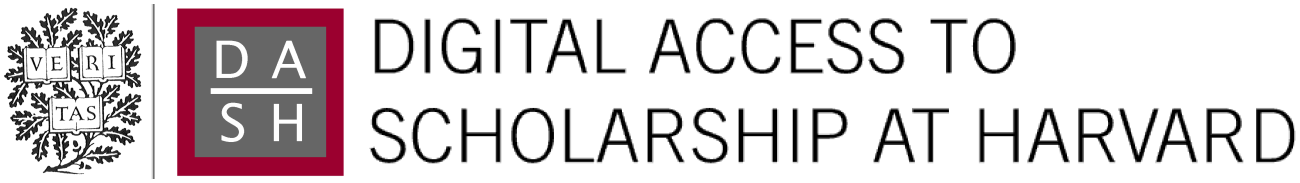

Long-Term Neighborhood Effects on Low-Income Families: Evidence from Moving to Opportunity

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By JENS LUDWIG, GREG J. DUNCAN, LISA A. GENNETIAN, LAWRENCE F. KATZ, RONALD C. KESSLER, JEFFREY R. KLING, AND LISA SANBONMATSU*

* Ludwig: University of Chicago, 1155 East 60th Street, Chicago, IL 60637 and National Bureau of Economic Research (NBER), jludwig@uchicago.edu; Duncan: University of California, Irvine, School of Education, 2056 Education Building, Irvine, CA 92697, gduncan@uci.edu; Gennetian: New York University, Institute of Human Development and Social Change, 246 Greene Street, Floor 6E, New York, NY 10003 and NBER, gennetl@nber.org; Katz: Harvard University, Department of Economics, Cambridge, MA 02138 and NBER, lkatz@harvard.edu; Kessler: Harvard Medical School, Department of Health Care Policy, 180 Longwood Avenue, Boston MA 02115, kessler@hcp.med.harvard.edu; Kling: Congressional Budget Office, 2nd and D Streets, SW, Washington DC 20515, and NBER, jeffrey_kling@nber.org; Sanbonmatsu: NBER, 1050 Massachusetts Avenue, Cambridge, MA, 02138, lsanbonm@nber.org. Support for this research was provided by a contract from the U.S. Department of Housing and Urban Development (HUD; C-CHI-00808) and grants from the National Science Foundation (SES-0527615), National Institute for Child Health and Human Development (R01-HD040404, R01-HD040444), Centers for Disease Control (R49-CE000906), National Institute of Mental Health (R01-MH077026), National Institute for Aging (P30-AG012810, R01-AG031259, and P01-AG005842-22S1), National Opinion Research Center's Population Research Center (through R24-HD051152-04 from the National Institute of Child Health and Human Development), University of Chicago's Center for Health Administration Studies, U.S. Department of Education/Institute of Education Sciences (R305U070006), Bill & Melinda Gates Foundation, John D. and Catherine T. MacArthur Foundation, Russell Sage Foundation, Smith Richardson Foundation, Spencer Foundation, Annie E. Casey, and Robert Wood Johnson Foundation. Outstanding assistance with the data and analysis was provided by Joe Amick, Ryan Gillette, Ray Yun Gou, Ijun Lai, Jordan Marvakov, Nicholas Potter, Matt Sciandra, Fanghua Yang, Sabrina Yusuf, and Michael Zabek. The survey data collection effort was led by Nancy Gebler of the University of Michigan's Survey Research Center under subcontract to our research team. We thank Janet Currie and many seminar participants for helpful comments. MTO data were provided by HUD. The data used in this paper are available through the Interuniversity Consortium on Political and Social Research (ICPSR) at the University of Michigan. The views expressed in this work are those of the authors and should not be interpreted as those of the Congressional Budget Office or HUD.

Research dating back to at least the 17th century has shown that people living in more disadvantaged neighborhoods fare worse with respect to earnings, education, health, crime involvement and other life outcomes (Sampson 2012). These patterns have led to concern that neighborhood environments may exert independent causal effects on people's long-term life chances. Living in a disadvantaged social environment may depress life outcomes by, for example, shaping exposure to peer norms or access to resources such as schools or job referrals. However some theories yield the opposite prediction about the effects of moving into a more affluent area, since more affluent areas could have greater discrimination and competition from advantaged peers and fewer social services for the poor.

