UC San Diego
UC San Diego Electronic Theses and Dissertations

Title
Mental Health Recovery in the Patient-Centered Medical Home

Permalink
https://escholarship.org/uc/item/5qj7q2bd

Author
Sklar, Marisa

Publication Date
2015

Peer reviewed|Thesis/dissertation

SAN DIEGO STATE UNIVERSITY/UNIVERSITY OF CALIFORNIA, SAN DIEGO

JOINT DOCTORAL PROGRAM IN CLINICAL PSYCHOLOGY

Mental Health Recovery in the Patient-Centered Medical Home

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor

of Philosophy

in

Clinical Psychology

by

Marisa Sklar

Committee in charge:

     University of California, San Diego

          Professor Erik Groessl, Chair
          Professor Gregory A. Aarons

     San Diego State University

          Professor Thereasa A. Cronan
          Professor Vanessa L. Malcarne
          Professor Scott C. Roesch

2015

The Dissertation of Marisa Sklar is approved, and it is acceptable in quality and form for

publication on microfilm and electronically:

_____

_____

_____

_____

_____
Chair

San Diego State University

University of California, San Diego

2015

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

EDUCATION

Undergraduate	B.A., University of California Santa Cruz, CA, 2006 Major: Psychology
Graduate	M.S., San Diego State University, San Diego, CA, 2010 Major: Applied Psychology: Program Evaluation Thesis: The influence of dissemination techniques on different evaluation stakeholders; Chair: Georg E. Matt
	Ph.D., San Diego State University/University of California San Diego, 2015 Major: Clinical Psychology Concentration: Behavioral Medicine Dissertation: Mental health recovery in the patient-centered medical home Chair: Erik J. Groessl
Internship	Brown University: Warren Alpert School of Medicine, Providence, RI APA Approved Predoctoral Internship in Clinical Psychology 2014-2015 Track: Behavioral Medicine Research Mentor: Justin Nash, PhD

GRANTS

Pending: NRSA Individual Postdoctoral Training Grant, F32-1F32HS024192-01
Agency for Healthcare Research and Quality (AHRQ)
Project Title: A Climate for Evidence-Based Practice Implementation in the Patient Centered Medical Home
Role: Principle Investigator
Sponsors: Charles Eaton, M.D., Gregory Aarons, Ph.D., Roberta Goldman, Ph.D., & Justin Nash, Ph.D.

2013-2015: NRSA Individual Predoctoral Training Grant, F31-MH100758-01A1
National Institute of Mental Health (NIMH)
Project Title: Mental Health Recovery in the Patient-Centered Medical Home
Role: Principal Investigator
Sponsors: Gregory A. Aarons, Ph.D., Erik J. Groessl, Ph.D., Scott Roesch, Ph.D., Larry Davidson, Ph.D., & Maria O'Connell, Ph.D.

ACADEMIC AND PROFESSIONAL HONORS

Spring 2015	Brown University, Warren Alpert School of Medicine Department of Psychiatry and Human Behavior Research Day 2nd Place Poster Award: $50.00
Fall 2014	Brown University, Warren Alpert School of Medicine, Department of Psychiatry and Human Behavior, Clinical Psychology Training Consortium Predoctoral Research Grant Award: $850.00
Summer 2011	Veterans Medical Research Foundation Summer Internship Award: $5,000.00
Fall 2010	Instructionally Related Activities Student Travel Award: $360.00
Fall 2010	UC San Diego Division of Research Affairs Graduate Student Travel Award: $400.00
Fall 2009	Instructionally Related Activities Student Travel Award: $250.00
Jan. 2005-June 2006	Psi Chi, National Honors Society in Psychology
Spring 2006	UC Santa Cruz, Student Employee Recognition Award Program: $400.00
Spring 2005	UC Santa Cruz, Student Employee Recognition Award Program: $200.00
Spring 2005	UC Santa Cruz, Undergraduate Honors Thesis Award: $300.00

PROFESSIONAL MEMBERSHIPS

2010—2011, 2013—present	Member, American Psychological Association
2010—2013, 2014—present	Member, Society of Behavioral Medicine
2007—2010	Member, American Evaluation Association
2007—2010	Member, Applied Psychology Student Association, San Diego State University
2007—2008	Member, American Public Health Association

CLINICAL EXPERIENCE

June 2014—June 2015   **Health Psychology/Behavioral Medicine, Brown University: The Warren Alpert School of Medicine— APA Accredited Internship, Providence, RI**
Rotations include the following: 1) The Miriam Hospital: Behavioral Medicine Rotation A (Chronic Illness and Sexual Health), within The Miriam Hospital's Behavioral Medicine Clinical Services, the Immunology Clinic, The Psychiatry Consultation/Liaison Service within the general medical inpatient and emergency services, and the Men's Health Clinic.; 2) The VA Medical Center: Behavioral Medicine Consultation Liaison Rotation, within the Mental Health and Behavioral Sciences (MHBSS) Service of the Providence VA Medical Center; 3) Butler Hospital: Alcohol and Drug Treatment Service Program within Butler Hospital's Day Hospital. **Supervisors: Lucy Rathier, Ph.D., Jeffrey Burock, M.D., Dwayne Heitmiller, M.D., Megan Pinkston, Ph.D., John Wincze, Ph.D., Alan Sirota, Ph.D., Robert Johnston, M.D., Tracy O'Leary Tevyaw,**

Ph.D.Ana Abrantes, Ph.D., Mary Ella Dubreuil, R.N., LCDP, & Andrea Kretzschmar, M.D.

July 2013—May 2014 **Mood Disorders Psychotherapy Program and the Behavioral Sleep Medicine Program (Mood-Sleep Clinic), La Jolla VA San Diego Health Care System, CA**
Responsibilities include: 1) conducting diagnostic intake assessments, providing orientation to clinic services, and developing initial treatment plans for Veterans new to the clinic; 2) facilitating weekly Dialectical Behavior Therapy skills group for Veterans diagnosed with mood disorders; 3) providing individual therapy (using traditional and third-wave Cognitive Behavioral Therapy; CBT) for mood disorders; 4) providing individual CBT for insomnia; 5) attending weekly Evidence Based Psychotherapy (EBP) Seminar; 5) participating in weekly multidisciplinary team meeting. **Supervisors: Sean Drummond, Ph.D. & Carla Nappi, Ph.D.**

January 2013—June 2013 **Smoking Cessation Clinic, La Jolla VA San Diego Health Care System, CA**
Responsibilities included: 1) leading/co-leading weekly smoking cessation group treatments for Veterans receiving inpatient treatment for substance use disorders in the Substance Abuse Residential Treatment Program (SARRTP) or outpatient Alcohol and Drug Treatment Program (ADTP), and for Veterans receiving treatment for psychiatric disorders in the VA mental health clinics [using CBT]; and 2) collaborating with pharmacists on medications (nicotine replacement therapy) to assist with patients' smoking cessation efforts. **Supervisor: Mark Myers, Ph.D.**

July 2012—June 2013 **General Behavioral Medicine, Mission Valley VA San Diego Health Care System CA**
Responsibilities included: 1) conducting organ pre-transplant evaluations; 2) performing behavioral medicine evaluations for diabetes, oncology, chronic pain, multiple sclerosis, irritable bowel syndrome, and other medical conditions to facilitate treatment planning; 3) co-leading group treatment for chronic pain, binge eating, and healthy women [using Acceptance and Commitment Therapy (ACT)]; 4) individual therapy (using ACT, CBT, Motivational Interviewing) for a variety of health-related difficulties (e.g. mood or anxiety disorders related to a medical condition; chronic pain; stress management) and for health behavior change and treatment compliance in the context of chronic illness (e.g. type 1 and type 2 diabetes, chronic lymphocytic leukemia); and 5) consultation with medical providers regarding patients with lifestyle and behavioral health concerns. **Supervisor: Niloofar Afari, Ph.D.**

March 2011—June 2012 **Community and Behavioral Medicine Clinic, SDSU/UCSD Joint Doctoral Program Clinic, CA**
Responsibilities included: 1) individual therapy (using CBT) with clients presenting with a variety of mental health needs (e.g., mood, anxiety, adjustment disorders, interpersonal difficulties). The clinic is operated by the Department of Psychology at SDSU and is designed to deliver specialized psychological services to members of the surrounding

community, and also serve as a training facility for the SDSU/UCSD Joint Doctoral Program in Clinical Psychology. **Supervisors: Brenda Johnson, Ph.D., Monica Ulibarri, Ph.D.; Clinic Director: Michael J. Taylor, Ph.D.**

April 2006—August 2006   **Ayudandos Niños en Centro America (ANECA—Helping Children in Central America), Puntarenas, Costa Rica**

Responsibilities included: 1) design psychosocial rehabilitation programs for children in Costa Rican orphanages; 2) leading/co-leading daily group-based behavioral interventions for children, adolescents, and program staff; 3) collaborating with Peace Corps and Patronato Nacional de la Infancia (PANI—National Children Board of Costa Rica); 4) Raising over $4000.00 for program support, materials, and student tuition. **Supervisor: Tony Hoffman, Ph.D.**

March 2006—June 2007   **7th Avenue Center, Mental Health Rehabilitation Center for 99 semi-acute residents, Santa Cruz, CA**

Responsibilities included: 1) leading/co-leading daily groups including stress management, anger management, creative expression, nature walk, music appreciation for transitional age youth, adults, and older adults with serious mental illness, substance use disorders, Veterans, and forensic clients; 2) provide non-violent crisis intervention; 3) monitor food intake and medication compliance and 4) document serious incidents including (e.g., suicide attempts, physical altercations). **Supervisor: Dr. Kathy Champlin, Ph.D.**

March 2005-August 2005   **Friends Outside Organization, Santa Cruz, CA**

Responsibilities included: 1) Weekly individual case management targeting pre-release planning for inmates in Santa Cruz County Jail.

RESEARCH EXPERIENCE

July 2013—present   **Graduate Student Researcher, Child and Adolescent Services Research Center**

Graduate research assistant contributing to a number of federally funded projects targeting dissemination and implementation of evidence based practices in child and adolescent mental health services. Responsibilities include: 1) contributing to grant writing; 2) authoring/co-authoring reports, presentations, and publications; 3) attend bi-monthly Implementation Science Seminars with local implementation science researchers to discuss grant opportunities and applications for studying implementation science in mental health services. **Supervisor: Dr. Gregory A. Aarons, Ph.D.**

July 2011—present   **Clinical Research Assistant, Veterans Medical Research Foundation (VMRF), VA San Diego Healthcare System, CA**

Graduate research assistant contributing to 2 federally funded projects examining the effectiveness of integrated care for Veterans with hepatitis C, and yoga interventions for Veterans with chronic low back pain. Responsibilities include: 1) designing research

methodology, including the selection of assessments, for evaluating intervention effectiveness; 2) designing and implementing treatment fidelity protocols; 3) recruiting participants; 4) abstracting data from VA Computerized Patient Records System; 5) managing and analyzing data using STATA and SPSS; and 5) authoring/co-authoring reports, presentations, and publications. **Supervisor: Erik J. Groessl, Ph.D.**

May 2008—present   **Project Coordinator/Evaluation Specialist, Health Services Research Center (HSRC), University of California, San Diego, CA**

Graduate student intern and full-time employee contributing to 3 evaluation projects as contracted with the Behavioral Health Division of the San Diego County Health and Human Services Agency (HHSA) (Prevention and Early Intervention (PEI), Recovery-Oriented Services Transformation, Adult and Older Adult Mental Health Services Evaluation). Responsibilities include: 1) designing, writing, and proposing evaluation strategy at multiple funding levels; 2) coordinating the development of the Health Outcomes Management System (HOMS), an online medical information system used to collect and report secure client, and program, level data; 3) designing and delivering training program to program staff to implement recovery-oriented outcome measures; 4) leading focus groups assessing implementation process; 5) managing and analyzing data using STATA and SPSS; 6) coding and analyzing qualitative data; 7) writing reports for HHSA directors and other important stakeholders; 8) training and supervising graduate and undergraduate interns, volunteers, and employees; 9) conducting expert interviews with HHSA representatives and medical providers; 10) developing instruments for screening and assessing outcomes of mental health issues; 11) authoring/co-authoring reports, presentations, and publications. **Supervisors: Erik J. Groessl, Ph.D. & Andrew Sarkin, Ph.D.**

August 2007—2010   **Research Assistant, Measurement and Evaluation Research Group (MERG), San Diego State University, CA**

Graduate research assistant contributing to 3 studies funded by the Tobacco-Related Disease Research Program examining the effectiveness of tobacco policy in creating second- and third-hand smoke-free environments (Smoking Policies and Tobacco Smoke Pollution (TSP) in Rental Cars, Behavioral Correlates of Nicotine Contamination in Used Cars, and Smoking Policies and Secondhand Smoke in Hotel Rooms) and 1 study evaluating the effects of the Youth Building Success (YBS) program which offered mental health services to at-risk youth in San Diego. Responsibilities included: 1) developing measures; 2) conducting semi-structured policy interviews; 3) managing and analyzing data using STATA and SPSS; 4) qualitative data analysis; 5) authoring/co-authoring reports, presentations and publications. **Supervisor: Georg E. Matt, Ph.D.**

Summer 2005—2006   **Research Assistant, Social Psychology Lab, University of California Santa Cruz, CA**

Undergraduate research assistant on a federally funded project aimed to reduce violence within dating and sexuality. Responsibilities included: 1) administering computer task, interview, and questionnaire to participants; 2) transcribing taped interviews; 3)

collaborating with colleagues at weekly meeting regarding experimental methodology and participant recruitment. **Supervisor: Eileen Zurbriggen, Ph.D.**

Jan. 2005—June 2005 **Research Assistant, Cognitive Psychology Lab, University of California Santa Cruz, CA**
Undergraduate research assistant on a federally funded project aimed to assess the relationship between visual perception and visually guided behavior. Responsibilities included: 1) guiding participants through visuospatial tasks 2) recording participant behavior; 3) reading and presenting research articles at weekly lab meetings. **Supervisor: Bruce Bridgeman, Ph.D.**

TEACHING EXPERIENCE
2012—2013   Design Analysis Research (Psy 770A/Psy 770B), San Diego State University, CA
2007—2009   Data Analysis in Psychology (Psy 270/Psy 271), San Diego State University, CA

UNIVERSITY SERVICE
2007—2010   Student Editor, Applied Psychology Student Association, San Diego State University, CA

AD-HOC REVIEWER
Evaluation and Program Planning

PROFESSIONAL PUBLICATIONS

ORIGINAL ARTICLES
1. **Sklar, M.**, Aarons, G. A., O'Connell, M., Davidson, L., Groessl, E. J. Mental health recovery in the patient-centered medical home. Accepted for publication in *American Journal of Public Health.* http://dx.doi.10.2105/AJPH.2015.302683.

2. Aarons, G. A., Ehrhart, M. G., Farahnak, L., **Sklar, M.** Discrepancy in leader and follower ratings of transformational leadership: Relationship to organizational culture. Under review for publication in *Administration and Policy in Mental Health*.

3. Groessl, E. J., **Sklar, M.**, Ganiats, T. G. Ho, S. Cost-effectiveness of the Hepatitis C Self-Management Program. Under review for publication in *Medical Care*.

4. Ho, S. B, Brau, N., Cheung, R. C., Liu, L. Sanchez, C., **Sklar, M.**, Phelps, T. E., Marcus, S. G., Wasil, M. M., Tisi, A. S., Huynh, L. K., Robinson, S. K., Gifford, A., Asch, S. M., Groessl, E. J. (in press). Integrated care increases treatment and improves outcomes of patients with chronic HCV infection and psychiatric illness or substance abuse. *Clinical Gastroenterology and Hepatology*. http://dx.doi.org/10.1016/j.cgh.2015.02.022.

5. Sarkin, A., Lale, R., **Sklar, M**. Center, K. C., Gilmer, T, Fowler, C., Heller, R., Ojeda, V. (2014). Stigma experienced by people using mental health services in San

Diego County. *Social Psychiatry and Psychiatric Epidemiology.* http://dx.doi.10.1007/s00127-014-0979-9.

6. Aarons, G. A., Ehrhart, M. G., Farahnak, L. R., **Sklar, M.** (2014). The role of leadership in creating a strategic climate for evidence-based practice implementation and sustainment in systems and organizations. *Frontiers in Public Health Services and Systems Research, 3*(4), Article 3. Available at: http://uknowledge.uky.edu/frontiersinphssr/vol3/iss4/3.

7. Sarkin, A., **Sklar, M.** (2014). Creating CHOIS: A recovery-oriented PROMIS-based measure for mental health screening and outcomes, *International Journal of Translation and Community Medicine, 2,* 401-405.

8. Aarons, G. A., Farahnak, L. R., Ehrhart, M. G., **Sklar, M.** (2014). The role of leadership and strategic climate in the implementation of evidence-based practices. *Annual Reviews of Public Health, 35*, 15.1-15.20. http://dx.doi.org/10.1146/annurev-publhealth-032013-182447

9. Gilmer, T.P., Stefancic, A., Katz, M., **Sklar, M.**, Ettner, S.L., Tsemberis, S. (2014). Fidelity to the Housing First Model and effectiveness of supported housing. *American Journal of Public Health, 65*(11), 1311-1317. http://dx.doi.org/10/1176/appi.ps.201300447

10. **Sklar, M.,** Groessl, E. J., Davidson, L., O'Connell, M., Aarons, G. (2013). Instruments for measuring mental health recovery: A systematic review. *Clinical Psychology Review, 33*(8), 1082-1095. http://dx.doi.org/10.1016/j.cpr.2013.08.002

11. Lale, R., **Sklar, M.,** Wooldridge, J. Sarkin, A. (2014). Gender congruence moderates beliefs about the causes of alcohol dependence and major depression. *International Journal of Mental Health and Addiction.* http://dx.doi.org/10.1007/s11469-013-9465-y

12. Lale, R., Sarkin, A., **Sklar, M**. (in press). Gender moderates social distancing stigma toward individuals with alcohol dependence versus depression. *Stigma Research and Action.*

13. Groessl, E. J., **Sklar, M.,** Cheung, R. C., Bräu, N., Ho, S. (2013). Increasing antiviral treatment through integrated Hepatitis C care: A randomized multicenter trial. *Contemporary Clinical Trials*, 35(2) 97-107. http://dx.doi.org/10.1016/j.cct.2013.05.002

14. Gilmer, T.P., Stefancic, A., **Sklar, M**. (2013). Development and validation of a housing first fidelity survey. *Psychiatric Services, 64*(9), 911-914. http://dx.doi.org/10.1176/appi.ps.201200500

15. Sarkin, A., Groessl, E., Mulligan, B., **Sklar, M**., Kaplan, R., Ganiats, T. (2013). Racial differences in self-rated health diminishing from 1972 to 2008. *Journal of Behavioral Medicine, 36*(1), 44-50. http://dx.doi.org/10.1007/s10865-011-9396-7

16. Groessl, E.J., Liu, L., **Sklar, M.**, Tally, S., Kaplan, R.M., Ganiats, T. (2012). Measuring the impact of cataract surgery on generic and vision-specific quality of

life. *Quality of Life Research, 22*(6), 1405-1414. http://dx.doi.org/10.1007/s11136-012-0270-z

17. **Sklar, M**., Sarkin, A., Gilmer, T., Groessl, E. (2012). The psychometric properties of the Illness Management and Recovery scale in a large American public mental health system. *Psychiatry Research, 199*(3), 220-227. http://dx.doi.org/10.1016/j.psychres.2012.03.013

18. Ho, S. B., **Sklar, M.**, Groessl, E. J. Integrated care protocols for management of patients with Hepatitis C in the VHA. *Managing Hepatitis C in the VA Health Care* System. A supplement of the Federal Practitioner, Accepted June 2011.

