Research Paper

Detroit's lines of desire: Footpaths and vacant land in the Motor City

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GRAPHICAL ABSTRACT

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Informal footpaths known as desire lines crisscross the city of Detroit and are visible from space. Despite their prevalence, especially in postindustrial cities, no comprehensive study of desire lines exists for any urban area. How extensive are these lines, how do people use them, and how are they changing over time? What is their potential to reinvigorate the fabric of neighborhoods and communities? We conducted a spatiotemporal analysis of desire lines in Detroit by combining remote sensing and spatial analysis with physical audits and interviews. Our results show that Detroit has more than 5680 of these footpaths, totaling more than 150 miles (> 240 km). Transportation planners may value desire lines for their efficiency, reducing travel time and distance. Urban theorists and community activists, however, view desire lines as a form of resistance and reclamation of space for a public poorly served by urban institutions. The results of our mixed-methods approach demonstrate how these two perspectives can co-exist. Desire lines are creative attempts to expand urban possibilities, enhance efficiency, and reaffirm agency in increasingly regulated cities. Desire lines in Detroit, however, are rapidly disappearing. From 2010 to 2016, the Lower Eastside region of the city witnessed a 70 percent reduction in the total length of these lines. Our analysis shows that this correlates with changes in land ownership, management practices, and population dynamics. The loss of desire lines exposes the limits of informal practices and indicates the need for connections to broader relationships of power and governance. Creative engagements with the state can formalize lines and help residents realize their rights to the city.

1. Introduction

"Humans are animals and like all animals we leave tracks as we walk: signs of passage made in snow, sand, mud, grass, dew, earth or moss… We easily forget that we are track-makers, though, because most of our journeys now occur on asphalt and concrete – and these are not substances easily impressed… Many regions still have their old ways, *connecting place to place, leading over passages or round mountains, to church or chapel, river, or sea…"* (Macfarlane, 2012, 13)

Centuries ago, Michigan's roads began as a network of Native American trails, worn deep by foot travel and located near riverways and streams (Pohl & Brown, 1997). These trails connected villages to each other and led to important hunting and fishing grounds. Many

Fig. 1. Michigan and Native American trails.

were segments of longer trails that connected the Atlantic seaboard to the midwestern plains. These trails pushed westward, leading fur traders, missionaries, and settlers into the Michigan frontier and beyond. Too narrow for wagons, these trails (12–18 in. wide) enabled travel in single file, sometimes by horse but usually by foot (Pohl & Brown, 1997).

Virtually all the principle highways that now radiate from Detroit were once such paths, weaving through forest and plain. The western portion of the Great Trail (or "Great Path") stretching from Fort Pitt (today known as Pittsburgh) up to Fort Detroit is now U.S. Route 24 (Fig. 1). Created by Algonquian and Iroquoia prior to the arrival of colonial settlers from Europe, the Great Trail was a network of footpaths that connected to the Overland Trail in the American West. A hunting and fishing trail stretching from Sault Ste. Marie in Eastern Canada to Green Bay, Wisconsin, and through Michigan's Upper Peninsula is now U.S. Route 2 and Michigan Route 35 (Pohl & Brown, 1997).

Anyone traveling through Detroit today will be struck by the abundance of informal footpaths, especially in neighborhoods with large tracts of vacant and abandoned land. Created by pedestrians, these footpaths crisscross the entire city. Often called "desire lines," these paths are also referred to as wishing trails, goat paths, and social paths (Moor, 2016). Visible from space, the presence of Detroit's desire lines raises more questions than answers. How did they get there? Who uses them? How are they perceived? Are we seeing a return of "the old ways," as MacFarlane (2012) suggests?

To answer these questions, we used a mixed-methods approach that included remote sensing, physical site audits, spatial and network analysis, and qualitative interviews. We investigated desire lines citywide through participatory in-depth work on Detroit's Lower Eastside with local nonprofits and residents. Designed to investigate urban socioecological systems at multiple scales, the methodology is transportable to other cities, adaptable to other elements of the urban fabric, and flexible enough to allow new methodological techniques to be

integrated.

We found an extensive network of desire lines in the city, totaling over one hundred and fifty miles (< 240 km). However, the most striking and unexpected result emerged from our time series analysis (2010–2016) in the city's Lower Eastside: desire lines are rapidly being lost in this dynamic landscape. The total length of desire lines in the neighborhood decreased by 70 percent in just six years. We found that two different processes are taking place on parcels that lost desire lines: an increase in management on some parcels, and abandonment and overgrowth on others. This loss of desire lines could negatively impact residents' mobility and accessibility, since our network analysis found that desire lines can reduce travel distances and increase the number of accessible destinations. Indeed, we found that residents who used desire lines largely did so for convenience. However, some participants gave other reasons for using them, while those who did not use them cited safety and aesthetic concerns.

Creators of desire lines are struggling for their rights to the city – the right to make and use urban spaces according to their desires. From the perspective of efficiency, desire lines enhance rights to move quickly through the urban fabric. From another perspective, they represent creative contestations of attempts to control and order urban space. In both viewpoints, these footpaths lines enhance possibilities for creative urban futures and increase agency in the city. However, their widespread loss and residents' safety concerns due to vacant, abandoned, and overgrown space highlight the limits of informal practices. Indeed, we argue for connection with state processes and power relationships so that selected desire lines can be maintained. Such connections reveal the productive tensions between power and resistance in the city, adding nuance to binary formulations of bottom-up and top-down management regimes of urban space. The formalization of desire lines symbolizes a realization of desire and acknowledgment of struggles for the right to city.

Like Detroit, legacy or shrinking cities across the United States (Dewar & Thomas, 2015; Schilling & Logan, 2008), Europe (Haase, Haase, & Rink, 2014), and Japan (Oda, Rupprecht, Tsuchiya, & McGreevy, 2018) are seeking solutions to vacancy and mobility challenges resulting from declining populations and fiscal challenges. Although desire lines exist in cities worldwide, they are especially prevalent in urban areas with large swathes of vacant and abandoned land. Creative collaborations between planners and local communities to preserve desire lines offer great potential.

2. Desire lines in the urban fabric

Desire lines are underexplored and undertheorized elements of the urban fabric, with minimal empirical research to date. Of the research that does exist, we have identified two rather different perspectives. First, transportation planners emphasize their efficiency and convenience. These emphases are also evident in blog posts and web discussion boards about desire lines. The second perspective associates desire lines with resistance to the rationalization and control of urban space. We briefly summarize both perspectives here.

2.1. Desire lines as efficiency

The 1955 Chicago Area Transportation Study (CATS) was the first English-language research publication in which desire lines appeared prominently. One of the first comprehensive transportation planning studies in the U.S. and among the most massive, CATS promoted a decidedly rationalist approach to urban mobility by plotting the shortest routes between origin and destination and assuming reduced travel time to be the priority of all urban residents (Throgmorton & Eckstein, 2000). Priority placed on "efficiency" has dominated studies and forecasts of travel behavior ever since (Corcoran, Chhetri, & Stimson, 2009; Nakanishi, Matsuo, & Black, 2013; Throgmorton & Eckstein, 2000).

Many bloggers promote desire lines for their perceived ability to reduce travel distance (Doctor Disruption, 2013; Diane Harvey, 2011; Roy, 2013). For the blogger Doctor Disruption, desire lines reflect an "important preference of users, based on more efficient patterns of behavior" (Doctor Disruption, 2013). On the social media aggregator and discussion website Reddit, a "subreddit" on desire lines has more than 80,000 subscribers. Although largely a forum to post pictures, the comments that appear also laud desire lines for the efficiency they enable. These comments often champion pedestrians for creating desire lines as a response to poor urban planning. This resonates with arguments that architects, planners, and other designers of the urban fabric should first observe how people move through the built environment (by creating desire lines, for example), before formalizing them as paved infrastructure, similar to how Native American footpaths were turned into roads and interstates. As one Reddit user writes, "I think when parks and school campuses are designed they should leave out walkways, except for one alongside roads and building entrances, until natural desire paths are formed, then pave over them" ("It's Official," 2017).

