TOWARDS A PEOPLE'S SOCIAL EPIDEMIOLOGY:

An Intergenerational Study of Place, Embodiment, & Health via Participatory Action Research with Residents of Public Housing

BY
RYAN J. PETTEWAY

A dissertation submitted in partial satisfaction of the
requirements for the degree of
Doctor of Public Health
in the
Graduate Division
of the
University of California, Berkeley

Committee in charge:
Rachel A. Morello-Frosch, Chair
Mahasin S. Mujahid
Amani M. Nuru-Jeter
Tapan S. Parikh

Fall 2015

Abstract

TOWARDS A PEOPLE'S SOCIAL EPIDEMIOLOGY:
An Intergenerational Study of Place, Embodiment, & Health via
Participatory Action Research with Residents of Public Housing

By
Ryan J. Petteway
Doctor of Public health
University of California, Berkeley

Professor Rachel Morello-Frosch, Chair

Social Epidemiology has made critical contributions to understanding health inequities. However, translation of social epidemiology science into meaningful and timely action remains a challenge. With so much focus within the field on issues like social position, discrimination, racism, power, and privilege, there has been surprisingly little deliberation about the extent and value of *social inclusion and equity within the field itself*, and how the challenge of translation might be more readily met through re-envisioning the role of *the people* in the research enterprise—reimagining what "social" could, or even *should*, mean for the future of the field. Place-health research represents a particularly promising subfield within which to emphasize these principles, especially within the context of public housing.

Thus, the overall aim for my dissertation work was to conduct research at the nexus of public health and public housing by integrating participatory research methods and information communication technologies (ICTs) to democratize the research process and facilitate local action. In this spirit, my work develops, introduces, and field-tests 3 interrelated and nested concepts that, in application, represent a model for inclusive and equitable social epidemiology: *A People's Social Epidemiology*, the *Placescape*, and *Geographies of Embodiment*.

First, ***Chapter 1*** introduces a conceptual framework for *A People's Social Epidemiology*—a multicomponent and tiered framework to guide social epidemiology research/practice to become more inclusive and equitable, improve knowledge translation, and facilitate timely, locally relevant action—essentially, to enhance the "social" in social epidemiology. The framework draws upon theory, concepts, and principles from social epidemiology, community-based participatory research (CBPR), and information and communication technologies for development (ICTD). This work specifically highlights place-health research as a subfield particularly suited for *A People's Social Epidemiology* approach, and the framework was accordingly "field-tested" through my development and implementation of the People's Social Epidemiology Project (PSEP)—an intergenerational CBPR study of place, embodiment, and health with residents of public housing.

For the PSEP, parent-youth dyads were recruited from a predominantly Black public housing community and trained in core principles related to social epidemiology and health equity, and fundamental aspects of public health research and CBPR. They were then trained in 4 participatory research methods: *Photovoice*, *Activity Space Mapping*, *X-Ray Mapping*, and

Participatory GIS. All research methods were completed by the participants themselves. First, participants used *Photovoice* (via cellphones) to identify, photo-document, and describe their important daily places and specific exposures/opportunities within each place they perceive affects their health. Next, they used *Activity Space Mapping* to geolocate and map their *Photovoice* photos, identify any additional non-photographed places, and to rate and provide time estimates for each mapped place. Then, using a cognitive mapping method known as *X-Ray Mapping,* they created symbolic representations of place-embodiment reflecting how each of their mapped places affects their bodies/health. Finally, constituting *Participatory GIS*, they integrated and digitally mapped their work via a web-based multimedia-enabled ICT platform, *Local Ground*. This platform allows participants to create, print, and digitally share their place-health research maps with the broader community and city officials.

Anchored in *A People's Social Epidemiology*, ***Chapter 2*** introduces the *Placescape* framework. The goal of the work presented here was to develop and field-test a place-health framework that: 1) accounts for the multi-nodal nature of "place" and its contingent spatial, temporal, and social inter-nodal connections/divisions; 2) elucidates potential intergenerational and life-stage differences in place experiences/perceptions; and 3) explicitly engages the sociopolitical mechanisms that make, unmake, and remake place over time. A framework for a *placescape* approach was developed drawing from place-health, social epidemiology, participatory research, geography, and sociology literatures. This framework was then applied to the PSEP study, with parents and youth using the above combination of participatory methods to map their "placescapes". Findings revealed clear spatial and temporal differences in adult and youth placescapes, as well as a very distinct pattern of place "nodes" among youth—indicating a multinodal placescape.

Lastly, rooted in the *Placescape* framework, ***Chapter 3*** introduces the *Geographies of Embodiment* concept through detailing the process and findings of a novel cognitive mapping methodology to elucidate subjective notions of place-embodiment within place-health research—*X-Ray Mapping*. This work aims to enhance place-health research efforts by furthering our understanding of: 1) *which* places matter for health and *when* (i.e. spatially- and temporally-specific notions of "place"); 2) *how* these places matter—the processes/mechanisms of the physiological embodiment of place; and 3) intergenerational and life-stage differences in place-embodiment experiences/perceptions. Findings revealed clear spatial differences between adult and youth geographies of embodiment, as well clear perceptual differences in which body areas are affected by place and how.

Overall, the work presented in these three chapters outlines a framework for conducting more inclusive and equitable—and more practicable and actionable—social epidemiology research, develops a new paradigm for understanding/researching place and health—especially within public housing communities—rooted in intergenerational and participatory approaches, and introduces a novel research methodology to elucidate subjective notions of place-embodiment within place-health research. These combined contributions improve efforts to appropriately conceptualize and measure "place", and further understanding of place, place-embodiment, and health within public housing. Moreover, these contributions offer guidance on how to move towards a more inclusive and equitable social epidemiology research practice—one that is of, for, and by the people, and not simply about them/us.

To KaLijah, to Kruz; to Kellen, to DW3,
'til the fire next time.
To the fire next time.

"Take no one's word for anything, including mine—but trust your experience. Know whence you came. If you know whence you came, there is really no limit to where you can go."[1]

***

[1] Baldwin, J (1993). The Fire Next Time. Vintage International: p.8.

TRACK LISTING

LIST OF TABLES

LIST OF FIGURES

PREFACE

"Is it ill, do it need to be fixed?"[2]

I used to listen to Nas more than I listened to my mother. The coalescence of his words with my view from 805 created a crucible of critical thought that drove me to this day. Near the beginning, I remember hand-writing my college application essays, no computer in the crib. Had an old type-writer with which I was about as proficient as Sarah Palin is in foreign policy. No bueno. But between school work and writing rhymes to Mobb Deep and LOX instrumentals, I was pretty good with a Bic and Mead by that time anyway. So pen and pad it was—"Project Windows" on repeat, some pretzel sticks and "starburst"[3] *Kool-Aid* (well, *Flavor*-Aid actually). Who knew that was the diet of "doctors"? Of "research scientists"?

Alas, I'm here. And somewhere along the way, something that I've grown to believe is that it's not necessarily about what we find through our research, but *how* we find it and what we do *after*. And I have to be honest in saying that a core part of my motivation to pursue a doctorate degree stems from the distrust and frustration that I have of/with the public health research enterprise as it attempts to address health inequities. I am in many ways a product of the underlying social inequity, and so is my scholarship. This dissertation, therefore, is not submitted under some guise of apolitical objectivity or detached neutrality. Rather, this work reflects an honest attempt to render meaning from a reality that, in no concealed fashion, has systematically deprived residents of communities like those of my formative years from a fair opportunity at health, at life. It reflects the mixture of hope, contempt, and embarrassment I feel for our collective field. A field that has grown accustomed to discussing health inequities with no more passion, compassion, or urgency than a meteorologist would show for the weekly weather report—failing to realize that every day is a hurricane where I'm from. I, too, want sun; but I refuse to partake in the embellishment of the clouds. So I'm excited to get on the other side of the "microscope", for, to remix Carter G, "the portrait of the *N* has seldom been drawn but by the pencil of *his/her* oppressor."[4] Consider this an initial forecast. In solidarity.

[2] Johnson, A and Jones, N et al (2000). Self Conscience. In: Jones, N (ed), Nas and Ill Will Presents QB's Finest, 1st edition. Ill Will Records.
[3] Pseudo-proprietary blend of 3 traditional flavors of Flavor-Aid, created by the Petteway brothers around 1998 in an Ohio St. laboratory.
[4] Woodson, CG (1998). The Mis-Education of the Negro. Africa World Press.

ACKNOWLEDGEMENTS

"At night the windows were speakers, pumpin' life out…"[5]

Looks like an appreciation situation. I'll try and keep this "short" so you can read the other 120 pages haha. *First things first*…

To Rebecca A. Petteway, a.k.a. Ms. P, a.k.a. Ms. Pett, a.k.a. mom… None of this exists without you. There are over 53,000 words in this dissertation. And I'd need to multiply that by at least 30 to show my love and respect for you; my appreciation of your selflessness and patience; my gratitude for your sacrifice and resolve; and the hope, encouragement, and honesty with which you raised us. Love. This is clearly one of those *Dear Mama* moments—*and there's no way I can pay you back, but the plan*… Exactly. Thank you. For making sure we always had chicken nuggets and sneakers, toothpaste and speakers haha. Can't wait to celebrate.

To my brothers, "for my blood"—KRC, we goin' keep it moving for sure. "Been through it all, man… blood, sweat, and tears… we done seen it all and been through it all…for real for real…". The quiet storm never stops, and I told you then—*I put my lifetime in between the paper's lines*. Lot of lines in this one… good luck haha. But Keith… couldn't ask for a better older brother. Though you probably could have worked on that left hand a little bit, just sayin'… Nothing but love, respect, and appreciation. Looking forward to the physical deterioration that awaits us, watching Kruz come to the realization that he's a Detroit fan, and cruisin' on the Allegheny sippin' caipirinhas. We goin' live it up for sure. Til then, keep them knees wrapped. Cam… I can honestly say that there might not be a greater source of inspiration than the beautiful struggle of your grind, your resilience. You've probably known it since *Flowapeutic Vol. 1* track #6, or "Breathe", but you keep me moving. You remind me why it is that I'm here—*because* I'm *here*. Because too many of us—from our cities, our communities, our hoods—are written off somewhere between mitosis and our first tetanus shot. But we, you, know what time it is. So while I'm out here surrounded by the privileged, the bubble-wrapped, and the hipsters—and the ubiquitous well-intentioned ignorance packaged as empathy that inevitably surfaces in such environs—rest assured that I'ma keep it 100. All love. And tell KaLijah I want a full report on this dissertation by his birthday if he wants any ninja turtle presents. #FOE

Dom, Dirk, Les, Jeremy, Threet, Tre etc… what can I say. Still here, still shining, still grinding. Got that *Juicy* in my head right now, "…and my whole crew is loungin' / celebratin' every day, no more…." You know the rest. But still work to do. I'ma see you soon, but let me leave you with a flashback track. Remember this:

"…hoop tournaments and custom-made tees /
Summer sun so hot we had to, cut the sleeves /
And, wasn't a day we didn't make it to the Shaft /
For, basketball, ping pong, orange sodas, laughs /
Then, back to the Square for some Madden and Live /
We used to kick it in the hallway, just passin' the time /
And, night time was the best time, but no one could drive /
So if it, started at 10, we were rollin' at 9 /
And it was live, eyes wide 'cause the cops was real /
4 o'clock in the morning walkin' off the hill /
The next day was ball practice and a Save-A-Lot trip /

[5] Jones, N et al (1999). Project Windows. In: Jones, N (ed), *Nastradamus*. Columbia Records.

To the shop for a cut, then we'd do the same sh*t /
(it's true) kinda sad, but the only thing to do /
Was to sit and talk about how there was nothin' to do /
But yo, no matter what the cause I'm down for yall /
So if I rep an OH it's not an alcohol…"[6]

And of course I gotta show some love for the grimeys, what up! And just in case you forgot:

"This is for my n*ggas on the block that's real /
The ones who shed a few drops when BIG and Pac got killed /
You never know when it's time, but that clock is real /
And there's no coming back once that box is sealed /
I'm from Ohio, South 7th, I rep The Ville /
Grimey n*ggas don't play games, we ref the field /
And keep it poppin', walk the block like we shoppin' /
N*ggas gettin' bids and every day is an auction /
Cats is on the block posted up like Dennis Rodman /
The only way to stop our grind, is a coffin /
D-What, Les, Jerm, and Harpmatic /
C-Quel, Bones, BG, it's all havoc…"[7]

And of course, to the youth and adults of Market Square for sharing your time, knowledge, and experience with me for this dissertation work—thank you. Looking forward to reconnecting and seeing what's next. Also, shout out to the staff at the MLK Center.

To the rest of my fam… G-ma (yeah, you Bonnie haha), thanks for the love and the pancakes, for always being willing to help us out. Good times and bad, thank you for being there. To my uncles Albert and Jack, thanks for the best 4th of Julys ever haha. To my aunt Medy, your lumpia changed my life forever, real talk haha. Shout out to my cousin Michael, been forever man. I still remember those Contra marathons with all of us huddled around your NES. To the rest of the fam that way, hope you're all well. To the 5 Rs—uncles Ron, Randy, Rob, Russ, and Roy… and all the cousins, I see you. To my uncles Russ and Roy, let's just say you held it down when it came to automobiles. Russ (and Robin), I can't thank you enough for your support with getting transportation when I first started this journey in college. I'm not quite sure how things would have turned out if not for the opportunities I had available to me simply because I had some wheels. From getting to class, getting to the research lab, getting groceries, to getting my future wife to the Shenandoah's Skyline Drive to watch sunset… To here. Priceless. Well, almost haha. I haven't forgotten ;) And Roy (and Dawn), the research behind this dissertation wouldn't have been possible without that VW, for real. Being able to get back and forth to project meetings, meetings with city officials and university faculty, and the airport; being able to pick up meeting supplies etc. And being able to pay project participants for their time—critically important for the principles of this work. None of it would have been possible without you. Thank you. Also, I gotta thank you for having mine and my brothers' backs when we were growing up. I still remember those days when you'd take us to the courts to play basketball or football, and how you'd stand up for us when some of the white kids/adults would give us brown kids a hard time. That right there truly is priceless, and I'll never forget that. To Shon, John, Johnna, Victor, Sean and my other "little" (thinking of Shaq

[6] Petteway, R (2003). On Stage. In: Petteway, R (ed), *Flowapeutic Vol. 1*. Oluponya Records.
[7] Petteway, R (2003). Where I'm From. In: Petteway, R (ed), *Flowapeutic Vol. 1*. Oluponya Records.

here, haha) cousins, and the rest of the Petteways, much love. Trying to do you and the name proud. Hope we can all kick it soon. When it's warmer of course… Pops, what up. You was right about these lemons.

Quick shout out to other side, RIP Corey and Nino, Chuck and Detox, Trey and Q; Lee (what up cuz!), G-pa James (don't worry, they'll say *I did it my way*), great G-pa (still your birthday boy), and great G-ma Woodard (much love; those little red cans of grapefruit juice and peanut butter graham crackers made me 300% smarter).

Definitely gotta acknowledge a few folks that I've met along the way who in one way or another held me down and helped bring this moment about. The UVA crew, quick shout out to RanDMC, Dare, P-Jack (stay low, keep firing), D-Holmes, and the rest. I'ma see you. The Michigan crew, what up Yusuf, Law, Natalie, Reiza, Wi, Wale, Sabes, S-Dilla, Goojitsu, KiSri, Nikwondo, Kyo, Anish, Morgan, Miguel, Maria, MeMary, and Sheila et al (2008)… Thanks for holding me down in various ways on those cold winter days. Now please do some work.

To the mentors/advisors that helped guide me to this moment, much respect and appreciation. Corey D. B. Walker, thanks for helping me find my way during those college years. Much love. Douglass Boettner, thanks for all the support and love you've shown me over the years, for showing me the ropes in the research lab, and for helping to guide my educational path. I guess it won't be Miami next time, but we're overdue for some mojitos. To the late John D. Arras, you fundamentally changed the way I think and see the world, research, ethics, and justice. For your support in my intellectual development and academic pursuits, thank you. To Cara James, Jomo Kassaye, and Marsha Lillie-Blanton, thank you for the opportunity to clarify my career path (and build my resume haha), and for the insight and guidance you provided during my time in DC.

To Melissa Valerio… likely wouldn't have made it through Michigan without you. I could never have asked for a better advisor/mentor. I can't describe enough how important it was for me to have someone who "got it", who knew the deal, as my advisor. Thank you for always being supportive and encouraging, and for being a lifelong mentor. I would say let's collaborate, but I don't mess with Texas haha. Derek Griffith… got a job for me? But seriously, what can I say. You've held me down and shown me love and support since day one, and have been fundamental to my development and academic success. The embodiment of a real mentor, for real. Knowing that I have you in my corner gives me a little more swag to get into this ring I'm about to enter. On that note, I'll probably be hitting you up soon... But thank you. No way I would have had the opportunity to file these pages without your guidance and support over the years. Looking forward to catching up soon. Also want to thank Barbara Israel for introducing me to this thing called CBPR, and George Kaplan for introducing me to social epidemiology. Game changers. I blame these 120 pages on you.

To B-more, what up. Quick nod to Caroline Fichtenberg, Alisa Aimes, and Michelle Spencer for the opportunity to do some real social determinants and health equity work, and sharpen my knowledge and skills when it comes to research and practice. Same goes to the *National Collaborative for Health Equity's* Baltimore PlaceMatters team, *Equity Matters*. Michael, Carol, Adrian, Yaz, Josh, Lorece Edwards, and Kim Sydnor— what's good. Hold it down. Shannon Cosgrove, keep doing your thing. Can't wait to see you in Cali again. To the CEASE collaborative, keep doing what you're doing. Thanks for the opportunity to be a part of the work and I look forward to staying connected. To the Carmelo Anthony Youth Development

Center, the residents of Douglass, PVG, Perkins, McCulloh, and Latrobe, I see you. And a special shout out to Jessica Ruglis. Thank you for being such an amazing friend, mentor, and colleague. Your work, brain power, edge, honesty, and candor are an inspiration, for real. Much love.

And California, what's good?! The DrPH crew, you know what it is. David, Alison, Anna, Evan, Kathi, Courtney, Victor, Sonia, Solange, Sara, and Kara… it's been real. Best of luck to you all. I'll def be seeing some of you soon—on the court, a barstool, or otherwise. Gotta add Irene ("Oh. That? You just type ', or' and it should work." Thanks haha!), Kimmi, Rachel (rendezvous at Vivi and Fred's, 2017?), and Joe to the mix too, what up!

A special thank you to Sandra Witt and Tony Iton of The California Endowment for the opportunity to gain some additional consulting/practice experience and training. Always amazed and inspired by the work you guys do there. Also, a quick shout out to Kaiser Permanente for the dope fellowship; to the people behind the Roselyn Lindheim Award, another dope fellowship; the Mayhew and Helen Derryberry Fellowship; and the UC Mentored Research Award. Muito obrigado.

To the faculty I had a chance to connect and interact with and learn from, thank you. To Carolina Reid for taking a genuine interest in my work, and also having a genuine interest in my learning and development. It seems rare to find professors who are so excited about teaching and invested in their students' growth. Thank you for your guidance and mentorship as I thought through this dissertation research, and for truly contributing to my growing understanding of community development and public housing policy and practice. I'm definitely hoping we get an opportunity to collaborate. To Malo Hutson for being supportive, open, and providing guidance from the jump-off. Scholar-mentors like you are far and few between. Seeing the quality and intersection of your work keeps me thinking and inspired, and I hope we stay connected and have a chance to work together in the future. To Darlene Francis… honestly one of my best experiences out here was sitting down in your class and seeing the energy, candor, insight, and criticality you brought from your work *and* your life into the classroom and your teaching. Just a rare sense of authenticity, realness, and passion. And I love me some epigenetics, so that was just all around dope. To Dr. Horton for the encouragement and affording the opportunity to stay connected with public health policy and practice. It was great to actually have some practice-oriented learning opportunities in our program, and your experience and insights were very much appreciated.

And of course I can't talk about practice and not talk about Cheri Pies. Truly a prototype for the research/practice lovers amongst us. I really can't express how important it's been to connect and discuss with you, to see your work and learn about your career trajectory, to witness how it's done—that research/practice thing haha. Thank you for all of your support and guidance, and for taking the time to really understand me, my work, my goals, and why I do/say it how I do/say it. To Merry Minkler, I can honestly say I wouldn't have even been in California if not for you. Not only your indirect impact through your work and scholarship, which has inspired me since I started in public health; but also your direct impact, through the encouragement and support you offered when I began to explore doctoral options. Your presence was a core factor in my decision to come out here, and having the opportunity to connect and co-teach with you immediately was incredible. I'm honestly not sure what I learned, and I'm honestly not sure what I contributed, but it was dope. Thank you for the experience, and for taking the time to provide guidance and direction during my time here. To

Len Syme... the #23 of social epidemiology haha. I might have you sign some high-tops for me. But seriously, I can't express how grateful I am to have had a chance to meet and discuss with you, to bounce ideas off you, to share my thoughts regarding social epidemiology—contents and discontents haha. You too were definitely fundamental to my decision to come all the way from the east coast. Thank you for your support, real talk, and encouragement, for sharing your experience and insight, for reading drafts and sketches and fragments, and for taking the time to invest in my development. I hope you like what you see in the pages below.

And now… Introducing… (think 1997 Chicago Bulls player intros) the H.C.I.C—the head committee in charge. A bastion of tough-love and committed awesomeness. To my advisor and dissertation chair, Rachel Morello-Frosch… I know you're probably tired of reading anything sent from an rjpway email address, so feel free to sit this one out haha (but it does look so nice in a PDF though). All the drafts, and cuts, and revisions, and edits, and comments, and feedback, and meetings, and emails, and phone calls… Thank you. For being supportive of this work, critical of its development, and genuinely interested in its success. For always being open, honest, and real, and for being generous with your time and patience. And for sharing with me your knowledge and experience, and for not discounting mine. To my qualifying chair, Amani Nuru-Jeter… thank you for one of the best experiences I had here—the qualifying exam! For real, though. I knew I wanted to connect and work with you before arrived here. And having the chance to take a course with you and see how you engaged students, ideas, concepts, theories, challenges, and faulty dry-erase markers… definitely needed you on the team haha. Thank you for sharing your perspective, knowledge, expertise, and time with me, and for showing me what, and who, a social epidemiologist can be. To my champion from day one (actually before that haha), Mahasin Mujahid... you've shown me nothing but love and support from the beginning. I don't know how many times I crashed by your office, unannounced, with no regard for the concept of office hours. Quite possibly the best meetings/discussions I've had here. You've always held me down, from analytic questions to conceptual inquiries to vexed circumstances. I can't thank you enough. For the realness and honest concern. For understanding my motivation, and appreciating my grind. For valuing my experience, and respecting my perspective. For strengthening my knowledge, and sharpening my thinking. I'm truly grateful. And don't look now, but I think we got something here. To Tapan Parikh… quite possibly the best decision I made was venturing over to the iSchool. Still don't really know, in any concrete terms anyway, what I've learned from it all, but I don't think I've ever been more excited to explore a new field. Your approach, style, perspective, and analytical lense are exactly what this work needed, and I'm grateful for the time you've invested in helping me think through and develop it. Thank you for taking an interest, for welcoming me into the *Local Ground* research group (what up everyone!), and, of course, reminding me what it means to represent haha. I hope I did it justice.

E por fim... Minha Jasmine, minha Aurelia haha. I hope I've chef-ed up enough meals, mixed up enough cocktails, washed enough dishes, and sent enough perfectly-timed texts over the last 4 years to make up for all the time I was in another mind frame. No way this gets done without your support of my passion, understanding of my motivation, and patience with my grind. If you're wondering if it's the last time in school: yes, is being my answer. Easy question.

Please excuse any typos; written on an android. ;)

INTRODUCTION

PLACE, HEALTH, AND PLACE-BASED STRATEGIES IN PUBLIC HOUSING

Place-based strategies are increasingly being turned to as options to improve health, education, and general life opportunities among poor and marginalized communities (HCZ, 2013; Whitehurst and Croft, 2010; NCHE, 2015; Maryland DHMH, 2013; TCE, 2013). This is especially true for residents of public housing, as many of the prominent place-based strategies in current practice are federal initiatives involving the Department of Housing and Urban Development (HUD), e.g. HOPE VI, Promise Zones, Choice Neighborhoods, and Sustainable Communities (HUD, 2013a; HUD, 2013b; USDE, 2013; HUD, 2013c; HUD, 2013d; HUD, 2013d). Public housing communities, particularly within urban settings, tend to be located within areas having particularly noxious built, social, economic, and natural environments (Popkin et al, 2002; Ruel et al, 2010). Moreover, research suggests that public housing tends to draw residents who already have health concerns prior to moving in—in other words, there appears to be health selection factor among residents of public housing that is presumably an artifact of their already vulnerable socioeconomic position (Ruel et al, 2010). Additionally, research suggests that public housing conditions themselves contribute to the poor health of residents, particularly among mothers (Fertig and Reingold, 2007). This leaves residents especially in need of interventions and policies aimed at improving health opportunity. Moreover, from a public health prevention and lifecourse perspective, place-based strategies involving public housing make intuitive sense—they're fixed, densely-populated communities and nearly 40% of residents are under the age of 18 (Harris and Kaye, 2004; Manjarrez et al, 2007; HUD, 2013e).

Overall, health status among public housing residents is much worse compared to the general population and to other low-income populations. Much of the related research is based on longitudinal work with a national sample of HOPE VI residents prior to and after revitalization or demolition/relocation efforts. For example, one HOPE VI tracking study found that 34% of adult residents reported having "excellent" or "very good" overall health (Buron et al, 2002), while another panel study by Popkin et al (2002) found it to be 38%—compared to 68% for the national population. And among older adults (i.e. over 62), just 10% of public housing residents reported "excellent" or "very good" health, compared to 39% of the national population. Popkin and colleagues also found that 39% of residents reported having a chronic disease, with asthma imposing a particular burden—22% of adult public housing residents reported having been diagnosed with asthma, more than twice the national average. Moreover, compared to national estimates, public housing residents were three times more likely to report having had an asthma attack in the previous year (Popkin et al, 2002). Additionally, their findings suggested that the prevalence of depression among adult public housing residents is 60% higher than national population estimates. Among children, the authors found asthma to be particularly problematic—25% of young children (age <6) in public housing had diagnosed asthma, over three times the national estimate, and they were almost three times more likely to have experienced an asthma attack in the previous year (Popkin et al, 2002).

Additional research by Howell et al (2005) found that residents of HOPE VI projects had worse health than not only the US non-poor population and the US poor population, but also residents receiving other forms of housing assistance (e.g. vouchers). Specifically, they found

that HOPE VI adult residents were significantly less likely to report "excellent" or "very good" health (37.7% vs. 48.7% for US poor), significantly more likely to report having an asthma diagnosis (21.8% vs. 15.2% for US poor), and, among those with asthma and a recent asthma episode, significantly more likely to report having visited the emergency department for asthma in the previous year (64.3% vs. 36.8% US poor). Their findings were similar among children, with children residing in HOPE VI faring significantly worse than other poor children and children benefiting from other forms of housing assistance.

Follow-up research in the chain of HOPE VI studies revealed that measures of residents' health status remained much worse than the overall US population. Harris and Kaye (2004) found that, in comparison to the overall US population and US black women overall, adults in public housing faired 1.5-4 times worse on measures of self-reported health and chronic disease.[1] Harris and Kaye's (2004) findings were duplicated in a second follow-up study by Manjarrez and colleagues (2007), in which the authors also found that mortality rates were much higher for HOPE VI women than they were for women nationally and black women nationally (e.g. 25 deaths per 1,000 vs. 7 deaths and 12 deaths per 1,000 among the 45-64 age group).

Unfortunately, there remains a paucity of public health research focused on the structural and place-based factors that adversely affect the health of residents of public housing. This lack of research not only limits our knowledge of the health status of public housing residents and how residing in public housing might influence health, but it also restricts our ability to understand how public housing fits into residents' larger geographic, social, political, and economic landscape as related to health. Understanding how the housing project fits into the broader context and geographic spaces of residents' lived "place" beyond the housing project boundaries is critical to evaluating and improving place-based health strategies involving public housing. Being able to do so would improve our ability to optimize spatial and social configurations of health assets and opportunities, while simultaneously minimizing negative place-based health exposures. In the context of place-based strategies involving public housing, this means understanding how the spatial location of the project fits within the daily *places* of its residents—where are the jobs, schools, parks, fresh food vendors, social hubs, pharmacies, health care providers, transportation hubs, and so on; what are the temporal, spatial, and social connections (or divisions) between these places; and where are the negative health exposures situated within these space-time configurations (e.g. at work, the walk to school, near the park). Thus, place-based strategies involving public housing would do well to critically assess and be responsive to the very person-centered spatiotemporal activity patterns of affected residents. This perspective would facilitate a more comprehensive understanding of health in public housing, and how to improve it, as well as ensure that place-based thinking maintains an appreciation for the individual and collective lived realities of residents—that is, a people-centered focus within place-based strategies.

If we want to fully understand and improve the health status of public housing residents, we need to fully understand how their place of residence is connected to and influences their larger place networks, as it is the total configuration of space- and time-specific

[1] The authors used US black women as a comparison because, as they note, 90% of the HOPE VI panel study sample was women and 89% were black. The authors also note the limitations of using such a comparison group.

exposures and opportunities that ultimately affects community health. The field of place-health research has grown rapidly in recent years (Ellen et al, 2001; Pickett and Pearl, 2001; Sampson et al, 2002; Riva et al, 2007; Santos et al, 2007; Diex-Roux and Mair, 2010), and is it well-suited to help understand health in the context of public housing. However, major conceptual and methodological challenges remain in defining "place", characterizing place contexts, and measuring place—all of which have implications for place-health research, public health practice, and the design and implementation of place-based strategies. Of particular need is work capable of revealing: 1) spatially- and temporally-specific configurations of place-based exposures and opportunities, 2) perspectives and influences of place across generations and over the lifecourse, and 3) opportunities for action to address place-based exposures that adversely affect community health.

Thus, the overall aim of this dissertation work was to conduct research, taking an intergenerational approach, at the nexus of public health and public housing by integrating participatory research methods and information communication technologies (ICTs) to democratize the research process and facilitate local action. In this spirit, this dissertation develops, introduces, and field-tests 3 interrelated and nested concepts that, in application, represent a model for inclusive and equitable social epidemiology: *A People's Social Epidemiology*, the *Placescape*, and *Geographies of Embodiment*.

ORGANIZATION OF THE DISSERTATION

Through the development and implementation of the *People's Social Epidemiology Project* (PSEP), this dissertation research integrates social epidemiological and community-based participatory research (CBPR) among youth and parents residing in public housing to further understand where and how place-based exposures are encountered, perceived, and experienced intergenerationally. This work seeks to expand and make novel contributions to research on health in public housing, and improve conceptual and operational understandings of "place" through identifying the spatial, temporal, and social connections between the places of residents' daily activities. Broadly, the aim was to capture spatially- and temporally-specific place-based exposures across generations to help elucidate the processes underlying the embodiment of place over time, with the goal of determining the space-time configurations of place exposures and opportunities that are particularly influential on health. This work is especially important for public housing residents because: 1) public housing residents are affected by severe health inequities, 2) there is a paucity of public health research aimed at understanding and addressing health inequities in public housing, and 3) public housing is at the core of the country's largest (by scale and funding) place-based strategies around health and opportunity.

The purpose of this work was to: 1) help guide thinking around the planning of place-based health interventions in the context of people's daily lives, especially public housing residents, 2) inform the future development of quantitative metrics for studying place effects on health (e.g. time- and location-specific), 3) elucidate considerations for, and implications of, intergenerational differences in place experiences and perceptions, 4) make contributions to both theoretical and practice-based literatures on place and health, especially that related to public housing, and 5) help bridge the gap between research and action through use of participatory process and methods to reveal participant concerns and identify action targets

(e.g. housing project built environment, school social environment, community food environment). Additionally, this work served as a community health assessment for a public housing community that had never completed one—in a city that had never completed a community health assessment and currently does not monitor indicators of community health equity. The aggregate work is presented here in three nested chapters.

First, ***Chapter 1*** introduces a conceptual framework for *A People's Social Epidemiology*—a multicomponent and tiered framework to guide social epidemiology research/practice to become more inclusive and equitable, improve knowledge translation, and facilitate timely, locally relevant action. The framework draws upon theory, concepts, and principles from social epidemiology, CBPR, and information and communication technologies for development (ICTD). This work specifically highlights place-health research as a subfield particularly suited for *A People's Social Epidemiology* approach, and the framework was accordingly "field-tested" through my development and implementation of the PSEP—an intergenerational CBPR study of place, embodiment, and health with residents of public housing with the following specific aims:

1) Determine the time- and location-specific health-related place exposures/experiences of youth and parents residing in public housing during a typical day/week within 5 Place Domains: *Home*, "*Neighborhood"*, *School/Work*, *Social/Leisure*, and *Transition Routes*

2) Characterize perceptions of how place-based exposures/experiences within the 5 Place Domains impact youth and parent physical, psychological, and emotional well-being

3) Assess the spatial and temporal differences of "place", and perceptual differences of place exposures/experiences, between youth and parents

For the PSEP, parent-youth dyads were recruited from a predominantly Black public housing community and trained in core principles related to social epidemiology and health equity, and fundamental aspects of public health research and CBPR. They were then trained in 4 participatory research methods: *Photovoice* (Wang and Burris, 1997; Catalani and Minkler, 2010), *Activity Space Mapping* (e.g. Perchoux et al, 2013; Matthews and Yang, 2013; Browning and Soller, 2014), *X-Ray Mapping* (see Ruglis, 2011), and *Participatory GIS*. All research methods were completed by the participants themselves. First, participants used *Photovoice* (via cellphones) to identify, photo-document, and describe their important daily places and specific exposures/opportunities within each place they perceive affects their health. Next, they used *Activity Space Mapping* to geolocate and map their *Photovoice* photos, identify any additional non-photographed places, and to rate and provide time estimates for each mapped place. Then, using a cognitive mapping method known as *X-Ray Mapping,* they created symbolic representations of place-embodiment reflecting how each of their mapped places affects their bodies/health. Finally, constituting *Participatory GIS*, they integrated and digitally mapped their work via a web-based multimedia-enabled ICT platform, *Local Ground* (Van Wart, Tsai, and Parikh, 2010). This platform allows participants to create, print, and digitally share their place-health research maps with the broader community and city officials.

Anchored in *A People's Social Epidemiology*, ***Chapter 2*** introduces the *Placescape* framework. The goal of the work presented here was to develop and field-test a place-health

framework that: 1) accounts for the multi-nodal nature of "place" and its contingent spatial, temporal, and social inter-nodal connections/divisions; 2) elucidates potential intergenerational and life-stage differences in place experiences/perceptions; and 3) explicitly engages the sociopolitical mechanisms that make, unmake, and remake place over time. A framework for a *placescape* approach was developed drawing from place-health, social epidemiology, participatory research, geography, and sociology literatures. This framework was then applied to the PSEP study, with parents and youth using the above combination of participatory methods to map their "placescapes".

Lastly, rooted in the *Placescape* framework, ***Chapter 3*** introduces the *Geographies of Embodiment* concept through detailing the process and findings of a novel cognitive mapping methodology to elucidate subjective notions of place-embodiment within place-health research—*X-Ray Mapping*. This work aims to enhance place-health research efforts by furthering our understanding of: 1) *which* places matter for health and *when* (i.e. spatially- and temporally-specific notions of "place"); 2) *how* these places matter—the processes/mechanisms of the physiological embodiment of place; and 3) intergenerational and life-stage differences in place-embodiment experiences/perceptions.

This combined work not only affords greater understanding of how, why, which, and when places matter for health and thus informs related theory and metric development, but it also reveals *what* matters most to residents (adults and youth) experiencing effects of place, and thus can guide social and political action that is place-, time- and factor-specific. Thus, this project holds promise for advancing the general field of place-health research, while simultaneously serving as a mechanism to facilitate local social and political action, guide local public health practice, and inform current and future place-based strategies involving public housing. It is hoped that the process and methods of the PSEP can not only serve as a model for how to critically engage residents of public housing to improve health, but also as model for how social epidemiology scientists and local public health practitioners can integrate participatory approaches into standard practice to enhance the "social" in social epidemiology.

REFERENCES:

Browning, C and Soller, B (2014). Moving Beyond Neighborhood: Activity Spaces and Ecological Networks As Contexts for Youth Development. *Cityscape*, 16 (1): 165–196.

Buron, L et al (2002). The HOPE VI Tracking Study: A Snapshot of the Current Living Situation of Original Residents from Eight Sites. Report for the US Department of Housing and Urban Development. Washington, DC: The Urban Institute.

Catalani, C and Minkler, M (2010). Photovoice: A Review of the Literature in Health and Public Health. *Health Education & Behavior*, 37 (3): 424-451.

Diez Roux, A and Mair, C (2010). Neighborhoods and Health. *Ann. N.Y. Acad. Sci*., 1186: 125-145.

Ellen, IG et al (2001). Neighborhood Effects on Health: Exploring the Links and Assessing the Evidence. *Journal of Urban Affairs*, 23 (3-34): 391-408.

Fertig, A, and Reingold, D (2007). Public housing, health and health behaviors: is there a connection? *J Policy Anal Manage*, 26: 831-859.

Harris, L and Kaye, D (2004). How are HOPE VI residents faring? Health. A Roof Over Their Heads, Brief 5. Washington, DC: The Urban Institute.

HCZ (2013). http://hcz.org/index.php, accessed 2/27/13.

Howell, EM et al (2005). The health status of HOPE VI public housing residents. *J Health Care Poor Underserved*, 16: 273-285.

HUD (2013a). HOPE VI program site accessed at http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/ph/hope6/about on 2/27/2013.

HUD (2013b). HUD Choice Neighborhoods program site: http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/ph/cn, accessed 2/27/13.

HUD (2013c). HUD Partnership for Sustainable Communities program site: http://www.sustainablecommunities.gov/aboutUs.html, accessed 2/27/13.

HUD (2013d). HUD Sustainable Housing and Communities program site: http://portal.hud.gov/hudportal/HUD?src=/program_offices/sustainable_housing_communities, accessed 2/27/13.

HUD (2013e). HUD resident characteristics report accessed at: http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/systems/pic/50058/rcr on 1/31/2013.

Manjarrez, C et al (2007). Poor Health: Adding Insult to Injury for HOPE VI Families. Washington, DC: Urban Institute.

Maryland DHMH (2013). HEZ program site accessed at http://dhmh.maryland.gov/healthenterprisezones/SitePages/About_Hez.aspx on 2/27/2013.

Matthews, S and Yang, T (2013). Spatial Polygamy and Contextual Exposures (SPACEs): Promoting Activity Space Approaches in Research on Place and Health. *Am Behav Sci*, 57 (8): 1057–1081.

NCHE (2015): National Collaborative for Health Equity, Place Matters Initiative: http://nationalcollaborative.org/?q=node/37, accessed 9/30/2015.

Perchoux, C et al (2013). Conceptualization and measurement of environmental exposure in epidemiology: Accounting for activity space related to daily mobility. *Health & Place*, http://dx.doi.org/10.1016/j.healthplace.2013.01.005

Picket, KE and Pearl, M (2001). Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *J Epidemiol Community Health*, 55: 111–122.

Popkin, S et al (2002). HOPE VI Panel Study: baseline report. Report to The Annie E. Casey Foundation, The John D. and Catherine T. MacArthur Foundation, and U.S. Department of Housing and Urban Development. UI No. 07032. Washington, D.C.: The Urban Institute.

Riva, M et al (2007). Toward the next generation of research into small area effects on health: a synthesis of multilevel investigations published since July 1998. *J Epidemiol Community Health*, 61: 853–861.

Ruel, E et al (2010). Is Public Housing the Cause of Poor Health or a Safety Net for the Unhealthy Poor? *Journal of Urban Health*, 87 (5). 827-838.

Ruglis, J (2011). Mapping the biopolitics of school dropout and youth resistance. *International Journal of Qualitative Studies in Education*, 24 (5): 627-637.

Sampson, RJ et al (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28: 443-478.

Santos, SM et al (2007). Association between contextual factors and self-rated health: a systematic review of multilevel studies. *Cad. Saúde Pública*, Rio de Janeiro, 23 (11):2533-2554.

TCE (2013). The California Endowment, Building Healthy Communities program site: http://www.calendow.org/healthycommunities/, accessed on 2/27/13.

USDE (2013). Promise Neighborhoods program site accessed at http://www2.ed.gov/programs/promiseneighborhoods/index.html on 2/27/2013.

Van Wart, S, Tsai, KJ and Parikh, T (2010). "Local Ground: A Paper-Based Toolkit for Documenting Local Geospatial Knowledge". *ACM Symposium on Computing for Development* (DEV), London, UK December 17-18, 2010.

Wang, CC and Burris, MA (1997). Photovoice: Concept, Methodology, and Use for Participatory Needs Assessment. *Health Education & Behavior*, 24(3): 369-387.

Whitehurst, G and Croft, M (2010). The Harlem Children's Zone, Promise Neighborhoods, and the Broader, Bolder Approach to Education. Brown Center on Education. Washington, DC: The Brookings Institute.

CHAPTER 1

TOWARDS A PEOPLE'S SOCIAL EPIDEMIOLOGY:
ENVISIONING A MORE INCLUSIVE & EQUITABLE FUTURE FOR SOCIAL EPI RESEARCH & PRACTICE IN THE 21ST CENTURY

Abstract

Social epidemiology has made critical contributions to understanding population health. As an applied field, it is meant to study the social production of health, not simply for the sake of science, but to inform action to improve underlying social conditions that create, incubate, and/or exacerbate inequities in health. *However, translation of social epidemiology science into meaningful action continues to be a challenge for scientists and practitioners, raising concerns about the tangible impacts of the field beyond the academic realm.* With so much focus within the field on issues related to social position, discrimination, racism, power, and privilege, there has been surprisingly little deliberation about the extent and value of *social inclusion and equity within the field itself*. Indeed, the challenge of translation/action might be more readily met through re-envisioning the role of *the people* in the research/practice enterprise—reimagining what "social" could, or even *should*, mean for the future of the field.

A path forward for this "re-envisioning" is promised at the nexus of social epidemiology, community-based participatory research (CBPR), and information and communication technology (ICT). Social epidemiology rooted in CBPR that makes use of available ICTs presents as an opportunity to enhance the "social" in social epidemiology and democratize the research enterprise to improve prospects for translation. The following work outlines a framework for *A People's Social Epidemiology* which seeks to bridge the divide between social epidemiology and its people by integrating social epidemiology science and social action to address the social production of health. The framework draws upon theory, concepts, and principles from social epidemiology, CBPR, and ICT, and is intended to challenge and enhance current paradigms of research and practice. It is presented not to minimize the centrality of other recently proposed "paths" for the future of social epidemiology, but in the belief that all paths benefit greatly from the people's active involvement, and that prospects for action, change, and tangible benefit are greatest when social epidemiology is something of, for, and by the people—and not simply about them.

