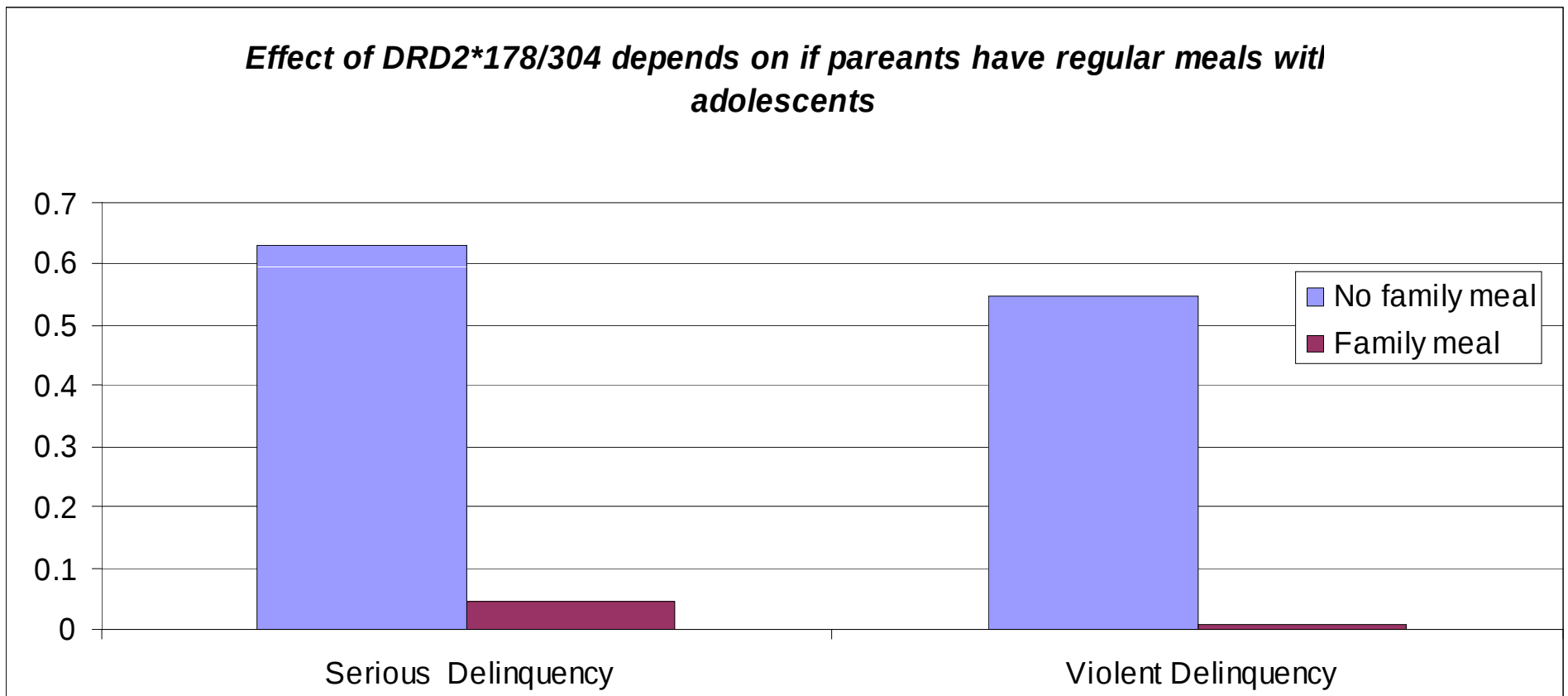


Gene-Environment Interaction Estimation Requires Exogenous Environments and Within-Family Genetic Designs