19. Carlson, J.A., Sarkin, A. J., Levack, A.E., **Sklar, M**., Tally, S.R., Gilmer, T.P., Groessl, E.J. (2010). Evaluating a Measure of Social Health derived from two Mental Health Recovery measures: The California Quality of Life (CA-QOL) and Mental Health Statistics Improvement Program Consumer Survey (MHSIP). *Community and Mental Health Journal*, 454-462.

20. Brewer, A. L., Romero, R. A., **Sklar, M**., Pham, V., Zakarian, J., Quintana, P. J., Chatfield, D., Matt, G. E. (2010). Residual tobacco smoke in used cars: Futile efforts and persistent pollutants. *Nicotine and Tobacco Research*, 1029-1036.

BOOK CHAPTERS
1. Nash, J., **Sklar, M**. Specific applications of behavior health in the medial home: Depression. In A. Maragakis, C. Snipes, & W. T. O'Donahue (Eds.), Integrated Primary and Behavioral Care: Role in Medical Homes and Chronic Disease Management. Springer.

2. Matt, G., **Sklar, M.** Generalizability theory. In J. D. Wright (Ed), International Encyclopedia of the Social and Behavioral Sciences (2nd ed.). Oxford: Elsevier.

3. Groessl, E. J., **Sklar, M.**, Chang, D. (2012) Yoga as a treatment for low back pain: A review of the literature. In A. A. Norasteh (Ed.), *Low Back Pain 2.* http://dx.doi.org/10.5772/35617

4. Matt, G. E., Brewer, A. L., **Sklar, M**. (2010) External Validity. In E. Baker, P. Peterson & B. McGaw (Eds.), International Encyclopedia of Education (3rd ed.). Oxford: Elsevier.

ORAL PRESENTATIONS
1. **Sklar, M.**, Groessl, E. J., Aarons, G. A. *Mental health recovery in the Patient-Centered Medical Home.* Paper under review for presentation at the 36th Annual Meeting and Scientific Sessions of the Society of Behavioral Medicine, San Antonio, TX; April 22-25, 2015.

2. Sarkin, A., **Sklar, M.**, Correa, A. *Mental Health Services Act Prevention and Early Intervention: Success stories in San Diego*. Panel presentation at the 14th Annual Meeting of the Minds Behavioral Health Conference and Resource Fair, San Diego, CA; November 10, 2011.

3. **Sklar, M.**, Sarkin, A., Choi, K. *Transforming a large mental health system with recovery-based assessment.* Paper presented at the 91st Annual Meeting of the Western Psychological Association, Los Angeles, CA; April 28-May 1, 2011.

4. **Sklar, M**., Matt, G. E. *The influence of dissemination techniques on different evaluation stakeholders.* Paper presented at the Annual Meeting of the American Evaluation Association, Orlando, FL; November 9-11, 2009.

5. Brewer, A. L**., Sklar, M**., Pham, V., Matt, G. E., Quintana, P. J. E., Zakarian, J., Romero, R. A., Aguilar, M. G., Chatfield, D. A., Hovell, M. F. *Residual tobacco smoke pollution and consistency of smoking policy implementation in rental cars.* Paper presented at the 137th Annual Meeting of the American Public Health Association, Philadelphia, PA; November 7-11, 2009.

6. Matt, G. E., Quintana, P. J. E., Brewer, A. L**.,** Romero, R. A., Zakarian, J. M., Aguilar, M. G., Chatfield, D. A., Hovell, M. F. *Smoking policies and secondhand smoke in rental cars*. Paper presented at the 136th Annual Meeting of the American Public Health Association, San Diego, CA; October 25-29, 2008.

7. Romero, R. A., Brewer, A. L**.**, **Sklar, M**., Quintana, P. J.E., Matt, G. E. *Correlates of nicotine contamination in cars.* Paper presented at the 136th Annual Meeting of the American Public Health Association, San Diego, CA; October 25-29, 2008.

POSTER PRESENTATIONS
1. Aarons, G. A., Ehrhart M. G., Farahnak L. R., **Sklar, M**. *Leader-follower discrepancy in transformational leadership ratings: Association with organizational culture*. Paper under review for presentation at the 30th Annual Conference of the Society for Industrial Organizational Psychology, Philadelphia, PN; April 23-25, 2015.

2. Groessl, E. J., **Sklar, M**., Laurent, D., Lorig, K., Ganiats, T., Ho, S. B. *Cost-effectiveness of the Hepatitis C Self-Management Program*. Paper accepted for presentation at the American Association for the Study of Liver Disease The Liver Meeting, Boston, MA; November 7-11, 2014.

3. Groessl, E. J., **Sklar, M.**, Ganiats, T. G., Ho, S. B. *Cost-effectiveness of the Hepatitis C Self-Management Program*. Paper accepted for presentation at the American Association for the Study of Liver Diseases, Boston, MA; November 7-11, 2014.

4. Sarkin, A., **Sklar, M.** *Creating CHOIS (Creating Healthy Outcomes Integrated Self-Assessment): A Recovery-Oriented PROMIS-Based Mental Health Screening and Outcomes Instrument*. Paper presented at the 34th Annual Meeting of the Society of Behavioral Medicine, San Francisco, CA; March 20-23, 2013.

5. Wooldridge, J., Lale, R., **Sklar, M.**, Lee, H., Nemlekar, P., Jan, A., Sarkin, A. *Gender Congruence Moderates Beliefs about the Causes of Alcohol Dependence and Major Depression*. Paper presented at the 34th Annual Meeting of the Society of Behavioral Medicine, San Francisco, CA: March 20-23, 2013.

6. Groessl, E. J., **Sklar, M**., Brau, N., Cheung, R., Sanchez, C., Campbell, C. *Primary Outcomes of a Multisite Randomized Trial of an Integrated Care Model for HCV Patients.* Paper presented at the 34th Annual Meeting of the Society of Behavioral Medicine, San Francisco, CA; March 20-23, 2013.

7. Ho, S. B, Groessl, E. J., Brau, N., Cheung, R. C., Weingart, K. R., Ward, M. A., **Sklar, M**., Phelps, T. E., Marcus, S. G., Wasil, M. M., Tisi, A. S., Huynh, L. K., Robinson, S. K. Multisite randomized trial of integrated care (IC) vs. usual care (UC) for improving access to antiviral therapy for high risk patients with chronic hepatitis C virus (HCV): initial results of treatment initiation and adverse events. Paper presented at the 63rd Annual Meeting of the American Association for the Study of Liver Disease, Boston, MA; November 9-13, 2012.

8. Ho, S. B, Groessl, E. J., Brau, N., Cheung, R. C., Weingart, K. R., Ward, M. A., Sklar, M., Phelps, T. E., Marcus, S. G., Wasil, M. M., Tisi, A. S., Huynh, L. K., Robinson, S. K. Prospective multisite randomized trial of integrated care vs. usual care for improving access to antiviral therapy for high risk patients with chronic HCV. *Journal of Hepatology*, 2012; 56:S386.

9. Groessl, E. J., Weingart, K. R., **Sklar, M.,** Johnson, N., Baxi, S. *The benefits of yoga for women veterans with chronic low back pain*. Paper presented at the 2012 International Research Congress Integrative Medicine and Health, Portland, OR; May 15-18, 2012.

10. Correa, A., Sarkin, A., **Sklar, M.**, Woodson, K., Gundrania, N. *Prevention of Behavioral Health Issues in Community-Based Alcohol and Drug Services Programs*. Paper presented at the 33rd Annual Meeting of the Society of Behavioral Medicine, New Orleans, LA; April 11-14, 2012.

11. Ho, S. B., Groessl, E. J., Brau, N., Cheung, R., Weingart, K., Ward, M., **Sklar, M.,** Phelps, T. E., Marcus, S. G., Wasil, M., Tisi, A. *Prospective multisite randomized trial of integrative care (IC) vs. usual care (UC) for improving access to antiviral therapy for high risk patients with chronic HCV*. Paper presented at the 47th Annual Meeting of the European Association for the Study of Liver, Barcelona, Spain; April 18-22, 2012.

12. Ho, S. B., Groessl, E. J, Weingart, K., Ward, M., **Sklar, M**., Robinson, S. K., Johnson, N., Phelps, T. E., Marcus, S. J., Cheung, R., Brau, N. Prospective multicenter evaluation of hepatitis C patients for psychiatric/substance use risk factors that reduce likelihood of antiviral treatment. *Hepatology,* 2011; 54:1194A-1195A.

13. **Sklar, M.,** Sarkin, A., Groessl, E. J. *Assessing the need for integrated physical and mental health services.* Paper presented at the 32nd Annual Meeting of the Society of Behavioral Medicine, Washington D.C.; April 27-30, 2011.

14. Lale, R., **Sklar, M.**, Weigert, D. S., Oyama, K., Robillos, E., Sarkin, A. *Gender differences in seeking help from the behavioral safety net.* Paper presented at the 13th

Annual Meeting of the Minds Behavioral Health Conference and Resource Fair, San Diego, CA; October 28, 2010.

15. Fowler, C., Thomas, D., **Sklar, M.**, Heller, R., Sarkin, A. *Mental illness stigma experienced by consumers in San Diego County.* Paper presented at the 13th Annual Meeting of the Minds Behavioral Health Conference and Resource Fair, San Diego, CA; October 28, 2010.

16. **Sklar, M**., Lewis, M., Sarkin, A. *Transforming a Large Public Mental Health System Using Recovery-Based Performance Outcome Measures*. Paper presented at the 62nd Annual Meeting of the Institute on Psychiatric Services, Boston MA; October 14-17, 2010.

17. **Sklar, M**., Matt, G. E. *The influence of dissemination techniques on different evaluation stakeholders.* Paper presented at the 118th Annual Meeting of the American Psychological Association, San Diego, CA; August 12-15, 2010.

18. **Sklar, M**., Sarkin, A., Lale, R., Matt, G. *The influence of research and evaluation findings: The effects of tailoring dissemination techniques.* Paper presented at the 31st Annual Meeting of the Society of Behavioral Medicine, Seattle, WA; April 7-10, 2010.

19. **Sklar, M**., Sarkin, A., Lale, R., Heller, R., Lewis, M., Gilmer, T., Milow, C., Tally, S., Groessl, E. *Agreement between clinician and client-reported mental health recovery outcomes: The effects of gender and ethnicity.* Paper presented at the 31st Annual Meeting of the Society of Behavioral Medicine, Seattle, WA; April 7-10, 2010.

20. Robillos, E., Sarkin, A., **Sklar, M**., Munoz, A., Lale, R., Leich, J., Thomas, D. *Reluctance to recommend seeking help for mental health issues: The effects of gender and ethnicity.* Paper presented at the 31st Annual Meeting of the Society of Behavioral Medicine, Seattle, WA; April 7-10, 2010.

21. Sarkin, A., Robillos, E., **Sklar, M**., Oyama, K., Nguyen, T., Truong, L., Liu, T., Cadang, A., Chen, R. *Mother's little helper: Gender differences in attitudes towards psychiatric medications*. Paper presented at the 31st Annual Meeting of the Society of Behavioral Medicine, Seattle, WA; April 7-10, 2010.

22. Sarkin, A., **Sklar, M**., Robillos, E., Leich, J., Munoz, A., Heller, R., Thomas, D. *Beliefs about the nature and causes of depression influence willingness to medicate.* Paper presented at the 31st Annual Meeting of the Society of Behavioral Medicine, Seattle, WA; April 7-10, 2010.

ABSTRACT OF THE DISSERTATION

Mental Health Recovery in the Patient-Centered Medical Home

by

Marisa Sklar

Doctor of Philosophy in Clinical Psychology

University of California San Diego, 2015

San Diego State University, 2015

Professor Erik J. Groessl, Chair

Background. The current United States (US) healthcare system focuses primarily on acute needs. As a result, the US ranks poorly in preventable mortality, and the incidence and prevalence of chronic conditions has increased. The "patient-centered medical home" (PCMH), a facility wherein patients' comprehensive healthcare needs may be met, is posited as an innovation for improving the healthcare system at lower costs. However, evidence regarding the effectiveness of the PCMH in improving health outcomes is limited. Additionally, a healthcare system that fails to address mental health will be incomplete and minimally effective. Consequently, an assessment of the effectiveness of the PCMH in improving the health, including mental health, of its patients is necessary. **Objectives.** This study examined the impact of transitioning clients from a Mental Health (MH) clinic to a patient-centered medical home (PCMH) on MH recovery. **Methods.** Data were drawn from a large US County Behavioral Health Services administrative data set. Propensity score analysis and multilevel modeling were used to assess the impact of the PCMH on MH recovery by comparing PCMH participants ($n =$

215) to clients receiving service as usual (SAU) (n = 22394). MH recovery is repeatedly assessed over time (days since baseline assessment range: 0-1,639, M = 186) by the Illness Management and Recovery (IMR) scale and the Recovery Markers Questionnaire (RMQ).

Results. For total IMR (LR χ^2 (1) = 4696.97, p < .0001) and IMR Factor 2 Management scores (LR χ^2 (1) = 7.9, p = .005), increases in MH recovery over time were greater for PCMH participants than SAU participants. Increases on all other measures over time were similar for PCMH and SAU participants.

Conclusions. Greater increases in MH recovery over time can be expected when patients with severe mental illness are provided treatment through the PCMH. Evaluative efforts should be taken to inform more wide-spread adoption of the PCMH.

Introduction

In 2004, California voters approved Proposition 63, the Mental Health Services Act (MHSA) to increase funding for the community mental health system and transform the mental health service delivery system to one that promotes prevention, early intervention, evidence-based practice, and recovery. San Diego County recently approved the use of these funds for the development and implementation of a physical health integration project (PHIP). This project will create a patient-centered medical home (PCMH) for persons with severe mental illness with the intention of enhancing participants' overall mental and physical health through a holistic and collaborative continuum of care across primary care and mental health. However, evidence regarding the effectiveness of the PCMH on improving patient health, including mental health, outcomes is sparse in the peer reviewed literature. The purpose of this project is to use a methodologically rigorous approach using advanced statistical techniques to assess the impact of the PCMH on participants' mental health outcomes. Specifically, this dissertation presents the literature to date on the history and clinical indicators of the PCMH, details a research strategy for its evaluation in a large public sector service system, and presents results regarding, the effectiveness of the PCMH in improving patient mental health outcomes. Last, implications regarding these results are presented.

Chapter 1. Background

1.1. History of the Patient-Centered Medical Home

In 2001, the Institute of Medicine (IOM) called for a commitment to improve the organization and delivery of health care in the United States (Committee on Quality of Health Care in America Institute of Medicine). This report discusses that, due to

1

advances in medical science and technology, Americans are living longer and an increase in the incidence and prevalence of chronic conditions has emerged, and despite these changes in the public's health care needs, much of today's health care system focuses primarily on acute needs. Additionally, a consensus exists among providers, payers, and policymakers that the current primary care system rewards quantity of services delivered at the expense of higher quality care (Bitton, Martin, and Landon, 2010). As a result, the United States is falling behind other countries in areas such as amenable mortality, identified as being the worst of sixteen industrial nations (Nolte and McKee, 2011), and ranks poorly on access and safety (Barr, 2008).

Following the IOM report, the patient-centered medical home (PCMH), a facility or group of facilities wherein patients' comprehensive healthcare needs may be met, has been discussed extensively as a delivery system innovation for facilitating health care delivery improvements (Barr, 2008, Bitton, Martin, and Landon, 2008, Bolin, Gamm, Vest et al., 2011, Davis, Schoenbaum, and Audet, 2005, DeGruy, and Etz, 2010). Although the American Academy of Pediatrics (AAP) introduced the medical home concept in 1967, the concept was recently expanded in a 2002 policy statement to address some of the guidelines proposed in the 2001 IOM report. In 2007, the AAP, along with the American Academy of Family Physicians (AAFP), the American College of Physicians (ACP) and the American Osteopathic Association (AOA), jointly approved principles of the PCMH (Robert Graham Center, 2007). Among others, these PCMH principles include an emphasis on ongoing patient relationships with a personal physician, provision of comprehensive care by addressing all of the patient's health care needs (including mental health), and improving access to care and communication

between patients and providers. See Table 1 for the additional joint principles of the PCMH. There are now efforts to broadly expand the PCMH approach in the United States and Canada (Crabtree, Nutting, Miller, et al., 2010, Rosser, Colwill, Kasperski, et al., 2011).

1.2. Characteristics of the Patient-Centered Medical Home

With the increased interest in the PCMH model and its potential to improve the quality of health care in the United States, attention is now turning to the characteristics of PCMH demonstration projects and the incorporation of mental healthcare. A nationwide survey of PCMH demonstration projects including over 14,000 physicians caring for approximately 5 million patients identified key elements regarding their structure, payment models, and transformation processes (Bitton, Martin, and Landon, 2010). The results from these demonstration projects suggested two models for helping transform practices. The first was an implementation of a chronic care model by quality improvement coaching and collaborative learning. The second was a model featuring external transformation consultants.

Because the problems afflicting patients in the primary care setting are typically chronic, the implementation of a chronic care model has several advantages (Wagner, Austin, and Von Korff, 1996). However, the PCMH is not simply a tool for disease management (DeGruy and Etz, 2010). Instead it is the "coordination and integration of the different care strategies for a person's unique combination of chronic and acute diseases, health beliefs, resources, prevention needs, and complicating factors" (p. 300). These authors argue that without the incorporation of the full psychosocial dimension of health and healthcare, the PCMH will be incomplete and less effective. Research has

supported the hypothesis that the addition of mental health care to primary care systems

can improve access to and quality of health care (Rost, Pyne, Dickinson, & Losasso,

2005; Smith, Williams, Owen, Rubenstein, & Chaney, 2008; Wang, Simon, & Kessler,

2008; Watts, Shriner, Pomerantz, Stender, & Weeks, 2007). The inclusion of mental

health treatments and mental health providers in medical homes can be accomplished by

either providing these services on site for fully integrated care, or enhancing these

services with careful coordination of care with mental health professionals at separate

sites (Dickinson & Miller, 2010).

The abovementioned nationwide survey and additional research on the PCMH

have facilitated a greater understanding of the characteristics of the PCMH particularly

regarding structure- and process-related clinical indicators (Mainz, 2003). Little evidence

is available regarding outcome-related clinical indicators associated with the PCMH.

1.2.1. Structure-related clinical indicators of the PCMH.

Structure-related clinical indicators refer to attributes of the setting in which care

occurs that affects the system's ability to meet the health care needs of individual patients

or a community (Mainz, 2003). With regard to structure-related clinical indicators,

research on the PCMH has focused on characteristics of staff/health care teams,

characteristics of patients, patients and staff access to services/information, program

evaluation/improvement, and fees/payments.