Luckert (2012, 326) photographed, mapped, and videoed twenty desire lines in one square kilometer in Edmonton, Canada. One of the most comprehensive studies to date, she viewed the informal footpaths as "physical, visible, tangible representations of the way we navigate our city – the way we take what is built for us, and build upon it." She argued that, although they serve as convenient shortcuts, they are also created for reasons of curiosity and exploration.

2.2. Desire lines as resistance

For others, desire lines are sites and practices of urban resistance. In an edited volume by Murray, Shepherd, and Hall (2007), desire lines are a metaphor for the lived rather than engineered space of post-apartheid South Africa. Contributors highlight everyday practices and representations that disrupt attempts to control urban denizens through spatial ordering. As Hall argues, "The social construction of 'official' space has invariably been a figuration of the grid… desire lines violate the order of the grid, and are invariably forms of resistance" (Hall, 2007, 289). Similarly, Hales (2009) uses desire lines to symbolically represent the contestation of public space in Chicago. For him, desire lines represent a fluid and flexible spatial practice and a form of resistance to hegemonic regulation and order.

For Smith and Walters (2017), desire lines subvert an ordering of urban space designed to prioritize commercialism. Drawing on De Certeau's theorization (1984) of walking the city as an everyday practice, and Deleuze and Guattari's (1987) notion of the productive nature of desire, they argue that desire lines open up possibilities beyond the constructed order. They are "the manifestation of a common will, and serve to inscribe that will on space that is dominated by contemporary logics of capital and neoliberal governance" (Smith and Walters, 2017, 12). In shorter, more abstract pieces by Tiessen (2007a, 2007b), desire lines symbolize the co-constitutive relationships between people and urban environments and serve to disrupt rather than increase the speed and efficiency of modernist cities.

2.3. Desire lines as a right to the city

Both efficiency and resistance perspectives are expressions of the *right to the city* (Lefebvre, 1996). The right to the city is the right to reimagine and remake our cities and ourselves (Harvey, 2003; Mitchell, 2003; Purcell, 2014). Following Harvey, "The right to the city is not merely a right to what already exists, but a right to change it after our heart's desire" (2003, 939). Conversely, the control of urban space by the state and by capital restricts this right (Lefebvre, 1996).

In this context, desire lines as resistance are residents reacting against increasingly privatized, rationalized, and surveilled public space and defensive architecture (Davis, 2007; Mitchell, 2003; Smith &

Walters, 2017). But forging these lines in response to infrastructural neglect and the claiming of space by capital can also be seen as a claiming of the right to urban efficiency. Desire lines shorten travel distances and times.

Both perspectives represent a struggle for the right to make and use the city in accord with residents' desires. They encourage us to consider how desire lines open possibilities for new creative urban futures and the reintroduction of human agency into the highly regulated modern city. However, these theorizations lack empirical grounds, which our research begins to address.

## 3. Vacancy, mobility, and desire lines in Detroit

Once a thriving city of 1.9 million people, Detroit is now home to just over 670,000 residents (U.S. Census Bureau, 2016). In 2015 the city's population was similar to that of 1915 (Reese, Eckert, Sands, & Vojnovic, 2017). Between 1970 and 2010, the city lost over half of its jobs (Reese et al., 2017). The decline of the auto and manufacturing industries, along with suburbanization, led to this exodus of residents, jobs, and revenue, culminating in the city declaring bankruptcy in 2013 (Eisinger, 2014; Gallagher, 2010).

Walking through neighborhoods in Detroit, one can witness entire streets without houses. In others, occupancy is low, with homes abandoned due to fire or neglect. Detroit has an estimated twenty-three square miles (59.6 sq. km) of "vacant land" (Detroit Future City, 2016) – roughly equivalent to the entire island of Manhattan, which has a population of over eight million. By vacant land, we refer to parcels without structures on them, excluding parcels with abandoned structures, parks, cemeteries, and related forms of land use. Exactly how much vacant land there is and who is responsible for it is difficult to say (Akers, 2013; Davidson, 2012; Kinder, 2016). Regardless of the exact amount, high levels of vacancy have a profound effect on the city's urban fabric and its residents. In Detroit, the issue of vacant land is inherently racialized. Vacancy and abandonment are especially pronounced in heavily African-American neighborhoods and poor neighborhoods (Fig. 2) (Safransky, 2018).

There are competing formal and informal claims for land designated as vacant (Safransky, 2016). Some community groups have resisted the large-scale transfer of vacant and abandoned land to a particular individual or organization, fearing land grabs. One notable case is Hantz Farms in the Lower Eastside of Detroit. Originally proposed as the world's largest urban farm, intense resistance from the local community resulted in scaling back the farm to 144 acres that are now planted with hardwood trees (Safransky, 2016; Vitiello & Wolf-Powers, 2014). But the company still has right of first refusal to buy all city-owned lots in a radius of one mile (1.6 km), which could lead to its potential ownership of over seven percent of the entire city. The development agreement limits the land use to agriculture or forestry for only a limited period. Property speculation is a common concern (Akers, 2013), and many Detroiters are fighting evictions and foreclosures to stay in their homes (Detroit Eviction Defense, 2018; Wilson, 2017).

The Hantz Farm case is just one example of competing visions of how to redevelop and revitalize Detroit (Fraser, 2018). Some view vacant land as an opportunity to expand open space and shrink the city. Kinder (2016, 46) finds that "instead of embracing Detroit's 'free spaces' as sites of autonomy and liberation, most residents wanted to live in neighborhoods with functioning housing markets and conventional lifestyles." In the four neighborhoods she studied, residents felt that vacant properties made them feel less secure. To avoid scrappers and property speculators, residents would often make vacant houses look occupied, and some would even act as informal real estate agents to attract potential buyers (Kinder, 2016). In addition to safety concerns, Herbert (2018, 12) found that residents who had lost their neighbors were "desperately seeking community and neighborly presence."

Vacancy, abandonment, and population loss are fundamentally
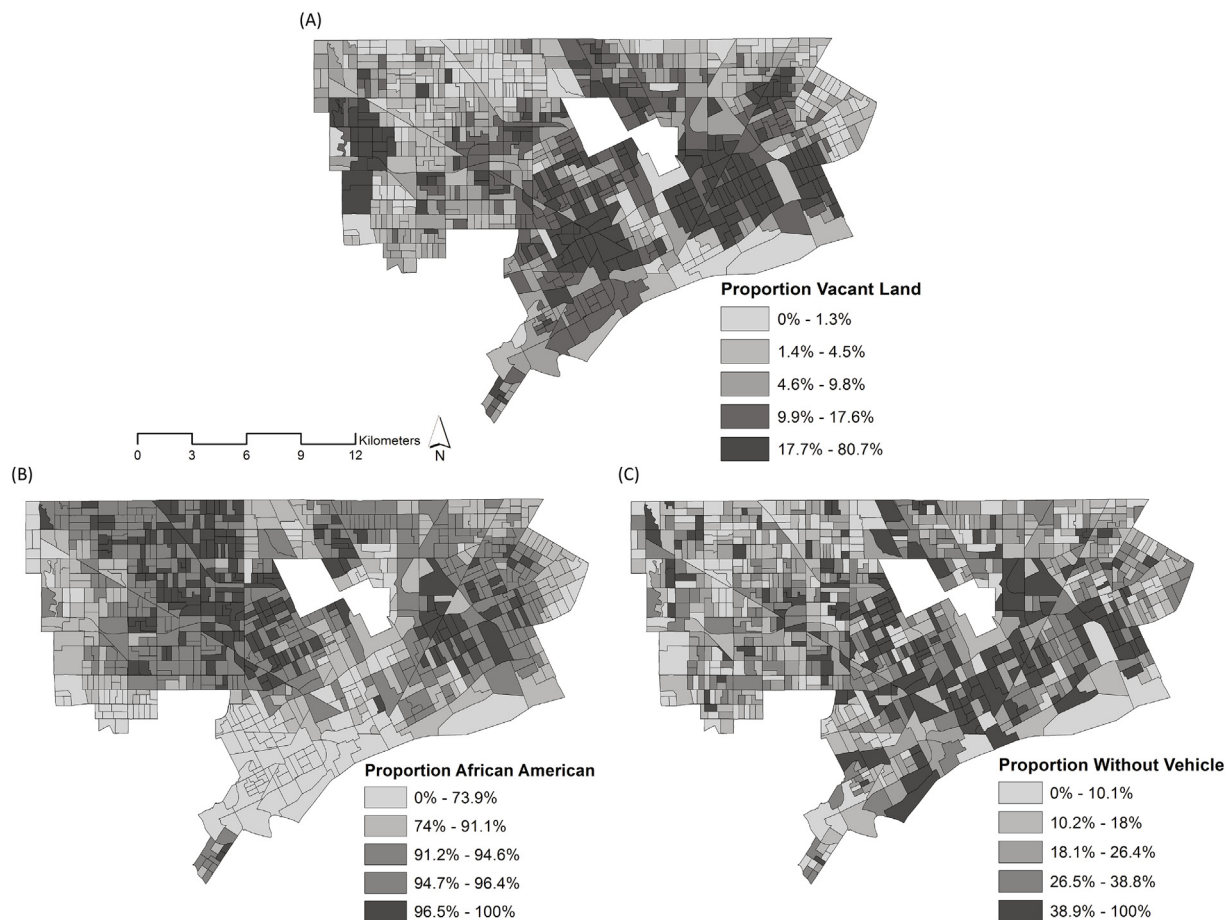
Fig. 2. A–C. Key indicators in Detroit: Vacant land, ethnicity, and vehicle ownership. Sources: Vacant land (Detroit Data Collaborative, 2009), Ethnicity (U.S. Census 2010), Vehicle access (U.S. Census, 2016).