Introduction

"Do epidemiologists and other public health professionals have a responsibility to ask whether the ways we think and work reflect or contribute to social inequality? Proponents of socially responsible science would answer yes. What say you?" (Krieger, 1999, p.1152)

Social equity and inclusion have become cornerstone considerations within public health research and practice in recent years, in part due to the increasing prominence of social epidemiology. In the most basic sense, the field is dedicated to the study and characterization of the social production of health and illness. From its early roots in the works of Louis-Rene Villerme and Rudolf Virchow (Ackernecht, 1953; Coleman, 1982; Krieger, 2011), and similar work by Engels and Chadwick (Engels, 1987; Hamlin, 1998; Krieger, 2011), to seminal moments like the notion of generalized susceptibility (Cassel, 1976) and the distinction between causes of "cases" and causes of "incidence" (Rose, 1985); to the demonstration of a "social gradient" in health across social classes (Marmott, 1984), and the concepts of "fundamental causes" (Link and Phelan, 1995) and "weathering" (Geronimus, 1992)—social epidemiology has continued to grow increasingly nuanced, refined, and capable of elucidating how the social world shapes patterns of, and prospects for, health. And despite all the debates about its weaknesses and limitations, some of which are ongoing (Kaufman and Cooper, 1999; Muntaner, 1999; Krieger, 2000; Oakes, 2004; Diez-Roux, 2004), it is fairly safe to say that the field has left an indelible mark on how we understand and approach public health in both research and practice, adding critical empirical and theoretical contributions that have fundamentally altered how we see and study health and its determinants (Syme and Berkman, 1976; Krieger, 1994; Lynch et al, 1998; McMichael, 1999; Kaplan et al, 2000; Berkman and Glass, 2000; Williams and Collins, 2001; Jones, 2001; Diez-Roux, 2004b; Geronimus et al, 2006; Lynch and Davey-Smith, 2005; Galea et al, 2011). Nevertheless, concerns remain about the relevance and impact of social epidemiology in current and future practice (Kaplan 2004; Galea and Link, 2013), and much reflection is warranted in regard to what social epidemiology is and what it could, or even *should*, be.

This paper begins with a discussion of recent debates regarding social epidemiology and its future, problematizing the absence of attention given to matters of inclusion, equity, and participation of *the people* within the field—*the people*, here, being research participants and their communities who are traditionally conceptualized as "N's" or potential "N's". This is followed by a discussion of ecosocial theory (Krieger, 1994) and its suitability as a foundation for envisioning *A People's Social Epidemiology*. Specifically, notions of agency, accountability, and the social production of science are discussed in light of the social epidemiology field. Then, the core elements of *A People's Social Epidemiology* are presented as a scaffolding framework: 1) Social Epidemiology + Community-Based Participatory Research, 2) Social Epidemiology + Community-Based Participatory Research + Information and Communication Technologies, and 3) Social Epidemiology + Community-Based Participatory Research + Information and Communication Technologies + Local Institutionalization. The inclusion and framing of these core elements is based upon five interrelated key premises:

1) Social epidemiology as a scientific institution is simultaneously implicated in the mitigation *and* the incubation of the social inequity it studies;

2) Social epidemiology, as an applied science, should produce actionable knowledge to improve the social conditions that affect health;
3) Proactive and equitable inclusion of the people in social epidemiology research and practice can help improve research questions, design, implementation, policy reach, and relevance;
4) Engagement of the people as collaborators and political constituents with agency can more readily facilitate the translation of social epidemiology research into action; and
5) Equitable inclusion of the people within social epidemiology can help build local capacity, improve prospects for sustainable local social epidemiology research/practice, and create opportunities for the training of future social epidemiology scientists.

This paper closes with a discussion of what *A People's Social Epidemiology* might look like in practice.

The State of Social Epidemiology and its (dis)Contents

Social epidemiology continues to make significant contributions to understanding determinants of population health. The impacts of these contributions, however, continue to be observed within the academic realm at a pace that dwarfs impacts within the policy realm. This is understandable, as the field deals with complex and seemingly intractable social issues, such as class inequality, poverty, and racism. Social epidemiology research translation, not surprisingly, is a real challenge—a challenge that may in part hinge upon the nature of the social epidemiology standard procedure.

Ironically, examination of the social epidemiology field reveals that most work is done in ways that preclude the agency of *the people*—the study participants and communities in which they reside (the so-called "N's)—and obscure pathways for translation. Research participants are viewed and valued primarily *as* data points, not as political constituents and social actors that could help explain or intervene *on* the data and its determinants. Common practice is to draw samples from communities with disparate social, cultural, and/or political contexts—such that findings may be generalizable in a broad sense, but may not yield actionable findings for specific communities. Even when relevant, results are often not directly applicable and/or practicable within the political jurisdiction and social context from which "N's" are selected. This may be in part because research is routinely conducted in social and political isolation (e.g. at a desk using secondary data), with only minimal contact and interaction (if any) with the researched communities, and even less engagement with the social and political realities of public health policy and practice within their jurisdiction. Whatever the case, findings often are not immediately acted upon, with a focus on publication in the scientific literature (which can take years) as the primary and often only means of dissemination. Furthermore, the "generalizable knowledge" produced through these practices is generally inaccessible to the communities upon whom it is based—published studies are written at a grade-20 reading level in pay-for-access journals to which "N's" (and their local health departments) do not have access. Research benefits accrue most directly to scientists (e.g. publications, more grant funding, enhanced tenure prospects), and only generically to the public via the creation of "knowledge". Indeed, as it currently stands, "social" epidemiology is ironically quite privatized. In essence, a field dedicated to understanding the *social production of health* struggles to critically engage the *social production of its science* and the *social value* of its findings. Nonetheless, social epidemiology continues to blossom and, with rare exception (Schwab and Syme, 1997; Leung et al, 2004; Syme, 2004; Lantz et al, 2006; Wallerstein, Yen, and Syme, 2011), very little has been said about the role of *the people* in regard to the future of the field and its value/relevance in facilitating social action on the social production of health. And based on recent exchanges within the field, much deliberation remains warranted in this regard.

In one series of recent articles, a group of social epidemiologists shared a discussion regarding "six paths for the future of social epidemiology" (Galea and Link, 2013), to outline how social epidemiology can remain "distinct and useful" (p.2). The resultant exchanges centered mostly on methodological and mechanistic considerations. For example, emphasis was placed on improving analytical techniques and developing novel methodological approaches to better establish social mechanisms and causal pathways (Galea and Link, 2013;

Glymour et al, 2013; Oakes, 2013; Muntaner, 2013), as well making use of improved computational powers and data system technology (e.g. "big data") (Glymour et al, 2013; Galea and Link, 2013). Some raised caution about the overly empiricist approach currently favored within social epidemiology, noting that new/more data and complex methods will not necessarily advance the field (Muntaner, 2013). Additional insights were offered in regard to recurring conceptual and theoretical concerns within the field, namely the need to improve work on macro-social determinants and increase our understanding of reciprocal relationships across multiple levels, to double-down on the examination of intergroup differences, and to continue pressing for sound theory to guide social epidemiology research (Galea and Link, 2013; Muntaner, 2013; Oakes, 2013). Also of critical importance was the call for a more practicable and actionable social epidemiology research, with a key understanding that social epidemiology is a social science, and as such, is "meant to produce knowledge that can be used for social change" (Muntaner, 2013 p.5). In this spirit, some called for use of specific and modifiable exposure levels to more clearly guide research translation into intervention possibilities (Glymour et al, 2013). Others, however, suggested taking a "realist" approach that engages larger questions capable of uncovering underlying social mechanisms, and not settling for simple associations (Muntaner, 2013). Regardless of the route taken, as stated simply by Glymour and colleagues (2013, p.1), "if we fail to translate research findings from academic journals to human health, the field is irrelevant".

In another volume of recent essays, a different group of social epidemiologists weighed in with their thoughts on how to "rethink social epidemiology" (O'Campo, 2012). The focus in this collection of essays was quite divergent from, though very much complimentary to, the "six paths" collection. While some pieces extended discussion on topical methodological and conceptual concerns within social epidemiology, especially those related to place-health research (Shankardass and Dunn, 2012; Yen et al, 2012; Shankardass, 2012), a noticeable and much needed amount of attention was given to deliberation over the role of values and politics in social epidemiology research, practice, and translation (Bayoumi and Guta, 2012; Murphy and Farfard, 2012; Muntaner, 2012), and whether the field is generating the "right kind" of practicable and actionable evidence (Mowat and Chambers, 2012; O'Campo and Dunn, 2012). Similar to views expressed by Glymour and colleagues (2013), a recurring theme in this volume was that "the products of social epidemiology must be rendered more relevant to public health and knowledge about social determinants must be put more readily into action" (Mowat and Chambers, 2012, p.318). This theme is inextricably linked to concerns raised over values (e.g. social, political) in social epidemiology, not only because values shape social epidemiology research funding priorities, research questions, design decisions, method choices, analysis plans, and reporting norms (e.g. pay-for-access journals), but perhaps more importantly because values play an integral and often underappreciated (if not entirely ignored) role in knowledge translation for policy and social action purposes (Bayoumi and Guta, 2012; Murphy and Farfard, 2012). As noted by some, social epidemiology in its current state, "by being overly descriptive and focused on methods, becomes almost irrelevant to policy efforts to reduce inequalities in health" (Muntaner, 2012, p.177). If this remains the case for social epidemiology moving forward, it begs a fairly simple question—what are we really doing here?

The insights, ideas, concerns, and visions communicated in each of these series represent very relevant and important facets for the field to engage and improve upon going

forward. The exchanges certainly highlighted some key methodological, mechanistic, and conceptual challenges and promises within the social epidemiology field, and it is clear that the field is in good hands, even if just half of the ideas articulated are actively pursued over the next ten years. However, there is an idea or notion that arguably belies all of these contributions that failed to garner any attention at all—there was not a single substantive discussion of equity, inclusion, or participation of *the people* within the social epidemiology research and practice enterprise. Indeed, discussions regarding social epidemiology and its relevance in *practice* and for *policy* and *action* (Mowat and Guta, 2012; Glymour et al, 2013; O'Campo and Dunn, 2012), failed to mention anything about the people whose voice and collective power is of ultimate importance in such practice, policy, and action.

This article submits that, in the end, perhaps more than anything else, "what's wrong with social epidemiology" is that it is, in fact, not very *social* at all. With so much focus within social epidemiology on issues like social position, discrimination, racism, power, and privilege, researchers and practitioners have remained curiously silent in regard to how the social epidemiology field itself is complicit in the reproduction and maintenance of related social inequity. The irony of the ever-increasing social gap between social epidemiology researchers and social epidemiology "N's" should not be lost here, nor should the ever-increasing gulf between social epidemiology *publications* and social epidemiology *public action*.[2] At some point it would seem necessary to ask whose interests, exactly, is social epidemiology most immediately serving? And who is doing social epidemiology, and for whom?

[2] Not to mention that health inequities based on some of the most common social indicators, e.g. income, class, race, are actually *increasing* (Berkman, 2009).

The Makings of a People's Social Epi

I. The People and Social Epidemiology: Reconnecting with "Demos"

As social epidemiology moves further into the 21st Century, it is a sad truth that the people have a place within the field only in name, quite literally. "Demos"—Greek for *the people.* Of course, there have been numerous critiques of social epidemiology calling for a greater emphasis on the development of sound theory for the field (McMichael, 1999; Muntaner, 1999; Krieger, 2001; Kaplan, 2004). Of those advanced, not a single one has articulated a role for the people beyond that of research subject, and only one has engaged notions of agency, accountability, and the social production of social epidemiology science: ecosocial theory (Krieger, 1994; 2001). Accordingly, it seems only fitting that *A People's Social Epidemiology* be rooted there.

Ecosocial theory was first articulated by Krieger (1994) to integrate the full spectrum of processes and levels that influence health, from the sociopolitical structural forces of societies down to the physiological processes and molecular mechanisms of cells. As described by Krieger (2001, p.672), the ecosocial approach "fully embraces a social production of disease perspective while aiming to bring in a comparably rich biological and ecological analysis." Additionally, ecosocial theory situates health and its determinants within a historical, generational, and lifecourse perspective. The core constructs of ecosocial theory include: 1) *embodiment*, 2) *pathways of embodiment*, 3) *cumulative interplay between exposure, susceptibility, and resistance,* and 4) *accountability and agency*. While each of these constructs is of course relevant, the second and fourth constructs are of particular focus here.

Pathways of embodiment are the underlying "societal arrangements of power and property and contingent patterns of production, consumption, and reproduction" that influence health within "constraints and possibilities of our biology" (Krieger, 2001, p.672). That is, the ways in which social inequality, power imbalances, and resource inequities shape and constrain life opportunities and health exposures with consequent effects on our physiologic functioning. Within the context of current social epidemiology research practice, it is clear that the current "arrangements" are not designed with inclusion and equity in mind, but rather predicated upon the assumption that social epidemiology research is best done by a privileged few—and done alone. The people are merely subjects, studied by credentialed outsiders possessing a power, status, and resource profile that is polar opposite to their own. But we have somehow managed to imagine social epidemiology as being outside of social patterns of production, consumption, and reproduction, and have accordingly failed to interrogate its rather blatant inequitable state. If social processes, such as research and the discursive practice of public health science, constitute pathways of embodiment, then social epidemiology is seemingly taking a treadmill path to its future—simultaneously studying and reproducing social inequity.

This state of affairs is directly linked to *agency and accountability*. This construct is anchored in considerations of who is responsible for shaping and maintaining the societal arrangements of power, resources, and opportunity, and thus accountable for consequent health inequity. This construct also encourages considerations for and of all entities as actors with varying degrees of knowledge, expertise, and power whose expressions and

manifestations are implicated in either the maintenance of or challenge to current conditions (Krieger, 1994; 2001). In other words, this construct challenges us to think critically about responsibility and culpability in regard to health inequities, and to assess balances of power in regard to whose voices and knowledge are valued and legitimized. Again, within the social epidemiology field, it is clear that current arrangements favor credentialed researchers seeking primarily to answer research questions (with potentially generalizable findings), not solve locally experienced and embodied social problems. In current form, social epidemiology does not evidence any real commitment to acknowledging, complimenting, facilitating, or enhancing the agency of the people (neither study participants nor those in the sampled community), nor does its standard procedural array accommodate such agency (e.g. non-participatory survey-based research). This approach to conducting social epidemiology research curtails prospects for timely social action and meaningful social change, especially that which could be realized at a local level within the communities from which the people are recruited. Appropriately realized, *agency* of the people could prove an invaluable asset to the field.

However, instead of critically engaging people and communities as actors and political constituents, the pervading social epidemiology paradigm situates the people and their communities as subjects and social phenomena. Instead actively creating opportunities for the people to participate in and shape the field, we tend to keep the people at arms-length and reinforce their role as passive participants. Expertise presumably rests only with the credentialed researchers, who leverage existing positions of power and privilege to study inequities of power and privilege, the result of which is the accumulation of more power and privilege for those engaged in the scientific enterprise—more publications, more grants, more social prestige and capital—all of which can currently be obtained and maintained without demonstrating that the social epidemiology work completed has tangibly benefited the actual people from whom the work was derived. The creation of generalizable knowledge is deemed sufficient. Thus, in addition to, and perhaps a result of, shortcomings in regard to agency, there also appears to be little social *accountability* in our beloved field.

Taken together, the principles represented by these two constructs from ecosocial theory, if applied *to the social epidemiology field itself*, offer a way forward for envisioning *A People's Social Epidemiology*. These constructs challenge us to critically appraise not only the role of the people, but also the roles and responsibilities of researchers and practitioners—as the very process of *doing* social epidemiology research is an opportunity to engage questions of agency and accountability. As Krieger notes, ecosocial theory "directs attention not only to the social production of disease, but also the social production of science." Indeed, social epidemiology represents not only a process to study social inequities in health, but also an avenue to redress inequity in the production of science and knowledge. Social epidemiology could stand to benefit greatly by us taking a step back and interrogating its current state in this regard. What is at stake in reproducing social exclusion and inequity within the field, and how can social epidemiology practice what it preaches?

The growing prominence of community-based participatory research (CBPR) and the increasing utility and uptake of information and communication technologies (ICTs) afford the opportunity to move towards a more inclusive and participatory social epidemiology—an avenue to democratize social epidemiology research/practice. In short, what we have before us is an opportunity to revise, remix, reprogram, and reboot social epidemiology with inclusion,

equity, and action built into its fundamental operating code. It is a chance to reimagine "social", and to revisit and recast Virchow (in a very paraphrased sense): what social epidemiology needs is full and unlimited democracy. The following sections sketch a framework for bridging the divide between social epidemiology and its people—and hence the divide between social epidemiology science on one hand, and timely social action on the social production of health and illness, on the other.

II. Participation and Social Epidemiology: Integrating CBPR

> "More than other subfields, social epidemiology is uniquely placed to benefit from partnerships to help generate new questions and to ensure findings are used to inform population health interventions" (Muntaner, 2013, p.855).

Despite the explicit focus of social epidemiology on studying how social processes and conditions affect health and well-being, very little has been said about the process of *doing* social epidemiology, and how the practice of social epidemiology might itself be modified to be more equitable and socially inclusive. It has been almost two decades since initial concerns over the state of social epidemiology in regard to inclusion and participation were raised (Schwab and Syme, 1997). These concerns have since been re-presented on occasion (Leung et al, 2004; Wallerstein, Yen, and Syme, 2011), but, based the current state of the field and on the direction of the recently articulated social epidemiology agenda for the future, they have received only minimal traction. Nonetheless, given the nature of social epidemiology research questions and espoused goals (policy, action, social change etc.), critical engagement and sustained collaboration with the communities actually experiencing health inequities would seem fundamental. The growing prominence and legitimacy of community-based participatory research is an opportunity that should not be discounted here.

Community-based participatory research (CBPR) has been a core element of much public health research in the last few decades, and is an indispensible approach for taking serious action to address health inequities (Gebbie et al, 2003; Cashman et al, 2008; Mercer and Green, 2008; Wallerstein and Duran, 2010). Seen as more of an orientation to research than a method or set of methods, CBPR is generally characterized by equitable, collaborative, and mutually beneficial engagement between outside researchers, community residents, and other local stakeholders in the research process, from start to finish (Israel et al, 1998; Israel et al, 2010; Minkler, 2010; Wallerstein and Duran, 2010). At its core are principles concerning equity, power, empowerment, and notions of knowledge and expertise. Specifically, CBPR differs from traditional research approaches (including those applied in most social epidemiology work to date) by: 1) involving equitable participation and co-learning among study participants and academic partners, 2) building on community strengths, assets, knowledge, and expertise, 3) fostering participant empowerment and local capacity building to address the factors under study, and 4) balancing research and action.

As noted by Israel et al (1998), participatory research approaches have had various names and iterations over the years. Whatever the name, a defining element is that participants and researchers equitably engage with an explicit objective to take action and effect social change through the process and findings of the research (Minkler, 2000). Methods employed to realize this objective can be both qualitative and quantitative, with the emphasis

being that the people actively participate in each method and that their perspective is at the core (Brown, 1992; Brown, 1997; Wing, 1998; Israel et al, 1998; Corburn, 2005; Corburn, 2009). CBPR also facilitates capacity building, empowerment, and agency and action based on critical reflection (see for example Wallerstein et al, 2007; Freire, 1970; Freire, 1982).

In light of the espoused goals within the social epidemiology field, seriously entertaining CBPR notions related to equitable engagement and capacity building for action would appear to be not only necessary, but indispensible. Moreover, critically engaging the people as co-learners and co-researchers, and building upon and enhancing various realms and levels of expertise and knowledge (taking the social production of social epidemiology science seriously), would also appear integral given that the intention is to conduct *relevant* and *actionable* research. Policy impact, action, and social change are social epidemiology goals that require more than surveys, secondary data analysis, and publication of associations—they require working with people. As the recent discussions regarding social epidemiology's future touched upon (Glymour et al. 2013; Mowat and Chambers, 2012; O'Campo and Dunn, 2012), the field is essentially failing if its ever-increasing body of science/knowledge is not similarly matched by ever-increasing action on that science/knowledge. The role of social values and politics in this process should not be discounted (Atwood, 1997; Oliver, 2004; Bayoumi and Guta, 2012; Murphy and Farfard, 2012; Liverani, 2013; Muntaner, 2013; Morgan-Trimmer, 2014; Smith, 2014). We should consider ourselves fortunate that CBPR is indeed established and respected as a research orientation, as it naturally complements social epidemiology goals and can help ensure that considerations for social values and the realities of knowledge translation (e.g. for policy) are taken seriously within social epidemiology research/practice (Bayoumi and Guta, 2012).

Furthermore, a CBPR orientation is a natural framework in which to anchor social epidemiology because of its focus on insider/outsider collaboration, co-learning, and the co-production of scientific knowledge for mutual benefit. CBPR seeks to create and maintain an equitable arrangement between researchers and participants/community members, such that power and control are shared throughout the process, and benefits do not accrue in a manner that disproportionately favors outside researchers. In other words, CBPR ensures that research processes and products do not actively create, maintain, or exacerbate inequity between researchers and those being researched. Therefore, anchoring social epidemiology research practice in a CBPR framework is just one way social epidemiology can "walk the walk", so to speak, in regard to taking action on social inequity.

Moreover, social epidemiology has a strong focus on social processes that are difficult to capture, measure, and act upon. Grounding social epidemiology research in CBPR affords opportunities to improve social epidemiology science in this regard (Leung et al, 2004; Lantz et al, 2006; Wallerstein, Yen, and Syme, 2011), particularly because CBPR approaches can: 1) enable the development of sharper, more refined and relevant research questions; 2) improve research design and implementation strategies; 3) improve data collection and analysis; 4) afford broader reach for dissemination of findings; 5) provide an explicit and more direct link to knowledge translation and social action; 6) increase local capacity to sustain research and change efforts. The value of CBPR in addressing translational challenges, particularly in relation to these last three points, has been articulated elsewhere (Wallerstein and Duran, 2010), with

the takeaway being that CBPR is ideally suited to improve social epidemiology research translation for health equity.

One promising example is the collaborative work done by Schulz and colleagues around healthy neighborhood environments and local social determinants of health (Schulz et al, 2005a; Schulz et al, 2005b). This long-standing community-academic CBPR collaboration has actively engaged local community groups and individual residents in all aspects of the research-action continuum—from deciding what should be researched and survey instrument development, to data collection, analysis, and results dissemination. Their work embodies what notions of co-researcher relationships and co-production of scientific knowledge entail, and the explicit commitment to building sustainable local capacity and prioritizing locally experienced and actionable issues make it a model for growing similar social epidemiology/CBPR collaborations. These characteristics, along with the power-sharing and transparency within the collaboration, exemplify what taking agency, accountability, and the social (co)production of social epidemiology science seriously might look like in practice.

Another approach to anchoring social epidemiology to principles reflected in CBPR is *popular epidemiology* (Brown, 1997). A core notion within popular epidemiology is that local knowledge, ways of knowing, and expertise are to be valued and respected in the same manner as standard outsider "objective" knowledge and expertise. Moreover, the purpose for commencing epidemiological inquiry is based on taking action on the factors affecting the lives of residents where the research is actually being conducted. As articulated by Brown (1997, p.139):

> "Popular epidemiology…is a broader process whereby lay persons gather data, and also collaborate with experts… [I]t is more than public participation in traditional epidemiology since it usually emphasizes social structural factors as part of the causal disease chain. Further, it involves social movements… and challenges basic assumptions."

The notion of popular epidemiology as a "citizen science" is well suited for application in a CBPR framework, especially within social epidemiology work aiming to alter the social production of health via policy and social action—people as "citizens", in the political constituent sense. The natural synergy between popular epidemiology and CBPR has been highlighted before (Leung et al, 2004)), and indeed it has been presented as an opportunity to improve the social epidemiology field in regard to producing more practicable and actionable science/knowledge (Lantz et al, 2006).

Of course, not every type of social epidemiology research lends itself naturally to a CBPR approach. However, many research endeavors involving primary data collection within single localities, or multiple localities with defined geographic areas, could benefit immensely. Within current social epidemiology research practice, studies within the subfield of place-health research represent perhaps the most promising and logical place to move towards this approach. Place-health research has grown rapidly over the last decade or so (Ellen et al, 2001; Picket and Pearl, 2001; Sampson et al, 2002; Riva et al, 2007; Santos et al, 2007; Diez-Roux and Mair, 2010), with a growing body of work examining topics ranging from neighborhood food environments, to community built and social environments, to residential segregation. Regardless of the topic, all of this work is dedicated to examining contextual factors and elements that communities experience and embody on a daily basis, and much of this work has

focused on singular cities and/or discrete "places", e.g. a "neighborhood" defined by census tract boundaries (Diez-Roux and Mair, 2010; Leal and Chaix, 2011). This makes place-health research particularly well-suited to incorporate and benefit from community-based approaches. Such integration is an opportunity to leverage the *practical and procedural* translational advantages of much place-based research (e.g. space-bound, locality and jurisdiction-specific), while simultaneously capitalizing on the *scientific and political* translational advantages of harnessing place-based knowledge, insight, and expertise of the people whose lives unfold within the "place" being studied. Moreover, collaborative and participatory place-based social epidemiology, coupled with inclusive and equitable access to related data, could prove pivotal to local research translation and action efforts that frequently hinge upon local politics and agenda setting (Mowat, 2012, p. 319; Smylie et al, 2012; O'Campo and Dunn, 2012; p.6; NACCHO, 2014). Within the standard approach to place-health research, opportunities abound for local collaboration with community groups, schools, and health and policy officials to more fully and equitably include the people in a manner which embraces and enhances their agency and more readily facilitates translation of research into local action and policy change.

III. Socializing Social Epidemiology: Incorporating ICTs

In order for social epidemiology to fully maximize the value and utility of CBPR, it is important to explore concrete mechanisms and tools that amplify the *community* and streamline the *participatory* in the research process. In other words, we need to explore ways to facilitate the social epidemiology/CBPR linkage to better address the challenge of inclusion and equity.

The rapidly developing and evolving field of information and communication technology (ICT) presents an opportunity to frame and address this challenge. ICT encompasses the development, use, and evaluation of communication devices/applications (referred to as ICTs)—such as television, cell phones, internet—that create, store, and facilitate access to and transfer of information. Existing and emergent tools, devices, and platforms offer a range of possibilities for enhancing the "social" in social epidemiology. Specifically, the rise of affordable smartphone technologies with camera and internet capabilities, the development and integration of open-source tools and interactive social media conduits, and the increasing availability of applications that lend themselves to "crowdsourcing" approaches, could potentially be harnessed as low-cost and highly-accessible avenues to facilitate critical engagement of the people and uplift community voice in social epidemiology research/practice. In other words, ICTs represent what could be a readily available way to bridge social epidemiology and CBPR processes and principles. Perhaps the most useful and relevant conceptual and theoretical groundings for the design and use of ICTs stem largely from a subfield referred to as *ICTD* (or ICT4D)—information and communication technology for development. ICTD has a particular focus on the role and value of ICTs within the context of social, economic, and human development, with an eye toward facilitating equitable accessibility and benefit. While this subfield is relatively new (Heeks, 2006; Parmar, 2009; Anderson and Hatakka, 2013; Karanasios, 2014), there exists a general consensus within ICTD circles that ICTs are capable of both improving *and* worsening prospects for human

development and social equity, and that their use should accordingly be guided by considerations of ethics and equity, from design and implementation, to impact and evaluation (Burrell and Toyama, 2009; Avgerou, 2010; Dearden, 2012).

Within the growing body of ICTD literature, there are a few lines of discourse that are particularly useful in guiding how to link social epidemiology and ICTs, and framing why such a linkage is not only timely and practical, but also intuitive both theoretically and scientifically. One line of discourse regarding the development, use, and role of ICTs in development and social equity work is that related to Sen's *human capability* approach (Sen, 1999; Gigler, 2004; Kleine, 2010; Hamel, 2010; Oosterlaken and van den Hoven, 2011; Smith et al, 2011). Here, *development* is the process of increasing/strengthening the freedoms people have to make choices regarding their personal, social, economic, and political lives, and their ability to exert control/express agency within each of these realms. Within this approach, people have: 1) "functionings"—things they value *doing* (e.g. working, eating, voting, playing soccer), and things they value *being* (e.g. employed, healthy, educated, respected); and 2) "capabilities"—dynamic and alternating combinations of functionings that vary in degree of feasibility and achievability (Sen, 1999; Kleine, 2010). These functionings and capabilities are often predetermined, constrained, delimited, or otherwise shaped by larger social and political forces (in which social epidemiology is well-versed, e.g. Navarro and Shi, 2001; Raphael, 2011; Chung and Muntaner, 2006; Beckfield and Krieger, 2009; Williams and Collins, 2001; Jones, 2001; Dow et al, 2010; Hutson et al, 2012). Thus, in the context of development, the objective is to "increase a person's capability set, or her/his substantive freedom, to lead the life she/he values" (Kleine, 2010, p.676). The use of ICTs within this approach is accordingly oriented around concerns over acknowledging and facilitating people's agency to make decisions/take actions that increase capabilities that they value for themselves. In the context of social epidemiology, incorporating ICTs into the research and practice process would afford a very tangible way for the people to exercise agency in investigating and intervening on the conditions of their daily reality. In Sen's terms, ICTs within social epidemiology could greatly increase the people's capabilities, especially those involving functionings related to social determinants implicated in local governance processes, practices, and policies. By more readily enabling equitable participation of the people within social epidemiology research, ICTs can help propagate more locally relevant and politically valuable science, and capture more actionable data that can be directed towards increasing capabilities of actual study participants.

A second line of ICT discourse of particular note here relates to the notions of "liberation technology" (Diamond, 2010) and "deliberation technology" (Pfister and Godana, 2012), both of which are primarily focused on the role of ICTs in the context of political transformations (e.g. for democratic governance) at the nation-state level. Liberation technology has been defined as any form of ICT that "can expand political, social, and economic freedom" (Diamond, 2010, p.70). This includes, for example, ICT use to increase government transparency and accountability, to organize and mobilize for social action, to generate and disseminate independent news (e.g. "citizen journalists"), and to simplify and deepen civic participation. As described by Diamond (2010), "liberation technology enables citizens to report news, expose wrongdoing, express opinions, mobilize protest, monitor elections, scrutinize government, deepen participation, and expand the horizons of freedom" (p.70). It is mostly concerned with the role of ICTs in organizing and amplifying the voice of dissident and/or

marginalized groups *during* political struggles/transformations. The related notion of "deliberation technology" was introduced to reframe liberation technology and expand focus to examine the role of ICTs *after* political struggles/transformation as well (Pfister and Godana, 2012). Accordingly, *de*liberation technologies (p.2):

> "…facilitate not just information circulation, but discussion and debate. Deliberation technologies focus not just on the hardware of communication, but on the software and the practices that support a broad-based conversation amongst affected citizens. Deliberation technologies do not serve specific and episodic goals, but focus on cultivating sites of sustained communication."

Taken together, these notions suggest a critical role for ICTs in facilitating social action and social change—professed goals of social epidemiology in relation to health. If ICTs have shown value in enhancing efforts for *actual* democratization of nation states—e.g. by facilitating organizing, advocacy, and information dissemination—perhaps they can help democratize and transform social epidemiology—e.g. by facilitating inclusive research design, implementation, and dissemination. Such transformation could consequently enhance its ability to more readily and tangibly contribute to improvements in democratic processes implicated in health inequities. Moreover, the liberation/deliberation technology discourse highlights what should be a core impetus for and focus of ICT use within social epidemiology—constructive and sustained dialogue to benefit the people and the field. Social epidemiology has many ongoing deliberations and conversations *about* the people, but none of them have been *with* the people. They have been exclusive and private deliberations, despite emphasizes on matters like discrimination, racism, and political marginalization. Indeed, there is an entire line of research and deliberation on social inclusion/exclusion and health that has socially excluded the people whose social inclusion/exclusion is being studied. In the sense that ICTs can facilitate the people's agency and amplify their voice, their use within social epidemiology affords a platform through which the people can not only contribute to these scientific deliberations, but also contribute to research translation efforts through identifying, organizing, and channeling health-related social and political concerns. In this manner, through integrating ICTs, social epidemiology can simultaneously do social science *and* social action.

Lastly, a third relevant line of conceptual discourse within the ICT field is that regarding "big" and "small" data. While recent exchanges within social epidemiology highlighted the importance of harnessing "big data" (Glymour et al, 2013; Galea and Link, 2013), a complimentary and perhaps alternate and more suitable approach, in regard to research translation and timely action, might lie in harnessing what has been termed "small data" within ICT circles. As described by D'Ignazio and colleagues (2014), *Small Data* is, "a practice owned and directed by those who are contributing the data… The essence of Small Data is that such communities may not just participate in, but can actually initiate and drive such data investigations towards the better understanding of an important local issue" (p.116). They suggest, specifically in regard to investigating environmental factors, that "a bottom-up, participatory, grassroots approach to… data collection addresses the key issues of inclusion, accountability, and credibility, by building public participation into the data lifecycle" (p.116). If research data is indeed as critical as we make it out to be within our spectrum of evidence to inform policy change and social action, then the nature of a Small Data approach appears more

capable of facilitating impacts on policy and social action compared to Big Data—especially if it were grounded in the principles and processes of CBPR. Much like the notion of "citizen science" within popular epidemiology (Brown, 1992; Brown, 1997), Small Data within a CBPR orientation for the conduct of social epidemiology research could promote a level of agency, transparency, and accountability within the field that we have not witnessed to date—elements that arguably belie any genuine effort to spur meaningful social action from social epidemiology science. As suggested before, such an approach holds particular promise within place-based social epidemiology work—work that examines local social, environmental, economic, and political contexts and draws upon the people's embodied experience of these contexts to answer research questions and, hopefully, inform local action. This sort of integrated, collaborative and inclusive approach to doing social epidemiology science and generating social epidemiology data distinguishes between data that metaphorically speaks for *itself*, and data (i.e. people) that literally speak for *themselves,* the latter of which is critically important for the research translation process, social action, and policy change.

Of course, ICTs, regardless of the epistemological and procedural underpinnings guiding their design and application, even if anchored within a CBPR approach, are not a panacea for all of social epidemiology's shortcomings in regard to inclusion, equity, and participation. The challenges and pitfalls of ICTs have been discussed elsewhere (Burrell and Toyama, 2009; Diamond, 2010; Avgerou, 2010; Pfister, 2012; Dearden, 2012), not the least of which relate to concerns over data quality, validity, and accessibility (D'Ignazio et al, 2014; Kamel Boulos et al, 2011), and concerns around power, privacy, over-surveillance, and potential exploitation/co-optation (Lupton, 2014; D'Ignazio et al, 2014). Applications of ICTs within a social epidemiology/CBPR framework will need to be sensitive to identified concerns and remain realistic about what ICTs can help achieve within given social, economic, and political contexts.

Nonetheless, within the existing mix of limitations and potentials, the use of ICTs has been common within public health research and practice for some time now (Patrick et al, 2008; NACCHO 2008, NACCHO 2009; Ozdalga et al, 2012; Brabham et al, 2014). Indeed, an entire field, commonly referred to as *mHealth*, has taken off to the point of being included within the National Healthy People 2020 Goals (DHHS, 2012). In the most basic sense, mHealth is an approach to public health research and practice that utilizes ICTs, including smartphones, tablets, and other technological devices, tools, and platforms, e.g. social media platforms (e.g. Facebook, Twitter), crowdsourcing platforms (e.g. FrontlineSMS, Ushahidi), and collaborative communication and mapping tools (e.g. GeoChat), to achieve research and/or programmatic goals. Efforts have ranged from simple text message communication for medication or care management (Lester et al, 2010; Lemay et al 2012; Stenner et al, 2012; Redfern, et al, 2014), to coordinating care systems (Tamrat and Kachnowski, 2011; Bravo et al, 2012), to disease monitoring and surveillance (Brownstein et al, 2009; Freifeld et al, 2010; Waidyanatha et al, 2010; Kamel Boulos et al, 2011; Ranard et al, 2013). Additionally, the use of smartphones for ecological momentary assessment (EMA), GPS tracking, and web-based mapping is quickly becoming a popular approach for research examining the dynamics of built and social environments and monitoring related health behaviors and outcomes (Shiffman et al, 2008; Zenk et al, 2011; Chaix et al, 2012; Spook et al, 2013). Stated simply, there is ample precedence and opportunity for social epidemiology to more actively and deliberately explore potential affordances of ICTs, especially those related to inclusion, equity, and participation of the

people, and how such affordances can improve social epidemiology science and research translation.

Furthermore, from more of a pragmatic standpoint, as recently as 2012 prominent public health organizations have issued briefs on the need for public health to "rewire" for the future (WHO, 2011; APHA, 2012; NACCHO, 2012; DHHS, 2012) in which recommendations were made to actively incorporate and explore the use of ICTs as part of standard practice. Other organizations have created subdivisions, programs, and/or training institutes for mHealth (NIH, 2014; CDC 2014; HRSA, 2014). Most recently there was a professional meeting of public health and medical researchers hosted by the Office of Behavioral and Social Sciences Research—"Wireless Health 2014" (NIH 2014b)—which focused on topics that most within social epidemiology would consider quite "downstream" and individualistic, e.g. apps for diabetes self-management and healthcare appointment reminders. Indeed, to date, use of ICTs within public health research and practice has favored such "downstream" applications. Consequently, it has been argued that this body of work, as technologically innovative as it might be, may in the long run detract from and dilute efforts to more fully engage and address social determinants of health by amplifying attention on personal responsibility (Lupton, 2014; Lupton, 2014b/2013). As such, now is a critical time to explore ways to incorporate ICTs within social epidemiology, lest the masses (and funders) become increasingly infatuated and distracted by cool apps that simply reinforce *individual* responsibility for *population* health—in 140 characters or less, nonetheless. Incorporating ICTs within social epidemiology would offer a counterbalance to current ICT use within public health, as well as present a path to popularize the field and "upgrade" it for 21st century practice.

Even in the context of research based on surveys or the collection of biometrics, for example, the potential for training and co-learning, to co-develop research questions and survey items, to collaborate in collecting and analyzing information/data, and disseminate knowledge via academic and popular media outlets is promising. There are tools readily available to facilitate each of these processes (see *TABLE 1* for examples). To paraphrase a bit, "[we] would not be required to surrender rigor, but [we] would be required to share power (Schwab and Syme, 1997, p.2050). The people can simultaneously serve as "N's", collaborators, co-researchers, and constituents. The challenge is whether social epidemiology researchers and practitioners are ready and willing to do the same. If so, the prospects for matching social epidemiology "talk" with comparable social epidemiology "walk" would be greatly improved.

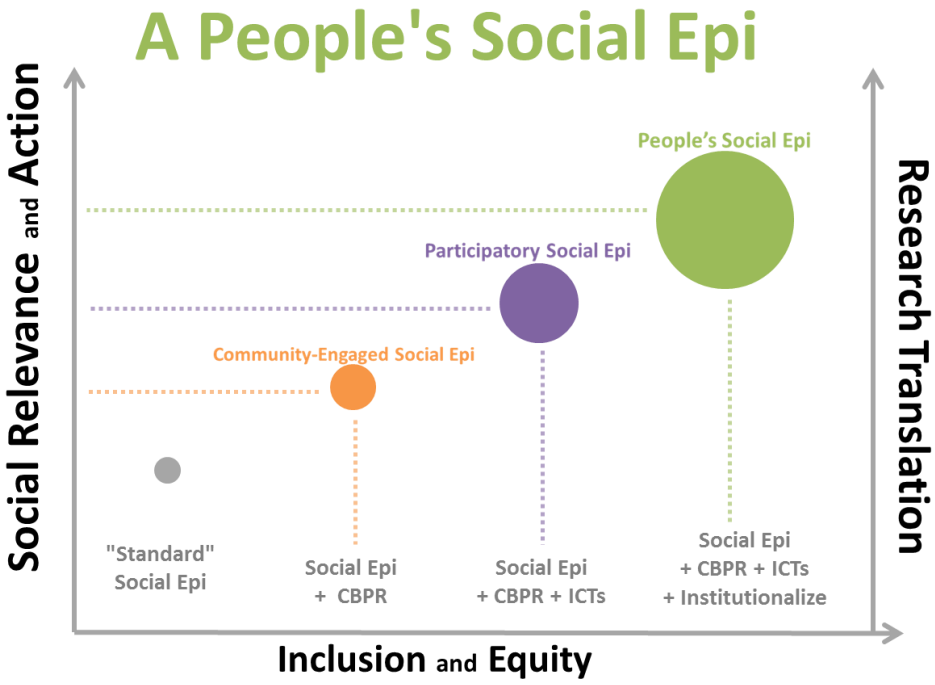
***TABLE 1*: 10 ICTs to Socialize Social Epidemiology**

	ICT Name	Platform/Device	Features/Applications
1	Magpi	Mobile Phone; Internet	Survey instrument design, data collection & analysis; real-time assessment; SMS, photo, and voice functionality; geolocation and mapping capability; smartphone deployment; built-in data analysis & visualization tools; collaborative use options
2	Survos	Mobile Phone; Internet	Survey instrument design, data collection & analysis; real-time assessment; SMS, photo, and voice functionality; geolocation and geo-prompting capability; smartphone deployment
3	nativeye	Mobile Phone; Internet	Qualitative and mixed-methods research platform for data collection and analysis; Text, photo, video, and audio capabilities; real-time assessment; geolocation capability; smartphone deployment; built-in data analysis & visualization tools; collaborative use options
4	Fulcrum	Mobile Phone; Internet	Survey instrument design, data collection & analysis; real-time assessment; geolocation and mapping capability; photo functionality; smartphone deployment; built-in data analysis & visualization tools; collaborative use options
5	MyInsights (MyPanel)	Mobile Phone; Internet	Qualitative and mixed-methods research platform for survey design, data collection and analysis; Text, photo, video, and audio capabilities; real-time assessment; geolocation capability; smartphone deployment; built-in data analysis & visualization tools; collaborative use options
6	ResearchKit (HealthKit)	Mobile Phone; Internet	Suite of customizable research tools for survey design and data collection; smart phone deployment
7	GeoChat	Mobile Phone; Internet	Real-time communication for coordinating collaborative field work/research; SMS, email, and map-based communication; geolocation and geo-visualization capabilities; smartphone compatible
8	Dedoose	Mobile Phone; Internet	Qualitative and mixed-methods research platform for data collection and analysis; Text, photo, video, and audio capabilities; real-time assessment; smartphone compatible; built-in data analysis & visualization tools; collaborative use options
9	Flava Note	Mobile Phone; Internet	Personal diary platform for recording, annotating, and visualizing text, photo, video, and audio data elements; geolocation capability; smartphone compatible
10	Argus	Mobile Phone	Smartphone app for collection of user generated individual-level data for various health metrics; real-time assessment; geolocation capability

IV. A People's Social Epidemiology

FIGURE 1 below represents a four-tiered framework for conceptualizing *A People's Social Epidemiology* in regard to research translation and prospects for social action. The first tier (from left-to-right) represents what has been referred to here as the "standard" social epidemiology approach—generally, social epidemiology that is non-participatory in nature, limits the role of people to being study participants, and is primarily concerned with generating science that is broadly generalizable, but not necessarily locally practicable or actionable. By preemptively excluding people from higher-level, deeper participation and devaluing their lived experience and embodied knowledge, and by not anchoring and engaging research objectives in locality-contingent social and political contexts, this standard format undermines its full potential and curtails translation and social action prospects—masking people's agency instead of facilitating and enhancing it.