Several peer-reviewed papers on the PCMH included an assessment of

characteristics of staff and health care providers comprising the PCMH health care teams

(Bitton, Martin, and Landon, 2010, Goldberg and Kuzel, 2009, Marshall, Doperak,

Milner, et al., 2011, Pomerantz, Shiner, Watts, et al., 2010, Reid, Coleman, Johnson, et

al., 2010). The Bitton, Martin, and Landon (2010) survey of PCMH demonstration projects reported the number of physicians per PCMH practice range from one to 400. The types of providers included family physicians and physician assistants, nurse practitioners and other registered nurses, clinical pharmacists, psychiatrists, therapists, and medical technicians

Other papers on the PCMH provided information regarding the characteristics of the patients receiving care in a PCMH (Goldberg and Kuzel, 2009, McCarter, Jones, and Rager, 2011, Reid, Coleman, Johnson, et al., 2010, Roby, Pourat, Pirritano, et al., 2010). McCarter, Jones, and Rager (2011) used data from the 2007 National Survey of Children's Health to identify characteristics of youth served in a PCMH. Their results indicated adolescents, youth of color, those with family income levels between 0-99% of the FPL, and those currently uninsured are least likely to receive services from medical home.

Although the PCMH can treat all age groups (Goldberg and Kuzel, 2009), other studies appeared to indicate that adults patients receiving care from a PCMH are typically 55-64 years old (Roby, Pourat, Pirritano, et al., 2010) or older than non-PCMH controls (Reid, Coleman, Johnson, et al., 2010). More patients tended to be female within the PCMH (Reid, Coleman, Johnson et al., 2010, Roby, Pourat, Pirritano, et al., 2010), and contrasting the characteristics of youth with a PCMH, had household income levels less than 100% of the FPL (Roby, Pourat, Pirritano, et al., 2010). The percentage of PCMH patients within disease related diagnostic groups was reported as follows: diabetes (28%), asthma (4%), congestive heart failure (5%), hypertension (78%), mental illness (14%) and musculoskeletal conditions (54%) (Roby, Pourat, Pirritano, et al., 2010).

There was a general consensus that the implementation of the PCMH was intended to improve patient accesses to services, and research on the PCMH has also provided information regarding how this is to be achieved (Goldberg and Kuzel, 2009,Marshall, Doperak, Milner, et al., 2011, Reid, Coleman, Johnson, et al., 2010, Rich, Lison, Libersky, et al., 2012). For papers reporting an attempt to improve patient access to services, methods for improving patient access included providing alternative scheduling options through the inclusion of an evening and weekend schedule, rapid access techniques for patients to obtain care on short notice, community linkages, the provision of linguistic services (Goldberg and Kuzel, 2009) and through the presence of access to an Electronic Medical Record (EMR) (Goldberg and Kuzel, 2009, Coleman, Johnson, et al., 2010). Other papers reported an increased staff-to-patient ratio, 24-7 call lines, increased visit times (Coleman, Johnson, et al., 2010, Rich, Lison, Libersky, et al., 2012), or increasing the total number of available appointments per week (Marshall, Doperak, Milner, et al., 2011). Interestingly, several papers failed to demonstrate an improvement in access to services/information within the PCMH. Coleman, Johnson, et al. (2010) reported the number of visits per patient being fewer at the PCMH.

Several papers investigating the PCMH reported structure-related indicators regarding fees and payment arrangements (Bitton, Martin, and Landon, 2010, Bolin, Gamm, Vest, et al., 2011, Reid, Coleman, Johnson, et al., 2010, Rich, Lison, Libersky, et al., 2012, Roby, Pourat, Pirritano, et al., 2010). Bitton, Martin, and Landon (2010) reported the majority of PCMH demonstration pilots included standard fee-for-service (FFS) payments that were supplemented by per person per month (PPPM) payments for eligible patients ranging from $0.50 to $9.00, yielding a range from $720 to $91,146 per

physician. They reported a few exceptions wherein programs used a risk adjusted fixed payment model or an enhanced fee schedule. Other papers indicated PCMH programs not designated as demonstration pilots also utilized productivity-based payments (Reid, Coleman, Johnson, et al., 2010, Roby, Pourat, Pirritano, et al., 2010). A majority of PCMH demonstration pilots reported using additional bonus payments as well, with most consisting of pay for performance bonus systems. More than 40% of PCMH demonstration pilots, and other PCMH programs not designated as demonstration pilots, included additional payments outside of fixed monthly payment arrangements, such as payments for embedded nurse care managers, licensed practical nurses, care coordination, quality improvement, and for support of population-based health management (Bitton, Martin, and Landon, 2010, Rich, Lison, Libersky, et al., 2012, Roby, Pourat, Pirritano, et al., 2010). Other papers indicated practices were paid for time spent on activities (Rich, Lison, Libersky, et al., 2012) and reported incentives for targeting the following five conditions: myocardial infarction, heart failure pneumonia, surgeries associated with complications, hospital-acquired or associated infections (Bolin, Gamm, Vest, et al., 2011).

Although there were similarities between the papers with regard to structure related clinical indicators, there was variability within the assessment of each clinical indicator. For example, many of the papers reported the use of an EMR, as well as the presence of a health care team. This is expected given the seven core principles of the PCMH specify the use of a personal physician leading a team of individuals at the practice level who collectively take responsibility for the care of patients, as well as coordinated care as facilitated by information technology. There is, however, room for

variability within each of these seven core principles. For example, the staff comprising the health care team differed between papers, as did methods for increasing access to care. Interestingly, evaluation of program services and an emphasis on quality and safety is one of the seven core principles of the PCMH and a requirement for inclusion as a nationwide PCMH demonstration project. However, nearly 60% of PCMH demonstration projects had not yet developed an evaluation plan (Bitton, Martin, and Landon, 2010).

1.2.2. Process-related clinical indicators of the PCMH.

Process-related clinical indicators refer to what is actually being done in the giving and receiving of care (Mainz, 2003). A review of the literature on the PCMH elucidated several domains within which the majority of process-related clinical indicators were reported. These include screening and preventive care processes, patient-guided health management, and improved utilization and continuity of services.

Many peer-reviewed papers reporting process-related clinical indicators describe the assessment of screening and preventive care within the PCMH (Beal, Hernandez, and Daly, 2009, DeVries, Li Sridhar, et al., 2012, Ferrante, Balasubramania, Hudson, et al., 2010, Harbrecht, 2012, Ortolon, 2011, Reid, Coleman, Johnson et al., 2010, Salberg, Asche, Fontaine, et al., 2011). These papers reported targeted screening processes with regard to coronary heart disease, including screening for cardiovascular disease (Harbrecht, 2012), cholesterol screening in past two years (Beal, Hernandez, and Daly, 2009), blood pressure check in past two years (Beal, Hernandez, and Daly, 2009), lipid testing within five years (Ferrante, Balasubramania, Hudson, et al., 2010, Salberg, Asche, Fontaine, et al., 2011). One paper noted higher rates of testing within cardiovascular disease patients in the PCMH compared to non-PCMH practices (DeVries, Li Sridhar, et

al., 2012). Targeted screening processes were also reported with regard to diabetes (Harbrecht, 2012, Solberg, Asche, Fontaine, et al., 2011), breast and/or cervical cancer (Beal, Hernandez, and Doty, 2009, Ferrante, Balasubramanian, Hudson, et al., 2010, Harbrecht, 2012, Solberg, Asche, Fontaine, et al., 2011), colorectal and/or prostate cancer (Beal, Hernandez, and Doty, 2009, Ferrante, Balasubramanian, Hudson, et al., 2010, Harbrecht, 2012, Solberg, Asche, Fontaine, et al., 2011), sexually transmitted diseases (Ferrante, Balasubramanian, Hudson, et al., 2010, Solberg, Asche, Fontaine, et al., 2011), depression (Harbrecht, 2012), tobacco use (Harbrecht, 2012), and influenza vaccinations (Ferrante, Balasubramanian, Hudson, et al., 2010). Similar to the screenings for coronary heart disease, the guidelines for when each of these screenings should occur varied between PCMH practices.

Other process-related clinical indicators regarding preventive care were reported such as outreach and follow-up for patients (Ferrante, Balasubramanian, Hudson, et al., 2010, Ortolon, 2011, Reid, Coleman, Johnson, et al., 2010, Rich, Lison, Libersky, et al., 2012). These papers indicated PCMH practices were providing patients with outreach and follow-up for all discharges, emergency or urgent care visits, medication monitoring, and abnormal test results. These papers also indicated PCMH practices were implementing processes to review quality-deficiency reports for unmet care needs. Some of these papers also demonstrated a greater likelihood of receiving preventive services, especially with regard to chronic disease, when receiving services in a PCMH vs. non-PCMH control.

Process-related clinical indicators regarding utilization and continuity of services were reported in several papers (Ferrante, Balasubramanian, Hudson, et al., 2010,

Goldberg and Kuzel, 2009, Harbrecht, 2012, Marshall, Doperak, Milner, et al., 2011, Reid, Coleman, Johnson, et al., 2010, Rich, Lison, Libersky, et al., 2012). To facilitate patient guided health management and continuity, some papers reported the presence, and patient access to EMR. Through this EMR, patients were provided with after visit summaries, secure email to contact their providers, and health maintenance reminders (Reid, Coleman, Johnson, et al., 2010). Other papers reported continuity of services through team-based care, care coordination, primary care continuity, utilization of health information systems, and through the guidance of evidence-based standards and care (Harbrecht, 2012, Marshall, Doperak, Milner, et al., 2010). Some papers reported improved utilization in the PCMH, as evidenced through receipt of behavioral counseling within one year (Ferrante, Balasubramanian, Hudson, et al., 2010), through 80% more secure message threads, 5% more telephone encounters, more specialty care use (Reid, Coleman, Johnson, et al., 2010), and through targeted care for high-need or high-cost users (Rich, Lison, Libersky, et al., 2012).

A majority of papers reporting process related clinical indicators targeted screening and preventive care. Screening and preventive care focused primarily on chronic conditions such as coronary heart disease, diabetes, breast and/or cervical cancer, and colorectal and/or prostate cancer. Interestingly, the targeted frequency with which these screenings should occur differed between papers. For example, one paper reported targeted cholesterol and lipid screenings within 2 years (Beal, Hernandez, and Doty, 2009), while other papers reported cholesterol and lipid screening targets within 5 years (Harbrecht, 2012, Solberg, Asche, Fontaine, et al., 2011). It should be noted that patient characteristics were likely to differ between these records, with the Beal, Hernandez, and

Doty (2009) paper reporting on Latino access to the PCMH, perhaps leading to different screening targets for cholesterol and lipid tests. Different processes were also evident when screening for colorectal cancer, with some papers reporting targeted colonoscopies within 10 years, yearly fecal occult blood tests, and sigmoidoscopies or double contrast barium enemas within five years.

1.2.3. Outcome-related clinical indicators of the PCMH.

Outcome-related clinical indicators refer to states of health or events that follow care and that may be affected by the care provided. A review of the literature identified several domains within which the majority of outcome-related clinical indicators were reported. These include targeted and improved outcomes regarding cardiovascular disease and diabetes, health behaviors with regard to pharmaceutical use and tobacco cessation, hospital and emergency room admission and readmission. Only one study reported the use of assessments to measure mental health outcomes (O'Toole, Pirroglia, Dosa, et al., 2011).

Targeted and improved outcomes often focused on cardiovascular disease and diabetes (DeVries, Li, Sridhar, et al., 2012, Harbrecht, 2012, O'Toole, Pirroglia, Dosa, et al., 2011, Solberg, Asche, Fontaine, et al., 2011), determined through reduction in lipids (low-density lipoprotein, LDL, cholesterol management defined as <100 mg/dl), blood pressure levels (management defined as <130/80) for patients with cardiovascular disease (Harbrecht, 2012, Solberg, Asche, Fontaine, et al., 2011), HbA1c for patients with diabetes, with poor control defined as >9% (Harbrecht, 2012) or >7% (Solberg, Asche, Fontaine, et al., 2011). Several papers reported better outcomes related to LDL

cholesterol control and HbA1c in the PCMH (DeVries, Li, Sridhar, et al., 2012, O'Toole, Pirroglia, Dosa, et al., 2011).

Outcomes-related clinical indicators regarding patient health behaviors, particularly medication adherence and tobacco cessation, were also reported (DeVries, Li, Sridhar, et al., 2012, Harbrecht, 2012, Solberg, Asche, Fontaine, et al., 2011). These papers reported that, among pediatric patients, inappropriate antibiotic use for nonspecific or viral respiratory infections was lower in PCMH vs. non-PCMH controls (DeVries, Li, Sridhar, et al., 2012). They also reported greater use of generic pharmaceuticals (Harbrecht, 2012), and regular use of Aspirin for those 40+ yrs. old (Solberg, Asche, Fontaine, et al., 2011). These papers also reported tobacco cessation (Harbrecht, 2012) or documented nonsmoking status (Solberg, Asche, Fontaine, et al., 2011) as intended outcome related clinical indicators with regard to health behaviors.

Outcome-related clinical indicators regarding hospital and/or emergency room admissions and readmissions were also reported (Cooley, McAllister, Sherrieb, et al., 2009, DeVries, Li, Sridhar, et al., 2012, Harbrecht, 2012, Marshall, Doperak, Milner, et al., 2011, Ortolon, 2011, O'Toole, Pirroglia, Dosa, et al., 2011, Reid, Colemam, Johnson, et al., 2010, Roby, Pourat, Pirritano, et al., 2010). One paper reported using the number of claims for emergency room (ER) visits to assess ER admissions and readmissions (Roby, Pourat, Pirritano, et al., 2010). Several papers reported fewer hospitalizations for patients receiving care from a PCMH (Cooley,McAllister, Sherrieb, et al., 2009, Marshall, Doperak, Milner, et al., 2011, Ortolon, 2011, Patient-Centered Primary Care Collaborative, 2008), while others reported fewer ER visits (Harbrecht, 2012, Ortolon, 2011, Reid, Coleman, Johnson, 2010, Roby, Pourat, Pirritano, et al., 2010). One paper

reported significantly shorter lengths of stays in the hospital and ER, though the same study also reported a significantly greater number of hospitalization and ER use for patients receiving care from a PCMH (O'Toole, Pirroglia, Dosa, et al., 2011). Another paper reported PCMH adults and children had 12 and 23% lower odds of hospitalization, and 11 and 17% fewer ER services, respectively (DeVries, Li, Sridhar, et al., 2012).

In comparison to structure and process related clinical indicators of the PCMH, few studies reported outcome related indicators. Of the studies that included outcomes, a majority reported on patient satisfaction as opposed to patient health related outcomes. This makes sense given the PCMH's early stage of development, within which structure and process related clinical indicators—indicators that aid in the description of the PCMH—may be more heavily targeted. However, as the PCMH model of healthcare deliver is sustained over years, greater emphasis should be placed on outcome related clinical indicators.

1.3. Mental Health Outcomes in the Patient-Centered Medical Home

The vast majority of peer-reviewed papers on the PCMH focus their assessment and discussion on structure- and process-related clinical indicators—indicators that aid in the description of the PCMH. Evidence regarding the effectiveness of the PCMH on improving patient health, including mental health, outcomes is sparse in the peer reviewed literature. One study discussed above included outcome-related clinical indicators of the PCMH that focused on mental health (O'Toole, Pirroglia, Dosa, et al., 2011). However, outcomes in this study were limited to hospitalizations for severe mental illness. Research has supported the hypothesis that the addition of mental health care to primary care systems can improve access to and quality of health care (Dickinson, and

Miller, 2010, Rost, Pyne, Dickinson, et al., 2005, Smith, Williams, Owen, et al., 2008, Wang, Simon, and Kessler, 2008, Watts, Shiner, Pomerantz, et al., 2007). The inclusion of mental health treatments and mental health providers in medical homes can be accomplished by either providing these services on site for fully integrated care, or enhancing these services with careful coordination of care with mental health professionals at separate sites (Dickinson, and Miller, 2010). Research should now prioritize assessing the effectiveness of the PCMH on improving patient health and mental health outcomes.

1.4. San Diego County Patient-Centered Medical Home Model

In 2004, California voters approved Proposition 63, the Mental Health Services Act (MHSA) to increase funding for the community mental health system and transform the mental health service delivery system to one that promotes prevention, early intervention, evidence-based practice, and recovery. One of the five components of the MHSA is "Innovation." Innovative programs are intended to be novel, creative, and/or ingenious mental health practices that are designed to increase access to services to underserved groups and the mental health community, increase the quality of services, and promote interagency collaboration (State of California, 2011).

San Diego County recently approved five separate Innovation programs including the physical health integration project (PHIP). One aim of the PHIP was to create a PCMH for persons with severe mental illness, enhancing participants' overall mental and physical health through a holistic and collaborative continuum of care across primary care and mental health. Specifically, the PHIP's intent was to establish a collaborative relationship between a Federally Qualified Health Center primary care clinic and an

existing County-funded mental health clinic. To facilitate the coordination between primary care and mental health clinics, the PHIP contract had the following requirements: 1) the establishment of joint administrative and clinical functions and educational meetings, and an establishment of a cross-referral relationship and process between the primary care and mental health clinics that included an arrangement for information sharing, 2) at least one licensed behavioral health consultant must work in the primary care clinic and one registered nurse care coordinator must work in the mental health clinic, 3) a certified alcohol and drug counselor must also work across teams at both sites to assist with the integrated treatment of individuals with co-occurring disorders, and 4) providers from the primary care clinic must demonstrate an increase in knowledge of behavioral health, and providers from the mental health clinic were mandated to demonstrate an increase in knowledge of primary health care issues and health literacy, with the intention of better facilitating comprehensive care. This was also in keeping with the County's reorganization of mental health and substance abuse services under an overarching "Behavioral Health Services" organizational structure.

1.5. Recovery-Oriented Mental Health Services

In the early 2000s, San Diego County Mental Health (now Behavioral Health) Services began exploring methods for transforming to a recovery-oriented model of service delivery (County of San Diego, Health and Human Services Agency, January, 2011). The notion of mental health recovery emerged in the 1980s following deinstitutionalization (Cohen, Abraham, Burk, et al., 2012). Writings of clients, family members, and mental health professionals expressed a desire for more than just symptom relief. They expressed a need to treat the consequences of the illness, including troubles

at work, disability, and discrimination. The recovery vision is often described in the writings of consumers or clients. One commonly cited definition of recovery is that provided by Pat Deegan who wrote "recovery is rediscovering meaning and purpose after a series of catastrophic events which mental illness is. It is a process, a way of life, an attitude, and a way of approaching the day's challenges…The need is to meet the challenge of the disability and to reestablish a new and valued sense of integrity and purpose within and beyond the limits of the disability; the aspiration is to live, work, and love in a community in which one makes a significant contribution" (Deegan, 1988, p. 15).

One way San Diego Behavioral Health Services began this transformation to a recovery-oriented model of services delivery was through the selection and implementation of recovery-based outcome assessments across its mental health treatment programs. A committee of representatives from the County Behavioral Health Division, treatment program staff, university researchers and consumers conducted a thorough evaluation of previous research, professional reviews of measures, pilot tests, and focus groups to facilitate the selection of recovery-based assessments. Following the selection and system wide implementation of these recovery-based assessments, an increase in the recovery-orientation of San Diego County Behavioral Health Services was found (Sklar, Sarkin, & Choi, 2011). Additionally, clients have demonstrated statistically significant clinician-reported and self-reported improvements towards mental health recovery over time while being treated in the mental health treatment programs (County of San Diego, Health and Human Services Agency, November, 2011, April, 2012a, April 2012b, August, 2011).