intertwined with the health of Detroit's infrastructure. Detroiters face severe mobility and accessibility challenges. They have to travel farther to access employment opportunities and shop for food and other necessities (Detroit Food Policy Council, 2012; Ledoux and Vojnovic, 2013; Lee, Vojnovic, & Grady, 2017). About 25 percent of the city's households do not have access to a vehicle (Fig. 2) (U.S. Census Bureau, 2016). The public transportation system is woefully overextended and underdeveloped (Detroit Food Policy Council, 2012; Fraser, 2017; Lee, Vojnovic, & Grady, 2017). Due to this lack of access to automobiles and reliable public transportation, residents of the Motor City walk more than their suburban counterparts (Lee et al., 2017).

In response to these mobility challenges, Detroiters have forged new routes from home to school, church, and business. These desire lines are visible from space and are particularly dense in the Lower Eastside (Fig. 3), where the issues of vacancy, poverty, and lack of mobility are among the most acute in the entire city.

3.1. Study area: the lower eastside of Detroit

Detroit holds a place in the history of radical geography. Bunge's Fitzgerald: A Geography of a Revolution (1971) changed human geography as a discipline by actively connecting with the communities we study and the social, economic, and ecological dynamics within them (Barnes & Heynen, 2011). The School Decentralization Study conducted by the Detroit Geographical Expedition and Institute was a seminal milestone in the use of geographical methods for social justice (Horvath, 1971).

Inspired by Bunge, our research includes detailed study of the Lower Eastside of Detroit in partnership with the Lower Eastside Action Plan

(LEAP), a community-driven initiative designed to improve quality of life and community for its residents (Fig. 4). Collaboration with LEAP participants and staff drove the participatory nature of this research. The LEAP area covers approximately fifteen square miles (38.9 sq. km). With one of the highest vacancy rates in Detroit, over 90 percent of LEAP-area residents are African American. The LEAP area is composed of eight neighborhoods, two of which (Indian Village and East Riverside) have higher median household incomes and percentage of white residents than the other six (Fig. 5).

4. Mixed methods

To uncover the geographical patterns and uses of Detroit's desire lines, we deployed a four-step methodology, composed of remote sensing, physical audits and behavioral observations, network and spatial analyses, and qualitative interviews (Fig. 6). This mixed-methods research design builds on previous urban work that combines spatial and social science approaches (Jiang, 2003; Newell et al., 2013; Wolch et al., 2010) and enables a multiscalar understanding of both physical landscapes (e.g., parcel, neighborhood, LEAP area, city) and social dynamics (e.g., neighborhood demographics, resident perceptions and motivations). It is therefore applicable for a wide range of investigations of urban socioecological systems in other cities and contexts.

4.1. Remote sensing

Google Earth has lower costs and technical barriers than traditional remote sensing tools (Lefer et al., 2008), consonant with our goal of creating a methodology replicable by community groups and local

Fig. 3. Desire line (a.k.a. footpath) in the Lower Eastside of Detroit.

Fig. 4. Study area. Note: Highland Park and Hamtramck are separate municipalities within Detroit's boundaries.

NGOs; in particular, Google Earth is freely available and works on any operating system. We used both commercial imagery purchased and made available by Google through Google Earth, as well as Google's proprietary Street View imagery, which researchers have used to identify street trees, vacant lots, blighted housing, recreational facilities, stores, churches, parking lots, and other features of the built environment (Berland & Lange, 2017; Clarke, Ailshire, Melendez, Bader, & Morenoff, 2010; Rundle, Bader, Richards, Neckerman, & Teitler, 2011). Google Earth's imagery is also longitudinal, enabling us to map desire lines over time as well as space.

We mapped desire lines for the entire city for 2010 and a portion of it (LEAP area) for 2016. This provided a six-year (2010–2016) time series for the LEAP area. The aerial and street view imagery dates we
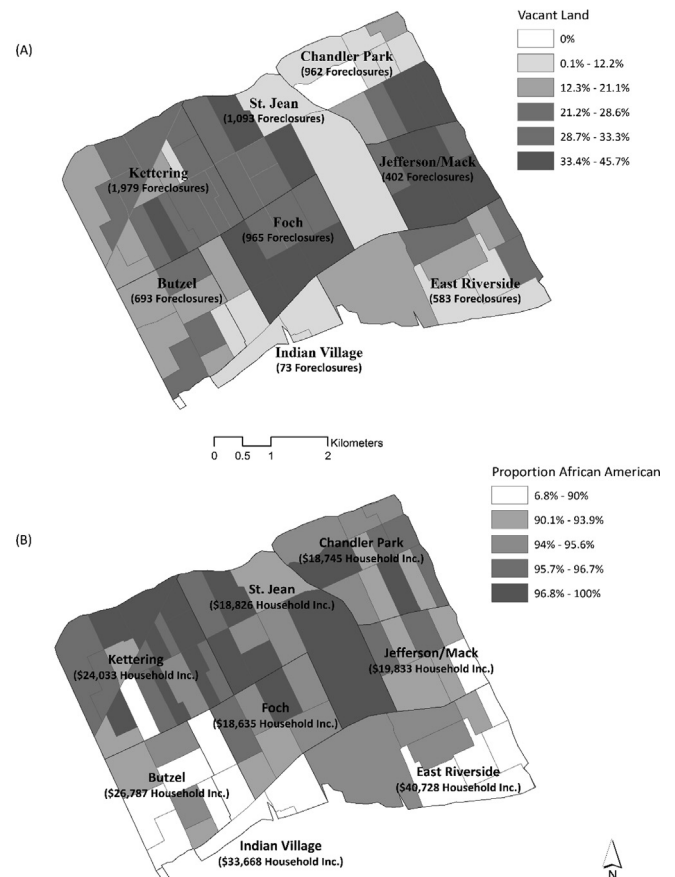

Fig. 5. A–B. Sociodemographics of the Lower Eastside of Detroit. Sources: Vacant land (Detroit Data Collaborative, 2009), Foreclosures based on 2002–2013 archival data (Data Driven Detroit, 2015), Proportion African-American and Median Household Income (U.S. Census, 2010).

used were: 2010 time period (Aerial: May 9, 2010, Street View: September–October 2011); 2016 time period (Aerial: April 4, 2016, Street View: 2013–2015). As reference data, we used parcel (Sanborn, 2010) and census block (United States Census Bureau, 2010) layers. Using Google Earth's line drawing tool in Google Earth Pro (also free to users after registration), we digitized the desire lines parcel by parcel for every census block in the city. All lines were digitized on a flat plane at an eye altitude of 700–850 feet (213–259 m) We then classified the lines based on usage levels: "heavy use" meant that the ground was bare throughout the entire path; "medium use" meant that there was flattened vegetation and bare ground visible through most of the path; and "lightly used" meant lines with flattened vegetation but no bare ground. To ensure accuracy, we performed an inter-rater reliability evaluation by having each digitizer independently assess thirty randomly sampled blocks and comparing the results.

