Richard MacLeod Single

Department of Mathematics and Statistics
University of Vermont, 306 Mansfield House
Burlington, VT 05405-0082

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Education

Ph.D. Statistics, State University of New York at Stony Brook, 1995
Thesis in Statistical Genetics, titled "An Application of Robust Estimation to Linkage Analysis"
Advisor: Stephen Finch

M.S. Applied Mathematics, State University of New York at Stony Brook, 1992

B.S. Mathematics, *summa cum laude*, State University of New York at Albany, 1990
Minors: Physics, Music. Phi Beta Kappa

Work Experience

University of Vermont, Burlington VT (2001 – present)
Associate Professor, Department of Mathematics and Statistics (2008 – present)
Assistant Professor, Department of Mathematics and Statistics (2004 – 2008)
Research Assistant Professor, Department of Medical Biostatistics (2001 – 2004)

St. Michael's College, Colchester, VT (2000 – 2001)
Assistant Professor, Department of Mathematics

University of California at Berkeley, Berkeley, CA (1999 – 2000)
Postdoctoral Research Associate, Department of Integrative Biology

Environmental Risk Analysis, San Mateo, CA (1998 – 1999)
Research Scientist

St. Olaf College, Northfield, MN (1995 – 1998)
Assistant Professor, Department of Mathematics
Director of Statistics Program (1996 – 1998)

Software Developed

EMhaplofreq: software for the estimation of multilocus haplotype frequencies and linkage disequilibrium. Copyright © 2003 – 2009. The Regents of the University of California, under the terms of the GNU General Public License.

PyPop: A Software Framework for Population Genomics. Copyright © 2003 – 2009. The Regents of the University of California, under the terms of the GNU General Public License **(**http://www.pypop.org/ or http://www.uvm.edu/~pypop/).

Refereed publications in print and in press

The publications listed below are organized by the three major areas of my research and scholarship: 1) Immunogenetics and Statistical Genetics, 2) Medical Biostatistics, 3) Education and Program Evaluation. A one page overview of my research is available at *www.uvm.edu/~rsingle/summary.pdf* .

1) Immunogenetics and Statistical Genetics

Hollenbach, J. A., Mack, S. J., Gourraud, P.-A., Single, R. M., Maiers, M., Middleton, D., Thomson, G., Marsh, S. G. E., Varney, M. D. and for the Immunogenomics Data Analysis Working Group (2011), A community standard for immunogenomic data reporting and analysis: proposal for a STrengthening the REporting of Immunogenomic Studies statement. *Tissue Antigens*, 78: 333-344.

Vina MA, Hollenbach JA, Lyke KE, Sztein MB, Maiers M, Klitz W, Cano P, Mack S, Single R, Brautbar C, Israel S, Raimondi E, Khoriaty E, Inati A, Andreani M, Testi M, Moraes ME, Thomson G, Stastny P,

Cao K. Tracking human migrations by the analysis of the distribution of HLA alleles, lineages and haplotypes in closed and open populations. *Philos Trans R Soc Lond B Biol Sci*. 2012 Mar 19;367(1590):820-829.

Hiby, S. E., Ashrafian-Bonab, M., Farrell, L., Single, R., Balloux, F., Carrington, M., Moffett, A. (2010). Distribution of killer cell immunoglobulin-like receptors (KIR) and their HLA-C ligands in two Iranian populations. *Immunogenetics*, 62(2), 65-73.

Thomson, G., Marthandan, N., Hollenbach, J. A., Mack, S. J., Erlich, H. A., Single, R., Waller, M. J., Marsh, S. G. E., Guidry, P. A., Karp, D. R., Scheuermann, R. H., Thompson, S. D., Glass, D. N., Helmberg, W. (2010). Sequence Feature Variant Type (SFVT) Analysis of the HLA Genetic Association in Juvenile Idiopathic Arthritis. *Pac Symp Biocomput*, 2010, 359-370.

Kennedy, L. J., Modrell, A., Groves, P., Wei, Z., Single, R., Happ, G. M. (2010). Genetic diversity of the Major Histocompatibility Complex class II in Alaskan caribou herds. *Int J Immunogenet*, 38(2), 109-19.