Although the San Diego County Behavioral Health Services intends to promote client recovery, the potential impact of the PCMH on participants' mental health recovery is unknown. Although San Diego County's establishment of the PCMH for persons with severe mental illness is intended to enhance participants' overall mental and physical health, it is unclear whether this PCMH model can facilitate mental health recovery. In December 2006, the University of California San Diego Health Services Research Center (HSRC) in the Department of Family and Preventive Medicine was contracted by the County of San Diego Health and Human Services Agency to provide data analysis and performance monitoring to Behavioral Health Services in support of their Quality Improvement unit. This contract includes tracking the San Diego County MHSA programs and services, including this PHIP. HSRC is contracted to provide descriptive reports on the PHIP to the Behavioral Health Services. Working in collaboration with HSRC, this research study adds an essential component to this contract. Specifically, this project takes a methodologically rigorous approach using advanced statistical techniques to assess the impact of the PCMH on participants' mental health recovery outcomes as compared to individuals receiving services as usual. An assessment of the impact of the PCMH on participant's mental health recovery will not only help to determine its effectiveness, but may guide decisions for subsequent program improvements.

Portions of this dissertation have been accepted for publication of the material as it may appear in the American Journal of Public Health, 2015. The dissertation author was the primary investigator and author of this paper. Drs. Gregory A. Aarons, Maria O'Connell, Larry Davidson and Erik J. Groessl served as co-authors of this paper.

Chapter 2. Methods

2.1. Study Location

The study took place in San Diego County. The county is approximately 4,207 square miles in land area, with ~736 persons per square mile. It is comprised of specific geographic regions, each with its own local history, demographic and cultural characteristics, climate and topography, encompassing urban, semi-urban, and rural areas. San Diego County is comprised of a diverse cultural mix of residents, including large Mexican-American and American Indian populations. The United States census bureau data indicates the San Diego County population is 47.6% non-Hispanic and/or non-Latino White, 32.7% Hispanic or Latino, 11.6% Asian, 5.6% Black or African American, 0.6% Native Hawaiian and Other Pacific Islander, and 4.2% two or more races. San Diego County is also home of many naval and military installations, including Marine Corps Base Camp Pendleton and Marine Corps Air Station Miramar.

Participants in the PCMH were assessed in either their primary care or mental health clinic. The County of San Diego has contracted the Family Health Centers of San Diego to participate in this PHIP as the Federally Qualified Health Center primary care clinic. The Family Health Centers of San Diego is a private nonprofit community clinic organization operating thirty locations throughout the County of San Diego (Family Health Centers of San Diego, 2007-2012). Three Family Health Centers of San Diego are participating in this PHIP: City Heights, Logan Heights, and North Park. The Community Research Foundation, a private non-profit community-based organization, is working in collaboration with the Family Health Centers of San Diego to participate in this PHIP and provide mental health services at their clinics. One Community Research Foundation

mental health clinic, the Areta Crowell Center, is participating in this PHIP. Other mental

health clinics are projected to collaborate as well. All agencies participating in the

proposed research study are participating under the County contract and providing

services and administrative data (including the measures for this study) as contracted.

2.2. Study Population

PCMH Participants. Because the PHIP's intervention is taking place at the

program level (i.e., each agency is contracted to provide either PCMH or services as

usual), all patients receiving care from the Family Health Centers and the Areta Crowell

Center are assigned to this proposal's PCMH condition. Because the County of San

Diego's Innovation projects are designed to increase access to care to underserved

groups, PCMH participants were projected to be a diverse group. Participants must be 18

years old and older from transitional aged youth (TAY; 18-24 years), adult, and older

adult (OA; 60+ years) populations. Participants must be indigent or eligible for Medi-Cal

(California's Medicaid program) funded services. Potential populations were projected to

include immigrants and refugees, Latino/Latina populations, Asian/Pacific Islander

populations, and lesbian, gay, bisexual, transgender, and questioning (LGBTQ)

population.

Projections of PCMH participant populations may be guided by considering the

patient populations of the programs from which PCMH patients are being transferred,

and to the programs to which they will be transferred. In fiscal year 2010/2011 the Areta

Crowell Center served a total of 723 unique clients and the Logan Heights Family Health

Center served a total of 160 unique clients (County of San Diego, Health and Human

Services Agency, April 2012c). Data from the 2010-2011 fiscal year suggests unique

clients from the Logan Heights Family Health Center are 56% female, 43% male, and 1% other/unknown gender, and 46% Hispanic, 40% White, 11% African American, 3% Asian/Pacific Islander, and 1% Native American (County of San Diego Health and Human Services Agency, 2012). Data from the 2010-2011 Fiscal year suggest unique clients from the Areta Crowell Center are 50% female and 50% male, 54% White, 20% Hispanic, 19% African American, 4% Asian/Pacific Islander, 2% Other, 1% Native American, and 1% Unknown (County of San Diego Health and Human Services Agency, 2012).

The County of San Diego has proposed its PCMH should reach a total of 600 participants by the end of the project's first year, with 150 participants referred to the PCMH from the primary care clinics and 150 participants referred to the PCMH from the mental health clinics within the projects first six months (County Agreement Number 536234). The sex/gender and racial/ethnic composition of the PCMH program participants were not expected to deviate significantly from that described above. As a result, the estimated racial/ethnic and gender composition of the full PCMH population is presented in Table 2. Despite the County's intention of serving 600 participants by the end of the project's first year, power analyses (described below) indicate a sample size of 393 PCMH participants at baseline for detecting the effect of the PCMH on mental health recovery over time as compared to SAU.

Participants referred to the PCMH from the mental health clinics must be deemed as "stable" based upon eligibility criteria (County Agreement Number 536234). Participants must have a Milestones of Recovery Scale (MORS) (Pilon & Ragins, 2007) score of 6 (Coping/rehabilitation), 7 (Early Recovery), or 8 (Advanced Recovery).

Program staff from the Areta Crowell Center assign MORS scores of 6 or greater if patients are not actively engaged in drug use, have not changed their medication or appointments in the last two weeks, have demonstrated compliance with prescribed medications, maintain a stable living environment, have not been hospitalized or incarcerated within the past year, and their symptom distress does not inhibit daily functioning (J. Leich, personal communication, May 13, 2013).

SAU Participants. To evaluate the effectiveness of the PCMH on participants' mental health recovery, a comparison sample was drawn from other San Diego County mental health clinics, wherein clients continue to receive mental health services as usual (SAU). Participants in this SAU comparison group were identified from the County of San Diego's medical information system and the HSRC's Health Outcomes Management System. As described in more detail below, propensity score analysis will be used to assemble a SAU comparison group that is similar to the PCMH participants with the exception being they do not receive treatment under the PCMH model.

2.3. Measures

As part of the PCMH program's administrative duties, all PCMH participants and their providers were asked to complete an assessment during their initial treatment appointment (baseline), and every 6-month follow up appointment. The measures included in this study were collected during these routine clinical/administrative assessments (described below). The scales assess self-reported and clinician-reported mental health recovery, participant demographic information (age, gender, sexual orientation, ethnicity, race, language preferences, marital status, and veteran status) and

participant treatment utilization (e.g., number of emergency room visits, number of inpatient hospitalizations).

All SAU participants and their providers are also asked to complete an assessment during clients' initial treatment appointment, and all treatment planning update appointments every 6-months that follow. SAU participants were assessed using the same self-reported and clinician-reported mental health recovery scales as the PCMH participants. For SAU participants, demographic information will be acquired through the County electronic medical record systems, Anasazi and the Health Outcomes Management System (the data in these systems parallels data noted above for PCMH clients). For this study, diagnoses of PCMH and SAU participants was obtained through as originally entered by their providers for reporting purposes. Participant diagnoses are determined and reported based upon the clinical judgment of their providers.

Illness Management and Recovery scale. The Illness Management and Recovery (IMR) client and clinician scales were developed by the Dartmouth Psychiatric Research Center (Mueser et al., 2004) to assess progress over time in other mental illness self-management treatment programs. The 15-item scales, generated by IMR practitioners and consumers with severe mental illness, demonstrate good convergent validity and internal consistency (Hasson-Ohayon et al., 2008; Salyers et al., 2007). Analyses assessing the psychometric properties of the IMR clinician scale within a sample of clients from San Diego County Adult Mental Health Services (n = 10,659) suggest moderately high estimates of internal consistency ($\alpha = .82$), and that the scale can be reduced into three interrelated factors, Recovery, Management, and Substance (Sklar, Sarkin, Groessl, & Gilmer, 2012). See Appendix A.

Recovery Markers Questionnaire. The Recovery Markers Questionnaire (RMQ) is a free-standing subscale of the Recovery Enhancing Environment measure (Ridgway & Press, 2004). The RMQ is a measure of self-reported recovery and consists of 24 items, measured on a five-point Likert-type response options that range from 1 'strongly agree' to 5 'strongly disagree.' Analyses assessing the psychometric properties of the RMQ within this same sample of clients from San Diego County Adult Mental Health Services suggest high estimates of internal consistency ($\alpha = .95$) and good construct validity (Sklar, Sarkin, Groessl, & Gilmer, 2012). See Appendix B.

2.4. Statistical Analyses

The analytic plan takes into account several concerns in regard to evaluating results of a quasi-experimental design in a manner that adds, rather than duplicates, work to be done under the existing contract with the HSRC. A primary concern in this quasi-experimental design is the potential non-equivalence between treatment (i.e., PCMH) and control (SAU) groups. Because the study uses convenience samples of PCMH and SAU clients, equating the groups is critical. The potential differing characteristics between groups at pre-treatment assessment, or unobserved, hidden variables (West et al, 2000, p. 68), can result in misleading inferences regarding post-treatment group differences. In this study, post-treatment group differences due to these hidden variables could mimic an effect of the PCMH services in its participants as compared to comparison group participants, or vice-versa. As a result, determinations regarding the causal impact of a particular treatment can be questionable with quasi-experimental methodologies. It is therefore crucial that rigorous statistical precautions are taken to prevent inaccurate inferences due to differences between groups. One approach to addressing this concern is

the use of propensity score analysis. The propensity score analysis and multilevel

modeling described below are conducted using Stata (StataCorp, 2011).

2.4.1. Propensity Score Analysis

This study utilizes propensity score analysis (Rosenbaum and Ruben, 1983), a

rigorous method for assessing causality in the absence of random assignment. Introduced

almost 30 years ago, propensity score analysis is gaining increased empirical support and

attention as a promising technique for behavioral research. The number of yearly

published applications of propensity score analyses has doubled from 15 in 2005 to 30 in

2009 (Pruzek, 2011). Additionally, the journal of Multivariate Behavioral Research

recently published a special issue on propensity score analyses with the intent of

broadening the awareness of the rigor and utility of propensity score analysis methods for

behavioral research (Pruzek, 2011).

In the absence of a randomized controlled trial, wherein covariates are accounted

for by the process of randomization, propensity score analysis provides a promising

mechanism by which one can assess causality while reducing confounding variables.

Although there are four methods of using estimated propensity scores to assess treatment

effects (stratification, matching, inverse probability of treatment weighting using the

propensity score, and covariate adjustment using the propensity score), all methods

attempt to balance covariates representing participant individual differences, reducing

and/or eliminating the effects of confounding variables. There are advantages and

disadvantages of each of the four methods. For a more detailed description of the four

methods and their advantages and disadvantages, readers are referred to Austin (2011),

Luellen et al. (2005), Rosenbaum and Rubin (1985) and West et al. (2000).

2.4.2. Multilevel Modeling

Multilevel modeling should be utilized in designs wherein observations are nested within a higher level unit (Gibbons, Hedeker, Elkin et al., 1993, Raudenbush and Bryk, 2002). An example of nested data is in designs wherein there are multiple observations for a given patient. In the present study, multilevel modeling was used to explore differences in growth trends in mental health recovery scores over time between PCMH and SAU participants. More specifically, the target model includes two levels such that repeated mental health recovery assessments (level one) are nested within individual patients (level two). Propensity scores were entered as a fixed, time-invariant covariate. A variable indicating days since baseline assessment was entered at the repeated assessment level, and the cross-level interaction between days since baseline assessment and treatment group condition was entered at the patient level. The model will be fitted using the expectation maximization algorithm until convergence, or until a specified number of iterations have been reached. At that point, maximization switches to a gradient-based method.

Consistent with Leckie (2013), first a two-level variance components model was specified and fit to patients' mental health recovery scores. This model included only an intercept, patient random effects, and a repeated assessment level residual error term. This model did not make any adjustments for explanatory variables (days since baseline, treatment group condition), but did include patient propensity score to serve as a fixed, time-invariant covariate. This model decomposes the total variance in mental health recovery scores into separate patient, and repeated assessment variance components. Following the two-level variance components models, the days since baseline

assessment, treatment group condition, and the treatment group condition by days interaction explanatory variables were introduced at the repeated level of the two-level model. The treatment group condition variable was then introduced as a random effect at the patient level. Afterward, a full multivariate model was assessed by including the treatment group condition by days cross level interaction effect at the patient level.

For each model, a variance partition coefficient (VPC) was obtained to indicate the proportion of variance in mental health recovery scores attributed to differences in each of the explanatory variables. Z-tests and corresponding p-values were assessed to determine the statistical significance of the fixed effect of the explanatory variables when including them in each of the models. Log-likelihood ratio (LR) test statistics, chi-square difference ($\Delta\chi^2$) test statistics, and comparative fit indices (CFI) were calculated to assess differences in overall model fit in comparison to the variance components model. Obtained LR and $\Delta\chi^2$ statistics were compared to critical test values at $\alpha = .05$ to assess statistically significant improvements in model fit. Obtained CFI values greater than 0.90 were indicative of descriptive improvements in model fit (Bentler, 1990). The LR test statistics were continued to be used along with change in Akaike information criterion (AIC) to assess statistical and descriptive differences in overall model fit with every iteration of including days since baseline assessment as an explanatory variable. Lower AIC values were indicative better fit (Burnham and Anderson, 2002).

Portions of this dissertation have been accepted for publication of the material as it may appear in the American Journal of Public Health, 2015. The dissertation author was the primary investigator and author of this paper. Drs. Gregory A. Aarons, Maria O'Connell, Larry Davidson and Erik J. Groessl served as co-authors of this paper.

Chapter 3. Results

3.1. PCMH Participant Demographics

Between the implementation of the PCMH in March of 2011 through December of 2013, the care of 215 individuals was transferred from the County mental health treatment programs to the PCMH across the FHC sites. Of these participants, 200 were identified in Anasazi allowing for the abstraction of demographic information. Of these 200 participants, 94 were female and 106 were male. The majority of PCMH participants (n = 96) were White, followed by Hispanic (n = 69), African American (n = 32), Asian/Pacific Islander (n = 1), and other race/ethnicity (n = 2). The majority of PCMH participants were diagnosed with major depressive disorder (n = 69), schizophrenia and/or schizoaffective disorder (n = 67), or a bipolar disorder (n = 53). The remaining PCMH participants were diagnosed with an anxiety disorder (n = 5), another psychotic disorder (n = 3) or another depressive disorder (n = 3). Most PCMH participants live independently (n = 165), though some are homeless (n = 17), live in a board and care (n = 10), or have another living arrangement (n = 8). A majority of PCMH participants completed a minimum of a high school education (n = 154). Of these participants, 35 completed less than 2 years of college, 11 earned an associate's degree, 18 completed more than 2 years of college, 24 earned a bachelor's degree, 1 completed some graduate school, 2 completed a master's degree, and 1 completed a doctoral degree. Most PCMH participants were unemployed (n = 155), 35 were employed for compensation and 6 were employed not for compensation/volunteer work. Approximately half (n = 94) of PCMH participants were uninsured at PCMH implementation, 96 were insured with Medi

Cal/Medicare only, and 10 were privately insured or insured with a combination of both Medi Cal/Medicare and private insurance.

Baseline mental health recovery information was available for 214 PCMH participants. Clinician reported mental health recovery was assessed with the IMR. Total IMR scores were 3.64 on average (sd. = .51) at baseline for PCMH participants. Factor 1 Recovery scores were 3.34 on average (sd. = .73). Factor 2 Management scores were 3.38 on average (sd. = .77). Factor 3 Substance scores were 4.77 on average (sd. = .77). Patient self-reported mental health recovery was assessed with the RMQ. Total RMQ scores were 3.58 on average (sd. = .73).

3.2. Propensity Scores

Propensity scores were created to facilitate the establishment of a comparison group of SAU patients similar to that of PCMH participants on a number of observed covariates. Specifically, this propensity score represents the probability of treatment assignment conditional on a number of observed baseline demographic and mental health recovery characteristics.

To create the propensity scores, demographic and mental health recovery characteristics from all patients receiving care from any of the San Diego County outpatient mental health treatment programs were pulled from the Anasazi and the Health Outcomes Management System. Univariate chi-square and independent samples t-tests were assessed to explore differences in baseline demographic and mental health recovery characteristics between PCMH and the full population SAU patients with mental health recovery data. Results from these analyses can be seen in Table 4.

PCMH and SAU patients differed significantly with regard to their racial/ethnic composition (χ^2 (5) = 37.55, p < .001), employment (χ^2 (2) = 19.09, p < .001), education (*t*(20122) = -1.98, p = .048), total IMR scores (*t*(22565) = -8.87, p < .001), IMR Factor 1 Recovery scores (*t*(22553) = -6.27, p < .001), IMR Factor 2 Management scores (*t*(22526) = -9.12, p < .001), IMR Factor 3 Substance scores (*t*(22118) = -2.76, p = .006) and total RMQ scores (*t*(2472) = -3.21, p = .001). PCMH and SAU patients did not differ significantly with regard to gender (χ^2 (1) = 1.27, p = .260), diagnosis (χ^2 (11) = 14.57, p = .203), living arrangement (χ^2 (6) = 11.97, p = .063), or insurance (χ^2 (2) = 1.65, p = .437).

Rosenbaum and Rubin (1983) describe an iterative approach to specifying a propensity score model. Using this approach, an initial propensity score model was specified such that the probability of having been transferred into the PCMH condition was predicted using the abovementioned baseline demographic and mental health recovery characteristics. After which, the comparability of PCMH and SAU patients was assessed. Categorical predictor variables with more than two values were naturally coded upon entry into the propensity score model. If important residual systematic differences between treatment group conditions remained, the initial propensity score model was modified. This process was repeated in an iterative fashion until systematic differences in observed baseline covariates between PCMH and SAU were either eliminated or reduced to an acceptable level such that the distribution of observed baseline covariates was similar between PCMH and SAU patients in each of several strata.

Using this approach, the final model regressed the probability of having been transferred into the PCMH treatment condition on race/ethnicity, living situation,

insurance status, education, total IMR scores at baseline, IMR Factor 1 Recovery scores at baseline, IMR Factor 2 Management scores at baseline, and IMR Factor 3 Substance score at baseline. Using the common support option such that individuals with resulting propensity scores that are not shared between PCMH and SAU conditions are excluded, six strata were created such that the mean propensity score within each stratum was similar between PCMH and SAU participants. See Table 5 and Figure 1 for more information regarding the resulting propensity scores for PCMH and SAU participants.

3.3. Multilevel Modeling

Multilevel modeling was used to explore differences in growth trends in mental health recovery scores over time between PCMH and SAU participants for the clinician reported mental health recovery measures and the client self-reported mental health recovery measures with the abovementioned propensity scores entered as a fixed, time-invariant covariate. Variables indicating treatment group condition, days since baseline assessment, and the cross level interaction between days since baseline assessment and treatment group condition were entered as random, time-varying covariates.

3.3.1. Clinician Reported Mental Health Recovery

Model 1. Separate two-level variance components models including only an intercept, patient identifier, a repeated assessment level residual error term, and the patient propensity scores was assessed first for total IMR scores, IMR Factor 1 Recovery scores, Factor 2 Management scores, and Factor 3 Substance scores.

