**Table S1. Results of Single-variant Analysis by Using Conventional Logistic Regression Approach**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Block | Gene | Genetic  Model1 | SNP in Block | Allele | MAF\_M2 | MAF\_B3 | SNP  p-value4 | Block  p-value5 |
| Block 1 | *GSTM4* | Maternal | rs542338 | A/G | 0.41 | 0.40 | 0.060 | 0.038 |
|  |  | Effect | rs668413 | A/C | 0.41 | 0.40 | 0.103 |  |
|  |  |  | rs560018 | A/G | 0.32 | 0.31 | 0.029 |  |
|  |  |  | rs535537 | A/G | 0.12 | 0.12 | 0.286 |  |
|  |  |  | rs670439 | A/G | 0.13 | 0.13 | 0.818 |  |
| Block 2 | *DNMT3A* | MFG | rs7578575 | A/T | 0.27 | 0.27 | 0.561 | 0.028 |
|  |  | Interaction | rs7590760 | C/G | 0.49 | 0.49 | 0.037 |  |
| Block 3 | *PGDS* | Fetal | rs8336 | A/G | 0.41 | 0.43 | 0.654 | 0.017 |
|  |  | Effect | rs11097411 | A/G | 0.42 | 0.42 | 0.056 |  |
|  |  |  | rs2016483 | A/T | 0.43 | 0.45 | 0.569 |  |
|  |  |  | rs11932130 | A/G | 0.16 | 0.15 | 0.414 |  |
|  |  |  | rs10033662 | A/G | 0.40 | 0.39 | 0.004 |  |
|  |  |  | rs11097413 | A/G | 0.42 | 0.45 | 0.827 |  |
|  |  |  | rs2865352 | A/G | 0.42 | 0.45 | 0.496 |  |
|  |  |  | rs10084984 | A/G | 0.16 | 0.16 | 0.257 |  |
|  |  |  | rs10516950 | A/G | 0.41 | 0.43 | 0.425 |  |
|  |  |  | rs2059605 | A/G | 0.41 | 0.40 | 0.003 |  |
|  |  |  | rs2289186 | A/C | 0.39 | 0.38 | 0.002 |  |
|  |  |  | rs724260 | A/G | 0.44 | 0.43 | 0.005 |  |
|  |  |  | rs11727030 | A/G | 0.46 | 0.45 | 0.017 |  |
|  |  |  | rs1991316 | A/C | 0.46 | 0.46 | 0.038 |  |
|  |  |  | rs10856909 | C/G | 0.39 | 0.41 | 0.942 |  |
|  |  |  | rs4282187 | A/G | 0.4 | 0.39 | 0.004 |  |
| Block 4 | *MGMT* | Fetal | rs11813363 | A/G | 0.20 | 0.18 | 0.514 | 0.0082 |
|  |  | Effect | rs7068306 | C/G | 0.34 | 0.32 | 0.385 |  |
|  |  |  | rs10829615 | A/G | 0.20 | 0.18 | 0.501 |  |
|  |  |  | rs10764896 | A/G | 0.48 | 0.48 | 0.104 |  |
|  |  |  | rs11016866 | A/G | 0.13 | 0.14 | 0.009 |  |
|  |  |  | rs7910123 | A/C | 0.33 | 0.34 | 0.161 |  |
| Block 5 | *MGMT* | Fetal | rs10829616 | A/G | 0.4 | 0.39 | 0.074 | 0.0015 |
|  |  | Effect | rs2039374 | A/G | 0.28 | 0.28 | 0.004 |  |
|  |  |  | rs11016875 | A/G | 0.07 | 0.07 | 0.716 |  |
| Block 6 | *MTHFS* | Fetal | rs7175723 | C/G | 0.26 | 0.25 | 0.146 | 0.031 |
|  |  | Effect | rs685487 | A/G | 0.39 | 0.38 | 0.189 |  |
|  |  |  | rs11854561 | A/G | 0.29 | 0.28 | 0.629 |  |
|  |  |  | rs2733103 | A/G | 0.18 | 0.16 | 0.405 |  |
|  |  |  | rs622506 | A/C | 0.37 | 0.36 | 0.078 |  |
|  |  |  | rs2054287 | A/G | 0.16 | 0.15 | 0.006 |  |
|  |  |  | rs17284990 | A/G | 0.21 | 0.21 | 0.098 |  |
|  |  |  | rs7164897 | A/T | 0.13 | 0.13 | 0.058 |  |
|  |  |  | rs12912711 | A/G | 0.08 | 0.08 | 0.094 |  |
|  |  |  | rs16971449 | A/G | 0.10 | 0.10 | 0.176 |  |
|  |  |  | rs6495446 | A/G | 0.29 | 0.28 | 0.554 |  |
|  |  |  |  |  |  |  |  |  |
| Block 7 | *MTHFS* | Fetal | rs12440609 | A/G | 0.20 | 0.22 | 0.342 | 0.0043 |
|  |  | Effect | rs8039272 | A/G | 0.32 | 0.31 | 0.670 |  |
|  |  |  | rs8030396 | A/G | 0.34 | 0.33 | 0.150 |  |
| Block 8 | *CBS* | MFG | rs4920037 | A/G | 0.2 | 0.22 | 0.155 | 0.0040 |
|  |  | Interaction | rs12329764 | A/G | 0.11 | 0.11 | 0.862 |  |
|  |  |  | rs234705 | A/G | 0.32 | 0.33 | 0.002 |  |
|  |  |  | rs9974224 | A/G | 0.10 | 0.10 | 0.128 |  |
|  |  |  | rs2851391 | A/G | 0.43 | 0.43 | 0.356 |  |
|  |  |  | rs11701048 | A/G | 0.10 | 0.10 | 0.624 |  |
| Block 9 | *DNMT3L* | MFG | rs2838540 | A/G | 0.26 | 0.27 | 0.070 | 0.0032 |
|  |  | Interaction | rs2838541 | A/G | 0.10 | 0.10 | 0.250 |  |

