"The farther you were from the trauma center, the more likely you were to die"

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Voices of Health Equity in Chicago
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CENTER FOR COMMUNITY HEALTH EQUITY

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Voices of Health Equity in Chicago
Our *Voices of Health Equity* project collects the stories of people who have made health equity a central concern in their work. We are interviewing academics, clinicians, public health advocates, community organizers, and others to better understand how different disciplines and professions could work together to eliminate avoidable, unnecessary and unfair health disparities.

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Telephone interview by Fernando De Maio and Jessica Ibrahim Puri

Background: Dr. Crandall's *American Journal of Public Health* article "Trauma deserts: distance from a trauma center, transport times, and mortality from gunshot wounds in Chicago" (2013) is a very important piece of the Chicago health equity research literature. We talked with Dr. Crandall about this work, the concept of trauma deserts, and the relationship between research and activism.

Fernando: Could you briefly describe the work that you do and why it matters for understanding health equity?

Marie: Ok, just to put it in a broader context, I'm a trauma surgeon, and surgery, when I got into the field, so in the early 90's when I was trying to decide what I wanted to do with my medical career, was not in most places thought of as a public health or public policy related field. That has changed quite a bit. There are a lot more people doing surgery and doing public health now than there were 20 years ago. But, I still wanted to be a surgeon. So I was trying to balance my social justice bent with surgery and ended up saying, well I can always be an activist and do surgery at the same time. Which was a little naïve because surgery is very time consuming! But when I started to do surgery, I saw how many global health and population health issues affected my patients and it affected everything from the risks that got them either in care or ill in the first place to their ultimate outcomes after surgery. And I thought you know what, I'm sometimes the first physician that this person has seen in fifty years. I'm as much of a primary care physician as my colleagues who went into primary care. And so when I was looking at different areas in surgery, the one that resonated most with me was trauma because I'm from Detroit. I'm from Michigan. I grew up basically surrounded by high risk youth. I understand the patient population very well because of my background. I empathize with it. So it was a natural connection with the patient base and I also really like the immediacy of saving people's lives. So then- and again I was always interested in social justice and was always very left wing. When I was doing my surgical training, while we pulled off some pretty spectacular saves, it felt like we were doing our patients a disservice because we'd save somebody but we wouldn't send them out with the skills to prevent it from happening again. And we might say, "wear seatbelts" or "don't get shot" but that was really inadequate. If we were doing that in any other field of medicine, it would be malpractice.

Fernando: Right

Marie: Right? Think about it. Sending somebody out after a heart attack, without beta blockers, aspirin, follow up, would be malpractice. And yet we did that for our trauma patients all the time. So, that then led me to say I really like the clinical practice of trauma surgery, but I needed more and at that time, the only place that was funding a masters in public health- which is really the path that I thought would be helpful in terms of injury prevention- and that kind of thing, was University of Washington, and I was fortunate enough to secure that spot as a Critical Care Fellow. And that was the place that taught me both rigidly evidence-based practice with critical care and trauma and to be very exacting about that. But also the skills that I subsequently had to use in the last fifteen years for research was really, really invaluable. I learned about prevention but I also realized that contributing to the greater medical

knowledge, by doing research and by continuing to evolve in that field, is one of the best ways to make an impact.

Fernando: Was there a particular source of the interest in social justice and health equity? Was it an article that you read or a lecture that you heard…

Marie: Not at all. It was basically who I was as a person before medicine. Medicine was a natural marriage of my interest in science and my interest in, again, reaching a community. It was basically like population-based and patient-based science. And I liked that better than doing science research which I discovered when I did basic science research.

Fernando: And where did you do your undergrad?

Marie: Berkeley

Fernando: Berkeley, alright. So along the way, you had opportunities to explore these topics or did you feel that they were kind of blocked off to you?

Marie: Uhm, going to Berkeley, was- I knew of the University of California, Berkeley before I went there, even though I was from Michigan. Part of the reason is because I was looking at- back in the day when they had college catalogues- I was looking at the best schools in the nation for science and engineering and genetics and biology, and UC Berkeley was at the top along with one or two other schools. It always was at the top and a top public school, but I also had read about it because just two years before, in 1984, students had taken over Sproul Hall, the administrative building and really shut down the campus to demand that UC Regents divest from apartheid era South Africa. And once again being from Michigan and being from a very distressed area, I was intimately aware of problems like poverty and social ills of early pregnancy and high mortality rates due to substance abuse and trauma. So it was a very natural field for me to be interested. Berkeley was a perfect choice because it helped not only in great education and a great foundation, but also I was surrounded by people who thought like I did and knew so much about topics that I probably would otherwise not have learned.