Isolating the causal effects of neighborhood environments on behavior and well-being is complicated by the fact that most people have at least some degree of choice over where they live. Observational studies may confound neighborhood influences with those of hard-to-measure individual- or family-level attributes that affect both residential sorting and the behavioral outcomes of interest.

Evidence about "neighborhood effects" is important in part because neighborhood residential segregation by income has been

increasing in the United States since 1970 beyond the amount expected from rising income inequality alone (Reardon and Bischoff 2011). Nearly 9 million Americans live in "extreme-poverty" neighborhoods in which at least 40 percent of residents are poor (Kneebone, Nadeau, and Berube 2011). Knowledge of neighborhood effects (and the mechanisms behind such effects) is relevant for evaluating policies that affect how people are sorted across neighborhoods and for assessing housing market efficiency.

This paper examines the long-term effects on low-income parents and children of moving from very disadvantaged to less distressed neighborhoods, using data from a unique, large-scale randomized social experiment – the U.S. Department of Housing and Urban Development's (HUD's) Moving to Opportunity (MTO) demonstration. Via random lottery, MTO offered housing vouchers to families with children living in high-poverty public housing projects that facilitate moves to less-distressed areas. MTO randomization generates large, persistent differences in neighborhood conditions for otherwise comparable groups and enables us to attribute group differences in post-baseline outcomes to the offer to move through MTO.

We find that 10-15 years after randomization, MTO-assisted moves improve several key adult mental and physical health outcomes, but have no consistent detectable impacts on adult economic self-sufficiency or children's educational achievement outcomes, even for children who were pre-school age at baseline. We also find signs of the same gender difference in the effects of MTO moves on youth risky behaviors and health found in the interim (4-7 year) follow-up, with girls doing better in some ways while boys do worse. Despite the mixed MTO impacts on the standard outcomes that have dominated the neighborhood-effects literature, MTO moves generate a large gain in subjective well-being (SWB) for adults (Ludwig et al. 2012).

I. The Moving to Opportunity Experiment

From 1994 to 1998 MTO enrolled 4,604 low-income public housing families living in high-poverty neighborhoods within five U.S. cities: Baltimore, Boston, Chicago, Los Angeles, and New York. Families were randomized into three groups: i) the *Experimental group*, which received housing vouchers that subsidize private-market rents and could only be used in census tracts with 1990 poverty rates below 10 percent, and additional housing-mobility counseling; ii) the *Section 8 group,* which received regular housing vouchers without any MTO relocation constraint; and iii) a *control* group*,* which

received no assistance through MTO. Some 48% of households assigned to the Experimental group and 63% of those assigned to the Section 8 group moved through MTO (the MTO "compliance rate").

Data from baseline surveys show that these families were quite economically disadvantaged when they applied for MTO (see Appendix Table 1). Most household heads were African-American or Hispanic females; fewer than 40% had completed high school. Around three-quarters of applicants reported getting away from gangs and drugs as the most important reason for enrolling in MTO. As one would expect from a properly-conducted random assignment, the distribution of baseline characteristics is balanced between the treatment and control groups.

II. Measures and Methods

To measure long-term outcomes, our research team subcontracted with the Institute for Social Research at the University of Michigan to collect in-person data with 3,273 MTO adults and 5,105 youth who were ages 10-20 at the end of 2007. Data were collected between 2008 and 2010, or 10-15 years after baseline. The effective response rates equaled 90% for MTO adults and 89% for youth, and were generally similar across randomized MTO groups. Adults in the Section 8 group were interviewed slightly later than other adults because funding for this activity was secured later during the project; we discuss implications of this delay below.

To measure neighborhood conditions we collected self-report address information and passive tracking data, which we linked to census tract-level data from the 1990 and 2000 censuses and the 2005-09 American Community Surveys. We focus on duration-weighted average tract characteristics over the 10-15 year study period, since people's life outcomes may depend on cumulative exposure to neighborhood environments. Our surveys also asked MTO adults and youth to self-report about their neighborhood conditions.