4.2. Physical site audits and behavioral observations

To catalogue the conditions of the desire lines and document their use, we conducted physical audits and behavioral observations in the LEAP study area. Through random sampling, we selected forty-six census blocks for physical audits and behavioral observations. The audit instrument, adapted from a detailed instrument developed for documenting alleyways in Los Angeles (Wolch et al., 2010), is composed of the following elements: 1) dominant land uses on each side of the block; 2) "signs of life"; 3) presence of litter; and 4) attractiveness (i.e., aesthetic ranking). We conducted the physical audits and behavioral observations in 2013 on varying days of the week and times (daytime only) to capture the full range of activities taking place on blocks with
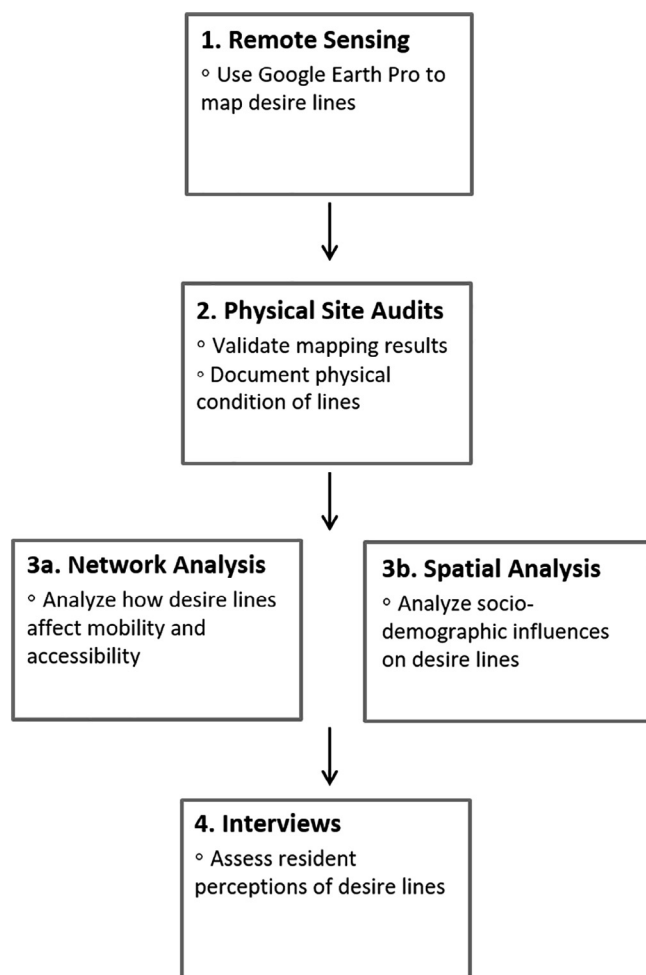
1. Remote Sensing
∘ Use Google Earth Pro to map desire lines

↓

2. Physical Site Audits
∘ Validate mapping results
∘ Document physical condition of lines

↓

3a. Network Analysis
∘ Analyze how desire lines affect mobility and accessibility

3b. Spatial Analysis
∘ Analyze socio-demographic influences on desire lines

↓

4. Interviews
∘ Assess resident perceptions of desire lines

Fig. 6. Mixed-methods approach used in study.

desire lines.

4.2.1. Network analysis

To create a comprehensive transportation infrastructure network for the LEAP area, we combined the digitized footpaths (2010) with data on roads and alleys (Tele Atlas, 2006). We used the Extend Line tool to account for gaps between the ends of the footpaths and the beginning of the roads and alleys (for example, sidewalks that link the lines with the streets). We created two network datasets: 1) roads, alleys, and footpaths; and 2) roads and alleys. In each transportation network, we also added businesses (Esri, 2012) and bus stops (Data Driven Detroit, 2014). For the 2010–2016 analysis, we built a 2016 transportation network for the LEAP area. Data sources for this updated network included 2016 digitized footpaths, roads (SEMCOG, 2017), businesses (Esri, 2017), and bus stops (Data Driven Detroit, 2017). An updated dataset of alleys for Detroit was unfortunately not available.

For the 2010 networks, we conducted three forms of network analysis: route analysis (shortest distance between two points), closest facility, and service area. For the route analysis, we selected a randomized sample of 131 points as origins (from 1,313 total businesses and bus stops) and added a quarter-mile (400 m) buffer. We randomly selected one point as the destination from the businesses and stops intersecting each buffer. We tabulated route length for these 131 origin–destination pairs and for four full transects of the LEAP area (2010, 2016): horizontal, vertical, diagonal east-to-west, and diagonal west-to-east. We then used this data to compare travel distance between the two networks. We conducted closest facility analysis on the full network to understand the proportion of distance traveled on roads versus alleys

and footpaths between seven businesses with a high density of lines converging on them and their surrounding households. We placed households (incidents) on the perimeter of a quarter-mile (400 m) buffer around each facility in north, northeast, east, southeast, south, southwest, west, and northwest directions. The route taken from each facility to incident was tabulated by distance traveled on roads, alleys, and/or footpaths. We used service area analysis to compare the number of accessible destinations originating from a business or bus stop on the full network versus the roads-only network. We chose ten businesses or bus stops that showed a convergence of lines around them and tabulated the number of points of interest intersecting each service area for both networks.

4.2.2. Spatial analysis

To predict to the density (length in kilometers per square kilometer of area) of desire lines at the census block group level (2010, citywide), we fitted a general linear model using Poisson distribution with log-link built on variables identified as important in previous research on desire lines, mobility, and environmental justice. Fundamentally, desire lines require open space for their creation and endurance (Throgmorton & Eckstein, 2000), so we included the percentage of each block group that was vacant. Research on Detroit has found that lower-income households are more dependent upon alternative modes of transportation (Lee et al., 2017), so we used median household income as a proxy for access to automobiles. Finally, environmental justice research has consistently documented that lower-income minority neighborhoods consistently have less access to green space (Boone, Buckley, Grove, & Sister, 2009; Heckert, 2013; Sister, Wolch, & Wilson, 2010), so we included the percent of African-American, Hispanic, and Asian-American residents in each block group. We checked the model for multicollinearity and influential observations.

4.3. Qualitative interviews

We identified interviewees and conducted nineteen semistructured in-person interviews (Rubin & Rubin, 2012) with assistance from our community partner. We conducted fifteen interviews in the summer of 2013 and four in spring 2017. We showed interviewees pictures of desire lines and then posed questions about them: Do you walk on them? Why do you use them? How do you feel about them? Are they integral components of Detroit's urban fabric? Interview data were recorded, transcribed, analyzed, and coded using ATLAS.ti (2018) software.

5. Results

Our census of the city of Detroit (2010) identified 5680 desire lines (Fig. 7). This represents 157 linear miles (233 km) of footpaths, a distance that would stretch from Washington, D.C., to Philadelphia and beyond. This is a conservative estimate, as we excluded car tracks across vacant lots, which also serve as informal footpaths. About half (53 percent) of these desire lines were lightly used, with the remaining either medium (25 percent) or heavy (22 percent) use.

How does the density of desire lines relate to neighborhood demographic characteristics? Based on our 2010 citywide regression model (Table 1), we found that the percentage of vacant land per census block group was a positive predictor of increased density of desire lines. The percentage of minority residents was also a positive predictor of the density of desire lines. Increased median household income was associated with a decrease in the density of desire lines. The regression model was highly significant ($p < 0.001$). In short, we found that, in 2010, as expected, vacancy and presence of minorities were strong positive predictors of the density of desire lines citywide in a census block group, while increasing median household incomes led to lower densities of desire lines.