1 Genetic model is determined by the penalized logistic regression model as described in the main text.

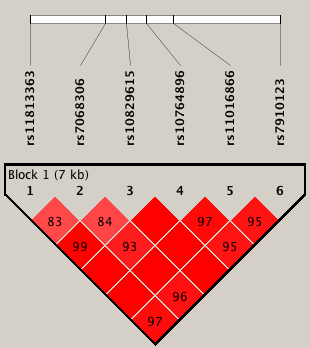
2 Minor Allele Frequency among mothers

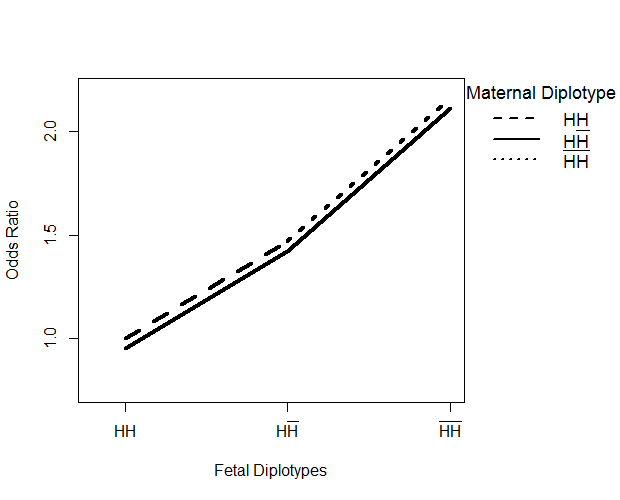
3 Minor Allele Frequency among babies

4 p-values by using conventional single-variant logistic regression

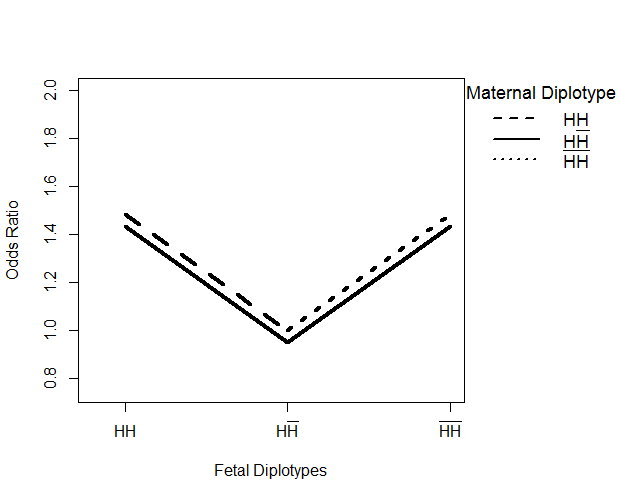
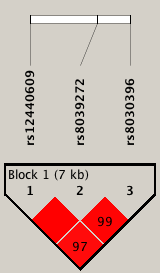
5 p-values by using haplotype-based penalized logistic regression

