



MSUTR Statistics

Table 1

N by Age at
Recruitment

Age Range	# of Twins Enrolled
3-7*	9,588
8-17	11,220
18-25*	440
35-45*	842
Total	22,090

*Recruitment is on-going.

Table 2

MTP Demographics

Twins	%
Male	50%
Female	50%
White	83%
Black	7%
Hispanic	2%
Asian	1%
Multiracial	5%
Other	2%
Same-sex MZ	28%
Same-sex DZ	35%
Opposite Sex	37%

The MSUTR: A useful addition to your research program?

The Michigan State University Twin Registry (MSUTR) is a large, population-based twin registry that is co-directed by Drs. S. Alexandra Burt and Kelly Klump in the Department of Psychology at Michigan State University (MSU). Twin studies are exceptionally strong tools for examining the etiology of a trait or disorder, as they allow for the examination of genetic influences across multiple levels of analysis (latent and molecular) and layers of risk (environmental, biological, epigenetic). The MSUTR capitalizes on the inherent strengths of twin methodology to build a leading resource for faculty and trainees and foster innovative scholarship in health and genetic research. The specific goals of the MSUTR are to:

- 1) *Significantly enhance health research infrastructure on MSU’s campus and around the globe by providing a unique resource for subject identification and recruitment; and*
- 2) *Immediately generate new knowledge through the analysis of collected twin data that can examine genetic risk, environmental risk, and gene-environment interplay in the development of major medical and psychiatric conditions.*

These goals are achieved by recruiting child, adolescent, and adult twins born in Michigan into the MSUTR. The majority of recruitment into the registry occurs through the Michigan Twins Project (MTP), a mail-in survey with questions about basic demographic characteristics, twin zygosity, birth variables (e.g., birth weight, birth complications), and family history of over 45 medical and psychiatric illnesses. By answering a future participation question, twins and their families indicate whether they would be interested in participating in future research studies (>95% of twins/families say yes). In addition to the potential for recruiting these twins for further research, answers on the health questionnaire can be immediately analyzed to examine genetic and environmental influences on major health conditions.

We welcome researchers to use the MTP in their research programs, and invite collaborations for new data collections and/or analysis of archival data. For more

information on collaborative opportunities, please see the “Accessing the Registry” section on page 3. For more information about the MSUTR and MTP, please see:

- Burt, S. A., & Klump, K. L. (2013). The Michigan State University Twin Registry (MSUTR): An update. *Twin Research and Human Genetics*, 16 (1), 344-350.
- Klump, K. L., & Burt, S. A. (2006). The Michigan State University Twin Registry (MSUTR): Genetic, environmental and neurobiological influences on behavior across development. *Twin Research and Human Genetics*, 9 (6), 971-977.

MTP Recruitment – History and Current Status

As noted above, the majority of recruitment into the MSUTR has occurred through the MTP. Recruitment for this project began in 2008 in collaboration with the Michigan Department of Community Health (MDCH). Recruitment efforts first focused on child and adolescent twins (ages 3-17 years), and over 22,000 twins have been enrolled in the registry to date. While this recruitment is on-going, the majority of the original target population has been recruited, so we are now focusing on the following recruitment efforts:

- **Enroll new cohorts of 3 year-old twins each year** to keep the registry active and increase the number of twins available for follow-up studies.
- **Re-assess the youngest twins (ages 3-7) every 5 years** to ensure updated health/family information and to allow for longitudinal analyses of MTP collected data.
- **Expand recruitment of young adult twins (ages 18-25)**, with the goal of enrolling 5,000 twins in this age group.
- **Recruit a new sample of twins in middle adulthood (ages 35-45)**, with the goal of enrolling 6,000 twins in this age group. This cohort will include assessments of the twins as well as information about their spouses and children that can be used for expanded twin analyses capable of examining intergenerational transmission of genetic and environmental risk.

Please note that parents of twins between the ages of 3 and 17 years complete the enrollment questionnaire for the entire family, while adult twins (ages 18-25 and 35-45) each receive and complete their own survey.

Recent Findings

Data from the MSUTR are already generating new information via analysis of archival data and new data collections. There currently are seven independent research groups (Dr. S. Alexandra Burt, MSU Dept. of Psychology; Dr. Kelly Klump, MSU Dept. of Psychology; Dr. Nigel Paneth, MSU Dept. of Epidemiology; Dr. Christopher Hopwood, MSU Dept. of Psychology; Dr. Jason Moser, MSU Dept. of Psychology; Dr. James Pivarnik, MSU Dept. of Kinesiology; Dr. Melisa Moore, the Children's Hospital of Philadelphia) making good use of the MSUTR in their research programs.

Examples of recent findings from this work include:

- **Dr. Klump and colleagues** used MSUTR data to examine developmental differences in genetic risk for eating disorders in female and male twins across puberty. Results indicated dramatic sex differences in puberty's effects – in girls, genetic influences on disordered eating increased substantially during puberty, whereas in males, no developmental differences in genetic effects were observed. This was the first study to examine sex differences in the influence of puberty on genetic risk for eating disorders. Such findings support a role for female-specific factors in genetic risk for disordered eating across the pubertal transition.
 - Klump, K. L., Culbert, K. M., Slane, J. D., Burt, S. A., Sisk, C. L., & Nigg, J. T. (2012). The effects of puberty on genetic risk for disordered eating: Evidence for a sex difference. *Psychological Medicine*, 42(3), 627-638.
- **Dr. Burt and colleagues** used MSUTR twins to examine the role of peer affiliation in modifying genetic and environmental risk for child behavior problems. Results suggested that delinquent peer affiliation (DPA) exacerbates shared environmental influences on childhood delinquency, while having little effect on genetic influences. This stands in sharp contrast to the significant moderating effect of DPA on genetic influences seen in adolescence. Such findings highlight differing etiological mechanisms for delinquency during childhood and adolescence, respectively, and particularly with regard to the role of socialization.
 - Burt, S. A., & Klump, K. L. (in press). Delinquent peer affiliation as an etiological moderator of childhood delinquency. *Psychological Medicine*.