***FIGURE 1*: A People's Social Epi Framework for Research Translation and Action**



The second tier represents *community-engaged social epidemiology*—generally, an approach rooted in the principles and processes or CBPR. Here, the people (study participants and their communities) are seen as collaborators and co-researchers, and there is an explicit focus on equitable engagement for the co-production of locally relevant and actionable science for mutual (and equitable) benefit. The people are simultaneously participants, scientists, collaborators, and constituents, and their voice and perspective are actively sought in all phases of the research-to-translation continuum—from defining and framing problems and deciding research questions, to collecting, analyzing, and disseminating data and determining solutions (e.g. more research, social action, policy targets). This approach to social epidemiology acknowledges that translating social epidemiology science into social action and policy change

requires drawing on and building upon the knowledge and expertise of study participants and their communities, and being aware of and responsive to their social and political values and those given credence within the local context where the research is being conducted. This approach to social epidemiology accordingly values participatory methodological approaches (quantitative and qualitative) that can accommodate multiple forms of knowledge expression which can be synthesized and shared via multiple formats for local consumption and impact.

The third tier represents *participatory social epidemiology*. This approach extends community-engaged social epidemiology by augmenting prospects and opportunities for the people's participation, facilitating greater inclusion in the research-to-action process via incorporation of ICT tools and applications. Strategic use of ICTs within a community-engaged social epidemiology affords concrete mechanisms for engaging the people in the scientific enterprise—from platforms for identifying and deliberating pressing local research needs and co-developing surveys (e.g. MyInsights, nativeye, Survos), to applications for systematically collecting, mapping, and analyzing data (e.g. Magpi, Fulcrum) and organizing social action activities (e.g. GeoChat; Ushahidi). Use of ICTs within a CBPR orientation afford opportunities to not only democratize social epidemiology in research and practice, but also more readily organize, channel, and translate findings for local social action and policy debates. For example, researchers and study participants can collaboratively collect and map research data through use of web-based community mapping platforms with social media and "share" functions that facilitate easy dissemination to community, local media, and city official audiences. Participatory social epidemiology in such "democratized" form holds promise, particularly in a local context, in uplifting and legitimizing community voice in local governance, e.g. in deliberation and decision processes that shape social determinants of health via policy and practice. In addition to being rooted in the principles and processes of CBPR, this approach is also guided by conceptual and ethical discourses regarding effective, responsible, and equitable use of ICTs. A *participatory social epidemiology* thus offers a conceptually rich and technology-enhanced and integrated approach to fostering inclusion and equity in social epidemiology research/practice—which could not only increase research relevance (e.g. if driven/guided by a local social determinants crowdsourcing and deliberation process), but also research translation and derivative action (e.g. by integrating ICTs to facilitate broader dissemination and organize/coordinate social action, advocacy, or voting activities).

As a final enhancement in the fourth tier, locally institutionalizing *participatory social epidemiology* constitutes what could be called *A People's Social Epidemiology*. This approach is oriented around producing practicable science and data for timely local social action, and prioritizes building long-term local capacity to integrate and sustain research and social change efforts over generating diffuse and decontextualized knowledge for generalization elsewhere. *A People's Social Epidemiology* proactively identifies ways to involve the people in the social epidemiology enterprise and create opportunities for their continued participation and benefit, with a belief that the people who are experiencing local social inequities in health are the best social epidemiologists to study and address them. Thus, a core element of this approach is creating mechanisms to not only build and sustain local capacity and legitimize local expertise, but also to facilitate more local "N's" becoming future social epidemiology scientists—thus affecting the trajectory of not only their individual health and their communities' health, but the health of the field. Adopting *A People's Social Epidemiology* through institutionalization can

of course take many forms, and the goal here is not to suggest any prescriptive extent or manner of institutionalization. However, it is worth outlining a few examples that can help illustrate the potential scope and impacts of *A People's Social Epidemiology* in a local context (see *TABLE 2* below).

***TABLE 2*: 8 Ways to Move Towards a People's Social Epi**

	Description	Core Collaborators	Objectives
1	Use local social epidemiology research study data in local public health and city planning practice • Develop data sharing/user agreements to promote open access and public dissemination	University Researchers; Local Health and Planning Agencies	Facilitate research translation and action based on local research; Facilitate collaboration between researchers and local agencies; Promote social value and relevance of social epidemiology research
2	Create Social Epidemiology/Health Equity programs within local health departments where social epidemiology research projects are being conducted • University researchers provide staff training and skill/knowledge transfer opportunities	University Researchers; Local Health Departments	Increase local health department capacity to do social epidemiology as part of standard practice; Facilitate collaboration between researchers and local health departments; Create opportunities for collaborative grant writing for local social epidemiology research and translation activities
3	Develop local social epidemiology Research & Practice Training Institutes • Co-led by university researchers, local practitioners, and local residents, with anchor point within local health department • Create standing "Community Social Epi Fellow" position at local health and/or planning department	University Researchers; Local Health Departments	Increase local health department capacity to do social epidemiology as part of standard practice; Facilitate collaboration between researchers and local health departments; Promote social value and relevance of social epidemiology research; Promote broader community understanding and knowledge of social epidemiology research
4	Develop social epidemiology "exchange program" for faculty/researchers of local universities currently conducting social epidemiology research to give guest lectures at local high schools	University Researchers; Local Education Departments	Promote social value and relevance of social epidemiology research; Encourage pursuit of future public health education opportunities; Promote meaningful opportunities for researchers to connect to local communities beyond research
5	Support and secure opportunities for local high school students to openly and freely attend courses taught by local social epidemiology faculty who are conducting research in the local community	University Researchers; Local Universities; Local Education Departments	Promote social value and relevance of social epidemiology research; Encourage pursuit of future public health education opportunities; Promote meaningful opportunities for researchers to connect and contribute to local communities beyond research
6	Develop social epidemiology and health equity-oriented school curricula for local high schools • STEM courses exploring math, science, and technology via quantitative social epidemiology research, social	University Researchers; Local Education and Health Departments	Promote social value and relevance of social epidemiology research; Encourage pursuit of future public health education

	epidemiology theory, CBPR, ICTD theory, and ICT design ○ Implement collaborative student-led social epidemiology research projects with mentorship/guidance for university researchers ○ Promote and support student development of abstracts/manuscripts for professional presentation and dissemination ○ Develop MOUs for incorporation of student research findings as part of standard local health and planning practice ○ Create standing "Youth Social Epi Fellow" position at local health and/or planning department		opportunities; Provide unique education, training, and professional development opportunities for students; Promote student connectivity to local health equity issues and facilitate their development as local change agents and future scientists
7	Develop social epidemiology/public health college pipeline programs and/or summer institutes for local high school students • Link pipeline to local community colleges and universities involved in local public health research ○ Support student campus visits and hosting recruitment activities at local high school ○ Develop MOUs to formally support recruitment of students from communities that are current or common social epidemiology research sites	Local Universities; Local Education Departments	Promote social value and relevance of social epidemiology research; Encourage pursuit of future public health education opportunities; Promote meaningful opportunities for researchers to connect and contribute to local communities beyond research
8	Create local media linkages for regular reporting/distribution of info/results/knowledge based on local social epidemiology research projects • Highlight work of local university researchers and local residents currently engaged in social epidemiology projects • Develop community-written/oriented social epidemiology journal (e.g. free, high-school reading level, readily accessible) focused on implications of local projects and action at local levels	University Researchers; Local Media Outlets	Promote social value and relevance of social epidemiology research; Facilitate research translation and action based on local research; Promote meaningful opportunities for researchers to connect and contribute to local communities beyond research; Promote broader community understanding and knowledge of social epidemiology research

A People's Social Epi in Practice

The intention here has been to outline a framework for how to move towards a more inclusive and equitable social epidemiology, with the goal of improving prospects for research translation for policy change, timely social action, and tangible benefit—for scientists and especially for the people and communities under study. The suggestions made here for how to achieve this goal are not intended as a definitive and exhaustive prescription. Regardless, the real challenge rests in determining how to actually incorporate and apply the elements of a framework such as the one presented here. The *People's Social Epi Project* was developed as a sort of "field test" to explore what *A People's Social Epidemiology* might look like in practice: a deliberate and explicit integration of social epidemiology, CBPR, and ICTs within the context of a place-health research study.

The People's Social Epi Project (PSEP) integrates social epidemiology and CBPR with parents and youth residing in public housing to further understand where and how place-based exposures that affect health and well-being are encountered, perceived, and experienced intergenerationally. This work seeks to: 1) expand and make novel contributions to research on health in public housing; 2) improve conceptual and operational understandings of place through identifying the spatial, temporal, and social connections and divisions between the places of residents' daily activities; and 3) elucidate spatial, temporal, social, and perceptual differences between parent and youth place experiences. The research was completed using participatory methods for the systematic documentation and assessment of place-based exposures and opportunities with two generations of public housing residents—one parent and at least one youth from each participating household recruited as parent-child dyads.

Participants were trained in key components of public health including core principles related to social epidemiology and health equity, and fundamental aspects of public health research and CBPR. All research methods were completed by the participants themselves. Research methods flowed sequentially and built upon each other as follows: (1) *Photovoice* (Wang and Burris, 1997; Wang, 2005; Catalani and Minker, 2010); (2) *Activity Space Mapping* (see for example Chaix et al, 2012; Matthews and Yang, 2013; Perchoux et al, 2013; Browning and Soller, 2014); (3) *X-Ray Mapping* (see Ruglis, 2011); (4) Participatory GIS. First, participants used *Photovoice* (via cellphones) to identify, photo-document, and describe their important daily places and specific exposures/opportunities within each place they perceive affects their health (positively or negatively). Next, they used *Activity Space Mapping* to geolocate and map their *Photovoice* photos and identify any additional non-photographed places, and to rate and provide time estimates for each mapped place. Then, using a cognitive mapping method known as *X-Ray Mapping,* they created symbolic representations of place-embodiment reflecting how each of their mapped places affects their bodies and health. Finally, constituting *Participatory GIS*, they integrated and digitally mapped their work via a web-based interactive and multimedia-enabled ICT platform, *Local Ground* (Van Wart, Tsai, and Parikh, 2010). This platform allows participants to easily create, print, and digitally share their place-health research maps with the broader community and city officials. Adults and youth completed each method simultaneously but in separate all-adult and all-youth groups. All research protocols were approved by the University of California, Berkley institutional review board (protocol

#2013-10-5700). Details regarding what participants' research revealed are presented elsewhere (Petteway, 2014a-b; Petteway, 2015a; CHAPTER 2; CHAPTER 3).

Aside from being collaborative, participatory, rooted in CBPR principles and processes, and incorporating the use of ICTs to promote and enhance each of these aspects, the PSEP models *A People's Social Epidemiology* by also making institutionalization a top priority. The PSEP is connected with local government through collaboration with the city manager and health commissioner for the future linkage and use of the project methodology and findings as part of the city's formal community health assessment, planning, and community development efforts. Preliminary discussions are also developing around the creation of a collaborative Community Health Equity program within the local health department that would be co-staffed by PSEP-trained and experienced participants. The program/division would also host community and student interns.

Additionally, plans are underway with the local school board for the development and institutionalization of a public health pipeline program—*iHEART*, the Institute for Health Equity and Action Research Training—to be implemented at the main public high school beginning the Fall of 2016. Drawing from the initial PSEP process and methodology, the curricular core of iHEART is a series of health-equity-oriented STEM courses rooted in critical pedagogy and project-based learning. This series of 6 sequential courses will focus on social epidemiology theory, science, and methodology; concepts related to health equity, CBPR, and GIS; and ICT/ICTD concepts, theory, and applications. Students completing the iHEART courses will also participate in paid *iHEART Summer* participatory research and internship institutes, becoming part of an *iHEART Public Health Scholars* cohort. Early connections and support have been established with faculty and administrators from at least 4 accredited and nationally ranked schools of public health to facilitate opportunities for iHEART Public Health Scholars to pursue undergraduate studies in public health. Some of these early commitments include hosting iHEART Public Health Scholars on site visits, making recruitment visits to the students' local high school, providing guest lectures for iHEART courses, leading training workshops during iHEART Summer, providing mentorship to iHEART Public Health Scholars, and offering guidance on iHEART student research projects.

Lastly, initial discussions have been held with the local city paper regarding the creation of a monthly community health equity column based on PSEP and iHEART activities. This column would be written by PSEP/iHEART participants (adults and youth) and highlight current projects in which they are participating or leading.

The PSEP is very much in its initial phase, with only the first iteration/cycle completed (see Petteway, 2014a-b and Petteway, 2015a). It will be important to allow sufficient time to complete multiple project cycles in regards to the research, as well as to strengthen the collaboration with project participants, residents, and local collaborators, before attempts to appraise its contributions/impacts or assess limitations/challenges. In its current state, however, PSEP "models" to some degree items 1, 2, 6, 7, and 8 from *TABLE 2*. Thus overall, prospects for conducting locally relevant and actionable research are apparent. Also clear is the potential for local institutionalization and long-term collaboration, as evidenced by iHEART and linkages to local health and planning agencies. Such collaboration could prove capable of not only enhancing research efforts, but also building local capacity (i.e. participants, residents, students, health department) to do social epidemiology and sustain change efforts by

encouraging and enabling meaningful contributions to research and local practice—contributions that can be synthesized, organized, and channeled to inform city governance decision processes that shape local social determinants. Moreover, transformation of the PSEP into iHEART creates a unique opportunity for students to tangibly explore and benefit from social epidemiology research, opening the door for their continued development as potential future social epidemiology scientists and/or (local) practitioners.

Conclusion

The goal here was to outline a framework that can help social epidemiology become more inclusive (e.g. extent of community participation, balance of power) and equitable (e.g. outputs, benefits). The overarching premise is that more equitable inclusion of the people within the social epidemiology enterprise can improve prospects for research translation and timely, meaningful, and (locally) relevant social action, as well as ensure that the outputs and benefits of research do not continue to disproportionately accumulate among researchers. Reappraising the value of peoples' lived and embodied knowledge of their social contexts and social inequity, and reassessing our assumptions about the ways and degrees to which people can contribute to social epidemiology research and practice, will allow for re-envisioning how social epidemiology can make more direct and tangible impacts on the conditions that shape health. Integrating social epidemiology with core principals and processes of CBPR, and further integrating the technical and procedural affordances and theoretical groundings of ICTs, can facilitate the development of a social epidemiology that is no longer simply about the people, but for and by them as well. This is how we can enhance the field and ensure it remains distinct and useful—for researchers/practitioners and, more importantly for participant communities—the "N's" whose experiences within the social production of health are the lifeblood of our field.

The next chapter introduces the *Placescape*—a new paradigm for understanding and studying place that, in application, can serve as model for how to move towards *A People's Social Epi* within the context of place-health research and practice.

References:

Ackernecht, EH (1953). Rudolf Virchow: doctor, statesman, anthropologist. Madison, WI: University of Wisconsin Press.

Anderson, A and Hatakka, M (2013). What are we doing? Theories used in ICT4D research. Paper presented at the IFIP Working Group 9.4 12th International Conference on Social Implications of Computers in Developing Countries, Ochos Rios, Jamaica.

APHA (2012). The New Public Health: Rewiring for the Future. APHA Midyear Meeting, Charlotte, NC. Available at: http://www.publichealthnewswire.org/?p=6496

Atwood, K (1997). From Public Health Science to Prevention Policy: Placing Science in Its Social and Political Contexts. *AJPH*, 87 (10): 1603-1606.

Avgerou, C (2010). Discourses on ICT and Development. *Information Technologies and International Development*, 6 (3): 1-18.

Bayoumi, A and Guta, A (2012). Values and Social Epidemiologic Research. In O'Campo, P and Dunn, J (Eds.), *Rethinking Social Epidemiology: Towards a Science of Change* (CH 3, 43-65): DOI 10.1007/978-94-007-2138-8_1.

Berkman, L and Glass, T (2000). Social Integration, Social Networks, Social Support, and Heath. In Berkman, L and Kawachi, I (Eds), *Social Epidemiology* (CH 7 137-173). Oxford University Press.

Berkman, L (2009). Social Epidemiology: Social Determinants of Health in the United States: AreWe Losing Ground? *Annu. Rev. Public Health*, 30: 27–41.

Berkman, L, Kawachi, I and Glymour, M (2014). *Social Epidemiology*, 2nd Edition. Oxford University Press.

Beckfield, J and Krieger, N (2009). Epi 1 demos 1 cracy: Linking Political Systems and Priorities to the Magnitude of Health Inequities—Evidence, Gaps, and a Research Agenda. *Epidemiol Rev*, 31: 152–177.

Brabham, DC et al (2014). Crowdsourcing Applications for Public Health. *Am J Prev Med*, 46 (2): 179–187.

Bravo, S et al (2012). A Tele-Health Communication and Information System for Underserved Children in Rural Areas of Nicaragua. *Information Technologies and International Development*, 8 (4): 205-221

Brown, P (1992). Popular Epidemiology and Toxic Waste Contamination: Lay and Professional Ways of Knowing. *Journal of Health and Social Behavior*, 33 (3): 267-281.

Brown, P (1997). Popular Epidemiology Revisited. *Current Sociology*, 45: 137-156

Browning, C and Soller, B (2014). Moving Beyond Neighborhood: Activity Spaces and Ecological Networks As Contexts for Youth Development. *Cityscape*, 16 (1): 165–196.

Brownstein, JS et al (2009). Digital Disease Detection — Harnessing the Web for Public Health Surveillance. *N Engl J Med*, 360 (21): 2143-2157.

Burrell, J and Toyama, K (2009). What Constitutes Good ICTD Research? *Information Technologies and International Development*, 5 (3): 82-94.
Cashman, B et al (2008). The Power and the Promise: Working With Communities to Analyze Data, Interpret Findings, and Get to Outcomes. *AJPH*, 98 (8): 1407-1417.

Cassel, J (1976). The Contribution of the Social Environment to Host Resistance. *Am J Epidemiol*, 141 (9): 843-9.

Catalani, C and Minkler, M (2010). Photovoice: A Review of the Literature in Health and Public Health. Health Education & Behavior, 37 (3): 424-451.

CDC (2014). http://www.cdc.gov/mobile/index.html

Chaix, B et al (2012). An Interactive Mapping Tool to Assess Individual Mobility Patterns in Neighborhood Studies. *Am J Prev Med*, 43 (4): 440–450.

Chung, H and Muntaner, C (2006). Political and welfare state determinants of infant and child health indicators: An analysis of wealthy countries. *Social Science & Medicine*, 63: 829–842.

Coleman, W (1982). Death is a social disease: public health and political economy in early industrial France. Madison, WI: University of Wisconsin Press.

Corburn, J (2005). *Street Science: Community Knowledge and Environmental Health Justice*. Cambridge: The MIT Press.

Corburn, J (2009). *Towards the Healthy City: People, Places, and the Politics of Urban Planning*. Cambridge: The MIT Press.

Dearden, A (2012). See No Evil? Ethics in an Interventionist ICTD. *Information Technologies and International Development*, 9 (2): 1-17.

DHHS (2012). http://www.hhs.gov/open/initiatives/mhealth/recommendations.html

Diamond, L (2010). Liberation Technology. *Journal of Democracy*, 21 (3): 69-93.

Dickens, L and Watkins, K (1999). Action research: Rethinking Lewin. *Management Learning*, 30: 127–140.

Diez-Roux, A (2004). Estimating neighborhood health effects: the challenges of causal inference in a complex world. *Social Science & Medicine*, 58: 1953–1960.

Diez-Roux, A (2004b). The Study of Group-Level Factors in Epidemiology: Rethinking Variables, Study Designs, and Analytical Approaches. *Epidemiol Rev*, 26: 104–111.

Diez Roux, A and Mair, C (2010). Neighborhoods and Health. *Ann. N.Y. Acad. Sci*., 1186: 125-145.

D'Ignazio, C et al (2014). Less is More: The Role of Small Data for Governance in the 21st Century. In Pimenta, MS and Canabarro, DR (Eds.), *Governança Digital* (CH 6, 115-129). Universidade Federal Rio Grande do Sul: Porto Alegre.

Dow, W et al (2010). Evaluating the evidence base: Policies and interventions to address socioeconomic status gradients in health. *Ann. N.Y. Acad. Sci*, 1186: 240–251.

Dunn, J (2012). "Explanation," Philosophy and Theory in Health Inequalities Research: Towards a Critical Realist Approach. In O'Campo, P and Dunn, J (Eds.), *Rethinking Social Epidemiology: Towards a Science of Change* (CH 2, 23-42): DOI 10.1007/978-94-007-2138-8_1.

Ellen, IG et al (2001). Neighborhood Effects on Health: Exploring the Links and Assessing the Evidence. *Journal of Urban Affairs*, 23 (3-34): 391-408.

Engels, F (1987). The condition of the working class in England. (First edition, 1845). Harmondsworth, England: Penguin.

Freifeld, C et al (2010). Participatory Epidemiology: Use of Mobile Phones for Community-Based Health Reporting. *PLoS Medicine*, 7 (12): e1000376.

Freire, P (1970). *Pedagogy of the Oppressed*. New York: The Continuum International Publishing Group, 2006.

Freire, P (1973). *Education for Critical Consciousness*. New York: Seabury Press.

Freire, P (1982). Creating alternative research methods: learning to do it by doing it. In: Hall B, Gillette A, Tandon R (eds). *Creating Knowledge: A Monopoly? Participatory Research in Development*. New Delhi: Society for Participatory Research in Asia, 1982, p. 29–37.

Galea, S et al (2011). Estimated Deaths Attributable to Social Factors in the United States. *AJPH*, 101 (8): 1456-65.

Galea, S and Link, B (2013). Six Paths for the Future of Social Epidemiology. *Am J Epidemiol*, 178 (6): 107-23.

Gebbie, K et al (2003). The Future of the Public's Health in the 21st Century. Washington, DC: National Academies Press, Institute of Medicine.

Geronimus, A (1992). The weathering hypothesis and the health of African-American women and infants: evidence and speculations. *Ethn Dis*, 2: 207–221.

Geronimus, A et al (2006). "Weathering" and Age Patterns of Allostatic Load Scores Among Blacks and Whites in the United States. *AJPH*, 96 (5): 826-833.

Gigler, B (2004). Including the Excluded- Can ICTs empower poor communities? Towards an alternative evaluation framework based on the capability approach. 4th International Conference on the Capability Approach, Sept.5-7, 2004. Pavia, Italy: University of Pavia.

Glymour, MM et al (2013). Invited Commentary: Off-RoadingWith Social Epidemiology—Exploration, Causation, Translation. *Am J Epidemiol*, 178 (6): 858-63.

Hamel, J (2010). ICT4D and the Human Development and Capability Approach: The Potentials of Information and Communication Technology. Human Development Reports Research Paper 2010/37. United Nations Development Programme.

Hamlin, C (1998). Public health and social justice in the age of Chadwick, Britain, 1800-1864. Cambridge, England: Cambridge University Press.

Heeks, R (2006). Theorizing ICT4D Research. *Information Technologies and International Development*, 3 (3): 1-4.

HRSA (2014). http://www.hrsa.gov/healthit/healthitgranteespotlight/mhealth2013/

Hutson, M et al (2012). Metropolitan Fragmentation and Health Disparities: Is There a Link? *Milbank Quarterly*, 90 (1): 187–207.

Israel, BA et al (1998). Review of community-based research: assessing partnership approaches to improve public health. *Annu Rev Public Health*. 19: 173–202.

Israel, et al (2001). The Detroit Community-Academic Urban Research Center: development, implementation and evaluation. *J Public Health Manag Pract*, 7 (5):1–19.

Israel, BA et al (2010). Community-Based Participatory Research: A Capacity-Building Approach for Policy Advocacy Aimed at Eliminating Health Disparities. *AJPH*, 100 (11): 2094-2102.

Jones, C (2001). Invited Commentary: "Race," Racism, and the Practice of Epidemiology. *Am J Epidemiol*, 154 (4): 299-304.

Kamel Boulos, MN et al (2011). Crowdsourcing, citizen sensing and sensor web technologies for public and environmental health surveillance and crisis management: trends, OGC standards and application examples. *International Journal of Health Geographics*, 10 (67).

Kaplan, G et al (2000). The Contribution of Social and Behavioral Research to an Understanding of the Distribution of Disease: A Multilevel Approach. In Smedley, B and Syme, SL (Eds.), *Promoting Health: Intervention Strategies from Social and Behavioral Research* (37-80).

Kaplan, G (2004). What's Wrong with Social Epidemiology, and How Can We Make It Better? *Epidemiol Rev*, 26: 124–135.

Karanasios, S (2014). Framing ICT4D Research Using Activity Theory: A Match Between the ICT4D Field and Theory? *Information Technologies and International Development*, 10 (2): 1-17.

Kaufman, J and Cooper, R (1999). Seeking Causal Explanations in Social Epidemiology. *Am J Epidemiol*, 150 (2): 113-120.

Kleine, D (2010). ICT4WHAT? Using the Choice Framework to Operationalise the Capability Approach to Development. *Journal of International Development*, 22: 674-692.

Krieger, N (1994). Epidemiology and the Web of Causation: Has Anyone Seen the Spider? *Soc Sci Med*, 39 (7): 887-903.

Krieger, N (1999). Questioning Epidemiology: Objectivity, Advocacy, and Socially Responsible Science. AJPH, 89 (8): 1151-1153.

Krieger, N (2000). Re: Seeking Causal Explanations in Social Epidemiology. *Am J Epidemiol*, 151 (8). 831-833.

Krieger, N (2011). *Epidemiology and the People's Health: Theory and Context*. New York: Oxford University Press.

Lantz, P et al (2006). Community-Based Participatory Research: Rationale and Relevance for Social Epidemiology. In Oakes, JM and Kaufman, J (Eds.), *Methods in Social Epidemiology* (CH 10, 229-266).

Leal, C and Chaix, B (2011). The influence of geographic life environments on cardiometabolic risk factors: a systematic review, a methodological assessment and a research agenda. *Obesity Reviews*, 12 (3): 217-30.

Lemay, N et al (2012). Reaching Remote Health Workers in Malawi: Baseline Assessment of a Pilot mHealth Intervention. *Journal of Health Communication*, 17: 105–117.

Lester, R et al (2010). Eff ects of a mobile phone short message service on antiretroviral treatment adherence in Kenya (WelTel Kenya1): a randomised trial. *Lancet*, 376: 1838–45.

Leung, MW et al (2004). Community-based participatory research: a promising approach for increasing epidemiology's relevance in the 21st century. *International Journal of Epidemiology*, 33: 499–506.

Lewin, K (1946). Action Research and Minority Problems. *Journal of Social Issues*, 2 (4): 34-46.

Link, B and Phelan, J (1995). Social Conditions As Fundamental Causes of Disease. *Journal of Health and Social Behavior*, 35: 80-94.

Liverani, M (2013). Political and institutional influences on the use of evidence in public health policy: a systematic review. *PLoS One*, 8: e77404.

Lupton, D (2014). Health promotion in the digital era: a critical commentary. *Health Promotion International*: doi:10.1093/heapro/dau091.

Lupton, D (2014b/2013). Digitized health promotion: risk and personal responsibility for health and illness in the Web 2.0 era. Sydney Health & Society Group Working Paper No. 5. Sydney: Sydney Health & Society Group.

Lynch, J et al (1998). Income Inequality and Mortality in Metropolitan Areas of the United States. *AJPH*, 88 (7): 1074-1080.

Lynch, J and Davey-Smith, G (2005). A Lifecourse Approach to Chronic Disease Epidemiology. *Annu. Rev. Public Health*, 26: 1–35.

Marmot, MG (1984). Inequalities in Death—Specific Explanations of a General Pattern? *Lancet*, 1 (8384): 1003-6.

Massey, S (2004). Segregation and Stratification: A Biosocial Perspective. *Du Bois Review*, 1 (1): 7–25.

Matthews, S and Yang, T (2013). Spatial Polygamy and Contextual Exposures (SPACEs): Promoting Activity Space Approaches in Research on Place and Health. *Am Behav Sci*, 57 (8): 1057–1081.

McMichael, AJ (1999). Prisoners of the Proximate: Loosening the Constraints on Epidemiology in an Age of Change. *Am J Epidemiol*, 149 (10): 887-897.

McEwen, B (1998). Protecting and Damaging Effects of Stress Mediators. *NEJM*, 338 (3): 171-179.

McEwen, B and Gianaros, P (2010). Central role of the brain in stress and adaptation: Links to socioeconomic status, health, and disease. *Ann. N.Y. Acad. Sci*, 1186: 190-222.

Mercer, S and Green, L (2008). Federal funding and support for participatory research in public health and health care. In: Minkler M, Wallerstein N, eds. Community Based Participatory Research for Health: Process to Outcomes. 2nd ed. San Francisco, CA: Jossey-Bass; 399–406.

Minkler, M (2000). Using Participatory Action Research to build Healthy Communities. *Public Health Reports*, 115: 191-197.

Minkler, M and Wallerstein, N (2005). Improving Health through Community Organization and Community Building: A Health Education Perspective. In: Minkler, M (ed). *Community Organizing and Community Building for Health, 2nd Edition*. New Brunswick: Rutgers University Press: p. 26-50.

Minkler, M (2010). Linking Science and Policy Through Community-Based Participatory Research to Study and Address Health Disparities. *AJPH*, 100 (S1), S81-S87.

Morgan-Trimmer, S (2014). Policy is political; our ideas about knowledge translation must be too. *J Epidemiol Community Health*, 68 (11): 1010-1011.

Mowat, D and Chambers, C (2012). Producing More Relevant Evidence: Applying a Social Epidemiology Research Agenda to Public Health Practice. In O'Campo, P and Dunn, J (Eds.), *Rethinking Social Epidemiology: Towards a Science of Change* (CH 15, 305-325): DOI 10.1007/978-94-007-2138-8_1.

Muntaner, C (1999). Invited Commentary: Social Mechanisms, Race, and Social Epidemiology. *Am J Epidemiol*, 150 (2): 121-126.

Muntaner, C (2012). Locating Politics in Social Epidemiology. In O'Campo, P and Dunn, J (Eds.), *Rethinking Social Epidemiology: Towards a Science of Change* (CH 9, 175-202): DOI 10.1007/978-94-007-2138-8_1.

Muntaner, C (2013). Invited Commentary: On the Future of Social Epidemiology—A Case for Scientific Realism. *Am J Epidemiol*, 178 (6): 852-7.

Murphy, K and Farfard, P (2012). Knowledge Translation and Social Epidemiology: Taking Power, Politics and Values Seriously. In O'Campo, P and Dunn, J (Eds.), *Rethinking Social Epidemiology: Towards a Science of Change* (CH 13, 267-283): DOI 10.1007/978-94-007-2138-8_1.

NACCHO (2008). YouTube, Facebook, MySpace, Blogs, and More: Innovative Ways Local Health Departments are Reaching Adolescents. Issue Brief, October 2008. Washington, DC.

NACCHO (2009). The Use of Public Health Informatics to Identify and Address Inequities. Issue Brief, November 2009. Washington, DC.

NACCHO (2012). Local Health Departments and mHealth. Issue Brief, June 2012. Washington, DC.

NACCHO (2014). Connecting the Dots: A Data Sharing Framework for the Local Public Health System. Issue Brief, May 2014. Washington, DC.

Navarro, V and Shi, L (2001). The political context of social inequalities and health. *Social Science & Medicine*, 52: 481-491.

NIH (2014). Office of Behavior and Social Science Research: http://obssr.od.nih.gov/scientific_areas/methodology/mhealth/index.aspx

NIH (2014b). http://www.wirelesshealth2014.org/

Oakes, JM (2004). The (mis)estimation of neighborhood effects: causal inference for a practicable social epidemiology. *Social Science & Medicine*, 58: 1929–1952.

Oakes, JM (2013). Invited Commentary: Paths and Pathologies of Social Epidemiology. *Am J Epidemiol*, 178 (6): 850-1.

O'Campo, P and Dunn, J (2012). Introduction. In O'Campo, P and Dunn, J (Eds.), *Rethinking Social Epidemiology: Towards a Science of Change* (CH 1, 1-19): DOI 10.1007/978-94-007-2138-8_1.

Oliver, T (2004). The Politics of Public Health Policy. *Annu. Rev. Public Health* (27): 195–233.

Oosterlaken, I and van den Hoven, J (2011). Editorial: ICT and the capability approach. *Ethics Inf Technol*, 13: 65–67.

Ozdalga, E et al (2012). The Smartphone in Medicine: A Review of Current and Potential Use Among Physicians and Students. *J Med Internet Res*, 14 (5): e128.

Parmar, V (2009). A Multidisciplinary Approach to ICT Development. *Information Technologies and International Development*, 5 (4): 89-96.

Patrick, K et al (2008). Health and the Mobile Phone. Am J Prev Med, 35 (2): 177-181.

Perchoux, C et al (2013). Conceptualization and measurement of environmental exposure in epidemiology: Accounting for activity space related to daily mobility. *Health & Place*, http://dx.doi.org/10.1016/j.healthplace.2013.01.005.

Petteway, R (2014a). "Towards a People's Social Epidemiology: Pursuit of a More Inclusive and Equitable Paradigm for Social Epi Research and Practice in the 21st Century". *142nd Meeting of the American Public Health Association: Healthography*, New Orleans, LA, November 15-19.

Petteway, R (2014b). "Placescapes and the Geography of Embodiment: A New Paradigm for Understanding Place and Health Across the Lifecourse". *142nd Meeting of the American Public Health Association: Healthography*, New Orleans, LA, November 15-19.

Petteway, R (2015a). "Public Housing is Public Health: Intergenerational Photovoice Perspectives of Place, Health, and Opportunity in the "Structure(d) Struggle" among Public Housing Residents." *143rdMeeting of the American Public Health Association: Health in All Policies,* Chicago, IL, October 31-November 4.

Petteway, R (2015b). Dissertation Chapter 2: Placescapes and Public Housing: Advancing Understanding of "Place" in Place-Health Research and Place-Based Health and Housing Strategies.

Petteway, R (2015c). Dissertation Chapter 3: The Body Language of Place: Mapping Intergenerational "Geographies of Embodiment" in Place-Health Research.

Pfister, DS and Godana, GD (2012). Deliberation Technology. *Journal of Public Deliberation*, 8 (1): article 10.

Phelan, J et al (2004). ''Fundamental Causes'' of Social Inequalities in Mortality: A Test of the Theory. *Journal of Health and Social Behavior*, 45: 265–285.

Picket, KE and Pearl, M (2001). Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *J Epidemiol Community Health*, 55: 111–122.

Ranard, B et al (2013). Crowdsourcing—Harnessing the Masses to Advance Health and Medicine, a Systematic Review. *J Gen Intern Med*, 29 (1): 187–203.

Raphael, D (2011). The political economy of health promotion: part 1, national commitments to provision of the prerequisites of health. *Health Promotion International*: doi:10.1093/heapro/dar084.

Redfern, J et al (2014). Development of a set of mobile phone text messages designed for prevention of recurrent cardiovascular events. *European Journal of Preventive Cardiology*, 21 (4): 492–499.

Riva, M et al (2007). Toward the next generation of research into small area effects on health: a synthesis of multilevel investigations published since July 1998. *J Epidemiol Community Health*, 61: 853–861.

Rose, G (1985). Sick Individuals and Sick Populations. *International Journal of Epidemiology*, 14: 32-38.

Sampson, RJ et al (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28: 443-478.

Santos, SM et al (2007). Association between contextual factors and self-rated health: a systematic review of multilevel studies. *Cad. Saúde Pública*, Rio de Janeiro, 23 (11):2533-2554.

Schulz, A et al (2005a). Community-based participatory approach to survey design and implementation: the Healthy Environments Community Survey. In: *Methods for Conducting Community-Based Participatory Research for Health* (Israel BA, Eng E,Schulz AJ, Parker E, eds). San Francisco:Jossey-Bass, 107–127.

Schulz, A et al (2005b). Social and Physical Environments and Disparities in Risk for Cardiovascular Disease: The Healthy Environments Partnership Conceptual Model. *Environmental Health Perspectives*, 13 (12):1817-1825.

Schwab, M and Syme, SL (1997). On Paradigms, Community Participation, and the Future of Public Health. *AJPH*, 87 (12): 2049-2051.

Seeman, T et al (2010). Socio-economic differentials in peripheral biology: Cumulative allostatic load. *Ann. N.Y. Acad. Sci*, 1186: 223-239.

Sen, A (1999). *Development as Freedom*. Oxford University Press: Oxford.

Shankardass (2012). Place-Based Stress and Chronic Disease: A Systems View of Environmental Determinants. In O'Campo, P and Dunn, J (Eds.), *Rethinking Social Epidemiology: Towards a Science of Change* (CH 6, 113-136): DOI 10.1007/978-94-007-2138-8_1.

Shankardass, K and Dunn, J (2012). How Goes the Neighbourhood? Rethinking Neighbourhoods and Health Research in Social Epidemiology. In O'Campo, P and Dunn, J (Eds.), *Rethinking Social Epidemiology: Towards a Science of Change* (CH 7, 137-156): DOI 10.1007/978-94-007-2138-8_1.

Shiffman, S et al (2008). Ecological Momentary Assessment. *Annu. Rev. Clin. Psychol*, 4: 1-32.

Smith, ML et al (2011). Mobile Phones and Expanding Human Capabilities. *Information Technologies and International Development*, 7 (3): 77-88.

Smith, K (2014). The politics of ideas: The complex interplay of health inequalities research and policy. *Science and Public Policy*, 41: 561–574.

Smylie, J et al (2012). Population-Based Data and Community Empowerment. In O'Campo, P and Dunn, J (Eds.), *Rethinking Social Epidemiology: Towards a Science of Change* (CH 4, 67-92): DOI 10.1007/978-94-007-2138-8_1.

Spook, JE et al (2013). Monitoring Dietary Intake and Physical Activity Electronically: Feasibility, Usability, and Ecological Validity of a Mobile-Based Ecological Momentary Assessment Tool. *J Med Internet Res*, 15 (9): e214.

Stenner, S et al (2012). PASTE: patient-centered SMS text tagging in a medication management system. *J Am Med Inform Assoc*, 19: 368e374.

Syme, SL and Berkman, L (1976). Social Class, Susceptibility, and Sickness. *Am J Epidemiol*, 104 (1). 1-8.

Syme, SL (2004). Social Determinants of Health: The Community as an Empowered Partner. *Prev Chronic* Dis, 1 (1): www.cdc.gov/pcd/issues/2004/jan/03_0001.htm

Tamrat, T and Kachnowskli, S (2010). Special Delivery: An Analysis of mHealth in Maternal and Newborn Health Programs and Their Outcomes Around the World. *Matern Child Health J*: DOI 10.1007/s10995-011-0836-3

Van Wart, S, Tsai, KJ and Parikh, T (2010). "Local Ground: A Paper-Based Toolkit for Documenting Local Geospatial Knowledge". *ACM Symposium on Computing for Development* (DEV), London, UK December 17-18, 2010.

Waidyanatha, N et al (2010). Real-Time Biosurveillance Pilot in India and Sri Lanka. *IEEE*: 978-1-4244-6376-3/10/

Wallerstein, N et al (2007). Freirian Praxis in Health Education and Community Organizing: A Case Study of an Adolescent Prevention Program. In: Minkler, M (ed). *Community Organizing and Community Building for Health, 2nd Edition*. Rutgers University Press: p. 218-236.

Wallerstein, N and Duran, B (2010). Community-Based Participatory Research Contributions to Intervention Research: The Intersection of Science and Practice to Improve Health Equity. *AJPH*, 100 (S1)(51), S40-S46.

Wallerstein, N, Yen, I and Syme, SL et al (2011). Integration of Social Epidemiology and Community-Engaged Interventions to Improve Health Equity. *AJPH*, 101 (5): 822-830.

Wang, C and Burris (1997). Photovoice: Concept, Methodology, and Use for Participatory Needs Assessment. Health Education & Behavior, 24(3): 369-387.

Wang, C (2005). Youth Participation in Photovoice as a Strategy for Community Change. Journal of Community Practice, 14(1/2): 147-161.

WHO (2011). mHealth: New horizons for health through mobile technologies. *WHO Global Observatory for eHealth Series*, volume 3. WHO: Geneva.

White, K and Borrell, L (2011). Racial/ethnic residential segregation: Framing the context of health risk and health disparities. *Health &Place*, 17: 438–448.

Williams, D and Collins, C (2001). Racial Residential Segregation: A Fundamental Cause of Racial Disparities in Health. Public Health Reports, 116: 404-416.

Wing, S (1998). Whose epidemiology, whose health? *Int J Health Serv*, 28 (2): 241-52.

Yen, I et al (2012). Application of Two Schools of Social Theory to Neighbourhood, Place and Health Research. In O'Campo, P and Dunn, J (Eds.), *Rethinking Social Epidemiology: Towards a Science of Change* (CH 8, 157-174): DOI 10.1007/978-94-007-2138-8_1.

CHAPTER 2

PLACESCAPES AND PUBLIC HOUSING:
ADVANCING UNDERSTANDING OF "PLACE" IN PLACE-HEALTH RESEARCH & PLACE-BASED HEALTH &HOUSING STRATEGIES

Abstract

Place-health research is an area of increasing importance and prominence within public health. However, major conceptual and methodological challenges remain in defining "place", characterizing place contexts, and measuring place—all of which have implications for place-health research, public health practice, and the design and implementation of place-based strategies, especially those involving public housing. Of particular need is work capable of revealing: 1) spatially- and temporally-specific configurations of place-based exposures and opportunities, 2) perspectives and influences of place across generations and over the lifecourse, and 3) opportunities for action to address place exposures that adversely affect community health. The goal of the work presented here was to develop and field-test a place-health framework that: 1) accounts for the multi-nodal nature of "place" and its contingent spatial, temporal, and social inter-nodal connections/divisions; 2) elucidates potential intergenerational and life-stage differences in place experiences/perceptions; and 3) explicitly engages the sociopolitical mechanisms that make, unmake, and remake place over time. A framework for a *placescape* approach was developed drawing from place-health, social epidemiology, participatory research, geography, and sociology literatures. This framework was then applied to an intergenerational community-based participatory research (CBPR) study of place, embodiment, and health. Parent-child dyads were recruited from a public housing community and trained in 4 participatory methods: Photovoice, Activity Space Mapping, X-Ray Mapping, and Participatory GIS. Participants used this combination of methods to map their "placescapes". This paper introduces the "placescape" framework, summarizes the process and preliminary findings from the CBPR study applying the framework within public housing, and discusses implications for intergenerational place-health research/practice and place-based public housing strategies.