**Figure S1. *MGMT* (Block 4) – Fetal Main Effect Only**

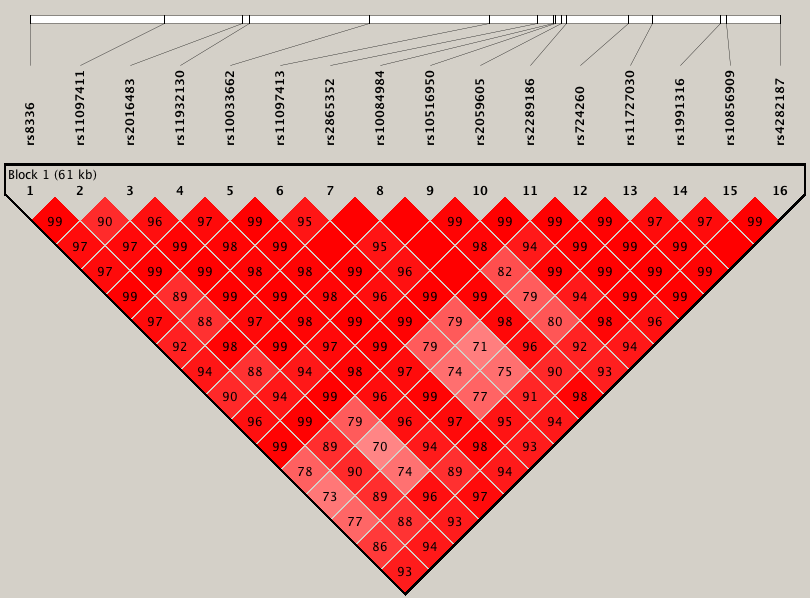
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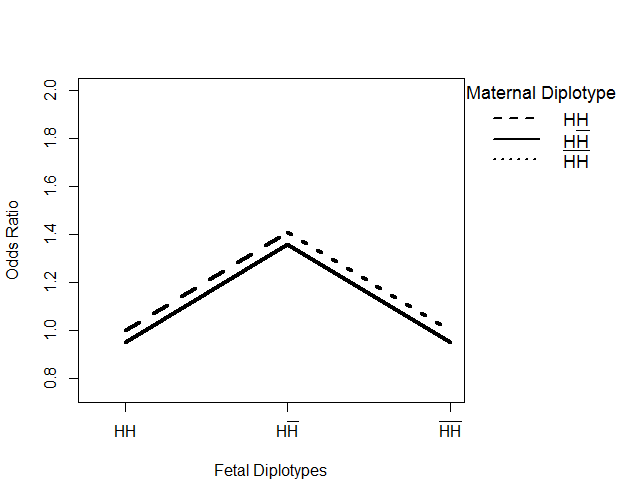


**Figure S2. *MTHFS* (Block 7) – Fetal Main Effect Only**

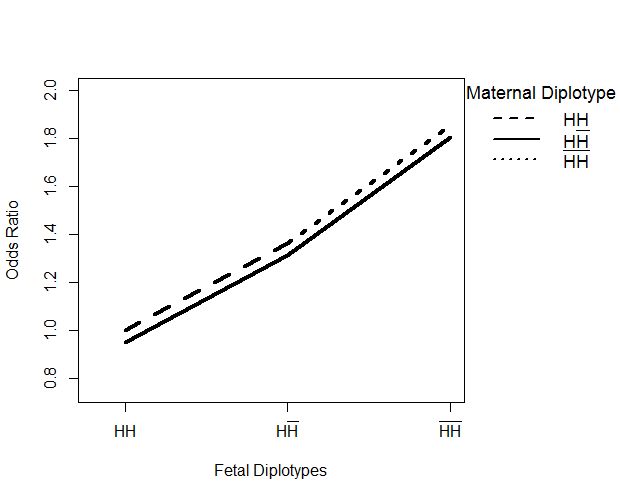
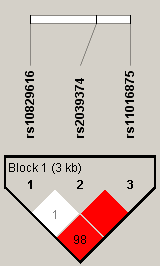
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**Figure S3. *PGDS* (Block 3) *-* Fetal Main Effect Only**

