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Designing with Dignity: Social determinants of health and design research

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Abstract: The human residential city environment is the site of our future health as a race, and how the inequities in this environment play out across cultures and countries will be the focus of our next century of design. Many in the urban environment do not have access to adequate housing, or security in their housing situation. The emotional stress of housing insecurity leads to harsh effects on health such as high blood pressure and diabetes. (Bennet et. al, 2009*)* Design research and evidence-based design are both significant processes in an increasingly urbanized vision of future design. (Furjan, 2007) A novel course, *Designing with Dignity* examines how design and health research informs problem-solving for such underserved communities. The process created a new informed design process based on social determinants of health, which drive forward the consideration of the residential condition health and access, in the urban environment. The course is particularly concerned with underserved groups who may be suffering poor health outcomes due to their lack of access to safe and healthy living spaces. *This article will examine how design research, trans-disciplinary design and human-centered concerns are applied to novel thinking about access to a home for underserved groups in service to future design and health speculation. Context and existing processes in both health and design will be considered to posit new frameworks in multi-disciplinary collaboration to drive informed health design in the built environment for the future.*

Keywords: Human-centered, Social Determinants of Health, Design Thinking, Responsive Environments, Visualization

1. Introduction

The next century will bring novel and innovative ways to access living spaces, especially as human populations become increasingly urbanized. The residential city environment is the site of our future health, and how inequities in this environment play out across cultures and countries will be the

focus of our next century of design. The Environmental Protection Agency (EPA) promotes the concept of "Smart Growth" for planners and designers to meet the emerging challenges for cities. The goal is to strengthen fair and equitable housing decisions and create an environment where those at risk can stay in their homes. (US EPA, 2006) Additionally, gentrification is contributing to the housing insecurity of many urban dwellers, and the EPA recommends addressing gentrification through the involvement of stakeholders in the design of their communities. (US EPA, 2006)

Humans are home minded and territorial in their expressions of their spaces, and the difference in how we interpret "house" and the feeling of "home" is an example of the adaptive capabilities of the human animal, related to our comfort within the surrounding environment. (Allen, 2015) Witold Rybczynski in his seminal book on the history of the concept of home, discusses comfort at length, as a construct it is personal. However there are some universalities to comfort, one of which is security. (Rybczynski, 1986) Humans have sought shelter since the beginning of their history on earth. Our ability to obtain the safety and security of such shelter is part of our internal construct what makes us human; Allen refers to it as "nest building" and compares us to primates in this respect. He goes on to identify the association between housing insecurity and health problems among many different groups including family, seniors, and children. (Allen, 2015)

The amplification of the housing market due to urbanization have contributed, and will continue to contribute, to a rising wave of housing deficiencies and issues that are creating problems for lower-income families in keeping their homes. These challenges include not enough affordable units for lower income renters; units with serious physical problems; and rising rates of lower income renters in the face of these shortages. Beyond Health Care: New Directions to a Healthier America examined the link between these housing inequities and infection, disease and problematic childhood development. ("Beyond Health Care," 2009) The emotional stress of housing insecurity leads to severe effects on health such as high blood pressure and diabetes. (Bennet et. al, 2009) The link between our rapid urbanizing and the deteriorating health among the least advantaged of our population is the defining problem for designers in the next century. This article is an examination of design research, trans-disciplinary design and human-centered strategies to understand the components of an emerging framework for innovation in this sector. The goal of this work is to mitigate the lack of access for underserved groups to secure affordable housing in urban conditions through inter-professional human centered work. Stable living environments for all is the design challenge for the next century, our "*Design for Next*."