Introduction

Place-based strategies are increasingly being explored as options to improve health, education, and general life opportunities among poor and marginalized communities (HCZ, 2013; Whitehurst and Croft, 2010; NCHE, 2015; Maryland DHMH, 2013; TCE, 2013). This is especially true for residents of public housing, as many of the prominent place-based strategies to date have been federal initiatives involving the Department of Housing and Urban Development (HUD), e.g. HOPE VI, Promise Zones, Choice Neighborhoods, and Sustainable Communities (HUD, 2013a; HUD, 2013b; USDE, 2013; HUD, 2013c; HUD, 2013d; HUD, 2013e). Health status among public housing residents is generally much worse compared to the general population, and public housing communities tend to be located within areas having particularly noxious built, social, and economic environments (Popkin et al, 2002; Buron et al, 2002; Harris and Kaye, 2004; Howell et al, 2005; Fertig and Rheingold, 2007; Manjarrez et al, 2007; Digenis-Bury et al, 2008; Ruel et al, 2010; Keane and Geronimus, 2011). This leaves public housing residents, especially, in need of interventions and policies aimed at improving health opportunities. Moreover, from a public health prevention and lifecourse perspective, place-based strategies for health promotion involving public housing make intuitive sense—they're fixed, densely-populated communities and nearly 40% of residents are under the age of 18 (HUD, 2013f).

The more recent iterations of place-based strategies have been increasingly comprehensive, moving beyond simple considerations of housing quality and aiming to coherently link affordable housing opportunities with health, education, and transportation opportunities (HUD, 2013b; HUD, 2013c; HUD, 2013e). On the other hand, these new and evolving strategies are being implemented in only a few select cities and regions, and many jurisdictions are precluded from programmatic support due to population size requirements. Thus the overwhelming majority of project-based public housing continues to operate without the benefit not only of new money streams, but perhaps more importantly, new idea streams. Moreover, many of the more prominent and large-scale place-based efforts to date have failed to engage notions of participation, power, and possession in their attempts to re-imagine, re-design, and revitalize "place" (NHLP, 2002; Clampet-Lundquist, 2004a; Keane and Geronimus, 2011; Chaskin, 2013; Slater, 2013). A consequence has been the continued problematizing and dislocation of *people* and the re-appropriation and re-constitution of their *place* as the solution. Not only have these efforts not led to many significant or consistent improvements in public housing resident well-being (Levanthal and Brooks-Gunn, 2003; Acevedo-Garcia et al, 2004; Clampet-Lundquist, 2004b; Harris and Kaye, 2004; Popkin et al, 2004a; Popkin et al, 2004b; Howell et al, 2005; Levy and Woolley, 2007; Fauth et al, 2008; Keane and Geronimus, 2011; Manjarrez et al, 2007; Goetz, 2010; Goetz and Chapple, 2010; Jones and Paulson, 2011; Ludwig, et al, 2011; Sampson, 2012), the manner in which they have been developed and implemented has systematically precluded resident agency—habitually circumventing critical examination of the underlying social, economic, and political structures that necessitate place-based strategies in the first place (NHLP, 2002; Keane and Geronimus, 2011; Chaskin, 2013; Slater, 2013; Goetz, 2013a; Goetz, 2013b). Accordingly, it is of critical importance to understand that many public housing "places" are pre-made and simply consumed by residents—residents are commonly dispossessed (displaced) of one place and then dispersed (re-placed) into new locations where

they have little control and few social or political connections. Thus a requisite to understanding residents' lived experience with place, and consequent health effects, is explicating the mechanisms that either facilitate or limit their ability and power to participate in and influence the placemaking process.

Unfortunately, there is a paucity of public health research focused on residents of public housing. This lack of research not only limits our knowledge of the health status of public housing residents and how residing in public housing might influence health, but it also restricts our ability to understand how public housing fits into residents' larger geographic, social, and economic landscapes. For example, project-based public housing residents must move between many places outside their project complex to meet their daily needs and complete daily functions. While this is generally true for residents of single family homes, it is especially important for public housing residents given their already vulnerable position and the added pressure to maintain their housing subsidy (Manjarrez et al, 2007). Moreover, there is often a spatial mismatch between where public housing residents live, and the amenities and opportunities they need to sustain themselves (e.g. education and employment opportunities, grocery stores, retail shopping, pharmacy, post office, church, and so on). These non-residential places constitute a significant portion of their daily health-related opportunities and exposures. The extent to which the housing location and its external connectivity influence residents' ability to meet their daily needs is instrumental to their overall well-being. Thus, understanding how public housing fits into the larger spatial, social, economic, and political landscape of residents' lived place beyond the housing community boundaries is critical to evaluating and improving place-based strategies involving public housing.

A central challenge is how to account for the daily space-time patterns of individuals and populations (who are simply residing in a particular location) to best design, implement, and evaluate place-based strategies that are sensitive to peoples' lived realities of place. Being able to do so would improve our ability to optimize spatial and social configurations of health assets and opportunities, while simultaneously minimizing negative place-based health exposures. In the context of place-based strategies involving public housing, this means understanding how the spatial location of the project fits within the daily *places* of its residents—where are the jobs, schools, parks, fresh food vendors, social hubs, pharmacies, health care providers, transportation hubs, and so on; what are the temporal, spatial, and social connections (or divisions) between these places; and where are the negative health exposures situated within these space-time configurations (e.g. at work, the walk to school, near the park). Thus, place-based strategies involving public housing would do well to critically assess and be responsive to the very person-centered spatiotemporal activity patterns of affected residents. This perspective would facilitate a more comprehensive understanding of health in public housing, and how to improve it, as well as ensure that place-based thinking maintains an appreciation for the individual and collective lived realities of residents—that is, a people-centered focus within place-based strategies.

The field of place-health research has grown rapidly in recent years (Ellen et al, 2001; Pickett and Pearl, 2001; Sampson et al, 2002; Riva et al, 2007; Santos et al, 2007; Diex-Roux and Mair, 2010), and is it well-suited to help understand health in the context of public housing. However, major conceptual and methodological challenges remain in defining "place", characterizing place contexts, and measuring place—all of which have implications for place-

health research, public health practice, and the design and implementation of place-based strategies. Of particular need is work capable of revealing: 1) spatially- and temporally-specific configurations of place-based exposures and opportunities, 2) perspectives and influences of place across generations and over the lifecourse, and 3) opportunities for action to address place exposures that adversely affect community health.

Accordingly, the goal of the work presented here was to develop and field-test a place-health framework that: 1) accounts for the multi-nodal nature of "place" and its contingent spatial, temporal, and social inter-nodal connections/divisions; 2) elucidates potential intergenerational and life-stage differences in place experiences/perceptions; and 3) explicitly engages the sociopolitical mechanisms that make, unmake, and remake place over time—shaping spatiotemporal patterns and sociospatial arrangements of place exposures and opportunities. A framework for the *placescape* approach was developed drawing from place-health, social epidemiology, participatory research, geography, and sociology literatures. This framework was then applied to an intergenerational community-based participatory research (CBPR) study of place, embodiment, and health. Parent-child dyads were recruited from a project-based public housing community and trained in four participatory action research (PAR) methods: *Photovoice*, *Activity Space Mapping*, *X-Ray Mapping*, and *Participatory GIS*. Participants used this combination of methods to map their placescapes, revealing spatially and temporally-specific distributions of place-based exposures and opportunities that reflect their lived experiences of "place", beyond and in relation to their housing community.

This paper begins with a discussion of core conceptual challenges and approaches within place-health research that can help inform work in the context of public housing and other place-based strategies. Then, a case is made for enhancing place-health research efforts through intergenerational and participatory approaches. The *placescape* framework is then introduced with an overview of its conceptual foundations and core tenets. This is followed by the presentation of the process and findings of a "field test" of the placescape approach in practice with residents of a public housing community. This paper closes with a discussion of implications of this work for intergenerational place-health research/practice and place-based health and housing strategies going forward.

What is this Place?
Core Conceptual Challenges and Approaches in Place-Health Research

Many conceptual challenges remain in place-health research (Diez-Roux, 2001; MacIntyre et al, 2002; Diez-Roux, 2004; Frumkin, 2006; Bernard, 2007; Matthews, 2008; Cummins et al, 2007; Cummins, 2007; Cutchin, 2007; Chaix et al, 2009; Kwan, 2009; Rainham et al, 2010; Matthews, 2011). Of particular prominence are matters related to conceptualizing and defining "place", and accounting for changes in place over time. For example, "place" is almost exclusively defined as an administrative location of residence, e.g. census tract where one lives, or as some other "territorial neighborhood" (Chaix et al, 2009). Additionally, most place-health research views "place" as singular in nature, thus the census tract ("neighborhood") of residence is the *only* place examined in most studies (Chaix et al, 2009; Diez-Roux and Mair, 2010). Moreover, the majority of place-health work has been cross-sectional, meaning that our understanding of place and health is derived mostly from examinations of one singular place at only one particular point in time. In short, "place" in health research has largely been arbitrary, singular, static, and, perhaps most importantly, operationally invisible and meaningless to those residing in it—such a place does not exist in their lived reality. Many researchers have of course questioned the legitimacy and utility of such a conception of and approach to studying place, and some have suggested more appropriate approaches.

As noted by Matthews (2008, p.259), there is "abundant evidence that people jump spatial scales and move across multiple, non-nested hierarchies in their daily activities." That is, people are not bounded by the artificial lines we often use to define place in our studies, thus our measures of place-effects are quite haphazard—presuming that the only place-based exposures of importance for health occur "24/7/365" in one location (Matthews, 2008; Kwan, 2009). MacIntyre and colleagues (2002) suggest an approach to place that is rooted in an understanding of human needs and how they are met. A particular location, a "neighborhood" for example, will only provide some of the requisite "opportunity structures" needed to support and sustain a healthy life; thus, people will inevitably have to navigate to and through multiple places. Accordingly, "this means operationalizing measures, appropriate for the particular society and historical period, of the ways in which these needs are met in particular places" (MacIntyre et al, 2002, p.133). Implicit in this approach is that each person will have a unique set of needs that they will need to meet in a particular way; thus, any notion of "place" and place-effects must be able to account for similarities and differences between peoples' needs-driven configuration of places—and these places are not in one singular area. Additionally, the authors encourage recognition of the dynamic and changing reality of places and peoples' interaction with features of place over time, and the need for theorizing around time in place-health research.

Cummins and colleagues (2007) put forth a "relational" approach to understanding place. From this perspective, places are best conceptualized as nodes within networks that are connected and/or separated by "socio-relational" distance. Additionally, these nodes and their bounds are seen as fluid and dynamic, changing over time. Moreover, people are no longer viewed as agency-less entities within a fixed area, but as actors with variant mobility patterns over time, e.g. a day, a week, their lifecourse. Similarly, work by Matthews and colleagues (2005) suggests understanding "place" based on the multiple spatial locations people interact

with during their daily activities—the heterogeneity of peoples' daily places a testament to the reality of their "spatial polygamy" (Matthews, 2011). From this perspective, "place" is no longer a singular location, but rather a particular configuration of nodes that constitutes a spatiotemporal network of a person's lived reality of multiple locations (Matthews et al, 2005; Cummins et al, 2007; Matthews, 2011).

Instead of arbitrarily defining place as a singular static and largely imaginary set of bounds, "place" becomes a dynamic reflection of peoples' real spatial experiences—experiences that are shaped by and possess historical, social, and political meanings (MacIntyre et al 2002; Cummins et al, 2007; Matthews, 2008; Kemp, 2011). The concept of "spatial polygamy" thus aptly captures the multi-nodal nature of a person's lived place—moving from, to, and through place to place throughout a day or week, for example (Matthews, 2011). The location of residence is but one node, and each individual's configuration of non-residential nodes will be different. Accordingly, the spatial polygamy approach extends the idea of "ego-centered neighborhoods"—each person's "place" ("neighborhood") becomes the aggregate of their person-centered nodes and inter-nodal connections (Chaix et al, 2009; Matthews, 2011). Because it does not artificially bound peoples' experience of place contexts, it enables accounting for and responding to health-related exposures beyond simply the "neighborhood", thus avoiding the "local trap" that pervades most place-health research (Cummins, 2007).

Relatedly, attention has also been drawn towards the relevance of concepts from time geography, specifically, person-centered time-space and activity space (Kwan, 2009; Rainham et al, 2010; Chaix et al, 2012; Matthews and Yang, 2013; Perchoux et al, 2013; Browning et al, 2014; Jones and Pebley, 2014). Here, "place" is less about a specific fixed location (e.g. neighborhood), but more about a specific person's actual daily "action space" (Kwan, 2009). Accordingly, notions of neighborhood and how to define it become largely irrelevant—a person's "place" is determined by where they go and how much time they spend en route and once they get there—an understanding complimentary to that suggested by MacIntyre and colleagues (2002) regarding human needs and "effective neighborhoods", and the "relational" place as described by Cummins and colleagues (2007). No two peoples' time-place experiences and exposures will be exactly alike (presumably). Thus, much like with the concept of spatial polygamy (Matthews, 2011), "place" effects on health are best viewed as the product of the space- and time-specific exposures people encounter in the course of their daily lives—multiple places for varying amounts of time. Place becomes person-centered and time-bound, as opposed to location-centered and timeless. As posited by Rainham and colleagues (2010, p.669), "place-based health research would benefit from both a greater knowledge of the patterns of movements of people, and insight into the heterogeneity of context associated with these movements within the population of interest."

In the context of public housing, projects are indeed clearly defined and fixed locales, and while they are undoubtedly in a particular census tract or set of tracts, the residents' lives are not bound within them. The housing project is a singular node in their spatially polygamous and multi-nodal lives. Exposures and opportunities encountered within the project or immediate surrounding "neighborhood" are only a fraction of all those influencing their health status. If we want to fully understand and improve the health status of and opportunity for public housing residents, we need to better understand and account for how their place of

residence is connected to and influences their larger lived place. Intergenerational and participatory approaches can prove valuable in this regard.

A Case for Intergenerational and Participatory Place-Health Research: An Overview and an Opportunity

In addition to core conceptual challenges, there are two central procedural limitations in the majority of place-health research to date that represent opportunities to enhance the field, especially in regard to work having the potential to inform place-based strategy development and evaluation. ***First***, a growing body of work suggests multigenerational place-effects. For example, neighborhood deprivation has been shown to be associated with child cognitive development across generations (Sharkey and Elwert, 2011). This work suggests that research must consider both "direct and indirect pathways by which neighborhood exposures in both the parent and child generations may influence children's trajectories" (p.2). While there is a general consensus that such exposures indeed exert influence on health and developmental outcomes, the potential mechanisms of multigenerational effects remain unclear. Additionally, such elaboration will require an improved understanding and enumeration not only of stable and varying exposures *across* generations, but also how perceptions of these exposures might vary *between* generations. Unfortunately, there is a paucity of place-health work that incorporates both youth and adult perspectives or accounts for changes in "place" over time. As public health practice and research continue to evolve and become more sensitive to the need for a lifecourse perspective on health (Hertzman et al, 2001; Ben-Shlomo and Kuh, 2002; Hertzman and Power, 2003; Lynch and Davey Smith, 2005), it will become increasingly important to include opportunities for intergenerational perspectives and participation in the work. Adults and youth have fundamentally different place experiences, encountering different physical and social environments throughout their day, for example, and those environments change over time. The intentional inclusion of more real-time youth perspective in current place-health work would enhance retrospective and real-time work with adults and allow for more rigorous and nuanced examination of place and health across generations and across the lifecourse (Curtis et al, 2004; Cummins et al, 2007). Moreover, this multi-generational approach facilitates examination of how perceptions vary between youth and adults and how these perceptions change over time—thus improving our ability to identify and appropriately characterize exposures, and correctly specify multigenerational mechanisms.

Second, most social epidemiological work on place and health to date has not effectively incorporated participatory methods. This practice gap presents as a missed opportunity to critically engage residents in the process of defining, understanding, and changing place and its local policy/political determinants. It is this chasm that has recently been highlighted for redress—integration of social epidemiology and community-engaged research (Leung et al, 2004; Lantz et al, 2006; Wallerstein et al, 2011). Incorporating participatory methods in the social epidemiologic inquiry into place and health can help bridge this gap. Employing an approach that is rooted in community-based participatory research (CBPR) and makes use of participatory methods ensures local knowledge and expertise are prioritized in the research

process, and facilitates power-sharing and critical engagement among local communities, research participants, and outside researchers (Israel et a, 1998; Minkler, 2000; Israel et al, 2010; Minkler, 2010; Wallerstein and Duran, 2010). Thus, the research findings reflect nuances and perspectives of peoples' lived realities that otherwise are often missed using non-participatory methods and a non-participatory approach. Such an integrated approach will allow for a more organic, grounded, and locally relevant exploration of place that can better inform place-health theory and metric development, as well as the development of place-based public health strategies. A community-engaged approach that utilizes participatory process and methods can improve not only research on place and health (e.g. research questions, data collection, analysis, and dissemination), but also local research translation and action based on the work completed (Morello-Frosch et al, 2005; Wallerstein and Duran, 2010; Minkler et al, 2010; Balazs et al, 2013).

Moving Towards a *Placescape* Approach: Conceptual Roots and Core Tenets

Current dominant approaches to place-health research are quite limited in their ability to account for peoples' lived spatial realities, thus affording only a partial rendition of relevant place-based health exposures, health opportunities, and their related sociopolitical determinants. Accordingly, there is a need for enhanced approaches to understanding and studying place. Here, the *Placescape* is introduced as both an analytical framework and a conceptual orientation for understanding place that can more adequately capture the lived reality of place and its social, economic, and political determinants, and accordingly better inform the development, implementation, and evaluation of place-based health strategies—especially those involving public housing. The Placescape framework (*FIGURE 1*) draws from the place-health literature summarized above, as well as from ecosocial theory (Krieger, 1994; Krieger, 2001) and critical theory (Foucault, 1978; Harvey, 2004; Fine and Ruglis, 2009; Ruglis, 2011). Specifically, *TABLE 1* shows the concepts that form the foundation for the Placescape framework. The first five concepts, *"relational" place* through *"activity space"*, deal primarily with considerations of how "place" is conceived, defined, measured, and operationalized. Taken together, these concepts outline the value of an approach to "place" that is spatially and temporally dynamic and bound not by imaginary administrative lines, but by the daily movements and spatial behavior patterns of public housing residents. The remaining concepts, *"riskscape"* through *"biopower"*, deal primarily with considerations of power, agency, and accountability within historic and current policies, practices, and processes that fundamentally shape the social, economic, and environmental character of residents' places, and the spatial patterns and distributions of health opportunities and risks within. These concepts highlight the critical import of taking an approach to place that explicitly acknowledges and engages the manner in which place is actively (and continuously) made, unmade, and remade, and is thus attuned with the structured yet malleable nature of residents' place-based health exposures and opportunities.

TABLE 1: **Conceptual Foundations for the Placescape Framework in Public Health and Public Housing**

Concept / Construct	Author(s)	Theoretical Home / Field(s)	Summary
"relational" place	Cummins et al (2007)	place-health research; human geography	• "Place" is not a singular and static spatial location, but rather a network of locations that vary by person over time and over the lifecourse. • Connections between these places are best understood in terms of "social-relational distance", as opposed to simply physical distance • Spatial and territorial divisions do not necessarily coincide with administrative boundaries, and are "imbued with social power relations and cultural meaning" (p.1827), and are experienced viscerally and corporally by residents moving through multiple places during their day-to-day activities and over their lifecourse. • Places change over time and are shaped by processes at both local and non-local levels
"opportunity structures"	MacIntyre et al (2002)	place-health research; human geography	• Refers to "socially constructed and socially patterned features of the physical and social environment which may promote or damage health either directly, or indirectly through the possibilities they provide for people to live healthy lives" (p.132). • These structures have particular spatial arrangements within a local geographic context and these arrangements are shaped by both local and non-local social, economic, and political processes, policies, and practices. • Opportunity structures are actively made, and accordingly can be either preserved as is or modified, with consequent effects on residents' lived place
needs-driven place	MacIntyre et al (2002)	place-health research; human geography	• People have a set of basic human needs which need to be met to live healthy lives. • A resident's needs-driven place is in part governed by the opportunity structures they encounter and experience within the context of their daily lives—which may necessitate, even dictate, that they meet their needs across spatially distant and socially disparate places.
"spatial polygamy"	Matthews (2011)	place-health research; human geography	• Rooted in the idea that people are not "loyal" to a singular place, but have an affinity for and meaningful connections to multiple places • People have core anchor points, or "nodes", in their daily lives, and residence is just one. • The spatial distributions of these place nodes and their inter-nodal connections do not readily coincide with traditional spatial bounds used in place-health research.
activity space	Perchoux et al (2013); Browning (2014); Matthews and Yang (2013)	human geography; space-time geography; transportation; place-health research	• The geographic spaces people travel to and within during their day-to-day activities. • Has both spatial (geographic locations and routes to/from places encountered) and temporal (e.g. frequency, regularity, duration, sequencing, and timing of place encounters) emphases. • A way to assess and account for peoples' mobility patterns and spatial behaviors, and thus their spatially- and temporally-specific health-related opportunities and exposures as experienced through their daily lives
"riskscape"	Morello-Frosch et al (2001)	Environmental Justice; environmental health research	• Describes the myriad of environmental health exposures that tend to overlap (temporally and spatially) within low-income and segregated communities of color. • The spatial distribution and concentration of these exposures is shaped by current and historical social, economic, and political practices and policies that devalue and disproportionately burden the community environments of socially disadvantaged

			populations.
"pathways of embodiment"	Krieger (1994; 2001)	Ecosocial Theory (Krieger, 1994); Social Epidemiology	• Within ecosocial theory, *embodiment* describes the process through which the outside material and social world becomes biologically incorporated. • *Pathways of embodiment* are the avenues through which social inequality, power imbalances, and resource inequities shape and constrain life opportunities with consequent effects on our physiologic functioning.
"agency and accountability"	Krieger (1994; 2001)	Ecosocial Theory (Krieger, 1994); Social Epidemiology	• Considers who is responsible for shaping and maintaining the societal arrangements of power, resources, and opportunity (i.e. the pathways of embodiment), and thus accountable for consequent health inequity. • In the context of "place", this construct challenges us to think critically about how historic and current power relations have patterned distributions of resources and opportunities both socially and spatially. • Challenges us to think explicitly about responsibility and culpability, asking who and what is responsible in shaping, maintaining, and/or mitigating inequities
"accumulation by dispossession"	Harvey (2004a,b; 2006)	Critical Theory; critical geography	• Describes how goods/assets are systematically transferred from the masses (i.e. public) to the upper class (i.e. private or class-privileged), driving a process of *uneven geographical development*. • These "transfers" are necessitated by crises of capital over-accumulation—new spaces of development are needed for continued value gains and growth. • The major modalities of accumulation by dispossession include privatization, financialization, the management and manipulation of crises, and state redistributions. • In the context of place and public housing, examples might include strategies involving mixed-income housing developments, the deliberate deterioration and devaluation of properties, demolition of public housing and subsequent use of the space for private benefit, demolition of public housing without 1-to-1 replacement, and displacement of residents under the auspices of community development or "revitalization".
"circuits and consequences of dispossession"	Fine and Ruglis (2009); Ruglis (2011)	Critical Theory	• Describes how neoliberal processes and mechanisms of accumulation by dispossession function to de-value and deprive socially disadvantaged youth of equitable education resources and opportunities. • Students are dispossessed of their right to a social good—education—the loss of which is "offset" by private gains • A "circuit" of dispossession is formed by various state-sanctioned education (and non-education) policies/practices. A "consequence" of this dispossession is compromised health.
"biopower"	Foucault (1978)	Biopolitics (Foucault, 1978/9); Critical Theory	• Refers to the myriad of technologies of power that center on managing, regulating, and subjugating physical bodies (people). • This ordering and manipulation of populations of bodies, accompanied by an array of techniques (e.g. statistics, laws) and discursive practices (e.g. science), is used to justify and maintain particular social and political arrangements (e.g. of goods, property, opportunity). • Technologies of biopower are thus a primary mechanism through which bodies are socially and spatially organized and controlled

The concepts outlined in *TABLE 1* form a rich theoretical foundation for developing the *Placescape* as a cursory analytical framework through which to view and appraise "place" and the manner and processes through which it is made, un-made, and re-made over time. In the context of public housing, these "placemaking" processes include not only public housing strategies and policies (e.g. Choice Neighborhoods, Sustainable Communities, Section 8) (HUD, 2013a-e; HUD, 2015e), but also mechanisms like the community development block grant (CDBG) (HUD, 2015f), the low-income housing tax credit (LIHTC) (HUD, 2015g), Home Investment Partnership Program (HOME) (HUD, 2015h), and the Community Reinvestment Act (CRA) (FDIC, 2015). These placemaking mechanisms, representing both "pathways of embodiment" and technologies of "biopower", are themselves influenced by larger social, economic, and political realities (Goetz, 2013), and ultimately shape residents' lived and embodied experiences of place—their individual and collective *placescapes*. The extent to which placemaking processes are inclusive, equitable, and attentive to residents' basic needs and well-being is thus a key determinant of the overall spatial structure of health opportunity and risk in relation to public housing, and this structure in turn shapes residents' daily mobility patterns and spatial movement (thus the centrality of needs-driven place, "relational" place, "opportunity structures", "spatial polygamy", "activity space", and "riskscape"). This larger Placescape framework challenges us to actively engage "place" in a manner that accounts for the historically dynamic, socially malleable, and economically and politically contingent nature of how it is and how it came to be—thus the import of "agency and accountability", "accumulation by dispossession", and "circuits and consequences of dispossession". One potential way to elucidate how these processes unfold, and how they are experienced to influence health opportunity and risk, is through engaging residents in processes of participatory research. Drawing from the concepts in *TABLE 1*, operationalizing a placescape orientation to place-health research entails a few core tenets, summarized in *TABLE 2*.

***TABLE 2*: The Placescape: Core Operational Tenets for Place-Health Research**

Placescape Tenet (PT)	Summary
PT1: NEEDS & OPPORTUNITIES	Each resident has a unique set of needs; thus, any notion of "place" must account for similarities and differences between residents' needs-driven configuration of places and the place-based opportunity structures that shape how and where such needs are met.
PT2: MOBILITY & BOUNDS	Residents viewed as actors with variant mobility patterns over time, and these patterns do not necessarily coincide with administrative bounds
PT3: MULTINODAL PLACE	"Place" is best seen as a particular configuration of "nodes" with connections, divisions, and restrictions that constitutes a person's lived spatiotemporal place network
PT4: POWER IN PLACE(MAKING)	Place configurations are consequences of historic and pervading power relations. Within these power relations, *place is both made and re-made, both consumed and produced, and both includes and excludes*. a. Distributions and degree of benefit and harm from each process are inextricably linked to distributions of power and participation underlying each process. b. Considerations of who is responsible for shaping and maintaining societal arrangements of power and resources—particularly as related to space (access, possession, and valuation), and the sociopolitical and economic mechanisms underlying the spatial sorting of opportunity—are critical.
PT5: LIFECOURSE IN PLACE	Place experiences and perceptions are not static or universal, but best seen as time-variant and generationally and life-stage contingent; as such, place effects on health are best viewed as the product of the space- and time-specific exposures (positive and negative) residents encounter in their daily lives and over their lifecourse.
PT6: AGENCY IN PLACE(MAKING)	Place-health research *is part of the placemaking process*. a. All entities/persons are actors with varying degrees of knowledge, expertise, and power whose expressions and manifestations are implicated in either the maintenance of or challenge to current conditions. b. As such, communities should be proactively engaged in the research process, as their embodied experiences, perspectives, and expertise can improve place-health research, research translation, and intervention efforts.

FIGURE 1 is a visual schematic of the Placescape framework in the context health in public housing. The large red circle represents a *circuit of dispossession* (e.g. placemaking). The blue circles represent expressions/technologies of *biopower*. The green circle represents the *placescape* paradigm (described in *TABLE 2* above) as experienced by residents, i.e. their spatially- and temporally-specific experiences, and life-stage contingent perceptions of place. Note that each of the circles representing *biopower* and the *placescape* are elements of the larger circuit of dispossession, but also function independently as circuits themselves (as represented by the red circle outlining around each). The blue arrow moving from the *placescape* to *health* represents the link through which the larger *circuit* of dispossession (e.g. placemaking) becomes a *consequence* of dispossession (here, health). For example, housing and community development policy, as technologies of biopower, form and interact within a circuit of dispossession, making and remaking residents' lived placescapes (e.g. via spatial ordering and sorting of people, modification of social networks, built and natural environments, economic and political contexts). This manifestation of biopower, expressed at the population level, is encountered and experienced via residents' lived *placescape*; and this *placescape* experience is embodied by residents *individually* (i.e. spatiotemporal and spatiosocial patterns of place-based exposures). Thus, the blue coloring of the arrow between the *placescape* and *health* indicates the link between technologies of biopower at the population level (e.g. public housing policy) and the physical embodiment of place at individual level, as mediated by residents' lived placescape.

***FIGURE 1*: A Placescape Framework for Place and Health in Public Housing**

The Placescape in Practice:
An Intergenerational Study of Place, Embodiment, and Health

The People's Social Epi Project (PSEP) was developed and executed with an orientation anchored in *A People's Social Epidemiology* framework (Petteway, 2014a; CHAPTER 1)—a multicomponent and tiered framework to guide social epidemiology research/practice to become more inclusive and equitable, improve knowledge translation, and facilitate timely, locally relevant action. The *placescape* approach was applied within PSEP to examine and demonstrate its utility in modeling *A People's Social Epi* within place-health research. The PSEP integrates social epidemiology and participatory action research (PAR) in collaboration with parents and youth residing in public housing to further understand where and how place-based exposures that affect health and well-being are encountered, perceived, and experienced intergenerationally. This work seeks to: 1) expand and make novel contributions to research on health in public housing; 2) improve conceptual and operational understandings of place through identifying the spatial, temporal, and social connections and divisions between the places of residents' daily activities; and 3) elucidate spatial, temporal, and perceptual differences between parent and youth place experiences. The specific aims for the work presented here were to:

1) Determine the spatial distribution of adult and youth daily places within 5 broad place-domains: *Home*, *Neighborhood*, *School/Work*, *Social/Leisure*, and *Transition*
2) Characterize adult and youth perceptions of place-embodiment for their daily places; and
3) Assess spatial differences of "place", and perceptual differences of place-embodiment between adults and youth.

The research was completed using participatory methods for the systematic documentation and assessment of place-based exposures and opportunities with two generations of public housing residents recruited from a predominantly Black public housing project. This public housing community represents one of only a few remaining affordable housing options in the participants' city, and at the time of this study, residents were feeling particularly concerned about their current and future housing prospects, due to adjacent development pressures (discussed below). This context made the current project especially timely and relevant.

All recruitment and project activities were completed with guidance from an adult resident research co-lead who was trained in human subjects research. One parent and at least one youth from each participating household were recruited as parent-child dyads. Youth were between ages 13 and 18 and had to be enrolled in school. Parents had to have some daily form of formal or informal employment or non-leisure activity (e.g. job, childcare, doing friends' hair, errands). The process and findings presented here are from the first iteration of the PSEP, for which complete data are available for 4 adults and 7 youth.

Methods

Participants were trained in key components of public health including core principles related to social epidemiology and health equity, and fundamental aspects of public health research and CBPR. All research methods were participatory and completed by the participants themselves. Research methods flowed sequentially and built upon each other as follows: (1) *Photovoice* (Wang and Burris, 1997; Wang, 2005; Catalani and Minker, 2010); (2) *Activity Space Mapping* (see for example Chaix et al, 2012; Matthews and Yang, 2013; Perchoux et al, 2013; Browning and Soller, 2014); (3) *X-Ray Mapping* (see Ruglis, 2011); (4) *Participatory GIS*. First, participants used *Photovoice* (via cellphones) to identify, photo-document, and describe important daily places, and specific exposures/opportunities within each place they perceive affect their health (positively or negatively). Next, participants used *Activity Space Mapping* to geolocate and map their *Photovoice* photos and identify any additional non-photographed places, and to rate and provide time estimates for each mapped place. Then, using a cognitive mapping method known as *X-Ray Mapping,* they created symbolic representations of place-embodiment reflecting how each of their mapped places affects their bodies and health. Finally, constituting *Participatory GIS*, study participants integrated and digitally mapped their work via a web-based interactive and multimedia-enabled information and communication technology (ICT) platform, *Local Ground* (Van Wart, Tsai, and Parikh, 2010). This platform allows participants to easily create, enhance, print, and digitally share their place research maps with the broader community and city officials. Adults and youth completed each method simultaneously but in separate all-adult and all-youth groups. All research protocols were approved by the University of California, Berkley institutional review board (protocol #2013-10-5700).

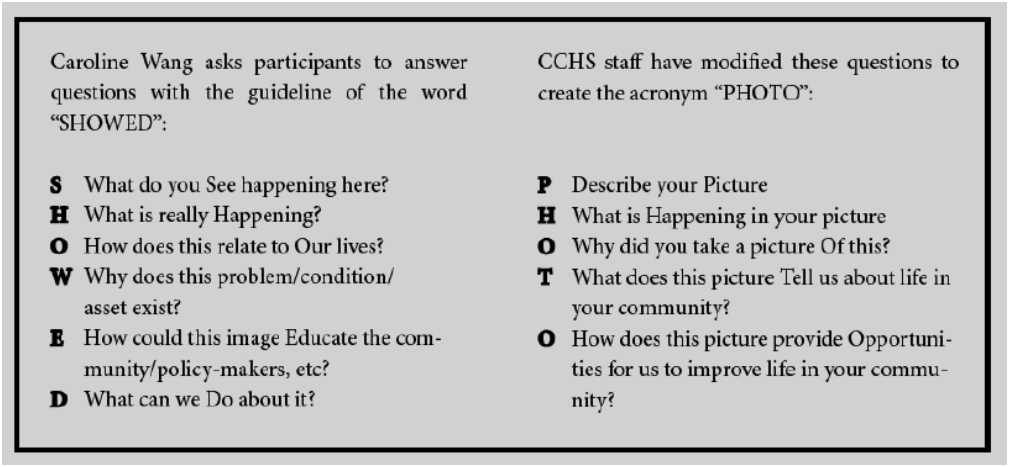
Photovoice

For *Photovoice*, there were 2 Training Sessions, 4 photo Review Sessions, and 2 participatory Analysis Sessions (see Petteway, 2015a for details regarding the photovoice process). The first Training Session described the *Photovoice* process, reviewed the overall research project theme (e.g. place and health), discussed participation-related concerns, and covered matters of parent consent and child assent. The second Training Session was used to train participants in basic photography techniques, principles, and ethics, and to discuss general principles of power, ownership, and safety. Participants were then prompted to take photos of important places that they go to or see on a regular basis (e.g. daily, weekly) and that they believe affect their health and the health of their community, positively or negatively. Participants took photos to document their places on their own time as they went about their daily lives, bringing their favorite photos to each Review Session to discuss them and complete narratives with guidance from a facilitator. At the next-to-last photo Review Session, participants selected their final 5 favorite photos for printing and completed a final photo narrative worksheet using a standard *Photovoice* guide (*FIGURE 2*) Participants used these final favorite photos and narratives for their participatory analysis, including sorting, coding, theming, and ranking processes (detailed in Petteway, 2015a).

During a 2-hour Final Review Session, participants framed their final favorite photos. Then, participants (in separate all-adult and all-youth groups) were asked to view each other's

photos and corresponding narratives, sort them, and group them based on how they thought they belonged together. They were instructed to create at least 4 groups of photos (with any range of photos in each). Next, they were asked to come up with an overall name/title for each group of photos they created. Participants' hand-written final photo narratives were typed-up and grouped based on the photo groupings decided upon by the participants. These typed narratives were printed for participatory analysis use during the Analysis Sessions, following a process similar to that used by Foster-Fischman and Lichty (2010) (see Petteway, 2015a for details).

***FIGURE 2*: Photovoice Narrative Guide** (from Pies and Parthasarathy, 2008)



Caroline Wang asks participants to answer questions with the guideline of the word "SHOWED":

S What do you See happening here?
H What is really Happening?
O How does this relate to Our lives?
W Why does this problem/condition/ asset exist?
E How could this image Educate the community/policy-makers, etc?
D What can we Do about it?

CCHS staff have modified these questions to create the acronym "PHOTO":

P Describe your Picture
H What is Happening in your picture
O Why did you take a picture Of this?
T What does this picture Tell us about life in your community?
O How does this picture provide Opportunities for us to improve life in your community?

Activity Space Mapping

For *Activity Space Mapping* (ASM), participants used large print-out maps to identify the locations of their *Photovoice* photos using stickers and markers. Participants then identified additional important places for which they had not taken photos. This process was completed over the course of 3 meetings. Participants were instructed to use green stickers to represent photo-places that were healthy/good/positive, red stickers for photo-places that were unhealthy/bad/negative, and yellow stickers for photo-places that they perceived as both healthy and unhealthy. Participants also completed an ASM worksheet for each mapped place. This worksheet asked them to estimate how much time they spend there, how long it takes to travel to and from, how they travel (e.g. walk, bus), and how often they go there. Participants also expressed a desire to "rate their place" and decided to use a star scale to do so, with 1-star being the lowest (e.g. very unhealthy) and 5-stars being the highest (e.g. very healthy) (*FIGURE 3*) These data were aggregated for adults and youth separately and used to develop two metrics decided upon by the participants: *PlaceTime* and *PlaceGrade*. *PlaceTime* is based on the estimates participants made for the amount of time (minutes per day) spent at each place identified via their ASM worksheets. *PlaceGrade* is based on the star-rating participants assigned to each place identified via their ASM worksheets—with the five star-levels transformed into a five-point grade point average scale with 12 categories, where 1=F and 5=A. So for example, if the average star rating a participant gave to their places in the *Neighborhood* place-domain was 2.5 stars, their place "GPA" would be 2.5—and thus a *Neighborhood PlaceGrade* of D+.

***FIGURE 3*: "Rate Your Place" section of Activity Space Mapping worksheet**

Note: Ratings were aggregated and averaged to determine adult-specific and youth-specific *PlaceGrades*

RATE YOUR PLACE

If you could rate how healthy/good for your health or your community's health this place is, or how unhealthy/bad for your health or your community's this place is, how would you rate it?

Give your photo-place a rating between 1 and 5 Stars.

1 Star = Very *un*healthy, bad, or negative

5 Stars = Very healthy, good, or positive

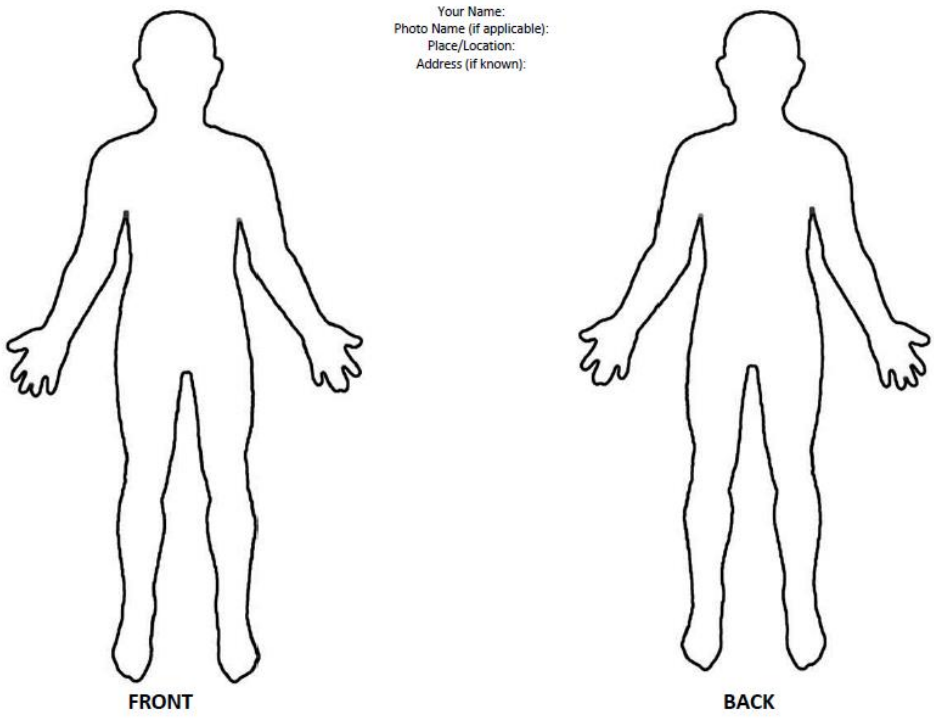
Other comments or thoughts:

X-Ray Mapping

During *X-Ray Mapping*, participants used 8.5" by 11" worksheets with a basic body outline with dorsal and ventral representation (i.e. front and back) to identify body areas that they believed were affected by each of their places (*FIGURE 4*). For each photo-place identified via *Photovoice* and *Activity Space Mapping* they created an X-Ray Map using stickers to indicate the areas of their body they perceived were affected by that particular place. That is, each photo-place had a corresponding X-Ray Map to represent participants' perceptions of place-embodiment. This was done over the course of 2 meetings. Participants expressed a desire to continue the color-coding scheme from *Activity Space Mapping*. Here, green represented healthy/good/positive body effects, red represented unhealthy/bad/negative body effects, and yellow represented both. Participants were free to use as many stickers as they believed necessary to capture all of their perceived place-embodiment effects for each place, such that each X-Ray Map could contain multiple positive and negative effects (e.g. positive heart, negative brain, and negative back) and each body area/part could have multiple stickers of the same or different colors (e.g. two positive and three negative brain effects). Participants were instructed to use the back of their X-Ray Map worksheets to write a brief description/narrative explaining their place-embodiment representations.

Each X-Ray Map was reviewed to complete simple counts and frequencies of: 1) place-embodiment geographic locations (based on the 5 overall PSEP place-domains of *Home*, *Neighborhood*, *School/Work*, *Leisure/Social*, and *Transitio*n), 2) place-embodiment physiologic locations (e.g. heart, brain, stomach), and 3) type of perceived place-embodiment effect (i.e. positive, negative, both). This was done for each individual participant separately. Once individual place-embodiment tabulations were completed, results were aggregated for youth and parents separately. Aggregate summary tables were produced for overall adult and youth place-embodiment data, as well as domain-specific adult and youth place-embodiment data. Qualitative comparisons were made between aggregate youth and aggregate adult X-Ray data. Summary infographics were developed to visually represent place-embodiment among adult and youth participants. All X-Ray Map data was then mapped on the *Local Ground* platform to enable geographic visualization and qualitative comparison of adult and youth "geographies of embodiment" (see Petteway, 2014b and CHAPTER 3 for complete X-Ray Mapping details).

FIGURE 4: **X-Ray Mapping Worksheet**



Participatory GIS

For *Participatory GIS*, participants synthesized and uploaded their data (photos, narratives, body-effects etc.) to the *Local Ground* platform. This platform allowed participants to create a password-protected account (similar to an email account) to upload and digitally map their data.

Place-Domain Categorization

Participants' data elements (e.g. photos, Activity Space Maps, X-Ray Maps) were assigned to a place-domain based on the data topic and location. For example, a photo of a participant's housing environment would be assigned to the "Home" domain, and a photo related to a participant's school/place of work would be assigned to the "School/Work" domain, and so on. Data reflecting their community built, social, and food environments etc. were assigned to the "Neighborhood" domain, except those data for which associated narratives indicated that a particular location was simply observed/passed on their route/way to another intended destination (e.g. "I walk by this building on the way to school"). In this case, data were assigned to the "Transition" domain *and* "Neighborhood" domain, but counted only in the "Transition" domain for the data presented here. Data related to leisure/social activities or related places were assigned to the "Leisure/Social" domain.