This variance components model indicated a mean total IMR score of 2.7887 with std. error of .0052. Between patient variance in total IMR scores was $\hat{\sigma}^2 = 0.2468$. The estimated within-patient-between repeated assessment variance in total IMR scores was

$\hat{\sigma}^2 = 0.5788$. The patient level VPC for total IMR is calculated as $(.2468)/((.2468) + (.5788)) = 0.2989$. The within-patient-between repeated assessment level VPC for total IMR is calculated as $(.5788)/((.2468) + (.5788)) = 0.7011$. As such, ~30% of the variation in total IMR scores lies between participants, and ~70% lies within patients between assessments. The likelihood ratio (LR) test comparing this model to a single-level model without patient level effects indicated a two-level model offers a significantly better fit to the data than the single-level model ($\chi^2 (1) = 1014.45$, p < .0001).

This variance components model indicated mean IMR Factor 1 Recovery score of 2.5070 with std. error of .0065. Between patient variance in IMR Factor 1 Recovery scores was $\hat{\sigma}^2 = 0.4284$. The estimated within-patient-between repeated assessment variance in IMR Factor 1 Recovery scores was $\hat{\sigma}^2 = 0.6112$. The patient level VPC for IMR Factor 1 Recovery is calculated 0.4121. The within-patient-between repeated assessment level VPC for IMR Factor 1 Recovery is calculated as 0.5879. As such, ~41% of the variation in IMR Factor 1 Recovery scores lies between participants, and ~59% lies within patients between assessments. The likelihood ratio (LR) test comparing this model to a single-level model without participant and treatment group condition effects indicated a two-level model offers a significantly better fit to the data than the single-level model ($\chi^2 (1) = 2381.49$, p < .0001).

This variance components model indicated a mean IMR Factor 2 Management score of 2.0139 with a std. error of .0062. Between patient variance in IMR Factor 2 Management scores was $\hat{\sigma}^2 = 0.3443$. The estimated within-patient-between repeated assessment variance in IMR Factor 2 Management scores was $\hat{\sigma}^2 = 0.6381$. The patient level VPC for IMR Factor 2 Management is calculated as 0.3505. The within-patient-

between repeated assessment level VPC for IMR Factor 2 Management is calculated as

0.6495. As such, ~35% of the variation in IMR Factor 2 Management scores lies between

participants, and ~65% lies within patients between assessments. The likelihood ratio

(LR) test comparing this model to a single-level model without participant and treatment

group condition effects indicated a two-level model offers a significantly better fit to the

data than the single-level model (χ^2 (1) = 1615.46, p < .0001).

This variance components model indicated a mean IMR Factor 3 Substance score

of 4.5497 with a std. error of .0082. Between patient variance in IMR Factor 3 Substance

scores was $\hat{\sigma}^2 = 0.5781$. The estimated within-patient-between repeated assessment

variance in IMR Factor 3 Substance scores was $\hat{\sigma}^2 = 0.7108$. The patient level VPC for

IMR Factor 3 Substance is calculated as 0.4485. The within-patient-between repeated

assessment level VPC for IMR Factor 3 Substance is calculated as 0.5515. As such,

~45% of the variation in IMR Factor 3 Substance scores lies between participants, and

~55% lies within patients between assessments. The likelihood ratio (LR) test comparing

this model to a single-level model without participant and treatment group condition

effects indicated a two-level model offers a significantly better fit to the data than the

single-level model (χ^2 (1) = 3007.28, p < .0001).

Model 2. Following the two-level variance components models, the days since

baseline assessment, treatment group condition, and the treatment group condition by

days interaction explanatory variables were introduced at the repeated assessment level.

The z-tests confirm that the fixed effect of days since baseline assessment improves the

fit of the model for total IMR scores ($z = 20.92$, p < .001), IMR Factor 1 Recovery scores

($z = 27.54$, p < .001), IMR Factor 2 Management scores ($z = 26.75$, p < .001), and IMR

Factor 3 Substance scores ($z = 2.66$, p = .008). Results suggest that within patients, as days since baseline assessment increase, total IMR and factor scores also increase. Results suggest the fixed effect of treatment group condition does not improve the fit of the model for total IMR scores ($z = 1.41$, p = .160), IMR Factor 1 Recovery scores ($z = -0.32$, p = .749), IMR Factor 2 Management scores ($z = 0.77$, p = .441), or for IMR Factor 3 Substances scores ($z = 0.73$, p = .467). The z-tests regarding the fixed effect of the treatment group condition by days since baseline assessment interaction varied between total IMR and factor scores. Specifically, results suggest the fixed effect of this interaction does improve the fit of the model for total IMR scores ($z = 4.79$, p < .001), IMR Factor 1 Recovery scores ($z = 1.99$, p = .046), and IMR Factor 2 Management scores ($z = 2.13$, p = .033), but does not improve the fit of the model for IMR Factor 3 Substances scores ($z = 0.43$, p = .667).

Including days since baseline assessment, treatment group condition, and their interaction at the repeated assessment level affects the variance parameters. For total IMR scores, VPC differed from Model 1 to Model 2 such that the patient level VPC increased from 0.2989 to 0.3007, and the within-patient-between repeated assessment level VPC decreased from 0.7011 to 0.6993. For IMR Factor1 Recovery scores, VPC differed from Model 1 to Model 2 such that the patient level VPC increased from 0.4121 to 0.4125, and the within-patient-between repeated assessment level VPC decreased from 0.5879 to 0.5875. For IMR Factor 2 Management scores, VPC differed from Model 1 to Model 2 such that the patient level VPC decreased from 0.3505 to 0.3497, and the within-patient-between repeated assessment level VPC increased from 0.6495 to 0.6503. For IMR Factor 3 Substance scores, VPC differed from Model 1 to Model 2 such that the patient

level VPC increased from 0.4485 to 0.4489, and the within-patient-between repeated

assessment level VPC decreased from 0.5515 to 0.5511.

Likelihood-ratio tests suggest a two-level model is still preferred to its single-

level counterpart, even after adjusting for days since baseline assessment, treatment

group condition and their interaction, for total IMR scores (χ^2 (1) = 1033.04, p < .0001),

IMR Factor 1 Recovery scores (χ^2 (1) = 2242.04, p < .0001), IMR Factor 2 Management

scores (χ^2 (1) = 1562.06, p < .0001), and IMR Factor 3 Substance scores (χ^2 (1) =

3008.63, p < .0001). Additionally, likelihood-ratio and chi-square difference tests

comparing Model 1 to Model 2 confirms that the addition of days since baseline

assessment, treatment group condition, and their interaction significantly improves the fit

of the model in comparison to the variance components models with regard to total IMR

(LR χ^2 (3) = 514.002, p < .0001; $\Delta\chi^2$ (3) = 7327.14 < .0001), IMR Factor 1 Recovery

scores (LR χ^2 (3) = 760.912, p < .0001; $\Delta\chi^2$ (3) = 5247.56.19, p < .0001), and IMR Factor

2 Management scores (LR χ^2 (3) = 730.202, p < .0001; $\Delta\chi^2$ (3) = 13254.00, p < .0001).

The resulting negative LR value assessing the effect of adding days since baseline

assessment with regard to the overall fit of the model for IMR Factor 3 Substance (LR χ^2

(3) = -31.728) is an indication that the log-likelihoods for Model 1 and/or Model 2 may

not be trustworthy. This is likely a result of many zero cells (Muthen, Mplus discussion,

November 12, 2008). However, the $\Delta\chi^2$ also confirms that the addition of days since

baseline assessment, treatment group condition, and their interaction, significantly

improves the fit of the model in comparison to the variance components model with

regard to IMR Factor 3 Substance ($\Delta\chi^2$ (3) = 208.33, p < .0001). These results indicate

between assessment heterogeneity in total IMR and factor scores is significantly

explained by days since baseline assessment, treatment group condition, and their
interaction.

Despite statistically significant improvements in model fit, results suggest the
addition of days since baseline assessment, treatment group condition, and their
interaction at the repeated assessments level did not fit well descriptively for total IMR
scores (CFI = 0.0694), IMR Factor 1 Recovery scores (CFI = 0.1336), IMR Factor 2
Management scores (CFI = 0.1027), or IMR Factor 3 Substance scores (CFI = .0211).
AIC values for total IMR scores, IMR Factor 1 Recovery scores, IMR Factor 2
Management scores, and IMR Factor 3 Substances scores were 10668.77, 7425.19,
18956.51, and 353.79 respectively.

Model 3. Next the effect of treatment group condition was introduced as a patient
level coefficient. Within this model, the z-tests again confirm that the fixed effect of days
since baseline assessment improves the fit of the model for total IMR scores ($z = 21.57$, p
< .001), IMR Factor 1 Recovery scores ($z = 27.60$, p < .001), IMR Factor 2 Management
scores ($z = 26.93$, p < .001), and IMR Factor 3 Substance scores ($z = 2.66$, p = .008).
Results suggest that within patients, as days since baseline assessment increase, total IMR
and factor scores also increase. Results suggest the fixed effect of treatment group
condition does not improve the fit of the model for total IMR scores ($z = -0.20$, p = .842),
IMR Factor 1 Recovery scores ($z = -0.59$, p = .558), IMR Factor 2 Management scores ($z
= 0.07$, p = .945), or for IMR Factor 3 Substances scores ($z = 0.73$, p = .467). The z-tests
regarding the fixed effect of the treatment group condition by days since baseline
assessment interaction varied between total IMR and factor scores. Specifically, results
suggest the fixed effect of this interaction does improve the fit of the model for total IMR

scores ($z = 6.97$, p < .001), IMR Factor 1 Recovery scores ($z = 2.44$, p = .015), and IMR Factor 2 Management scores ($z = 2.97$, p = .003), but does not improve the fit of the model for IMR Factor 3 Substances scores ($z = 0.43$, p = .667).

Including treatment group condition at the patient level affects the variance parameters. For total IMR scores, VPC differed from Model 2 to Model 3 such that the patient level VPC decreased from 0.3007 to 0.0911, and the within-patient-between repeated assessment level VPC increased from 0.6993 to 0.2958. The VPC indicating between patient variability in total IMR scores associated with treatment group condition was calculated as .6131. For IMR Factor1 Recovery scores, VPC differed from Model 2 to Model 3 such that the patient level VPC decreased from 0.4124 to 0.2954, and the within-patient-between repeated assessment level VPC decreased from 0.5875 to 0.4258. The VPC indicating between patient variability in Factor 1 Recovery scores associated with treatment group condition was calculated as .0.2788. For IMR Factor 2 Management scores, VPC differed from Model 2 to Model 3 such that the patient level VPC increased from 0.3389 to 0.3430, and the within-patient-between repeated assessment level VPC increased from 0.6503 to 0.6570. The VPC indicating between patient variability in Factor 2 Management scores associated with treatment group condition was calculated as 0.6288. For IMR Factor 3 Substance scores, VPC differed from Model 2 to Model 3 such that the patient level VPC and within-patient-between repeated assessment level VPC remained the same at 0.4489 and 0.5511 respectively. The VPC indicating between patient variability in Factor 3 Substance scores associated with days since baseline assessment was calculated as <0.0001.

Likelihood-ratio tests suggest a two-level model is still preferred to its single-level counterpart, even after adjusting for treatment group condition at the patient level, for total IMR scores (χ^2 (2) = 2589.69, p < .0001), IMR Factor 1 Recovery scores (χ^2 (2) = 2262.65, p < .0001), IMR Factor 2 Management scores (χ^2 (2) = 1676.75, p < .0001), and IMR Factor 3 Substance scores (χ^2 (2) = 3008.63, p < .0001). Additionally, likelihood-ratio tests comparing Model 2 to Model 3 confirms that the addition of treatment group condition at the patient level significantly improves the fit of the model with regard to total IMR (LR χ^2 (1) = 1556.656, p < .0001), IMR Factor 1 Recovery scores (LR χ^2 (1) = 20.612, p < .0001), and IMR Factor 2 Management scores (LR χ^2 (1) = 116.138, p < .0001). Likelihood-ratio tests indicate no change in model fit between Model 2 and Model 3 associated with the addition of treatment group condition at the patient level for IMR Factor 3 Substance scores.

AIC values for Model 3 associated with total IMR scores, IMR Factor 1 Recovery scores, and IMR Factor 2 Management, and IMR Factor 3 Substance scores demonstrated poorer overall model fit as values increased to 11491.73, 7440.01, 19039.31 and 359.79, respectively.

Model 4. Next the effects of the cross level interaction between treatment group condition and days since baseline assessment was introduced as a patient level coefficient. Within this model, the z-tests again confirm that the fixed effect of days since baseline assessment improves the fit of the model for total IMR scores ($z = 23.75$, p < .001), IMR Factor 1 Recovery scores ($z = 27.61$, p < .001), IMR Factor 2 Management scores ($z = 26.95$, p < .001), and IMR Factor 3 Substance scores ($z = 2.66$, p = .008). Results suggest that within patients, as days since baseline assessment increase, total IMR

and factor scores also increase. Results suggest the fixed effect of treatment group condition does not improve the fit of the model for total IMR scores (z = -1.44, p = .148), IMR Factor 1 Recovery scores (z = -0.71, p = .475), IMR Factor 2 Management scores (z = -0.17, p = .868), or for IMR Factor 3 Substances scores (z = 0.73, p = .467). The z-tests regarding the fixed effect of the treatment group condition by days since baseline assessment interaction varied between total IMR and factor scores. Specifically, results suggest the fixed effect of this interaction does improve the fit of the model for total IMR scores (β = .0010, z = 1.99, p = .047), IMR Factor 1 Recovery scores (z = 2.57, p = .010), and IMR Factor 2 Management scores (z = 3.12, p = .002), but does not improve the fit of the model for IMR Factor 3 Substances scores (z = 0.43, p = .667).

Including the cross level interaction between treatment group condition and days since baseline assessment at the patient level affects the variance parameters. For total IMR scores, VPC differed from Model 3 to Model 4 such that the patient level VPC increased from 0.0911to 0.1488, the between patient VPC variability associated with treatment group condition decreased from 0.6131 to 0.5194, and the within-patient-between repeated assessment level VPC increased from 0.2958 to 0.3276. The VPC indicating between treatment group condition variability in total IMR scores associated with the treatment group condition by days since baseline assessment interaction was calculated as 0.0042. For IMR Factor1 Recovery scores, VPC differed from Model 3 to Model 4 such that the patient level VPC increased from 0.2954 to 0.3008, the between patient VPC variability associated with treatment group condition decreased from 0.2788 to 0.2659, and the within-patient-between repeated assessment level VPC increased from 0.4258 to 0.4330. The VPC indicating between treatment group condition variability in

Factor 1 Recovery scores associated with the treatment group condition by days since baseline assessment interaction was calculated as 0.0002. For IMR Factor 2 Management scores, VPC differed from Model 3 to Model 4 such that the patient level VPC decreased from 0.3430 to 0.2132, the between patient VPC variability associated with treatment group condition increased from 0.6288 to 0.3793, and the within-patient-between repeated assessment level VPC decreased from 0.6570 to 0.4071. The VPC indicating between patient variability in Factor 2 Management scores associated with the treatment group condition and days since baseline assessment interaction was calculated as 0.0003. For IMR Factor 3 Substance scores, VPC remained the same from Model 3 to Model 4 such that the patient level VPC remained at 0.4489, the between patient VPC associated with treatment group condition remained at <0.0001, and the within-patient-between repeated assessment level VPC remained at 0.4681. The VPC indicating between treatment group condition variability in IMR Factor 3 Substance scores associated with days since baseline assessment was calculated as < 0.0001.

Likelihood-ratio tests suggest a two-level model is still preferred to its single-level counterpart, even after adjusting for the cross level interaction between treatment group condition and days since baseline assessment at the patient level, for total IMR scores (χ^2 (3) = 7286.66, p < .0001), IMR Factor 1 Recovery scores (χ^2 (3) = 2265.87, p < .0001), IMR Factor 2 Management scores (χ^2 (3) = 1686.10, p < .0001), and IMR Factor 3 Substance scores (χ^2 (3) = 3008.63, p < .0001). Additionally, likelihood-ratio tests comparing Model 3 to Model 4 indicate that the addition of the cross level interaction between treatment group condition and days since baseline assessment at the patient level significantly improves the fit of the model with regard to total IMR scores (LR χ^2 (1) =

4696.97, p < .0001), and IMR Factor 2 Management scores (LR χ^2 (1) = 7.9, p = .005), but does not improve the fit of the model with regard to IMR Factor 1 Recovery scores (LR χ^2 (1) = 3.22, p = .073), or IMR Factor 3 Substance scores (LR χ^2 (1) = 2.00, p = .158). See figures 2 and 3 for a graphical representation of the change in mental health recovery scores for total IMR and IMR Factor 2 Management scores over time by SAU and PCMH participants.

AIC values for Model 4 associated with total IMR scores, IMR Factor 1 Recovery scores, IMR Factor 2 Management, and IMR Factor 3 Substance scores demonstrated poorer overall model fit as values increased to 13019.77, 7425.97, 19029.36 and remained at 359.79, respectively.

3.3.2. Patient Self-Reported Mental Health Recovery

Model 1. A two-level variance components model including only an intercept, patient level effects, a repeated assessment level residual error term, and the patient propensity scores was assessed for total RMQ scores.

This variance components model indicated a mean total RMQ score of 3.4650 with std. error of .0161. Between patient variance in total RMQ scores was $\hat{\sigma}^2 = 0.5049$. The estimated within-patient-between repeated assessment variance in total RMQ scores was $\hat{\sigma}^2 = 0.4537$. The patient level VPC for total RMQ is calculated as 0.5267. The within-patient-between repeated assessment level VPC for total RMQ is calculated as 0.4733. As such, ~53% of the variation in total RMQ scores lies between patients and ~47% lies within patients between assessments. The likelihood ratio (LR) test comparing this model to a single-level model without patient effects indicated a two-level model

offers a significantly better fit to the data than the single-level model (χ^2 (1) = 1838.62, p < .0001).

Model 2. Following the two-level variance components model, the days since baseline assessment, treatment group condition, and the treatment group condition by days since baseline assessment interaction explanatory variables were introduced at the repeated assessment level. The z-tests confirm that the fixed effect of days since baseline assessment improves the fit of the model for total RMQ scores ($z = 6.25$, p < .001) while the fixed effect of treatment group condition ($z = -1.06$, p = .289) and the treatment group condition by days since baseline assessment interaction ($z = -1.76$, p = .078) do not improve the fit of the model for total RMQ scores. These results suggest that within patients, as days since baseline assessment increase, total RMQ scores also increase.

Including days since baseline assessment, treatment group condition, and the treatment group condition by days since baseline assessment interaction explanatory variables at the repeated assessment level affects the variance parameters. For total RMQ scores, VPC differed from Model 1 to Model 2 such that the patient level VPC decreased slightly from 0.5267 to 0.5265, and the within-patient-between repeated assessment level VPC increased slightly from 0.4733 to 0.4735.

Likelihood-ratio tests suggest a two-level model is still preferred to its single-level counterpart, even after adjusting for days since baseline assessment, treatment group condition, and the treatment group condition by days since baseline assessment interaction, for total RMQ scores (χ^2 (1) = 1829.48, p < .0001). While the likelihood-ratio test comparing Model 1 to Model 2 indicates the addition of days since baseline assessment, treatment group condition, and the treatment group condition by days since

baseline assessment interaction explanatory variables does not improve the statistical fit of the model in comparison to the variance components model with regard to total RMQ (LR χ^2 (1) = 2.4898, p = .477), the chi-square difference test comparing Model 1 to Model 2 indicates the addition of these explanatory variables does improve model fit ($\Delta\chi^2$ (3) = 198.18, p < .001).