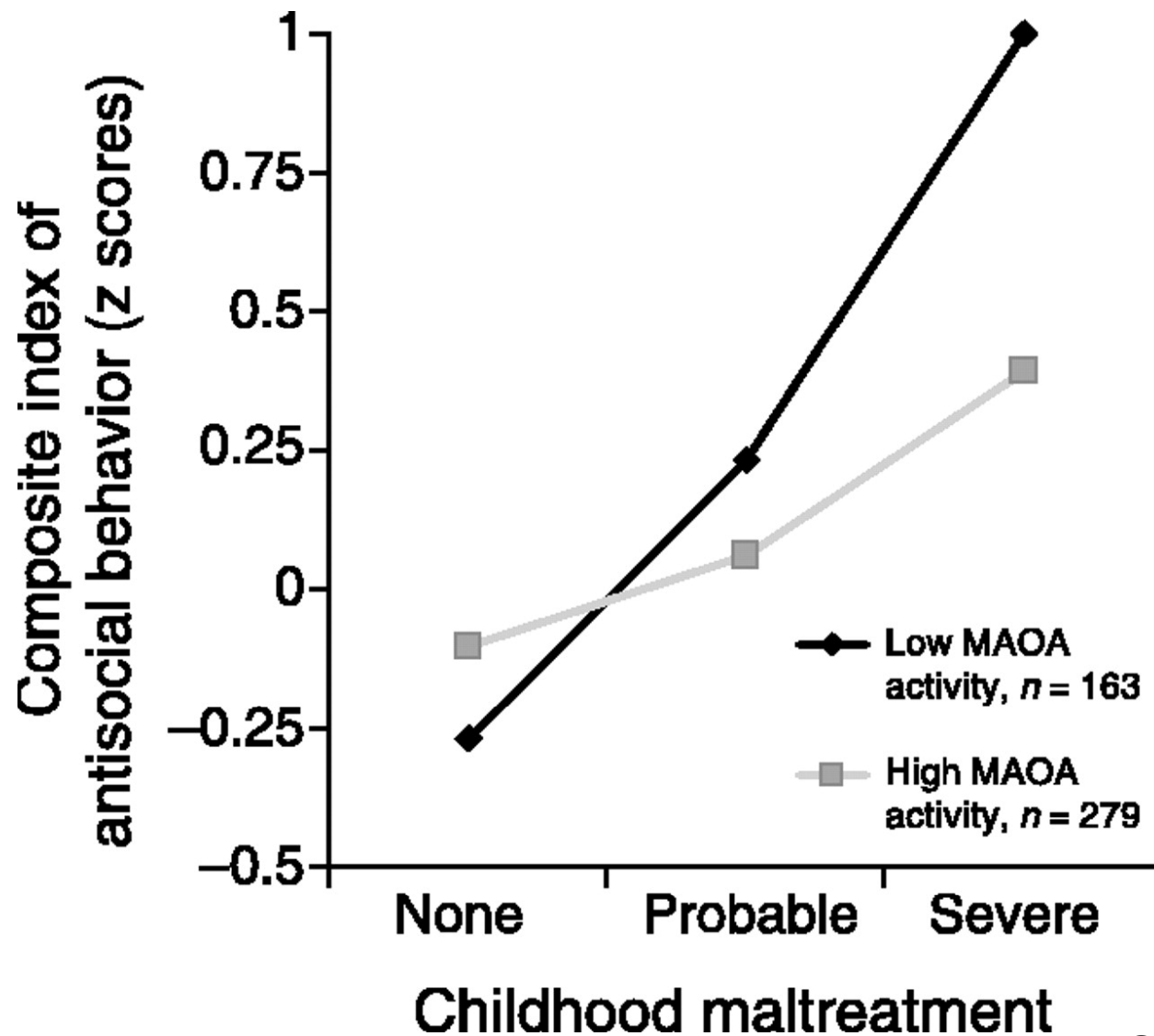
Dalton Conley

NYU & NBER

Guo et al. 2008

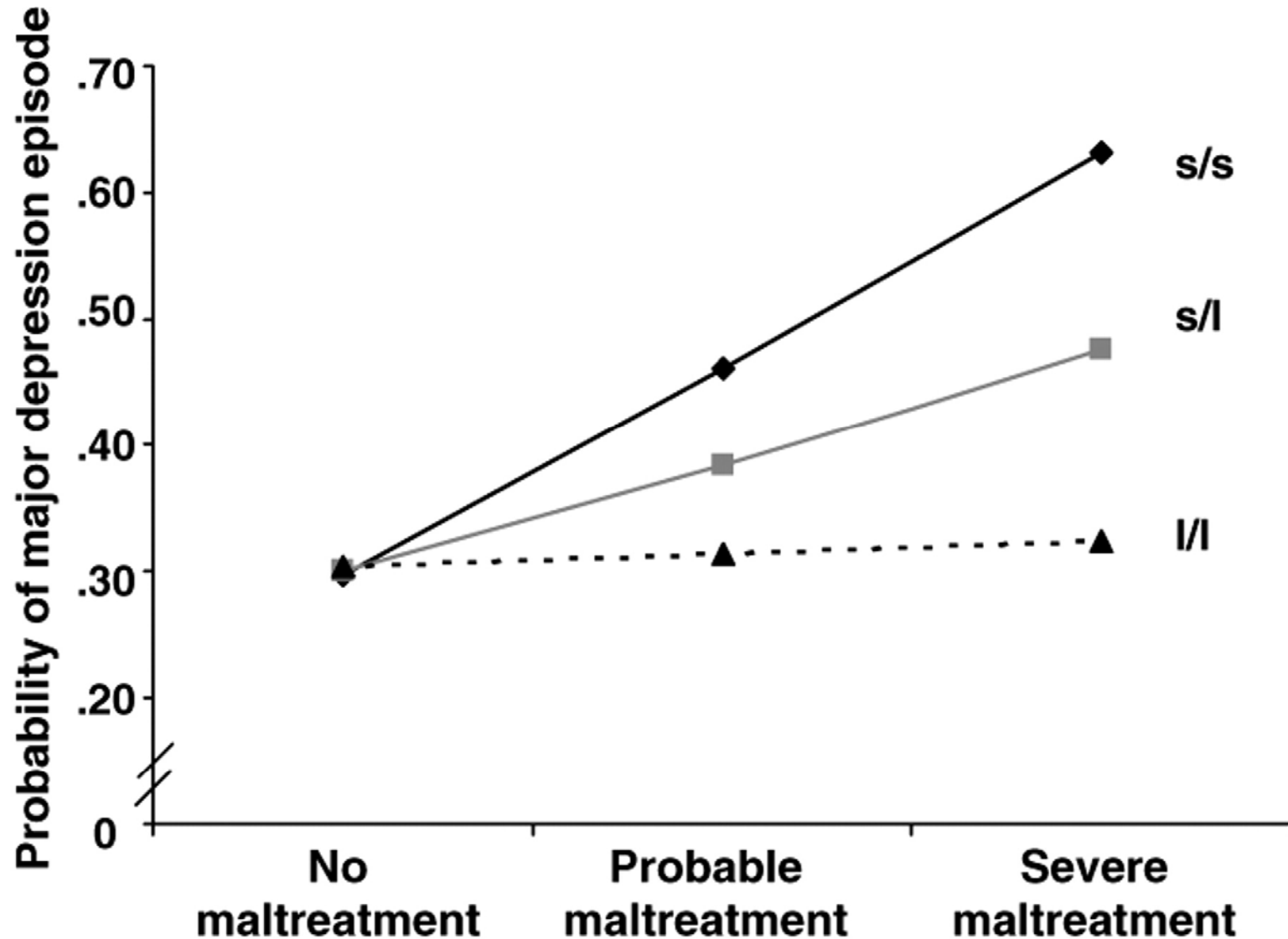