Findings

Youth took a total of 66 photos during *Photovoice*, of which they selected 31 for inclusion in their participatory theming, coding, and ranking analysis (detailed in Petteway, 2015a). However, sufficient information was available to geolocate, assign a place-domain category, and determine positive/negative participant place appraisals for 47 photos. Adults took 49 photos total, 20 of which they included in their participatory analysis. For adults there was sufficient information for 31 photos for geolocation, place-domain categorization, and positive/negative determinations. *TABLE 3* and *TABLE 4* summarize youth and adult *Photovoice* data across the 5 place-domains in regard to how they appraised their photo-places. *FIGURES 5 and 6* show an example of how participants geolocated their photovoice photos (and narratives) using the Local Ground platform. The photos chosen for presentation here were selected based on how prominent or important participants viewed their photovoice photos—they represent the photos that received the most participatory analysis codes within the thematic photo group voted to be the most important.

***TABLE 3*: Youth Photovoice Results Summary**

Youth Photovoice Results Summary			
Place-Domain	**# of Photos**	**# Positive/Healthy/Good Place**	**# Negative/Unhealthy/Bad Place**
Home	7	0 (0%)	7 (100%)
Neigborhood	23	6 (26%)	17 (84%)
School	6	1 (17%)	5 (83%)
Leisure/Social	6	6 (100%)	0 (0%)
Transition	5	1 (20%)	4 (80%)
Total	47	14 (30%)	33 (70%)

***TABLE 4*: Adult Photovoice Results Summary**

Adult Photovoice Results Summary			
Place-Domain	**# of Photos**	**# Positive/Healthy/Good Place**	**# Negative/Unhealthy/Bad Place**
Home	10	2 (20%)	8 (80%)
Neigborhood	15	2 (13%)	13 (87%)
Work/Errand	0	0	0
Leisure/Social	4	4 (100%)	0 (0%)
Transition	2	0 (0%)	2 (100%)
Total	31	8 (26%)	23 (74%)

FIGURE 5*: Youth Geolocated Photovoice Place on *Local Ground

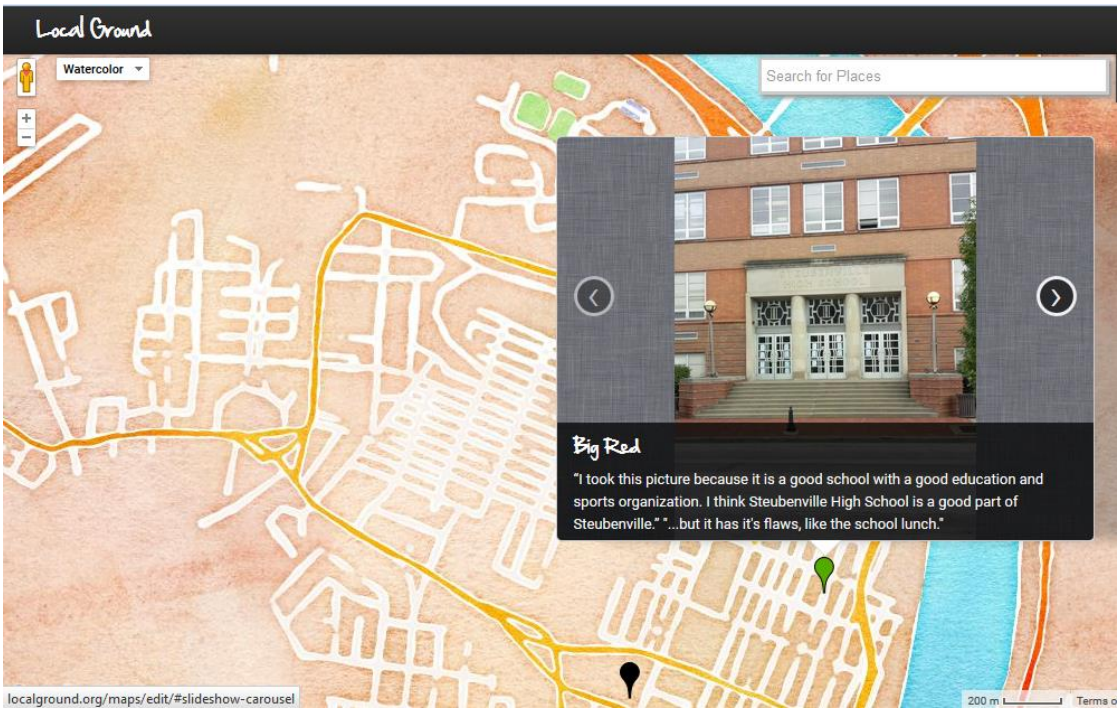


FIGURE 5: Photo from thematic photo group youth ranked as most important, "Positive Buildings". Participants identified 4 unique codes with a total 22 codings. The green marker corresponding to the photo indicates their appraisal of this particular place as positive/good/healthy. The black marker represents their housing community.

FIGURE 6*: Adult Geolocated Photovoice Place on *Local Ground

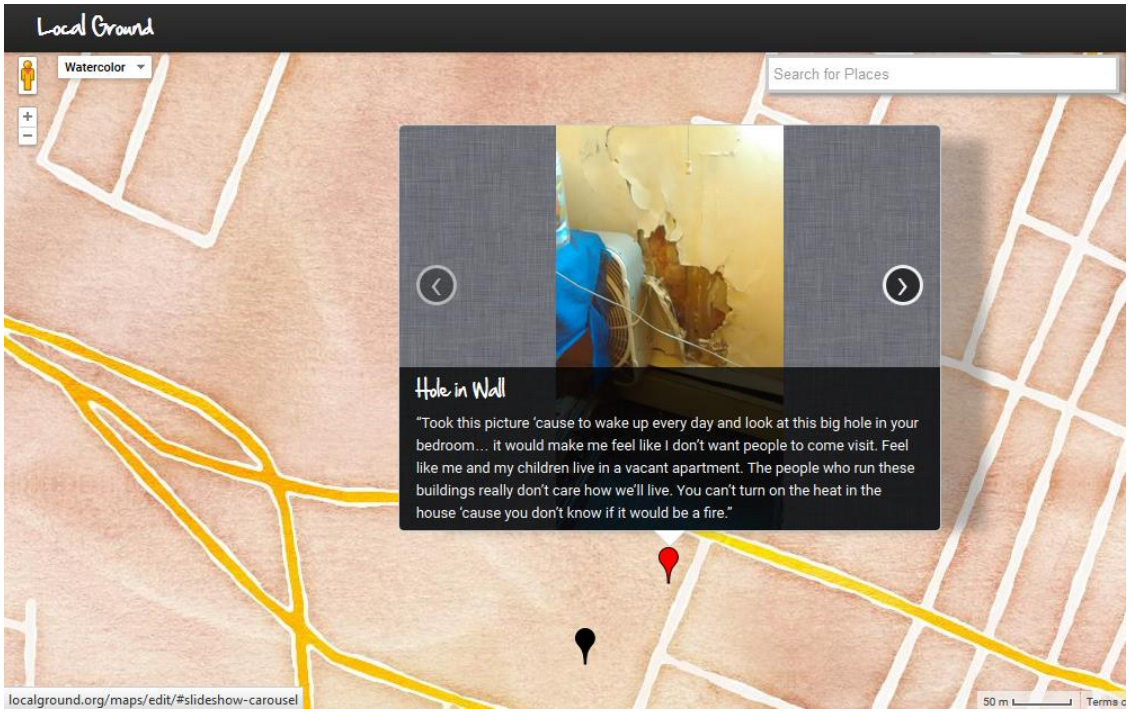


FIGURE 6: Photo from thematic photo group adults ranked as most important, "Housing". Participants identified 4 unique codes with a total 10 codings. The red marker corresponding to the photo indicates their appraisal of this particular place as negative/bad/unhealthy. The black marker represents their housing community.

Youth completed a total of 43 Activity Space Maps, and Adults completed a total of 21. *TABLE 5* and *TABLE 6* summarize youth and adult *Activity Space Mapping* data across the 5 place-domains. Data for all participants were aggregated and averaged for each place-domain. So for example, based on the data they provided via their Activity Space Maps, youth spent an average of 887 minutes per day (*PlaceTime*) in places within their Home place-domain (e.g. in their own housing unit, in the building hallways, in common spaces). The average star-rating they assigned to these Home place-domain places was 1.6 stars (*PlaceScore*), which translates to a letter grade of "F" on a 5.0 grading scale (*PlaceGrade*). For the "Transition" place-domain, tabulations for *PlaceTime*, *PlaceScore*, and *PlaceGrade* were made only for data corresponding to Activity Space Maps that were specifically related to their transition routes, i.e. those explicitly evaluating aspects of their travel routes. Thus an Activity Space Map related to a "Leisure/Social" place, for example, might contain data on travel time to/from that place (e.g. 12 minutes), but the focus of that Activity Space Map and remaining data is the intended *destination*, not the journey. These Activity Space Maps thus contain unevaluated transition times. These non-evaluated transition times are shown in light-orange, e.g. 17 minutes per day transitioning to/from school among youth participants.

***TABLE 5*: Youth Activity Space Mapping Summary**

	Avg. PlaceTime (min./day)	Avg. PlaceScore (1 to 5)	PlaceGrade
Home	**887**	1.6	F
Transition (Home)	3		
Neighborhood	**9**	2.34	D
Transition (Neighborhood)	8		
School	**420**	3	C
Transition (School)	17		
Leisure/Social	**72**	4.75	A-
Transition (Leisure/Social)	12		
Transition	**14**	2.42	D+
Total PlaceTime	**1440**	2.82	**C-**

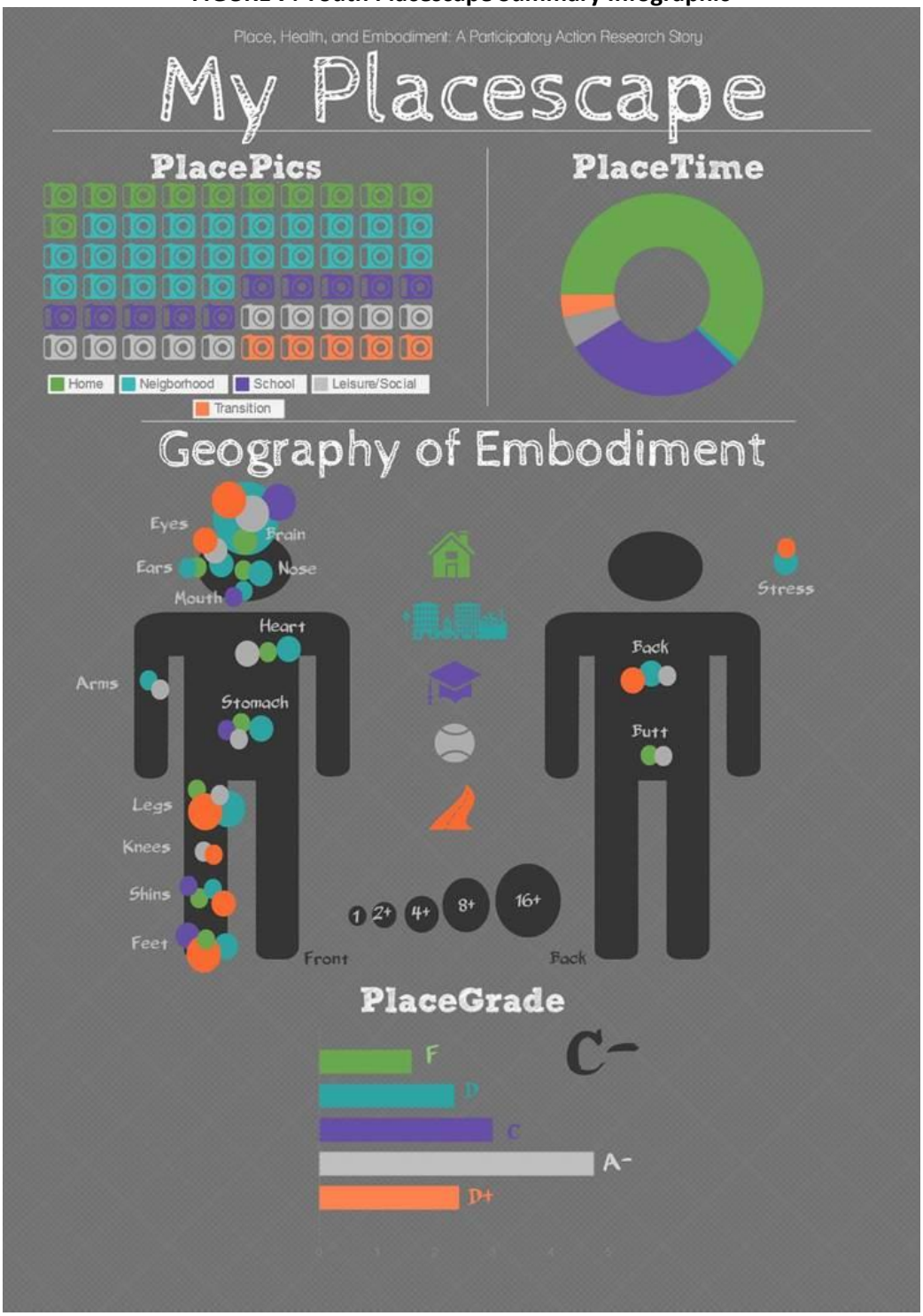
***TABLE 6*: Adult Activity Space Mapping Summary**

	Avg. PlaceTime (min./day)	Avg. PlaceScore (1 to 5)	PlaceGrade
Home	**1026**	1.33	F
Transition (Home)	-		
Neighborhood	**11**	1.64	F
Transition (Neighborhood)	14		
Work/Errand	**263**	4	B
Transition (School)	13		
Leisure/Social	**90**	3.67	C+
Transition (Leisure/Social)	14		
Transition	**9**	1	F
Total PlaceTime	**1440**	2.33	**D+**

Youth completed a total of 45 X-Ray Maps, while adults completed 23. The "Geography of Embodiment" section in *FIGURES 7 and 8* summarize adult and youth place-embodiment data across the 5 place-domains based on their completed X-Ray Maps. Overall, youth indicated that their daily places positively and/or negatively affected 20 different body areas across the 5 place-domains, with a total of 107 perceived body effects across the 20 body areas. Adults identified 12 body areas, with a total of 87 perceived body effects (see Petteway, 2014b and CHAPTER 3 for complete X-Ray Mapping findings).

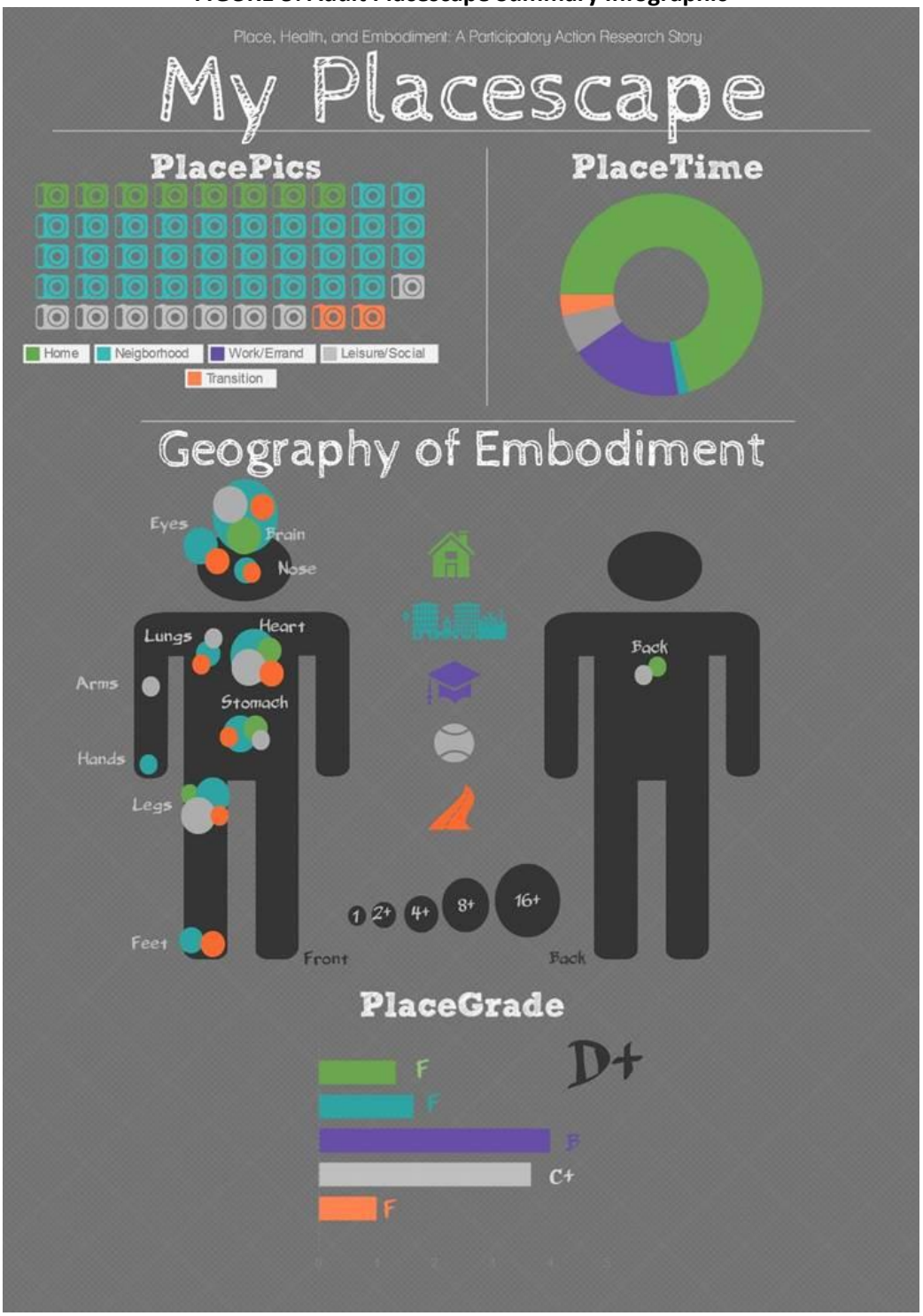
Data from all methods were compiled to examine what adult and youth placescapes entailed spatially, temporally, and physiologically. *FIGURE 7* and *FIGURE 8* are overall graphic summaries of adult and youth placescapes based on the data they generated for all research methods. Infographics were chosen as a method to display participants' data based on discussions regarding ease of creation, use, interpretation, and integration within popular social media platforms (e.g. tagging them on Facebook, Twitter). It should be noted that the infographics presented here are the first iterations informed and approved by the participants; however, these versions were not created by the participants' themselves as not all had sufficient time and internet access to receive basic training during the data collection phase of this project. These infographics are based on the aggregated Photovoice, Activity Space Mapping, and X-Ray Mapping data for adults and youth, separately. *PlacePics* represents the number of photos from *Photovoice* across the place-domains, including only those for which place-domain categorization was possible (60 for youth, 49 for adults). *PlaceTime* represents the average estimated time participants spent across the place-domains based on their *Activity Space Mapping* data. *Geography of Embodiment* summarizes their place-embodiment perceptions across place-domains based on their *X-Ray Mapping* data. *PlaceGrade* is the average rating participants assigned to their various places across the place-domains based on their *Activity Space Mapping* data.

***FIGURE 7*: Youth Placescape Summary Infographic**



PlacePics: number of participant Photovoice photos for each place-domain;
PlaceTime: participants' averaged estimated time spent (minutes per day) within each place-domain;
Geography of Embodiment: participants' subjective representation of where each place-domain is physiologically embodied;
PlaceGrade: averaged grade participants assigned each to place-domain based on a 5.0 scale (1=F; 5=A)

***FIGURE 8*: Adult Placescape Summary Infographic**



PlacePics: number of participant Photovoice photos for each place-domain;
PlaceTime: participants' averaged estimated time spent (minutes per day) within each place-domain;
Geography of Embodiment: participants' subjective representation of where each place-domain is physiologically embodied;
PlaceGrade: averaged grade participants assigned each to place-domain based on a 5.0 scale (1=F; 5=A)

FIGURE 9 and *FIGURE 10* geographically illustrate the positive/negative distribution of place-locations identified by youth and adult participants during *Photovoice* and *Activity Space Mapping*. The polygon outline is the residential census tract for participants' housing project community, here represented by the single black marker. Green markers represent places participants identified as positive/healthy/good, while red markers represent places identified as negative/unhealthy/bad. *TABLES 7 and 8* represent this data in tabular form in relation to participants' census tract of residence. Overall, 55% of adult and 51% of youth places were located spatially outside of their residential census tract. For youth (*TABLE 7*), 80% of their positive/healthy/good places were outside of their census tract, while 67% of their negative/unhealthy/bad places were inside. Among adults, 62% of positive/healthy/good places were outside of their census tract, while negative/unhealthy/bad places were fairly evenly distributed inside and outside.

***FIGURE 9*: Spatial Distribution of Youth Photovoice and Activity Space Mapping Places**

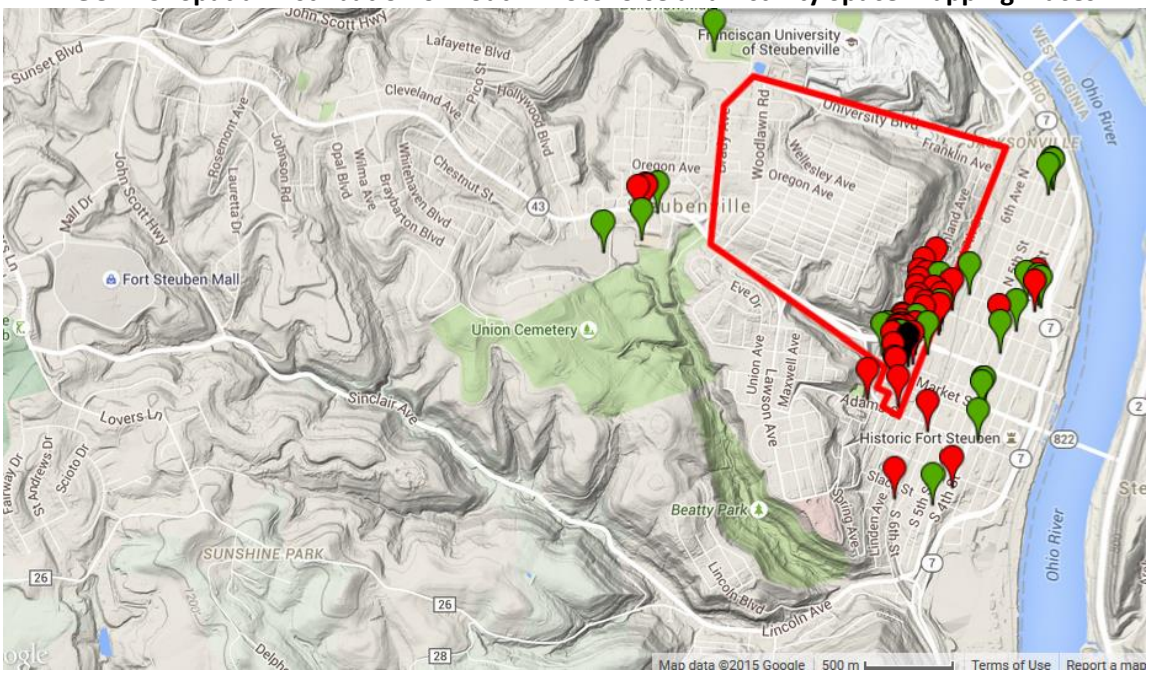


Figure 9: Green = positive/healthy/good place. Red = negative/unhealthy/bad place. Black marker = participants' housing community. Polygon outline = participants' residential census tract.

***TABLE 7*: Youth Appraisal of Photovoice and Activity Space Mapping Places**

Youth Photovoice and Activity Space Mapping Places			
	In CT	Outside CT	Farthest Place (miles)
Positive	5 (20%)	20 (80%)	1.7
Negative	28 (67%)	14 (33%)	1.4
Total	33 (49%)	34 (51%)	--

***FIGURE 10*: Spatial Distribution of Adult Photovoice and Activity Space Mapping Places**

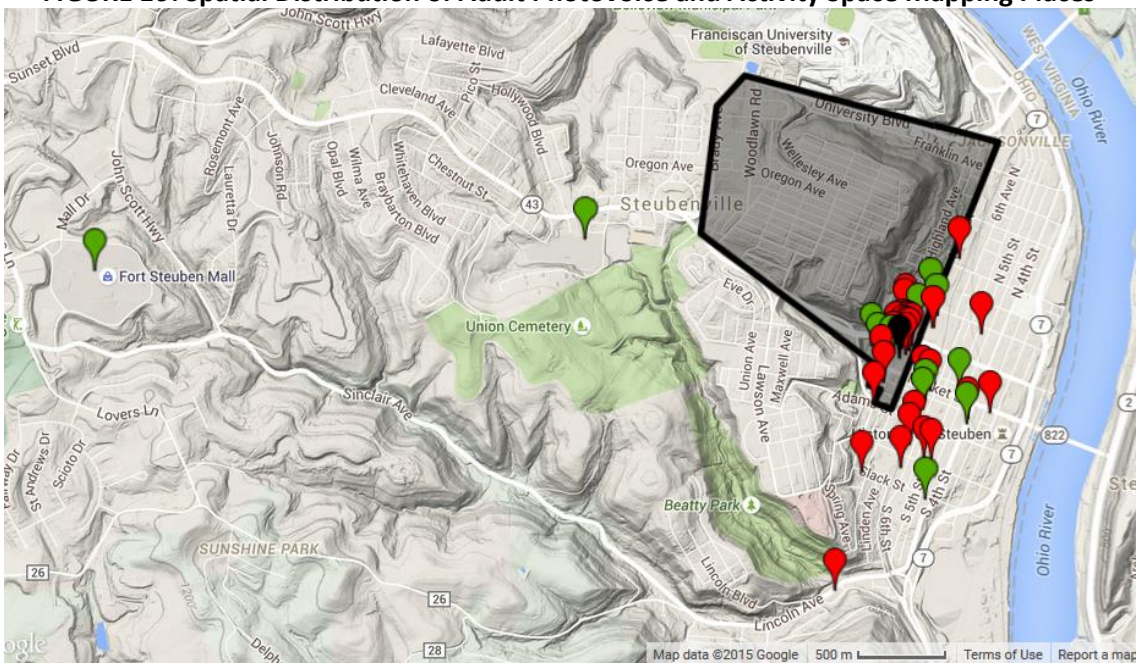


Figure 10: Green = positive/healthy/good place. Red = negative/unhealthy/bad place. Black marker = participants' housing community. Polygon outline = participants' residential census tract.

***TABLE 8*: Adult Appraisal of Photovoice and Activity Space Mapping Places**

Adult Photovoice and Activity Space Mapping Places			
	In CT	Outside CT	Farthest Place (miles)
Positive	5 (38%)	8 (62%)	4.3
Negative	14 (48%)	15 (52%)	1.1
Total	19 (45%)	23 (55%)	--

FIGURE 11 illustrates the multinodal structure of "place" for youth participants. The majority of youth data for Photovoice and Activity Space Mapping tended to "cluster" in 6 particular areas of the city. Each of these areas contained at least 4 unique Photovoice or Activity Space Mapping data elements (e.g. photos and activity space maps). Following the place-domain color scheme from above, the green node represents participants' "Home", here accounted for by participants' in-home and immediate housing project community environment (14 data elements). The two blue nodes represent "Neighborhood", here accounted for by a cluster of vacant properties frequented when visiting friends (11 data elements), and their nearest community shopping plaza (4 data elements). The two purple nodes represent "School", here accounted for by participants' middle school (6 data elements) and high school (5 data elements). The grey node represents "Leisure/Social", here accounted for by an afterschool youth development center (4 data elements). Taken together, these 6 "nodes" account for roughly two-thirds (44/67) of youth participants' data elements. Notice that 4 of their 6 primary place nodes are outside their residential census tract (the black polygon outline). *FIGURE 12* illustrates adults' multinodal "place", with markedly fewer nodes in comparison to youth. Adults' Photovoice and Activity Space Mapping results revealed two clusters of data elements. The first represents part of their "Home" place-domain (11 data

elements). The second represents a part of their "Neighborhood" place-domain (4 data elements), here consisting of the same cluster of retail shops youth identified.

***FIGURE 11*: Youth Participants' "Multinodal" Placescape**

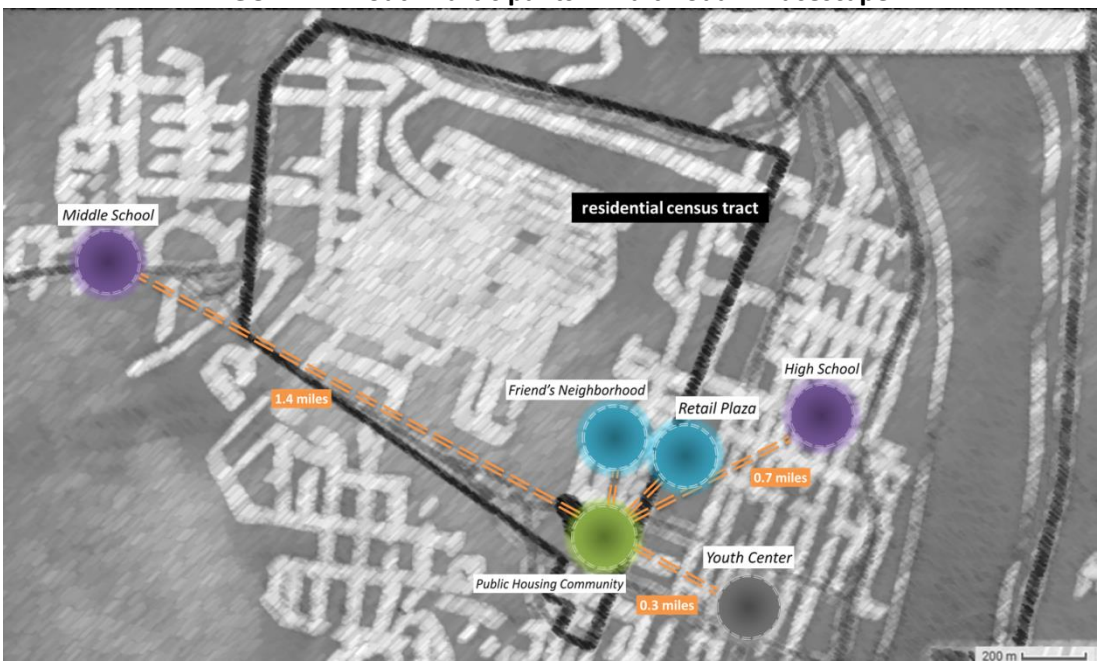


Figure 11: Illustration of youth participants' multinodal place network. Purple "nodes" represent part of their "School" place-domain; Blue is "Neigborhood"; Gray is "Leisure/Social"; Green is "Home".

***FIGURE 12*: Adult Participants' "Multinodal" Placescape**

Figure 12: Illustration of adult participants' multinodal place network. The Blue "node" represents part of their "Neighborhood" place-domain; Green is "Home".

Discussion

The goal of the work presented here was to introduce the *Placescape* as an analytical framework for understanding place and health in the context of place-based strategies, and to outline a conceptual foundation for operationalizing it in the context of place-health research—the *placescape*. Taking a placescape approach to studying place and health can enhance our conceptual understanding of place, and can consequently inform and improve place-health research design, metrics, and methodological choices, as well as the development and evaluation of place-based strategies. The work pursued here attempted to operationalize the 6 core *placescape* tenets (PTs) from *TABLE 2* in a "field test" study to aid efforts on each of these fronts.

In regard to *Needs & Opportunities* (PT1)*, Mobility & Bounds* (PT2)*, Multinodal Place* (PT3), and *Agency in Place(making)* (PT6), the participatory and non-arbitrary, non-spatially bound approach of this project allowed participants to freely document their important daily places as they actually experience them. This not only facilitated revelation of what could be considered some of participants' basic daily necessities (e.g. education, retail access, social/recreation spaces), but also where these necessities were spatially located and how participants perceived they influenced health (*FIGURES 9 & 10*). For example, a key finding here is that 55% of adult and 51% of youth places were located spatially outside of their residential census tract (*TABLES 9 & 10*). Indeed for youth, 80% of their positive/healthy/good places were outside of their census tract, while 67% of their negative/unhealthy/bad places were inside. Here, participant mobility, and the manner in which they repeatedly cross various imaginary lines of "place", was acknowledged and duly accounted for. Accordingly, participants' "spatial polygamy" was duly appreciated (Matthews, 2011), which enabled the discernment of spatially diverse patterns of place-experience clustering, or place "nodes"—thus hinting at the multi-nodal structure of participants' lived place (*FIGURE 11*). Moreover, because this project entailed multiple participatory methods designed to elicit participants' subjective appraisals of their place-based experiences and exposures, each place within these "nodes" (and the nodes themselves) helps "map" geographically and physiologically (via X-Ray Mapping) the health risk *and* opportunity landscape (*FIGURES 9 & 10*), thus embracing and extending the notion of "riskscape" (Morello-Frosch, 2001). For example, in another report based on the present study, participant X-Ray Mapping data revealed that 62% of adult and 49% of youth place-embodiment reports were for places spatially outside of their residential census tract (Petteway, 2014b; CHAPTER 3). An even more important finding was that 75% of youth positive place-embodiment places were located outside their census tract, while 66% of the negative place-embodiment locations were located inside. Indeed overall, FIGURES 9 and 10 make it clear that, spatially speaking, the overwhelming majority of participants' census tract has no bearing on their place experiences. These findings lend further support to literature raising concerns over the misspecification of place-effects (Inagami et al, 2007; Diez-Roux, 2007; Spielman and Yoo, 2008; Kwan, 2009; Kwan, 2012), and calling for more nuanced approaches to studying place and health (MacIntyre et al, 2002; Cummins et al, 2007; Rainham et al, 2010; Cutchin et al 2011; Browning and Soller, 2014; Jones and Pebley, 2014). The placescape approach as outlined and operationalized here stands as a conceptually rich prism through

which to examine work that is beginning to engage place beyond residential areas, but is still based on administrative boundaries (Hoehner et al, 2013; Moore et al, 2013).

In regard to *Lifecourse in Place* (PT5), the intergenerational design of this project meant that both adult and youth perspectives were engaged. This allowed for an exploration of not only potential spatial differences between adult and youth place, but also their perceptual differences of place and its health effects (*FIGURES 9 & 10*). Accordingly, this project responds to calls for lifecourse perspectives in place-health research (Curtis et al, 2004; Gustafsson et al, 2014), and makes a rare qualitative contribution to a growing body of literature regarding the physical embodiment of place over time (Crimmins et al, 2003; Petersen et al, 2008; Mekin et al, 2009; Bird et al, 2010; Nazmi et al, 2010; Gustafsson, 2011; King et al, 2011; Broyles et al, 2012; Theall et al, 2012; Brenner et al, 2013; Brody et al, 2013; Rudolph et al, 2014). Relatedly, and in regard to *Mobility & Bounds* (PT2), *Multinodal Place* (PT3), and *Lifecourse in Place* (PT5), this project attempted to explore and account for temporality in the context of place experiences/exposures. Temporality, here, was focused on elucidating participants' place-specific time patterns. The goal was to get a greater sense of which places (or nodes) tend to account for the most place "exposure time", with the goal of being able to outline ways to time-weight place experiences. The Activity Space Mapping process employed for this project proved useful here (*TABLES 5 & 6*, *FIGURES 7 & 8*), if only in an exploratory and introductory sense. Even so, this project does well to illustrate potential ways to arrive at both spatially- and temporally-specific measures of place—and how to do so in a manner that is sensitive to potential life-stage or generation-contingent differences. Thus this work moves us further along in our pursuit of more dynamic and specific measures of place (O'Campo, 2003; Cummins et al, 2005; Diez-Roux, 2007; Mujahid et al, 2007; Chaix et al, 2009).

In relation to *Lifecourse in Place* (PT5) and *Agency in Place(making)* (PT6), this project employed only participatory action research methods with two generations of public housing residents. The results accordingly tell a story of place and health that traditional approaches tend to overlook and discount. By adopting a CBPR orientation, and an intergenerational one at that, this project was able to uncover place-health nuances not readily afforded to standard survey-based, administrative-boundary delimited research. Of important note here is that this work was greatly facilitated through the use of a collaborative web-based and multimedia-enabled information and communication technology (ICT) platform, *Local Ground*. The result was location-specific, time-specific, and generation-specific illustrations of place and place perceptions that are just as visceral as they are empirical, and in their production serve as a form of social and political expression—their placescapes can be readily shared with one another, via social media, and with city officials (touching on *Power in Place(making)*). This more thorough and embodied rendition of place holds special value not only in the context of public health practice and place-based strategizing (e.g. as a model for community assessment and participatory health and city planning), but also in the context of place-health research translation. Moreover, the work presented here encourages more focused exploration into the value and relative importance of "objective" and "subjective" measures of place. Place-health research to date has demonstrated that both matter (Wen et al, 2006; Pampalon et al, 2007; Weden et al, 2008; Schulz et al, 2013; Barrington et al, 2014), and indeed work involving public housing residents suggests that subjective place data may be more meaningful and predictive of well-being (Buron and Patrabansh, 2008).

The work presented here also highlights possibilities for more innovative mixed-methods examinations of place and health, e.g. via utilization of ICTs and GIS (Kwan and Ding, 2008; Fielding and Cisneros-Puebla, 2009; Dennis et al, 2009; Chaix et al, 2012). *Local Ground* served as a mechanism to "crowdsource" local community assessment and enhance resident voice via potential linkages with the local health department and planning commission. This work could potentially serve as a model specifically for participatory planning and community health/opportunity assessment within public housing and other HUD place-based strategies. For example, this sort of work could be used to systematically document and assess specific community housing conditions, both social and physical, the results of which could be used to inform larger scale (i.e. entire housing community) survey-based quantitative or mixed-methods (e.g. surveys, photo/video, GIS) efforts. At minimum, HUD public housing communities and local housing authorities could use this work as a model to develop and execute regular "community health" assessments among and *with* residents, the findings of which can be examined in relation to, and be used to supplement, the standard HUD housing inspection process (HUD, 2015a, b), as well as the recently developed Healthy Communities Assessment Tool (HUD, 2015c, d).

Lastly, in light of *Power in Place(making)* (PT4) and *Agency in Place(making)* (PT6), this project engaged residents of public housing through a CBPR approach, using exclusively participatory methods. As such, residents were able to identify and reveal their place-related perspectives, concerns, and experiences from a position of expertise in a process marked by mutual respect and co-learning. They did so not only through their mapping-oriented work, but also during group training and project meeting sessions. For example, in the context of a discussion regarding health in public housing and in light of what residents believe is the city's deliberate effort to get rid of public housing, one adult participant submitted that, "it's like they wanna wipe us off the map"—both poignant and ironic given the nature of the project. "They" referred to city officials whom the participants believe are "configuring" their places to an overwhelming deleterious effect—ostensibly allowing conditions to deteriorate to the extent that their housing communities are condemned, or extreme un-inhabitability forces a move. Indeed, that is precisely what has happened to at least three public housing communities in recent years. One such community was adjacent to a prestigious private Catholic university. Relations between residents and the university were tenuous to say the least, and city officials agreed to sell the property to the university after allowing it deteriorate—a rather blatant and direct example of displacement and accumulation by dispossession.

Moving for the project participants, however, seems increasingly improbable, perhaps impossible given the increasing deficit of affordable housing options. While the city recently released its new comprehensive plan, there is no clear indication of plans regarding public housing in participants' downtown community, and none of them were invited to inform the development of the plan (or were aware of it, for that matter). Making matters worse, a recently completed housing development—the only new multiunit complex developed in over 20 years—has been reserved exclusively for students of the university. Not only that, but there is a growing sense of housing discrimination among the adult participants. As one participant put it in describing her attempts to find new housing, "they find out where you live and they don't even want you to apply." The stigma attached to her as a tenant of her current housing project—stigma in part due to the city's failure to adequately maintain the property and

support its tenants—prevents her from being considered an acceptable tenant elsewhere. Thus, the many policies and practices (actions and inactions) that have historically shaped and continue to influence residents' configurations of place nodes, of course, need to be more thoroughly expounded. Nonetheless, the aggregate work completed by the participants here stands as a good starting point to unpack these larger issues, particularly in regard to notions of dispossession, agency, accountability, and processes of inclusion and exclusion within public housing.

In a more immediate sense, results here highlight the heterogeneity of "place" perceptions and experiences among people who share the same space, with a few key take-away implications for place-based strategies in the city. First, participants' work revealed a clear pattern of positive/negative places to suggest where to invest more, and possibly where to best locate new housing. Second, there is clear indication of wasted/vacant space frequently encountered and traversed by residents—participants' work here suggests where community enhancements could be made (greenspace, urban gardens, sports fields, new retail and cafes, public transportation improvements etc.), where there might be physical space for new housing, and where there might be clustered community safety concerns. Third, there is clear indication of where residents spend their time and social lives—hinting at the structure and spatial bounds of their social lives, and suggesting that their sense of belonging and social embeddedness, both space-wise and community-wise, is "downtown". These findings suggest that locating potential new affordable housing elsewhere in the city is not appropriate (again, see *FIGURES 9 & 10*).

In aggregate, the work presented here contributes to the field of place-health research, as well as place-based public health and community development practice and housing strategies. Even so, there are a few limitations and key areas to improve upon in future work. First, this work did not adequately capture notions related to accountability and agency in terms of participants' perceptions on who is responsible and who has power in influencing where they live/don't live, where they go/don't go, etc. More qualitative information on these aspects of their placescapes would be valuable. Second, and relatedly, participant training and methods for this project did not allow for the explicit identification and enumeration of fundamental placemaking mechanisms at the local level, e.g. actual local/regional housing and land use policies, or the role of the CDBG and LIHTC locally. Collaboratively gathering more information on actual local public housing and community development policies and practices, both currently and historically, could prove especially valuable in uncovering the determinants and structure of residents lived placescapes. This could be a particularly promising endeavor to be pursued through follow-up CBPR and youth participatory action research work. Third, this project did not adequately capture spatial restrictions and divisions within residents' configurations of place nodes. There is a need for more qualitative and geospatial information on the places "missing" from their placescapes—understanding why they do not go to certain places is just as much a part of their placescape as the places they do go. These unspecified places are a sort of "invisible placescape" that influence their lived placescapes—for example, when not feeling particularly welcomed or safe in a neighborhood influences daily walking routes. Future work could better characterize: 1) places they did not identify because they don't or *can't* go there; 2) and places they didn't identify simply because they forgot or because the methodological processes and time did not permit. Fourth, the methods as implemented

did not adequately capture timing and temporal ordering of participants' places and place-experiences, e.g. in the morning, only in the evening, before this, after that, during this, only in the summer. Part of this limitation is simply the nature of cross-sectional work, but follow-up efforts would be enhanced greatly by exploring more systematic ways to infuse participants' placescapes with a greater sense of time and timing. Applying more thorough and robust activity space and/or qualitative GIS approaches could prove particularly helpful here (e.g. Chaix et al, 2012; Kwan and Ding, 2008; Jung and Elwood, 2010).