2. Housing Design, Health, and Change

2.1 Health, housing and access in the 21st-century city

To understand the appropriate design and health "levers" that we might press to change the current state of housing insecurity in our country and the attendant health issues associated with this sector, it is necessary to examine the pressure points of this spreading problem. Federal policies, including financing policies, have had a major impact on the availability of affordable housing in our modern cities and the attendant health of urban dwellers. These policies in the past have driven segregation and created suburban sprawl. High housing costs can create financial stressors for families through reducing their pre-tax income and making it difficult to afford necessities. By no means is safe and affordable housing a guarantee for many Americans. (Yates & Milligan, 2007) The risk of chronic disease is associated with housing-related stress and lack of access to preventative treatments due to financial issues arising from the overwhelming expense of housing for many of these individuals. (Pollack & Lynch, 2009) Stahre et al studied the correlation between housing insecurity and negative

health outcomes. Almost 30% of respondents expressed that they experience high stress due to perceived inabilities to maintain their housing situation. Those reporting housing insecurity were also more likely to delay seeking medical attention for health issues due to cost. Thus, access to housing has an effect on health, and it impedes the ability to assist lower income populations in preventive health therapies that would forestall chronic health issues such as cancer, heart disease, and diabetes. (Stahre, VanEenwyk, Siegel, & Njai, 2015) Perception of risk is also linked to the ability to modify behavior, in addition to socio-demographic factors (e.g., socioeconomic position, race/ethnicity) which can play a role as well and influence whether or not people successfully adopt healthy behaviors.(Abrams et al., 2012) As we will see in the example below, the ability to adopt healthy behavior is often out of the control of the group most susceptible to these health risks, because perceived lack of access compounds the challenges in accessing health care, or preventive health measures.

It has been shown that specific housing interventions can yield positive health outcomes.(Jacobs et al., 2010) The fact that public health and housing sectors do not often collaborate to solve these issues contributes to this problem. Part of the challenge lies in the inadequacy of the language for change written, graphic, and verbal. Often housing is assessed only regarding inadequacies, or the basest requirements; this leaves very little room for the exploration of possibilities. (Haines et al., 2013) To create change in this area, we must examine emerging developments in both public health and design. We must change the system through novel thinking at many levels including the diverse methods espoused by human-centered design, and informed design.

2.2 Design Research and Health for the future: synthesizing evolving processes

> "Design in architecture, then, like that of microenvironments in biology, is not just a question of code or process but a question of performance...Complex feedback relations with the environment must be front ended and generative. Code is no longer everything, context matters." (Furján, 2007)

A novel framework for the health-based consideration of housing security must cross disciplinary bounds, this knowledge is by necessity so complex, one discipline cannot approach the problem alone. (O'Campo, 2012) To understand how design might contribute to a knowledge driven, health-based solution for those without housing, examining the emerging language of our built environment is important. In the world of design, instrumentality, envelope, performance, and generative design, refer to the increasing mechanization of our environments both through the tools used to design them, and the types of tools within them. Generative design refers to the ability of our design tools to create new geometries based on existing mathematical and geometric operations. Instrumentality refers to the relative use and usefulness of a tool, and the envelope is the skin or ability of a building to enclose. (Kolarevic & Klinger, 2008) In addition, the language of human-centered design is used to explore the needs of the inhabitants of spaces and to integrate research into design. Here, we deploy empathy, and the Deep Dive, to understand the needs of the user and design directly based on their experience and needs. (Cross, 2011; Owen, 2008)

Also known as evidence-based design, informed design is a method for rigorously engaging with research data to drive design. It can include behavioral evidence, or quantitative research including climactic information, designer experience, or user comfort. (Chong, Brandt, & Martin, 2010)

> "To interpret the problems and possibilities of impending changes, science thinking must be solicited and heard. To explore and conceptualize ways to proceed, design thinking must receive equal attention."(Owen, 2008)

Charles Owen compares the ways different disciplines think and process information at length. As we face ever more complex problems, it becomes radically more important to deploy information based design thinking and visualization in service to problem-solving. (Owen, 2008) Central to the consideration of language and tools is the possibility of cross-pollinating information-driven solutions, with creative thought. Information that drives design and responds to user needs and their environments is key to motivating this process. This idea of responsive information and responsive visualization through deploying a wide variety of design tactics and health-based information puts the power for change squarely in the hands of those who need it the most.

