 0.9986 | -0.21 | 0.036 | 8.07E-09 |
| n-men | rs2855268 | 2 | 222775163 | C,G | 0.8459 | 0.9962 | 0.209 | 0.036 | 8.77E-09 |
| n-men | rs7597751 | 2 | 222767149 | C,T | 0.8458 | 0.9938 | 0.209 | 0.036 | 9.81E-09 |
| n-men | rs10209300 | 2 | 222764744 | A,G | 0.8458 | 0.9923 | 0.209 | 0.036 | 1.07E-08 |
| n-men | rs7590866 | 2 | 222795573 | A,G | 0.1541 | 0.9974 | -0.208 | 0.036 | 1.11E-08 |
| n-men | rs13410020 | 2 | 222811181 | A,G | 0.1488 | 0.7776 | -0.236 | 0.042 | 1.22E-08 |
| n-men | rs17401668 | 2 | 222797983 | A,G | 0.8459 | 0.997 | 0.206 | 0.036 | 1.40E-08 |
| n-men | rs1549773 | 2 | 222804212 | C,T | 0.8459 | 0.9971 | 0.205 | 0.036 | 1.71E-08 |
| n-men | rs6728938 | 2 | 222762001 | C,T | 0.8452 | 0.9884 | 0.202 | 0.037 | 3.38E-08 |
| n-men | rs1430655 | 2 | 222811792 | A,G | 0.111 | 0.932 | -0.238 | 0.043 | 3.57E-08 |
| n-men | rs10169326 | 2 | 222759746 | A,G | 0.1548 | 0.9879 | -0.202 | 0.037 | 3.59E-08 |
| n-men | rs1438605 | 2 | 222751581 | A,G | 0.855 | 0.9405 | 0.209 | 0.039 | 8.23E-08 |
| n-men | rs10211404 | 2 | 222747424 | A,G | 0.1451 | 0.943 | -0.209 | 0.039 | 8.99E-08 |
| n-men | rs13388386 | 2 | 222812662 | A,G | 0.8886 | 0.9778 | 0.225 | 0.042 | 9.08E-08 |
| n-men | rs10210971 | 2 | 222747139 | C,T | 0.8547 | 0.9495 | 0.206 | 0.039 | 1.12E-07 |
| n-men | rs7607981 | 2 | 222740246 | C,T | 0.8546 | 0.9522 | 0.205 | 0.039 | 1.24E-07 |
| n-men | rs7608778 | 2 | 222731823 | C,T | 0.1455 | 0.9523 | -0.205 | 0.039 | 1.27E-07 |
| n-men | rs13385121 | 2 | 222710949 | A,G | 0.8543 | 0.95 | 0.204 | 0.039 | 1.62E-07 |
| n-men | rs10932943 | 2 | 222709305 | A,G | 0.1458 | 0.9459 | -0.204 | 0.039 | 1.72E-07 |
| n-men | rs6749789 | 2 | 222702465 | A,G | 0.1461 | 0.9325 | -0.204 | 0.039 | 1.88E-07 |
| n-men | rs11886961 | 2 | 222700162 | C,G | 0.8535 | 0.9162 | 0.205 | 0.039 | 2.03E-07 |
| n-men | rs6757456 | 2 | 222695072 | C,T | 0.1461 | 0.7332 | -0.226 | 0.044 | 2.75E-07 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| n-men | rs7588554 | 2 | 222782895 | A,G | 0.5819 | 0.9975 | -0.137 | 0.027 | 3.72E-07 |
| n-men | rs1438607 | 2 | 222768195 | A,G | 0.5815 | 0.9941 | -0.137 | 0.027 | 3.77E-07 |
| n-men | rs10208761 | 2 | 222764220 | A,C | 0.5809 | 0.9901 | -0.137 | 0.027 | 3.92E-07 |
| n-men | rs10498131 | 2 | 222764049 | A,G | 0.4191 | 0.99 | 0.137 | 0.027 | 3.92E-07 |
| n-men | rs2894450 | 2 | 222705348 | A,G | 0.6015 | 0.9848 | 0.137 | 0.027 | 3.93E-07 |