Conclusion

A *placescape* approach to studying place and health can enhance our conceptual understanding of place, and consequently inform and improve place-health research metrics and methodological potentials. Moreover, by modeling what *A People's Social Epidemiology* might entail within in the context of place-health research, a placescape orientation can enhance prospects for research translation in ways that can make direct contributions to public health and city planning/community development practice. As applied here, this approach can characterize the diversity of place-based experiences among public housing residents, yielding spatially- and generationally-specific information that can inform evaluation of current housing conditions and strategies, as well as guide the design and implementation of future strategies, especially in relation to matters of health equity and place-based health opportunity.

The next chapter details the novel *X-Ray Mapping* methodology as applied here within the placescape approach, and introduces the notion of "geographies of embodiment", highlighting its analytical and conceptual value within participatory place-health research and practice.

References:

Acevedo-Garcia, D et al (2004). Does Housing Mobility Policy Improve Health? *Housing Policy Debate*, 15 (1): 49-98.

Balazs, C and Morello-Frosch, R (2013). The Three Rs: How Community-Based Participatory Research Strengthens the Rigor, Relevance, and Reach of Science. *Environmental Justice*, 6 (1): 9-16.

Barrington, WE et al (2014). Socioeconomic deprivation, perceived neighborhood factors, and cortisol responses to induced stress among healthy adults. *Health and Place*, 27: 120–126.

Ben-Shlomo, Y and Kuh, D (2002). A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. *Int. J. Epidemiol*, 31 (2): 285-293.

Bernard, P et al (2007). Health inequalities and place: A theoretical conception of neighbourhood. *Social Science & Medicine*, 65: 1839–1852.

Bird, CE et al (2010). Neighbourhood Socioeconomic Status and Biological "Wear & Tear" in a Nationally Representative Sample of US Adults. *J Epidemiol Community Health*, 64 (10): 860–865.

Brenner, AB et al (2013). The Physiological Expression of Living in Disadvantaged Neighborhoods for Youth. *J Youth Adolesc*, 42 (6): 792–806.

Brody, GH et al (2013). Neighborhood Poverty and Allostatic Load in African American Youth. *Pediatrics*, 134 (5): e1362-e1368.

Browning, C and Soller, B (2014). Moving Beyond Neighborhood: Activity Spaces and Ecological Networks As Contexts for Youth Development. *Cityscape*, 16 (1): 165–196.

Broyles, ST et al. (2012). Elevated C-Reactive Protein in Children from Risky Neighborhoods: Evidence for a Stress Pathway Linking Neighborhoods and Inflammation in Children. *PLoS ONE* 7(9): e45419.

Buron, L et al (2002). The HOPE VI Tracking Study: A Snapshot of the Current Living Situation of Original Residents from Eight Sites. Report for the US Department of Housing and Urban Development. Washington, DC: The Urban Institute.

Buron, L and Patrabansh, S (2008). Are Census Variables Highly Correlated With Housing Choice Voucher Holders' Perception of the Quality of Their Neighborhoods? Cityscape, 10 (1): 157-184.

Catalani, C and Minkler, M (2010). Photovoice: A Review of the Literature in Health and Public Health. *Health Education & Behavior*, 37 (3): 424-451.

Chaix, B et al (2009). Neighbourhoods in eco-epidemiologic research: delimiting personal exposure areas. A response to Riva, Gauvin, Apparicio and Brodeur. *Soc Sci Med*, 69 (9): 1306 –1310.

Chaix, B et al (2012). An Interactive Mapping Tool to Assess Individual Mobility Patterns in Neighborhood Studies. *Am J Prev Med*, 43 (4): 440–450.

Chaskin, R (2013). Integration and Exclusion: Urban Poverty, Public Housing Reform, and the Dynamics of Neighborhood Restructuring. *ANNALS, AAPSS,* 647: 237-267.

Clampet-Lundquist, S (2004a). HOPE VI Relocation: Moving to New Neighborhoods and Building New Ties. *Housing Policy Debate*, 15 (2): 415-447.

Clampet-Lundquist, S (2004b). Moving Over or Moving Up? Short-Term Gains and Losses for Relocated HOPE VI Families. *Cityscape: A Journal of Policy Development and Research*, 7 (1): 57-80.

Crimmins, EM et al (2003). Age differences in allostatic load: an index of physiological dysregulation. *Experimental Gerontology*, 38: 731–734.

Cummins, S et al (2005). Measuring neighbourhood social and material context: generation and interpretation of ecological data from routine and non-routine sources. *Health & Place*, 11: 249–260.

Cummins, S (2007). Commentary: investigating neighbourhood effects on health—avoiding the "local trap." *Int J Epidemiol*, 36 (2): 355–7.

Cummins, S et al (2007). Understanding and representing 'place' in health research: A relational approach. *Social Science & Medicine*, 65: 1825-1838.

Curtis, S et al (2004). Area effects on health variation over the life-course: Analysis of the longitudinal study sample in England using new data on area of residence in childhood. *Social Science & Medicine*, 58: 57-74.

Cutchin, M (2007). The Need for the "New Health Geography" in Epidemiologic Studies of Environment and Health. *Health & Place*, 13 (3): 725–742.

Cutchin, M et al (2011). The socio-spatial neighborhood estimation method: An approach to operationalizing the neighborhood concept. *Health & Place*, 17 (5): 1113–1121.

Dennis, S et al (2009). Participatory photo mapping (PPM): Exploring an integrated method for health and place research with young people. *Health &Place*, 15: 466-473.

Diez Roux, A (2001). Investigating Neighborhood and Area Effects on Health. *AJPH*, 91 (11): 1783-1789.

Diez-Roux, A (2004). The Study of Group-Level Factors in Epidemiology: Rethinking Variables, Study Designs, and Analytical Approaches. *Epidemiol Rev*, 26: 104–111.

Diez Roux, A (2007). Neighborhoods and health: where are we and where do we go from here? *Rev Epidemiol Sante Publique*. 55 (1): 13–21.

Diez Roux, A and Mair, C (2010). Neighborhoods and Health. *Ann. N.Y. Acad. Sci*., 1186: 125-145.

Digenis-Bury EC et al (2008). Use of a population-based survey to describe the health of Boston public housing residents. *AJPH*; 98: 85-91.

Ellen, IG et al (2001). Neighborhood Effects on Health: Exploring the Links and Assessing the Evidence. *Journal of Urban Affairs*, 23 (3-34): 391-408.

Fauth, R et al (2008). Seven Years Later: Effects of a Neighborhood Mobility Program on Poor Black and Latino Adults' Well-being. *J Health Soc Behav*, 49 (2): 119-130.

FDIC (2015). Community Reinvestment Act program site of the Federal Deposit Insurance Corporation, available at https://www.fdic.gov/regulations/cra/, accessed 10/28/2015.

Fertig, A, and Reingold, D (2007). Public housing, health and health behaviors: is there a connection? *J Policy Anal Manage*, 26: 831-859.

Fielding, N and Cisneros-Puebla, C (2009). CAQDAS-GIS Convergence: Toward a New Integrated Mixed Method Research Practice? *Journal of Mixed Methods Research*, 3 (4): 349-370.

Fine, M and Ruglis, R (2009).). Circuits and Consequences of Dispossession: The Racialized Realignment of the Public Sphere for US Youth. *Transforming Anthropology*, 17 (1): 20-33.

Foucault, M (1978/1990). The history of sexuality. Vol. 1. New York: Vintage Books.

Foucault, M (1978/9). The birth of biopolitics: Lectures at the College de France, 1978–1979. New York: Picador.

Frumkin, H (2006). The Measure of Place. *Am J Prev Med*, 31 (6): 530-532.

Goetz, E (2010). Better Neighborhoods, Better Outcomes? Explaining Relocation Outcomes in HOPE VI. *Cityscape: A Journal of Policy Development and Research*, 12 (1): 5-32.

Goetz, E and Chapple, K (2010). You gotta move: advancing the debate on the record of dispersal. *Housing Policy Debate*, 20 (2): 209–236.

Goetz, E (2013a). New Deal Ruins: Race, Economic Justice, and Public Housing Policy. Ithaca, NY: Cornell University Press.

Goetz, E (2013b). The audacity of HOPE VI: Discourse and the dismantling of public housing. *Cities*, 35: 342–348.

Gustafsson, P et al (2011). Socioeconomic status over the life course and allostatic load in adulthood: results from the Northern Swedish Cohort. *J Epidemiol Community Health*, 65: 986-992.

Gustafsson, PE et al (2014). Life-Course Accumulation of Neighborhood Disadvantage and Allostatic Load: Empirical Integration of Three Social Determinants of Health Frameworks. *AJPH*, 104 (5): 904-910.

Harris, L and Kaye, D (2004). How are HOPE VI residents faring? Health. A Roof Over Their Heads, Brief 5. Washington, DC: The Urban Institute.

Harvey, D (2004a). The "New" Imperialism: Accumulation by Dispossession. *Social Register*, 40: 63-87.

Harvey, D (2004b). A Geographer's Perspective on the New American Imperialism. Conversations with History. UC Berkeley: Institute of International Studies.

Harvey, D (2006). Spaces of Global Capitalism: Towards a Theory of Uneven Geographical Development. New York/London: Verso.

HCZ (2013). http://hcz.org/index.php, accessed 2/27/13.

Hertzman, C et al (2001). Using an interactive framework of society and lifecourse to explain self-rated health in early adulthood. *Social Science & Medicine*, 53: 1575–1585.

Hertzman, C and Power, C (2003). Health and Human Development: Understandings From Life-Course Research. Developmental Neuropsychology, 24 (2-3): 719-744.

Hoehner, CM et al (2013). Understanding the Independent and Joint Associations of the Home and Workplace Built Environments on Cardiorespiratory Fitness and Body Mass Index. *Am J Epidemiol*, 178 (7): 1094–1105.

Howell, EM et al (2005). The health status of HOPE VI public housing residents. *J Health Care Poor Underserved*, 16: 273-285.

HUD (2013a). HOPE VI program site accessed at http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/ph/hope6/about on 2/27/2013.

HUD (2013b). HUD Choice Neighborhoods program site: http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/ph/cn, accessed 2/27/13.

HUD (2013c). HUD Partnership for Sustainable Communities program site: http://www.sustainablecommunities.gov/aboutUs.html, accessed 2/27/13.

HUD (2013d). HUD Sustainable Housing and Communities program site: http://portal.hud.gov/hudportal/HUD?src=/program_offices/sustainable_housing_communities, accessed 2/27/13.

HUD (2013e). HUD Sustainable Communities Regional Planning program site: http://portal.hud.gov/hudportal/HUD?src=/program_offices/sustainable_housing_communities/sustainable_communities_regional_planning_grants, accessed 2/27/13.

HUD (2013f). HUD resident characteristics report accessed at http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/systems/pic/50058/rcr on 1/31/2013.

HUD (2015a). Physical Inspection Summary Report. Available at http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/reac/products/pass/pass_isrpt, accessed 10/9/2015.

HUD (2015b): Real Estate Assessment Center, Physical Inspection, available at http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/reac/products/prodpass, accessed 10/9/2015.

HUD (2015c). HUD Healthy Communities Transformation Initiative, available at: http://healthyhousingsolutions.com/service/applied-field-research/hud-healthy-communities-transformation-initiative/, accessed 10/9/2015.

HUD (2015d). Healthy Communities Assessment Tool, San Diego, available at: https://hci-sandiego.icfwebservices.com/, accessed 10/9/2015.

HUD (2015e). HUD Housing Choice Voucher Program (Section 8) program site, available at: http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/hcv/about, accessed 10/28/2015.

HUD (2015f). HUD Community Development Block Grant Entitlement Program, available at: https://www.hudexchange.info/programs/cdbg-entitlement/, accessed 10/28/2015.

HUD (2015g). Low-Income Housing Tax Credit (LIHTC) program, available at: http://www.huduser.gov/portal/datasets/lihtc.html, accessed 10/28/2015.

HUD (2015h). Home Investment Partnership Program (HOME), available at: https://www.hudexchange.info/home/home-overview/, accessed 10/28/2015.

Inagami, S et al (2007). Non-residential neighborhood exposures suppress neighborhood effects on self-rated health. *Soc Sci Med*, 65: 1779–1791

Israel, BA et al (1998). Review of community-based research: assessing partnership approaches to improve public health. *Annu Rev Public Health*. 19: 173–202.

Israel, BA et al (2010). Community-Based Participatory Research: A Capacity-Building Approach for Policy Advocacy Aimed at Eliminating Health Disparities. *AJPH*, 100 (11): 2094-2102.

Jones, R and Paulsen, D (2011). HOPE VI Resident Displacement: Using HOPE VI Program Goals to Evaluate Neighborhood Outcomes. *Cityscape: A Journal of Policy Development and Research*, 13 (3): 85-102.

Jones, M and Pebley, A (2014). Redefining Neighborhoods Using Common Destinations: Social Characteristics of Activity Spaces and Home Census Tracts Compared. *Demography*, 51: 727–752.

Jung, K and Elwood, S (2010). Extending the Qualitative Capabilities of GIS: Computer-Aided Qualitative GIS. *Transactions in GIS*, 14 (1): 63–87.

Keene, D and Geronimus, A (2011a). "Weathering" HOPE VI: The Importance of Evaluating the Population Health Impact of Public Housing Demolition and Displacement. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 88 (3): 417-435.

Kemp, S (2011). Place, History, Memory: Thinking Time Within Place. In: Burton, L, Kemp, S, Leung, M., Matthews, S, Takeuchi, D (Eds.), *Communities, Neighborhoods, and Health: Expanding the Boundaries of Place*, Social Disparities in Health and Health Care 1, DOI 10.1007/978-1-4419-7482-2_1.

King, KE et al (2011). Neighborhood Context and Social Disparities in Cumulative Biological Risk Factors. *Psychosomatic Medicine*, 73: 572-579.

Krieger, N (1994). Epidemiology and the Web of Causation: Has Anyone Seen the Spider? *Soc Sci Med*, 39 (7): 887-903.

Krieger, N (2001). Theories for social epidemiology in the 21st century: an ecosocial perspective. *International Journal of Epidemiology*, 30 (4): 668-677.

Kwan, M and Ding, G (2008). Geo-Narrative: Extending Geographic Information Systems for Narrative Analysis in Qualitative and Mixed-Method Research. *The Professional Geographer*, 60 (4): 443-465.

Kwan, M (2009). From place-based to people-based exposure measures. *Social Science & Medicine*, 69: 1311–1313.

Kwan, M (2012). How GIS can help address the uncertain geographic context problem in social science research. *Annals of GIS*, 18 (4): 245–255.

Lantz, P et al (2006). Community-Based Participatory Research: Rationale and Relevance for Social Epidemiology. In Oakes, JM and Kaufman, J (Eds.), *Methods in Social Epidemiology* (CH 10, 229-266).

Leung, MW et al (2004). Community-based participatory research: a promising approach for increasing epidemiology's relevance in the 21st century. *International Journal of Epidemiology*, 33: 499–506.

Levanthal, T and Brooks-Gunn, J (2003). Moving to Opportunity: an Experimental Study of Neighborhood Effects on Mental Health. *AJPH*, 93 (9): 1576-1582.

Levy, D and Woolley, M (2007). Relocation Is Not Enough Employment Barriers among HOPE VI Families. Washington, DC: The Urban Institute.

Ludwig, J et al (2011). Neighborhoods, Obesity, and Diabetes: A Randomized Social Experiment. *N Engl J Med*, 365: 1509-1519.

Lynch, J and Davey Smith, G (2005). A Life Course Approach to Chronic Disease Epidemiology. *Annu. Rev. Public Health*, 26: 1–35.

MacIntyre, S et al (2002). Place effects on health: how can we conceptualise, operationalize, and measure them? *Social Science & Medicine*, 55: 125-139.

Manjarrez, C et al (2007). Poor Health: Adding Insult to Injury for HOPE VI Families. Washington, DC: Urban Institute.

Maryland DHMH (2013). HEZ program site accessed at http://dhmh.maryland.gov/healthenterprisezones/SitePages/About_Hez.aspx on 2/27/2013.

Matthews, S et al (2005). Geo-ethnography: Coupling geographic information analysis techniques with ethnographic methods in urban research. *Cartographica*, 40 (4): 75–90.

Matthews, S (2008). The Salience of Neighborhood: Some Lessons from Sociology. *Am J Prev Med*, 34 (3): 257-259.

Matthews, SA (2011). Spatial Polygamy and the Heterogeneity of Place: Studying People and Place via Egocentric Methods. In Burton, LM et al (eds), *Communities, Neighborhoods, and Health*: *Expanding the Boundaries of Place*, Social Disparities in Health and Health Care, 1 (1): 35-55.

Matthews, S and Yang, T (2013). Spatial Polygamy and Contextual Exposures (SPACEs): Promoting Activity Space Approaches in Research on Place and Health. *Am Behav Sci*, 57 (8): 1057–1081.

Mekin, SS et al (2009). Neighborhoods and Cumulative Biological Risk Profiles by Race/Ethnicity in a National Sample of U.S. Adults: NHANES III. *Ann Epidemiol*, 19 (3): 194–201.

Minkler, M (2000). Using Participatory Action Research to build Healthy Communities. *Public Health Reports*, 115: 191-197.

Minkler, M (2010). Linking Science and Policy Through Community-Based Participatory Research to Study and Address Health Disparities. *AJPH*, 100 (S1): S81-S87.

Moore, K et al (2013). Home and Work Neighborhood Environments in Relation to Body Mass Index: The Multi-Ethnic Study of Atherosclerosis (MESA). *J Epidemiol Community Health*, 67 (10): 846–853.

Morello-Frosch, R et al (2001). Environmental Justice and Southern California's "Riskscape": The Distribution of Air Toxics Exposures and Health Risks Among Diverse Communities. *Urban Affairs Review*, 36 (4): 551-578.

Morello-Frosch, R et al (2005): Citizens, Science, and Data Judo: Leveraging Secondary Data Analysis to Build a Community-Academic Collaborative for Environmental Justice in Southern California. In Israel, BA, Eng, E, Schulz, AJ, and Parker, EA (eds), *Methods in Community-Based Participatory Research for Health*. San Francisco: Jossey-Bass.

Mujahid, M et al (2007). Assessing the Measurement Properties of Neighborhood Scales: From Psychometrics to Ecometrics. *Am J Epidemiol*, 165 (8): 858–867.

Nazmi, A et al (2010). Cross-sectional and longitudinal associations of neighborhood characteristics with inflammatory markers: findings from the Multi-Ethnic Study of Atherosclerosis. Health and Place, 16 (6): 1104–1112

NCHE (2015): National Collaborative for Health Equity, Place Matters Initiative: http://nationalcollaborative.org/?q=node/37, accessed 9/30/2015.

NHLP (2002). False HOPE: A Critical Assessment of the HOPE VI Public Housing Redevelopment Program. Oakland, CA: National Housing Law Project.

O' Campo, P (2003). Invited Commentary: Advancing Theory and Methods for Multilevel Models of Residential Neighborhoods and Health. *Am J Epidemiol*, 157: 9–13.

Pampalon, R et al (2007). Perception of place and health: Differences between neighbourhoods in the Que´bec City region. *Social Science & Medicine*, 65: 95–111.

Perchoux, C et al (2013). Conceptualization and measurement of environmental exposure in epidemiology: Accounting for activity space related to daily mobility. *Health & Place*, http://dx.doi.org/10.1016/j.healthplace.2013.01.005

Petersen, K et al (2008). Community Socioeconomic Status is Associated With Circulating Interleukin-6 and C-Reactive Protein. *Psychosomatic Medicine*, 70: 646-652.

Petteway, R (2014a). "Towards a People's Social Epidemiology: Pursuit of a More Inclusive and Equitable Paradigm for Social Epi Research and Practice in the 21st Century". *142nd Meeting of the American Public Health Association: Healthography*, New Orleans, LA, November 15-19.

Petteway, R (2014b). "Placescapes and the Geography of Embodiment: A New Paradigm for Understanding Place and Health Across the Lifecourse". *142nd Meeting of the American Public Health Association: Healthography*, New Orleans, LA, November 15-19.

Petteway, R (2015a). "Public Housing is Public Health: Intergenerational Photovoice Perspectives of Place, Health, and Opportunity in the "Structure(d) Struggle" among Public Housing Residents." *143rdMeeting of the American Public Health Association: Health in All Policies,* Chicago, IL, October 31-November 4.

Petteway, R (2015b). Dissertation Chapter 1: Towards a People's Social Epidemiology: Envisioning a More Inclusive and Equitable Future for Social Epi Research and Practice in the 21st Century.

Petteway, R (2015c). Dissertation Chapter 3: The Body Language of Place: Mapping Intergenerational "Geographies of Embodiment" in Place-Health Research.

Pies,C and Parthasarathy, P (2008). Photovoice: Giving Local Health Departments a New Perspective on Community Health Issues. Contra Costa Health Services, Public Health Division.

Picket, KE and Pearl, M (2001). Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *J Epidemiol Community Health*, 55: 111–122.

Popkin, S et al (2002). HOPE VI Panel Study: baseline report. Report to The Annie E. Casey Foundation, The John D. and Catherine T. MacArthur Foundation, and U.S. Department of Housing and Urban Development. UI No. 07032. Washington, D.C.: The Urban Institute.

Popkin, S et al (2004a). A Decade of HOPE VI: Research Findings and Policy Challenges. Washington, DC: Urban Institute.

Popkin, S et al (2004b). The HOPE VI Program: What About the Residents? *Housing Policy Debate*, 15 (2): 385-414.

Rainham, D et al (2010). Conceptualizing the healthscape: contributions of time geography, location technologies and spatial ecology to place and health research. *Soc Sci Med*, 70 (5): 668-676.

Riva, M et al (2007). Toward the next generation of research into small area effects on health: a synthesis of multilevel investigations published since July 1998. *J Epidemiol Community Health*, 61: 853–861.

Rudolph, KE et al (2014). The Association between Cortisol and Neighborhood Disadvantage in a U.S. Population-Based Sample of Adolescents. *Health and Place*, 25: 68–77.

Ruel, E et al (2010). Is Public Housing the Cause of Poor Health or a Safety Net for the Unhealthy Poor? *Journal of Urban Health*, 87 (5). 827-838.

Ruglis, J (2011). Mapping the biopolitics of school dropout and youth resistance. *International Journal of Qualitative Studies in Education*, 24 (5): 627-637.

Sampson, RJ et al (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28: 443-478.

Sampson, R (2012). Sampson, R. (2012) Great American city: Chicago and the enduring neighborhood effect. Chicago, IL: Chicago University Press.

Santos, SM et al (2007). Association between contextual factors and self-rated health: a systematic review of multilevel studies. *Cad. Saúde Pública*, Rio de Janeiro, 23 (11):2533-2554.

Schulz, AJ et al (2013). Do observed or perceived characteristics of the neighborhood environment mediate associations between neighborhood poverty and cumulative biological risk? *Health and Place*, 24: doi:10.1016/j.healthplace.2013.09.005

Sharkey, P and Elwert, F (2011). The Legacy of Disadvantage: Multigenerational Neighborhood Effects on Cognitive Ability. *AJS*, 116 (6): 1934–1981.

Spielman, S and Yoo, E (2008). The spatial dimensions of neighborhood effects. *Soc Sci Med*, 68 (6): 1098 –105.

TCE (2013). The California Endowment, Building Healthy Communities program site: http://www.calendow.org/healthycommunities/, accessed on 2/27/13.

Theall, P et al (2012). Cumulative Neighborhood Risk of Psychosocial Stress and Allostatic Load in Adolescents. *Am J Epidemiol*, 176 (Suppl): S164–S174.

USDE (2013). Promise Neighborhoods program site accessed at http://www2.ed.gov/programs/promiseneighborhoods/index.html on 2/27/2013.

Van Wart, S, Tsai, KJ and Parikh, T (2010). "Local Ground: A Paper-Based Toolkit for Documenting Local Geospatial Knowledge". *ACM Symposium on Computing for Development* (DEV), London, UK December 17-18, 2010.

Wallerstein, N and Duran, B (2010). Community-Based Participatory Research Contributions to Intervention Research: The Intersection of Science and Practice to Improve Health Equity. *AJPH*, 100 (S1)(51), S40-S46.

Wallerstein, N et al (2011). Integration of Social Epidemiology and Community-Engaged Interventions to Improve Health Equity. *AJPH*, 101 (5): 822-830.

Wang, CC and Burris, MA (1997). Photovoice: Concept, Methodology, and Use for Participatory Needs Assessment. *Health Education & Behavior*, 24(3): 369-387.

Wang, CC (2005). Youth Participation in Photovoice as a Strategy for Community Change. *Journal of Community Practice*, 14(1/2): 147-161.

Wen, M et al (2006). Objective and perceived neighborhood environment, individual SES and psychosocial factors, and self-rated health: An analysis of older adults in Cook County, Illinois. *Social Science & Medicine*, 63: 2575–2590.

Weden, MM et al (2008). Subjective and objective neighborhood characteristics and adult health. *Social Science & Medicine*, 66: 1256-1270.

Whitehurst, G and Croft, M (2010). The Harlem Children's Zone, Promise Neighborhoods, and the Broader, Bolder Approach to Education. Brown Center on Education. Washington, DC: The Brookings Institute.

CHAPTER 3

THE BODY LANGUAGE OF PLACE:
MAPPING INTERGENERATIONAL "GEOGRAPHIES OF EMBODIMENT" IN PLACE-HEALTH RESEARCH

Abstract

Research on place and health has grown rapidly in recent years. While this research continues to improve understanding of *why* place matters, there is particular need for work capable of revealing: 1) *which* places matter for health and *when* (i.e. spatially- and temporally-specific notions of "place"); 2) *how* these places matter—that is the processes and mechanisms of the physiological embodiment of place; and 3) potential intergenerational and life-stage differences in place-embodiment experiences/perceptions. The research presented here seeks to make contributions in each of these three areas through developing the "geographies of embodiment" concept. Drawing from a multi-method intergenerational community-based participatory action research project examining place and health, the research presented here specifically highlights *X-Ray Mapping* as a novel cognitive mapping methodology to elucidate subjective notions of place-embodiment within place-health research, and thus facilitate the construction of generationally-contingent and varying geographies of embodiment that inform efforts to arrive at spatially- and temporally-specific measures of place-health exposures and experiences. X-Ray Mapping results here revealed that 49% of youth place-embodiment locations were spatially located outside of their residential census tract, with 75% of positive place-embodiment locations outside, contrasted with 66% of negative place-embodiment locations inside. Overall, 67% of youth and adult positive place-embodiment locations were outside of their home census tract. Through mapping geographies of embodiment via participatory methods like X-Ray Mapping, we can gain greater insight into what is embodied (i.e. specific place experiences/exposures), when (i.e. temporally, life stage), and where (i.e. spatially). These gains can improve development of quantitative place-health metrics and greatly enhance efforts to uncover and intervene on the "pathways of embodiment"—specifically, those elements of local social, political, economic, and environmental contexts that constitute expressions of, and shape experiences of, social inequality.

Introduction

Place-health research has grown rapidly in recent years (Ellen et al, 2001; Pickett and Pearl, 2001; Sampson et al, 2002; Santos et al, 2007; Riva et al, 2007; Diez-Roux and Mair, 2010). However, major conceptual and methodological challenges remain in defining "place", characterizing place contexts, and measuring place (Diez-Roux, 2001; O'Campo, 2003; Diez-Roux, 2004a; Diez-Roux, 2004b; Diez-Roux, 2007; Frumkin, 2006; Bernard et al, 2007; Cutchin, 2007; Matthews, 2008; Matthews, 2011; Kwan, 2009; Kwan, 2012; Chaix et al, 2009; Cummins, 2007; Cummins et al, 2007; MacIntyre et al, 2002; Mujahid et al, 2007; Spielman and Yoo, 2008; Rainham et al, 2010; Oakes, 2004)—all of which have implications for place-health research, public health practice, and the design and implementation of place-based strategies.

One area of place-health research that is especially beholden to these challenges is work examining the physical embodiment of place and how it affects health and well-being over time. Much of this work at the population level entails the collection and spatial analysis of biometrics (e.g. diurnal cortisol, C-reactive protein, IL-6) in light of what are considered core social determinants of health, such as socioeconomic status (SES). Indeed, more often than not, SES or neighborhood disadvantage is the *only* measure of "place" used to characterize the spatial contexts of embodiment, e.g. work revealing how living in a low-SES neighborhood affects measures of inflammatory markers (e.g. Pollit et al, 2008). Such work certainly invites us to probe deeper into the notion of place-embodiment. However, if the ultimate goal is to correctly specify the processes and mechanisms through which "place" becomes biologically incorporated over time (with an eye towards intervention), it is of paramount importance that pertinent and *specific* physical and social exposures/experiences, and their corresponding spatial locations, patterns, and geographic distributions, are elucidated and accounted for. Moreover, given the cumulative and dynamic nature of embodiment (Krieger, 2001; Curtis et al, 2004; Seeman et al, 2010; Gustafsson et al, 2014), considerations of life stage and lifecourse perspectives are critical in optimizing our ability to appropriately gauge and weigh social experiences and exposures that might vary over time and/or be generationally- or life stage-contingent (e.g. age-related differences in the perception and appraisal of social/physical environments). Thus, while research continues to improve understanding of *why* place matters, there remains particular need for work capable of revealing: 1) *which* places matter for health and *when* (i.e. spatially- and temporally-specific notions of "place"); 2) *how* these places matter—that is, continued exploration of processes and mechanisms underlying (and driving spatial patterns of) the physiological embodiment of place; and 3) potential intergenerational and life-stage differences in place-embodiment experiences/perceptions.

The research presented here seeks to make contributions in each of these three areas through developing the "geographies of embodiment" concept. This research was completed as part of the *People's Social Epi Project* (PSEP)—an intergenerational community-based participatory action research project examining place, embodiment, and health using an information and communication technology-enhanced approach. The aims of this work were to: 1) Determine the spatial distribution of adult and youth daily places; 2) Characterize adult and youth perceptions of place-embodiment for their daily environments; and 3) Assess spatial differences of "place", and perceptual differences of place-embodiment between adults and youth. This paper highlights *X-Ray Mapping* as a novel cognitive mapping methodology to

elucidate subjective notions of place-embodiment within place-health research, and thus enable the construction of generationally-contingent and varying "geographies of embodiment" that can help inform efforts to arrive at spatially- and temporally-specific measures of place-health exposures and experiences.

This paper begins with an overview of some conceptual roots for "embodiment" within public health. This is followed by a brief summary of the place-health literature related to the embodiment of place, highlighting common approaches and core limitations and opportunities. Then, a brief overview of the PSEP process and methods is provided for context. This paper then details the X-Ray Mapping methodology and findings, including data illustrations from a web-based multimedia-enabled community mapping platform. The paper closes with a discussion of the potential utility of the X-Ray Mapping methodology in complimenting and enhancing place-embodiment research, and possible applications/implications for intergenerational and participatory place-health research and practice going forward.

Embodiment: Some Roots and Conceptual Groundings

"Bodies tell stories about—and cannot be studied divorced from—the conditions of our existence."
(Krieger, 2001, p.350)

In public health perhaps the most developed and useful conception of embodiment is that articulated by Krieger (2001; 2005). As a foundational construct of ecosocial theory (Krieger, 1994), *embodiment* is understood as the process through which the outside physical and social world becomes embedded into our biology—that is, how daily interactions with our social and physical environments "get under our skin" to affect our physical, psychological, and emotional well-being by altering how our body functions (Krieger, 2001, p.672). The general idea is that we encounter, perceive, interpret, and incorporate an endless array of social and physical environmental experiences and exposures that shape our physiologic functioning on a day-to-day basis (with both short- and long-term implications), whether such incorporation be biologically and/or chemically direct (e.g. air pollution, roach antigens), or psychosocially mediated (e.g. experience of discrimination, exposure to community violence). Thus, in the same moment we might simultaneously incorporate the air around us just as we incorporate the conversation *about* us, and might do so consciously or unconsciously. And in another moment we might simultaneously incorporate a menthol cigarette and a hug—perhaps both of which were induced by that conversation about us.

Embodiment, then, is both continuous and dynamic, as well as both literal and subjective. Our bodies, in a sense, are archives of and testaments about the world around us—even if we ourselves do not always consciously document or testify. Our bodies keep tally of our lived experiences—our physical and social encounters—and the health and well-being of our bodies can accordingly bear witness to the contexts and conditions of such experiences and encounters. Moreover, these contexts and conditions of embodiment are shaped and organized by societal arrangements of power, privilege, and opportunity—both current and historic. The processes and mechanisms of embodiment—the so called "pathways of embodiment" (Krieger, 2001), forged through an interplay of our inner biology and the outer social world—are beholden to and an expression of such arrangements. Inequalities in health across populations, then, present as "embodied expressions of social inequality" (Krieger, 2004, p.1). "Reading" bodies as texts can accordingly offer clues for discerning, and provide insight into, the matrix of structural factors that underlie and drive patterns of population health and illness.

As Krieger and Davey Smith (2004) articulate, embodiment "invites us to consider how our bodies, each and every day, accumulate and integrate experiences and exposures structured by diverse yet commingled aspects of social position and inequality" (p.99). How such accumulation and integration occurs can in part be understood through engaging two distinct yet related concepts that represent manifestations/mechanisms of embodiment: "weathering" (Geronimus, 1992) and allostatic load (McEwen and Stellar, 1993; McEwen, 1998; McEwen and Gianaros, 2010). Developed to help explain inequalities in black-white mortality and birth outcomes, the *weathering hypothesis* posits that populations subjected to the stress and stressors of chronic socioeconomic disadvantage, e.g. racial discrimination and poverty, experience an early breakdown and dysregulation of physiologic systems which leads to a deterioration of health at an earlier age (Geronimus, 1992; 1996). In essence, weathering

describes a process of premature aging due to accelerated "wear and tear" of the body brought about by repeated and cumulative exposure to inequitable social, economic, political, and environmental conditions deleterious to health and well-being (Geronimus et al, 2006; Geronimus et al, 2010). Weathering can thus be understood as a physiological consequence of social inequality—the embodiment of a society predicated upon and patterned by inequalities of power, privilege, and opportunity. Those with a less favorable arrangement must endure the storm, and their bodies tell a corresponding story—weathered by their biological incorporation of social inequality.

Related to weathering, and in many ways underlying the process through which it operates, is the concept of *allostatic load* (McEwen and Stellar, 1993; McEwen, 1998). Allostatic load refers to the long-term effect of physiologic responses to stress—the strain imposed upon and cumulative wear and tear of the body resultant from stress responses to "repeated or chronic environmental challenge" (McEwen and Stellar, 1997, p.2093). Allostatic load is based on the notion of allostasis, understood as the body's normal short-term adaptive response to environmental stimuli—a process of "maintaining stability through change" (McEwen and Seeman, 1999, p.32; Sterling and Eyer, 1988). Unlike the notion of homeostasis wherein physiologic systems are understood to operate at optimal set-points (e.g. body temperature), allostasis "emphasizes the idea of optimal operating ranges of physiologic systems" (Seeman et al, 2010, p.226). Allostatic systems are fluid and responsive to environmental demands, enabling the body to adapt to and cope with short-term physical and psychological challenges. The classic example is the "fight or flight" response, wherein short-term alterations in multiple physiologic systems (e.g. those regulating heart and respiratory rate), enable us to physically respond and react to situations we appraise as dangerous or threatening. These short-term alterations are necessary for optimal physiological functioning—they are normal. Over time, these normal allostatic responses can become dysregulated (e.g. too frequent, excessive, maladaptive stress response), the consequence of which is allostatic load—essentially, allostasis gone wrong. As summarized by Seeman and colleagues (2010, p.226):

> Allostatic load represents the cumulative physiological toll (i.e., the extent of such dysregulation) across multiple systems over time. It reflects both a multisystem and life-span orientation, visualizing disease risks as resulting from the individual's cumulative exposure over time to the "wear and tear" associated with elevations in physiologic activity across the body's multiple regulatory systems.

Allostatic load, then, can be understood as the physical embodiment of repeated or chronic exposure to stress-inducing social and living conditions over time—a physiologic expression of weathering. Given the cumulative nature of allostatic load and weathering processes, and as alluded to by Krieger (2001), embodiment accordingly must be understood within a lifecourse perspective (Hertzman et al, 2001; Ben-Shlomo and Kuh, 2002; Hertzman and Power, 2003; Graham and Power, 2004; Lynch and Davey Smith, 2005; Pearlin et al, 2005; Shankoff et al, 2009; Merlo, 2011), and there is a growing body of work aimed at revealing how the outside world gets "under our skin" over time and over the course of our lives (Crimmins et al, 2003; Gimeno et al, 2008; Pollit et al, 2008; Kuzawa and Sweet, 2009; Love et al, 2010; Gustafsson et al, 2011; Goldman-Mellor et al, 20012; Evans and Kim, 2012; Peckins et al, 2012; Ploubidis et al, 2015). Engaging the interplay and overlap of these concepts—weathering and

allostatic load—offers guidance to aid our understanding of how our daily encounters with the world around us can influence our health and well-being. And with this understanding we can begin to explore notions of embodiment in relation to "place", and how the places in which we live, learn, work, play, and age leave their marks on and inside of our bodies.

Embodiment in Place-Health Research: Approaches, Limitations, and Opportunities

Our physiologic functioning and overall health are perpetually influenced by and cannot be divorced from the lived realities and contexts of our daily lives—lives that unfold in particular locales and time periods. Thus, the story of embodiment is in many ways a story about place—what it is, when it is, where it is, why it is, and how it is and for whom. Telling this story about the embodiment of place has been the focus of an increasing amount of place-health research in recent years. Much of this work at the population level entails the collection and spatial analysis of biometrics (e.g. resting blood pressure, diurnal cortisol patterns, C-reactive protein levels) in light of what are considered core social determinants of health, e.g. SES, race/ethnicity. In the majority of studies, "place" is defined as a *singular* neighborhood, and with rare exception (e.g. Nazmi et al, 2010; Phoung Do et al, 2011; Karb et al, 2012; Schulz et al, 2012), measures of neighborhood context, and the spatial bounds of neighborhoods, are based exclusively on census data for area of residence, and *only* the area of residence. Generally, this work can be categorized based on whether cross-sectional or longitudinal approaches are taken, whether samples are adults or youth, and whether a cumulative measure of "embodiment", i.e. multi-component assessments of cumulative biological risk or allostatic load, or a singular biometric component is explored (e.g. diurnal cortisol).

In regard to longitudinal approaches, Gustafsson et al (2014), for example, examined whether cumulative neighborhood disadvantage—based on residential census area data—measured over four time points between ages 16 and 43 was associated with allostatic load (AL) at age 43. Their measure of AL was based on 12 biomarkers, with cardiac, metabolic, neuroendocrine, and inflammatory metrics. After all controls, they found that cumulative neighborhood disadvantage was associated with higher AL in the total sample and for men, but not among women. Similarly, Nazmi et al (2010) examined longitudinal associations between neighborhood context and changes in inflammatory marker IL-6 over a 3-4 year period among adults. Here, neighborhood "context" consisted of census-based and survey-based measures of "deprivation", "problems", "safety", and "social cohesion". Their results showed that higher levels of deprivation and problems, and lower levels of safety, were associated with increases in IL-6 levels after all controls.

The majority of findings to date, however, are based on cross-sectional approaches. For example, in the same Nazmi et al (2010) study, cross-sectional analyses revealed that deprivation, safety, and problems remained significantly associated with fibrinogen after all controls, and IL-6 remained associated with safety and problems. In another study related to place and inflammatory markers among adults, Petersen et al (2008) examined associations between neighborhood SES (based on residential census tracts) and C-reactive protein (CRP) and IL-6, finding that neighborhood SES was inversely associated with both IL-6 and CRP levels, but only the IL-6 association remained significant after all controls. A similar study among youth

ages 5-18 by Broyles et al (2012) examined associations between neighborhood poverty and crime (again based on residential census tracts) and fasting serum CRP levels, revealing that children living in neighborhoods with high levels of poverty or crime had elevated CRP levels compared to children from other neighborhoods.

Another line of cross-sectional work has explored associations between measures of place context and cortisol patterns. For example, Barrington et al (2014) examined stress as an explanatory mechanism for the relationship between neighborhood deprivation and health. They tested associations between measures of individual perceptions of neighborhood "social control" and "fear of crime" (based on residential census tracts), and cortisol reactivity to a stress test among adults. Their findings revealed that while neighborhood deprivation was significantly associated with both measures, it was only associated with women's cortisol reactivity. They also found that social control, but not fear of crime, was significantly positively associated with cortisol reactivity, and that it mediated the association between neighborhood deprivation and cortisol reactivity among women. In a similar study among adults, Karb et al (2012) examined the association between neighborhood stressors (again based on residential census tracts) and diurnal cortisol patterns. Findings revealed that those residing in neighborhoods with high levels of perceived or observed stressors exhibited greater cortisol dysregulation (e.g. flatter/slower decline), and that mean cortisol levels were lower for those in neighborhoods with higher neighborhood stressor levels and lower levels of social support (a combination of findings suggesting dysregulation due to chronic stress). Phoung Do et al (2011) demonstrated similar findings among adults in their examination of neighborhood context (poverty, violence, disorder, and social cohesion based on census tract and survey-based data) and circadian cortisol levels, as did Roe et al (2013) in their examination of neighborhood greenspace (based on residential census tract) and diurnal cortisol patterns. Results similar to these have also been observed in studies focused on youth (Hackman et al, 2012; Brenner et al, 2013; Rudolph et al, 2014).

Cross-sectional approaches have also been popular in exploring associations between place contexts and more cumulative measures embodiment, i.e. allostatic load (AL) and cumulative biological risk (CBR). For example, Bird et al (2010) examined whether neighborhood SES, based on residential census tract data, was associated with disparities in AL, measured as an aggregate index with metabolic (e.g. HDL cholesterol), cardiac (e.g. systolic blood pressure), and inflammatory (e.g. CRP) biomarkers among adults. They found that living in a lower SES neighborhood was associated with worse AL, independent of individual SES measures. Similarly, Mekins et al (2009) examined race-specific patterns of associations between neighborhood SES (again based on residential census tract), and AL based on 9 biometrics (serum levels of CRP, albumin, glycated hemoglobin, total and HDL cholesterol, waist-to-hip ratio, systolic and diastolic blood pressure, and resting heart rate). They found a significant inverse (negative) association between neighborhood SES and AL for Blacks, with weaker and non-significant inverse associations for Mexican Americans and whites after all controls. Schulz et al (2012) corroborate these findings in their study of associations between neighborhood poverty (based on residential census tracts), and AL based on 8 biometrics (systolic and diastolic blood pressure; blood glucose; waist circumference; HDL and total cholesterol; fasting triglycerides). They found that neighborhood poverty was significantly positively associated with higher levels of AL, and that this association was mediated by self-

reports of neighborhood environmental stress. King et al (2011) observed similar results in their examination of associations between measures of neighborhood context ("neighborhood socioeconomic disadvantage" and "neighborhood affluence") based on census tract boundaries, and cumulative biological risk (CBR) measured using 8 biometrics (systolic and diastolic blood pressure; resting heart rate; hemoglobin A1c; C-reactive protein; waist circumference; total and HDL cholesterol). Here, neighborhood affluence predicted higher levels of CBR, but neighborhood socioeconomic disadvantage did not. Mair et al (2011) has also demonstrated similar associations among adults, while a work by Theall et al (2012) and Brody et al (2013) has revealed that these associations also exist among youth.