Caspi et al. 2002: MAOA

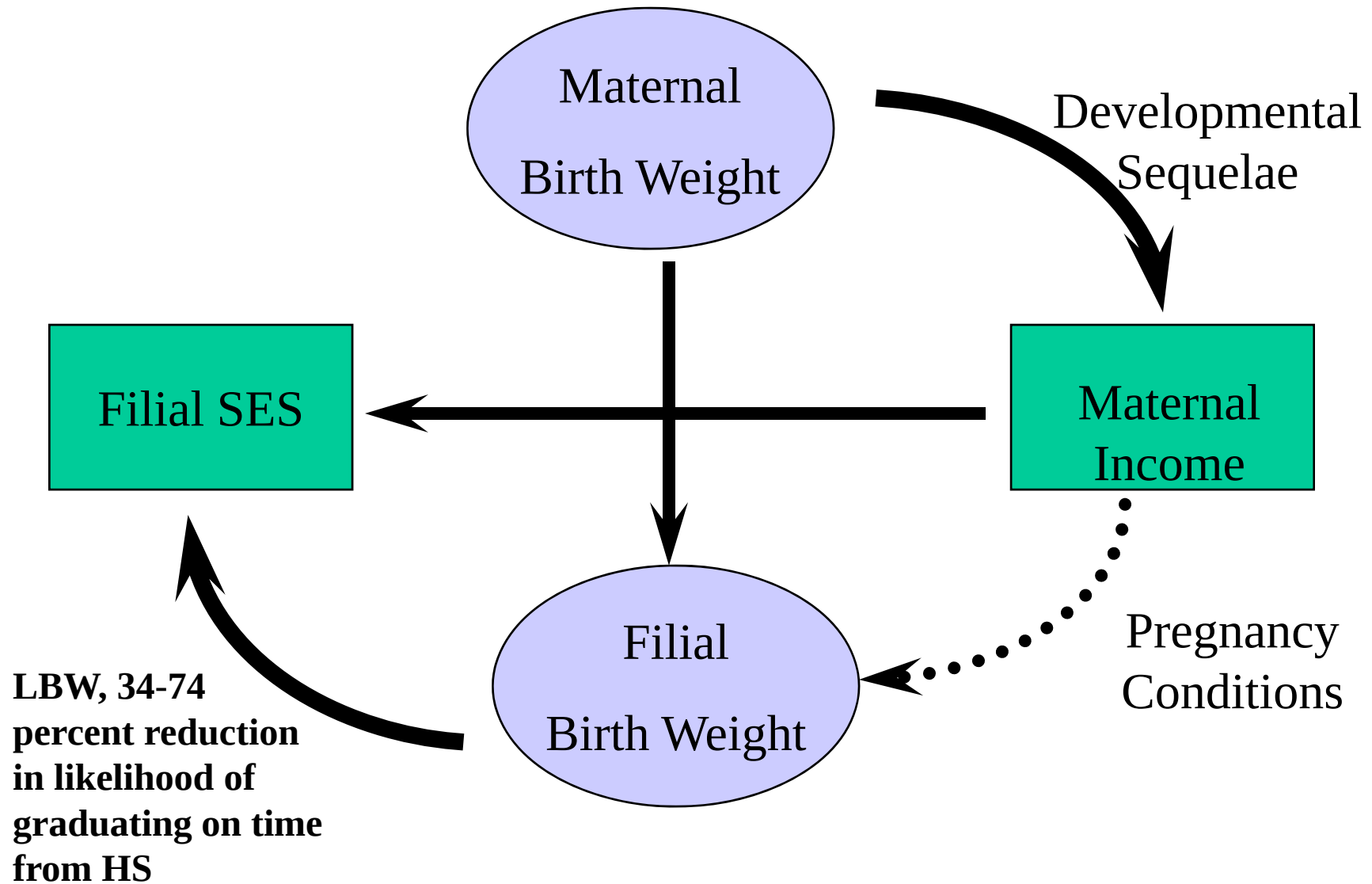


Caspi et al. 2002

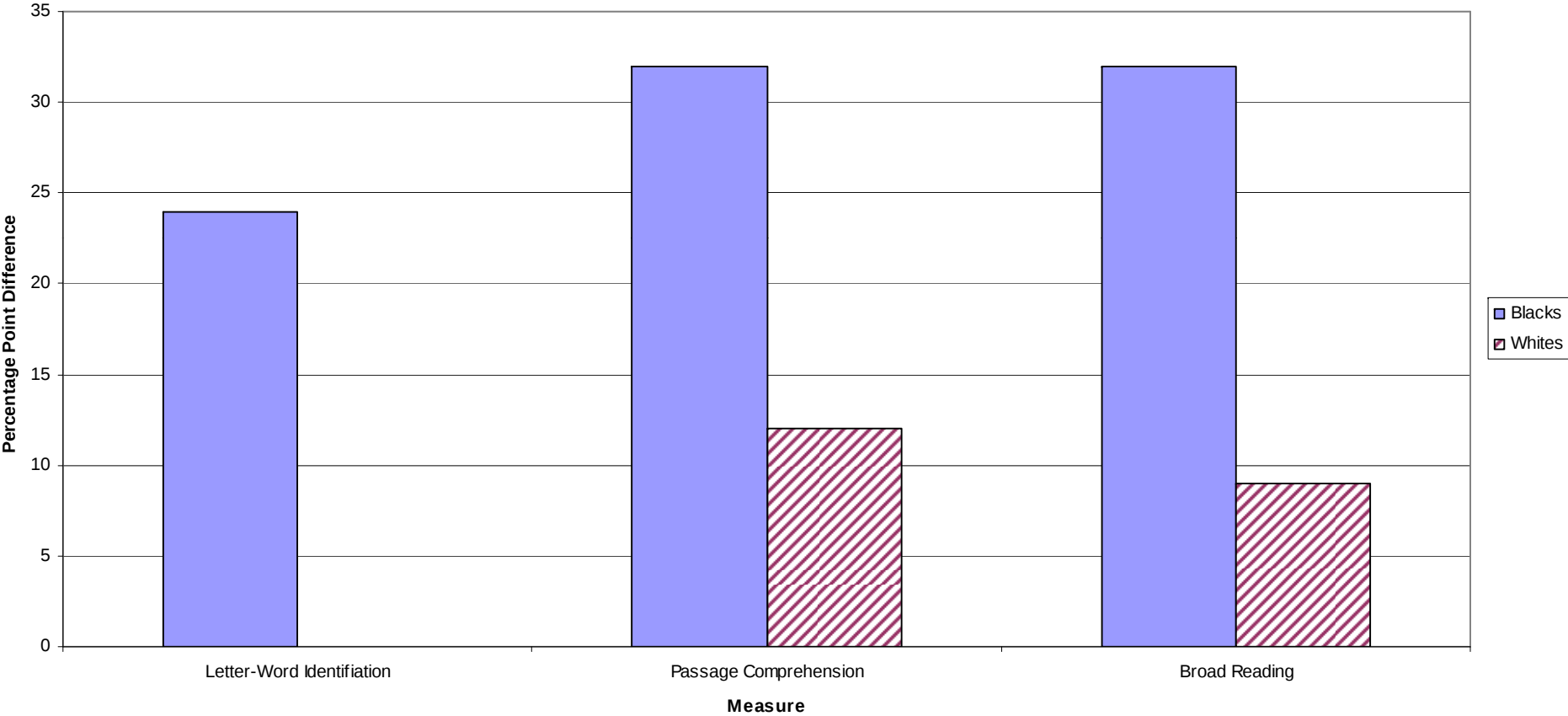