Our primary focus is on indices of adult outcomes in the domains of economic outcomes, physical health, and mental health, and youth outcomes in the domains of education, physical health, mental health, and risky behavior. The outcome indices are constructed from a set of individual outcomes from our surveys that are rescaled so that higher values represent "better" outcomes and then converted to Z-scores using the control group distribution. Aggregating outcomes improves statistical power to detect impacts and reduces the risk of "false positives" by reducing the number of statistical tests carried out. To further reduce the risk of false

positives due to data mining, the outcome indices we examine were pre-specified for the interim MTO follow-up done in 2002 (Kling, Liebman, and Katz 2007).

We present intention-to-treat (ITT) estimates that capture the effect of being offered the chance to use an MTO voucher to move into a different neighborhood. These estimates are calculated as the difference in average outcomes for families assigned to treatment versus the control condition, by regressing an outcome index against indicators for treatment-group assignment and (pre-random assignment) baseline covariates that include indicators for MTO demonstration site and participant socio-demographic characteristics to improve precision (see Appendix Table 1). The estimates are weighted to account for changes over time in the probability of treatment assignment due to higher-than-expected compliance rates.

We also present estimates of the effects of treatment on the treated (TOT), which use random assignment indicators as instruments for moving through MTO in the Experimental or Section 8 groups and assume the treatment assignment only affects families who move using a MTO voucher.

III. Results

One year after baseline, the average control group adult was living in a neighborhood with an average tract poverty rate of 50 percent (Appendix Table 2). Moving with an Experimental voucher reduced average tract poverty rates one year after baseline by 35 percentage points (2.8 standard deviations in the 2000 census tract poverty distribution), while moving through MTO with a regular Section 8 voucher reduced tract poverty rates by 21 percentage points (1.8 standard deviations). These differences across MTO groups in neighborhood conditions narrowed over time, mostly because the neighborhood poverty rates for controls declined.

Despite the convergence of neighborhood conditions across MTO groups over the study period, MTO-induced differences in duration-weighted average tract poverty rates over the course of the 10-15 year follow-up period were quite sizable. Figure 1 shows that a large share of adults who moved with an MTO Experimental voucher had an average tract poverty rate below 20%, which was true for few control group families. The effects of moving with a regular Section 8 voucher on average tract poverty rates were somewhat less pronounced. (Appendix Table 2 presents

MTO impacts on a broader set of neighborhood characteristics.)

[Insert Figure 1 Here]

Contrary to the widespread view that living in a disadvantaged inner-city neighborhood depresses labor market outcomes, Table 1 shows that being offered a voucher through MTO did not improve economic self-sufficiency, at least for this study sample. Although the ITT estimate for the Section 8 group was negative and marginally significant ($p<.10$), we believe this was most likely an artifact of our interviewing the Section 8 group adults a bit later than control adults, when labor market conditions were less favorable (see Sanbonmatsu et al. 2011).

The results in Table 1 also hint at some potentially positive impacts of MTO on adult mental and physical health outcomes, with ITT effects on these broad health outcome indices that were in the direction of better health but not quite statistically significant. However some specific individual health outcomes showed large and statistically significant improvements in response to MTO-assisted moves. For example, moving with an Experimental-group voucher (the TOT effect) reduced the prevalence of having a body mass index of 40 or more (BMI, defined as weight in kilograms divided by the square of height in meters) by 7 percentage points. This was a decline of nearly 40% of the control group mean of 18 percent (Ludwig et al. 2011). For a five-foot-four woman, a BMI of 40 would correspond to a weight of about 235 pounds. We also found the Experimental-voucher TOT effect reduced the prevalence of diabetes, measured from blood samples and defined as having a level of glycosylated hemoglobin (HbA1c)≥6.5%, by 10 percentage points, or one-half of the control group's rate.

[Insert Table 1 Here]

We found no evidence that MTO had beneficial impacts on youth educational outcomes. Effects on math and reading test scores were very close to zero both for youth who were pre-school age at baseline and for youth who were ages 6 and up at baseline. MTO did tend to have some beneficial effects on female but not male youth in other outcome domains (Table 2). Assignment to the Experimental and Section 8 groups improved physical health for girls, while the Experimental group effect on mental health outcomes is also positive and statistically significant for girls. The estimated effects on health outcomes for boys range from zero to negative (worse health). We can reject the null hypothesis that the physical and mental health

impacts of the Experimental treatment are the same by gender (Appendix Table 3).