Overall, this growing body of place-embodiment research not only draws clear connections between measures of place and measures of physiological dysfunction, but also suggests potential mechanisms through which place experiences and exposures become biologically embedded (e.g. Schulz et al, 2012; Brenner et al, 2013; Roe et al, 2013; Barrington et al, 2014), and reveals important gender-based differences in associations between measures of place context and biomarkers (Mair et al, 2011; Hackman et al, 2012; Roe et al, 2013; Barrington et al, 2014; Gustafsson et al, 2014). In short, this work does well to evince place-embodiment as a phenomenon and encourage further elucidation of relevant experiences/exposures, as well as explication of processes through which they become embodied. Yet as with any burgeoning area of inquiry, there are some fundamental challenges and limitations that warrant thorough consideration going forward.

First, as is the case with much place-heath research in general, place-embodiment work to date has relied entirely on quantitative approaches to tell the story of place, using exclusively survey-based methods with collection of biometrics. Thus, peoples' bodies have "spoken" *about* them *without* them—that is, study participants have not been afforded opportunities to speak on behalf of their own bodies (e.g. corroborate, extend, counter) beyond responses to predetermined survey items. Yet researchers are using their bodies to tell stories about them as people—the bounds and plots of which have been preemptively delimited. Highlighting this tension is not necessarily to question the strengths of this form and line of survey- and biometric-oriented work, or even to challenge the value and potential impact of related findings. It is, however, to suggest that the stories of place-embodiment currently being told are incomplete, and indeed might be enhanced (i.e. more nuanced, more relevant, more actionable) with qualitative approaches that afford people opportunities to speak about their place-embodiment themselves—a sort of bifurcation of the place-embodiment narrative with both quantitative and qualitative chapters intermixed along the way. Tales of C-reactive protein and IL-6 in the third-person are one thing, autobiographic articulations of the spatially-specific experiences that might influence such biomarkers are another. Qualitative and mixed-methods approaches, particularly those with a community-based participatory research orientation (Israel et al, 1998; Minkler, 2000; Minkler and Wallerstein, 2005), can allow for a more nuanced and grounded rendition of the place-embodiment landscape by eliciting and organizing people's lived and embodied expertise regarding place-based experiences and exposures. This in turn can more readily facilitate knowledge translation and action that is timely and responsive to the social and political realities of people's daily place contexts, thus moving place-embodiment research beyond abstract and de-placed associations whose value and utility stem primarily from generalizability, not actionability.

Second, operational definitions of "place" in this body of work are based almost exclusively on administrative boundaries (e.g. census tract)—and only the administrative boundary of residence. This of course fails to capture the complete place-embodiment experience, ignoring the actual everyday lived reality of peoples' "spatially polygamous" lives as they move to and through spaces and places far beyond the area surrounding their residence (Matthews, 2011; Matthews and Yang, 2013). A growing body of literature has made clear that efforts to unpack the relationships between place, people, and the people's health must be able to account for their multi-nodal, time-variant, and spatially-specific place experiences (MacIntyre et al, 2002; Chaix et al, 2009; Kwan, 2009; Rainham et al, 2010; Cutchin et al, 2011; Perchoux et al, 2013; Browing and Soller, 2014; Jones and Pebley, 2014). This means engaging "relational" and dynamic notions of place that are defined not by arbitrary (and imaginary) administrative lines, but by lived spatially realities and patterns of mobility (Cummins et al, 2007). Furthermore, even within the administrative boundary approach, much work to date falls short in revealing what it is specifically (e.g. beyond SES) that matters for place-embodiment processes, and *where* that "what" is specifically located and experienced spatially. In other words, within the current approach to place-embodiment research, "place" is non-specific and quite literally imaginary, and it is not clear *what* is being embodied, nor when or where. Place-embodiment research will be enhanced greatly through design and methodological approaches that prioritize and can accommodate not only more nuanced and dynamic operational definitions of "place" (e.g. multiple spatial locations within in activity space), but also greater specificity regarding *which* place-based experiences and exposures are most salient and thus most germane to place-embodiment.

Third, place-embodiment work to date has only sparingly focused on or directly involved youth (e.g. Broyles et al, 2012; Theall et al, 2012; Brenner et al, 2013; Brody et al, 2013; Rudolph et al, 2014). This means that the current story of place-embodiment is based largely on an adult's perspective (and body), which accordingly limits our ability to appropriately situate, gauge, and delineate the role(s) of age, generation, time, and timing in place-embodiment over the lifecourse. As with place-health research in general, both objective and subjective (i.e. perceived) measures of place matter (Wen et al, 2006; Weden et al, 2008; Schulz et al, 2013; Barrington et al, 2014). On the most basic level, adults and youth encounter and experience drastically different places and place contexts on a day-to-day basis. Appraisals of and responses to these experiences are inextricably linked to age and life-stage—a 50 year-old will see, interpret, process, and react to aspects of place context (e.g. community violence, segregation) differently than a 15 year-old. Furthermore, the 50 year-old "version" of an individual will perceive and respond to their place-based experiences and exposures differently than their 15 year-old self. Ultimately, a lack of progress in this area will inhibit our ability to correctly specify mechanisms of place-embodiment over time and, consequently, our ability to identify, design, and time appropriate interventions for optimal effect. Again, given the cumulative and dynamic nature of embodiment (Krieger, 2001; Geronimus et al, 2006; Nazmi et al, 2010; Peckins et al, 2012; Gustafsson et al, 2014; Jimenez et al, 2015), the dynamic and relational nature of place (Cummins et al, 2007; Kemp, 2011; Matthews, 2011; Jones and Pebley, 2014), and the age- and life-stage contingency of place-embodiment experiences and exposures and perceptions/appraisals thereof (Crimmins et al, 2003; Curtis et al, 2004; Goldman-Mellor et al, 2012; Brenner et al, 2013), it is critical that future work explores and

accounts for experiential and perceptual differences that may be life-stage and generation-contingent. Growing the field to encompass more intergenerational and longitudinal approaches could prove fruitful here.

Fourth, and in aggregate, current approaches to place-embodiment research tend to decontextualize the embodiment experience, losing sight of and leaving out details related to the lived reality of everyday social, political, environmental, and economic conditions that are experienced. The goal of conducting place-embodiment research, ostensibly, is to identify a set of spatially organized exposures and/or patterns of experiences that exert some form of positive or negative health effect through altering the physiologic functioning of those who encounter or share such exposures and experiences. The motivation, presumably, is to be able to intervene and take action to mitigate the negative and enhance the positive. But the work completed thus far has lacked specificity in regard to what place is (to those embodying it), which attributes of place matter, where these attributes are spatially located, when these attributes are experienced/encountered, and the underlying structural factors that determine the spatial distributions of these attributes in relation to population patterns. Nor has existing work engaged study samples as *full people*—as constituents with political voice, networked social power, and agency. As such, current approaches to date, as articulated above, cannot tell the full story of embodiment and accordingly offer little direction in regard to intervention and action—such de-placed, de-politicized, and ironically disembodied accounts of place-embodiment are not enough.

An approach to place-embodiment research that puts people back in their bodies can more thoroughly tell the story of embodiment and provide a more complete rendition of the place, embodiment, and health picture. Adopting participatory mixed-methods approaches can help re-contextualize place (and the embodiment of place) by putting people back into their bodies and allowing them, the study samples, to contribute more fully to the knowledge creation (and translation) process. In other words, the story of place embodiment needs to be a co-authorship between community and academic experts that aims to co-create, co-produce, and integrate various forms of knowledge and expertise regarding place and how it "gets under our skin". The following sections describe an attempt to do just that.

People's Social Epi Project:
An Intergenerational Study of Place, Embodiment, and Health

Background

The People's Social Epi Project (PSEP) was developed and executed with an orientation anchored in *A People's Social Epidemiology* framework (Petteway, 2014a; CHAPTER 1), a multicomponent and tiered framework to guide social epidemiology research/practice to become more inclusive and equitable, improve knowledge translation, and facilitate timely, locally relevant action. PSEP integrates social epidemiology and participatory action research (PAR) in collaboration with parents and youth residing in public housing to further understand where and how place-based exposures that affect health and well-being are encountered, perceived, and experienced intergenerationally within 5 broad place-domains: *Home*, *Neighborhood*, *School/Work*, *Social/Leisure*, and *Transition routes/spaces.* This work sought to: 1) expand and make novel contributions to research on health in public housing; 2) improve conceptual and operational understandings of place through identifying the spatial, temporal, and social connections and divisions between the places of residents' daily activities; and 3) elucidate spatial, temporal, social, and perceptual differences between adult and youth place experiences. Taking a *placescape* approach (Petteway, 2014b; CHAPTER 2), the research was completed using participatory methods for the systematic documentation and assessment of place-based exposures and opportunities with two generations of public housing residents—one parent and at least one youth from each participating household recruited as parent-child dyads. Research process and findings presented here are from the first iteration of PSEP.

Participants and Process

Adult and youth participants were recruited from a predominantly black public housing project in a small Midwestern industrial city. Youth were between ages 13 and 18 and had to be enrolled in school. Adults had to be formally employed or have some form of daily non-leisure activity (e.g. child care, doing hair, informal side jobs). A total of 8 adults and 10 youth were initially recruited. A total of 4 adults and 7 youth completed all project trainings and research activities. Prior to commencing the formal research, all participants were trained in public health basics and core principles related to social epidemiology and health equity, and trained in public health research and CBPR/PAR basics. Trainings included formal presentations covering core background material and illustrating key project-related concepts and methods, as well as more open-ended and participant driven discussion.

All research methods were completed by the participants themselves. Youth and adults completed the same methods simultaneously but in separate all-youth and all-adult groups. Informed consent and assent were obtained after the initial training, followed later by method-specific informed consent and assent. Participants received a participation stipend on a per-meeting basis. All project meetings were held at a public recreation center located adjacent to the housing project, with the exception of two meetings held at a public library branch located about half a mile from the housing community. An informal project advisory board consisted of three staff members at the recreation center, one adult public housing community resident, and one at-large city council member serving on health and education committees. All project activities, including recruitment, were co-coordinated and co-led with an adult project co-lead

from the housing community who was trained in human subjects research. PSEP protocols were approved by the Institutional Review Board of the University of California, Berkeley (2013-10-5700). Research methods flowed sequentially and built upon each other, as follows:

1) Photovoice (Wang and Burris, 1997; Wang, 2005; Hergenrather et al, 2009; Catalani and Minker, 2010);
2) Activity Space Mapping (see for example Zenk et al, 2011; Villanueva et al, 2012; Chaix et al, 2012)
3) X-Ray Mapping (see for example Ruglis, 2011);
4) Participatory GIS (Elwood, 2006; Dunn, 2007).

First, participants used *Photovoice* (via cellphones) to identify, photo-document, and describe their important daily places and specific exposures/opportunities within each place they perceive affects their health, positively or negatively (detailed in Petteway, 2015a). They then used *Activity Space Mapping* to geolocate the spatial locations of these photos and place-based narratives using large printed maps. Participants used this data to create symbolic representations of how each of these mapped photo-places affects their bodies/health using a cognitive mapping method known as *X-Ray Mapping* (discussed in detail below). Finally, constituting the *Participatory GIS* process, they integrated and digitally mapped their work via a web-based interactive and multimedia-enabled information and communication technology (ICT) platform, *Local Ground* (Van Wart, Tsai, and Parikh, 2010) This platform allows participants to easily create, enhance, print, and digitally share their place research maps with each other, the broader community, and city officials.

The X-Ray Mapping Method: Elucidating Subjective Notions of Place-Embodiment

Background

X-Ray Mapping is a cognitive mapping method that can elucidate how outside social and built environment experiences become physically embodied (Ruglis, 2011). The goal for X-Ray Mapping here was to understand how participants perceive that their daily places are affecting their health—specifically, how their places "get under their skin" and affect their bodies. Through describing which areas of their body are affected by place and how they are affected (e.g. positively, negatively), participants are able to tell a story of how their bodies experience place. This process qualitatively captures subjective notions of the embodiment of place. To the authors' knowledge, "X-Ray Mapping" as a terminology and a method has not been used in the public health or any place-health research to date.

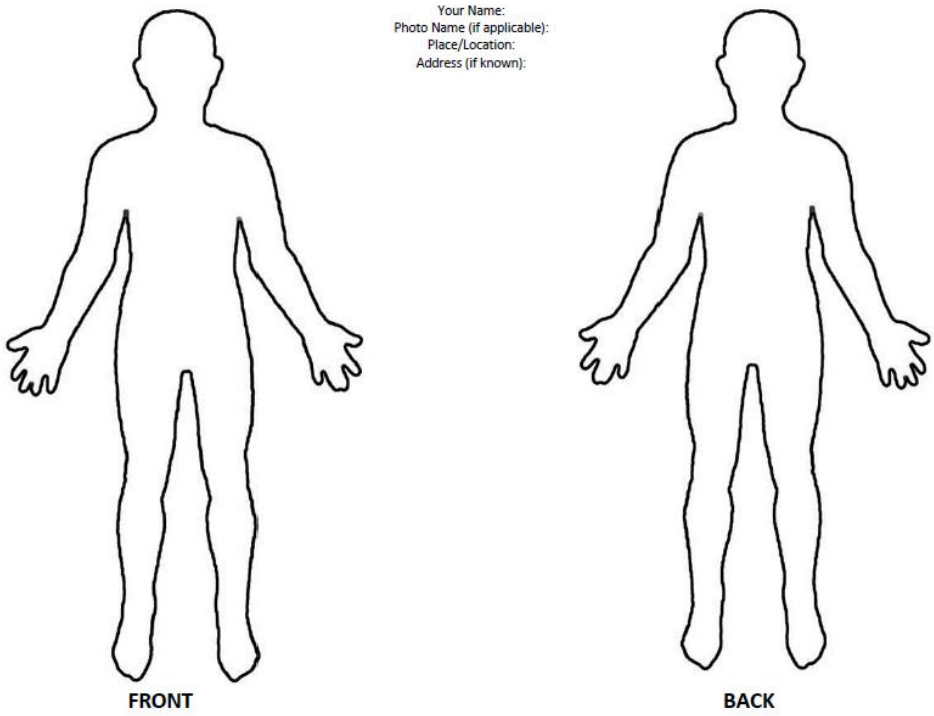
X-Ray Mapping Process and Data Collection

Prior to commencing the X-Ray Mapping method, all participants attended a two-hour training and discussion session. This session included a 20 minute presentation summarizing what X-Ray Mapping is and what it would entail for participants. Informed consent and assent specific for X-Ray Mapping were obtained after this presentation. Participants were then provided with basic training in the notion of "embodiment" and related processes/concepts of

stress, allostasis, allostatic load (McEwen, 1998), and "weathering" (Geronimus, 1992; Geronimus, 2006). This training included open-ended and participant-led question/discussion of the concepts and the sharing of example illustrations of each as they had experienced them based on their own interpretations.

Following the training session, each participant attended 2 or 3 sessions to complete the X-Ray Mapping methodology. For this method, participants worked with 8.5"x11" "X-Ray Map" worksheets containing a basic body outline with ventral and dorsal representation on the front side of the paper (*FIGURE* 1). They were asked to think about and describe what their bodies/minds feel in each place they identified during the *Photovoice* and *Activity Space Mapping* exercises and complete an X-Ray Map for each place—that is, each photo-documented and mapped place would have a corresponding X-Ray Map to represent how they perceived *that* particular place affected them physically, psychologically, and/or emotionally. So for example, a participant might take a photo of a park during *Photovoice*, then map that photo location during *Activity Space Mapping*. Then they would complete the *X-Ray Mapping* worksheet specifically for that photo-place, using the worksheet to indicate how they perceive that particular park affects their body/health. This was repeated by participants for each of their place locations identified via *Photovoice* and *Activity Space Mapping*.

FIGURE 1: **X-Ray Mapping Worksheet**



Participants were instructed to locate their perceived place-embodiment effects on their X-Ray Maps using color-coded stickers. Participants expressed a desire to continue the color representation scheme used for the *Activity Space Mapping* method, which used green for positive (or healthy/good) places, red for negative (or unhealthy/bad) places, and yellow for places they believed had both positive and negative effects. For X-Ray Mapping, green

represented a perceived positive body effect, red represented a negative effect, and yellow represented a positive/negative effect. For example, if they say that visiting at a friend's apartment makes them happy, then they would place a green sticker on the head/brain and/or heart of their X-Ray map. If they say that crime in their neighborhood makes them feel nervous or makes their heart beat faster, then they would place the appropriately colored red sticker on the head and/or heart area. Or if they say that a particular park is good for exercising but people often smoke there, then they would notate it by placing a yellow sticker on the lungs, for example (or alternatively they could use separate red and green stickers). Participants were free to use as many stickers as they believed necessary to capture all of their perceived place-embodiment effects for each place, such that each X-Ray Map could contain multiple positive and negative effects (e.g. positive heart, negative brain, and negative back) and each body area/part could have multiple stickers of the same or different colors (e.g. two positive and three negative brain effects). Participants were instructed to use the back of their X-Ray Map worksheets to write a brief description/narrative explaining their place-embodiment representations.

***PHOTO 1*: Participants Completing X-Ray Maps**

X-Ray Mapping Analysis

FIGURE 2 shows a completed X-Ray Map example, and *TEXT BOX 1* shows an example place-embodiment narrative corresponding to a completed X-Ray Map. Each X-Ray Map was reviewed to complete simple counts and frequencies of: 1) place-embodiment geographic locations (based on the 5 overall PSEP place-domains of *Home*, *Neighborhood*, *School/Work*, *Leisure/Social*, and *Transition*), 2) place-embodiment physiologic locations (e.g. heart, brain, stomach), and 3) type of perceived place-embodiment effect (i.e. positive, negative, both). This was done for each individual participant separately. Once individual place-embodiment tabulations were completed, results were aggregated for youth and parents separately. Aggregate summary tables were produced for overall adult and youth place-embodiment data, as well as domain-specific adult and youth place-embodiment data (*TABLES 1-3*).

FIGURE 2: **Example of a Completed X-Ray Map**

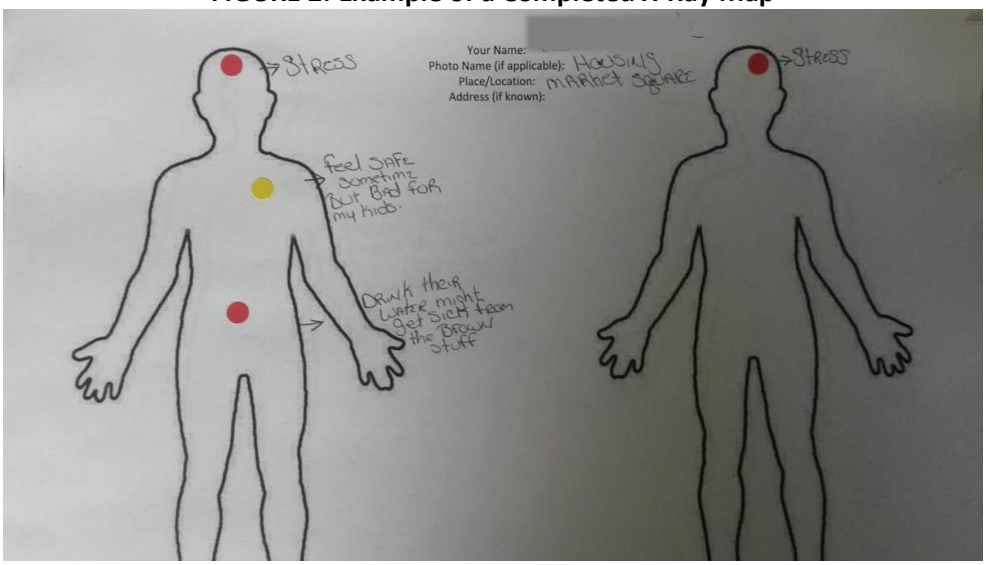


FIGURE 2: X-Ray Map representing perceptions of place-embodiment related to housing conditions (Adult Participant D)

TEXT BOX 1: **X-Ray Map Place-Embodiment Narrative Example**

"Market Square people are very stressing, unhealthy, and annoying due to all of the nonsense, partying and loud talking at night. Also some of the people make my stomach hurt by the things they do and say." ***Youth Participant G***

Qualitative comparisons were made between aggregate youth and aggregate adult X-Ray data (e.g. youth neighborhood embodiment X-Ray Map vs. adult neighborhood embodiment X-Ray Map). *TABLES 1-3* summarize intergenerational perceptual differences of place-embodiment by place-domain. Summary infographics were developed to visually represent place-embodiment among adult and youth participants (*FIGURES 3-6*). All X-Ray Map data was then mapped on the *Local Ground* platform to enable geographic visualization and qualitative comparison of adult and youth "geographies of embodiment".

X-Ray Mapping Findings

In the end, what participants generated were place-specific representations of perceived place-embodiment effects that are physiologically-specific. In other words, they created maps of place-embodiment that are simultaneously physiologic and geographic in nature—their "geographies of embodiment".

TABLE 1 summarizes the overall adult and youth place-embodiment data, as well as domain-specific adult and youth place-embodiment data. The table shows a breakdown of the total number of body areas identified by participants as being affected by places within each place-domain, "Total Body Areas Affected". For example, adult participants indicated that 5 different body areas are affected within their *Home* place-domain (1 positively, and all 5 negatively). Each body area could be affected in more than one way, thus the total number of indicated body effects across body areas is shown as "Total Body Effects" below. Using the same example, adults identified 11 total body effects across the 5 body areas they indicated were affected by their *Home* place-domain. Overall, youth indicated that their daily places positively and/or negatively affected 20 different body areas across the 5 place-domains, compared to 12 body areas for adults. Among all body areas affected, youth reported 85% (17/20) being affected positively and 80% (16/20) being affected negatively across the place-domains, compared to 58% (7/12) and 83% (10/12), respectively, for the adults. Among all body-effects identified across the 5 place-domains, youth and parents indicated 39% and 32%, respectively, as being positive. The *Neighborhood* place-domain had the most identified body-effects for both adults (42) and youth (44), with both groups reporting more negative effects than positive effects (74% and 64% negative). Among the 5 place-domains, the *Home* place-domain was the most "negative" overall, with adults indicating 91% of identified body-effects as negative and youth identifying fully 100% of body-effects as such. The *Transition* place-domain was similarly identified as having predominantly negative body-effects (92% and 80% for adults and youth, respectively). The *Leisure/Social* place-domain was the most positive overall, with 71% of body-effects indicated as positive for adults and 94% indicated as positive for youth.

TABLE 1: Adult vs. Youth Place-Embodiment Summary Comparison

X-Ray Mapping Summary Results: Place-Embodiment Perceptions by Place-Domain												
Summary Indicator	HOME		NEIGHBORHOOD		SCHOOL/WORK		LEISURE/SOCIAL		TRANSITION		OVERALL	
	Adult	Youth	Adult	Youth	Adult*	Youth	Adult	Youth	Adult	Youth	Adult	Youth
Total Body Areas Affected	5	10	9	16	-	6	7	10	8	9	12	20
Total Body Effects	11	10	42	44	-	11	21	17	13	25	87	107
Positively Affected Body Areas	1 (20%)	0	4 (44%)	11 (69%)	-	4 (67%)	7 (100%)	9 (90%)	1 (13%)	5 (56%)	7 (58%)	17 (85%)
Total Positive Effects	1 (9%)	0	11 (26%)	16 (36%)	-	5 (45%)	15 (71%)	16 (94%)	1 (8%)	5 (20%)	28 (32%)	42 (39%)
Negatively Affected Body Areas	5 (100%)	10 (100%)	9 (100%)	11 (69%)	-	4 (67%)	3 (43%)	1 (10%)	8 (100%)	8 (89%)	10 (83%)	16 (80%)
Total Negative Effects	10 (91%)	10 (100%)	31 (74%)	28 (64%)	-	6 (55%)	6 (29%)	1 (6%)	12 (92%)	20 (80%)	59 (68%)	65 (61%)

*Although adults identified places of work during this project, they did not complete any X-Ray maps detailing their related place-embodiment perceptions.

TABLE 2 and *TABLE 3* summarize intergenerational perceptual differences of place-embodiment body effects by place-domain. Perceived positive body-effects are represented in the column headed by "+", while perceived negative body-effects are represented in the column headed "-". For both adults and youth, the body area most identified as being affected by their places was the brain, with 22 effects indicated by adults across the 5 place-domains

and 27 effects indicated by youth (35 effects if including "brain/head" and "mind"). For the adults, heart, legs, stomach, and eyes round out the top 5 body areas affected by their daily places across the 5 place-domains.; for youth, legs, feet, eyes, and stomach complete the top 5 most affected body areas. Adults identified heart, brain, and legs as the most positively affected body areas, and brain, heart, and eyes as the most negatively affected. Youth identified brain, legs, and stomach as the most positively affected body areas, and brain, legs, and feet as the most negatively affected.

***TABLE 2*: Youth Place-Embodiment: Positive/Negative Body Effect Perceptions by Place-Domain**

YOUTH X-Ray Mapping: Place-Embodiment Body Effect Perceptions by Place-Domain												
Affected Body Area	HOME		NEIGHBORHOOD		SCHOOL		LEISURE/SOCIAL		TRANSITION		OVERALL	
	+	-	+	-	+	-	+	-	+	-	+	-
Brain	0	1	2	10	2	2	5	0	0	5	**9**	**18**
Brain/Head	0	1	1	2	0	0	1	0	1	1	**3**	**4**
Mind	0	0	0	1	0	0	0	0	0	0	**0**	**1**
Head	0	0	0	1	0	0	0	0	0	0	**0**	**1**
Eyes	0	0	0	2	0	0	3	0	0	3	**3**	**5**
Ears	0	1	1	0	0	0	0	0	0	0	**1**	**1**
Nose	0	1	1	1	0	0	0	0	0	0	**1**	**2**
Mouth	0	0	1	0	1	0	0	0	0	0	**2**	**0**
Heart	0	1	1	1	0	0	2	0	0	0	**3**	**2**
Lungs	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Stomach	0	1	3	0	0	1	1	0	0	0	**4**	**2**
Back	0	0	0	2	0	0	1	0	0	2	**1**	**4**
Arms	0	0	1	0	0	0	1	0	0	0	**2**	**0**
Hands	0	0	0	0	1	0	0	0	0	0	**1**	**0**
Butt	0	1	0	0	0	0	1	0	0	0	**1**	**1**
Legs	0	1	3	4	0	0	1	0	1	4	**5**	**9**
Knees	0	0	0	0	0	0	0	1	1	0	**1**	**1**
Shins	0	1	1	0	0	1	0	0	1	1	**2**	**3**
Feet	0	1	1	2	1	2	0	0	1	3	**3**	**8**
Stress	0	0	0	2	0	0	0	0	0	1	**0**	**3**
Total	**0**	**10**	**16**	**28**	**5**	**6**	**16**	**1**	**5**	**20**	**42**	**65**

***TABLE 3*: Adult Place-Embodiment: Positive/Negative Body Effect Perceptions by Place-Domain**

ADULT X-Ray Mapping: Place-Embodiment Body Effect Perceptions by Place-Domain												
Affected Body Area	HOME		NEIGHBORHOOD		WORK		LEISURE/SOCIAL		TRANSITION		OVERALL	
	+	-	+	-	+	-	+	-	+	-	+	-
Brain	0	4	4	8	0	0	3	1	0	2	**7**	**15**
Brain/Head	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Mind	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Head	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Eyes	0	0	0	5	0	0	0	0	0	2	**0**	**7**
Ears	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Nose	0	0	0	2	0	0	0	0	0	1	**0**	**3**
Mouth	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Heart	1	2	2	6	0	0	5	2	1	2	**9**	**12**
Lungs	0	0	0	2	0	0	1	0	0	1	**1**	**3**
Stomach	0	2	2	3	0	0	1	0	0	1	**3**	**6**
Back	0	1	0	0	0	0	1	0	0	0	**1**	**1**
Arms	0	0	0	0	0	0	1	0	0	0	**1**	**0**
Hands	0	0	0	1	0	0	0	0	0	0	**0**	**1**
Butt	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Legs	0	1	3	1	0	0	3	3	0	1	**6**	**6**
Knees	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Shins	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Feet	0	0	0	3	0	0	0	0	0	2	**0**	**5**
Stress	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Total	**1**	**10**	**11**	**31**	**0**	**0**	**15**	**6**	**1**	**12**	**28**	**59**

FIGURE 3 and *FIGURE 4* graphically represent adult and youth "geographies of embodiment". The 5 place-domains are represented by the color-coded symbols and embodiment circles. The size of the circles corresponds to the number of times a specific body area was identified as being affected, either positively or negatively, within that particular place-domain. Green represents the "Home" place-domain; blue represents the "Neighborhood" place-domain; purple represents the "School/Work" place-domain; grey represents the "Leisure/Social" place-domain; and orange represents the "Transition" place-domain.

***FIGURE 3*: Adult "Geography of Embodiment" Summary**

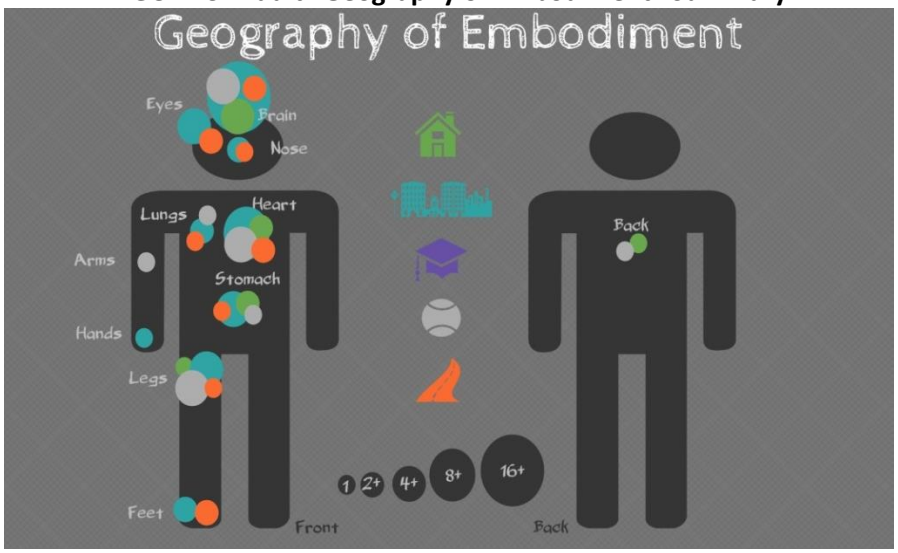


FIGURE 3: *Adult Geography of Embodiment*. Green represents the "Home" place-domain; Blue represents "Neighborhood"; Purple represents "School/Work"; Grey represents "Leisure/Social"; and Orange represents "Transition". The size of the circle reflects the number of times a specific body area was identified as being affected. This figure includes both positive and negative place-embodiment perceptions.

***FIGURE 4*: Youth "Geography of Embodiment" Summary**

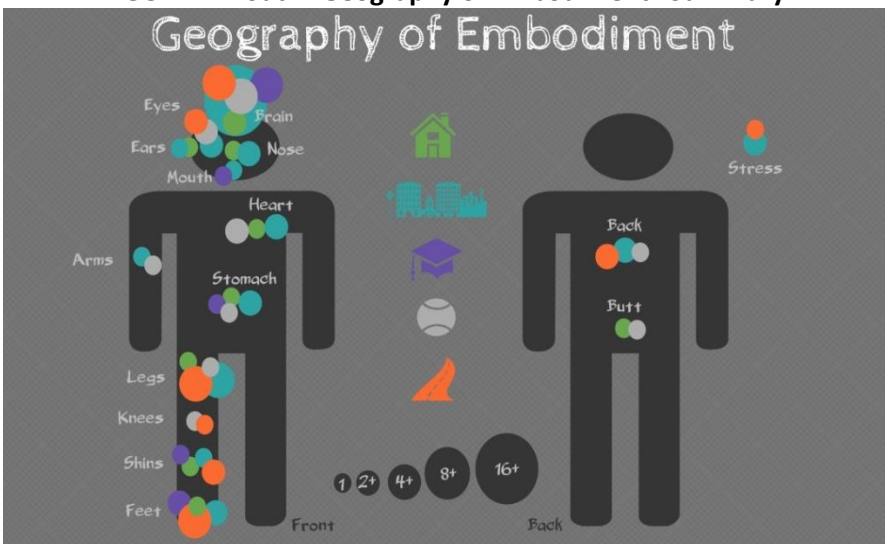


FIGURE 4: *Youth Geography of Embodiment*. Green represents the "Home" place-domain; Blue represents "Neighborhood"; Purple represents "School/Work"; Grey represents "Leisure/Social"; and Orange represents "Transition". The size of the circle reflects the number of times a specific body area was identified as being affected. This figure includes both positive and negative place-embodiment perceptions.

FIGURE 5 and *FIGURE 6* show adult and youth place-embodiment perceptions specifically for the Neighborhood place-domain, with representation of positive and negative body-effects. Here, indicated positive effects are represented in green, with negative effects represented in red. The size of the circle corresponds to the number of times a positive/negative effect was indicated for that particular body area.

***FIGURE 5*: Adult Neighborhood "Geography of Embodiment"**

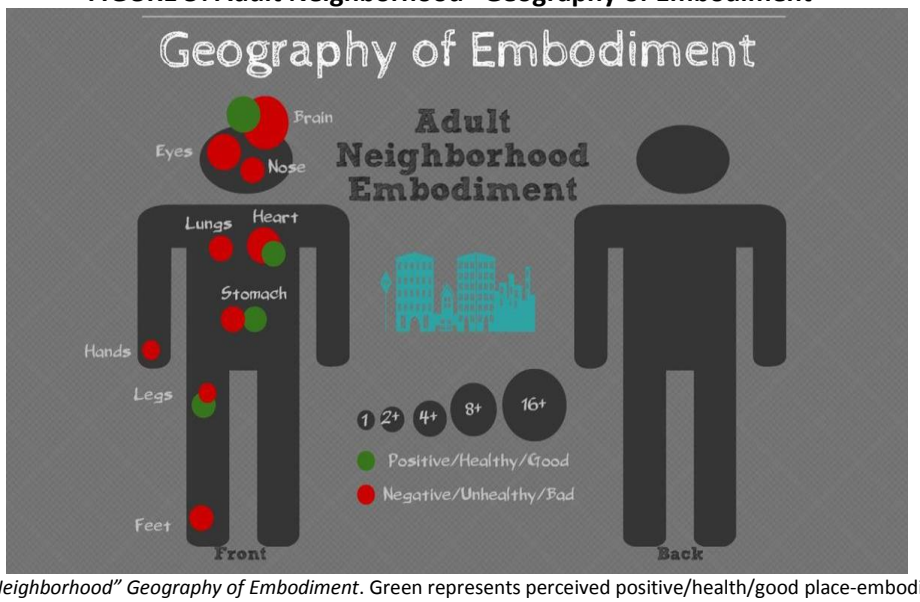


FIGURE 5: *Adult "Neighborhood" Geography of Embodiment*. Green represents perceived positive/health/good place-embodiment effects; Red represents perceived negative/unhealthy/bad place-embodiment effects. The size of the circle reflects the number of times a specific body area was identified as being affected.

***FIGURE 6*: Youth Neighborhood "Geography of Embodiment"**

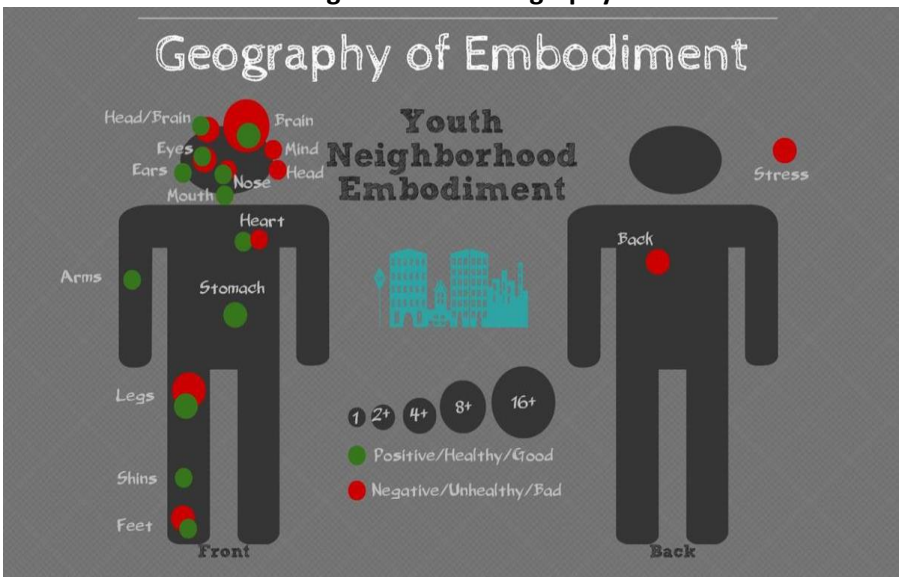


FIGURE 6: *Youth "Neighborhood" Geography of Embodiment*. Green represents perceived positive/health/good place-embodiment effects; Red represents perceived negative/unhealthy/bad place-embodiment effects. The size of the circle reflects the number of times a specific body area was identified as being affected.

FIGURE 7 and *FIGURE 8* show adult and youth "geographies of embodiment" as mapped through the web-based community mapping platform, *Local Ground*. The maps are participants' spatially-specific perceptions of place-embodiment across the 5 place-domains—maps of embodiment that are simultaneously physiologic and geographic in nature. The black polygon is the participants' residential census tract, while the black marker is the location of their housing community. Youth embodiment locations are based on 50 completed X-Ray Maps, while adult locations are based on 26 completed X-Ray Maps. Youth had 20 unique reports of positive place-embodiment and 31 unique reports of negative place-embodiment across the 5 place-domains, with some youth reporting effects for the same location (e.g. their housing community). Adults had 13 unique reports of positive place-embodiment and 16 unique reports of negative place-embodiment across the 5 place-domains. Overall, 25 out of 51 (49%) youth reports of place-embodiment were for places spatially outside of their residential census tract; for adults, 18 out 29 (62%) were spatially outside of their residential census tract. Among youth, 15 of 20 (75%) positive place-embodiment locations were outside of their residential census tract, while 21 of 31 (66%) negative place-embodiment locations were inside. Among adult and youth participants, 22 of 33 (67%) of positive place-embodiment locations were spatially located outside of their residential census tract.

***FIGURE 7*: Youth Geography of Embodiment:**
Positive Place-Embodiment (Left) and Negative Place-Embodiment (Right)

FIGURE 7: Youth reported perceptions of place-embodiment for specific locations they encounter. Green Markers represent locations youth perceived as having a positive body-effect, while represent Red Markers represent the opposite. The black polygon is an outline of the census tract in which the participants' housing community is located. The Black Marker is their housing location.

***FIGURE 8*: Adult Geography of Embodiment:**
Positive Place-Embodiment (Left) and Negative Place-Embodiment (Right)

FIGURE 8: Adult reported perceptions of place-embodiment for specific locations they encounter. Green Markers represent locations adults perceived as having a positive body-effect, while represent Red Markers represent the opposite. The black polygon is an outline of the census tract in which the participants' housing community is located. The Black Marker is their housing location.

Discussion: "Geographies of Embodiment" and the Real Limits of Imaginary Lines

Adult and youth participants' "geographies of embodiment" varied widely, as did their perceptions of place-embodiment. Within this variation, a few prominent take-away observations are particularly worth noting here. **First**, while there was some expected overlap in both positive and negative place-embodiment spatial locations between adults and youth, most of this occurred for locations within their residential census tract—namely their housing community and the community recreation center. Beyond their census tract, overlap between adult and youth place-embodiment locations was limited to a retail shopping plaza just outside census tract bounds. Within these overlapping places of embodiment, however, perceptions of embodiment in regard to the specific experiences/exposures (i.e. place attributes) identified as affecting their bodies and how (i.e. which body areas) were markedly different between adults and youth (*TABLES 2 and 3*). For example within the "Home" place-domain, both adults and youth reported place-embodiment effects related to their physical home environment and the quality of housing management services. On one hand, adults identified place-embodiment effects related to the quality of their tap water (i.e. "brown stuff" in it), holes in their apartment unit walls and ceilings, and regularly dysfunctional washers and dryers, for example. Youth on the other hand reported place-embodiment perceptions related to distressed building hallways, deteriorating community greenspace, and tears in apartment unit carpeting (which management "fixes" with duct tape), for example. It should also be noted that only youth reported place-embodiment effects related to the social environment of their housing community (e.g. *TEXT BOX 1*), while adult perceptions of place-embodiment were limited exclusively to physical attributes. These variations highlight the heterogeneity of "place" as experienced by people who jointly encounter the same physical spaces on a regular basis—what is salient to some might not be so for others. Overall, findings here attest to the importance of taking intergenerational approaches when possible, more actively involving both youth and adults so as to better elucidate age, generation, life-stage, and timing considerations for place-embodiment over the lifecourse.

Second, 49% of youth place-embodiment reports and 62% of adult place-embodiment reports were for places spatially located outside of their residential census tract. Moreover, an overwhelming majority of positive place-embodiment effects were reported for locations outside of their census tract. This was especially true for youth, with 75% of positive place-embodiment locations outside their census tract, contrasted with 66% of negative place-embodiment locations inside. These overall patterns lend further support to increasing calls to move away from administratively defined/bound and static notions of place, and towards a more dynamic, relational, and activity space oriented approaches (Cummins et al, 2007; Rainham et al, 2010; Cutchins et al, 2011; Matthews, 2011; Perchoux et al, 2013; Browning and Soller, 2014). As discussed above, current research on place-embodiment has focused exclusively on people's area of residence. The results for this present study, however, clearly indicate that traditional approaches to assessing relationships between place and health are inadequate—namely, those approaches which arbitrarily delimit notions of "neighborhood" using, experientially and viscerally speaking, imaginary administrative lines, and those which fail to account for where people actually go beyond those imaginary lines. Anchoring the geographies of embodiment concept within a "placescape" approach (Petteway, 2014b;

CHAPTER 2) allowed for the discernment of spatially-specific patterns of place experiences and exposures, patterns which paid no regard to the imaginary lines bounding participants' area of residence. This approach accordingly enabled examination of participants' geographies of embodiment in relation to their "geographies of census tracts", highlighting shortcomings of the latter in regard to its analytic utility in place-embodiment research. Understanding gained from these findings will accordingly enhance future work within this community aimed at developing appropriate quantitative metrics to examine place-embodiment both cross-sectionally and longitudinally.