Caspi et al. 2003



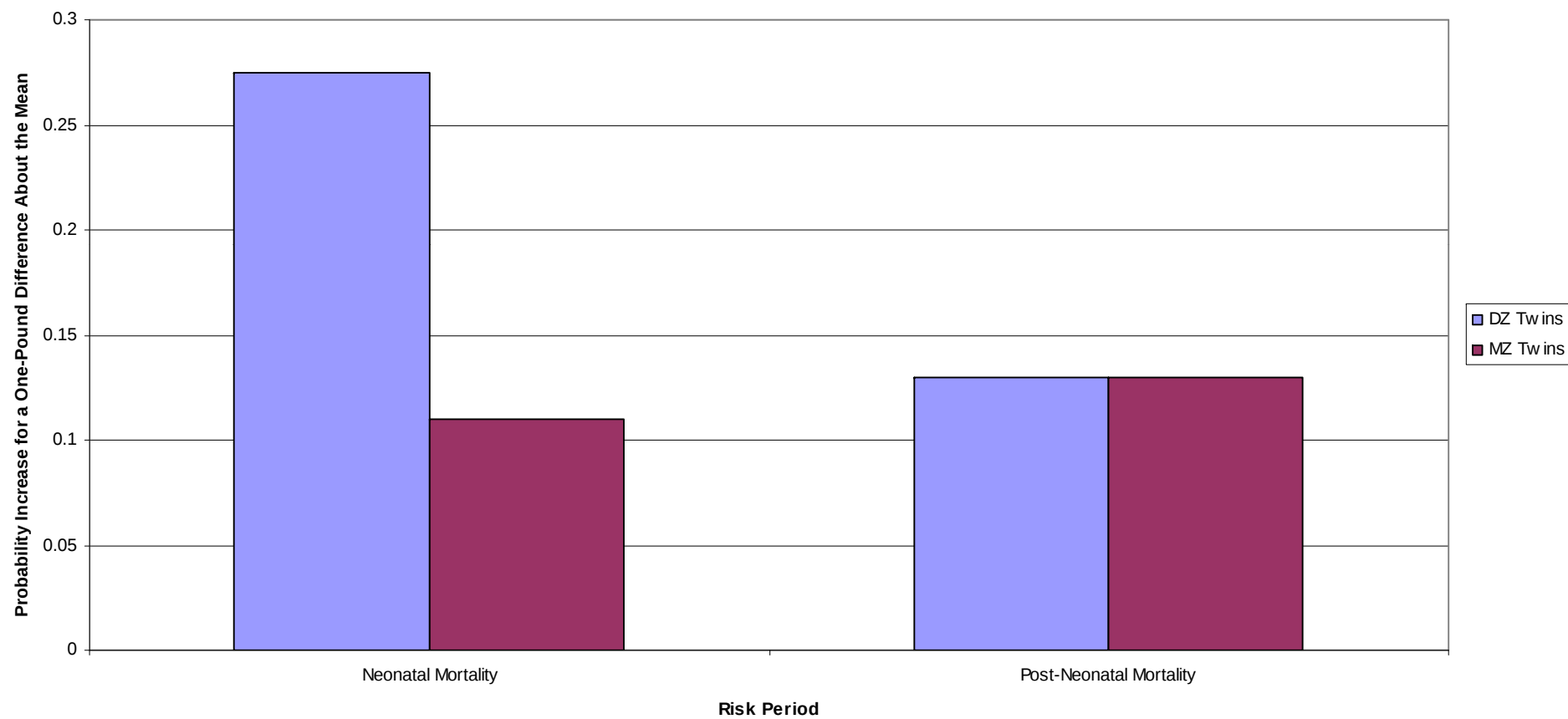
Bidirectional Relationship Between Infant Health and Adult SES