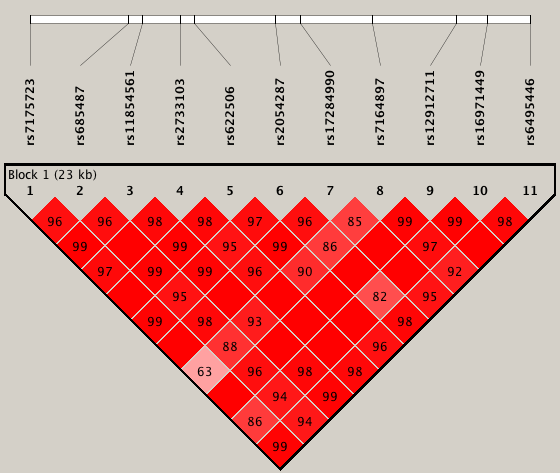
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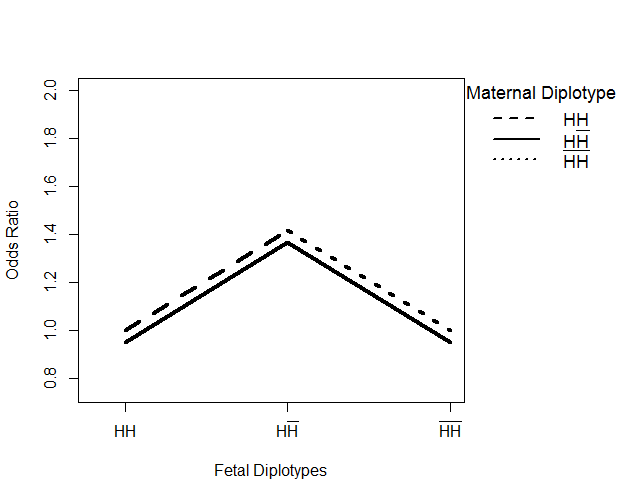


**Figure S4. *MGMT* (Block 5) *-* Fetal Main Effect Only**

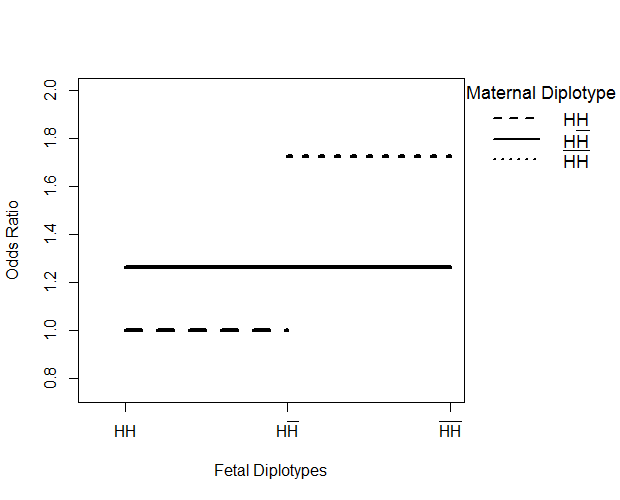
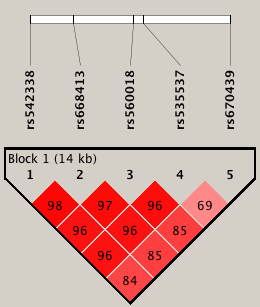
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**Figure S5. *MTHFS* (Block 6)– Fetal Main Effect Only**