Then I went to the UCLA/Charles R Drew Medical School program where I did my third and fourth year rotations at Martin Luther King Hospital in South Central. And that also was very community focused. The idea was to provide care for the underserved patients of South Central Los Angeles. And I guess I would say it sort of sounds like I ended up in these places, but they're deliberate choices, because of my interest in social justice and my interest in disparities. And then when I went to Rush and Cook County. Residency employs a match program, so I did have some control of these places that I selected to apply.

And you know most of the places that I applied were places that had a large trauma center and had the opportunity to take care of disadvantaged patients.

Fernando: Sure. See as a sociologist, I'm really interested not just in people's biography, but in how they interact with institutions. The choices that we make about where we work and where we study and how we take advantage of those institutions, maybe leverage them and change them over time; it is one of the recurring themes that we see in these interviews. And I think that would be really valuable for our students to see – the decisions that we make along our way in our careers and how they influence the work that we do.

Marie: Yeah and you know it's interesting because, like the whole trauma surgery thing, I don't know how much of that was directly thought out. That may have been- it may have been a more organic process but I mean I don't you have to be Dr. Phil to figure out why I would be attracted to trauma, having grown up in Detroit, Michigan and seeing people just overcome by trauma.

Fernando: Let's transition to the *American Journal of Public Health* piece. What was your overall goal in publishing the trauma desert work?

Marie: So I've gotten at the point of my career where I'm starting to do a fair number of lectures and being asked to be a visiting professor, so I've had to really look back and figure out what that narrative was- like how that happened, because you know you're busy and you're doing less research and I think I've narrowed it down to really two things. One is that I had been doing some public health research as a trauma surgeon for a few years and had been awarded a Robert Wood Johnson Clinical faculty grant that was a career development grant and I was looking at racial disparities and socioeconomic disparities and trauma care and basically what we were finding was that everywhere we looked, there were disparities. It was kind of a black box and I wasn't sure what created it. I wanted to know more about what created these disparities.

Around the same time, a medical student at another institution approached me because he had seen some of the research I had done and said “hey, are you interested in the golden hour of trauma?” That the time it takes to get to the hospital in an urban trauma center is different. And I said, well I don't know. I mean it certainly been dogma, but I didn’t actually know the data. So, we did some background work and I reflected upon it and I realized that when I had been a resident at Rush and Cook County, Cook County was certainly at the time in a less savory area than it is now. There's been a lot of development and much safer- arguably- than it was you know, 20 years ago. And the city as a whole is safer, but what I found is that at Cook County, because people were getting shot or stabbed right across the street from the hospital or down the street from the hospital, we would have these spectacular saves, you know. Someone would be shot in the heart and they're come in and we'd open their chest and stitch the heart and you know, high fives all around, it's great. To save a life, send them home in a

couple of days. But at Northwestern where I was faculty- and I thought I would come back to Chicago and it'd be very similar, but what I was finding is that patient transport times to Northwestern hospital for deadly injuries such as gunshot wounds were much longer for the most part, because of the longer distances from our patients' neighborhoods to the hospital.

So we mapped it out and we realized that the vast majority of our penetrating trauma came from the South East side of the city. That transport times were a lot higher than what I had seen at Cook County and the spectacular saves were not happening. We did save people, but like a crazy save where you just don't expect- that just never happened. When people had a 25 minute transport time, they came in dead. And I thought, "You know what? That's terrible. I want to study that" and I had a kid come in around that same time that I was working on this racial disparities work for Robert Wood Johnson Foundation, I had a kid come in shot, right across the street from the University of Chicago, and that alerted me to the community protests that were happening about the lack of participation in the trauma systems at the University of Chicago.

And I really- you know I didn't really think about it. They hadn't been a trauma center at any time in the time I had been in Chicago and I thought, you know, if they're not committed to it, they probably wouldn't do a good job. They do many other things for the community. Like many people, I thought it probably doesn't matter if they have a trauma center or not. But then I decided to look at it. Not because of the University of Chicago but mostly because I had this grant, I had some time, I had somebody who was hired as a research geo coder and I just wondered, you know, is there a difference? And there had just been a fairly comprehensive paper that looked at multiple trauma centers across the country that showed that as long as you're, you know, within an hour from the center, that the people who were transported with the fastest time and the longest times there was no difference in outcomes. And I thought you know what, that doesn't really seem right to me and when I looked at the subset analysis, most of the patients were injured by blunt mechanisms such as car crashes. For the small number of patients that were injured by penetrating mechanisms, the vast majority, like almost 70% were transported within that first quartile- the fastest quartile. And I didn't think that answered our question, so we decided to look at it in Chicago.