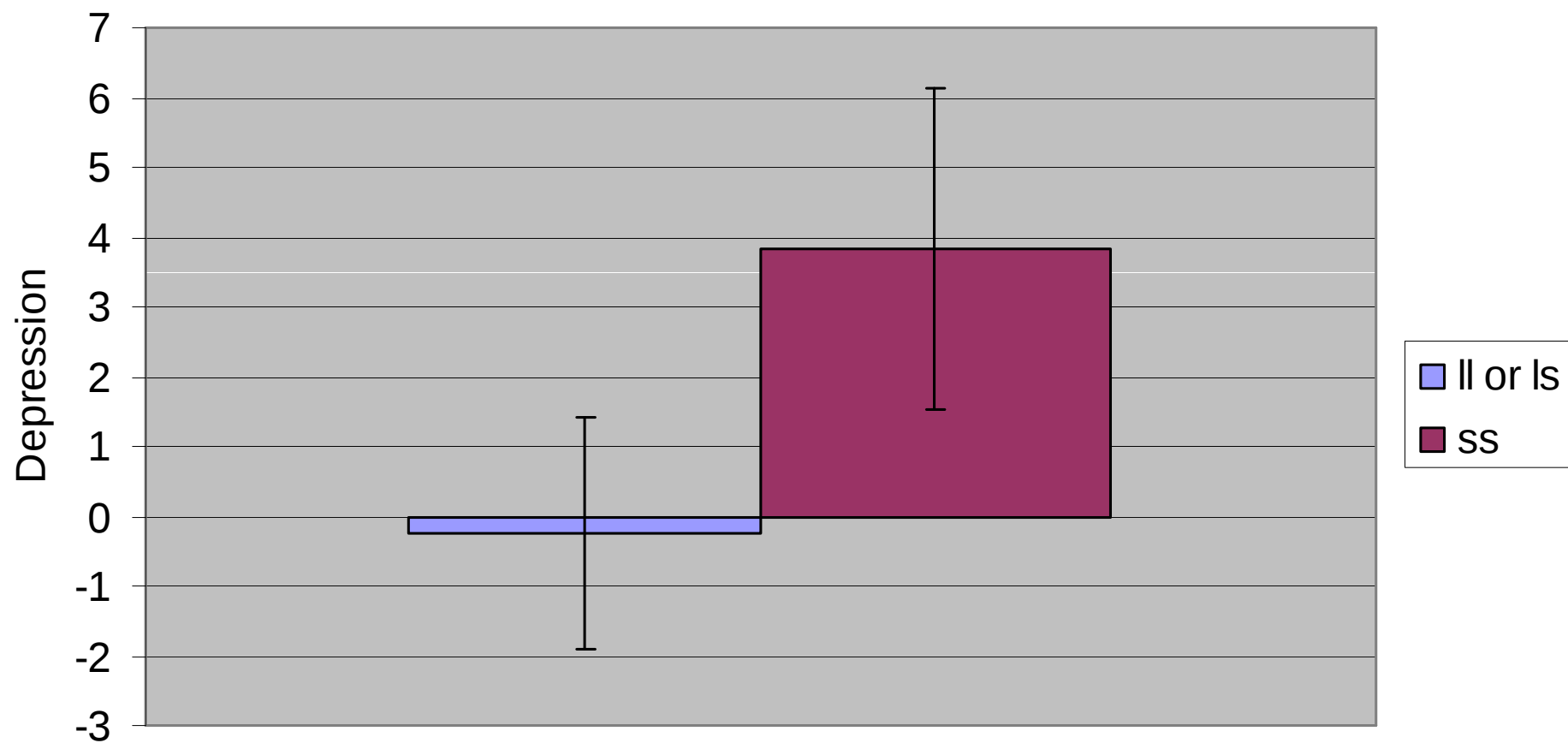
Effect of One Pound of Birth Weight on Reading Ability, Ages 6 - 12, Sibling FE Models