Results suggest the addition of days since baseline assessment, treatment group condition, and the treatment group condition by days since baseline assessment interaction explanatory variables at the repeated assessments level did not fit well descriptively for total RMQ scores (CFI = 0.1534). The AIC value for Model 2 associated with total RMQ was 322.98.

Model 3. Next the effect of treatment group condition was introduced as a patient level random coefficient. The z-tests again confirm that the fixed effect of days since baseline assessment improves the fit of the model for total RMQ scores ($z = 6.25$, p < .001) while the fixed effect of treatment group condition ($z = -1.06$, p = .289) and the treatment group condition by days since baseline assessment interaction ($z = -1.76$, p = .078) do not improve the fit of the model for total RMQ scores. These results suggest that within patients, as days since baseline assessment increase, total RMQ scores also increase.

Including treatment group condition at the patient level affects the variance parameters. For total RMQ scores, VPC differed from Model 2 to Model 3 such that the patient level VPC remained at 0.5265, and the within-patient-between repeated assessment level VPC increased from 0.4524 to 0.4735. The VPC indicating between

patient variability in total RMQ scores associated with treatment group condition was calculated as <0.0001.

Likelihood-ratio tests suggest a two-level model is still preferred to its single-level counterpart, even after adjusting for treatment group condition at the patient level, for total RMQ scores (χ^2 (2) = 1829.48, p < .0001).

The LR value assessing the effect of adding treatment group condition at the patient level with regard to the overall fit of the model for total RMQ scores indicated no change in model fit (LR χ^2 (1) = 0, p = 1).

The AIC value for Model 3 associated with total RMQ scores demonstrated poorer overall model fit due to its increase to 326.98.

Model 4. Next the effects of the treatment group condition by days since baseline assessment cross level interaction was introduced as a patient level random coefficient. The z-tests again confirm that the fixed effect of days since baseline assessment improves the fit of the model for total RMQ scores (z = 6.25, p < .001) while the fixed effect of treatment group condition (z = -1.06, p = .289) and the treatment group condition by days since baseline assessment interaction (z = -1.76, p = .078) do not improve the fit of the model for total RMQ scores. These results suggest that within patients, as days since baseline assessment increase, total RMQ scores also increase.

Including the treatment group condition by days since baseline assessment cross level interaction at the patient level had minimal effects on the variance parameters. For total RMQ scores, VPC differed from Model 3 to Model 4 such that the patient level VPC remained at 0.5265, the between patient VPC variability associated with treatment group condition remained the same at <0.0001, and the within-patient-between repeated

assessment level VPC remained at 0.4735. The VPC indicating variability in total RMQ scores associated with the treatment group condition by days since baseline assessment cross level interaction was calculated as <0.0001.

Likelihood-ratio tests suggest a two-level model is still preferred to its single-level counterpart, even after adjusting for days since baseline assessment at the treatment group condition level, for total RMQ scores (χ^2 (3) = 1829.48, p < .0001). The likelihood-ratio tests comparing Model 3 to Model 4 indicates no change in model fit with regard to total RMQ scores (LR χ^2 (1) = 0, p = 1).

The AIC value for Model 4 associated with total RMQ scores demonstrated no change in descriptive model fit in comparison to Model 3 (AIC = 326.98).

These results suggest that between patient heterogeneity in total RMQ scores was not significantly, nor descriptively, explained by the treatment group condition by days since baseline assessment interaction. While RMQ scores generally improved within patients over time, improvements did not vary as a function of treatment group condition.

Portions of this dissertation have been accepted for publication of the material as it may appear in the American Journal of Public Health, 2015. The dissertation author was the primary investigator and author of this paper. Drs. Gregory A. Aarons, Maria O'Connell, Larry Davidson and Erik J. Groessl served as co-authors of this paper.

Chapter 4. Discussion

After equating SAU and PCMH participants on observable baseline characteristics with propensity scores, the outcome of multilevel modeling suggests mixed results with regard to growth trends in mental health recovery over time between SAU and PCMH participants. For both clinician and patient ratings of mental health recovery, results suggest within patient increases in mental health recovery over time irrespective of treatment group condition. Despite this similarity in results between clinician and patient ratings of mental health recovery, results regarding between treatment group condition heterogeneity in mental health recovery ratings over time differed between clinician and patient ratings.

With regard to provider ratings of patient mental health recovery, results suggested within patient increases in ratings of mental health recovery over time for total IMR and IMR factor scores. However, results suggested that increases in ratings over time with regard to total IMR and IMR Factor 2 Management scores varied as function of treatment group. Specifically, these results suggested that for total IMR and IMR Factor 2 Management scores, the increases in mental health recovery scores over time were greater for PCMH participants than SAU participants. Interestingly, increases in IMR Factor 1 Recovery and IMR Factor 3 Substances scores over time did not vary between PCMH and SAU participants.

With regard to patient ratings of their own mental health recovery, results again suggested within patient increases in ratings of mental health recovery over time for total RMQ scores. Although there were between group differences in clinician reported mental health recovery over time as assessed with the total IMR or IMR Factor 2 Management

45

scores, results suggested no differences in total RMQ scores over time between PCMH and SAU participants. Within patient self-reported ratings of mental health recovery increased over time to a similar degree for both PCMH and SAU participants.

The finding that total IMR and IMR Factor 2 Management scores varied as a function of treatment group condition, while IMR Factor 1 Recovery, IMR Factor 3 Substance scores, and total RMQ scores were similar between groups, is quite interesting especially when considering the role of the PCMH in enhancing progress toward mental health recovery. IMR Factor 2 Management scores represent a patient's symptom distress/relapse, impairment of functioning, and psychiatric hospitalization. IMR Factor 1 Recovery scores represent a patient's progress toward personal goals, mental illness knowledge, involvement in self-help activities, and involvement of family/friends in treatment. IMR Factor 3 Substance scores represent impairment of functioning through alcohol and/or drug use. Total IMR scores are comprised of these three factors. The findings of this study suggest the PCMH may facilitate a patient's illness management to a greater degree than SAU, and that greater illness management may be what's driving enhances in overall mental health recovery.

There may be features of the PCMH model of healthcare delivery that contribute to greater management of symptoms and functioning, and prevention of relapse and psychiatric hospitalizations, than SAU. Prior research has elucidated several common structure and/or process-related clinical indicators of the PCMH in practice that theoretically align with a recovery-oriented model of mental health service delivery, particularly with regard to illness self-management. These include screening and

preventive care processes, patient-guided health management, and improved access to medical records with subsequent utilization and continuity of services.

At the heart of the recovery-oriented model of healthcare is the collaboration between patients and providers (Hornick Ralph, and Salmons, 1999; U.S. Department of Health and Human Services, 1999) and research suggests consensus about treatment goals and collaboration between patient and provider predicts better treatment outcomes (Tryon and Winograd, 2011). Structure and process-related clinical indicators of the PCMH regarding patient-guided health management and improved access to medical records and services may facilitate greater collaboration between patients and providers regarding their own healthcare and treatment goals. For example, providing PCMH providers and patients with access to patient medical records through the secure, online, Health Outcomes Management System (HOMS) can enhance monitoring of objective health outcomes over time. Furthermore, discussions between patient and provider regarding these health outcomes over time may also enhance greater collaboration in patient healthcare and treatment goals. It is possible these structure and process-related clinical indicators of the PCMH aided in the similar and/or increased mental health recovery ratings over time as compared to SAU.

While the traditional medical model for the treatment of mental illness focused on symptom stability, a critical component of the recovery-oriented model of healthcare is treatment that focuses on more than just symptom relief (Barton, 1998). PCMH process-related clinical indicators focusing on screening and preventive care may facilitate treatment that is more comprehensive in nature, rather than treatment that is narrowly focused on relief of symptoms when present. Processes devoted to the screening of health

indicators may not only aid in the prevention and early intervention of more severe conditions, but also communicates to patients that their overall health and wellness is valued in addition to the elimination of symptoms if/when they emerge. These screening and preventive care processes may also communicate to patients the value of taking a proactive approach to one's healthcare and treatment goals. This proactive approach may also encourage patient-guided health management, as described above, further reinforcing the similarities between the PCMH service delivery model and the recovery-oriented service delivery model.

Although similar or greater increases in mental health recovery over time were found in the PCMH as compared to SAU, implementation of the PCMH did not occur exactly as planned and/or contracted. This is perhaps most evident when examining the number of patients that were transferred into the PCMH from the County mental health clinics. The County of San Diego has proposed its PCMH would reach a total of 600 participants by the end of the project's first year, with 150 participants referred to the PCMH from the primary care clinics and 150 participants referred to the PCMH from the mental health clinics within the projects first six months (County Agreement Number 536234). Actual utilization data demonstrated that only 215 patients' care was transferred into the PCMH from the County mental health treatment programs from March of 2011 through December of 2013. The care of only 38 of these patients was transferred in the first 6 months following the program's inception.

Semi-structured interviews with PCMH staff have illuminated shared concerns across staff "that the program was slow to populate" (County of San Diego Health and Human Services Agency, June 1, 2012, p. 11). Clinical and support staff reported not

knowing what caused the issue while administrative staff identified the eligibility criteria

as the main reason more patients had not been transferred into the PCMH. Specifically,

the process of determining eligibility varied between providers and administrative staff,

and also changed throughout the course of implementation. Initially, eligible participants

were to have a Milestones of Recovery Scale (MORS) (Pilon & Ragins, 2007) score of 6

(Coping/rehabilitation), 7 (Early Recovery), or 8 (Advanced Recovery) as determined by

Areta Crowell program staff. Results from these semi-structured interviews indicate

Areta Crowell program staff did not often rate their patients with MORS scores of 6 or

greater (County of San Diego Health and Human Services Agency, June 1, 2012).

Furthermore, results indicate Areta Crowell program staff members were reluctant to

transfer patients into the PCMH until PCMH staff "got accustomed to seeing their

clients" (J. Leich, personal communication, May 13, 2013). Results also suggest Areta

Crowell program staff determined patient eligibility for transfer by assessing "stability of

home environment, having a good record of keeping appointments, and not missing any

appointments in the last six months in addition to/rather than MORS scores (J. Leich,

personal communication, May 13, 2013). In an effort to transfer more patients into the

PCMH, eligibility criteria changed post-implementation such that patients with MORS

scores of 5 or greater were deemed eligible. Additionally, a screening tool that does not

include MORS scores was developed to help distribute the work of identifying eligible

patients across the mental health clinic providers (J. Leich, personal communication, May

13, 2013). These results illustrate that the transfer of patients from the County mental

health clinic into the PCMH was not implemented in a reliable fashion, but rather

determined subjectively by County mental health clinic staff.

Because the transfer of patients from the County mental health clinic into the PCMH was not implemented in a reliable fashion, qualitative differences may exist between patients selected for transfer into the PCMH and patients selected to remain in SAU. While propensity score analyses facilitate the equating of treatment group conditions on baseline characteristics, it is limited to the equating of groups on observed characteristics. As a result, significant biases may remain (Michalopoulos, Bloom & Hill, 2004). Without reliable identification and assessment of the characteristics used for determining eligibility for transfer into the PCMH, equating groups on these unknown characteristics is an inherent challenge.

Despite the difficulty inherent in equating groups on these unknown characteristics, using instruments with high criterion and construct related validity with these unmeasured characteristics can aid in decreasing this bias. Theory and prior research has illustrated the IMR scales that were included in the development of propensity scores in this study demonstrate high criterion and construct related validity with the characteristics reportedly used in determining patient eligibility for transfer into the PCMH but were not formally assessed (Sklar, Sarkin, Groessl, & Gilmer, 2012). Significant positive relationships were found between total IMR and factor scores and progress toward housing goals, employment goals, and education goals. Convergence in IMR scores with assessments of substance use was also found such that increases in mental health recovery were associated with less substance use. Additionally, the IMR scales measure psychiatric hospitalizations, effectiveness of medication use, relapse of symptoms, and impairment of functioning. Consequently, using the IMR for the

development of propensity scores may account for differences in PCMH and SAU participants at baseline not otherwise assessed.

It is important to consider the possibility that the differences in providers' ratings of mental health recovery over time between PCMH and SAU patients may be a function of greater motivation for PCMH providers to demonstrate progress than SAU providers. The PCMH was implemented as a County of San Diego Innovations PHIP pilot. It is one of five MHSA components designed specifically to foster new approaches to increasing knowledge about serving the mental health needs of San Diego County communities (County of San Diego, Health and Human Services Agency, June 1, 2012). Given the program status as an Innovation pilot that was recently funded by the MHSA, there are likely processes in place to monitor the PCMH structures, processes, and outcomes to a greater degree than monitoring taking place in SAU. There may also be greater incentive to demonstrate program effectiveness in the PCMH than in SAU in order to secure continued and/or additional financial support to maintain the program following the pilot period. The fact that patient self-ratings of mental health recovery over time did not differ between PCMH and SAU patients is potential support for the hypothesis that differences in provider ratings of mental health recovery over time between PCMH and SAU patients was driven by greater motivation for providers to demonstrate program effectiveness in the PCMH than SAU. Nonetheless, these results have important implications as interest regarding the PCMH model of healthcare delivery and its potential to improve the quality of health care in the United States grows.

These results provide support that the PCMH can serve as an alternative model of healthcare delivery for patients with severe mental illness without sacrificing the mental

health recovery of these patients. Furthermore, these results provide support that even greater increases in mental health recovery over time can be expected when patients with severe mental illness are provided healthcare through the PCMH model of service delivery than through services as usual. While other studies have demonstrated the promise the PCMH model of healthcare delivery holds for improving the physiological health of its patients, this is the first study that demonstrates the promise the PCMH model of healthcare delivery holds for improving the mental health recovery of its patients.

The results of this study are particularly relevant when considering the PCMH model is an important component of health care transformation in the United States (Davis, Abrams, and Stremikis, 2011). The Affordable Care Act (ACA) has features that inherently support and promote the PCMH model of service delivery. Among others, these provisions include financially incentivizing state Medicaid programs to transfer select patients into medical home healthcare, funding the Centers for Medicare and Medicaid Services to test innovative models of healthcare such as the PCMH, and supporting the information technology infrastructure investments the PCMH model requires. The ACA is also transforming the way in which healthcare providers are delivering care as its push for integrated care particularly in the primary care system is supporting more collaborative, multi and/or interdisciplinary models of service delivery like the PCMH. While many are hesitant to embrace healthcare reform in the United States, the results of this study demonstrate the potential benefits of the ACA in facilitating greater improvements in mental health recovery over time through the support of the PCMH.

As the PCMH model of healthcare delivery continues to spread across the United States, another area for future research is the economics of service provision under the PCMH vs. specialty behavioral health services, particularly with regard to the long term economic impacts of implementing PCMH model. Previous reports have demonstrated mixed results with regard to the overall costs of the PCMH, and direct comparisons between studies are difficult due to the significant variations in the way costs are measured (Hoff, Weller and DePuccio, 2012). Milstein and Gilbertson (2009) identified four PCMHs wherein patients incurred 15-20% less costs than comparison non-PCMH sites, without evidence of reduced quality of care. Studies have shown that the Community Care of North Carolina's PCMH program resulted in a reduction in per member per month cost by 17% in 2004 and by 11% in 2007 (Fortune-Greeley and Greene, 2009) Other studies have also found significant savings associated with aspects of the PCMH (Dorr, Wilcox, Brunker, et al., 2008). Other studies found either no significant differences in costs or spending (Gilfillan, Tomcavage, Rosenthal, et. Al., 2010), or results were mixed (Reid, Fishman, Yu, et al, 2009).

This study is among the first to assess the impact of transformation efforts on mental health recovery and is among the first that demonstrates the promise the PCMH model of healthcare delivery holds for improving the mental health recovery of its patients. Through the use of rigorous statistical techniques equating treatment group conditions in the absence of randomization with propensity scores, and multilevel modeling to account for the nested data structure of repeated assessments within individual patients, results support the notion that similar or greater increases in mental health recovery over time can be expected when patients with severe mental illness are

provided treatment through the PCMH than through services as usual. These results hold tremendous implications as interest regarding the potential for the PCMH model of healthcare delivery to improve the quality of health care in the United States grows. With continued implementation of the PCMH to treat clients with severe mental illness, additional rigorous evaluative efforts should be taken to inform more wide-spread adoption.

Portions of this dissertation have been accepted for publication of the material as it may appear in the American Journal of Public Health, 2015. The dissertation author was the primary investigator and author of this paper. Drs. Gregory A. Aarons, Maria O'Connell, Larry Davidson and Erik J. Groessl served as co-authors of this paper.

Table. 1. Joint principles of the patient-centered medical home.

1. **Personal physician:** Each patient has an ongoing relationship with a personal physician who provides first contact, continuous, and comprehensive care.

2. **Physician directed medical practice:** The personal physician leads a team of individuals at the practice level who collectively take responsibility for the ongoing care of patients.

3. **Whole person orientation:** The personal physician is responsible for providing for all the patient's health care needs or taking responsibility for appropriately arranging care with other qualified professionals. This includes care for all stages of life; acute care; chronic care; preventive services; and end of life care.

4. **Care is coordinated and/or integrated:** Coordination and integration across the care continuum, including chronic illness care and prevention, facilitated by information technology.

5. **Quality and safety:** Emphasis on quality and safety including use of evidence-based decision support, performance feedback to physicians, active engagement in quality improvement activities, and focus on patient experience.

6. **Enhanced access:** Timely access to the care and improved methods of communication between patient and the health care team.

7. **Payment reform:** Calls for payment structure that combines fee-for-service, pay-for performance, and a separate payment for care coordination and integration. Explicitly intended to compensate for care coordination, care management, and medical consultation outside the traditional face-to-face visit. Includes for financial recognition of case-mix differences, the adoption and use of clinical information technology for quality improvement, savings from reduced hospitalizations, and the achievement of quality targets.

Table 2. Projected characteristics of PCMH patients.

Racial/Ethnic Category	Sex/Gender			Total
	Females	**Males**	**Unknown**	**Total**
American Indian/Alaska Native	3	3	0	6
Asian or Pacific Islander	10	8	0	18
Black, not of Hispanic Origin	48	42	0	90
Hispanic	105	91	0	196
White, not of Hispanic Origin	150	130	1	281
Other or Unknown	5	4	0	9
Total of All Subjects	321	278	1	600

Table 3. Demographic and Mental Health Recovery Differences between Services As Usual (SAU) and Patient Centered Medical Home (PCMH) Patients at Baseline.

	SAU		PCMH	
	n	**%**	n	%
Gender				
Female	10947	51	94	47
Male	10516	49	106	53
Race/Ethnicity*				
White	10554	51.1	96	48
African American	2562	12.4	32	16
Asian/Pacific Islander	1516	7.3	1	0.5
Hispanic	4649	22.5	69	34.5
Native American	187	0.9	0	0
Other	1200	5.8	2	1
Diagnosis				
Schizophrenia and Schizoaffective Disorder	7139	34.3	67	33.5
Bipolar Disorders	4233	20.3	53	26.5
Major Depressive Disorders	6614	31.7	69	34.5
Other Psychotic Disorders	623	3	3	1.5
Other Depression	811	3.9	3	1.5
Anxiety Disorders	1097	5.3	5	2.5
Dysthymia	7	0	0	0
Adjustment Disorders	92	0.4	0	0
Alcohol Use Disorder	28	0.1	0	0
Substance Use Disorder	37	0.2	0	0
Cognitive Disorders	16	0.1	0	0
Other	137	0.7	0	0
Living Arrangement				
Lives Independently	15857	75.5	165	82.5
Board & Care	1920	9.1	10	5
Homeless	1881	9	17	8.5
Institutional	284	1.4	0	0
Justice Related	125	0.6	0	0
Other	659	3.1	8	4
Unknown	268	1.3	0	0

Table 3. Demographic and Mental Health Recovery Differences between Services As Usual (SAU) and Patient Centered Medical Home (PCMH) Patients at Baseline.