[Insert Table 2 Here]

IV. Discussion

The MTO long-term results did not provide support for the view that high rates of school failure and non-employment in central city neighborhoods are due to the direct adverse effects of living in a poor neighborhood. The pattern of findings was consistent with the results from the 4-7 year interim follow-up of MTO adults and youth (Kling, Liebman, and Katz 2007). Our long-term data also showed no detectable impacts on academic achievement for children of pre-school age at baseline even though MTO led to very large changes in their neighborhood conditions at a life stage when they may be most developmentally malleable.

One obvious question involves generalizability: Do neighborhood changes have no impact on earnings or educational achievement outcomes here because the MTO study sample is somehow unusual? MTO families were drawn from extremely distressed communities. The baseline census tracts for MTO families were fully 3 standard deviations above the national average in the 2000 census tract-poverty distribution. On the other hand much of the scientific and policy concern about "neighborhood effects" is precisely with families living in the most distressed areas. And previous observational studies report finding impacts on samples similar to the MTO sample.

Looking at broad indices of outcomes that were pre-specified for the interim MTO data, we see suggestive (but not always statistically significant) signs that physical and mental health outcomes improved for adult women and female youth. We see very large MTO impacts on specific health measures, particularly those related to extreme obesity and diabetes. Although we acknowledge that measuring candidate mechanisms like diet, exercise and access to health care is intrinsically challenging, and that our available data on these factors are quite limited, it is noteworthy that MTO moves reduced extreme obesity and diabetes by fully 40-50% for adults while generating almost no detectable changes in our measures of these candidate mediators. One hypothesis for why MTO improved physical health is because of MTO's beneficial impacts on neighborhood safety, and subsequent gains in mental health – including measures of psychological distress. This safety-stress-health hypothesis is also consistent with our finding that the majority of MTO households signed up for

MTO because of concerns about crime and violence.

The long-term MTO data did not show any signs of the large drop in violent-crime arrests that were found in the 4-7 year MTO follow-up among both male and female youth (Kling, Ludwig, and Katz 2005). However the long-term data did echo the interim data to some extent in showing female youth may benefit from MTO moves in other outcome domains like mental health or risky behaviors, but male youth tended to do no better (or do worse) as a result of such moves. The reason for these gender differences remains unclear; they do not seem to be due merely to gender differences in the prevalence of these outcomes or behaviors.

The sizes of these gender differences in MTO impacts were smaller in the long-term than interim data, just as the difference across MTO groups in neighborhood conditions was smaller at the time of the long-term surveys than interim surveys. These patterns suggest youth outcomes may be more affected by contemporaneous neighborhood conditions than accumulated exposure to neighborhood environments, or what Sampson (2012) calls "situational" neighborhood effects as opposed to "developmental" neighborhood effects.

The MTO data make clear that neighborhood environments have important impacts on the overall quality of life and well-being of low-income families despite the mixed pattern of impacts on traditional "objective" outcome measures, including null effects on earnings and education. Ludwig et al. (2012) show that a 1 standard deviation decline in census tract poverty rates (about 13 percentage points) is associated with an increase in SWB that is about the same size as the difference in SWB between households whose annual incomes differ by $13,000 – a very large amount given that the average control group family's annual income in the long-term survey is just $20,000.