Effect of Birth Weight on Infant Mortality, Twin Difference Models, by Age

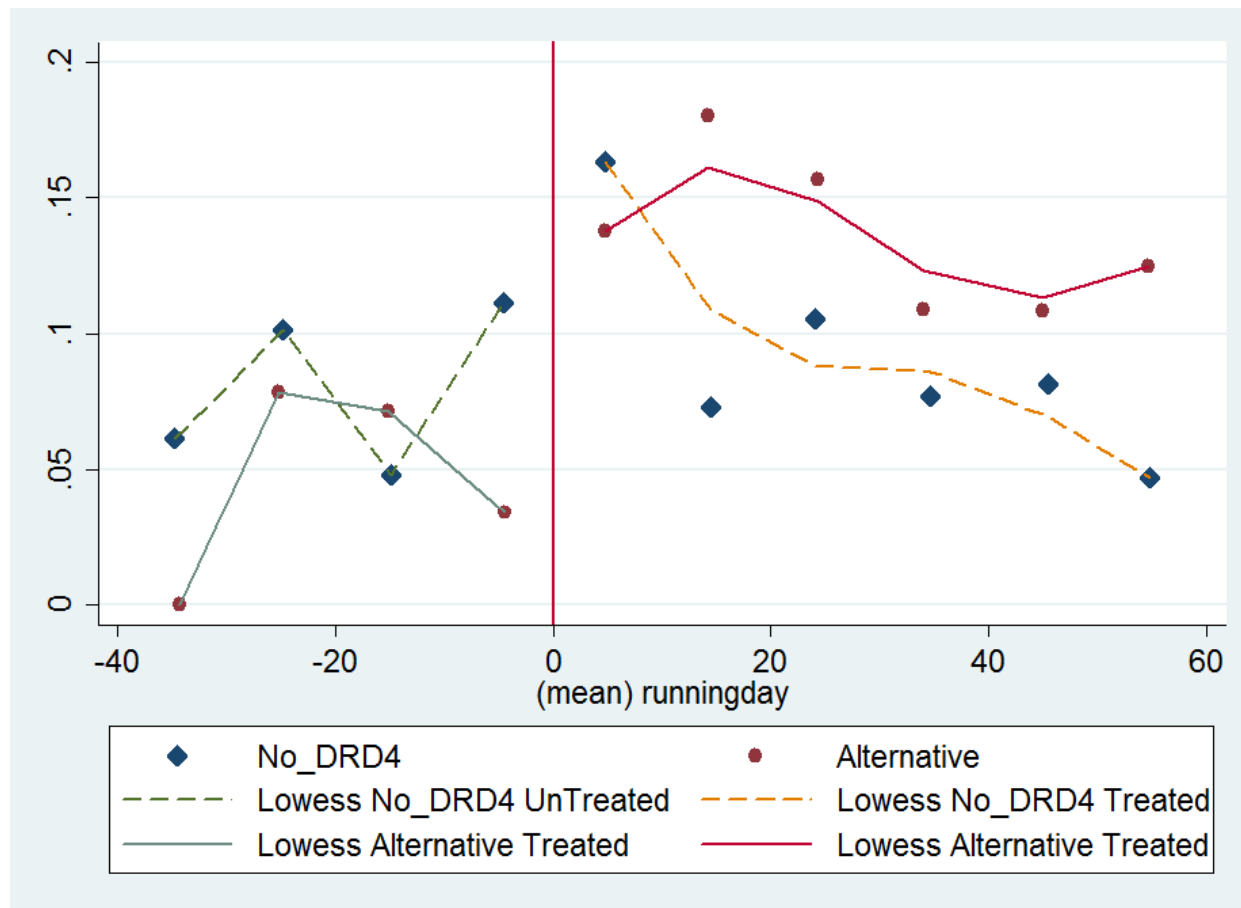


Depression Due to an Additional Pound at Birth by 5HTT ss vs. others



Dynamic Results: Fletcher (2011)

Proportion of Individuals Reporting “A Lot” of Sadness (Results Stratified by Genotype)



Thanks!

Mark Siegal

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Emily Rauscher; Siegal Lab

National Longitudinal Survey of Adolescent
Health



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National Science Foundation
WHERE DISCOVERIES BEGIN

I. Genes Violate the Exclusion Restriction

Homo Sapiens:

87 % Single Network Component



Source: Stelzl et al. 2005.

DRD4 Expression

Gene : DRD4 - Cluster Unigene : Hs.99922 Unigene
libraryTissueOrganStageNumber of EST% of library

- 1 [nci cgap brn41](#) oligodendroglioma brain 1 0.13
- 2 [ui-e-ej1](#) fetal eyes, lens, eye anterior segment, optic nerve, retina, retina foveal and macular, rpe and choroid eye fetal and adult 4 0.04
- 3 [ui-e-ej0](#) fetal eyes, lens, eye anterior segment, optic nerve, retina, retina foveal and macular, rpe and choroid eye fetal and adult 5 0.03
- 4 [nci cgap kid11](#) kidney 2 0.01
- 5 [ui-e-ci1](#) rpe and choroid eye adult 1 0.01
- 6 [soares adult brain n2b5hb55y](#) brain 55-year old 1 0.01
- 7 [soares ovary tumor nbhot](#) ovarian tumor ovary 1 0.01

DRD4 Homo Sapiens Homologs (172)