The first thing we did was look at patients who had low blood pressure and low blood pressure is bad- means that you lost a lot of blood. So patients with low blood pressure. If you had low blood pressure and some sort of injury to your torso, your chest, if you had a longer transport time, were you more likely to die? So if you believed that paper-that multicenter study, you wouldn't be more likely to die, but theirs was a mixed study with other institutions. So we actually looked at more patients with respect to penetrating thoracic trauma- anyone we'd looked at before. We looked at five years of data and we found that if it took you longer to get to a trauma center, you were up to like 15 times more likely to die. And, it was a direct correlation with transport times. If your blood pressure was normal, then transport times didn't matter. But, in those patients, if you had a normal blood pressure, you probably weren't injured severely enough that that transport time made a difference. But if you were very severely injured, then it did. So then what we did is we said, well that's kind of persuasive, but we do have

something with gunshot wounds. And so we looked at- we decided to see if location influenced transport time. And the reason why we needed to study that, both in terms of location and transport times is because the EMTs in particular argued that they could get to any trauma center within the city in 20 minutes. That that was just a standard. And, so therefore, transport times wouldn't make a difference, because this is an organized, seasoned trauma system. And we didn't know if that was true or not. That was the assertion. And, there was quite a bit of resistance to me even looking at that. Both internally and externally. And I just said, well we have to look.

We looked at 11 years of data of gunshot wounds which unfortunately was 12,000 patients, and we found that even controlling for age, gender, intent, because suicidal intent has a much higher case fatality rate than other types of intent- and injury severity, blood pressure in the field, that kind of thing. If you control for those things that are the predictors of death, that simply being shot more than 5 miles away from a trauma center would result in both a longer transport time and a higher mortality and that simply being more than 5 miles away from a trauma center increased your likelihood of dying by 23%, controlling for everything else. All of the things being equal. Just being further away makes you more likely to die.

And it was at the time by far the most rigorous analysis of transport times and geography and mortality for a fairly distressed population. What we were also able to do was to map out a 5 mile radius around all the trauma centers in Chicago- look at the crude mortality for each of those regions, and what we found was the crude mortality was higher as well. And places that were outside of that 5 mile radius, even though penetrating trauma seriously over represents the African-Americans in Chicago in particular and young men, and the uninsured. So that would be the general population of people who were shot in the first place. But if you were shot at more than 5 miles outside of a trauma center, that area was even more likely to be lower socioeconomic status, higher proportion African-American, higher proportion head-of-house hold, more socioeconomically stressed. And that was surprising. Surprising and not surprising I guess. It was surprising that within a relatively homogenous population, people were getting shot in Chicago, that geographically, we could show a difference- show that this area was even more distressed, it was truly a trauma desert. They're definitely the ones who don't have access to not only hospital trauma centers, but if you superimpose food deserts, in certain populations.

Fernando: That was going to be my next question because the comparison with food deserts is so striking. Were you trying to make a link with that and kind of piggyback on the discussion in Chicago around food deserts?

Marie: So we did and in fact that was why we called it "trauma desert". We asked those questions. And it's not exactly superimposable, because there are places that are within 5 miles of a trauma center that are still quite distressed food deserts.

Fernando: It was in many ways a great connection to make right? Because it is an image that the wider population and policy makers can understand and visualize…

Marie: Yeah that's what we felt as well. We felt it was important to make that connection and show that it's not just for us- this is a marker for other kind of societal and community ills in a given area. So yes, the next question, since we've pointed out this disparity, it appears to make a difference in terms of mortality for gunshot wounds victims, is there a way to fix it? Then about 2 years later, we published a study that looked, that compared transport time clusters- like what is the average transport time for a given area of the city. And we compared pediatric and adult gunshot wounds. We were just looking at transport times, not outcomes, because it's really hard to compare between peds and adults in injury severity and all that stuff. But we did- what we found is that just by the addition of a level one trauma center, on the South East side, which is of course the University of Chicago, which is the pediatric level one trauma center, that on the map for adults, there are huge numbers of patients who were experiencing transport times greater than 30 minutes. And that was the South side of the city. Whereas in pediatric gunshot wounds, those transport time disparities had gone away by the addition of one trauma center.