| n-men | rs1013262 | 2 | 222799023 | G,T | 0.4182 | 0.9916 | 0.136 | 0.027 | 4.67E-07 |
| n-men | rs13023573 | 2 | 222763470 | A,C | 0.5792 | 0.9844 | -0.136 | 0.027 | 4.86E-07 |
| sn-men | rs4832657 | 2 | 16590220 | C,T | 0.7276 | 0.9604 | 0.154 | 0.03 | 2.68E-07 |
| sn-men | rs6761778 | 2 | 16580947 | C,T | 0.7281 | 0.9796 | 0.152 | 0.03 | 2.87E-07 |
| sn-men | rs2067702 | 2 | 16582375 | A,G | 0.7281 | 0.9791 | 0.152 | 0.03 | 2.87E-07 |
| sn-men | rs7573656 | 2 | 16598913 | A,G | 0.2737 | 0.9129 | -0.157 | 0.031 | 3.01E-07 |
| sn-men | rs7552 | 2 | 16597409 | A,G | 0.7095 | 0.883 | 0.156 | 0.031 | 3.25E-07 |
| sn-men | rs5007483 | 2 | 16597006 | G,T | 0.7318 | 0.9242 | 0.155 | 0.031 | 4.42E-07 |
| prn-sn | rs12532887 | 7 | 88040653 | A,T | 0.0136 | 0.406 | -1.059 | 0.197 | 7.16E-08 |
| prn-alL | rs11738462 | 5 | 61049533 | A,G | 0.1701 | 0.996 | 0.204 | 0.036 | 1.77E-08 |
| prn-alL | rs12521924 | 5 | 61046695 | A,G | 0.17 | 0.9978 | 0.204 | 0.036 | 1.77E-08 |
| prn-alL | rs13154578 | 5 | 61049025 | A,T | 0.83 | 0.9967 | -0.204 | 0.036 | 1.77E-08 |
| prn-alL | rs13159935 | 5 | 61046869 | C,T | 0.17 | 0.9983 | 0.204 | 0.036 | 1.79E-08 |
| prn-alL | rs12514378 | 5 | 61046957 | C,T | 0.17 | 0.9985 | 0.204 | 0.036 | 1.80E-08 |
| prn-alL | rs1982862 | 3 | 55039780 | A,C | 0.1249 | 0.7971 | 0.258 | 0.046 | 1.82E-08 |
| prn-alL | rs13160822 | 5 | 61043203 | G,T | 0.8485 | 0.809 | -0.231 | 0.042 | 4.55E-08 |
| prn-alL | rs7704929 | 5 | 61007579 | A,G | 0.809 | 0.9726 | -0.189 | 0.035 | 8.25E-08 |
| prn-alL | rs11746049 | 5 | 61008040 | C,T | 0.8115 | 0.9816 | -0.188 | 0.035 | 8.43E-08 |
| prn-alL | rs13175459 | 5 | 61021456 | A,G | 0.8108 | 0.9972 | -0.186 | 0.035 | 8.46E-08 |
| prn-alL | rs11750644 | 5 | 61009820 | C,T | 0.1888 | 0.9937 | 0.187 | 0.035 | 8.50E-08 |
| prn-alL | rs11747208 | 5 | 61009334 | C,G | 0.1888 | 0.9933 | 0.187 | 0.035 | 8.50E-08 |
| prn-alL | rs1501845 | 5 | 61012367 | A,G | 0.8112 | 0.9989 | -0.186 | 0.035 | 8.51E-08 |
| prn-alL | rs11740126 | 5 | 61026710 | A,G | 0.1894 | 0.9967 | 0.185 | 0.035 | 9.45E-08 |
| prn-alL | rs13156637 | 5 | 61037146 | A,G | 0.8102 | 0.9952 | -0.184 | 0.035 | 1.08E-07 |
| prn-alL | rs12520360 | 5 | 61035117 | C,T | 0.1898 | 0.9954 | 0.184 | 0.035 | 1.08E-07 |
| prn-alL | rs11748959 | 5 | 61034436 | A,G | 0.8102 | 0.9955 | -0.184 | 0.035 | 1.10E-07 |
| prn-alL | rs4700430 | 5 | 61033066 | A,G | 0.1898 | 0.9957 | 0.184 | 0.035 | 1.12E-07 |