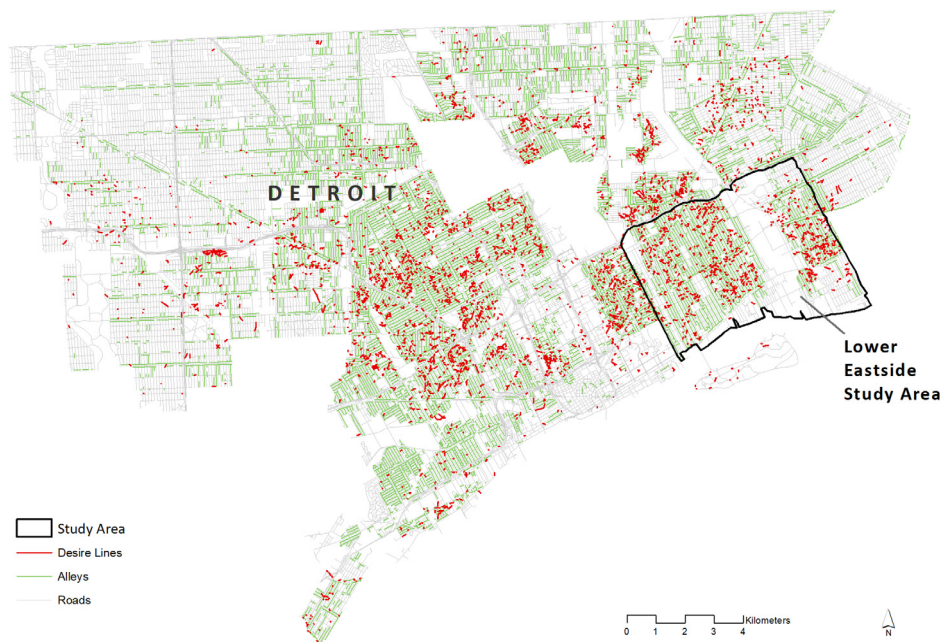We had expected this abundance of desire lines in the city. But one

Fig. 7. Desire lines in the city of Detroit, 2010.

Table 1
Influence of sociodemographic factors on the density of desire lines in Detroit, 2010.

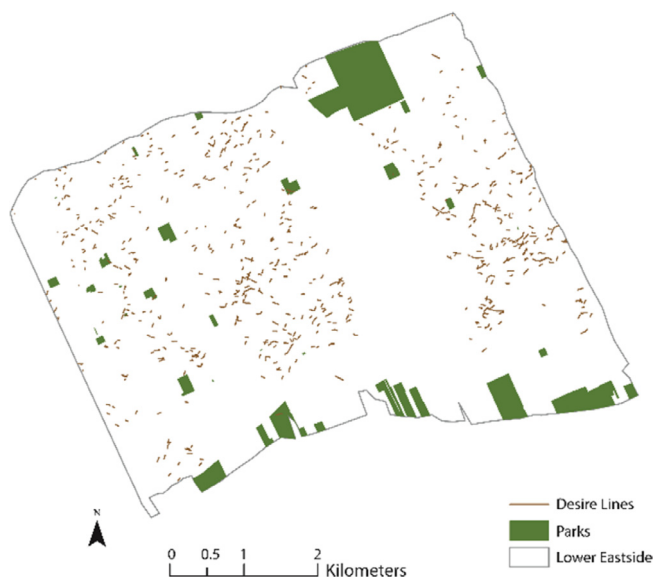| Variable	Beta
Intercept	4.1248
Median HHI	−0.00003[*]
Percent Vacant	0.001[*]
Percent Black	0.963[*]
Percent Asian	0.141[**]
Percent Hispanic	43.86[*]
LR Chi-Square	67573.751[*]

Note: * = p < 0.01, ** = p < 0.05.

Fig. 8. Loss of desire lines in the Lower Eastside of Detroit, 2010–2016.

result was highly unexpected: Detroit is rapidly losing its desire lines. In a span of just six years (2010–2016), the spatial extent of desire lines decreased by 70 percent (from 23.7 to 7.06 miles [38.3 to 11.4 km]) in

the LEAP study area. In this dynamic landscape, 758 desire lines present in 2010 were no longer visible in 2016 (Fig. 8). Almost half of the parcels that lost desire lines were on publicly owned land. Over this period, residents also created ninety-nine new desires lines. One might expect lost lines to be primarily those classified as "lightly used," as they would seem to be more ephemeral, but this was not the case. The proportion of heavy, medium, and lightly used desire lines lost corresponds with the proportion of each in 2010.

So what is the primary reason for this rapid loss in desire lines? The loss in the Lower Eastside from 2010 to 2016 varies significantly by neighborhood. In Indian Village, for example, less than 50 percent of the lines were lost, but in the Foch neighborhood, this total was almost 90 percent (Fig. 9). This neighborhood difference is not explained by income or ethnicity. Rather, the density of lines is highly correlated with the level of vacant land in a neighborhood (Fig. 10), as it was citywide in 2010. It is not surprising, therefore, that the two LEAP neighborhoods (Foch and Jefferson/Mack) where vacancy percentage decreased the most between 2010 and 2016 also had the greatest decrease in desire-line density. This raises the question of whether the lost lines are directly attributable to changes in parcel ownership and subsequent development, including fencing. Foreclosure and demolition activity are often good indicators of changes in parcel status, so we analyzed both in these two neighborhoods.

In the Foch neighborhood, only two demolitions took place on parcels that lost desire lines (Data Driven Detroit, 2015b). Although foreclosures seem to play a role, with thirty-seven desire lines lost on parcels that had been foreclosed, only one of those parcels was not eventually part of Hantz Farms (Data Driven Detroit, 2015a). Indeed, of the 141 desire lines lost in the Foch neighborhood, 82 percent (115 in total) were located on parcels owned by Hantz Farms (Fig. 11), which demolished and cleared structures and planted trees on 1800 parcels (Hantz Farms, 2018). These lines represent almost twenty percent (3.26 miles or 5.25 km) of the total distance lost in the entire LEAP area. Thus, in this neighborhood, changes in land ownership and management practices seem to be a highly significant source of the loss.

In the Jefferson/Mack neighborhood, demolitions and foreclosures took place on only five of the 416 parcels that lost desire lines (Data Driven Detroit 2015a, 2015b). We randomly selected ninety-nine of these parcels and examined land use change on them using Google Earth aerial and street view imagery. On twenty-four parcels, we
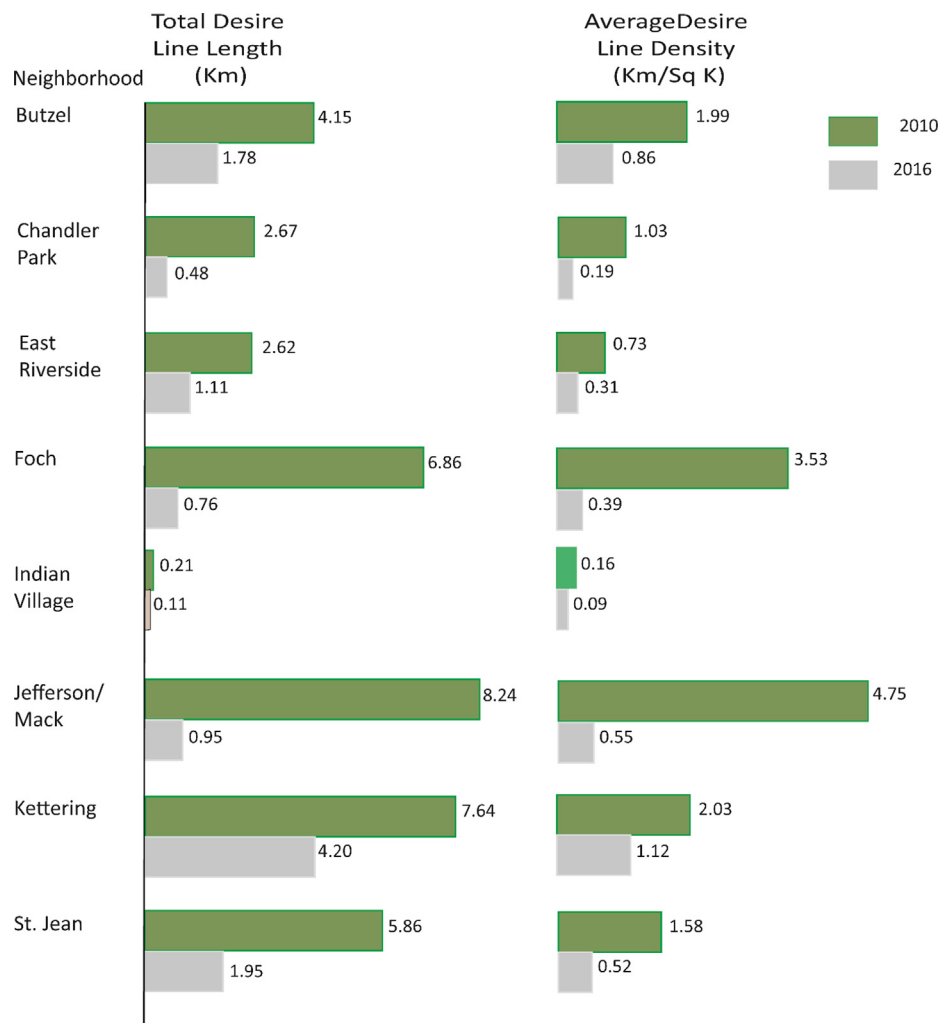
Fig. 9. Loss of desire lines by neighborhood in the Lower Eastside of Detroit, 2010–2016.