3. Framework in Action

3.1 Process in motion: a team case study

The criteria via which health, design thinking, and evidence-based design can be connected to create innovative housing insecurity solutions is further developed through an examination of a case study into the use of human-centered design to inform the an intervention. The goal being to reduce inequalities in housing access. The case study describes the experience of a team of design and public health students enrolled in an inter-disciplinary course. Charged with identifying place-based solutions to housing insecurity, this team focused specifically on single mothers living in the shelter system. The case study is described as a first-person narrative from the perspective of one of the students in the group. The group of students served as participant observers in a discussion group for residents of a temporary women's shelter in Philadelphia.

Here the student describes their initial contact and discussions with the women they wanted to learn more about:

> "We … were welcomed by the other student volunteers into a chilly back room that had been made inviting with hand-painted murals and worn-in sofas. We waited for a dozen exhausted women in their mid-20s-to-30s to trickle in after dropping off their children to the playroom down the hall. Some reclined into the cushions and sprawled their legs, while others perched timidly and kept a straight posture.
>
> The conversation began with talking about smartphones, as all women in the circle were tapping away at their screens. One woman said her children beg her for tablets to play games on, and she hates having to tell them "no." Another woman said she loves taking photos and reminiscing later on. The conversation then moved to worries about child development; one daughter suffers from "night terrors," seizures, and delayed speech. Her mother did not know where to get help for these problems or what insurance covers. Another mother was concerned about her son's shyness and risk of bullying. The women talked about day-care programs, and their toddlers are coming home with new bruises and marks every day."

Next, the student describes their findings in talking with the women:

> "These single mothers self-identified as "homeless." Constantly relocating between parents' homes, partners' homes, and shelters, the women struggled with daily inconveniences such as lugging around belongings in a suitcase ("I need a better bag", one woman said) and paying for bus fare to get their children across the city for school ("too much paperwork" to get free bus rides). Some spoke of drug addiction and abuse that their children had been exposed to when staying in the homes of the mothers' parents or male partners. All women agreed that that being in the shelter feels safer than where they had been a few days or a few weeks ago, and that feeling safer is the first step of taking control to break the cycle of housing

instability for their children. One day, one of the women said, "I want a house with a white picket fence and a yard, the whole deal."

The student then describes what they learned:

> "Our group came to the conclusion that permanence and stability are not synonymous; a temporary home may be a more stable environment than a permanent home. This seemed to be proven true by the women's shelter itself – a cramped space in the middle of a busy neighbourhood, with different women and children constantly coming and going. The glass on the front door had been shattered and never repaired, the walls were thin, and the floor was cold. While the place did not feel like a traditional home by any definition, the women seemed to feel "at home" here and described the shelter as the first step to a better life for themselves and their children. The women's comfort or discomfort in a given environment was related to a sense of ownership, how in-control the women feel they are of the physical environment in which they sleep, eat, and bathe, and raise their children. For example, the woman who described her dream of a house with a "white picket fence" was perhaps describing the stable home life and sense of ownership she wants to achieve for her family, rather than describing simply the type of fence and house she imagines."

Here follows a student description of the solution reached after an ideation and synthesis of what they learned through their interaction with the mothers:

> "to give women control over their daily instability and the lives of their children, they need confidence and skills – they need a sense of control that can only come as a result of education or training. We came to believe that training women to budget money, plan career and education goals, and manage health care, could allow single mothers to develop a sense of constant control over their daily lives and long-term goals.
>
> We found it helpful to envision a space designed to meet these goals. We imagined a space for single mothers (after they left the shelter) to meet and work together – to discuss progress on career goals, and to have a discussion circle much like the one we experienced. Because we were considering both design and health simultaneously, and because we had real women and their needs in mind, we prioritized finding a solution that could realistically be implemented and make an immediate impact, rather than flaunting our design skills and inventing a sophisticated solution. We knew that there were real women who wanted to change their children's lives but felt they did not have the power to, and so we felt the pressure and time sensitivity of their reality."