Single RM, Martin MP, and Carrington M. Statistical and population genetic methods for KIR genes typed for presence/absence. *Immunogenetics*, 2008; 60(12): 711-725.

Martin MP, Single RM, Wilson MJ, Trowsdale J, and Carrington M. KIR haplotypes defined by segregation analysis in 59 Centre d'Etude Polymorphisme Humain (CEPH) families. *Immunogenetics*, 2008; 60: 767-774.

Solberg OD, Mack SJ, Lancaster AK, Single RM, Sanchez-Mazas A, Tsai Y, and Thomson G Balancing selection and heterogeneity across the classical human leukocyte antigen loci: A meta-analytic review of 497 population studies. *Human Immunology*, 2008; 69(7): 443-464.

Kulkarni S, Single RM, Martin MP, Joshi N, Badwe R, and Carrington M. Comparison of the Rapidly Evolving KIR Locus in Parsis and Natives of India. *Immunogenetics*, 2008; 60(3-4): 121-129.

Single RM*, Martin MP*, Gao X, Meyer D, Yeager M, Kidd JR, Kidd KK, Carrington M. Global diversity and evidence for co-evolution of KIR and HLA genes. *Nature Genetics*, 2007; 39(9): 1114-1119. *joint first authors.

Single RM, Meyer D, Mack SJ, Lancaster A, Erlich HA, Thomson G. Biostatistics and Anthropology/Human Genetic Diversity joint report: Overview of progress in methodology, data collection, and analyses. *Tissue Antigens*, 2007; 69: 185-187.

Mack SJ, Sanchez-Mazas A, Single RM, Meyer D, Hill J, Dron HA, Jani AJ, Thomson G, Erlich HA. Biostatistics and Anthropology/Human Genetic Diversity joint report: Population samples and genotyping technology. *Tissue Antigens*, 2007; 69: 188-191.

Lancaster AK, Single RM, Nelson MP, Solberg O, Thomson G. PyPop update - a software pipeline for large-scale multi-locus population genomics. *Tissue Antigens*, 2007; 69: 192-197.

Gourraud PA, Cambon-Thomsen A, Dauber EM, Feolo M, Hansen J, Mickelson E, Single RM, Thomsen M, Mayr WR. Nomenclature for HLA microsatellites. *Tissue Antigens*, 2007; 69: 210-213.

Meyer* D, Single* RM, Mack SJ, Erlich H, and Thomson G. Signatures of demographic history and natural selection in the human MHC loci. *Genetics*, 2006; 173: 2121-2142. *joint first authors.

Gao X, Single RM, Karacki P, Marti D, O'Brien SJ, and Carrington M. Diversity of MICA and linkage disequilibrium with HLA-B in two North American populations. *Human Immunology*, 2006; 67: 152-158.

Malkki* M, Single* R, Carrington M, Thomson G, and Petersdorf E. MHC microsatellite diversity and linkage disequilibrium among common HLA-A, HLA-B, DRB1 haplotypes: Implications for unrelated donor hematopoietic transplantation and disease association studies. *Tissue Antigens*, 2005; 66: 114-124. *joint first authors.

Chen JJ, Duan T, Single RM, Mather KA, and Thomson G. Hardy-Weinberg testing of a single homozygous genotype. *Genetics*, 2005; 170: 1439-1442.

Williams F, Meenagh A, Single R, McNally M, Kelly P, Nelson MP, Meyer D, Lancaster A, Thomson G, and Middleton D. High resolution HLA-DRB1 identification of a Caucasian population. *Human Immunology*, 2004 Jan; 65(1): 66-77.

Cao K, Moormann AM, Lyke KE, Masaberg C, Sumba OP, Doumbo OK, Koech D, Lancaster A, Nelson M, Meyer D, Single R, Hartzman RJ, Plowe CV, Kazura J, Mann DL, Sztein MB, Thomson G, and Fernandez-Viña M. Diversity of HLA class I-A, B and C alleles and haplotypes in five African populations. *Tissue Antigens*, 2004; 63(4):293-325.

