



**Figure S2** Bias of the LD estimates for  $D$  (A),  $D'$  (C) and  $r^2$  (E) and standard error (SE) of LD estimates for  $D$  (B),  $D'$  (D) and  $r^2$  (F) when  $p_{A_1} = 0.9$ ,  $p_{A_2} = 0.9$ ,  $\varepsilon = 0.01$  and the true values of  $D$  were  $-0.01$ ,  $0.03$ ,  $0.06$  and  $0.09$ . The dashed lines represents the estimates obtained using GUS-LD whereas the solid lines represents the estimates obtained using the standard likelihood approach. The upper and lower bound for  $D$  are  $-0.01$  and  $0.09$  respectively.