➤ **Dr. James Pivarnik's lab** in the Department of Kinesiology at MSU investigated genetic and environmental influences on body fatness and physical activity (PA), using male and female adolescent twins drawn from the MSUTR. Body fatness was found to be influenced by genetic effects for males and females, while physical activity was influenced solely by environmental effects for both sexes. These results indicate that, when developing interventions to increase PA in adolescents, it is important to consider their environment.

- Kuffel, E. E., Klump, K. L., Burt, S. A., & Pivarnik, J. M. (2009). A description of adolescent twins' body composition and physical activity. *Medicine & Science in Sports & Exercise*, 41 (Supplement), S507.

➤ **Dr. Melisa Moore** with the Sleep Center at the Children's Hospital of Philadelphia used MSUTR data to investigate the relative contributions of genetic and environmental factors to adolescent and preadolescent sleep problems. While both genetic and environmental influences appeared to be important to adolescent sleep problems, environmental factors made a larger contribution than genetic factors, highlighting the importance of targeting modifiable environmental factors when treating adolescents with sleep problems.

- Moore, M., Slane, J., Mindell, J. A., Burt, S. A., & Klump, K. L. (2011). Genetic and environmental influences on sleep problems: A study of preadolescent and adolescent twins. *Child: Care, Health and Development*, 37, 638–641.

Other labs are collecting new data using the MTP as the recruitment pool. Examples of these studies include:

➤ **Dr. Christopher Hopwood's lab** in the Department of Psychology at MSU is collecting longitudinal, pilot data from adolescent twins recruited from the MSUTR for a study on the etiological influences on stability and change in different features of personality, including traits, disorders, and self-narratives.

➤ **Dr. Jason Moser's lab** in the Department of Psychology at MSU is collecting pilot data from late adolescent/early adult female twins recruited from the MSUTR for a study of genetic and environmental factors influencing anxiety and brain activity.

➤ **The OWL (Outcomes, Wellness and Life course in Cerebral Palsy) project** in the Department of Epidemiology at MSU is recruiting twin pairs from the MSUTR to study the origins of cerebral palsy. A particular interest is in twins discordant for cerebral palsy, which is the case for nearly 90% of twin pairs. This project selects twins with CP from the MTP Health Questionnaire and then conducts in-depth, follow-up assessments with each family.

Accessing the Registry

We welcome inquiries from scientists interested in accessing the MSUTR for use in their own projects, whether as a resource for the identification and recruitment of participants or as a pre-existing source of data on health conditions, demographics, and behavioral characteristics of twins and their families.

Researchers interested in using the registry are asked to submit a data use proposal that outlines the study aims, the target subject population, project timelines, and the resources needed. Proposals may be submitted for data analysis of existing data only, or for

targeted recruitments from the registry. All proposals will be evaluated by the MTP Advisory Committee (Current members: Drs. Burt, Klump, Hopwood, Moser, and Paneth), particularly with regard to potential overlap in subject recruitment with other projects. Once approval is received, access to the data will be granted or the recruitment process begun, depending on the needs of each investigator.

Partial List of Screening Items:

- | | |
|---------------------|-------------------------|
| • ADHD | • Depression |
| • Alcoholism | • Diabetes |
| • Anxiety Disorders | • Drug Abuse |
| • Asthma | • Eating Disorders |
| • Autism | • Heart Problems |
| • Bipolar Disorder | • Learning Disabilities |
| • Cancer | • Schizophrenia |
| • Cerebral Palsy | • Stuttering |
| • Conduct Disorder | |

Twins may be selected for recruitment based on age, sex, twin type, and development status, in addition to the screening items listed on the health survey (please page 3 for a partial list). Recruitment mailings to the selected twins will be prepared by MTP staff and delivered to the MDCH for mailing. Up to four mailings will be sent to those who do not respond to prior mailings, with the fourth mailing using certified letters. Using these methods, studies recruiting from the MTP have observed excellent response rates (57-86%; mean response rate is 70%) that include subjects who are representative of the state of Michigan in terms of racial/ethnic background and socioeconomic status (see Burt & Klump (2013) paper listed on page 1).

In order to cover expenses associated with subject selection and recruitment mailings, each project will be charged a Registry Access fee (for details, please contact MTP Project Coordinator Eric Gernaat: gernaate@msu.edu). These fees cover the cost of mailing preparation, all mailing expenses (including a certified, fourth mailing), and staff time at both MSU and MDCH. Please note that costs are higher for the recruitment of adult than child twins since adult recruitment requires mailing two separate recruitment packets (one to each adult twin) whereas recruitment of child/adolescent pairs requires only one packet sent to the twins' parents. There is no charge for analyzing existing MSUTR data.

If you would be interested in accessing the MSUTR for use in your own project, or you would like to learn more about the MSUTR, please feel free to contact us using the information provided below:

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MSUTR Website: www.msutwinstudies.com

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