Nicklas JA, Brooks EM, Hunter TC, Single R, and Branda RF. Development of a quantitative PCR (TaqMan) assay for mitochondrial DNA copy number and the common mitochondrial DNA deletion in the rat. *Environmental and Molecular Mutagenesis*, 2004; 44:313-320.

Lancaster A, Nelson MP, Meyer D, Thomson G, and Single RM. PyPop: A software framework for population genomics: Analyzing large-scale multi-locus genotype data. *Pacific Symposium on Biocomputing*, 2003; 514-25.

Single RM, Meyer D, Hollenbeck J, Nelson M, Noble JA, Erlich HA, and Thomson G. Haplotype frequency estimation in patient populations: The effect of departures from Hardy-Weinberg proportions and collapsing over a locus in the HLA region. *Genetic Epidemiology*, 2002; 22:186-195.

Gordon D, Finch SJ, Jacobs AL, Mendell NR, Single RM and Marr TG. Association of posterior p-values of S.A.G.E. SIBPAL proportion-IBD and Haseman-Elston statistics for ACTHR 112. *Genetic Epidemiology*, 1997; 14:629-634.

Single RM and Finch SJ. Gain in efficiency from using Generalized Least Squares in the Haseman Elston procedure. *Genetic Epidemiology*, 1995; 12:889-894.

2) Medical Biostatistics

McCahill LE, Single RM, Aiello Bowles EJ, Feigelson HS, James TA, Barney T, Engel JM, Onitilo AA. Variability in reexcision following breast conservation surgery. *JAMA*. 2012 Feb 1;307(5):467-475.

McCahill LE, Single R, Ratliff J, Sheehey-Jones J, Gray A, James T. Local recurrence after partial mastectomy: relation to initial surgical margins. *Am J Surg*. 2011 Mar;201(3):374-378

James T, McCahill LE, Ratliff J, Ashikaga T, Single R, Sheehey-Jones J, Messier N, Stanley M, Krag D, Harlow S. Quality Assessment of Neoadjuvant Therapy Use in Breast Conservation: Barriers to Implementation.*The Breast Journal*, Volume 15 Number 5, 2009; 524-526.

Privette A, McCahill L, Borrazzo E, Single RM, Zubarik R. Laparoscopic approaches to resection of suspected gastric gastrointestinal stromal tumors based on tumor location. *Surgical Endoscopy*, 2008; 22(2): 487-494.

McCahill LE, Ahern JW, Gruppi LA, Limanek J, Dion GA, Sussman JA, McCaffrey CB, Leary DB, Lesage MB, and Single RM. Enhancing compliance with Medicare guidelines for surgical infection prevention: Experience with a cross-disciplinary quality improvement team. *Archives of Surgery*, 2007 142: 355-361.

Cook AD, Single R, and McCahill LE. Utilization of surgical resection of primary tumors in patients presenting with Stage IV colorectal cancer: An analysis of SEER data, 1988-2000. *Annals of Surgical Oncology*, 2005; 12(8): 637-645.

Krag, DN, Julian, TB, Harlow, SP, Weaver, DL, Ashikaga, T, Bryant, J, Single, RM, and Wolmark, N. NSABP-32: Phase III, Randomized trial comparing auxiliary resection with sentinel lymph node dissection: A description of the trial. *Annals of Surgical Oncology*, 2004; 11: 208S-210.

Krag D and Single RM. Breast cancer survival according to number of nodes removed. *Annals of Surgical Oncology*, 2003; 10: 1152-1159.

Stokes IA, Henry SM, and Single RM. Surface EMG Electrodes do not accurately record from lumbar multifidus muscles. *Clinical Biomechanics*, 2003 Jan; 18(1):9-13.

3) Education and Program Evaluation

Kasprisin CA, Single PB, Single RM, Muller CB, and Ferrier, JL. Improved mentor satisfaction: Emphasizing protégé training for adult age mentoring dyads. *Mentoring and Tutoring, 16*(2), 163–174.

Single, PB and Single, RM. E-mentoring for social equity: Review of research to inform program development. *Mentoring and Tutoring*, 2005; 13(2): 303-322.