| prn-alL | rs13163936 | 5 | 61031899 | A,G | 0.1898 | 0.996 | 0.184 | 0.035 | 1.14E-07 |
| prn-alL | rs6870236 | 5 | 61031633 | C,T | 0.8102 | 0.9961 | -0.184 | 0.035 | 1.15E-07 |
| prn-alL | rs13186555 | 5 | 61030794 | C,T | 0.8103 | 0.9967 | -0.184 | 0.035 | 1.18E-07 |
| prn-alL | rs11747263 | 5 | 61030624 | C,T | 0.1897 | 0.9967 | 0.184 | 0.035 | 1.19E-07 |
| prn-alL | rs11743702 | 5 | 61030585 | A,G | 0.1897 | 0.9969 | 0.184 | 0.035 | 1.20E-07 |
| prn-alL | rs4855096 | 3 | 180798461 | G,T | 0.5364 | 0.9956 | -0.139 | 0.027 | 3.32E-07 |
| prn-alL | rs9831673 | 3 | 180796256 | C,T | 0.5426 | 0.9765 | -0.141 | 0.028 | 3.32E-07 |
| prn-alL | rs6790272 | 3 | 180772123 | A,C | 0.4637 | 0.9896 | 0.14 | 0.027 | 3.34E-07 |
| prn-alL | rs7630170 | 3 | 180812289 | A,G | 0.5364 | 0.9971 | -0.139 | 0.027 | 3.34E-07 |
| prn-alL | rs9883607 | 3 | 180813386 | A,G | 0.4636 | 0.9977 | 0.139 | 0.027 | 3.35E-07 |
| prn-alL | rs9816801 | 3 | 180762075 | C,G | 0.536 | 0.9791 | -0.14 | 0.027 | 3.45E-07 |
| ls-cphL | rs10822139 | 10 | 52462200 | A,G | 0.689 | 0.9708 | 0.169 | 0.032 | 1.04E-07 |
| cphL-cphR | rs10822139 | 10 | 52462200 | A,G | 0.689 | 0.9708 | 0.156 | 0.031 | 4.90E-07 |
| chL-chR | rs4717019 | 7 | 155703821 | G,T | 0.3941 | 0.955 | -0.166 | 0.031 | 5.96E-08 |
| chL-chR | rs4717018 | 7 | 155703260 | C,T | 0.606 | 0.9547 | 0.166 | 0.031 | 6.02E-08 |
| chL-chR | rs4717017 | 7 | 155703058 | A,G | 0.403 | 0.9535 | -0.163 | 0.031 | 1.04E-07 |
| chL-chR | rs6698642 | 1 | 19128258 | C,T | 0.8352 | 0.9992 | -0.208 | 0.04 | 2.32E-07 |
| chL-chR | rs4717023 | 7 | 155707483 | A,T | 0.3693 | 0.9968 | -0.155 | 0.031 | 4.06E-07 |
| chL-chR | rs4716593 | 7 | 155704176 | A,G | 0.3727 | 0.9992 | -0.154 | 0.031 | 4.75E-07 |
| chL-chR | rs4717020 | 7 | 155704226 | A,G | 0.3727 | 0.999 | -0.154 | 0.031 | 4.78E-07 |
| chL-chR | rs4717021 | 7 | 155704640 | C,T | 0.6272 | 0.9987 | 0.154 | 0.031 | 4.84E-07 |
| chr-li | rs9599075 | 13 | 65624171 | A,T | 0.7905 | 0.8865 | 0.188 | 0.037 | 4.04E-07 |
| ls-men | rs12997119 | 2 | 16597765 | C,T | 0.2246 | 0.9136 | -0.156 | 0.03 | 2.52E-07 |
| li-men | rs7158989 | 14 | 54655311 | C,T | 0.9035 | 0.954 | -0.224 | 0.044 | 3.99E-07 |
| pg-n | rs3012485 | 10 | 17064855 | A,G | 0.0964 | 0.9972 | -0.231 | 0.045 | 3.14E-07 |
| pg-n | rs3012486 | 10 | 17064965 | C,T | 0.0964 | 0.9964 | -0.231 | 0.045 | 3.14E-07 |