Employment***				
Unemployed	17332	88.6	155	79.1
Employed for Compensation	1762	9	35	17.9
Employed not for Compensation/Volunteer	462	2.4	6	3.1
Insurance				
Uninsured	11171	49.9	94	47
Medi Cal/Medicare Only	10436	46.6	96	48
Private	787	3.5	10	5
Education (mean years/sd)*	12.08	2.85	12.48	2.64
IMR Total (mean/sd)***	3.04	0.66	3.6	0.51
F1: Recovery (mean/sd)***	2.74	0.85	3.34	0.73
F2: Management (mean/sd)***	2.46	0.96	3.38	0.77
F3: Substance (mean/sd)**	4.63	0.93	4.77	0.77
RMQ Total (mean/sd)**	3.57	0.74	3.74	0.59
* = p < .05; ** = p < .01; *** = p < .001				

Table 4. Propensity Scores for PCMH and SAU Participants.

Inferior of Block of Propensity Score	Treatment Group		Total
	SAU	PCMH	
0.00142	7626	19	7645
0.00625	3820	39	3859
0.0125	2836	63	2889
0.025	1447	55	1502
0.05	395	15	410
0.1	3	1	4
Total	**16117**	**192**	**16309**
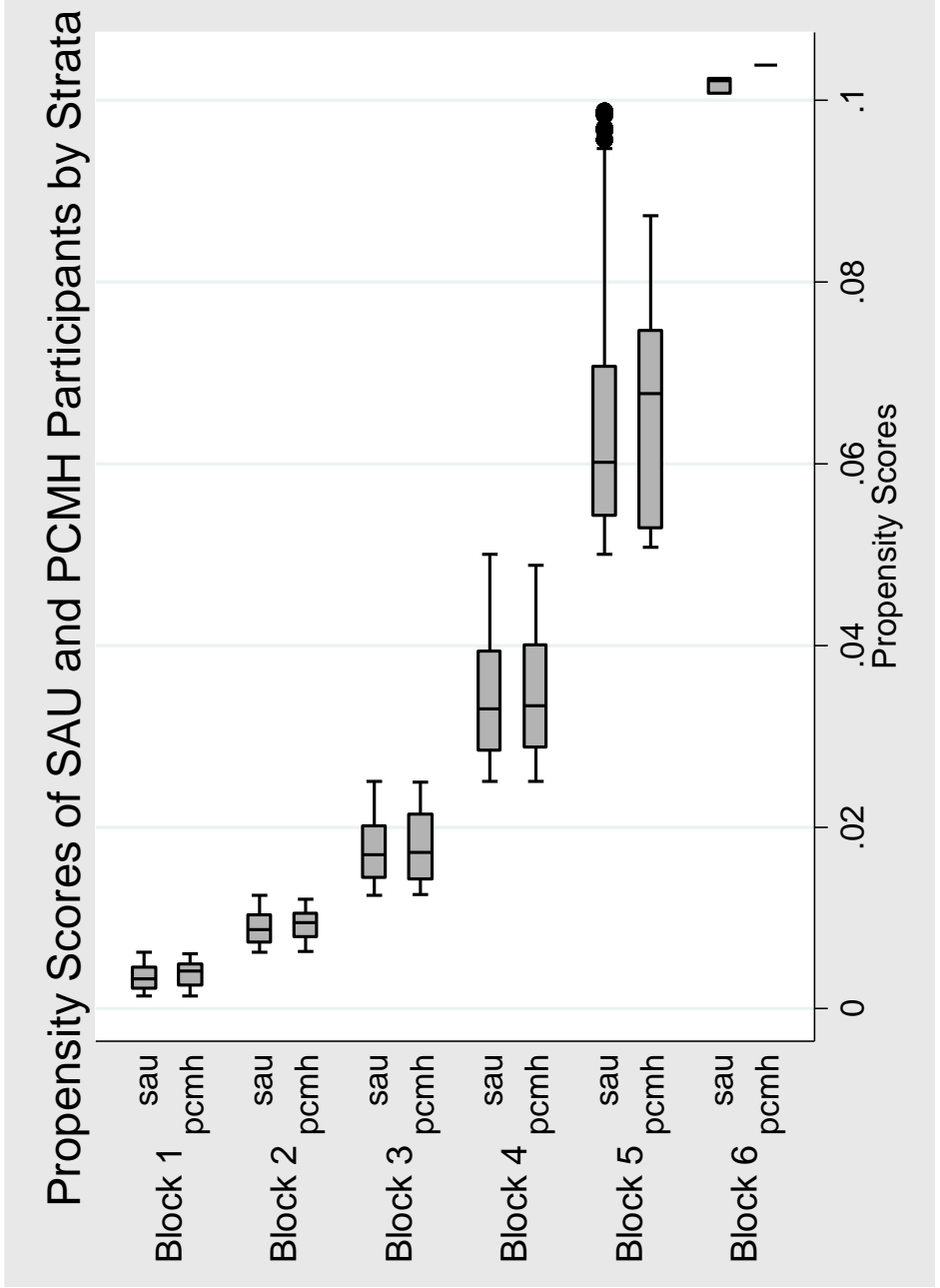
Figure 1. Propensity Scores for SAU and PCMH Participants by Strata.
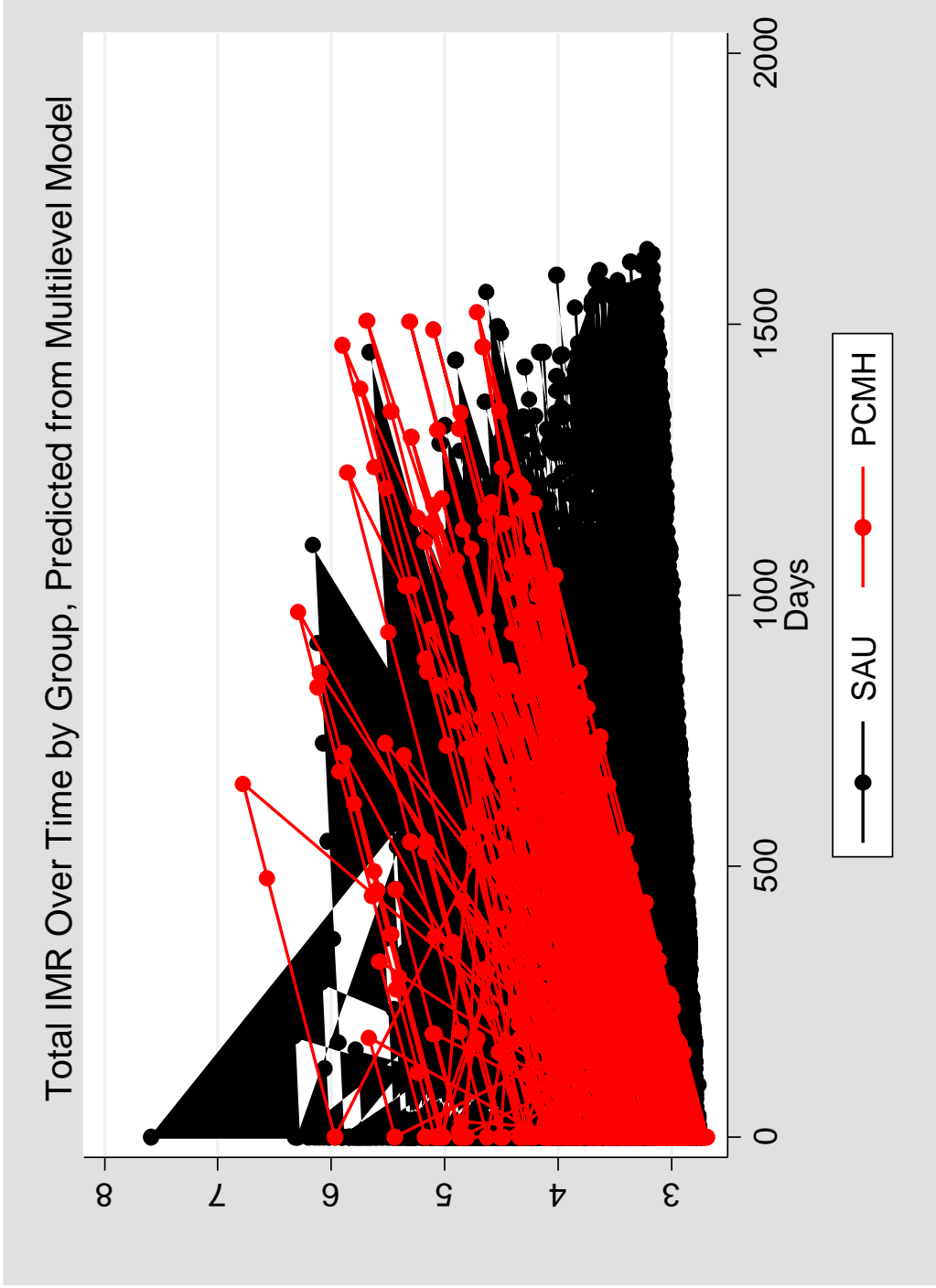
Figure 2. Total IMR scores over time for SAU and PCMH participants predicted from multilevel model.
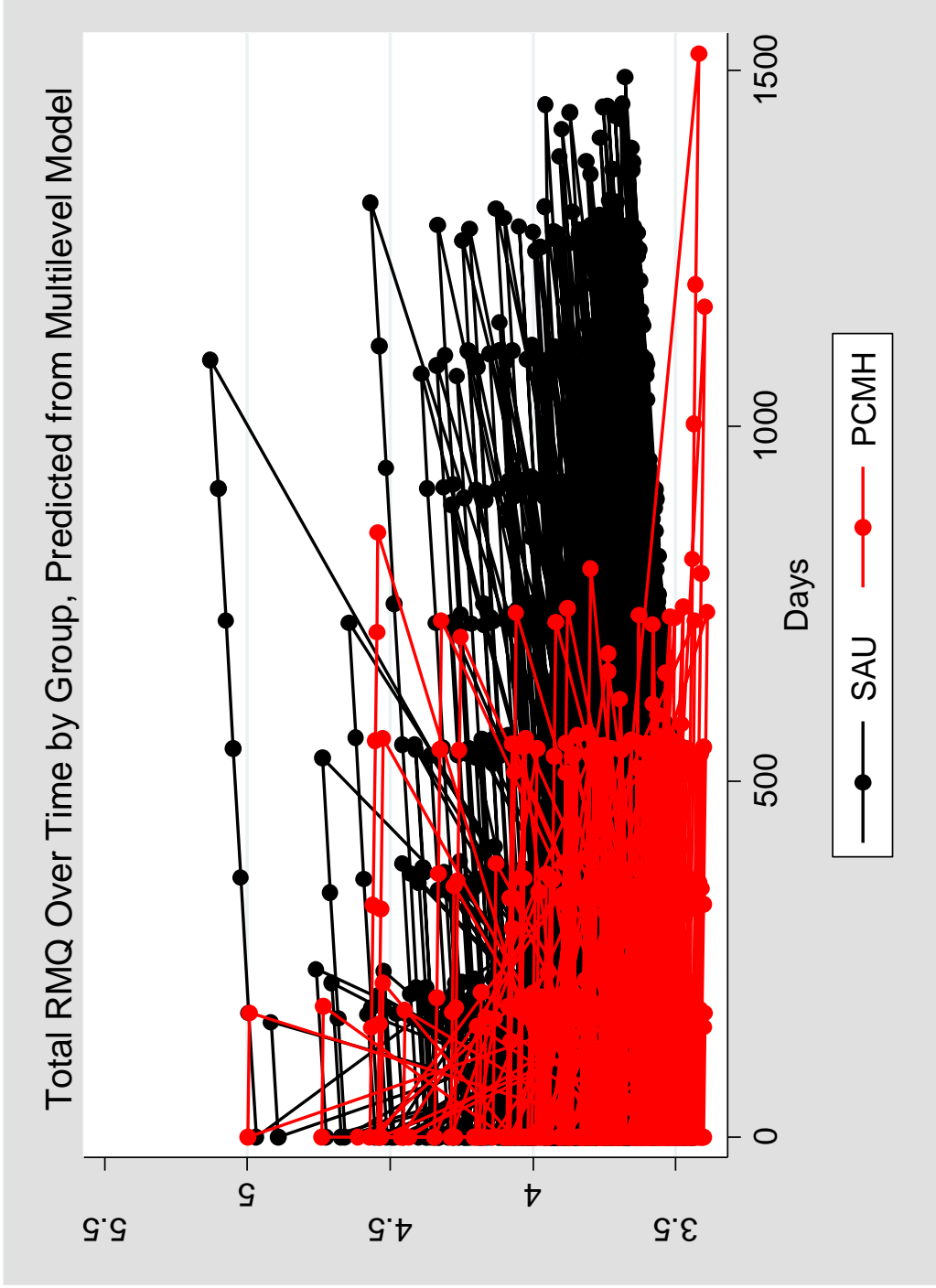
Figure 3. Total RMQ scores over time for SAU and PCMH participants predicted from multilevel model.

Appendix A:

Illness Management and Recovery Scale

The Illness Management and Recovery (IMR) client and clinician scales were developed by the Dartmouth Psychiatric Research Center[22] to assess progress over time in other mental illness self-management treatment programs. Items for the IMR scales were generated by IMR practitioners and consumers with severe mental illness to address the strategies targeted by the IMR program. The items were selected and re-worded per clinician and consumer feedback, and the resulting 15-item scale was formatted for a client self-report measure and a clinician-reported measure[35]. Studies assessing the psychometric properties of the IMR scales have found adequate estimates of convergent validity with measures thought to relate to the construct of recovery, and internal consistency[23,24]. Recently, the San Diego County Adult Mental Health Services began using the clinician version of the IMR scale in outpatient treatment programs to assess client recovery during intake assessments and treatment planning appointments occurring approximately every six months after intake. Analyses assessing the psychometric properties of the IMR clinician scale within this population (n = 10,659) suggest moderately high estimates of internal consistency (α = .82), and that the scale can be reduced into three interrelated factors, Recovery, Management, and Substance[25].

1. <u>Progress towards personal goals</u>: In the past 3 months, s/he has come up with…

○	○	○	○	○
No personal goals	A personal goal, but has not done anything to finish the goal	A personal goal and made it a little way toward finishing it	A personal goal and has gotten pretty far in finishing the goal	A personal goal and has finished it

2. <u>Knowledge</u>: How much do you feel your client knows about symptoms, treatment, coping strategies (coping methods), and medication?

○	○	○	○	○
Not very much	A little	Some	Quite a bit	A great deal

3. <u>Involvement of family and friends in my mental health treatment</u>: How much are people like family, friends, boyfriends/girlfriends, and other people who are important to your client (outside the mental health agency) involved in his/her mental health treatment?

○	○	○	○	○
Not at all	Only when there is a serious problem	Sometimes, like when things are starting to go badly	Much of the time	A lot of the time and they really help with his/her mental health

4. <u>Contact with people outside of my family</u>: In a normal week, how many times does s/he talk to someone outside of his/her family (like a friend, co-worker, classmate, roommate, etc.)

○	○	○	○	○
0 times/week	1-2 times/week	3-4 times/week	6-7 times/week	8 or more times/week

5. <u>Time in Structured Roles</u>: How much time does s/he spend working, volunteering, being a student, being a parent, taking care of someone else or someone else's house or apartment? That is, how much time does s/he spend in doing activities for or with another person that are expected of him/her? (This would not include self-care or personal home maintenance.)

○	○	○	○	○
2 hours or less/week	3-4 hours/week	6-15 hours/week	16-30 hours/week	More than 30 hours/week

6. <u>Symptom distress</u>: How much do symptoms bother him/her?

○	○	○	○	○
Symptoms really bother him/her a lot	Symptoms bother him/her quite a bit	Symptoms bother him/her somewhat	Symptoms bother him/her very little	Symptoms don't bother him/her at all

7. <u>Impairment of functioning</u>: How much do symptoms get in the way of him/her doing things that s/he would like to do or need to do?

○	○	○	○	○
Symptoms really get in his/her way a lot	Symptoms get in his/her way quite a bit	Symptoms get in his/her way somewhat	Symptoms get in his/her way very little	Symptoms don't get in his/her way at all

8. <u>Relapse Prevention Planning</u>: Which of the following would best describe what s/he knows and has done in order not to have a relapse?

○	○	○	○	○
Doesn't know how to prevent relapses	Knows a little, but hasn't made a relapse prevention plan	Knows 1 or 2 things to do, but doesn't have a written plan	Knows several things to do, but doesn't have a written plan	Has a written plan and has shared it with others

9. <u>Relapse of Symptoms</u>: When is the last time s/he had a relapse of symptoms (that is, when his/her symptoms have gotten much worse)?

○	○	○	○	○
Within the last month	In the past 2 to 3 months	In the past 4 to 6 months	In the past 7 to 12 months	Hasn't had a relapse in the past year

10. <u>Psychiatric Hospitalizations</u>: When is the last time s/he has been hospitalized for mental health or substance abuse reasons?

○	○	○	○	○
Within the last month	In the past 2 to 3 months	In the past 4 to 6 months	In the past 7 to 12 months	No hospitalizations in the past year

11. <u>Coping</u>: How well do feel your client is coping with his/her mental or emotional illness from day to day?

○	○	○	○	○
Not well at all	Not very well	Alright	Well	Very well

12. <u>Involvement with self-help activities</u>: How involved is s/he in consumer run services, peer support groups, Alcoholics Anonymous, drop-in centers, WRAP (Wellness Recovery Action Plan), or other similar self-help programs?

○	○	○	○	○
Doesn't know about any self-help activities	Knows about some self-help activities but isn't interested	Is interested in self-help activities, but hasn't participated in the past year	Participates in self-help activities occasionally	Participates in self-help activities regularly

13. <u>Using Medication Effectively</u>: (Don't answer this question if his/her doctor has not prescribed medication). How often does s/he take his/her medication as prescribed?

○	○	○	○	○
Never	Occasionally	About half the time	Most of the time	Every day

_____ Check here if the client is <u>not</u> prescribed psychiatric medications.

14. <u>Impairment of functioning through alcohol use</u>: Drinking can interfere with functioning when it contributes to conflict in relationships, or to financial, housing and legal concerns, to difficulty showing up at appointments or focusing during them, or to increases of symptoms. Over the past 3 months, did alcohol use get in the way of his/her functioning?

○	○	○	○	○
Alcohol use really gets in his/her way a lot	Alcohol use gets in his/her way quite a bit	Alcohol use gets in his/her way somewhat	Alcohol use gets in his/her way very little	Alcohol use is not a factor in his/her functioning

15. <u>Impairment of functioning through drug use</u>: Using street drugs, and misusing prescription or over-the-counter medication can interfere with functioning when it contributes to conflict in relationships, or to financial, housing and legal concerns, to difficulty showing up at appointments or focusing during them, or to increases of symptoms. Over the past 3 months, did drug use get in the way of his/her functioning?