- [gi|4503389](#) dopamine receptor D4; D(2C) dopamine receptor [Homo sapiens] [832](#) 0.0 [gi|4503387](#) dopamine receptor D3 isoform a [Homo sapiens] [256](#) 3e-68 [gi|17986270](#) dopamine receptor D2 isoform short [Homo sapiens] [243](#) 1e-64 [gi|4503385](#) dopamine receptor D2 isoform long [Homo sapiens] [234](#) 6e-62 [gi|15718670](#) alpha-2A-adrenergic receptor; alpha-2AAR subtyp... [207](#) 1e-53 [gi|4501967](#) alpha-2C-adrenergic receptor; alpha2-AR-C4 [Homo sapiens] [207](#) 1e-53 [gi|4501965](#) alpha-2B-adrenergic receptor; alpha-2-adrenergic... [206](#) 3e-53 [gi|4504531](#) 5-hydroxytryptamine (serotonin) receptor 1A [Homo sapiens] [188](#) 5e-48 [gi|16445398](#) dopamine receptor D3 isoform c [Homo sapiens] [173](#) 2e-43 [gi|16445402](#) dopamine receptor D3 isoform e [Homo sapiens] [173](#) 2e-43 [gi|4557265](#) beta-1-adrenergic receptor [Homo sapiens] [169](#) 3e-42 [gi|4557267](#) adrenergic, beta-3-, receptor [Homo sapiens] [166](#) 2e-41 [gi|4504539](#) 5-hydroxytryptamine (serotonin) receptor 2B [Homo sapiens] [156](#) 3e-38 [gi|6005782](#) histamine receptor H3; G protein-coupled recepto... [151](#) 7e-37 [gi|16445396](#) dopamine receptor D3 isoform b [Homo sapiens] [150](#) 1e-36 [gi|16445400](#) dopamine receptor D3 isoform d [Homo sapiens] [147](#) 1e-35 [gi|4502821](#) cholinergic receptor, muscarinic 4; muscarinic a... [145](#) 7e-35 [gi|4504533](#) 5-hydroxytryptamine (serotonin) receptor 1B; 5-H... [145](#) 7e-35 [gi|4502815](#) cholinergic receptor, muscarinic 1; muscarinic a... [142](#) 4e-34 [gi|4501957](#) alpha-1D-adrenergic receptor; adrenergic, alpha-... [135](#) 4e-32 [gi|10880131](#) 5-hydroxytryptamine receptor 7 isoform b; serot... [129](#) 3e-30 [gi|10880129](#) 5-hydroxytryptamine receptor 7 isoform d; serot... [129](#) 3e-30 [gi|4504547](#) 5-hydroxytryptamine receptor 7 isoform a; seroto... [129](#) 3e-30 [gi|10835175](#) 5-hydroxytryptamine (serotonin) receptor 2A [Homo sapiens] [129](#) 5e-30 [gi|4502817](#) cholinergic receptor, muscarinic 2; muscarinic a... [127](#) 1e-29 [gi|4501959](#) alpha-1B-adrenergic receptor; adrenergic, alpha ... [126](#) 3e-29 [gi|15451761](#) alpha-1A-adrenergic receptor isoform 4; adrener... [123](#) 2e-28 [gi|15451759](#) alpha-1A-adrenergic receptor isoform 2; adrener... [123](#) 2e-28 [gi|15451757](#) alpha-1A-adrenergic receptor isoform 3; adrener... [123](#) 2e-28 [gi|4501961](#) alpha-1A-adrenergic receptor isoform 1; adrener... [123](#) 2e-28 [gi|4504541](#) 5-hydroxytryptamine (serotonin) receptor 2C [Homo sapiens] [120](#) 1e-27 [gi|29727439](#) similar to 5-HT5B serotonin receptor [Homo sapiens] [118](#) 7e-27 [gi|4503383](#) dopamine receptor D1 [Homo sapiens] [114](#) 1e-25 [gi|30150689](#) similar to D(1B) dopamine receptor (D(5) dopami... [114](#) 1e-25 [gi|4504545](#) 5-hydroxytryptamine (serotonin) receptor 6 [Homo sapiens] [111](#) 1e-24 [gi|4503391](#) dopamine receptor D5; dopamine receptor D1B; D1b... [110](#) 1e-24 [gi|13236497](#) 5-hydroxytryptamine (serotonin) receptor 5A [Homo sapiens] [110](#) 2e-24 [gi|4504537](#) 5-hydroxytryptamine (serotonin) receptor 1E [Homo sapiens] [100](#) 2e-21 [gi|30148127](#) similar to D(1B) dopamine receptor (D(5) dopami... [99](#) 7e-21 [gi|4504535](#) 5-hydroxytryptamine (serotonin) receptor 1D [Homo sapiens] [99](#) 7e-21 [gi|30148324](#) similar to D(1B) dopamine receptor (D(5) dopami... [97](#) 2e-20 [gi|13435405](#) histamine receptor H2; gastric receptor 1 [Homo sapiens] [96](#) 5e-20 [gi|10835197](#) 5-hydroxytryptamine (serotonin) receptor 1F; 5-... [96](#) 6e-20 [gi|4502819](#) cholinergic receptor, muscarinic 3; muscarinic a... [95](#) 8e-20 [gi|11321563](#) 5-hydroxytryptamine (serotonin) receptor 4 [Homo sapiens] [94](#) 2e-19 [gi|17484441](#) similar to Alpha-1D adrenergic receptor (Alpha ... [92](#) 5e-19 [gi|7108336](#) cholinergic receptor, muscarinic 5; muscarinic a... [91](#) 1e-18 [gi|4501969](#) adrenergic, beta-2-, receptor, surface; beta-2 