| pg-n | rs3012487 | 10 | 17065000 | C,T | 0.0963 | 0.9956 | -0.231 | 0.045 | 3.15E-07 |
| pg-n | rs3012490 | 10 | 17065651 | C,T | 0.0963 | 0.9948 | -0.231 | 0.045 | 3.15E-07 |
| pg-n | rs3012488 | 10 | 17065113 | A,T | 0.9037 | 0.9951 | 0.231 | 0.045 | 3.15E-07 |
| pg-n | rs3012491 | 10 | 17065672 | C,T | 0.9037 | 0.9943 | 0.232 | 0.045 | 3.16E-07 |
| pg-n | rs3012493 | 10 | 17065834 | C,T | 0.0962 | 0.9912 | -0.232 | 0.045 | 3.19E-07 |
| pg-n | rs1801229 | 10 | 17064621 | A,T | 0.0964 | 0.9971 | -0.231 | 0.045 | 3.19E-07 |
| pg-n | rs1801231 | 10 | 17064509 | A,G | 0.9036 | 0.997 | 0.231 | 0.045 | 3.25E-07 |
| pg-n | rs3012484 | 10 | 17064410 | C,T | 0.0963 | 0.9954 | -0.231 | 0.045 | 3.51E-07 |
| pg-n | rs2932895 | 10 | 17064381 | A,T | 0.0962 | 0.9952 | -0.231 | 0.045 | 3.55E-07 |
| pg-n | rs2942365 | 10 | 17064223 | A,C | 0.0962 | 0.9946 | -0.23 | 0.045 | 3.68E-07 |
| pg-n | rs2942364 | 10 | 17064031 | C,T | 0.9039 | 0.9943 | 0.23 | 0.045 | 3.76E-07 |
| pg-n | rs1512702 | 10 | 17063674 | G,T | 0.9039 | 0.9939 | 0.23 | 0.045 | 3.85E-07 |
| pg-n | rs3012494 | 10 | 17066390 | A,G | 0.0949 | 0.9706 | -0.233 | 0.046 | 4.02E-07 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| pg-n | rs3012482 | 10 | 17063663 | C,T | 0.096 | 0.9932 | -0.23 | 0.045 | 4.05E-07 |
| pg-n | rs3012480 | 10 | 17063570 | C,T | 0.9041 | 0.9926 | 0.23 | 0.045 | 4.25E-07 |
| pg-chL | rs463498 | 21 | 43150483 | C,T | 0.9347 | 0.9819 | 0.326 | 0.061 | 7.55E-08 |
| pg-chL | rs4148974 | 21 | 43196789 | C,T | 0.9472 | 0.9768 | 0.365 | 0.068 | 7.65E-08 |
| pg-chL | rs460128 | 21 | 43147076 | A,T | 0.0645 | 0.9837 | -0.324 | 0.061 | 1.08E-07 |
| pg-chL | rs2839603 | 21 | 43197575 | C,T | 0.0674 | 0.9723 | -0.312 | 0.06 | 2.05E-07 |
| pg-chL | rs11203166 | 21 | 43216705 | A,G | 0.9322 | 0.9523 | 0.314 | 0.06 | 2.12E-07 |
| pg-chL | rs2321769 | 6 | 79494679 | G,T | 0.548 | 0.999 | -0.154 | 0.031 | 4.27E-07 |
| pg-chL | rs9350774 | 6 | 79518322 | A,G | 0.5481 | 1 | -0.154 | 0.031 | 4.27E-07 |
| pg-chL | rs9350776 | 6 | 79520564 | A,G | 0.5481 | 1 | -0.154 | 0.031 | 4.27E-07 |
| pg-chL | rs1180825 | 6 | 79490569 | G,T | 0.548 | 0.9987 | -0.154 | 0.031 | 4.28E-07 |
| pg-chL | rs3918524 | 6 | 79515816 | A,G | 0.4519 | 0.9999 | 0.154 | 0.031 | 4.28E-07 |
| pg-chL | rs7740607 | 6 | 79498009 | C,T | 0.548 | 0.9991 | -0.154 | 0.031 | 4.28E-07 |
| pg-chL | rs9352628 | 6 | 79514166 | G,T | 0.4519 | 0.9998 | 0.154 | 0.031 | 4.28E-07 |