So that was when I started being approached by policy makers and law makers to testify about my research. And I will say community activists were very interested in our work. However, I knew there was insufficient data to advocate for a particular position because I don't think- we didn't have the data to say if there was a trauma center on the south side of Chicago, things would've been better. I didn't have the power to say that. But what I could say is there are transport time disparities and you could fix that issue by the placement of another trauma center on the south east side of Chicago. And that was, you know, it's hard to know because it's not exactly the most transparent process of progress or decision-making but I feel like it was persuasive to some leadership somewhere. I don't think that University of Chicago was pushed into becoming a trauma center, but ultimately they did decide to participate in the trauma system. I don't think they were pushed into it at all, but I do think that they were persuaded in a way they had not been before by the legitimacy of our data and that may have helped persuade some leadership in terms of, do we think this would be beneficial for us, for our relationship with the community and in terms of patient care and Chicago.

Fernando: Sure. You know every year we host a *Health Disparities and Social Justice* conference throughout DePaul's MPH program and this past summer we had Alex Goldenberg from STOP as one of the panelists in a session on community activism and health equity. He spoke about social mobilization and protest for the trauma center. For me it raises really interesting questions of the spectrum between research, advocacy and activism and the degree to which those things can intertwine and the degree to which they are separate. And it sounds like you're also grappling with that as well. Grappling with what the evidence base tells you and how you make the leap from research and data collection to social change and policy making.

Marie: Yeah, that's well put. So I think I was pretty careful to always say that we're just identifying disparities to show association and not causation and through those, things will be better if there was a trauma center on the south side of Chicago, and these are our data. It also probably helps that I wasn't advocating for a particular position when I started this. I didn't start doing research because I wanted there to be a trauma center on the south side of Chicago.

Fernando: Let's go on to the third section of questions which is kind of broader about your perceptions of health equity over all. So thinking very broadly, how would you define community health? What makes a healthy community?

Marie: Healthy communities have adequate access to education, fresh, clean water, food, job opportunities and health care.

Fernando: And as you look around Chicago then, do you think we're doing the things that nurture healthy communities, or should we as a society be doing different things?

Marie: I think that my answer to that is- forgive me for hedging- I don't know that I can say absolutely yes or no. I will say that in my estimation that Chicago was on a pretty good track for many communities in the city in the early 2000s. I think that the Daley administration helped promote health in areas of the city that were otherwise ignored and yet I do think that some communities were prioritized over others in the sense of gentrification, development, property selling, etc. Some have argued that there was an enormous disparity and that many communities were completely ignored during that time. I don't think that Emmanuel's administration made any progress in that and I think that the election of Governor Rauner, much worse. So it's a mixed picture. I think the general improvement in the economy of many parts of the city, helped the city to some degree, but there remains tremendous wealth disparities within the city and an increasing wealth gap not just in Chicago but across the nation. So, from the social justice perspective, I think things got worse. From the public health perspective, I think some things got better.

Fernando: It is complex. If we look at data on life expectancy or infant mortality, I think we can say that every community has experienced some improvement over the past 25 years, but the gaps are increasing as I drive from my office in Lincoln Park to visit my colleagues at Rush, the community loses about 15 years of life expectancy and infant mortality is three times as high. One thing that I'm kind of comforted by is the *Healthy Chicago 2.0* campaign which actually set equity targets for the city. I'm a little bit optimistic that we might see some progress in social justice and health, but it's a real challenge.

Marie: I'm not a natural optimist. That's not a natural thing for me [laughs]. I don't know that I can say I'm optimistic about it, but who knows?

Fernando: Thinking about students and people that are just beginning to engage with questions of social justice and health equity, would you have any general advice? Things that they should look for or try to do in their careers to make an impact?

Marie: I mean it's certainly more gratifying and fulfilling to study things that resonate with you personally. So anything with which you have former experience or something that you're already passionate about, is great topic for research. And in terms of research principle, don't have the answer before you start. I think it helps to have a healthy skepticism of your own results. Analyze, reanalyze, and ensure that you're really being true to the data.

Fernando: Dr. Crandall this has been a really inspiring talk for us.

Marie: It's interesting how much traction this project has given me and I've been so humbled and gratified by the changes that have happened in Chicago trauma system, not because, like I said, at any point did I think or hope that the University of Chicago would commit to becoming a trauma center, like it didn't even occur to me, but the idea that perhaps some of my research caused people to think differently about their surrounding communities and perhaps investing something that is more important to the community itself within which they work, I think is just very humbling.

Fernando: Thank you very much for your time.