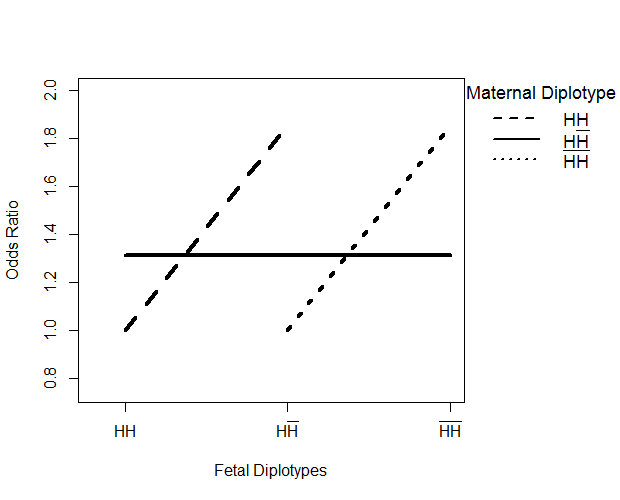
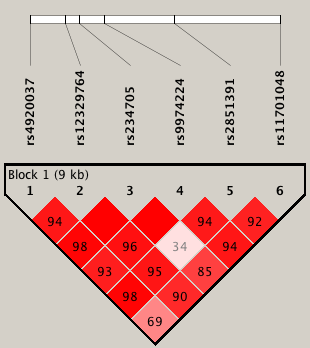
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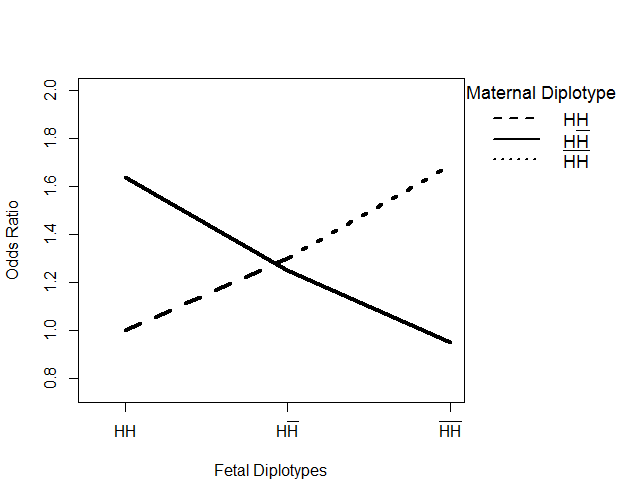


**Figure S6. *GSTM4* (Block 1) - Maternal Main Effect Only**

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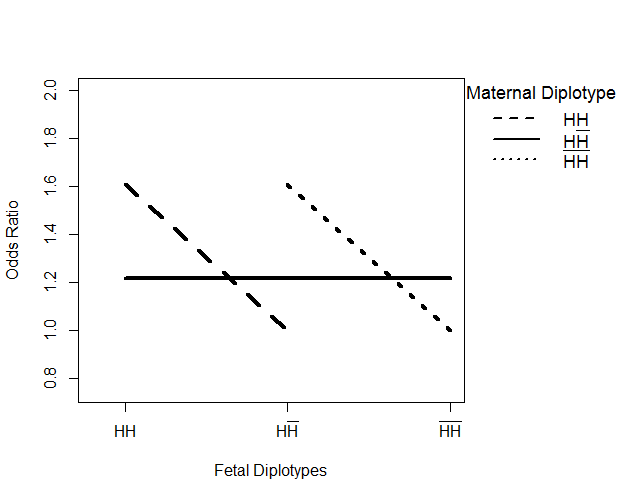
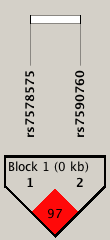
**Figure S7. *CBS* (Block 8) - MFG Interaction Effect**

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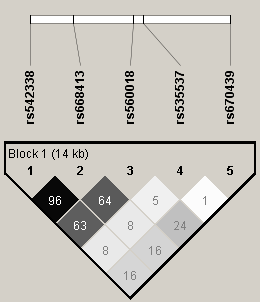
**Figure S8. *DNMT3L* (Block 9) - MFG Interaction Effect**

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**Figure S9. *DNMT3A* ((Block 2) – MFG Interaction Effect**