| pg-chL | rs9359343 | 6 | 79513450 | A,G | 0.4519 | 0.9997 | 0.154 | 0.031 | 4.28E-07 |
| pg-chL | rs7743640 | 6 | 79510794 | A,G | 0.5481 | 0.9996 | -0.154 | 0.031 | 4.29E-07 |
| pg-chL | rs9352627 | 6 | 79512305 | C,T | 0.4519 | 0.9997 | 0.154 | 0.031 | 4.29E-07 |
| pg-chL | rs9448542 | 6 | 79501084 | A,C | 0.4519 | 0.9995 | 0.154 | 0.031 | 4.29E-07 |
| pg-chL | rs2321772 | 6 | 79532909 | G,T | 0.452 | 0.9994 | 0.154 | 0.031 | 4.31E-07 |
| pg-chR | rs9350774 | 6 | 79518322 | A,G | 0.5481 | 1 | -0.156 | 0.03 | 2.42E-07 |
| pg-chR | rs9350776 | 6 | 79520564 | A,G | 0.5481 | 1 | -0.156 | 0.03 | 2.42E-07 |
| pg-chR | rs3918524 | 6 | 79515816 | A,G | 0.4519 | 0.9999 | 0.156 | 0.03 | 2.43E-07 |
| pg-chR | rs2321769 | 6 | 79494679 | G,T | 0.548 | 0.999 | -0.156 | 0.03 | 2.43E-07 |
| pg-chR | rs9352628 | 6 | 79514166 | G,T | 0.4519 | 0.9998 | 0.156 | 0.03 | 2.43E-07 |
| pg-chR | rs1180825 | 6 | 79490569 | G,T | 0.548 | 0.9987 | -0.156 | 0.03 | 2.43E-07 |
| pg-chR | rs7740607 | 6 | 79498009 | C,T | 0.548 | 0.9991 | -0.156 | 0.03 | 2.43E-07 |
| pg-chR | rs9359343 | 6 | 79513450 | A,G | 0.4519 | 0.9997 | 0.156 | 0.03 | 2.44E-07 |
| pg-chR | rs9448542 | 6 | 79501084 | A,C | 0.4519 | 0.9995 | 0.156 | 0.03 | 2.44E-07 |
| pg-chR | rs7743640 | 6 | 79510794 | A,G | 0.5481 | 0.9996 | -0.156 | 0.03 | 2.44E-07 |
| pg-chR | rs9352627 | 6 | 79512305 | C,T | 0.4519 | 0.9997 | 0.156 | 0.03 | 2.44E-07 |
| pg-chR | rs2321772 | 6 | 79532909 | G,T | 0.452 | 0.9994 | 0.156 | 0.03 | 2.45E-07 |
| PC6 | rs507798 | 5 | 84846956 | C,G | 0.3687 | 0.9334 | -0.157 | 0.031 | 4.8E-07 |
| PC6 | rs612777 | 5 | 84847479 | A,G | 0.6313 | 0.9335 | 0.157 | 0.031 | 4.8E-07 |
| PC6 | rs413927 | 5 | 84848924 | C,T | 0.3687 | 0.9335 | -0.157 | 0.031 | 4.8E-07 |
| PC6 | rs488160 | 5 | 84849976 | A,G | 0.3688 | 0.9335 | -0.157 | 0.031 | 4.8E-07 |
| PC6 | rs800837 | 5 | 84853165 | A,G | 0.6312 | 0.9336 | 0.157 | 0.031 | 4.8E-07 |
| PC6 | rs1697833 | 5 | 84853946 | G,T | 0.6312 | 0.9337 | 0.157 | 0.031 | 4.9E-07 |
| PC6 | rs405852 | 5 | 84854071 | C,T | 0.6311 | 0.9338 | 0.157 | 0.031 | 4.9E-07 |
| PC6 | rs373272 | 5 | 84854412 | A,G | 0.3689 | 0.9338 | -0.157 | 0.031 | 4.9E-07 |
| PC6 | rs395495 | 5 | 84856749 | C,T | 0.3689 | 0.9338 | -0.157 | 0.031 | 4.9E-07 |
| PC6 | rs576581 | 5 | 84858101 | A,G | 0.6311 | 0.9339 | 0.157 | 0.031 | 4.9E-07 |
| PC6 | rs596598 | 5 | 84858153 | C,G | 0.631 | 0.934 | 0.157 | 0.031 | 4.9E-07 |