observed a shift in management practices: seventeen were mowed, three were fenced, two were used for gardens, and two for parking. Four of the desire lines counted as lost were actually digitizing errors due to faint lines that we did not initially identify. The remaining seventy-one parcels were all overgrown with tall grass and thick weeds. This suggests that desires lines, even heavily used ones, can be ephemeral. Furthermore, changes in land-use practices can influence the loss of desire lines, whether from increased management and oversight, as with Hantz Farms, or from increased neglect and weedy overgrowth, as with the majority of the Jefferson/Mack parcels we investigated.

5.1. Desire lines are important for mobility

So what are the impacts associated with the loss of desire lines in the Lower Eastside? Our network analyses revealed the potential of footpaths to increase mobility and access. They serve as shortcuts that reduce the distance necessary to travel between point A and point B. We compared the shortest distance between 131 random origin–destination pairs on a transportation network with and without desire lines. We found that adding desire lines to the transportation network along with roads and alleys saved an average of 20.58 feet (6.27 m) per route. The largest reduction in travel distance was 798 feet (243 m), and 13.2 percent of routes were shorter due to the ability to use desire lines as shortcuts. To see how desire lines affect longer journeys, we analyzed four full transects across the entire LEAP area and found that the use of

desire lines could save over a total of half a mile (800 m) in travel distance. Through closest facility analysis, we tabulated the shortest routes between eight businesses and hypothetical households, finding that, on average, one-fifth of the shortest distance consisted of desire lines. Another way that desire lines increase mobility and access is by increasing the number of available destinations within a certain distance. We found through our service area analysis that adding desire lines to the transportation network increased the total number of accessible businesses and bus stops within a quarter mile (400 m) of ten origins from 141 to 158 (Fig. 12).

Loss of desire lines has a clear impact on travel distance from points of origin to destinations. In terms of impact on residents of the Lower Eastside, this loss of mobility can be visualized by illustrating how loss of desire lines affects a route between origin and destination. Fig. 13 shows the shortest route from home to a school (the Detroit Lions Academy, a middle school) in 2010 and 2016. Here, the loss of a desire line providing a shortcut increases the travel distance by over 40 percent. These network examples provide evidence of how desire lines can increase mobility and accessibility, making their loss a serious challenge to the LEAP community.

5.2. Physical audits and behavioral observations

Our physical audits of randomly selected census blocks containing desire lines (forty-six in total) indicate they are predominantly located in single-family neighborhoods. Auditors rated over half (57 percent) of
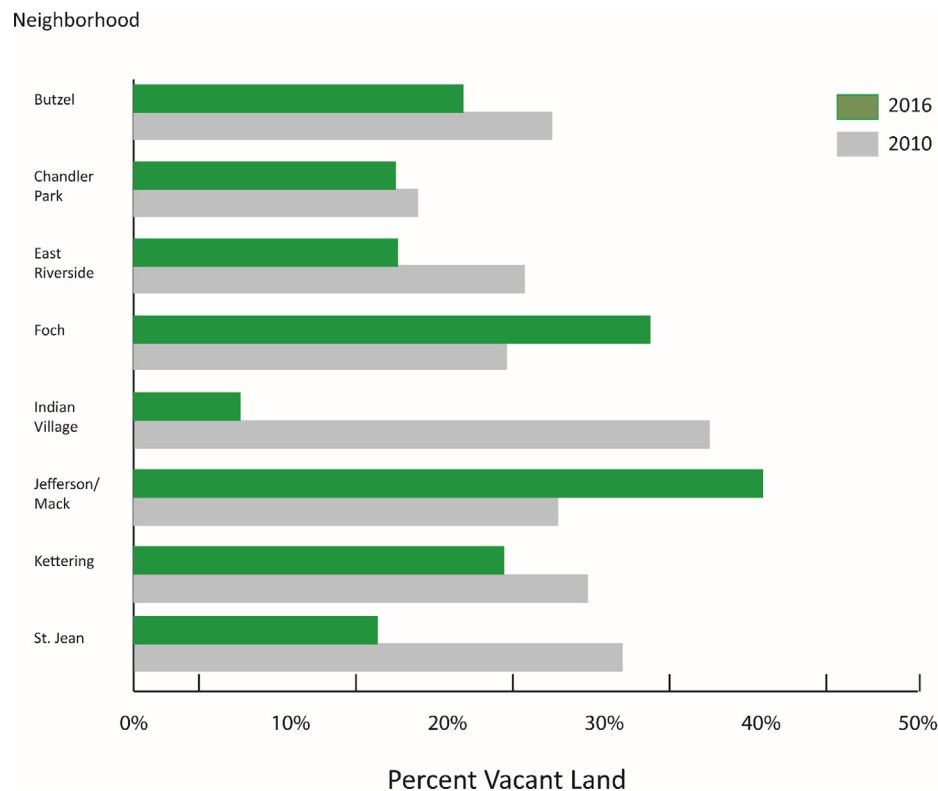
Neighborhood

Fig. 10. Change in vacant land by neighborhood in the Lower Eastside of Detroit, 2010–2016.

these blocks as either average (46.1 percent), attractive (6.5 percent), or very attractive (4.4 percent). The remaining blocks were rated either unattractive (26.1 percent) or very unattractive (15.2 percent). While slightly under a fifth of the blocks had large amounts of small litter items, only 4 percent had large quantities of big litter items (e.g., car tires and furniture) and none had large amounts of "risky" litter (e.g. alcohol containers, beer caps, condoms, and drug paraphernalia). Signs of life included parked cars (93 percent of all blocks), chairs or benches (41 percent of blocks), advertising signage (35 percent), private signage (30 percent), and sports equipment (24 percent). Animals were also frequent signs of life, both companion animals (24 percent) and wildlife (9 percent).

The behavioral observations of these blocks with desire lines revealed that both people and animals are using these landscapes for a wide range of activities. The most common were sitting (25 occurrences, 44 participants) and walking (24 occurrences, 27 participants). Other activities observed included biking, socializing, and standing. The frequency of walking and biking shows the importance of non-automotive forms of mobility in the LEAP area. There were a range of uses by animals (10 occurrences, 22 participants). We observed birds (17), cats (10), dogs (4), and squirrels (2). These observations of humans and animals sharing the same spaces resonate with other research on nature and cities (Hinchliffe & Whatmore, 2006).

5.3. Resident perceptions

To understand how residents use and perceive desire lines, we interviewed residents in the Lower Eastside. Respondents who frequently used them cited their use partly as an antidote to poor transportation options. Given the low levels of vehicle ownership in the LEAP area (Lee et al., 2017), this is not surprising. Infrequent and/or inconvenient bus service was a common concern, as one respondent explained:

The bus system comes through here, but it's not all that reliable and the timings aren't that often, so it's a little rough for some people.

They have to walk all the way up to Jefferson [the major East-West artery in the LEAP area] just to get a bus.

Participants felt cut off from other parts of the city and its amenities, such as the Detroit River. Others felt the neighborhood was like an island and separated from downtown and midtown.

According to a Detroit Food Policy Council report (2012), improving public transportation is the number-one issue needed for the city to thrive.