Single PB, Muller CB, Cunningham CM, Single RM, and Carlsen WS. MentorNet: E-mentoring for women students in engineering and science. *Journal of Women and Minorities in Science and Engineering*, 2005; 11(3), 295-309.

Kasprisin CA., Single PB, Single RM, and Muller CB. Building a better bridge: Testing e-training to improve e-mentoring programs in higher education. *Mentoring and Tutoring*, 2003; 11(1): 67-78.

Single RM. 52,467 + 57,204 = 254,281,227? Using the National Health Interview Survey and the 2000 Census to introduce statistical sampling and weights. *Journal of Statistics Education*, 2000; 8. (http://www.amstat.org/publications/jse/v8n1_abstracts.html)

Single PB, Muller CB, Cunningham CM, and Single RM. Electronic communities: A forum for supporting women professionals and students in technical and scientific fields. *Journal of Women and Minorities in Science and Engineering*, 2000; 6:115-129.

Single RM. Difference quotients, derivates, and data through modeling. *PRIMUS: Problems, Resources, and Issues in Mathematics Undergraduate Studies*, 1999; 9:279-288.

Refereed Book Chapters

Single, PB and Single, RM. Mentoring and the technology revolution: A literature review on how face-to-face mentoring set the stage for e-mentoring. In: F. K. Kochan & J. T. Pascarelli, eds., Creating successful telementoring programs. Greenwich, CT: Information Age Press, 2005; 7-27.

Single RM, Meyer D, and Thomson G. Statistical methods for analysis of population genetic data. In: J.A. Hansen, ed: Immunobiology of the Human MHC. Proceedings of the 13th International Histocompatibility Workshop and Conference. Vol I, IHWG Press, Seattle, 2007; 518-522.

Single RM, Meyer D, Mack SJ, Lancaster A, Nelson MP, Fernández-Viña M, Erlich H, and Thomson G. Haplotype Frequencies and Linkage Disequilibrium among classical HLA genes. In: J.A. Hansen, ed: Immunobiology of the Human MHC. Proceedings of the 13th International Histocompatibility Workshop and Conference. Vol I, IHWG Press, Seattle, 2007; 705-746.

Single RM, Malkki M, Thomson G, Mather KA, Carrington M, and Petersdorf E. Linkage disequilibrium and HLA-A: B: DRB1 haplotype probabilities for Class I, II, III microsatellite markers in unrelated donor hematopoietic stem cell transplantation. In: J.A. Hansen, ed: Immunobiology of the Human MHC. Proceedings of the 13th International Histocompatibility Workshop and Conference. Vol I, IHWG Press, Seattle, 2007; 1372-1377.

Meyer D, Single RM, Mack SJ, Lancaster A, Nelson MP, Fernández-Viña M, Erlich H, and Thomson G. Single locus polymorphism of classical HLA genes. In: J.A. Hansen, ed: Immunobiology of the Human MHC. Proceedings of the 13th International Histocompatibility Workshop and Conference. Vol I, IHWG Press, Seattle, 2007; 653-704.

Lancaster A, Nelson MP, Single RM, Meyer D, and Thomson G. Software framework for the Biostatistics Core. In: J.A. Hansen, ed: Immunobiology of the Human MHC. Proceedings of the 13th International Histocompatibility Workshop and Conference. Vol I, IHWG Press, Seattle, 2007; 510-517.

Mack SJ, Sanchez-Mazas A, Meyer D, Single R, Tsai Y, and Erlich HA. Methods used in the generation and preparation of data for analysis in the 13th International Histocompatibility Workshop. In: J.A. Hansen, ed: Immunobiology of the Human MHC. Proceedings of the 13th International Histocompatibility Workshop and Conference. Vol I, IHWG Press, Seattle, 2007; 564-579.

Thomson G, Hongzhe L, Dorman J, Lie BA, Mignot E, Steenkiste A, Thorsby E, Akey J, McWeeney S, and Single RM. Statistical approaches for analyses of HLA-associated and other complex diseases. In: J.A. Hansen, ed: Immunobiology of the Human MHC. Proceedings of the 13th International Histocompatibility Workshop and Conference. Vol I, IHWG Press, Seattle, 2007; 782-787.