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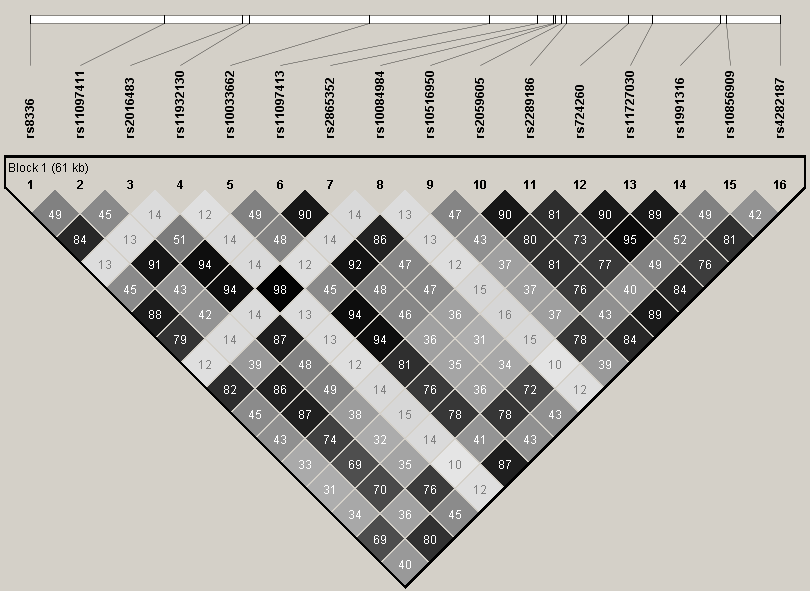
**Figure S10. Pairwise R2 values for SNPs within Block 1**

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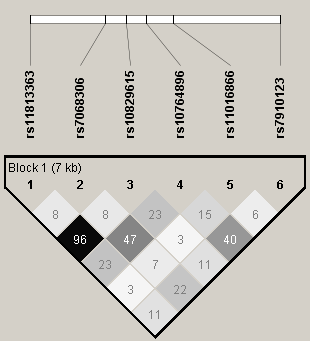
**Figure S11. Pairwise R2 values for SNPs within Block 2**

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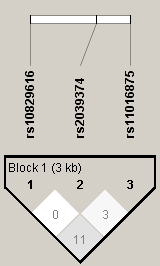
**Figure S12. Pairwise R2 values for SNPs within Block 3**

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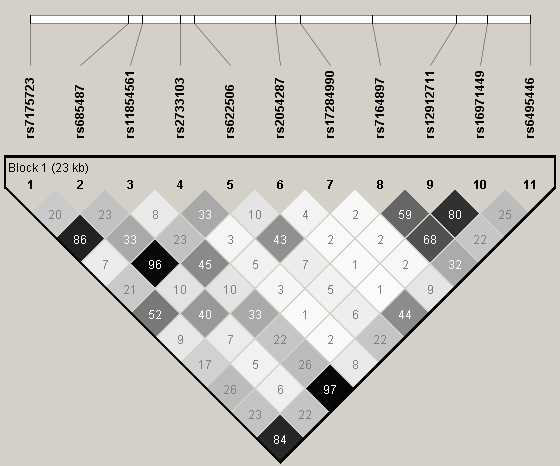
**Figure S13. Pairwise R2 values for SNPs within Block 4**

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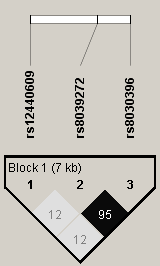
**Figure S14. Pairwise R2 values for SNPs within Block 5**

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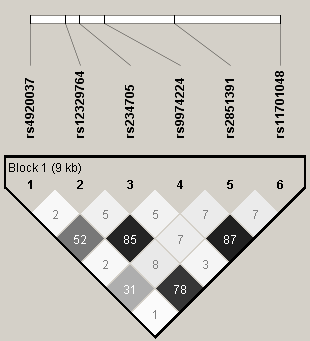
**Figure S15. Pairwise R2 values for SNPs within Block 6**

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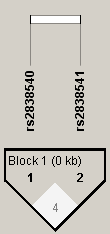
**Figure S16. Pairwise R2 values for SNPs within Block 7**

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**Figure S17. Pairwise R2 values for SNPs within Block 8**

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**Figure S18. Pairwise R2 values for SNPs within Block 9**

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