○	○	○	○	○
Drug use really gets in his/her way a lot	Drug use gets in his/her way quite a bit	Drug use gets in his/her way somewhat	Drug use gets in his/her way very little	Drug use is not a factor in his/her functioning

Appendix B:

Recovery Markers Questionnaire

The Recovery Markers Questionnaire is a free-standing subscale of the Recovery Enhancing Environment measure[26]. The Recovery Markers Questionnaire consists of 24 items, using five-point Likert-type response options that range from 1 'strongly agree' to 5 'strongly disagree.' Among other things, these recovery markers are intended to represent the client's motivation, health status, symptom control, connection with others, and whether they use their personal strengths, skills and talents. The San Diego County Adult Mental Health Services also began using the RMQ to assess client's self-reported recovery during intake assessments and treatment planning appointments occurring approximately every six months after intake. Analyses assessing the psychometric properties of the RMQ within this population suggest high estimates of internal consistency ($\alpha = .95$). Its convergence with the IMR scale scores, and each of the IMR factor scores, support the RMQ scale's construct validity[25].

For each of the following questions, please fill in the answer that is true for you now.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
My living situation is safe and feels like home to me.	○	○	○	○	○
I have trusted people I can turn to for help.	○	○	○	○	○
I have at least one close mutual (give-and-take) relationship.	○	○	○	○	○
I am involved in meaningful productive activities.	○	○	○	○	○
My psychiatric symptoms are under control.	○	○	○	○	○
I have enough income to meet my needs.	○	○	○	○	○
I am not working, but see myself working within 6 months.	○	○	○	○	○
I am learning new things that are important to me.	○	○	○	○	○
I am in good physical health.	○	○	○	○	○
I have a positive spiritual life/connection to a higher power.	○	○	○	○	○
I like and respect myself.	○	○	○	○	○
I am using my personal strengths skills or talents.	○	○	○	○	○
I have goals I'm working to achieve.	○	○	○	○	○
I have reasons to get out of bed in the morning.	○	○	○	○	○
I have more good days than bad.	○	○	○	○	○

I have a decent quality of life.	○	○	○	○	○
I control the important decisions in my life.	○	○	○	○	○
I contribute to my community.	○	○	○	○	○
I am growing as a person.	○	○	○	○	○
I have a sense of belonging.	○	○	○	○	○
I feel alert and alive.	○	○	○	○	○
I feel hopeful about my future.	○	○	○	○	○
I am able to deal with stress.	○	○	○	○	○
I believe I can make positive changes in my life.	○	○	○	○	○

References

1. County of San Diego Health and Human Services Agency, Behavioral Health Division (2009). Innovation Work Plan. Retrieved from http://www.mhsoac.ca.gov/Counties/Innovation/docs/InnovationPlans/SanDiego_INN_Final_Plan_12_09.pdf.

2. Committee on Quality of Health Care in America, Institute of Medicine (2001). Crossing the quality chasm: A new health system for the 21st century, Washington, DC: National Academy Press. Retrieved from http://www.nap.edu/html/quality_chasm/reportbrief.pdf.

3. Barr, M. S. (2008). The need to test the patient-centered medical home. *Journal of the American Medical Association, 300,* 834-835.

4. Bitton, A., Martin, C., & Landon, B. (2010). A nationwide survey of patient centered medical home demonstration projects. *Journal of General Internal Medicine, 25,* 584-592.

5. Nolte, E., & McKee, M. (2011). Variations in amenable mortality—Trends in 16 igh-income nations. *Health Policy, 103,* 47-52.

6. Bolin, J. N., Gamm, L., Vest, J. R., Edwardson, N., & Miller, T. R. (2011). Patient-centered medical homes: Will health care reform provide new options for rural communities and providers? *Family Community Health, 34,* 93-101.

7. Davis, K. Schoenbaum, S. C., & Audet, A. M. (2005). A 2020 vision of patient-centered primary care. *Journal of General Internal Medicine, 20,* 953-957.

8. DeGruy, F. V., & Etz, R. S. (2010). Attending to the whole person in the patient-centered medical home: The case for incorporating mental healthcare, substance abuse care, and health behavior change

9. Robert Graham Center (2007). The patient centered medical home: History, seven core features, evidence and transformational change. Retrieved from http://www.aafp.org/online/etc/medialib/aafp_org/documents/about/pcmh.Par.0001.File.dat/PCMH.pdf.

10. Rittenhouse, D., Thom, D., & Schmittdiel, J. (2010). Developing a policy-relevant research agenda for the patient-centered medical home: A focus on outcomes. *Journal of General Internal Medicine, 25*(6), 593-600.

11. Crabtree, B. F., Nutting, P. A., Miller, W. L., Stange, K. C., Stewart, E. E., & Jaén, C. R. (2010). Summary of the National Demonstration Project and recommendations for the patient-centered medical home. *The Annals of Family Medicine*, *8*(Suppl 1), S80-S90.

12. Rosser, W. W., Colwill, J. M., Kasperski, J., & Wilson, L. (2011). Progress of Ontario's family health team model: a patient-centered medical home. *The Annals of Family Medicine*, *9*(2), 165-171.

13. Wagner, E. H., Austin, B. T., & Von Korff, M. (1996). Organizing care for patients with chronic illness. *Milbank Quarterly, 74,* 511-544.

14. Dickinson, W. P., & Miller, B. F. (2010). Comprehensiveness and continuity of care and the inseparability of mental and behavioral health from the patient-centered medical home. *Families, Systems, and Health, 28,* 348-355.

15. Rost, K., Pyne, J. M., Dickinson, L. M., & LoSasso, A. T. (2005). Cost-effectiveness of enhancing primary care depression management on an ongoing basis. *Annals of Family Medicine, 3,* 7-14.

16. Smith, J. L., Williams, J. W. Jr., Owen, R. R., Rubenstein, L. V., & Chaney, E. (2008). Developing a national dissemination plan for collaborative care for depression: QUERI series. *Implementation Science, 3,* 59.

17. Wang, P. S., Simon, G. E., & Kessler, R. C. (2008). Making the business case for enhanced depression care: The National Institute of Mental health-Harvard work outcomes research and cost-effectiveness study. *Journal of Occupational and Environmental Medicine, 50,* 468-475.

18. Watts, B. V., Shiner, B., Pomerantz, A., Stender, P., & Weeks, W. B. (2007). Outcomes of a quality improvement project integrating mental health into primary care. *Quality and Safety in Health Care, 16,* 378–381.

19. State of California (2011). Innovation. Retrieved from http://www.dmh.ca.gov/Prop_63/MHSA/Innovation/.

20. County of San Diego Health and Human Services Agency (January, 2011) Outcomes Process Improvement Project (PIP): Health Services Research Center.

21. Cohen, J. L., Abraham, K. M., Burk, J. P. & Stein, C. H. (2012). Emerging opportunities for psychologists: Joining consumers in the recovery-oriented care movement. *Professional Psychology Research and Practice, 43,* 24-31.

22. Deegan, P. E. (1988). Recovery: The lived experience of rehabilitation. *Psychosocial Rehabilitation Journal, 11,* 11-19.

23. Sklar, M., Sarkin, A., Choi, K. *Transforming a large mental health system with recovery-based assessment.* Paper presented at the 91st Annual Meeting of the Western Psychological Association, Los Angeles, CA; April 28-May 1, 2011.

24. U.S. Census Bureau: State and County QuickFacts. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State

and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits Last Revised: Thursday, 27-Mar-2014 09:53:47 EDT.

25. Family Health Centers of San Diego (2007-2012). Retrieved from http://www.fhcsd.org/about.cfm.

26. County Agreement Number 536234. Agreement with Family Health Centers of San Diego for Physical Health Integration Pilot.

27. Mueser, K. T., Gingerich, S., Salyers, M. P., McGuire, A. B., Reyes, R. U., & Cunningham, H. 2004. The Illness Management and Recovery (IMR) Scales (Client and Clinician Versions). Concord, NH: New Hampshire-Dartmouth Psychiatric Research Center.

28. Hasson-Ohayon, I. Roe, D., & Kravetz, S. 2008. The psychometric properties of the Illness management and Recovery scale: client and clinician versions. Psychiatry Research, 160, 228-235.

29. Salyers, M. P., Godfrey, J. L., Mueser, K. T., & Labriola, S. 2007. Measuring illness management outcomes: a psychometric study of clinician and consumer rating scales for illness self-management and recovery. Community Mental Health Journal, 43, 459-480.

30. Sklar, M., Sarkin, A. J., Groessl, E. J. & Gilmer, T. The psychometric properties of the Illness Management and Recovery scale in a large American public mental health system, *Psychiatry Review,* http://dx.doi.org/10.1016/j.psychres.2012.03.013.

31. Ridgway, P., & Press, A. 2004. Assessing the recovery-orientation of your mental health program: A user's guide for the Recovery-Enhancing Environment scale (REE). Version 1. Lawrence, Kansas: University of Kansas, School of Social Welfare, Office of Mental Health Training and Research.

32. West, S. G., Biesanz, J. C., & Pitts, S. C. (2000). Causal inference and generalization in field settings experimental and quasi-experimental designs. In H. T. Reis & C. M. Judd (Eds.), *Handbook of Research Methods in Social and Personality Psychology* (pp. 40–88). New York: Cambridge University Press.

33. StataCorp. 2011. *Stata Statistical Software: Release 12*. College Station, TX: StataCorp LP.

34. Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika, 70*, 41–55.

35. Pruzek, R. M. (2011). Introduction to the special issue on propensity score methods in behavioral research. *Multivariate Behavioral Research, 46,* 389-398.

36. Austin, P.C. (2011). An introduction to propensity score methods for reducing the effects of confounding in observational studies, *Multivariate Behavioral Research, 46*(3), 399-424.

37. Luellen, J. K., Shadish, W. R., & Clark, M. H. (2005). Propensity scores: an introduction and experimental test. *Evaluation Review, 29*, 530-558.

38. Rosenbaum, P. R., & Rubin, D. B. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *The American Statistician, 39*, 33-38.

39. Hedeker, D, Gibbons, R. D., Waternaux, C. (1999). Sample size estimation for longitudinal designs with attrition: Comparing time-related contrasts between two groups, *Journal of Educational and Behavioral Statistics, 24*(1), 70-93.

40. Cohen, J. (1977). *Statistical power analysis for the behavioral sciences* (revised edition). New York: Academic Press.

41. Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd edition). Hillsdale, NJ: Erlbaum.

42. Matt, G. E., Brewer, A., & Sklar, M. (2010). Quantitative methods and research design. In P Peterson, E Baker, B. McGaw (Eds.), *International Encyclopedia of Education, (*pp. 521-527). Oxford: Elsevier.

43. Mueser, K. T., Gingerich, S., Salyers, M. P., McGuire, A. B., Reyes, R. U., & Cunningham, H. Illness Management and Recovery (IMR) Scales. In: Campbell-Orde, T., Chamberlin, J., Carpenter, J., Leff, H. S., eds. Measuring the Promise: A Compendium of Recovery Measures. Vol 2. Cambridge, Mass: Evaluation Center at Human Services Research Institute (2005). 124-132.

44. County of San Diego Health and Human Services Agency (November, 2011) Full Service Partnerships Outcomes Report: IMPACT. San Diego, CA: Health Services Research Center. Retrieved from http://hsrc.ucsd.edu/index.php/reports/.

45. County of San Diego Health and Human Services Agency (April, 2012) Full Service Partnerships Outcomes Report: FSP Programs. San Diego, CA: Health Services Research Center.

46. County of San Diego Health and Human Services Agency (April, 2012) Full Service Partnerships Outcomes Report: FSP-Lite Programs. San Diego, CA: Health Services Research Center.

47. County of San Diego Health and Human Services Agency (August, 2011) IMR Outcomes Report. San Diego, CA: Health Services Research Center. Retrieved from http://hsrc.ucsd.edu/index.php/reports/.

48. County of San Diego Health and Human Services Agency (April, 2012) County Mental Health Services Program Databook, FY2010-2011. San Diego, CA: Health Services Research Center. Retrieved from http://hsrc.ucsd.edu/index.php/reports/.

49. National Institutes of Health (August 8, 2001) NIH Policy on Reporting Race and Ethnicity Data: Subjects in Clinical Research. Notice: NOT-OD-01-053. Retrieved from http://grants.nih.gov/grants/guide/notice-files/NOT-OD-01-053.html.

50. Mainz, J. (2003). Defining and classifying clinical indicators for quality improvement. *International Journal for Quality in Health Care, 15*(6), 523-530.

51. Goldberg, D., Kuzel, A. (2009) Elements of the patient-centered medical home in family practices Virginia, *Annals of Family Medicine, 7,* 301-308.

52. Marshall, R., Doperak, M., Milner, M., Motsinger, C., Newton, T., Padden, M., Pastoor, S., Hughes, C., LeFurgy, J., Mun, S. (2011) Patient-Centered Medical Home: An emerging primary care model and the military health system, *Military Medicine, 176,* 1253-1259.

53. Pomerantz, A., Shiner, B., Watts, B., Kutter, C., Street, B., Scott, D. (2010) The White River model of colocated collaborative care: A platform for mental and behavioral health care in the medical home, *Families, Systems, & Health, 28*(2), 114-129.

54. Reid, R., Coleman, K., Johnson, E., Fishman, P., Hsu, C., Soman, M., Trescott, C., Erikson, M., Larson, E. (2010) The group health medical home at year two: cost savings, higher patient satisfaction, and less burnout for providers, *Health Affairs, 29*(5), 835-843.

55. McCarter, S., Jones, K., Rager, K. (2011) Characteristics of youth in the U.S. receiving services from a patient-centered medical home (PCMH), *Social Work in Health Care, 50*(8), 596-605.

56. Roby, D., Pourat, N., Pirritano, M., Vrungos, S., Himmet, D., Castillo, D., Kominski, G. (2010) Impact of patient-centered medical home assignment on emergency room visits among uninsured patients in a county health system, *Medical Care Research and Review, 67,* 412-430.

57. Rich, E., Lison, D., Libersky, J., Peikes, D., Parchman, M. (2012) Organizing care for complex patients in the Patient-Centered Medial Home, *Annals of Family Medicine, 10,* 60-62.

58. Beal, A., Hernandez, S., Doty, M. (2009) Latino access to the patient-centered medical home, *Journal of General Internal Medicine, 24*(Suppl 3), 514-520.

59. DeVries, A., Li, C., Sridhar, G., Hummel, J., Breidbart, S., Barron, J. (2012) Impact of medical homes on quality, healthcare utilization, and costs, *American Journal of Managed Care, 18*(9), 534-544.

60. Ferrante, J., Balasubramanian, B., Hudson, S., Crabtree, B. (2010) Principles of the patient-centered medical home and preventive services delivery, *Annals of Family Medicine, 8,* 108-116.

61. Harbrecht, M. (2012) Colorado's Patient-Centered Medical Home Pilot met numerous obstacles, yet saw results such as reduced hospital admissions, *Health Affairs (Project Hope), 31*(9), 2010-2017.

62. Ortolon, K. (2011) Finding a home, *Texas Medicine, 107*(5), 49-53.

63. O'Toole, T., Pirroglia, P., Dosa, D., Bourgault, C., Redihan, S., O'Toole, M., Blumen, J. (2011) Building care systems to improve access for high-risk and vulnerable veteran populations, *Journal of General Internal Medicine, 26*(Suppl 2), 683-688.

64. Solberg, L., Asche, S., Fontaine, P., Flottemesch, T., Anderson. (2011) Trends in quality during medical home transformation, *Annals of Family Medicine, 9,* 515-521.

65. Cooley, W. C., McAllister, J., Sherrieb, K., Kuhlthau, K. (2009) Improved outcomes associated with medical home implementation in pediatric primary care, *Pediatrics, 124,* 358-364.

66. Gibbons, R. D., Hedeker, D., Elkin, I., Waternaux, C., Kraemer, H. C., Greenhouse, J. B., Shea, M.T., Imber, S.D., Sotsky, S. M., and Watkins, J. T. (1993). Some conceptual and statistical issues in analysis of longitudinal psychiatric data: application to the NIMH Treatment of Depression Collaborative Research Program dataset. *Archives of General Psychiatry*, *50*(9), 739-750.

67. Raudenbush, S. W., and Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (Second edition). Sage Publications, Inc.: Thousand Oaks, California.

68. Leckie, G. (2013). Three-Level Multilevel Models – Stata Practical. LEMMA VLE Module 11, 1-52. http://www.bristol.ac.uk/cmm/learning/course.html.

69. Bentler, P.M. (1990). Comparative fit indexes in structural models, *Psychological Bulletin, 107*(2), 238-246.

70. Burnham, K. P., and D. R. Anderson. 2002. Model selection and multimodel inference : a practical information-theoretic approach. Springer, New York.

71. B. Muthen (2008, November 12). Mplus discussion: Multilevel modeling. Retrieved from http://www.statmodel.com/

72. County of San Diego Health and Human Services Agency (June 1, 2012) I-CARE Physical Health Integration Project Baseline Evaluation Report. San Diego, CA: Health Services Research Center.

73. Hornick, J., Ralph, R., & Salmons, T. (1999). Images of power and solidarity: Assessing relationships between staff and clients of mental health programs. National Conference on Mental Health Statistics. Washington, DC: Center for Mental Health Services.

74. U.S. Department of Health and Human Services, Mental Health: A report of the surgeon general. U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services, National Institutes of Health, national Institute of Mental Health, Rockville (MD) (1999). Available from http://www.surgeongeneral.gov/library/mentalhealth/home.html).

75. Tyron, G. S., and Winograd, G. (2011). Goal consensus and collaboration. *Psychotherapy, 48*(1), 50-57.

76. Barton, R. (1998). The rehabilitation-recovery paradigm. A statement of philosophy for a public mental health system. *Psychiatric Rehabilitation Journal*, 2(2), pp. 171-187.

77. Michalopoulos, C., Bloom, H.S. & Hill, C.J. (2004). Can propensity-score methods match the findings from a random assignment evaluation of mandatory welfare-to-work programs? *Review of Economics and Statistics, 86*, 156-179.

78. Davis, K., Abrams, M., & Stremikis, K. (2011). How the Affordable Care Act will strengthen the nation's primary care foundation. *Journal of General Internal Medicine, 26*, 1201-1203.

79. Hoff, T., Weller, W., and DePuccio, M. (2012). The patient-centered medical home: A review of recent research, *Medical Care Research and Review, 69*(6), 619-644.

80. Milstein, A., Gilbertson, E. (2009). American medical home runs. *Health Affairs, 28*(5), 1317-1326.

81. Fortune-Greeley, A. K., and Greene, S. B. (2009). Community Care of North Carolina program evaluation: Strategies and challenges. *North Carolina Medical Journal, 70*(3), 277-279.

82. Dorr, D. A., Wilcox, A. B., Brunker, C. P., Burdon, R. E., & Donnelly, S. M. (2008). The effect of technology-supported, multidisease care management on the mortality and hospitalization of seniors. *Journal of the American Geriatrics Society, 56*, 2195-2202.

83. Gilfillan, R. J., Tomcavage, J., Rosenthal, M. B., Davis, D. E., Graham, J., Roy, J. A., . . .Steele, G. D., Jr. (2010). Value and the medical home: Effects of transformed primary care. *American Journal of Managed Care, 16*, 607-614.

84. Reid, R. J., Fishman, P. A., Yu, O., Ross, T. R., Tufano, J. T., Soman, M. P., & Larson, E. B.(2009). Patient-centered medical home demonstration: A prospective, quasi-experimental, before and after evaluation. *American Journal of Managed Care, 27*, 362-367.