Participants thus stated that desire lines were a response to these accessibility and mobility challenges. Those who used desire lines for such reasons did so almost exclusively for convenience, to reduce travel distances, and to save time. As one participant explained:

Rather than going all the way down to the corner … if there's a footpath going straight through, it's nice to have those. So we use 'em to get from one place to another, shortest distance between two points, that type of thing… . It's just a convenience … if there's a shortcut, we take it.

Some participants did not use desire lines but nonetheless commented on their use in similar terms: "Instead of walking all the way around in terms of the sidewalk, they'll cut through a vacant lot in order to get where they're going."

Despite the strong emphasis on desire lines as shortcuts, a few residents indicated that they use the footpaths out of curiosity. As one resident expressed her reason for using desire lines, "A lot of times, I was just curious … as to what was there and … what used to be there and try to imagine." Several residents also stated that it was important to preserve the desire lines to maintain their benefits. For some this meant mowing and maintenance, for others a more permanent solution, such as the suggestion by one participant: "Let's just put the bricks on the path and connect that … their preservation is important."

Some participants, however, did not use desire lines, feeling they were a negative feature of their neighborhoods, citing safety and aesthetic concerns. We did not find any demographic patterns (e.g., age,

Fig. 11. Lost desire lines on Hantz Farms parcels in the Foch neighborhood, Lower Eastside of Detroit, 2010–2016.

race, gender, class) behind these differing uses and perceptions of desire lines. Some were especially worried about children's safety and identified lack of visibility as a prime indicator of unsafe routes and areas. As one participant stated:

> I see kids do that on the way to school, and I try to talk to the parents and tell them, "Have your child stay out on the street. Don't go through no shortcuts 'cause if something happened, he [*sic*] won't be visible at all times."

Others felt that desire lines signified disrespect and decline. Connecting safety and aesthetics, one participant said that they were concerned about users of desire lines in their neighborhood, because of "Their safety and also the way it makes the lot look, especially if they have nice grass, it makes a pathway, it kills the grass." Another suggested that desire lines were created in lots that gave off visual cues of abandonment:

> Yeah, they're the one that people just don't care, they go, "Okay, well, this is a short cut." But when they see the grass cut and see little nice stuff, they'll say "Well, that's somebody's lot, they own that, so I better not walk through there 'cause they might say something." So they respect it more because they be like, "Well, it's nice and clean so we know somebody own that."

These aesthetic and safety concerns are consonant with other research in the LEAP area and other city contexts. Travel behavior surveys indicate both women (43 percent) and men (37 percent) were fearful of crime while walking during the day, increasing to 76 and 72 percent at night, respectively (Lee, Vojnovic, and Grady 2017). Kinder (2016) found that, although residents downplayed hyperbole from outside news sources about crime in Detroit, they nonetheless felt safety was a prominent issue. Previous research from Los Angeles on alleys, a similarly liminal urban space, also found that some residents felt they were unsafe and aesthetically unappealing (Wolch et al., 2010). Brownlow (2006) found similar results in Cobbs Creek Park in Philadelphia, where abandonment and overgrowth created an aesthetic of fear in the once popular park.

In summary, for some residents, desire lines are convenient shortcuts that reduce travel distance and enhance mobility and access, while for others they represent abandonment, decline, and unsafe liminal space in the urban fabric.

6. Discussion

The creation and loss of desire lines reminds us that landscapes such as Detroit are dynamic – an ongoing dialectical interplay between the objectives and tactics of state structures (i.e. government institutions for the protection and maintenance of society), capital, and those of human agency. Desire lines reveal issues with non-participatory planning, where top-down decisions have forged a transportation infrastructure poorly aligned with the needs and desires of residents, leading them to create their own pathways and shape urban infrastructure and mobility accordingly. Property speculation, land grabs, and redevelopment lead to changes in land ownership and management practices – key factors behind the loss of desire lines in the Lower Eastside. Indeed, this dynamic reminds us that the state, capital, and the
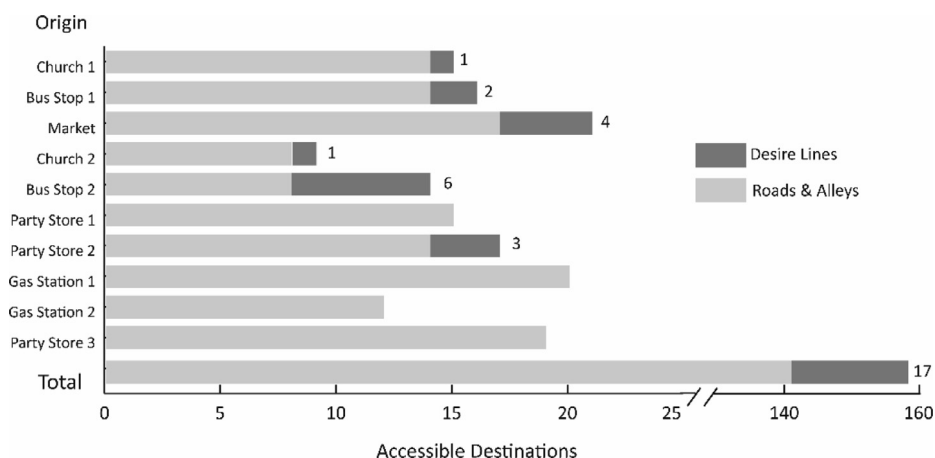

Fig. 12. Increase in accessible destinations due to desire lines. Note: Figure represents the number of points of interest accessible within a ¼ mile (400-meter) service area for each of the ten nonrandom origins.

(A)   (B)

Fig. 13. A–B. Loss of desire line (2010–2016) led to longer travel distance between home and school.

everyday practices of local residents continually (re)construct the material and social landscapes of cities. Cities are indeed processes, not products.

In this discussion, we reflect on the role of human agency in claiming a right to the city. Specifically, we draw on three concepts (*autogestion*, *people as infrastructure*, and *everyday urban walking*) to consider how agency asserts itself in the modern city via desire lines, and why this is important for generating progressive urban futures. But we also reflect on how the impermanence and liminality of desire lines reveals the limits of agency and informal practices and, therefore, the need to connect to broader structures of power, such as institutions. We conclude by illustrating how residents can realize their rights to the city through creative engagements with the state to formalize selected desire lines. These engagements are often struggles and serve to illuminate the tensions between structure and agency in the planning, creation, and management of urban space.

6.1. Desire lines and human agency

Lefebvre's (2009) notion of *autogestion*, or democratic self-management, is an emancipatory concept in which urban residents' appropriate space for a desired use. Autogestion is spontaneous and sprouts up in weak points, voids, or lacunae in social structures. Vacant land can be seen as such and so residents create desire lines through the happenstance of footsteps tracing the same ground repeatedly (Luckert, 2012). In this sense, residents are literally taking back public or liminal space. This destabilizes orderly relations in physical space, opening up possibilities beyond state control. Desire lines are an expression of human agency, of self-management and self-determination, similar to how residents re-imagine and redevelop the city in a manner responsive to needs, desires, and pleasures in claiming their right to the city (Mitchell, 2003: Purcell, 2014).

Simone's (2004) *people as infrastructure* asks us to reflect on how people's daily activities in the city and their interactions with urban form and flow are in essence a form of infrastructure. These infrastructures of everyday life are much different from the infrastructures that typically imprint themselves on the city, through state and federal mega-projects like highways, energy grids, and water systems. Desire lines as shortcuts to improve mobility and accessibility are responses to

the failure or abandonment of traditional transportation infrastructure. They offer opportunities for those marginalized or abandoned by infrastructural neglect and inefficiency to make their way through the city. People as infrastructure multiplies possibilities beyond those provided by the state and by capital. Understanding how people create their own infrastructure for everyday life counters narratives that discursively position Detroit as a *terra nullius*, a blank slate for inscribing redevelopment (Millington 2013; Safransky 2016, 2014, 2018; Fraser, 2018).