3.2 Process examined:

The findings of the student's group is consistent with the earlier observation that the difference in how we interpret "house" and the feeling of "home" is an example of the adaptive capabilities of humans. (Allen 2015). As stated before, close connection and understanding of the people for whom you are designing helps to refine the essential questions. We have established here that space is uniquely connected to health—and a responsive visualization of how that might affect the users creates opportunities that were not apparent previously for the student group. Perception of space may be as important as the physical space for the users this emerges in how they self-describe their situations. Students practice and learn the usefulness of collecting qualitative and quantitative data to inform the design process from the very beginning. Here, these teams including public health and

design students, result in a more creative use of data to inform interventions that transform space, perception, and behavior to improve health.

The students ideated a prototypical gallery and creative space that could be responsive to the mothers' needs. The idea is expressed in an illustration that also tracks the experiences the group had in affinitizing their findings of the mothers they spoke to. They consistently deployed graphics imbued with informational validity. This is a flexible framework for them to continue the ideation exercise-leading towards a user-centered and data driven solution. This group engaged closely with users and created a novel and responsive solution based on direct experience with the needs they heard. The process is diagrammed below; as the students created a system that was responsive in its approach to visualizing the problem and solutions they also found their ideas about what would serve the users' needs shifting. Through the framework of *"Identify, Immerse, Interpret, Ideate, Implement"* (IDEO, 2011): from their design thinking readings, students worked to consider how a solution might be responsive, and useful.
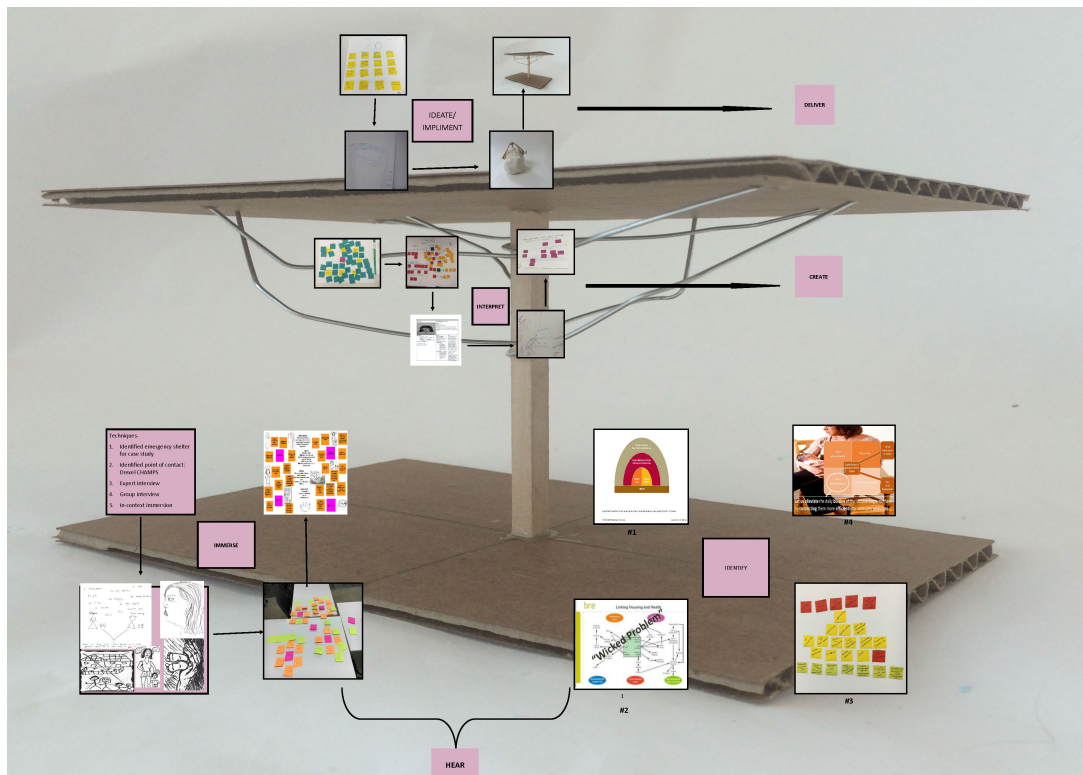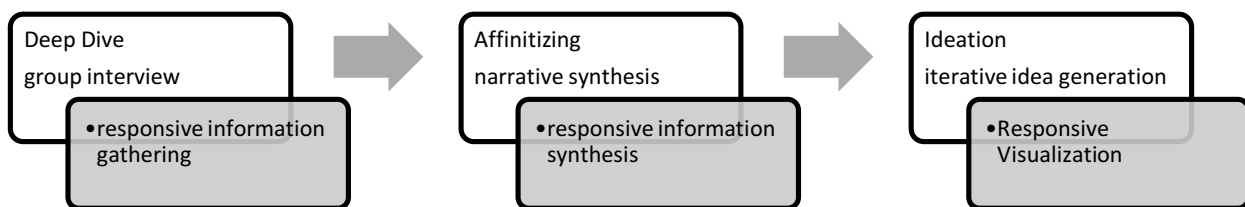
Table 1. Student process diagram