| PC6 | rs425542 | 5 | 84858536 | A,T | 0.369 | 0.934 | -0.157 | 0.031 | 5.0E-07 |
| PC6 | rs414692 | 5 | 84858565 | C,T | 0.631 | 0.9341 | 0.157 | 0.031 | 5.0E-07 |
| PC7 | rs4780055 | 15 | 30955652 | C,T | 0.7365 | 0.9747 | 0.17 | 0.034 | 4.0E-07 |
| PC7 | rs4780056 | 15 | 30956048 | C,G | 0.2635 | 0.9745 | -0.17 | 0.034 | 4.0E-07 |
| PC7 | rs8026174 | 15 | 30956497 | A,G | 0.2635 | 0.9744 | -0.17 | 0.034 | 4.0E-07 |
| PC7 | rs8030979 | 15 | 91794785 | C,T | 0.7328 | 0.8568 | 0.183 | 0.036 | 4.6E-07 |
| PC10 | rs11122837 | 2 | 121428330 | A,G | 0.9766 | 0.3007 | 1.019 | 0.191 | 9.6E-08 |
| PC10 | rs11689760 | 2 | 121428730 | A,C | 0.0234 | 0.3004 | -1.019 | 0.191 | 9.6E-08 |
| PC10 | rs2084234 | 2 | 121427325 | G,T | 0.9766 | 0.3007 | 1.018 | 0.191 | 9.7E-08 |
| PC10 | rs12711536 | 2 | 121426256 | C,T | 0.0234 | 0.3016 | -1.016 | 0.191 | 9.7E-08 |
| PC10 | rs10864866 | 2 | 121425133 | A,G | 0.0234 | 0.3041 | -1.011 | 0.19 | 9.9E-08 |
| PC10 | rs11681136 | 2 | 121425561 | A,G | 0.9766 | 0.3041 | 1.011 | 0.19 | 9.9E-08 |
| PC10 | rs12711535 | 2 | 121426006 | C,T | 0.0234 | 0.3034 | -1.012 | 0.19 | 1.0E-07 |
| PC10 | rs11122835 | 2 | 121424629 | G,T | 0.9766 | 0.3061 | 1.006 | 0.189 | 1.0E-07 |
| PC10 | rs1466042 | 2 | 121419389 | A,G | 0.0234 | 0.3064 | -1.005 | 0.189 | 1.0E-07 |
| PC10 | rs4848658 | 2 | 121423860 | C,T | 0.0234 | 0.3061 | -1.006 | 0.189 | 1.0E-07 |
| PC10 | rs2166565 | 2 | 121408947 | A,G | 0.0235 | 0.3105 | -0.995 | 0.188 | 1.1E-07 |
| PC10 | rs7816288 | 8 | 53271417 | C,T | 0.9891 | 0.4249 | 1.333 | 0.257 | 2.1E-07 |
| PC10 | rs10206938 | 2 | 121391708 | A,G | 0.9762 | 0.3488 | 0.912 | 0.176 | 2.2E-07 |
| PC10 | rs935428 | 2 | 121390883 | A,G | 0.9762 | 0.3491 | 0.91 | 0.176 | 2.3E-07 |
| PC11 | rs970797 | 2 | 176820065 | G,T | 0.5783 | 0.9996 | -0.159 | 0.029 | 7.6E-08 |

**Table S4. rs7559271 results for the 14 principal components.**

| PC | Beta | SE | p-value |
|---|---|---|---|
| 1 | -0.007 | 0.026 | 0.784 |
| 2 | 0.024 | 0.030 | 0.434 |
| 3 | 0.048 | 0.028 | 0.087 |
| 4 | 0.004 | 0.029 | 0.900 |
| 5 | 0.095 | 0.025 | 2E-4 |
| 6 | 0.012 | 0.029 | 0.689 |
| 7 | -0.011 | 0.030 | 0.717 |
| 8 | 0.000 | 0.031 | 0.997 |
| 9 | -0.008 | 0.031 | 0.788 |
| 10 | 0.027 | 0.032 | 0.403 |
| 11 | 0.130 | 0.029 | 6E-6 |
| 12 | 0.015 | 0.031 | 0.624 |
| 13 | 0.009 | 0.030 | 0.764 |
| 14 | 0.001 | 0.030 | 0.974 |

Betas are shown according to the G allele