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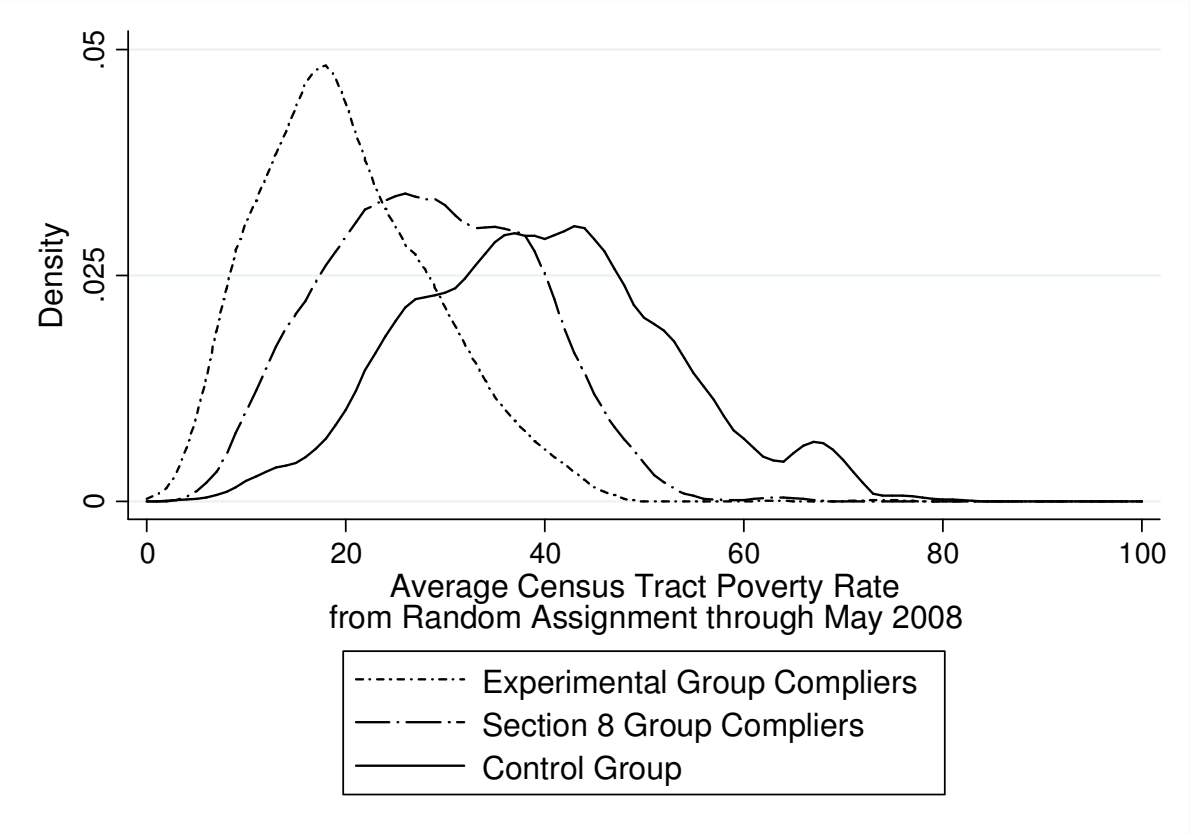

FIGURE 1. DENSITIES OF AVERAGE POVERTY RATE BY TREATMENT GROUP

Notes: Duration-weighted average of census tract poverty at all addresses from random assignment through May 2008 (just prior to the long-term survey fielding period), based on linear interpolation of 1990 and 2000 decennial census and the 2005-09 American Community Survey data. Density estimates used an Epanechnikov kernel with a half-width of 2.

Source and Sample: The sample is all adults who were interviewed as part of the long-term survey (with Experimental and Section 8 group adults limited to those who used an MTO voucher to move). Sample sizes in the Experimental, Section 8, and control groups are 711, 413, and 1,139.

TABLE 1 — MTO IMPACTS ON ADULT OUTCOMES

	Experimental vs. Control	Section 8 vs. Control
Panel A. Outcome Indices (z-scores)		
Index for all outcomes	0.037	-0.010
	(0.040)	(0.059)
Economic self-sufficiency	-0.029	-0.112*
	(0.040)	(0.059)
Absence of physical health problems	0.055	0.062
	(0.042)	(0.058)
Absence of mental health problems	0.069	0.063
	(0.042)	(0.062)
Panel B. Selected individual health outcomes		
Psychological distress, K6 z-score	-0.106**	-0.081
	(0.042)	(0.060)
BMI≥40	-0.036**	-0.038*
	(0.016)	(0.023)
Blood test detected diabetes (HbA1c≥6.5%)	-0.050***	-0.015
	(0.018)	(0.026)