Mickelson E, Damodaran A, He P, Malkki M, Smith A, Petersdorf E, Carrington M, Harding A, Cambon-Thomsen A, Gagne K, Bignon J-D, Gebuhner L, Dubois V, Dormoy A, Tongio M-M, Bois M, Concannon P, Martin B, Lie B, Thorsby E, Bétard C, Lathrop M, Mignot E, Schroeder M, Reveille J, Feolo M, Inoko H, Thomson G, Single R, and Hansen JA, on behalf of the IHWG Microsatellite Project and participating laboratories. Standardization of Microsatellite Data: Comparative Analysis of Results from 13th IHWS Participating Laboratories and Establishment of a Microsatellite Reference Panel and Standard Nomenclature. In: J.A. Hansen, ed: Immunobiology of the Human MHC. Proceedings of the 13th International Histocompatibility Workshop and Conference. Vol I, IHWG Press, Seattle, 2007; 1277-1314.

Reports and manuals

Single RM, Mather KA, Mack SJ, Maiers M, Gragert L. A Comparison of HLA and Informative Microsatellite Markers for Population Group Assignment in Clustering. National Marrow Donor Program (NMDP) technical report, 2008.

Lancaster A, Nelson MP, Meyer D, and Single RM. PyPop User Guide: User Guide for Python for Population Genetics, Version 0.6.0. Available at http://www.uvm.edu/~pypop/docs and http://www.pypop.org/docs , Copyright © 2003-2007. Regents of the University of California.

Single PB, Cunningham CM, Single RM, Nepton CN, and Kirk L. 2000-01 MentorNet Research Project Evaluation Report, 2002; March; University of Vermont: Burlington, VT. Retrieved on February 4, 2004, from http://www.mentornet.net/documents/about/results/evaluation/00-01/00.01.YearEnd.Eval.Report.appendices.pdf

Single RM and Finch SJ. Properties of the Null Distribution of the GLS Test Statistic Applied to the Haseman-Elston Procedure. American Statistical Association Proceedings of the Epidemiology Section 1997.

Finch SJ, Yu Q, Lipfert FW, Baxter LA, Mendell NR, Thode HC Jr, Single RM and Gong H. Review of External Costs of Air Pollution with Respect to Human Health Effects. Technical Report, 1995; AMS Report 95-11.

Mendell NR, Lipfert FW, Finch SJ, Baxter LA, Grimson R, Larsen U, Single RM, Thode HC Jr, and Yu Q. Ozone Pollution and Human Mortality: A Review of Studies Applicable to Estimating the External Health Costs of Pollution. Technical Report, 1994; AMS Report No. 9413.

Papers in Progress

Single RM, Mack SJ, Lancaster AK, Erlich HA, Thomson G. A multi-locus asymmetric extension of the r-squared measure of linkage disequilibrium: Application to amino acid correlations in classical HLA genes. In preparation.

Privette A, McCahill LE, Borrazzo E, Zubarik R, Nicole Messier N, Single RM. Endoscopically assisted laparoscopic resections of submucosal gastric and GE junction tumors - A novel approach based on tumor location. Submitted to *Surgical Endoscopy*.

James TA, McCahill LE, Ratliff J, Ashikaga T, Single R, Sheehey-Jones H, Messier N, Stanley M, Krag D, Harlow S. Neoadjuvant therapy as a quality indicator in breast conservative surgery: Barriers to implementation. Submitted to *Archives of Surgery*.

Research Support

NGIT/BISC, Scheuermann (PI) 09/30/06 - 9/30/11
Northrup Grumman Information Technology (NGIT) Bioinformatics Integration Support Contract (BISC)
NIH/NIAID Contract HHSN266200400076C, ADB Number N01-AI-40076

Consulting related to statistical methods for population genetic analysis of the human immune genes, data validation and standardization for HLA and KIR, and integration of software tools with NGIT's Immunology Database and Analysis Portal (ImmPort).