Figure 1.   Team final image: students created a responsive graphic that was expressive of their ideation and process

4. Conclusion

4.1 Levers and Change: visualizing and uncovering health and design research:

> "THE REMOVAL OF THE PUMP HANDLE WAS A HISTORICAL turning point, marked the end of London's most explosive outbreak….and in the years and decades that follow, a thousand changes ripple out from that simple act." (Johnson, 2007)

Public health is by definition community engaged, but the individual human level may sometimes be missing because of the aggregate types of data informing the health disciplines. Public health practitioners are masters at creating patterns of data, and reading new patterns within that data. In this way, data can sometimes become uncoupled from the human experience of those being studied. The design thinking process reconnects specific and individual human needs to the understanding of these aggregate health concerns. These two frameworks, when combined, create mutual benefit for each other. Design thinking refines the creation of the appropriate intervention. The human-centered actions that don't just tell people how they should behave but allows people to make choices.

In Stephen Johnson's The Ghost Map, he details the birth of modern epidemiology through charting the journey and theories of John Snow during the cholera outbreak in London in 1854. This story winds through many disease etiology theories of the time and reveals that despite inaccurate disease theories, a visual mapping process led to an accurate conclusion about the cause of the epidemic. Data were synthesized and aggregated to make them accessible to experts and common folk. (Johnson, 2007) In the ghost map, both complex and simple diagrammatic techniques were deployed to express the relationship between public space and disease. We can trace this type of visual information coding back to The Nolli Map of Rome. This 1748 map is one of the first visual tools to "see" a chosen condition within the urban environment. It is considered a tool used to understand the relationship between the public and private in the eternal city, and an apt example of visual innovation for this outlet. ("The Nolli Map and Urban Theory," 2006) These two examples are responsive historical frameworks, we ask the question what current visual frameworks can move the issues examined here for the future of such inter-professional engagement? The methods that came form The Nolli Map still drive urban design visualization and the ghost map is a seminal work of epidemiology. Are there newer more inter-professional active frameworks that can be created in this context for future design, to address the challenge of housing insecurity? How do such innovations as GIS, Generative Design and Building Information Modeling lead to a new type of Nolli map that will help us know which "levers" to pull and which questions to ask.

4.2 Spatial Visualization, Responsive Frameworks

Design for the next century will assuredly focus, in part, on housing and access. This process of examining and thinking creatively allows us to design an intervention or "lever" to create change. In the method posited here, the synthesis of design and health information and research, design representation and design thinking come together with health information to create new pathways to change. This paper has examined the "levers" for change in this health-centered, urban and human-centered problem for the future of our cities. As we have seen, this challenge requires a multi-disciplinary investigation that will occur quantitatively, qualitatively, graphically and in new processes of design. The idea that a flexible framework for user-centered and data-driven solutions can emerge is examined. As we surveyed the initial work in one student process driven by user needs and information, the need for such solutions to be both responsive and user driven is clearly a priority. The novel concepts of responsive visualization and responsive information provide an

emerging novel framework for how we might approach this challenge and will define the "Next of Design."

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