Notes: Estimates are the intent-to-treat effect sizes from an ordinary least squares regression of each outcome on treatment indicators and the baseline covariates listed in Appendix Table 1. Robust standard errors are in parentheses. Outcome indices and psychological distress are z-scores using the mean and standard deviation for the control group. Index components are as follows (positive outcomes (+) were included as is, while the signs for negative outcomes (−) were reversed so that higher index values indicate "better" outcomes): Economic self-sufficiency: + adult employed and not on TANF + employed + 2009 earnings − on TANF − 2009 government income. Mental health: − distress index − depression − Generalized Anxiety Disorder + calmness + sleep. Physical health: − self-reported health fair/poor − asthma attack past year − obesity − hypertension − trouble carrying/climbing. The index for all outcomes includes the 15 measures in the self-sufficiency, physical health, and mental health indices. Psychological distress consists of 6 items (sadness, nervousness, restless, hopelessness, feeling that everything is an effort, worthlessness) scaled on a score from 0 (no distress) to 24 (highest distress). Body mass index (BMI) is weight in kilograms divided by height in meters squared (BMI >= 40 indicates extreme obesity). Glycosylated hemoglobin (HbA1c) level is from a blood sample, and a level >= 6.5% indicates diabetes.

Source and Sample: The sample is all adults who were interviewed as part of the long-term survey. Sample sizes in the Experimental, Section 8, and Control groups are 1,456, 678, and 1,139.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

TABLE 2 — MTO IMPACTS ON YOUTH OUTCOMES

	Experimental vs. Control	Section 8 vs. Control	Experimental vs. Control	Section 8 vs. Control
Panel A. Outcome Indices (z-scores)				
	Female Youth		Male Youth	
Index for all outcomes	0.079	0.077	-0.016	-0.116*
	(0.062)	(0.065)	(0.062)	(0.069)
Absence of physical health problems	0.109*	0.124*	-0.075	-0.058
	(0.061)	(0.065)	(0.068)	(0.078)
Absence of mental health problems	0.160***	0.039	0.008	-0.062
	(0.058)	(0.065)	(0.064)	(0.071)
Absence of risky behavior	-0.001	0.007	0.027	-0.069
	(0.065)	(0.066)	(0.061)	(0.067)
Education	-0.043	0.027	-0.006	-0.082
	(0.061)	(0.072)	(0.061)	(0.069)
Panel B. Selected education outcomes by age group (z-scores)				
	Under Age 6		Ages 6 and Over	
Combined math/reading assessment	-0.014	0.019	-0.018	0.043
	(0.055)	(0.056)	(0.061)	(0.072)

Notes: Estimates are the intent-to-treat effect sizes from an ordinary least squares regression of each outcome on treatment indicators and the baseline covariates listed in Appendix Table 1 (the analyses also control for a series of youth-specific covariates not listed in Appendix Table 1). Robust standard errors adjusted for household clustering are in parentheses. All measures are z-scores using the mean and standard deviation for the control group. Index components are as follows (positive outcomes (+) were included as is, while the signs for negative outcomes (–) were reversed so that higher index values indicate "better" outcomes): Physical health: – self-reported health fair/poor – asthma attack past year – overweight – non-sports injury past year. Mental health: – distress index – depression – Generalized Anxiety Disorder. Risky behavior: – marijuana past 30 days – smoking past 30 days – alcohol past 30 days – ever pregnant or gotten someone pregnant. Education: + graduated high school or still in school + in school or working + Early Childhood Longitudinal Study-Kindergarten cohort study (ECLS-K) reading score + ECLS-K math score. The index for all outcomes includes the 15 measures in the physical health, mental health, risky behavior, and education indices. Combined math/reading assessment scores are the average of the reading and math scores from ECLS-K assessments adapted for the MTO study.

Source and Sample: The sample in both panels is youth who were interviewed as part of the long-term survey. Panel A is youth ages 15-20 as of December 2007, and Panel B is youth ages 13-20 as of the same date (in analysis not shown, effects for youth ages 10-12 were similar to those for youth ages13-20). Sample sizes in the Experimental, Section 8, and Control groups are 1,437, 1,031, and 1,153.

*** Significant at the 1 percent level.

* Significant at the 10 percent level.