A **third** and related takeaway, as noticeable in their embodiment maps, is that the majority of the participants' residential census tract, spatially and experientially speaking, has no bearing on their daily lived and embodied place experiences. Indeed, participants' place-embodiment data revealed a distinct pattern of clusters of important day-to-day place locations, some of which were spatially distributed within only a small portion of their census tract, with others distributed outside of their census tract entirely. These clusters constitute what might be considered spatial "nodes". For example, the notion of "spatial polygamy" (Matthews, 2011) draws attention to the importance of our daily mobility patterns and activity spaces of in shaping place-health related outcomes, highlighting the multi-nodal nature of place—nodes that stretch the bounds of "place" far beyond the imaginary lines of administrative polygons. For the work presented here, clear spatial nodes emerged as participants mapped their geographies of embodiment—geographies baring little resemblance to the geography of their census tract. For the present study, as illustrated in FIGURES 7 and 8, operationalizing measures of "place" context based generically on participants' *entire* residential census tract would be inappropriate in itself. To then focus *only* on their residential census tract would only further distort assessment of their real "place". Failing to account for participants' multi-nodal "place" (and its actual spatial structure and contexts) would increase risk for the misspecification of place-effects, an increasing concern within the field (Diez-Roux, 2007; Spielman and Yoo, 2008; Kwan, 2012; Jones and Pebley, 2014). Work by Inagami and colleagues (2007), for example, found that residents of disadvantaged neighborhoods had better self-reported health as they spent more time outside their census tract of residence. Within a "placescape" approach (Petteway, 2014b; CHAPTER 2), the geographies of embodiment concept can help allay concerns over misspecification and more aptly capture people's experiences of place and place-embodiment.

Fourth, spatially locating perceptions of embodiment as related to specific physical and social environmental factors allowed participants to tell a story of place-embodiment within which potential pathways of embodiment can more readily be discerned. Given the spatial and physiologic range of embodiment effects, there is clear implication of a broad range of local/regional policies, processes, and practices that shape daily living conditions, experiences, and exposures that become physically embodied by residents. This is in stark contrast to much place-embodiment work to date that has both failed to identify and spatially locate specific place attributes implicated in place-embodiment, and foregone attempts to uncover elements of the local context (i.e. pertinent to the samples' place-embodiment prospects) that are on or might constitute potential pathways of embodiment. As articulated by Krieger (2001), embodiment and pathways of embodiment should be understood in light of and cannot be divorced from notions of *agency and accountability*. By not identifying specific

attributes/aspects of place contexts and their relations to embodiment, and by not elucidating a more robust spectrum of potential social and political processes and practices that shape place-embodiment patterns, we compromise our ability to answer fundamental questions in regards to: 1) who and what shapes/determines distributions and patterns of underlying health opportunities, exposures, and risks in these locally experienced spaces of embodiment; 2) what these distributions and patterns can tell us about agency and accountability at the local and regional level; and 3) what is at stake in, and what is the value of, telling geographically situated stories of embodiment. The placescape approach taken to the work discussed here allows for these questions to be meaningfully engaged within participants' daily place contexts.

Most reported perceptions of place-embodiment, for both adults and youth, were what could be categorized as stress-mediated perceptions and response (e.g. "brain", "mind") to social and environmental conditions, exposures, and experiences (e.g. vacant buildings, bad school food). For example, many participants indicated that various aspects of their built and social environments "stress" them out (e.g. housing community noise and dysfunction, neighborhood blight) or make them "happy" (e.g. church, good restaurant). Participants also indicated that some places simultaneously exerted both positive and negative influence, e.g. a Rest-In-Peace tagging on a vacant building that elicited both positive and negative emotions and memories for a youth participant. This reminds us that "subjective" appraisals of real place experiences matter just as much as "objective" measures of place attributes/exposures (e.g. vacant building density, food environment indices). Thus efforts to uncover place-embodiment processes will need to continue engaging both objective and subjective measures of place, especially as biomarkers become increasingly used to examine place-health relationships. Such efforts should also keep in mind considerations of lifecourse and life-stage in regard to subjective appraisals of place.

Outside of the psychosocially-mediated perceptions, most remaining effects were explicit and direct. For example, some participants noted that walking long distances, up hills, or over damaged sidewalks is physically taxing (e.g. makes feet/legs/back hurt). This was particularly noted in the context of their daily transition routes, and especially in relation to having to traverse "the hill". The topography of their city serves as natural physical barrier between participants' housing community located downtown "off the hill", and friends, family, and basic amenities (e.g. the nearest grocery store) "on the hill". Participants noted that there was only one public transportation route with very infrequent and inconsistent service near/to their community. These perceptions accordingly, for example, might have implications for the planning of transportation routes and the upkeep of basic built environmental infrastructure, as well as for the future siting of basic social amenities.

Though the geographies of embodiment concept helped to uncover and translate the body language of place amongst participants in this study, there are a few core limitations worth noting here. First**,** though the participatory nature of this work was indeed a strength, it also meant that it was very time-intensive for participants. The small sample for this particular research reflects this reality, and the findings accordingly cannot be taken as a complete representation for all residents in their housing community. Second**,** the voluntary and participatory nature of this project meant that participants generated and shared only data that they personally felt was important and were comfortable sharing. Furthermore, they did so during only a limited window of time for the project. As such, the places they identified and the

perceived place-embodiment effects they reported for each place represent, at best, only a cross-section of their entire geographies of embodiment. Each participant undoubtedly had additional places they experienced and encountered that they did not identify through this research, whether due to limitations imposed by the research methods and timeframe, or because they forgot or didn't feel that a particular place was worth mentioning. Regardless of the reasons, the "geography" aspect of the geographies of embodiment they generated here can certainly stand to be improved upon in future work. Relatedly, the "embodiment" aspect of their geographies of embodiment was based exclusively on their self-reported perceptions of how particular places (or specific place attributes/experience) affect them. Such perceptions of course vary between individuals and are accordingly open to a range of interpretations. For example, one participant identified a series of vacant and deteriorating buildings as affecting their "eyes" (i.e. "an eyesore"), while another participant identified a series of vacant buildings as affecting their "brain" (i.e. "stresses me out"). These varying interpretations of place-embodiment are of course interesting in themselves and are certainly worth exploring in more detail. However, continued work in this area will need to keep these interpretive variations in mind when attempting to unpack physiological mechanisms and examine place-embodiment/health associations.

Finally, some reports of place-embodiment made by participants were in regard to how *other people* might embody place. For example, one adult participant identified a housing community playground as having positive body effects for kids, while also noting that it made her happy herself that kids had somewhere to play. Clearly it will be important to distinguish and disentangle such place-embodiment perceptions going forward so that specific place-embodiment relationships are correctly specified at the person-level before attempting to examine associations at a spatial and population level.

Conclusion and Future Direction

The aim of the work presented here was to highlight potential limitations facing place-embodiment research, and introduce "geographies of embodiment" as an opportunity to enhance research efforts going forward. The geographies of embodiment concept is responsive to existing limitations and offers a way to reframe and re-approach our research. Rooted in a *placescape* approach, the geographies of embodiment concept is not only capable of revealing general patterns of place-embodiment within a particular population, but can reveal specific place attributes within those patterns that directly or indirectly implicate local policies and practices that shape daily social and physical environments.

Accordingly, the geographies of embodiment concept can improve efforts to uncover place-embodiment processes and mechanisms, and better inform appropriate and timely action, be it programmatic interventions or changes in policy and practice—especially that which can be realized within the local contexts where place-embodiment research unfolds. For example, applying the geographies of embodiment concept and coupling the X-Ray Mapping methodology with biometric place-embodiment work could allow for assessing potential compatibility and convergence of objective and subjective place-embodiment patterns. Additionally, taking such a dual approach would enable assessment of the political utility, local social value, and action potential of various forms and representations of place-embodiment

knowledge and data. Moreover, there is increasing movement towards place-based initiatives and strategies in public health, city planning, and community development (NCHE, 2015; TCE, 2013; HUD, 2013a-c; HOPE SF, 2015; FRBSF, 2010; Jutte et al, 2011; Seigel et al, 2015; Pastor and Morello-Frosch, 2014; Fukazawa and Karnas, 2015). The notion of "geographies of embodiment" could represent a potentially valuable conceptual and analytical framework to inform the design, development, and evaluation of place-based efforts in current and future practice, particularly those involving public housing. It might also complement the use of other metrics aimed at assessing "geographies of opportunity" (Galster and Killen, 1995; de Souza Briggs, 2005), e.g. the Child Opportunity Index (Acevedo-Garcia et al, 2014), as geographies of embodiment might reflect and extend this notion as an expression and consequence of local or regional policy decisions that spatially sort place-embodiment experiences.

The X-Ray Mapping methodology, and other participatory intergenerational approaches that draw upon people's situated knowledge of local contexts and their lived and embodied experience of "place", could represent and encourage novel approaches to community assessments for public health strategizing and comprehensive city planning. Also, taking advantage of the increasing availability and utility of ICTs could further enhance the value and extend the reach of methodologies like X-Ray Mapping. The research presented here made use of a web-based multimedia-enabled community mapping platform, thus enabling participants' "geographies of embodiment" to be digitally mapped and readily shared and distributed. Such ICTs, appropriately designed and deployed (Burrell and Toyama, 2009; Diamond, 2010; Avgerou, 2010; Pfister, 2012; Dearden, 2012; D'Ignazio et al, 2014), raise the prospect of population-wide assessment of place, embodiment, and health relationships in both research and practice, e.g. via crowdsourcing approaches (e.g. Kamel-Boulos et al, 2011). All in all, the work presented here suggests a range a possibilities to enhance place-health and place-embodiment research and practice going forward.

References:

Acevedo-Garcia, D et al (2014). The Child Opportunity Index: Improving Collaboration Between Community Development And Public Health. *Health Affairs*, 33 (11): 1948-1957.

Avgerou, C (2010). Discourses on ICT and Development. *Information Technologies and International Development*, 6 (3): 1-18.

Barrington, WE et al (2014). Socioeconomic deprivation, perceived neighborhood factors, and cortisol responses to induced stress among healthy adults. *Health and Place*, 27: 120–126.

Ben-Shlomo, Y and Kuh, D (2002). A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. *Int. J. Epidemiol*, 31 (2): 285-293.

Bernard, P et al (2007). Health inequalities and place: A theoretical conception of neighbourhood. *Social Science & Medicine*, 65: 1839–1852.

Bird, CE et al (2010). Neighbourhood Socioeconomic Status and Biological "Wear & Tear" in a Nationally Representative Sample of US Adults. *J Epidemiol Community Health*, 64 (10): 860–865.

Brenner, AB et al (2013). The Physiological Expression of Living in Disadvantaged Neighborhoods for Youth. *J Youth Adolesc*, 42 (6): 792–806.

Brody, GH et al (2013). Neighborhood Poverty and Allostatic Load in African American Youth. *Pediatrics*, 134 (5): e1362-e1368.

Browning, C and Cagney, K (2003). Moving Beyond Poverty: Neighborhood Structure, Social Processes, and Health. *Journal of Health and Social Behavior*, 44 (5): 5 2-571.

Browning, C and Soller, B (2014). Moving Beyond Neighborhood: Activity Spaces and Ecological Networks As Contexts for Youth Development. *Cityscape*, 16 (1): 165–196.

Broyles, ST et al. (2012). Elevated C-Reactive Protein in Children from Risky Neighborhoods: Evidence for a Stress Pathway Linking Neighborhoods and Inflammation in Children. *PLoS ONE* 7(9): e45419.

Burrell, J and Toyama, K (2009). What Constitutes Good ICTD Research? *Information Technologies and International Development*, 5 (3): 82-94.

Catalani, C and Minkler, M (2010). Photovoice: A Review of the Literature in Health and Public Health. *Health Education & Behavior*, 37 (3): 424-451.

Chaix, B et al (2009). Neighbourhoods in eco-epidemiologic research: delimiting personal exposure areas. A response to Riva, Gauvin, Apparicio and Brodeur. *Soc Sci Med*, 69 (9): 1306 –1310.

Chaix, B et al (2012). An Interactive Mapping Tool to Assess Individual Mobility Patterns in Neighborhood Studies. *Am J Prev Med*, 43 (4): 440–450.

Crimmins, EM et al (2003). Age differences in allostatic load: an index of physiological dysregulation. *Experimental Gerontology*, 38: 731–734.

Cummins, S (2007). Commentary: investigating neighbourhood effects on health—avoiding the "local trap." *Int J Epidemiol*, 36 (2): 355–7.

Cummins, S et al (2007). Understanding and representing 'place' in health research: A relational approach. *Social Science & Medicine*, 65: 1825-1838.

Curtis, S et al (2004). Area effects on health variation over the life-course: Analysis of the longitudinal study sample in England using new data on area of residence in childhood. *Social Science & Medicine*, 58: 57-74.

Cutchin, M (2007). The Need for the "New Health Geography" in Epidemiologic Studies of Environment and Health. *Health & Place*, 13 (3): 725–742.

Cutchin, M et al (2011). The socio-spatial neighborhood estimation method: An approach to operationalizing the neighborhood concept. *Health & Place*, 17 (5): 1113–1121.

D'Ignazio, C et al (2014). Less is More: The Role of Small Data for Governance in the 21st Century. In Pimenta, MS and Canabarro, DR (Eds.), *Governança Digital* (CH 6, 115-129). Universidade Federal Rio Grande do Sul: Porto Alegre.

Dearden, A (2012). See No Evil? Ethics in an Interventionist ICTD. *Information Technologies and International Development*, 9 (2): 1-17.

De Souza Briggs, X (2005). More Pluribus, Less Unum? The Changing Geography of Race and Opportunity. In de Souza Briggs (ed), *Geography of Opportunity:*
Race and Housing Choice in Metropolitan America. Washington, DC: Brookings Institution.

Diamond, L (2010). Liberation Technology. *Journal of Democracy*, 21 (3): 69-93.

Diez Roux, A (2001). Investigating Neighborhood and Area Effects on Health. *AJPH*, 91 (11): 1783-1789.

Diez Roux, A (2004). Estimating neighborhood health effects: the challenges of causal inference in a complex world. *Social Science & Medicine*, 58: 1953-1960.

Diez-Roux, A (2004b). The Study of Group-Level Factors in Epidemiology: Rethinking Variables, Study Designs, and Analytical Approaches. *Epidemiol Rev*, 26: 104–111.

Diez Roux, A (2007). Neighborhoods and health: where are we and where do we go from here? *Rev Epidemiol Sante Publique*. 55 (1): 13–21.

Diez Roux, A and Mair, C (2010). Neighborhoods and Health. *Ann. N.Y. Acad. Sci*., 1186: 125-145.

Dunn, CE (2007). Participatory GIS – a people's GIS? *Progress in Human Geography*, 31(5): 616–637.

Ellen, IG et al (2001). Neighborhood Effects on Health: Exploring the Links and Assessing the Evidence. *Journal of Urban Affairs*, 23 (3-34): 391-408.

Elwood, S (2006). Critical Issues in Participatory GIS: Deconstructions, Reconstructions, and New Research Directions. *Transactions in GIS*, 10 (5): 693–708.

Evans, G and Kim, P (2012). Childhood Poverty and Young Adults' Allostatic Load: The Mediating Role of Childhood Cumulative Risk Exposure. *Psychol Sci*, 23 (9): 979-83.

FRBSF (2010). Place-Based Initiatives. *Community Investments*, 22 (1).

Frumkin, H (2006). The Measure of Place. *Am J Prev Med*, 31 (6): 530-532.

Fukazawa, DD and Karnas, F (2015). Reconnecting Health and Housing: Philanthropy's New Opportunity. *Environmental Justice*, 8 (3): 86-94.

Galster, GC and Killen, SP (1995). The Geography of Metropolitan Opportunity: A Reconnaissance and Conceptual Framework. *Housing Policy Debate*, 6 (1): 7-43.

Geronimus, AT (1992). The weathering hypothesis and the health of African-American women and infants: evidence and speculations. *Ethn Dis.* 2: 207–221.

Geronimus, AT (1996). Black/White Differences in the Relationship of Maternal Age to Birthweight: A Population-Based Test of the Weathering Hypothesis. *Soc Sci. Med*, 42 (4): 589-597.

Geronimus, AT et al (2006). "Weathering" and Age Patterns of Allostatic Load Scores Among Blacks and Whites in the United States. AJPH, 96 (5): 826-833.

Geronimus, AT et al (2010). Do US Black Women Experience Stress-Related Accelerated Biological Aging? A Novel Theory and First Population-Based Test of Black-White Differences in Telomere Length. *Hum Nat*, 21: 19–38.

Gimeno, D et al (2008). When do social inequalities in C-reactive protein start? A life course perspective from conception to adulthood in the Cardiovascular Risk in Young Finns Study. *International Journal of Epidemiology*, 37: 290-298.

Goldman-Mellor, S et al (2012). Early-life stress and recurrent psychological distress over the lifecourse predict divergent cortisol reactivity patterns in adulthood. *Psychoneuroendocrinology*, 37: 1755–68.

Graham, H and Power, C (2004). Childhood disadvantage and health inequalities: a framework for policy based on lifecourse research. *Child: Care, Health & Development*, 30 (6): 671–678.

Gustafsson, P et al (2011). Socioeconomic status over the life course and allostatic load in adulthood: results from the Northern Swedish Cohort. *J Epidemiol Community Health*, 65: 986-992.

Gustafsson, PE et al (2014). Life-Course Accumulation of Neighborhood Disadvantage and Allostatic Load: Empirical Integration of Three Social Determinants of Health Frameworks. *AJPH*, 104 (5): 904-910.

Hackman, DA et al (2012). Neighborhood disadvantage and adolescent stress reactivity. doi: 10.3389/fnhum.2012.00277

Hergenrather, K et al (2009). Photovoice as Community-Based Participatory Research: A Qualitative Review. *Am J Health Behav*, 33 (6): 686-698.

Hertzman, C et al (2001). Using an interactive framework of society and lifecourse to explain self-rated health in early adulthood. *Social Science & Medicine*, 53: 1575–1585.

Hertzman, C and Power, C (2003). Health and Human Development: Understandings From Life-Course Research. Developmental Neuropsychology, 24 (2-3): 719-744.

HOPE SF (2015). http://hope-sf.org/about.php, accessed 9/30/2015.

HUD (2013a). HUD Choice Neighborhoods program site: http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/ph/cn, accessed 2/27/13.

HUD (2013b). HUD Partnership for Sustainable Communities program site: http://www.sustainablecommunities.gov/aboutUs.html, accessed 2/27/13.

HUD (2013c). HUD Sustainable Communities Regional Planning program site: http://portal.hud.gov/hudportal/HUD?src=/program_offices/sustainable_housing_communities/sustainable_communities_regional_planning_grants, accessed 2/27/13.

Hutson, MA et al (2012). Metropolitan Fragmentation and Health Disparities: Is There a Link? *Milbank Quarterly*, 99 (1): 187–207.

Jimenez, MP et al (2015). Neighborhood socioeconomic context and change in allostatic load among older Puerto Ricans: The Boston Puerto Rican health study. *Health &Place*, 33: 1–8.

Israel, BA et al (1998). Review of community-based research: assessing partnership approaches to improve public health. *Annu Rev Public Health*. 19: 173–202

Jones, M and Pebley, A (2014). Redefining Neighborhoods Using Common Destinations: Social Characteristics of Activity Spaces and Home Census Tracts Compared. *Demography*, 51: 727–752.

Jutte, DP et al (2011). Bringing Researchers and Community Developers Together to Revitalize a Public Housing Project and Improve Health. *Health Affairs*, 30 (11): 2072-2078.

Karb, RA et al (2012). Neighborhood-level stressors, social support, and diurnal patterns of cortisol: the Chicago Community Adult Health Study. *Soc Sci Med*, 75 (6): 1038–1047.

Kamel Boulos, MN et al (2011). Crowdsourcing, citizen sensing and sensor web technologies for public and environmental health surveillance and crisis management: trends, OGC standards and application examples. *International Journal of Health Geographics*, 10 (67).

Kemp, S (2011). Place, History, Memory: Thinking Time Within Place. In: Burton, L, Kemp, S, Leung, M., Matthews, S, Takeuchi, D (Eds.), *Communities, Neighborhoods, and Health: Expanding the Boundaries of Place*, Social Disparities in Health and Health Care 1, DOI 10.1007/978-1-4419-7482-2_1.

King, KE et al (2011). Neighborhood Context and Social Disparities in Cumulative Biological Risk Factors. *Psychosomatic Medicine*, 73: 572-579.

Krieger, N (1994). Epidemiology and the Web of Causation: Has Anyone Seen the Spider? *Soc Sci Med*, 39 (7): 887-903.

Krieger, N (2001). Theories for social epidemiology in the 21st century: an ecosocial perspective. *International Journal of Epidemiology*, 30 (4): 668-677.

Krieger, N (2004). Embodiment, Inequality, and Epidemiology: What are the Connections? In: Krieger, N (ed), *Embodying Inequality: Epidemiologic Perspectives*, Politics, Policy, Health, and Medicine Series. Baywood: Amityville, New York.

Krieger, N and Smith, GD (2004). "Bodies Count," and Body Counts: Social Epidemiology and Embodying Inequality. *Epidemiol Rev*, 26: 92–103.

Krieger, N (2005). Embodiment: A conceptual glossary for epidemiology. *J Epidemiol Community Health*, 59: 350-355.

Kuzawa, CW and Sweet, E (2009). Epigenetics and the Embodiment of Race: Developmental Origins of US Racial Disparities in Cardiovascular Health. *American Journal of Human Biology*, 21: 2–15.

Kwan, M (2009). From place-based to people-based exposure measures. *Social Science & Medicine*, 69: 1311–1313.

Kwan, M (2012). How GIS can help address the uncertain geographic context problem in social science research. *Annals of GIS*, 18 (4): 245–255.

Love, C et al (2010). Exploring Weathering: Effects of Lifelong Economic Environment and Maternal Age on Low Birth Weight, Small for Gestational Age, and Preterm Birth in African- American and White Women. *Am J Epidemiol*, (172): 127–134.

Lynch, J and Davey Smith, G (2005). A Life Course Approach to Chronic Disease Epidemiology. *Annu. Rev. Public Health*, 26: 1–35.

MacIntyre, S et al (2002). Place effects on health: how can we conceptualise, operationalize, and measure them? *Social Science & Medicine*, 55: 125-139.

Mair, C et al (2011). Allostatic Load in an Environmental Riskscape: The Role of Stressors and Gender. *Health and Place*, 17 (4): 978–987.

Matthews, S (2008). The Salience of Neighborhood: Some Lessons from Sociology. *Am J Prev Med*, 34 (3): 257-259.

Matthews, SA (2011). Spatial Polygamy and the Heterogeneity of Place: Studying People and Place via Egocentric Methods., in Burton, LM et al (eds), *Communities, Neighborhoods, and Health*: *Expanding the Boundaries of Place*, Social Disparities in Health and Health Care, 1 (1): 35-55.

Matthews, S and Yang, T (2013). Spatial Polygamy and Contextual Exposures (SPACEs): Promoting Activity Space Approaches in Research on Place and Health. *Am Behav Sci*, 57 (8): 1057–1081.

McEwen, B and Stellar, E (1993). Stress and the Individual: Mechanisms Leading to Disease. *Arch Intern Med*, 153: 2093-2101.

McEwen, B (1998). Stress, adaptation, and disease: allostasis and allostatic load. *Ann N Y Acad Sci*, 840: 33–44.

McEwen, B and Gianaros, P (2010). Central role of the brain in stress and adaptation: Links to socioeconomic status, health, and disease. *Ann. N.Y. Acad. Sci*., 1186: 190-222.

Mekin, SS et al (2009). Neighborhoods and Cumulative Biological Risk Profiles by Race/Ethnicity in a National Sample of U.S. Adults: NHANES III. *Ann Epidemiol*, 19 (3): 194–201.

Merlo, J (2011). Contextual Influences on the Individual Life Course: Building a Research Framework for Social Epidemiology. *Psychosocial Intervention*, 20 (1): 109-118.

Minkler, M (2000). Using Participatory Action Research to build Healthy Communities. *Public Health Reports*, 115: 191-197.

Minkler, M and Wallerstein, N (2005). Improving Health through Community Organization and Community Building: A Health Education Perspective. In: Minkler, M (ed). *Community Organizing and Community Building for Health, 2nd Edition*. New Brunswick: Rutgers University Press: p. 26-50.

Mujahid, M et al (2007). Assessing the Measurement Properties of Neighborhood Scales: From Psychometrics to Ecometrics. *Am J Epidemiol*, 165 (8): 858–867.

Nazmi, A et al (2010). Cross-sectional and longitudinal associations of neighborhood characteristics with inflammatory markers: findings from the Multi-Ethnic Study of Atherosclerosis. Health and Place, 16 (6): 1104–1112.

NCHE (2015): National Collaborative for Health Equity, Place Matters Initiative: http://nationalcollaborative.org/?q=node/37, accessed 9/30/2015.

O' Campo, P (2003). Invited Commentary: Advancing Theory and Methods for Multilevel Models of Residential Neighborhoods and Health. *Am J Epidemiol*, 157: 9–13.

Oakes, JM (2004). The (mis)estimation of neighborhood health effects: causal inference for a practicable epidemiology. *Social Science & Medicine*, 58: 1929-1952.

Pastor, M and Morello-Frosch, R (2014). Integrating Public Health And Community Development To Tackle Neighborhood Distress And Promote Well-Being. *Health Affairs*, 33 (11): 1890-1896.

Pearlin, L et al (2005). Stress, Health, and the Life Course: Some Conceptual Perspectives. *Journal of Health and Social Behavior*, 46: 205–219.

Peckins, MK et al (2012). The Longitudinal Impact of Exposure to Violence on Cortisol Reactivity in Adolescents. *J Adolesc Health*, 51 (4): 366–372.

Perchoux, C et al (2013). Conceptualization and measurement of environmental exposure in epidemiology: Accounting for activity space related to daily mobility. *Health & Place*, http://dx.doi.org/10.1016/j.healthplace.2013.01.005.

Petersen, K et al (2008). Community Socioeconomic Status is Associated with Circulating Interleukin-6 and C-Reactive Protein. *Psychosomatic Medicine*, 70: 646-652.

Petteway, R (2014a). "Towards a People's Social Epidemiology: Pursuit of a More Inclusive and Equitable Paradigm for Social Epi Research and Practice in the 21st Century". *142nd Meeting of the American Public Health Association: Healthography*, New Orleans, LA, November 15-19.

Petteway, R (2014b). “Placescapes and the Geography of Embodiment: A New Paradigm for Understanding Place and Health Across the Lifecourse”. *142nd Meeting of the American Public Health Association: Healthography*, New Orleans, LA, November 15-19.

Petteway, R (2015a). “Public Housing is Public Health: Intergenerational Photovoice Perspectives of Place, Health, and Opportunity in the “Structure(d) Struggle” among Public Housing Residents.” *143rdMeeting of the American Public Health Association: Health in All Policies,* Chicago, IL, October 31-November 4.

Petteway, R (2015b). Dissertation Chapter 1: Towards a People’s Social Epidemiology: Envisioning a More Inclusive and Equitable Future for Social Epi Research and Practice in the 21st Century.

Petteway, R (2015c). Dissertation Chapter 2: Placescapes and Public Housing: Advancing Understanding of “Place” Place-Health Research and Place-Based Health and Housing Strategies.

Pfister, DS and Godana, GD (2012). Deliberation Technology. *Journal of Public Deliberation*, 8 (1): article 10.

Phuong Do, D et al (2011). Circadian rhythm of cortisol and neighborhood characteristics in a population-based sample: The Multi-Ethnic Study of Atherosclerosis. *Health and Place*, 17: 625–632.

Picket, KE and Pearl, M (2001). Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *J Epidemiol Community Health*, 55: 111–122.

Ploubidis, G et al (2015). Life-Course Partnership Status and Biomarkers in Midlife: Evidence From the 1958 British Birth Cohort. *AJPH*, 105 (8): 1596-1603.

Pollit, R et al (2008). Cumulative life course and adult socioeconomic status and markers of inflammation in adulthood. *J Epidemiol Community Health*, 62: 484–491.

Rainham, D et al (2010). Conceptualizing the healthscape: contributions of time geography, location technologies and spatial ecology to place and health research. *Soc Sci Med*, 70 (5): 668-676.

Riva, M et al (2007). Toward the next generation of research into small area effects on health: a synthesis of multilevel investigations published since July 1998. *J Epidemiol Community Health*, 61: 853–861.

Roe, JJ et al (2013). Green Space and Stress: Evidence from Cortisol Measures in Deprived Urban Communities. *Int. J. Environ. Res. Public Health*, 10: 4086-4103.

Rudolph, KE et al (2014). The Association between Cortisol and Neighborhood Disadvantage in a U.S. Population-Based Sample of Adolescents. *Health and Place*, 25: 68–77.

Ruglis, J (2011). Mapping the biopolitics of school dropout and youth resistance. *International Journal of Qualitative Studies in Education*, 24 (5): 627-637.

Sampson, RJ et al (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28: 443-478.

Santos, SM et al (2007). Association between contextual factors and self-rated health: a systematic review of multilevel studies. *Cad. Saúde Pública*, Rio de Janeiro, 23 (11):2533-2554.

Schulz, AJ et al (2012). Associations Between Socioeconomic Status and Allostatic Load: Effects of Neighborhood Poverty and Tests of Mediating Pathways. *AJPH*, 102 (9): 1706-1714.

Schulz, AJ et al (2013). Do observed or perceived characteristics of the neighborhood environment mediate associations between neighborhood poverty and cumulative biological risk? *Health and Place*, 24: doi:10.1016/j.healthplace.2013.09.005

Seeman, T et al (2010). Socio-economic differentials in peripheral biology: Cumulative allostatic load. *Ann. N.Y. Acad. Sci.*, 1186: 223-239.

Seigel, B et al (2015). Pathways to System Change: The Design of Multisite, Cross-Sector Initiatives. Federal Reserve Bank of San Francisco, Community Development Investment Center, Working Paper 2015-03: http://www.frbsf.org/community-development

Shankoff, JP et al (2009). Neuroscience, Molecular Biology, and the Childhood Roots of Health Disparities Building a New Framework for Health Promotion and Disease Prevention. *JAMA*, 301 (21): 2252-2259.

Spielman, S and Yoo, E (2008). The spatial dimensions of neighborhood effects. *Soc Sci Med*, 68 (6): 1098 –105.

Squires, GD and Kurbin, CE (2005). Privileged Places: Race, Uneven Development and the Geography of Opportunity in Urban America. *Urban Studies*, 42 (1): 47–68.

TCE (2013). The California Endowment, Building Healthy Communities program site: http://www.calendow.org/healthycommunities/, accessed on 2/27/13.

Theall, P et al (2012). Cumulative Neighborhood Risk of Psychosocial Stress and Allostatic Load in Adolescents. *Am J Epidemiol*, 176 (Suppl): S164–S174.

Van Wart, S, Tsai, KJ and Parikh, T (2010). "Local Ground: A Paper-Based Toolkit for Documenting Local Geospatial Knowledge". *ACM Symposium on Computing for Development* (DEV), London, UK December 17-18, 2010.

Wang, CC and Burris, MA (1997). Photovoice: Concept, Methodology, and Use for Participatory Needs Assessment. *Health Education & Behavior*, 24(3): 369-387.

Wang, CC (2005). Youth Participation in Photovoice as a Strategy for Community Change. *Journal of Community Practice*, 14(1/2): 147-161.

Weden, MM et al (2008). Subjective and objective neighborhood characteristics and adult health. *Social Science & Medicine*, 66: 1256-1270

Wen, M et al (2006). Objective and perceived neighborhood environment, individual SES and psychosocial factors, and self-rated health: An analysis of older adults in Cook County, Illinois. *Social Science & Medicine*, 63: 2575–2590.

Villanueva, K et al (2012). How far do children travel from their homes? Exploring children's activity spaces in their neighborhoods. *Health &Place*, 18: 263–273.

Zenk, S et al (2011). Activity Space Environment and Dietary and Physical Activity Behaviors: A Pilot Study. *Health Place*, 17 (5): 1150-1161.

CONCLUSION

This dissertation research problematizes the lack of inclusiveness and equity within social epidemiology, explicitly challenging current research paradigms that view the people—research participants and their communities—merely as "N's" or potential "N's". By integrating social epidemiology and community-based participatory research (CBPR) at the nexus of public health and public housing, and by making use of information and communication technologies (ICTs), this dissertation research sought to democratize the research process to improve prospects for translation and local social action. The work presented here through the People's Social Epi Project (PSEP) makes conceptual and empirical contributions to social epidemiology and place-health research by developing and testing three interrelated research/practice paradigms: 1) *A People's Social Epidemiology*, 2) the *Placescape*, and 3) *Geographies of Embodiment*. Each of these paradigms connects notions of power, agency, and accountability in the context of place and health, in relation to: 1) social and political processes, policies, and practices that make, unmake, and remake place over time; 2) representations of knowledge, expertise, and evidence used to study and intervene on place; and 3) principles of equity, justice, and beneficence within public health research.

The People's Social Epi framework introduced in **Chapter 1** was developed to not only guide the design and implementation of the PSEP, but to guide the general social epidemiology field as well. The PSEP accordingly serves as an illustration of how researchers and practitioners in the field can draw from social epidemiology's rich history, and principles and frameworks within CBPR and ICTD, to better align standard research aims and approaches with values of inclusion and equity. At the core of this work is a very simple concept: social epidemiology should be something of, for, and by the people—not simply about them/us. This framework accordingly challenges social epidemiology researchers and practitioners to critically reflect on our work, how we do it, with whom, and for whom. We should aspire to create a social epidemiology that is inclusive (e.g. extent of community participation, balance of power) and equitable (e.g. outputs, benefits), actionable, more just, and quite simply, more social. Otherwise, the field risks a legacy as simply a more politically correct expression of colonialist research, within which the social inequities that create and incubate health inequities in the first place are knowingly reproduced. A People's Social Epi acknowledges and facilitates the agency of the people, respecting the value of their contributions and perspectives as constituents and co-researchers, and thereby opening the possibility that public action impact will one day no longer be secondary to journal impact ratings. And while it is true that social epidemiology science will always require a certain form of trained expertise, the presumption that such expertise is possessed by and can only be demonstrated within academia creates barriers to productive discourse and meaningful research translation for action. If we want to change prospects for equity within the social production of health, perhaps we should begin by changing prospects for equity within the social production of our science.

Chapter 2 introduced the *Placescape* concept to help improve place-health research efforts. Specifically, the Placescape enhances understanding of "place" and how to operationalize it within research by making contributions on three levels. First, the Placescape embraces and illustrates a view of place that is multinodal and within which health exposures

and opportunities are both spatially- and temporally-specific. These spatiotemporal patterns of place-based exposures are based on where (and when) people actually go—their lived placescapes—and accordingly are not bound by standard conceptions and definitions of place which pre-emptively and arbitrarily limit place. Second, the Placescape encourages intergenerational approaches to studying place and offers guidance on how to elucidate and account for potential intergenerational differences in place (e.g. spatial and temporal differences) and place experiences and perceptions. The Placescape accordingly embraces a lifecourse understanding of health, and is well-suited to guide work within settings where, and/or for which matters of, age and life-stage or generation are important considerations. Third, the Placescape is rooted in notions of agency and power as related to how place is made, unmade, and remade over time, and also in regard to how place is studied and intervened on. The Placescape accordingly encourages critical and explicit examination of the social, economic, and political practices, processes, and policies that shape or constitute "placemaking" mechanisms. Additionally, it draws attention to value of participatory approaches and methods within place-health research, emphasizing the critical import of local knowledge and lived, embodied experience of place for improving research (e.g. questions, design, implementation, analysis, dissemination), and research translation for local place-health action. As developed and "field-tested" through this dissertation work, the placescape approach serves as a model for how to "do" *A People's Social Epi* in practice, specifically within the context of place-health research. As such, the Placescape is intended as an enhancement for dominant paradigms of place-health research that are less inclusive of participant knowledge and experience, mask participant agency, and that prioritize production of science that is generalizable but not necessarily locally practicable or actionable.

Chapter 3 introduced the notion of "Geographies of Embodiment" to improve understanding of how place becomes physiologically embodied to affect health. This concept is grounded in the use of a novel cognitive mapping methodology—*X-Ray Mapping*—to elicit subjective notions of place-embodiment within place-health research. Using X-Ray Mapping and participatory GIS within a placescape approach, PSEP participants were able to illustrate both spatially and physiologically how their daily places affect their health and well-being. The intergenerational and participatory nature of the PSEP allowed for examination of spatial, physiological, and perceptual differences between adult and youth geographies of embodiment. This concept, and the methodology behind it, could prove valuable within growing efforts to uncover and understand how place affects health over the lifecourse, as well as multigenerational place-effects. Moreover, the geographies of embodiment concept can help uncover and elucidate potential "pathways of embodiment" that shape the social and spatial distribution of health opportunities and exposures within local contexts. Mapping out participant geographies of embodiment can help reveal spatial locations and social and political patterns of local built and social environments factors that influence health, and can accordingly highlight specific elements that are shaped by local/regional governance decisions, policies, practices, and processes.

***

Overall, this dissertation research afforded an integrated, multidimensional, and intergenerational understanding of place as experienced by a specific community, yielding two

new concepts—the *Placescape* and *Geographies of Embodiment*—which enhance conceptual understanding of place and inform and strengthen place-health theory development. Moreover, this dissertation presented a novel qualitative method to examine and geolocate subjective notions of place-embodiment within place-health research—*X-Ray Mapping*. Findings from the PSEP will inform the future development of quantitative place metrics that are rooted in and derived from experiences specific to the community under study, and that are place- and time-specific, thereby improving efforts to measure and quantify place/health relationships at socially and politically meaningful levels. The process and methods of the PSEP can not only serve as a model for how to critically engage residents of public housing to improve health, but also as model for how local public health entities can integrate participatory community assessment into standard practice to enhance the "social" in social epidemiology.

Findings from the PSEP are uniquely and indelibly stamped with participant voice, expertise, and narrative context—characteristics not typical of most place/health examinations. As a result, research products are not only co-created and co-owned, but locally meaningful and actionable. The nature of their data affords residents the opportunity to enhance and monitor local accountability and responsibility (e.g. the local housing authority and planning commission), and presents as an avenue to affirm their agency. Moreover, the intergenerational approach utilized in the work presented here could improve intergenerational awareness of place/health equity concerns and strengthen calls/support for local action. Additionally, because of the emphasis on participatory process in addition to participatory methods, the PSEP holds strength in its ability to help increase local capacity to identify and respond to place-related concerns. The combination of participatory methods and process can help facilitate community critical consciousness to transform a community that *experiences* place into a community that actively *changes* and improves place—something that place/health research to date has generally failed to do. Accordingly, the PSEP illustrates how *A People's Social Epi* framework, if incorporated within standard public health practice, could improve efforts to monitor local social determinants of health and ensure equity of voice in local health equity agendas.

Immediate implications of and applications for project findings relate most directly to identified public housing issues that residents can share with local and regional housing authorities. Depending on what participants decide, potential action targets might also include the city council, the local planning and zoning commission, the local school board, and the health department. Project findings also served as a community health assessment for a housing community that had never completed one—in a city that has never completed a community health assessment and currently does not monitor community health and equity indicators. Future considerations for expanding the work of this project include the possible development of a formal project report describing related place-health concerns, a community research/action guide using the methods employed here as a standard template, and the development of community-specific place and health equity action organizing sites (physical and web). It is also expected that project findings, with continued participant involvement, will be used to inform the development of a quantitative survey to assess health and equity in their larger communities, and that participant placescape data will be examined in relation to existing objective place data on health and social determinants.

At present, the PSEP process and methods are being transformed into a public health pipeline program for high school students—the Institute for Health Equity and Action Research Training, *iHEART*—the core of which is a series of health-equity-oriented STEM courses rooted in critical pedagogy and project-based learning. Plans are underway to implement iHEART at PSEP youth participants' high school (my former high school) beginning Fall 2016. Discussions are also underway with local health and planning departments to incorporate PSEP (and future iHEART) process and findings into standard local practice. A goal of this dissertation work was, through the PSEP, to examine the utility of participatory social epidemiology as an avenue towards participatory urban governance. Thus continuing to build PSEP process/methods into local practice beyond iHEART will continue to be important. Fundamental to this work will be continued reflection and evaluation of the role and value of ICTs, like *Local Ground*, in creating and sustaining permanent mechanisms for integrating community voices into local decisions/processes that make, remake, and shape their places and impact their health.

FOR THE PEOPLE OF MARKET SQUARE AND PROJECTS EVERYWHERE

BEYOND THE ARC

Calibrated through Calibri,
though it seems absurd,
these words mark the arc
of a dream preferred
over,
        chain-link fences
        and project windows,
wiped like tears from memories, live…
        97, those basketball courts, shots.
Playgrounds riddled with
        vividness. Witnesses.
Of the torn and razed,
born and raised
and risking freedom.
        We worked our whole lives
        for this, for real…
From steel, cities,
        but 21 is not made in a mill,
        or sweet 16s; ill.
Gritty, distilled pretty.
Grimey ones grind,
        on grounds, outlines.
        The chalk, the paint, the block—
        post up and make the most of,
Ropes...
In the tangles of a triple consciousness' hopes.
High…
        and the audacity is dope,
        our capacity for growth, stoked.
Polymers forged from steel
        will.
Be still. Outlie until
this arc becomes a period.

BIBLIOGRAPHY

Carter, S et al (1996). Reasonable Doubt. Priority Records.

Carter, S et al (1997). In My Lifetime Vol. 1. Roc-A-Fella; Def Jam.

Cruz, A et al (1995). Doe or Die. EMI.

Cruz, A et al (2001). 9 Lives. Motown.

Cruz, A et al (2002). Aziatic. Motown.

Erickson, D (2009). *The Housing Policy Revolution: Networks and Neighborhoods*.

Freire, P (1970). *Pedagogy of the Oppressed*. New York: The Continuum International Publishing Group, 2006.

Freire, P (1973). *Education for Critical Consciousness*. New York: Seabury Press.

Freire, P (1998). Pedagogy of Freedom. Rowman and Littlefield.

Goetz, E (2013). *New Deal Ruins: Race, Economic Justice, and Public Housing Policy*. Ithaca, NY: Cornell University Press

Harvey, D (1973). *Social Justice and the City*. University of Georgia Press.

Heron, GS et al (1970). Small Talk at 125th and Lenox. Flying Dutchman.

Heron, GS et al (1998). Ghetto Style. Camden.

hooks,b (1994). *Teaching to Transgress: Education as the Practice of Freedom*. Routledge.

Hutson, MA et al (2012). Metropolitan Fragmentation and Health Disparities: Is There a Link? *Milbank Quarterly*, 99 (1): 187–207.

Jones, N et al (1994). Illmatic. Columbia.

Jones, N et al (1996). It Was Written. Columbia.

Jones, N et al (1999). I Am. Columbia.

Jones, N et al (2002). The Lost Tapes. Ill Will; Columbia.

Johnson, A and Muchita, K et al (1999). Murda Muzik. Loud Records.

Krieger, N (2013). *Epidemiology and the People's Health*. OUP USA.

Kweli, T and Cottrell, T et al (2000). Train of Thought. Rawkus Records.

Kweli, T et al (2002). Quality. Rawkus Records.

Phillips, J, Styles, D, and Jacobs, S et al (1998). Money, Power, and Respect. Bad Boy.

Sampson, R (2012). *The Great American City: Chicago and the Enduring Neighborhood Effect*. University of Chicago Press.

Schwartz, A (2010). Housing Policy in the United States, 2nd edition. Routledge.

Shakur, T et al (1995). Me Against the World. Interscope Records.

Sharkey, P (2013). *Stuck in Place: Urban Neighborhoods and the End of Progress Toward Racial Equality*. University of Chicago Press.

Simone, N et al (1991). The Blues. RCA.

Simone, N (2006). The Very Best of Nina Simone. Sony BMG.

Wallace, C et al (1997). Life After Death. Bad Boy.