For De Certeau (1984), walking the street is a *tactic of everyday life*, a notion embraced by scholars who laud everyday urban walking for its ability to increase local agency (Gros, 2015; Sletto & Palmer, 2016; Smith and Walters, 2017). Effectively, urban residents create desire lines as routes and routines in liminal spaces between the structural constraints of capitalist urbanization and state surveillance. The everyday becomes a site of agency (De Certeau, 1984; Nightingale, 2011), in which individuals are both making places and are being made by them through a continuous co-constitutive, relational process (Bendiner-Viani, 2013; Edensor, 2000; Wylie, 2005). As Solnit (2000, 213) writes, "a city is a language, a repository of possibilities. Just as language limits what can be said, architecture limits where one can walk, but the walkers invent other ways to go."

But whose agency is being affirmed through this everyday walking? Walking is mediated by power, race, class, and gender, limiting where, how, and with whom one can walk in the city (Cadogan, 2016; Middleton, 2018; Scalway, 2002; Warren, 2017). These critiques lead one to consider whether desire lines increase the agency of all residents and whose rights are being affirmed and whose are being suppressed. As an example, our findings suggest desire lines increase agency and a right to the city for some but not all residents in the Lower Eastside. Some Detroiters view them as dangerous spaces, especially those footpaths that transect overgrown parcels. This is a loss of agency and security in terms of moving across the urban fabric. In addition, the aesthetic of abandonment that desire lines represents for some, contrasts with preferences for orderly, mowed, and maintained landscapes. For such respondents, desire lines increased safety concerns and signify neglect and neighborhood decline. Kinder (2016) and Herbert (2018) found similar concerns in their research on neighborhood dynamics in Detroit.

6.2. Desire lines and impermanence

Spaces and routes are often liminal (Sletto and Palmer, 2016). Some desire lines last years and others quickly fade away. Our results quantify the impermanence, with the city's Lower Eastside losing almost three-quarters of its footpaths in a span of just six years. So while desire lines reveal the power of human agency to appropriate space as a human right to the city, they also reveal the limitations of this agency, of informal practices in a dynamic urban landscape continually reshaped by governance structures and capital. So what is the potential for scaling-up these informal practices by formalizing desire lines and making them a durable feature of the built environment?

For some, formalizing desire lines would represent cooptation by the state. Luckert (2012) argues that the spontaneous and creative expression of desire are lost if footpaths are rendered permanent. Indeed, sanctioning them reduces their desirability. In contrast, for Smith and Walters (2017) formalizing footpaths serves to concretize desire and forge an urban space that accords with residents' preferences. Others such as Kinder (2016) have noted the difficulty in scaling-up these urban self-provisioning practices and they often failed to transcend racial and class-based forms of exclusion and control. But Kinder (2016) nonetheless affirms that informal practices need to be actively supported rather than abandoned by connecting them to larger processes and power relationships.

6.3. Desire lines as formal features of the urban fabric

For us, making some desire lines permanent can advance residents' right to the city. They serve as shortcuts and mobility corridors and are creative and expressive uses of abandoned land. Formalizing them may also reduce safety and aesthetic concerns, as occurred with alleys in Los Angeles (Wolch et al., 2010) and other cities (Newell et al., 2013). Regular maintenance, mowing, and landscaping of parcels containing formalized desire lines would address residents' concerns about overgrown lots where the lack of visibility makes pathways unsafe and the appearance of neglect signals a lack of stewardship.

However, successfully doing so hinges on the process and the purpose. Well-intended urban redevelopment strategies can further marginalize residents by failing to account for socio-economic activities already underway (Safransky, 2014; Wolch et al., 2014). Displacement of residents and their informal land use practices can occur if they are not included in plans for neighborhood change (Hackworth, 2018). Urban environmental improvements can paradoxically have negative repercussions for residents due to increasing housing costs and property values, ultimately leading to gentrification and the displacement of residents in communities where vacant land is repurposed as part of the redevelopment process. Scholars have termed this environmental gentrification, green gentrification, or eco-gentrification (Miller, 2016; Pearsall, 2010; Quastel, 2009).

Thoughtful co-design and inclusive planning can help mitigate this phenomenon. We began this project by working with the community group, LEAP, which is developing creative reuses of vacant land. The creation of formalized footpaths aligns with their goals of multifunctional greenspaces. Involving grassroots groups such as LEAP and residents more broadly in the co-design of their neighborhoods not only increases their satisfaction with the results, but inclusion of this expertise and local knowledge creates more realistic outcomes (Lovell & Taylor, 2013). Digital technologies hold much promise for such participatory planning, whether app-based (Wilson, Tewdwr-Jones, & Comber, 2017) or through immersive visualization (Lindquist, 2007). To inform local planning processes, we shared our results with the sustainability and planning departments in the city of Detroit, who are leading neighborhood redevelopment efforts. Desires lines are now being considered in these redevelopment efforts. A map of desire lines for the Jefferson Chalmers neighborhood in the Lower Eastside was presented at a community meeting and residents voted pedestrian

footpaths as the second most popular option (after tot lots) for the reuse of vacant lots (City of Detroit, 2018).

Strategic choices need to be made in terms of which desire lines should be formalized, where, and for whom. Urban design analysis, similar to the modeling of pedestrian behavior and spatial accessibility provided by consultants such as Space Syntax, could be used to determine which desire lines to preserve (Bates, 2017). One can prioritize based upon usage, with the most heavily used footpaths that have worn grass down completely through repeated use representing the greatest accumulations of desire. Residents are quite literally "voting with their feet" for the preservation of certain desire lines and not others. One can prioritize based upon what are deemed essential destinations, such as the route to school featured in Fig. 13. A third possibility is to prioritize neighborhoods facing the greatest mobility challenges. Areas lacking public transportation access, car ownership, and maintained sidewalks could benefit the most from having more formalized pedestrian infrastructure. Following the participatory approach outlined above, planners could work with residents to determine which desire lines they feel are most important to preserve in their neighborhoods.

The preservation and maintenance of desire lines in Detroit would make them formal, sanctioned footpaths, illuminating the dialectical relationship between top-down and bottom-up planning, creation, and management of urban spaces. Individual desires have accumulated to create a collective expression and materialization of desire. From both the efficiency and resistance perspectives, residents are using their feet to write a story in the urban fabric about their desired transportation infrastructure, to talk back to power, and to be heard in a conversation that is far too often one-sided. Recognizing and acknowledging their desires is recognizing their rights to the city. Productive tensions between resistance and power are in constant negotiation to construct desired urban spaces and practices. Recognizing these tensions problematizes the simple binary between cooptation and resistance, allowing for a more nuanced conception of structure and agency in the city. Indeed, this engagement between informal and insurgent urbanisms and the state can harness the creative imaginaries of the former and the resources of the latter to realize new urban landscapes. Such engagements are a first step toward realizing the desires of all Detroiters.

7. Conclusion

This article presents the first census of desire lines for a major city. In response to intense vacancy and mobility challenges, Detroit's informal pedestrian practices have created an infrastructure of over 150 miles (< 240 km) of desire lines. This landscape is highly dynamic, with the city's Lower Eastside losing almost three-quarters of its desire lines between 2010 and 2016. Neighborhood-level analysis revealed that the loss of desire lines resulted from enclosure and maintenance or increasing levels of abandonment. We found that desire lines increase mobility and accessibility, making their loss a major concern in an area with low levels of car ownership and public transportation. LEAP residents primarily used desire lines for convenience, as shortcuts to address mobility and accessibility challenges of everyday life. Despite this benefit, other participants did not use desire lines and felt they were a negative presence in their neighborhoods due to safety and aesthetic concerns. These contradictory results reveal some of the conflicting spatial imaginaries for Detroit's future.

Beyond the efficiency provided by desire lines as shortcuts reducing travel time, they also need to be considered from the resistance perspective as struggles for more creative urban possibilities and agency. However, our results illuminate the difficulty in scaling up the progressive potential of desire lines and other informal urban practices over space and time. Indeed, others have previously cautioned against relying upon informal practices, both in Detroit (Kinder, 2016) and across the Global South (Bayat, 1997; Roy, 2011; Scott, 1998). A sustained engagement between bottom-up initiatives (driven largely by

human agency) and top-down institutional policies, plans, and practices would nuance distinctions between resistance and co-optation, acknowledging demands for the right to the city through formalizing and preserving desire lines. Managing and maintaining selected desire lines would help preserve this embodied infrastructure of everyday life, much as we did in creating highway systems in Michigan and across the world.

Acknowledgements

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