RC1CA145402, McCahill (PI) 09/30/09 – 09/29/11
NIH/NCI
"Quality of Breast Cancer Surgery and Outcomes"
The goals of this project are to establish measures of quality for initial breast cancer surgery and assess variability in outcomes and healthcare costs associated with breast cancer surgery.
Role: Co-PI/PD

LCCRO, McCahill (PI) 3/1/08- 10/1/09
Lake Champlain Cancer Research Organization (LCCRO)
"Impact of a Multidisciplinary Cancer Program and Nurse Navigator System on Healthcare Delivery for Upper Gastrointestinal Cancer"
The goal of this study is to assess the impact of the nurse navigator system on health care delivery/quality.
Role: Co-Investigator

FAPESP, Meyer/Single (PI) 9/1/08- 1/31/09
Fundación para o Amparo da Pesquisa do Estado de São Paulo (FAPESP), Brazil
The goal of this research is to conduct a comparative genomic analysis of selection and demographic history in immune-related genes in worldwide populations, with a focus on Amerindian populations.
Role: Co-PI/Visiting Researcher

NMDP, Single (PI) 10/1/07- 9/30/08
National Marrow Donor Program (NMDP)
"Donor Registry Modeling"
The goal of this study was to assess the frequency of unique HLA-A, -B, -DRB1 phenotypes in the donor registry and their implications for registry modeling and predictions.

NMDP, Single (PI) 12/1/06- 11/30/07
National Marrow Donor Program (NMDP)
"Donor Genetic Clustering"
Agency: National Marrow Donor Program (NMDP)
The goal of this study was to compare HLA and informative microsatellite markers for population group assignment through genetic clustering in order to facilitate donor recruitment and matching with patients.

VACC, Single (PI) 10/1/05-7/31/07
Vermont Advanced Computer Center (VACC)
"Computational Infrastructure for the Relocation, Maintenance, and Expansion of the PyPop Software Development Project"
The goal of this project was to move the infrastructure for development of the on-going software framework, for the analysis of large-scale genomic data, to the University of Vermont.

NIH/NIAID, Single (PI) 1/1/03-6/30/05
International Histocompatibility Working Group: Core B Biostatistics
Subcontract on NIH/NIAID-U24AI49213, Hansen (PI)

NCI, Hansen (PI) 7/1/01-12/31/02
International Histocompatibility Working Group.
Consultant on NCI/R24CA84497

Service

Department

Member of the Steering Committee for the Statistics program (2002 – present).

Member of Statistics Program curriculum committee (2002 – present).

Coordinator for the Statistics Student Association's Journal Club (2004 – present).

College

Member of the College of Engineering and Mathematics Studies Committee (2003 – present).

University

Member of a National Cancer Institute Data Safety and Monitoring Committee, UVM (2001 – 2005).

Reviewer for the Protocol Review Committee of the Vermont Cancer Center (VCC) (2002 – 2004).

Member of the Genome Stability and Expression Program of the VCC (2004 – present).

State/National/International

Member of the editorial board for *Human Immunology*.

Invited member of a National Marrow Donor Program (NMDP) expert panel on Population Genetics for projecting optimal donor and cord blood registry sizes and predicting match rates for potential transplant recipients (Fall, 2007).

15th International Histocompatibility and Immunogenetics Workshop (IHIW) (2006 – present).

- Member of the Scientific Advisory Committee.
- Co-chair of the Anthropology/Human Genetic Diversity and Biostatistics Project.

Co-chair of the Biostatistical Analysis Project for the 14th IHIW (2002 – 2006).

Co-chair of the Microsatellite Working Group session at the 14th IHIW (2005).

Assisted with questionnaire design and analysis for the Vermont State Department of Education on the School Readiness Assessment Initiative, 2002 - 2003.

Assisted with questionnaire design and analysis for the Vermont Agency of Human Services on Vermont's Youth Risk Behavior Survey and a project investigating mediators of child well-being in low-income families, 2002 - 2003.

Reviewer for *Genetic Epidemiology, American Journal of Human Genetics, Human Immunology, European Journal of Human Genetics, Tissue Antigens, Genes and Immunity, the American Statistician,* and the *Journal of Statistics Education*.