a... [89](#) 4e-18 [gi|4505925](#) putative neurotransmitter receptor [Homo sapiens] [88](#) 1e-17 [gi|21361153](#) cholecystokinin B receptor [Homo sapiens] [86](#) 6e-17 [gi|19923823](#) neuromedin U receptor 2 [Homo sapiens] [86](#) 6e-17 [gi|28173558](#) trace amine receptor 4 [Homo sapiens] [85](#) 8e-17 [gi|4504491](#) histamine receptor H1; histamine receptor, subcl... [85](#) 8e-17 [gi|24432089](#) G protein-coupled receptor 66 [Homo sapiens] [85](#) 8e-17 [gi|28875799](#) cholecystokinin B receptor [Homo sapiens] [85](#) 1e-16 [gi|4557637](#) orexin receptor 1 [Homo sapiens] [83](#) 3e-16 [gi|4501951](#) adenosine A2b receptor [Homo sapiens] [82](#) 7e-16 [gi|28173562](#) trace amine receptor 3 [Homo sapiens] [82](#) 7e-16 [gi|21264324](#) trace amine receptor 1 [Homo sapiens] [82](#) 7e-16 [gi|5921992](#) adenosine A2a receptor; adenosine A2 receptor; a... [82](#) 9e-16 [gi|4557865](#) somatostatin receptor 5 [Homo sapiens] [81](#) 1e-15 [gi|9506747](#) G protein-coupled receptor 27; super conserved r... [79](#) 5e-15 [gi|4501947](#) adenosine A1 receptor [Homo sapiens] [78](#) 1e-14 [gi|5453666](#) G protein-coupled receptor 19 [Homo sapiens] [77](#) 2e-14 [gi|4557863](#) somatostatin receptor 4 [Homo sapiens] [75](#) 7e-14 [gi|16751917](#) G protein-coupled receptor 102; trace amine rec... [75](#) 8e-14 [gi|16876435](#) G protein-coupled receptor 101 [Homo sapiens] [73](#) 4e-13 [gi|4503903](#) galanin receptor 1; Galanin receptor [Homo sapiens] [72](#) 6e-13 [gi|4557857](#) somatostatin receptor 1 [Homo sapiens] [72](#) 6e-13 [gi|4503907](#) galanin receptor 3; galanin receptor, family mem... [72](#) 7e-13 [gi|4557861](#) somatostatin receptor 3 [Homo sapiens] [72](#) 7e-13 [gi|11545887](#) neuropeptide FF 1; RFamide-related peptide rece... [72](#) 7e-13 [gi|4501953](#) adenosine A3 receptor [Homo sapiens] [72](#) 9e-13 [gi|4758468](#) G protein-coupled receptor 50 [Homo sapiens] [71](#) 1e-12 [gi|14211847](#) G protein-coupled receptor 54; G protein-couple... [71](#) 1e-12 [gi|4758474](#) G protein-coupled receptor 10; prolactin-releasi... [71](#) 1e-12 [gi|4557639](#) orexin receptor 2 [Homo sapiens] [71](#) 1e-12 [gi|4505513](#) opiate receptor-like 1; opioid receptor-like 1; ... [70](#) 2e-12 [gi|7657142](#) G protein-coupled receptor 58 [Homo sapiens] [70](#) 2e-12 [gi|4503905](#) galanin receptor 2 [Homo sapiens] [70](#) 3e-12 [gi|4503639](#) coagulation factor II (thrombin) receptor-like 3... [69](#) 6e-12 [gi|15150803](#) opsin 4 (melanopsin); melanopsin [Homo sapiens] [69](#) 6e-12 [gi|14251205](#) histamine H4 receptor [Homo sapiens] [68](#) 1e-11 [gi|29729009](#) similar to seven transmembrane helix receptor [... [68](#) 1e-11 [gi|27734717](#) opioid receptor, delta 1 [Homo sapiens] [68](#) 1e-11 [gi|5174593](#) melatonin receptor 1A; melatonin receptor type 1... [68](#) 1e-11 [gi|30151598](#) similar to seven transmembrane helix receptor [... [68](#) 1e-11 [gi|17437027](#) similar to seven transmembrane helix receptor [... [68](#) 1e-11 [gi|4758434](#) growth hormone secretagogue receptor [Homo sapiens] [67](#) 2e-11 [gi|4505515](#) opioid receptor, mu 1 [Homo sapiens] [66](#) 5e-11 [gi|9507143](#) super conserved receptor expressed in brain 3 [Homo sapiens] [65](#) 9e-11 [gi|7705316](#) CC chemokine receptor 10 [Homo sapiens] [64](#) 2e-10 [gi|4557859](#) somatostatin receptor 2 [Homo sapiens] [64](#) 2e-10 [gi|14210484](#) G protein-coupled receptor slt; melanin-concent... [64](#) 2e-10 [gi|16604258](#) G protein-coupled receptor 74; neuropeptide G p... [64](#) 2e-10 [gi|4758820](#) G protein-coupled receptor 74; neuropeptide G pr... [64](#) 2e-10 [gi|4505447](#) neuropeptide Y receptor Y2 [Homo sapiens] [64](#) 2e-10 [gi|24476016](#) G-protein coupled receptor [Homo sapiens] [64](#) 3e-10 [gi|6677701](#) G-protein coupled receptor [Homo sapiens] [64](#) 3e-10 [gi|5174595](#) melatonin receptor 1B; melatonin receptor type 1... [63](#) 3e-10